AN25103

Gunn Point Clay Investigations 2011-12

Distribution:  1. Midglex Pty Ltd
               2. Micronised Mineral Solutions Pty Ltd:
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Reference Materials:
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Amdel Laboratories – Adelaide
Baker Hughes Australia
Micronised Mineral Solutions Pty Ltd (Laboratory)
SNF Floeger Andreieux, France.
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Figure I: Gunn Point AN 25103 tenement boundary on topographic base.
2. *Exploration Summary 2008-2012*

This report outlines historical exploration data and our investigations through April 2008 and includes our conclusions for the continuation of exploration over the area during the dry season of 2010-11, 2011-12 and the progress made from the collection of fresh samples. Mineral comparisons were made with local and international product currently in use for the offshore oil & gas drilling industries.

With consideration for the initial results obtained, it has been ascertained that swelling clays, vermiculite and smectite exists within the zones between 20 & 28m depths these results have provided us with enough incentive to re-apply for the entire 3 blocks and to undertake shallow sample drilling or costeaming in the areas due west of drill holes 12 - 16.

The area selected for sampling is intended to provide us with access to target zones using the natural descending contours of the landscape and to further explore the extents of the zones of interest across the axis of the original linier drilling pattern. The drill hole areas 12-16 contained the core samples of interest in which our analysis re-confirmed the presence of montmorillinite.

**Reviewed as follows:**

Authorisation (A)25103 was granted to Leon Tarrant on the 19th of March 2007. As part of a detailed investigative strategy, drill core from a selection of drill holes (Lau 1973) was sampled and analysed for chemistry and mineralogy to confirm previous analysis and to characterise the clay phase. Drill holes M9 to M16 currently lie within the granted Authorisation (A)25103. The drill core from these holes was sampled according to the identified clay horizons, (Lau 1973).

Three composite samples, representing the white kaolinitic band, the pale brown weathered clay and the grey clay were prepared from the samples collected. Additionally three individual samples representing particular sections of interest were selected for qualitative and quantitative analysis. The major element chemistry (using XRF) shows considerable variation between the 6 composite samples (refer table 3). However this variation falls within the ranges noted by (Lau 1973). Some notable observations include:

- Less silica associated with the Kaolinitic clay phase.
- Decrease in Alumina associated with the Vermiculite/Smectite clay phase.
- Increased iron associated with the Vermiculite/Smectite clay phase.

It is, however exceedingly difficult to draw any specific conclusion regarding the clays minerals present using this approach.

Clay mineralogy determined by XRD and Siroquant identifies all samples as containing the following suit of clays.

- Major Kaolinite
- Major Vermiculite except for MMS1 and 4.
- Minor mica, probably muscovite.
As well as the above clays the samples contain major quartz. However the vermiculite composition, refer table 3 does not look very probable having insufficient Al, Mg or Fe for any known vermiculite.

Additional tests conducted on a minus 2 micron separated clay fraction included glycolation heating and cation exchange capacity.

Eggleton (Appendix 2) concludes that the identity of the swelling clays is vermiculite based on its 15:4 A basal spacing glycolated its collapse to 10-A on heating and the high correlation of implied CEC’s of 90 meq/100g (sample MMS 5).

This analysis has confirmed the following of the Gunn Point clays:

- Kaolinite appears to be ubiquitous in all samples ranging from 20% to 75%.
- The swelling clay phase is most likely to be vermiculite and restricted to no more than 40% of the samples tested.
- The major non clay mineral is quartz and ranges from 14% to 25%.

Further testing (Mg saturation) of the swelling clay is required to conclusively identify and unravel the complex nature of this clay phase.

Following on from the comprehensive investigations of the samples at hand and as per the figures below the author can only conclude that;
Figure II:

The core samples are unlikely to provide us with a comprehensive and competent analysis and this is evidenced by the substantial variations in XRF element chemistry per Figure III compared to the latest testing Figure VII.

Production of new samples must be obtained to better explore the mineral composition within the target zone by either augur drilling or consteaning as per our projected program 2010-11.

Appendix 1 XRF major element chemistry

<table>
<thead>
<tr>
<th></th>
<th>MMS1</th>
<th>MMS2</th>
<th>MMS3</th>
<th>MMS4</th>
<th>MMS5</th>
<th>MMS6</th>
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<td>SiO₂</td>
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<td>55.67</td>
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<td>TiO₂</td>
<td>1.52</td>
<td>1.00</td>
<td>1.05</td>
<td>1.00</td>
<td>0.96</td>
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<tr>
<td>Al₂O₃</td>
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<td>23.72</td>
<td>20.91</td>
<td>24.02</td>
<td>15.73</td>
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<tr>
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<td>5.75</td>
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<td>S</td>
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<td>0.53</td>
<td>0.03</td>
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<td>99.39</td>
<td>99.70</td>
<td>100.33</td>
<td>100.42</td>
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</table>

Figure III:
The results (Lau 1973) indicated the presence of an extensive and laterally uniform layer or white (weathered) kaolinitic clay of varying thickness ranging from 15 to 25 metres. This layer overlies unweathered montmorillonitic claystone;

On this basis the author considered that the montmorillonitic clay may cover an extensive area as it is evidenced that the kaolinite extends northward along the shoreline and is exposed on the minor cliff face 4.5 kilometres from the area where the montmorillinite clay has been reported by Lau (1973);

Fig: IV, Blue line extending from Sth to Nth.

*Figure IV:*

Costean sample area
12-17-04 S
131-02-04 E

The three sites marked with the black cross and light blue fill have been marked and GPS logged as the target areas for costean exploration. These points vary in distance from the (Lau 1973) drill sites by between 1.5 & 2.5 kilometres. After achieving such good sample results from the most northern of the three areas chosen no more costeans were considered necessary for the 2010-11 exploration season.

A minor costean program was planned and undertaken. The first costean resulted in the exposure of the montmorillinte clay phase at 6m depth. See *Figures V:*

This result confirmed that natural weathering has eroded the overlay of gravels and kaolin which may be considered to allow economic recoverability of the bentonite for commercial production and sale. Note the expansive nature of the clay when exposed to air for only a short time.
Due to the overwhelming success of the first costean two more costeans were constructed in a linear track northward from costean one.

See cross sections 1-3
Sample buckets were filled from each of the costeans at approximately 20kg each. The costeans were ramped and bunded for ease of access and backfilled after each sample was taken to prevent fall or entrapment of wildlife. The costeans were completed over a two day period using a 29 metric tonne excavator.

Access to the area was via the cleared boundary adjacent to the Nature Reserve. A relatively bare area was chosen for the construction of the costeans with the minimisation of the removal of flora. This was of primary consideration. The costeans were backfilled and compacted using the excavator.

**Figure VI.**
3. Introduction

The Gunn Point project is located between Gunn Point & Tree Point, Shoal Bay, and approximately 30 kilometres North East of Darwin.

The clay deposit is located parallel to the coastline to the south of Gunn Point and occurs in weathered mudstone of the Wangarlu Formation.

Rix (1964) and Lau (1973) showed that the white clay is Kaolinite and suitable for heavy clay ware, stoneware pottery and low grade pigment. Also identified in these early investigations (underlying the Kaolinitic horizon range – 7 to 26 metres) is a horizon of dark grey montmorillonitic clays, considered suitable as blending clay to improve extrusion or moulding properties and increase “green strength of cast products.

Two samples of Rix (1964) were tested at the CSIRO Division of Building Research and the results indicated that the dark claystone is montmorillonitic rock of high plasticity that has very strong mechanical properties in the green state.

In 1965 The Northern Territory Mines branch drilled a cored hole (Gunn Point DDH1) through the Wangarlu mudstone to basement. A further 16 holes were drilled in 1972 to a depth of 30 metres and two holes to 60 metres (McMeekin 1968)

The results (Lau 1973) indicated the presence of an extensive and laterally uniform layer or white (weathered) kaolinitic clay of varying thickness ranging from 15 to 25 metres. This layer overlies unweathered montmorillonitic claystone.

Well preserved drill core from both historic investigations, Rix (1964) DDH1 and McMeekin (1968) M1 – m19 are stored at the Core Facility NT Geological Survey Darwin.

The Gunn Point clay deposit is currently covered by Mining Reserve Authorisation (A)25103 and currently held by Leon Michael Tarrant.

In November 2007 Micronised Minerals Solutions Pty Ltd which Leon Tarrant is now the 100% stakeholder, undertook to further investigate the Gunn Point clay deposit.

The emphasis of this proposed program was to:

a. Validate existing knowledge (Lau 1973) of the Gunn Point clays
b. Use modern analytical methods to characterise the clays
c. Confirm the economic potential of a swelling clay resource
d. Make accurate resource estimates.

The onset of the 2008 wet season (December to March) precluded any new drilling or bulk sampling to take place prior to April 2009. Instead the immediate focus of this investigative activity was to use the existing drill core to make some initial assessment on the nature of the clays, particularly the identified swelling clays and the feasibility for further exploration.
4. **Native Title & Clearance**

The tenement is wholly incorporated in the Mining Reserve depicted as RO 239, NT Portion 3601 and covers some 3 tenement blocks with a total area of four square kilometres. Native Title claimants are registered over the NT Portion 3601 inclusive of the following DC01/22 Gunn Point Road accepted for registration 17th April 2001. Gunn Point gas pipeline accepted for registration 16th October 2001 and Koolpinyah Central accepted for registration 6th June 2002. A further check of issues and clearance will be sought by us in conjunction with our final exploration proposal for 2012 bulk sample.

5. **Location**

AN 25103 is situated within the area nominated as mining reserve RO 239 approximately 30 kilometres as the crow flies North East of Darwin with the Gunn Point and Tree Point area of Shoal Bay. Access is via a well maintained gravel road North East of the Howard River bridge. The clay deposits occur in the weathered mudstones of the Wangarlu Formation.

6. **Physiography and Climate:**

The Gun Point area consists of two features consisting of a minor plateau 26m above sea level which abruptly falls into the Shoal Bay shore line to the west. The area consists of a range native flora species including areas of semi dense and stunted trees to open grasslands towards the coastline, particularly to the South West.

This area has likely been cleared for the grazing of stock. Trees consist mainly of eucalypt with fingerings of paper barks along the stretches of drains and creeks running from the plateau toward Shoal Bay. A small paper bark billabong is located North East of DDH 9.

Due west of the RO 239 and toward the shoreline a larger area of swampland is designated as Coastal Reserve.

Rainfall is comparable with that of Darwin and surrounds with annual totals between 1500 & 2200mm.
7. **Local Geology:**

*Proterzoic Strata 7:1*

Gunn Point (Nott 1994) To the east of Darwin, lower greenschist facies metasediments occur. The Proterozoic strata underwent one major deformation approximately 1800 Ma resulting in tight folds with limbs dipping steeply at more than 50’ (Pieutsch 1983)

*Mesozoic Strata 7:2*

Mesozoic strata in the Darwin region are dominated by the Darwin member of the early Cretaceous Bathurst Island formation include the Wangarlu Mudstone Member and overlying Mookinu Member. The Wangarlu Mudstone Member does not crop out in the Urban Darwin area and is restricted to the region near Gunn Point.

The Mookinu Member is not present at all on the mainland but lies stratigraphically above the Wangarlu Member which in turn overlies the Darwin Member on Bathurst Island to the North.

8. **Summary**

In January 2012 comprehensive laboratory equipment was purchased with the express purpose of developing API-13A drilling grade bentonite from samples taken from Gunn Point in our 2010-11 exploration campaign.

This equipment included the International drilling industry standard Fann SA-35 Viscometer and a laboratory scale drum mill.

Currently 250 hours of laboratory work has been undertaken to determine the best formulae for the beneficiation of the Gunn Point clay. Polymer additions for this application vary considerably in their functionality where acidic mineral oxides and metal ions exist in the clays.

The polymers are both expensive at $5. Per kilogram and are sensitive to the oxides contained in the clay contaminates. These issues present the need for an extensive testing regime and input by broad group of experienced consultants and drilling industry experts.

This report outlines the development of the Micronised Mineral Solutions Pty Ltd (MMS) company and its continued exploration of the Gunn Point clay deposits.

Included in this report are the current investigations by MMS for the effective beneficiation of the Gunn Point montmorillinite clays.

Micronised Mineral Solutions Pty Ltd is a Darwin based company, incorporated 4th July 2007. The incorporation of this new entity was undertaken to take the place of Midglex Pty Ltd and as a material change from the importation and trading of commodities to “local producer”. MMS and its associated companies have been supplying barite and bentonite minerals for the Oil Gas drilling and cattle cube feed industries for in excess of 13 years.
Since 1999 the company has secured contracts with Rio Tinto Alcan, Xstrata, McArthur River Mine and agricultural clients including the Peanut Company of Australia, Westfarmers, Landmark. MMS was granted access to several mine sites and conducted tests for Ranger Uranium, The Northern Territory Department of Mines and the Cosmo Howley Mine site owner GBS Gold Pty Ltd.

In 2007 the company was contracted by Compass Mining & Resources PL to build and operate a 120,000 metric tonnes per annum calcium carbonate milling operation at their Browns Creek Copper and Oxide plant 100km South of Darwin.

MMS constructed the plant on site at the Compass Mine and commissioned the mills in August 2008. MMS produced 3000mt of ground lime prior the premature closure of the mining and processing operations in 2009.

In January 2011 MMS purchased 15500 square metres of industrial land located within the East Arm Port Precinct of Darwin Northern Territory. The land was purchased as a suitable site for the reconstruction of the milling plant removed from the Compass Copper mine.

MMS had undertaken 13 years in the research and use of Gunn Point clays for use in drilling mud production and as binder and filler materials for general industry. Under an agreement with the owners of the Dorisvale barite leases, the company now the opportunity to supply both these large volume products into the Western Australia, Queensland and the Northern Territory Oil & Gas drilling markets.

This research was pivotal in the decision to purchase land for the mill relocation as a result of the Compass Mine closure, the mills have since been relocated and commissioned in Darwin’s East Arm Precinct.

All three products are imported and are in current use for oil and gas drilling. The company Midglex Pty Ltd has been actively engaged in the marketing and importation of bentonite clays for a number of years now.

The clays used by manufactures of API bentonite are of medium grade at best and are treated with Polymers and soda ash to increase yield.

The author now considers that there is real potential for Gunn Point clays to provide the impetus to replace the current imports of expanding clays for both the drilling and other industrial markets.

Vermiculite / Smectite clays have a broad range of uses and my company markets these products for sealing of dams, oil well and water drilling and lubrication of cattle feed compression dies.

I have recently engaged the services of suitably qualified and experienced technicians to help undertake laboratory scale manufacturing trials of Gunn Point clay to API drilling standards.

In late 2011 MMS met with three major drilling fluid manufactures in Perth Western Australia seeking interest in the purchase of locally produced barite and bentonite.

The outcomes of these meetings now include expression of interest for the purchase of barite in July this year and for trial quantities of bentonite to be available by the third quarter of 2012.
**Background**

Barite and bentonite are the two largest consumer products used in the production of drilling mud. The Chinese become the largest suppliers of barite in the early 1980’s producing and supplying 70% of the world’s market, the greater majority of which was used in the production of Oil & Gas drilling muds.

In recent years the Chinese Government has put in place taxes and greater restrictions on the export of low value mineral products and in particular barite used for oil well drilling in favour of higher value added products such as barium carbonate and filler grade barium used in paints and plastics.

These restrictions have compelled many of the large global drilling companies to look for more regional supplies and has provided opportunities for Australian mineral producers and with a competitive position replace imports.

Bentonite being the second largest drilling mud commodity had been traditionally produced from the State of Wyoming in the USA for much of the world market. With rising production and international freight costs, the expanding global oil and gas exploration markets has compelled mud companies to look at regional options for the rationalised supply of this important product.

Currently India is the cheapest source of reasonable quality bentonite, the cost of international shipping and distance from the Pacific Rim regions like Australia, has further enhanced opportunities for Northern Australian producers.

**Bentonite and Barite :**

As discussed earlier in this report rationalisation for the supply of barite and bentonite is a key factor in the economic success of drilling mud companies, it is equally important for the regional supplier to provide both products in order to mitigate ship charter and change their importation rationale.
10. Results / Reviewed

Bentonite samples were sourced for the local mud company Baker Inteq for comparison purposed in addition to bentonite product in use in Indonesia and America.

Minerals analysis was undertake by Amdel in Adelaide and the comparisons are chartered as per below. Figure VII:

Figure VII: Source Amdel Laboratories
The minerals analysis provided comparable mineral quantities particularly when compared to the product in use by Baker Hughes for Timor Sea drilling.

These results prompted MMS to engage the services of a Perth based consultant Intachem Pty Ltd and the purchase of American Petroleum Industry (API) standard mud testing equipment from overseas.

Using the benchmark products provided by two drilling mud companies, Baker Hughes and Unichem MMS undertook an extensive a series of tests, to API-13A standard for drilling mud.

These tests provided evidence that the Gunn Point bentonite required some polymer addition to meet the standards required. In consultation with Russell Schroater SNF Australia, recommendations for suitable polymers were made and samples provided to MMS from their international operations in France.

The samples used for the original evaluation were taken from the core library and were limited in number and of questionable quality. This latest round of testing has proven that the quality of the bentonite is close to that currently in use by the local and international drilling sectors.
Materials and Methods.

Acidic oxidants contained in the Gunn Point clays presented some challenges in the development of the clays to the required specifications. With continued input from the consultants and polymer manufactures and approximately 250 hours of laboratory time MMS established repeat results to the required specification using the Gunn Point clays sample.

Figures VIII.

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Materials and Methods Cont:

Figure IX
Materials and Methods Cont:

Figure X.

Drying and milling to <75pU of Gunn Point Clay Samples;
Materials and Methods Cont:

2 x 50” Roller Mills located at East Arm Darwin were commissioned in January 2012.

Figure XI
12. Inferred Resource

Drill hole samples from M12 through to M16 all contained montmorillonite clays at depths of between 22-25 metres, with consideration of the natural weathering towards the coast, the decision to explore the extent of the deposit towards the west provided further evidence of the size of the montmorillonite clay deposit.

Further to this there is strong indication that this resource is extensive and has potential to provide enough product to service the Australian drilling markets in Northern and Western Australia and to import replace products such as Kitty Litter, binder product for cattle feed mills and as a sealing agent for acidated mine drainage retention ponds and solids contaminated leachate sites. Inferred Resource over the target area 17 million Tonnes.

The map on the following page provides continuing evidence of a large resource and the probability that millions of tonnes are contained within the locality of the drill holes and extends for at least 2.4Km to the west.
Location of sample costeans:
12-17' -04" S
131-02' -04 E

Location of proposed bulk sample:
12-17' -50" S
131-02' -14" E

Drill hole locations containing montmorillinite clay.
13. Conclusions

Samples of both barite and laboratory scale drilling bentonite have been sent to Baker Hughes and have been approved as suitable for API drilling mud use.

Baker Hughes have since registered Micronised Mineral Solutions Pty Ltd as a vendor for the supply of drilling products to its Northern Territory and West Australian operations.

It has taken the author over 14 years to get to this position, and has cost in the order of $8,000,000. At age 51 this is somewhat the pinnacle of my career and it has been achieved with gut determination personal and family sacrifice, a huge amount of personal time and money.

I am hoping the Northern Territory Government are able to understand the long term nature of this project going forward and the importance of these products to the rapidly developing Oil & Gas Industries in the region.

14. Bulk Sample Proposal 2012-13:

It is proposed that a bulk sampling exercise be undertaken in dry season 2012 for the purpose of commercial production trials and market testing of the Gunn Point clay as drilling mud for Timor Sea exploration.

Lease applications over the sample sites on AN 25103 will be submitted to the Department of Resources in the coming weeks.