Colluli Potash

SUMMARY
Project Summary

The Colluli Potash project located in Eritrea, East Africa is a large resource, located close to the coast, carrying a composition of potassium bearing salts suitable for low energy, high yield conversion to produce potassium sulphate. The proximity to coast, access to key growth markets, and unique composition of potassium salts significantly and positively differentiate the Colluli resource from both current and planned potassium sulphate production centres.

Potash is a non-substitutable, consumable commodity that is underpinned by strong demand drivers. Growing population, reduction in arable land and dietary preferences, coupled with limited resources suitable for economic exploitation of potassium sulphate, make Colluli a resource of significance for future potassium sulphate supply.

Eritrea’s mining industry, while in its infancy, is growing rapidly and the Colluli Mining Share Company, is advancing the project with a clear focus on developing the right foundational work to develop a platform for growth. South Boulder Mines and ENAMCO are working in partnership to develop the resource and have a strong and effective working relationship.

The pre-feasibility study is well advanced and due for completion in early 2015. The Colluli Mining Share Company will develop the project in a modular fashion to mitigate safety, capital and commercial risk.

The Colluli Resource

The Colluli resource contains over 1 billion tonnes of potassium bearing salts. The three key salts are sylvinite, carnallitite and kainitite.

Sylvinite (KCl.NaCl) is the most commonly used mineralisation for the production of potassium chloride. Large deposits typically exist underground at depths ranging from 400 to 1500m with the most significant deposits being located in Canada and Russia.

Carnallitite (KCl.MgCl_2.6H_2O.NaCl) is also used for potassium chloride production, most commonly from carnallite brines in the Middle East from the Dead Sea.

Kainitite (KCl.MgSO_4.3H_2O.NaCl) is the most commonly used salt for the production of potassium sulphate. It rarely exists in salt form and is typically extracted from brines. Kainite salt in solid form only occurs in volumes of significance in three areas of the world; the Ukraine, Italy and East Africa. Separation of sodium chloride from kainitite gives kainite - a potassium chloride, magnesium sulphate double salt suitable for the production of potassium sulphate. It typically exists in sulphate rich brines which require concentrating by evaporation processes to produce kainite salt.
Table 1: N43-101/JORC compliant mineral resource estimate

<table>
<thead>
<tr>
<th>Occurrence</th>
<th>Tonnes (Mt)</th>
<th>Equivalent KCl</th>
<th>Contained KCl</th>
<th>% of Total Resource</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sylvinite (KCl.NaCl)</td>
<td>110</td>
<td>28.4%</td>
<td>31</td>
<td>16%</td>
</tr>
<tr>
<td>Polysulphate (K₂SO₄.NaCl·MgSO₄·H₂O)</td>
<td>65</td>
<td>10.8%</td>
<td>7</td>
<td>4%</td>
</tr>
<tr>
<td>Carnallite (KCl·MgCl₂·H₂O)</td>
<td>309</td>
<td>12.3%</td>
<td>38</td>
<td>19%</td>
</tr>
<tr>
<td>Kainite (KCl·MgSO₄·3H₂O)</td>
<td>596</td>
<td>19.8%</td>
<td>118</td>
<td>61%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,080</strong></td>
<td><strong>18.0%</strong></td>
<td><strong>194</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Shallow Mineralisation**

With mineralisation commencing at only 16m, Colluli is the shallowest known potash deposit globally and is amenable to open cut mining. In general, open cut mining is a proven mining method that is safer, easier to expand and provides better overall resource recovery relative to underground and solution mining methods, which lose up to 40% of the resource for roof support and subsidence prevention.

The Colluli deposit has a shallow dip of approximately 1° with its deepest point at approximately 140m.

Although in general the potassium bearing salts within Colluli are stratified, all salts are accessible simultaneously from different parts of the deposit. This is a significant advantage as it allows all salts to be processed together. It is one of the unique strengths of the resource.

Open cut salt mining is not new and is conducted in arid operating regions such as the Atacama desert. The Dombrovksi mine in the Ukraine was the first open cut potash mine, which extracted sylvinite and kainite salts from 40m below surface.

**Unique mineralisation provides a low energy, high recovery path to potassium sulphate production**

The most commonly used, low cost process for the production of potassium sulphate is by the addition of potassium chloride with kainite. Kainite represents approximately 60% of the Colluli resource with the remaining salts comprising of sylvinite and carnallitite which are commonly used for the production of potassium chloride. Using simple, proven and well understood processing principles, the sylvinite and carnallite ores can be converted to potassium chloride, then recombined with floated kainite ore. The reaction occurs spontaneously under ambient conditions and provides a high potassium yield relative to other potassium sulphate production processes. The combination of the potassium salts within Colluli allows this low energy, high yield process to occur and is another of the many strengths of the resource.
Potassium yields are further improved using a series of ponds to collect excess brines exiting the processing plant. With highly favourable ambient conditions for solar evaporation, additional potassium salts precipitate from the collection ponds and are recirculated back through the processing plant.
Production of kainite and combining it with potassium chloride is the process used by all major producers having potassium/sulphate rich brines as shown in Table 2.

The three key brine producers globally are shown in Table 2.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Location</th>
<th>Raw Materials</th>
<th>Process</th>
<th>KCI purchased</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Compass Minerals</strong></td>
<td>Utah</td>
<td>Sulphate rich brine</td>
<td>Evaporation followed by flotation and reaction of decomposed kainite with KCl</td>
<td>✓</td>
</tr>
<tr>
<td><strong>2 SQM</strong></td>
<td>Chile</td>
<td>Sulphate and chloride rich brines</td>
<td>Evaporation followed by flotation and reaction of decomposed kainite with KCl</td>
<td>×</td>
</tr>
<tr>
<td><strong>Xinjiang Luobupo</strong></td>
<td>China</td>
<td>Sulphate and chloride rich brines</td>
<td>Evaporation followed by flotation and reaction of decomposed kainite with KCl</td>
<td>×</td>
</tr>
</tbody>
</table>

3) SDIC Discussion, April, 2013

Potassium salts in solid form give the process an advantage

One of the key differences of the Colluli resource relative to operations producing potassium sulphate from brines, is that the salts exist in solid form and therefore do not require evaporation to produce the feed for the processing plant. This substantially reduces the overall footprint required, reduces land disturbance and environmental impact, reduces the amount of double handling of raw materials, and most importantly gives reliability of product delivery, as production rates are not significantly impacted by ambient conditions. Salts from the Colluli resource will simply be mined, stockpiled to the allocated areas and fed directly to the processing plant.
Geographic Advantage

Only 75km separates the Colluli mine site from the Red Sea coast, simplifying logistics and giving Colluli the most favourable access to sea freight relative to potassium sulphate producing peers.

Figure 1: Distance to coast for key potassium sulphate production areas

The Red Sea forms part of one of the world’s busiest shipping routes. The planned ship loading facility at Anfile Bay provides deepwater access suitable for loading up to Panamax vessel size.

The city of Massawa is the second largest in Eritrea and is located 180km from the Colluli site. The Port of Massawa is Eritrea’s primary import-export facility and will form a key part of the consumables supply chain for the Colluli operation.

The Port of Massawa is suitable for both container and bulk shipping and currently exports over 250,000 tonnes of copper concentrate from existing mining operations. This is expected to increase as the mining grows. The Port of Massawa represents an opportunity as an export facility for early stage production of potassium sulphate from Colluli and will be the subject of infrastructure options analysis as the project moves from pre-feasibility to feasibility.

Massawa also represents the in country recruitment pool for Colluli. Employees will be bussed to site via the existing, unsealed coastal highway.
Access to the World

The Colluli resource is favourably positioned relative to the key potash growth markets, namely; China, India, Thailand and Indonesia.

China is the largest potash consumer in the world since overtaking the USA in 2000, and currently accounts for 20% of global potash demand.
Mining in Eritrea and the Colluli Mining Share Company (CMSC)

Eritrea is a stable jurisdiction with a rapidly emerging mining industry. It has a reputation for low levels of corruption and clear government policy. South Boulder Mines has a strong, effective working relationship with the government.

Under the Eritrean mining proclamation, the Eritrean government has an option to participate in mining projects.

Eritrea’s first major mining operation is the Bisha mine which is a joint venture between the Eritrean National Mining Company (ENAMCO) and Nevsun Resources. Since commissioning in 2011, the Bisha operation has undergone its first phase expansion with an additional flotation circuit expansion planned in the future.

Commissioning of the Zara gold project, a joint venture between Chinese based construction company, SFECO and Enamco, is expected in 2015, with construction and pre-stripping well underway. Sunridge Gold has recently completed a definitive feasibility study and finalised its joint venture terms with Enamco for the development of the Asmara gold-copper project.

The Colluli Mining Share Company (CMSC) is a formally incorporated and established entity. The joint venture company owns 100% of the Colluli potash project with ENAMCO and South Boulder Mines each having a 50% ownership of the joint venture company. The agreement allows the government direct participation in the project with two board seats.

CMSC will seek to fund the initial project development costs with a mixture of debt (up to 70%) and equity. Any shortfall in the debt component will be underwritten by STB on market terms with repayment and security consistent with third party debt. The 30% equity component is STB’s obligation. After third party debt is serviced, 50% of the equity contribution of STB will be preferentially repaid to it from 50% of the cashflow. The remaining 50% will then be split across the joint venture owners.
Prefeasibility well advanced

Following a comprehensive review of development options for the resource in 2013, a pre-feasibility study was initiated in May 2014 for the production of potassium sulphate from all potassium bearing salts in the resource. Preliminary design of the processing plant and the associated process flow diagrams have been completed, and geotechnical, hydrogeological and sterilization drilling have commenced to support the development strategy. The prefeasibility study is due to be completed in early 2015 with the final DFS completed in the second half of 2015.

Environmental studies supporting the project are well advanced. Eight baseline assessments were submitted to the Ministry of Energy and Mines in August 2014 as part of a three tranche submission process to ensure sufficient time is allowed to address any unlikely concerns.
Potash and Potassium Sulphate (Sulphate of Potash)

Potash is the common term for fertiliser forms of the element potassium (K). The name derives from the collection of wood ash in metal pots which were recognised to have beneficial fertiliser properties many centuries ago.

Potassium is one of three key fertiliser ‘macro-nutrients’ essential for healthy soil and plant growth. It is generally used in combination with the other two macro-nutrients, nitrogen and phosphorus, to produce a range of fertilisers, the type used being dependent on the soil to which it will be applied.

Potassium is essential to the workings of every living plant cell. It not only plays an important role in plants’ water utilisation but also helps regulate the rate of photosynthesis. Potassium promotes the growth of strong stalks, protects plants from extreme temperatures and enhances their ability to cope with stress. Importantly, there is no substitute for potash.

Large potash bearing rock deposits occur in many regions of the world deriving from the minerals in ancient seas which dried up millions of years ago. Potassium is the 7th most common element in the earth’s crust and the most common potassium bearing fertiliser is potassium chloride (KCl) which is also referred to as Muriate of Potash (MOP). Production of potassium chloride is quite concentrated with the key production areas being Canada and Russia.

Potassium may also be present in sulphate form and used to produce less common potassium sulphate or sulphate of potash (SOP). The key areas for potassium sulphate production are China, United States and South America. These areas typically extract potassium sulphate from brines. Potassium sulphate can also be produced through the combination of potassium chloride and sulphuric acid. Potash is non substitutable and is consumed in the growing process. Long term demand is underpinned by ongoing population growth, reduced availability of arable land and changing dietary preferences as disposable income improves.
Dietary preferences are linked to economic development. Higher levels of disposable income results in a shift to higher protein diets and higher fruit and vegetable intake.

Potassium Sulphate is a specialty fertiliser that carries a price premium relative to the more common potassium chloride. It not only carries potassium as the primary nutrient, it also contains appreciable amounts of sulphur which is also valuable to plants.
Potassium sulphate is chloride free. This means its application is best suited to crops which have low tolerance for chlorides. However, its application is not limited to these crops. Potassium sulphate can act as a substitute for potassium chloride in a number of applications. Potassium chloride however, cannot substitute potassium sulphate.

There are limited economic resources available for the production of potassium sulphate, and while the market is substantially smaller than the more common potassium chloride, less supply growth has been demonstrated and there are few planned projects identified to come into production in the next five years.
Colluli Potash Summary

The Colluli Potash project is located in mid-southern Eritrea, East Africa. The resource lies approximately 75km from the Red Sea Coast and is 180km from the port of Massawa, the key import-export facility for the country.

Since exploration began in 2010, a JORC/N43-101 compliant resource containing over 1 billion tonnes of potassium bearing salts has been identified. The suite of potassium salts includes sylvinites, carnallitite and kainitite which are commonly used for the production of both potassium chloride (Muriate of potash or MOP) and potassium sulphate (sulphate of potash or SOP). Mineralisation commences at just 16m below surface, making Colluli the shallowest known potash resource globally. The shallow mineralisation in combination with favourable ambient conditions make the resource Colluli suitable for open cut mining.

Although Colluli was originally planned as a potassium chloride production facility using the sylvinites ore only, the stratification of the potassium salts within the resource means significant mining cost benefits from reduced strip ratio by extracting and processing all salts. Scoping studies completed in 2013 identified three potential processing options suitable for the production of potash products and in April 2014 pre-feasibility studies commenced for the production of potassium sulphate, a premium potash fertiliser, using all potassium bearing salts.

The process chosen for prefeasibility study involves producing pure kainite and potassium chloride using simple and proven processes of liberation and flotation. The combination of the kainite and potassium chloride results in a spontaneous chemical reaction that occurs under ambient conditions to produce potassium sulphate. It is believed that this process is the lowest energy, highest potassium yield route to produce potassium sulphate. Metallurgical testing on the process design is well progressed.

The Colluli Potash project is 100% owned by the Colluli Mining Share Company (CMSC) which is a 50:50 joint venture between South Boulder Mines and the Eritrean National Mining Company (ENAMCO). Pre-feasibility studies are well progressed and expected to be complete by February 2015.
About South Boulder Mines

South Boulder Mines (ASX:STB) was established in 2003 as a gold and nickel explorer. In 2007 the company acquired tenements in Lake Disappointment as an entry point to the potash market.

In 2008 the company further expanded its fertiliser portfolio by acquiring prospective phosphate tenements in North West Australia. In 2009 STB was granted exploration tenements for the Colluli concession. Drilling commenced in 2010 and since that time 97 holes have been drilled to define a resource of over 1 billion tonnes of potassium bearing salts.

In 2013 STB restructured its management team and spun out its non-core and lower prospective tenements to focus on the development of the Colluli potash project in partnership with ENAMCO.

The senior management team has a diverse range of operational, project, marketing, legal, exploration and supply chain management experience.
Board and Management

Chairman: Seamus Cornelius

A corporate lawyer and former partner of one of Australia’s leading law firms, Mr. Cornelius has extensive experience in cross border transactions in the resources sector. Mr. Cornelius took over the chairmanship of South Boulder mines in July 2013.

Managing Director: Paul Donaldson

Formal qualifications in metallurgy and chemical engineering, and master’s degrees in business and technology and mining engineering, Paul Donaldson has over 24 years operational experience in mining, manufacturing and marketing. Having spent all of his career prior to joining South Boulder Mines with BHP Billiton, Paul Donaldson has held senior roles across the entire mining and manufacturing supply chain with his most recent role in BHP Billiton being the General Manager of Mining Area C, a 50 million tonne per annum iron ore operation located in the Pilbara. In addition to large scale open cut mine management, port management, marketing and manufacturing, Mr. Donaldson also has substantial experience in working in and managing remote mining operations. He was appointed CEO in February 2013 and managing director in April 2014.
Non-Executive Director: 
Tony Kiernan

Mr. Kiernan has over 25 years of experience in the mining industry and was previously a commercial lawyer. He is currently a corporate advisor and has extensive experience in the administration and operation of public listed companies. He brings particular skills in the areas of government relations and approvals, corporate strategy and corporate governance, all of which are key areas for the company as it progresses the development of the Colluli Project.

Non-Executive Director: 
Liam Cornelius

Appointed on 21 August 2001, Mr. Cornelius graduated from Curtin University of Technology with a BApp. Sc in Geology. Mr. Cornelius has been involved in the exploration industry within Australia, Asia and Africa for nearly 20 years. Whilst originally specializing in gold he has experience with a wide range of commodities including nickel, copper, platinum, uranium and potash.

Colluli Study Manager: 
James Durrant

Mr. Durrant joined South Boulder Mines in May 2014 following 7 years in large scale open cut mining within BHP Billiton Iron ore operations. With experience in operational management, project management and corporate strategy, Mr. Durrant takes responsibility for delivery of the Colluli PFS and DFS.

Eritrea Country Manager: 
Zeray Leake

Mr. Leake is a Geologist with over 12 years’ experience in the development and exploration of potash, gold, base metals and industrial minerals. He previously worked for the Geological Survey of Eritrea and has a strong relationship with key stakeholders in country.
Further Information

For further information on the Colluli potash project, please contact;

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**James Durrant**  
*Colluli Project Study Manager*  
jdurrant@southbouldermines.com.au

Or visit our website at [www.southbouldermines.com.au](http://www.southbouldermines.com.au)
Notes

The Colluli Potash Project has a current JORC/NI43-101 Compliant Measured, Indicated and Inferred Mineral Resource Estimate of 1,079.00Mt @ 17.97% KCl or 11.35% K2O (total contained potash of 194.09Mt KCl or 122.61Mt K2O). The resource contains 261.81Mt @ 17.94% KCl or 11.33% K2O of Measured Resources, 674.48Mt @ 17.98% KCl or 11.36% K2O of Indicated Resources and 143.50Mt @ 18.00% KCl or 11.37% K2O of Inferred Resources.

This information was prepared and first disclosed under the JORC Code 2004. It has not been updated since to comply with the JORC Code 2012 on the basis that the information has not materially changed since it was last reported by independent consultants ERCOSPLAN and announced by South Boulder on 16 April 2012.

Competent Persons and Responsibility Statement

The information in this report that relates to Exploration Results and Mineral Resources is based on information compiled by Greg Knox using estimates supplied by South Boulder Mines Ltd under supervision by Ercosplan. Dr Henry Rauche and Dr Sebastiaan Van Der Klauw are co-authors of the JORC and NI43-101 compliant resource report. Greg Knox is a member in good standing of the Australian Institute of Mining and Metallurgy and Drs’ Rauche and Van Der Klauw are members in good standing of the European Federation of Geologists (EurGeol) which is a “Recognised Overseas Professional Organisation” (ROPO). A ROPO is an accredited organisation to which Competent Persons must belong for the purpose of preparing reports on Exploration Results, Mineral Resources and Ore Reserves for submission to the ASX.

Mr Knox, Dr Rauche and Dr Van Der Klauw are geologists and they have sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which they have undertaken to qualify as a Competent Person as defined in the 2004 Edition of the “Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves”. Mr Knox, Dr Rauche and Dr Van Der Klauw consent to the inclusion in the report of the matters based on information in the form and context in which it appears.