



# Danakali Ltd

Global | Mining | ASX:DNK

11 October 2017

## Share data

Shares - m (basic/fully diluted)	248.3m / 270.8m
52-week high/low	A\$0.84 / A\$0.37
Free float	64%
3M average daily volume	120,176
Market capitalisation (US\$m)	143
Net debt (cash) (US\$m)	-18
Enterprise value (US\$m)	125
Dividend yield	0.0%
Fair Value (A\$)	1.28

DNK valuation	A\$m	A\$/sh
DNK share of Colluli (NAV)	424	0.83
Salt resource	56	0.11
Net cash (debt)	18	0.04
Unpaid capital	156	0.31
NAV	655	1.28

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Source: Arlington Group, Bloomberg

## The end of the road for Mannheim

Danakali is developing the Colluli potash project in the Danakil potash basin of Eritrea as a 50/50 JV with the Eritrean National Mining Company, ENAMCO. Colluli is differentiated from other potash projects by the fact that the orebody is open pit-able and it contains both sulphate and chloride potassium minerals allowing low-cost primary production of SOP, a premium product vs MOP. The project is best in class of current SOP development projects, in our view, and has the potential to change the dynamics of the SOP market by replacing large volumes of high cost Mannheim production. High quality product, diversification potential and good geographical positioning makes it one of the world's best development projects, in our view.

### World-class management team

CEO Paul Donaldson had a number of senior roles in BHP Billiton's marketing, base metals and iron ore divisions including as general manager of Mining Area C. Project manager Tony Harrington has 35 years' experience across African development projects and Head of Marketing Danny Goeman was GM Marketing at Rio Tinto.

### World-class project

The Colluli project boasts a reserve of 1.1Bt @ 10% K<sub>2</sub>O which should support stage 1 production of 472Ktpa of SOP from Q4/19, rising to 944Ktpa in year 6. All of this is deliverable on up-front capex of US\$298m, at a project IRR of 33% and with bottom quartile operating costs.

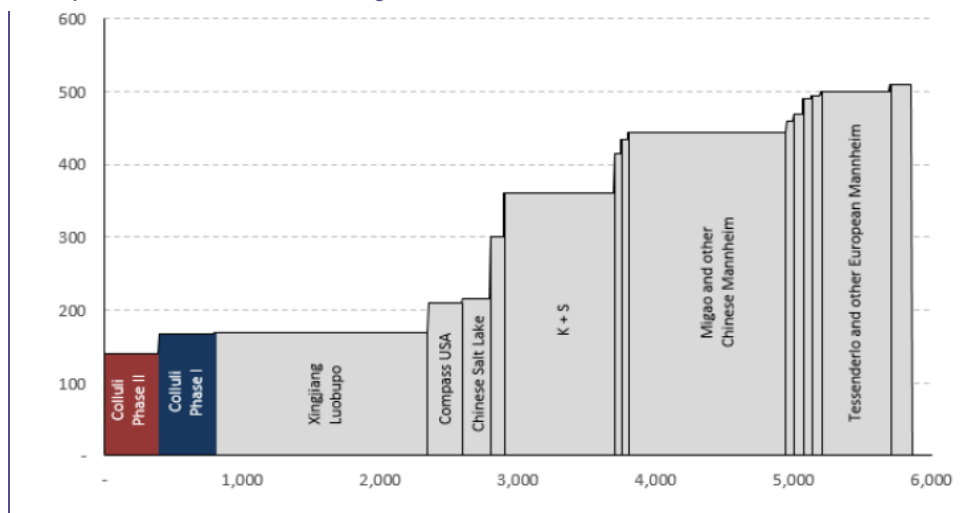
### Probably the best potash project in the world

Given its position near the bottom of the cost curve, the project should be able to displace high-cost Mannheim SOP producers, and there is significant potential to increase production beyond the 944Ktpa planned for stage 2, in our view.

### Attractive valuation

We value DNK's share of Colluli on a DCF at a 10% discount rate. This yields a NPV of US\$326m (A\$424m). Our Sum of the Parts valuation yields a fair value for Danakali of A\$1.28/sh. We note that once in production by 2020E we value DNK's share of Colluli at US\$737m (8% discount rate), more than double current valuations.

### SOP production cost curve (mine gate basis)



Source: Company data, CRU, EPM, Inteater Research

Prepared by Arlington Group Asset Management Limited

See important disclosures at end of this report

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## Investment Summary

We believe that Danakali is one of the most exciting investments in the mining industry currently. Boasting a world-class project with significant growth potential, strong management team and attractive valuation, it has all the superlatives.

### Standing out from the pack

Colluli is unique among current potash developments insofar as it offers:

- Mining reserve of 1.1Bt at 10% K<sub>2</sub>O supporting a potential mine life of over 200 years at stage 2 production rates.
- Shallow, near-horizontal orebody amenable to open cast mining.
- Open cast mining means that less of the resource is diluted than in underground room and pillar or solution mining.
- Mineral assemblage boasting both sylvite and kainite minerals making production of premium quality sulphate of potash (SOP) profitable.
- Two stage development with initial production capacity of 472Ktpa for stage 1 and 944Ktpa for stage 2.
- Low capital intensity for first stage development with total project capex of US\$298m including 15% contingency, and ability to fund second stage expansions from cash flow.
- Multi-product potential and further product optionality.
- Bottom quartile operating costs of US\$275/tonne (AISC) for stage 1 of the project and US\$246/tonne for combined stage 1 and 2 giving the potential to displace higher cost production assets from the market.

### Experienced management team

Danakali's management team has significant bulk commodity operating and development experience. CEO Paul Donaldson was a senior manager at BHP Billiton's iron ore and base metals operations, Head of Marketing Danny Goeman was a senior marketing manager at Rio Tinto, and Project Construction Manager Tony Harrington has over 30 years' of experience in development projects in Africa.

### SOP Game Changer

The project sits right at the bottom of the current SOP cost curve and, while stage 2 production capacity is 944Ktpa, the reserve size would easily support double that giving the possibility for the project to displace large volumes of high-cost Mannheim capacity (which has production costs of c.US\$500/t) from the market.

### Compelling valuation

We use a Sum of the parts valuation approach with the key part a DCF to value DNK's share of Colluli cash flow. Our 10% discount rate reflects African development risk, although we do not see Eritrea as more risky than other African countries. This yields a valuation of A\$424m at an IRR of 26%. We value DNK's portion of the existing rocksalt resource to represent additional optionality of other products from the deposit. Using a US\$0.25/t EV multiple gives a valuation of A\$56m, and we also include DNK's current cash position.

We believe that the company is likely to source some of its funding via the equity route and hence we assume an additional issue of up to 251m shares which lowers our per share valuation to A\$1.28 on a fully diluted basis.

### Further potential

We see considerable potential in the project and expect management to start to flesh out the optionality of other parts of the orebody once construction is underway.

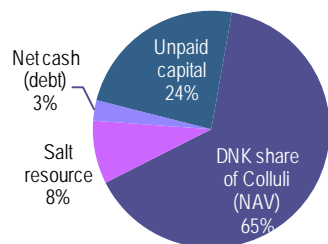
## Danakali Ltd financial summary

Year-end 31 Dec

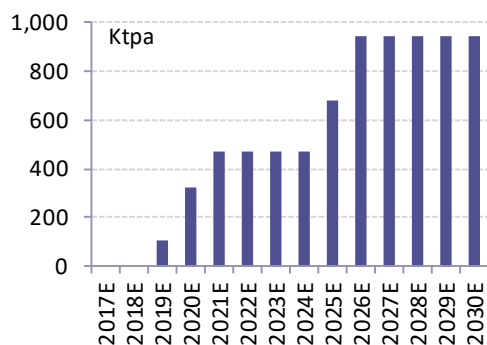
Valuation	A\$m	A\$/sh*
DNK share of Colluli (NAV)	424	0.83
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NAV	655	1.28

\*No. of shares reflects forecast

### Asset valuation summary



### Colluli production forecasts (100% basis)



### Reserves & resources (Mt)

Potash		
Reserves	Mt	K2O Equiv %
Proved	286	11%
Probable	827	10%
<b>Total</b>	<b>1,113</b>	<b>10%</b>

Resources		
	Mt	K2O Equiv %
Measured	303	11%
Indicated	951	11%
Inferred	35	10%
<b>Total</b>	<b>1,289</b>	<b>11%</b>

Others	
Rocksalt (M&I Area A)	208
Rocksalt (Inf Area A)	139
<b>Rocksalt (Total, Area A)</b>	<b>347</b>

Forecast assumptions	2016	2017E	2018E	2019E	2020E
US\$/A\$	1.35	1.33	1.30	1.30	1.30
SOP FOB Massawa (US\$/t)	550	550	550	550	550

Production summary (100% basis)	2016	2017E	2018E	2019E	2020E
SOP production (Mtpa)	-	-	-	105	320
Mine gate costs (US\$/t)	-	-	-	192	170
Royalties (US\$/t)	-	-	-	19	19
Transport costs (US\$/t)	-	-	-	67	67
Total cash costs (FOB; US\$/t)	-	-	-	279	256

PROFIT & LOSS (A\$m)	2016	2017E	2018E	2019E	2020E
Revenues	-	-	-	38	114
Cost of sales	-	-	-	13	35
<b>EBITDA</b>	<b>-2</b>	<b>-</b>	<b>-</b>	<b>19</b>	<b>61</b>
D&A	0	0	8	17	16
<b>EBIT</b>	<b>-2</b>	<b>-0</b>	<b>-8</b>	<b>1</b>	<b>45</b>
Net interest income/(ex pence)	0	0	3	4	-27
Other financials income/(ex pence)	-2	-1	-1	-1	-1
Adjusted PTP*	-5	-1	-6	4	17
Taxation	-	-	-	-2	-7
<b>Post-tax income</b>	<b>-5</b>	<b>-1</b>	<b>-6</b>	<b>3</b>	<b>11</b>
Net income (adjusted)	-5	-1	-6	3	11
<b>Per share data (US\$)</b>					
EPS (adjusted, basic*)	-0.02	0.00	-0.03	0.01	0.04
EPS (adjusted, diluted*)	-0.02	0.00	-0.02	0.01	0.04
Shares outstanding (period end, basic)	224	248	248	248	248
Shares outstanding (fully diluted)	230	259	259	259	259

BALANCE SHEET (A\$m)	2016	2017E	2018E	2019E	2020E
<b>Assets</b>					
Cash & equivalents	11	73	150	23	53
Inv'ts in Assocs/JVs	14	23	151	271	259
<b>Total assets</b>	<b>34</b>	<b>105</b>	<b>310</b>	<b>313</b>	<b>347</b>
<b>Liabilities</b>					
Interest bearing debt	-	60	118	118	107
<b>Total liabilities</b>	<b>0</b>	<b>60</b>	<b>118</b>	<b>130</b>	<b>141</b>
Shareholders equity	34	45	192	183	206
Minority interests	-	-	-	-	-
<b>Net debt</b>	<b>-11</b>	<b>-13</b>	<b>-31</b>	<b>95</b>	<b>53</b>

CASH FLOW (A\$m)	2016	2017E	2018E	2019E	2020E
Total cash from operating activities	-2	0	0	12	46
Inv'ts in Assocs/JVs	-3	-11	-136	-137	-4
Net (acquisitions)/disposals	-	-	-	-	-
<b>Cash from investing activities</b>	<b>-3</b>	<b>-11</b>	<b>-136</b>	<b>-137</b>	<b>-4</b>
Cash from financing activities	13	72	212	-1	-12
<b>Net cash flow</b>	<b>8</b>	<b>62</b>	<b>77</b>	<b>-126</b>	<b>30</b>

PROFITABILITY & VALUATION	2016	2017E	2018E	2019E	2020E
EBIT margin, %	NM	NM	NM	3%	39%
ROIC (EBIT), %	NM	NM	NM	NM	NM
EV/EBITDA, x	NM	NM	NM	8.9	2.7
PE (adj.), x	NM	NM	NM	NM	16.5

Source: Company data, Arlington estimates

\* excluding non-recurring items

## Company description

ASX-listed Danakali is developing the Colluli SOP (Sulphate of Potash) project in Eritrea. Colluli is unique among global potash projects and operations insofar as it represents the only major deposit yet discovered with solid state kainitite occurring in situ with Sylvinit and Carnallitite. Hence, both sulphatic and chloridic potassium salts occur together, allowing the company to pursue production of SOP without having to buy in either Kainitite or MOP (Muriate of Potash) for its processing. This results in much lower operating costs than for comparative projects.

In addition, the Eritrean side of the Danakil basin boasts near-surface potassium salts with only 10-90m of overburden, meaning that stripping ratios are low and that capital and mining costs are very competitive. Some of the overburden (rock salt) can even be stockpiled for later sale.

The Eritrean government is very pro-mining and is a 50% JV partner in the project. While there are mixed messages regarding Eritrea, the successful development of Colluli would result in significant foreign currency earnings for the country and at this point the government has been highly supportive of the project.

## Company history

**17 October 2003:** Company lists as South Boulder Mines Ltd

**June 2009:** Company acquires a new exploration permit for the Colluli project in Eritrea.

**October 2011:** Engineering Scoping Study supports 1Mtpa MOP project at Colluli for capex of US\$700-1000m supporting a 17 year mine life.

**November 2012:** Paul Donaldson joins as COO.

**January 2013:** Paul Donaldson promoted to CEO and new Chairman, Seamus Cornelius, appointed (July 2013).

**April 2013:** Completes de-merger of company's non-potash assets via an in-specie distribution of 100% of the shares in Duketon Mining to South Boulder shareholders on a one-to-four basis.

**July 2013:** New CEO Paul Donaldson commissions a study to examine extraction of all potassium-bearing salts from Colluli project

**Late-2013:** New Colluli project study supports potassium sulphate production for significant drop in capex and opex assumptions

**February 2015:** Company publishes updated JORC compliant resource for Colluli project of 1.289Mt@ 10.76%K<sub>2</sub>O with a contained K<sub>2</sub>SO<sub>4</sub> equivalent of 260Mt.

**March 2015:** Company publishes PFS for Colluli supporting 425Ktpa of SOP production for a stage 1 capital cost of US\$442m and bottom quartile cash costs of US\$189/t of SOP (LOM).

**May 2015:** Company publishes 1.1Bt @ 10% K<sub>2</sub>O ore reserve estimate for Colluli, equivalent to 205Mt of SOP. Theoretical mine life was extended to over 200 years.

**June 2015:** South Boulder Mines Ltd changes name to Danakali Ltd.

**September 2015:** Company reports a JORC compliant resource of 347Mt of rock salt at Colluli.

**November 2015:** Company publishes Colluli DFS supporting 425Ktpa of SOP from stage 1 for a significant reduction in up-front capital to US\$298m with average total cash costs of US\$255/t.

**August 2016:** Company reports that over 85Mt of kieserite resources have been defined.

**December 2016:** Eritrean Government accepted and approved Social and Environmental Impact Assessment for Colluli.

**February 2017:** Eritrean Government grants mining licences to Colluli Mining Share Company, 50/50 JV between Danakali and ENAMCO. The licenses allow exploitation of potassium, calcium, sodium, and magnesium salts from the Colluli resource, as well as bromine.

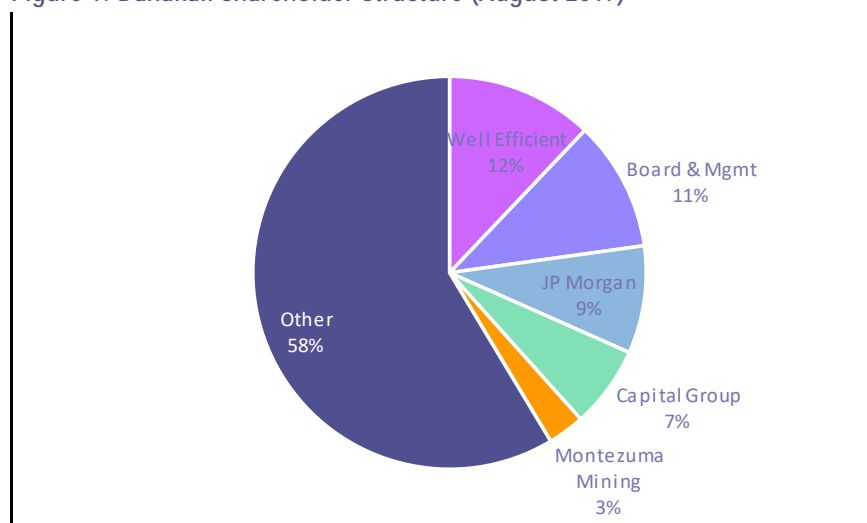
**May 2017:** Company announces that FEED optimisation has liberated additional 47Ktpa of expected SOP capacity taking stage 1 output to 472Ktpa.

### *Shareholder structure*

There are 248.3m shares in issue (including ADRs), 8.3m options and performance rights held by board and management, and a total of 22.5m in the money options and performance rights, giving a total of 270.8m shares on a fully diluted basis.

The largest shareholder is private Hong Kong investor group, Well Efficient, followed by JP Morgan Asset Management and Capital Group. Combined Board & Management have 26.6m shares and 8.3m options and performance rights, giving them 10.6% of ordinary shares and 12.9% on a fully diluted basis.

Figure 1: Danakali shareholder structure (August 2017)



Source: Company data

## Colluli project (Danakali 50%)

The Colluli project is located on the Eritrean side of the Danakil evaporite basin in northeastern Africa. Danakali owns 50% of the project with the other 50% held by the Eritrean state mining company ENAMCO.

### *Project history*

Danakali (then known as South Boulder Mines Ltd) first acquired an exploration permit for the project on 23 June 2009. While Potash occurrences were known in the Danakil basin since it had been mined by the Italians, these occurrences were all in Ethiopia. Previous exploration on the permit had been carried out by the former Ethiopian Potash Company (EPC). South Boulder opened a regional office and embarked on a round of drilling which identified potash intercepts from very shallow depths of 30-60m.

The company had delineated a JORC-compliant resource of 564.4Mt @ 18.6% KCl by 2011, and published the results of an Engineering Scoping Study in late-2011 which supported production of 1Mtpa of MOP for a capital investment of US\$0.74bn. Continuing to target MOP production, it embarked on a DFS, aimed for completion in early-2013.

It was only with the joining of the current CEO and Chairman in 2013 that the emphasis of the project began to shift. The macro conditions in the potash market had started to weaken and new CEO Paul Donaldson was concerned about the most recent capital cost forecasts (US\$1.5bn from a second Engineering Scoping Study). In June 2013, he commissioned a study looking at extraction of all potassium-bearing salts, not just sylvinite and carnalite. The study indicated strip ratios could fall from 14:1 for sylvinite to 2.3:1 for all salts, realising a potential reduction in mining costs from US\$122/t to US\$70/t of product. Preliminary process design also indicated significant savings.

The company established the 50/50 JV company, Colluli Mining Share Company (CMSC) with ENAMCO in March 2014. It commenced a PFS for the production of potassium sulphate (SOP) in April 2014, and with the successful results from that study, the current Colluli project was born. A DFS was completed in 2015, chemical and offtake testing in recent years and a mining licence was granted to CMSC in February 2017.

### *Location*

The Colluli project area is located in Eritrea in East Africa, c.177km south-east of the capital Asmara (as the crow flies, 350km by road) and 180km (230km by road) from the port of Massawa, Eritrea's main import-export facility. It is also located only 75km from Anfile Bay, which could be developed as a new port facility later on in the project.

Figure 2: Colluli site and transportation links



Source: Company data

### *Geology and resources*

There are two key differentiators of the Colluli resource in our view:

- 1) That it is the only potassium salt resource in the world where sulphate minerals (kainite) occur in association with chloride minerals (sylvinite, carnallite) in large quantities. In other resources targeting SOP production the producer generally has to buy in either MOP if they have a large sulphate resource or Kainite if they have a chloride resource.
- 2) That the minerals occur in solid state, large thicknesses and close to surface. In other projects in the Danakil basin the deposits are at a depth requiring solution mining to produce a brine. In some parts of the world potash projects are in the form of brines. Brines require an evaporation step to produce solid material which adds a cost and time aspect to the processing. The fact that the Colluli minerals are already in solid state is a significant differentiator, in our view.

The Colluli resource is an evaporite deposit (which means it was formed by the evaporation of a large inland lake to deposit layers of salts). In this part of the Danakil basin the layers of salts are largely flat, dipping at only 1° and are overlain by only 10-70m of overburden, averaging only 16m. Further to the west the overburden is larger, the layers thinner and the beds dip at more acute angles.

The deposit itself is overlain by a rocksalt layer known as Upper RockSalt. This material is planned to be mined and stockpiled for later use. The first ore layer is the Sylvinite layer, which is up to 10m thick. It is underlain by an intermediate layer comprising layers of carnallites and bischofites between 3-25m thick. Below this layer is the Kainite Member comprising a layer of kainite c.5-15m thick, which in turn overlies the Lower Rock Salt member, the lower part of the mineralisation.

Figure 3: Colluli deposit salt layers



Source: Company data

In addition to the three primary ore minerals, there are also a number of other important compounds present in the resource. The company has already reported a JORC compliant resource of 347Mt of rock salt at Colluli. Rocksalt will be mined but stockpiled elsewhere within stage 1 of the mining plan.



Figure 4: Colluli deposit ore members and mineral occurrence

Ore member	Formula	Mineral	Formula
Sylvinite	KCl.NaCl	Sylvite	KCl
Carnallite	KCl.MgCl <sub>2</sub> .H <sub>2</sub> O	Carnallite	KMgCl <sub>3</sub> .6H <sub>2</sub> O
Kainitite	KCl.MgSO <sub>4</sub> .H <sub>2</sub> O	Kainite	KMgSO <sub>4</sub> Cl.3H <sub>2</sub> O

Source: Company data, Arlington Group estimates

However, CEO Paul Donaldson has also talked about the significant additional salt occurrences within the resource area. While it is not in the company's current stage 1 mine plan, there is significant potential to build a substantial multi-product chemicals business from the resource in the future, in our view:

- In August 2016 the company reported that it had defined over 85Mt of kieserite resources. Kieserite is a magnesium sulphate which can be used as a fertiliser in its own right or be reacted with sylvite to produce potassium sulphate.
- The company has stated at various times that there is a fair amount of gypsum present in the resource area although it has not released a JORC compliant resource as yet.
- The Mining licence agreed with the Eritrean government referred to production of potassium, calcium, sodium and magnesium salts from the resources, as well as bromine.

We believe that the potential exists to build a significant chemicals business off the back of the project in coming years, but for the moment management's focus is on getting stage 1 into production. It can then worry about other products when the operation is cash flow positive.

Figure 5: Colluli summary resource and reserve statements

Measured		Indicated		Inferred		Total	
Mt K2O equiv		Mt K2O equiv		Mt K2O equiv		Mt K2O equiv	
303	11%	951	11%	35	10%	1,289	11%
Proved		Probable		Total			
Mt K2O equiv		Mt K2O equiv		Mt K2O equiv			
286	11%	827	10%	1,113	10%		

Source: Company data

### Mining and processing

Mining at Colluli is intended to take place utilising conventional truck and shovel techniques, as well as continuous miners within a single pit structure, with backfilling taking place through the first 60 years of production. Mining will utilise contractors, rather than on an owner-operator basis to minimise upfront capital expenditure and diversify risk.

Given the nature of the orebody it is not envisaged that blasting will be required and material can effectively be scraped off the surface. It will then be screened with oversize material being fed to impact crushers. It is possible to physically differentiate the 3-4 major ore types by eye, making stockpiling easier. Conventional grade control drilling is also planned.

Material mined will average 9.0Mtpa over the first stage, ramping up to 16Mtpa by stage 2. Mill throughput will be of the order of 2.3Mtpa rising to 4.4Mtpa. However, not all of the material not used for processing will be waste with the company intending to stockpile rock salt, gypsum and other materials. While it

is not economic to transport these other bulk materials at the present time, if the company goes on to pursue bulk transportation methods it might well be viable to do so in the future, in or view.

Figure 6: Colluli mining plan



Source: Company data

The DFS is targeting a stripping ratio of below 2:1 for both stages of the mine. This is significantly below the levels used in the PFS and has the potential to fall further once the company publishes its FEED Optimisation study. The company has reported that there is potential to increase stage 1 production from 425Ktpa of SOP in the DFS to 472Ktpa but has not yet published the impact on cash costs.

### Processing

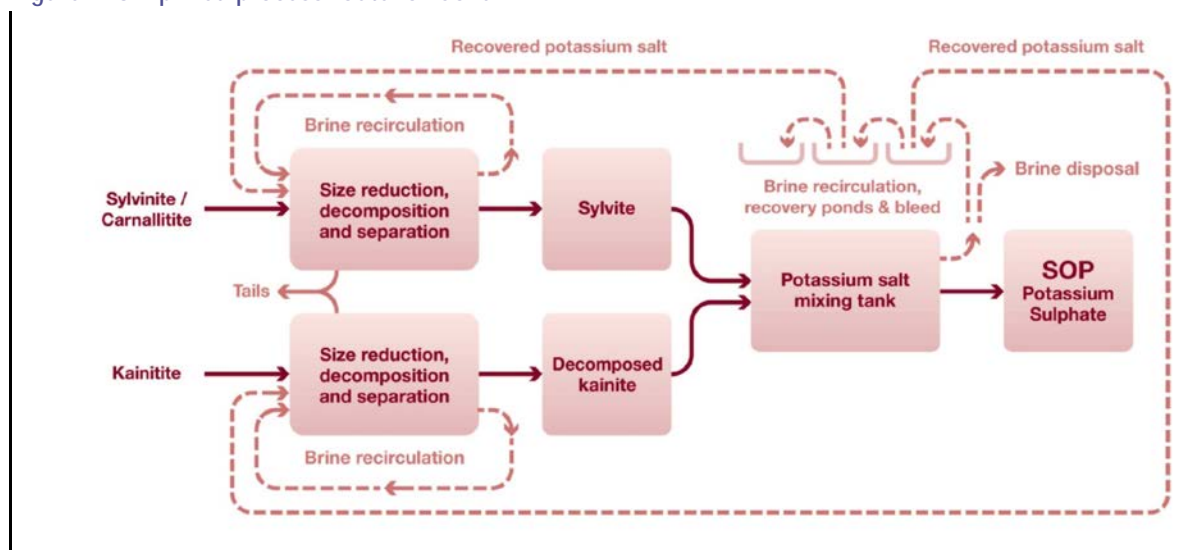
The company plans to use the most commonly used processing method for production of SOP. This involves the addition of potassium chloride (sylvite) to kainite. In most other SOP operations this requires the acquisition of sylvite but at Colluli the sylvite is a part of the orebody, which has a significant positive impact on project economics.

The actual method includes combining sylvinite and carnallite in water. The material is rinsed and agitated with a saturated salt solution (brine) to remove clay and other impurities. It is then mixed with amine and KCl may be separated from NaCl using flotation (amine coats KCl and air bubbles cling to it, pushing KCl to the surface, while the NaCl sinks). This results in a purified KCl (sylvite) product and waste material which goes to tailings.

Separately Kainite is cleaned via a similar process to make kainite.

Kainite and sylvite are then combined at ambient temperatures and react together to produce potassium sulphate (SOP) and magnesium chloride, which are separated using centrifuges. The magnesium chloride and any unreacted potassium salts are then passed out into recovery ponds and further potassium may be recovered by evaporation, with magnesium chloride being disposed of.

Figure 7: Simplified process route for Colluli



Source: Company data

The evaporation ponds are a substantially less significant proportion of the processing route than for a brine project but nevertheless, given the ambient temperature and weather conditions, they are expected to be significantly more productive than for many brine projects. For instance, precipitation rates are estimated at 4m per annum, more than double average rates in Australia. Water requirements for evaporation are c.200x less than for a brine-only project.

The finished potassium sulphate is then rinsed with saturated brine water, dewatered, centrifuged and dried. Three types of SOP may be produced:

- **Granular:** The finished product is compacted in a hot roller press and then the sheet of pressed material is crushed and screened to uniform sizes of between 0.8-3.4mm. This is the most widely used grade and is used in bulk blends and mechanised spreading. The price premium for granular SOP is of the order of US\$20-30/tonne.
- **Standard:** It appears as fine crystals with a typical size range of 0.2-1.7mm and is used for direct application on hardy crops or for compound NPK production.
- **Soluble:** Materials with small particle sizes (0.1-0.3mm) are screened from the product. Sales of soluble SOP comprise less than 5% of total SOP sales, however it sells for a substantial premium to other forms of SOP. It is used primarily for open field fertigation, foliar feeding and greenhouse hydroponic systems.

### *Logistics and infrastructure*

Besides the ore minerals, the other main component of processing is water. The DFS has provision for the construction of an 85km freshwater pipeline, but the company is also exploring the potential for sourcing groundwater from near-site by drilling. Management believes that there is enough groundwater in the potential source for up to 5 years of operation. c.2.6 cubic metres of saline and c.1.7 cubic metres of freshwater will be required per tonne of SOP produced, implying a need for 1.1MCM of saline water and 0.7MCM of freshwater per annum in stage 1 and double that in stage 2.

The company is planning to utilise a Heavy Fuel Oil generator for its power needs, using 1.5MW modules. It forecasts a peak load of 12MW and a base load of 9MW. It has appointed Inglett and Stubbs International (ISI) as the preferred power provider for the project.

The transportation solution for stage 1 is focused on containerised shipping although, in our view, bulk shipping may be contemplated for stage 2 of the project. Dried SOP product will be stored in shipping containers at the processing plant before being loaded onto trucks for haulage to the port of Massawa, c.230km away.

Trucking will be on a contractor basis which means that there is reasonably good visibility on operating costs. So far as transport infrastructure goes, there is 50km of bitumen road from the port and 100km of all-weather road. The company will need to construct c.57km of all-weather road from the mine to the existing transport system.

The company’s calculations are based on moving c.55 trucks per day with a 24 hour cycle time. In our view, this is a reasonably conservative assumption. Trucking costs of c.US\$65/tonne are assumed.

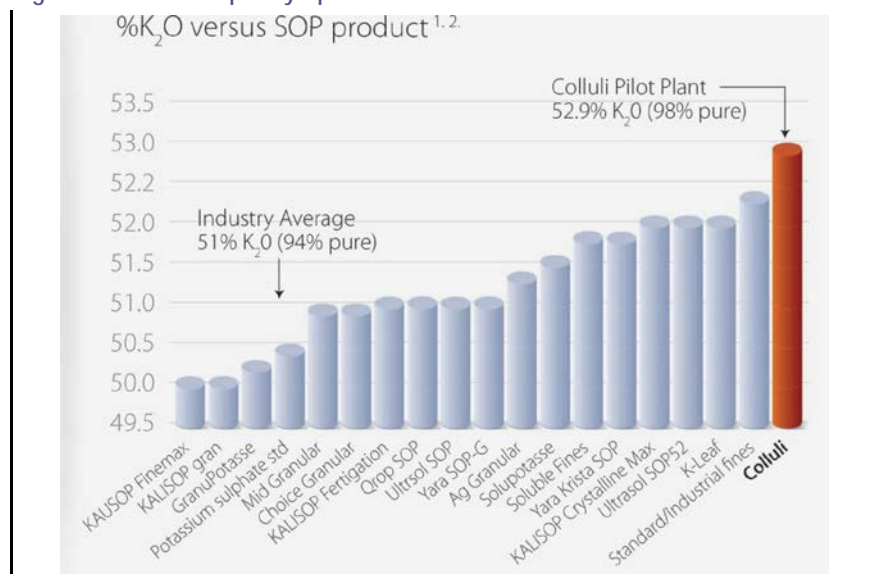
Several developments could be considered for stage 2, including building a new 85km road link to Anfile Bay and constructing a new port there. We believe that such a development makes sense when considering the potential to ship rock-salt and gypsum. Such low-value products will need a less expensive transportation cost to make exports economically viable. A shift to bulk transportation may also be necessary, in our view.

### Marketing plans

So far c.4 tonnes of Colluli drill core material have been processed at Sakatchewan Research Council for bench testing and pilot plant trials. Over 100kg of material was tested at Ludman Industries for product compaction behaviour.

Typical SOP contains c.94% potassium sulphate but so far Colluli samples have returned on average 98% purity, making Colluli a premium grade product.

Figure 8: The SOP quality spectrum



Source: Company data

The company reported in July 2016 that it had signed non-binding MOUs with various companies for several products, including for 200Ktpa of sulphate of potash-magnesia (SOP-M) and 800Ktpa of SOP, meaning that it should have no problem selling its products when the time comes.

As well as fertiliser companies, counter-parties for the MOUs include Borealis, Indagro and Gavilon.

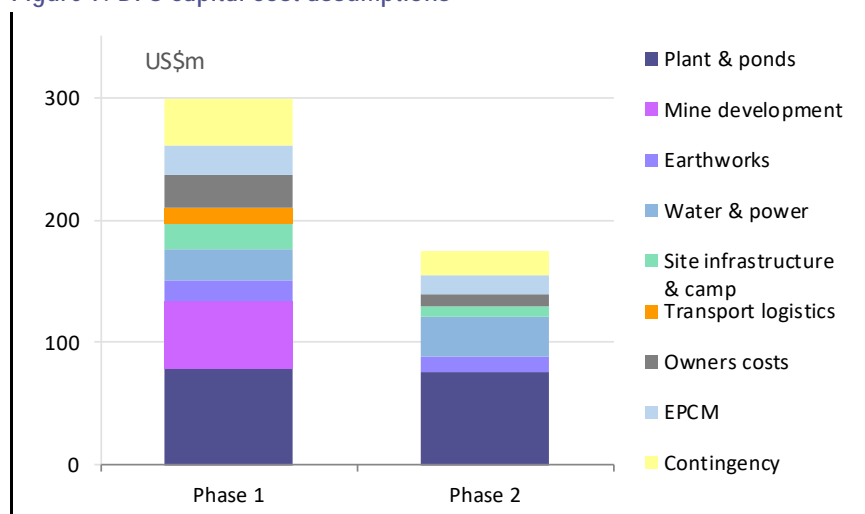
### *Development and operating assumptions*

The DFS, published in November 2015, envisaged capex of US\$298m for stage 1 of the project and an additional US\$175m for Phase 2. This was to support production of 425Ktpa in stage 1 and 850Ktpa in stage 2.

The company recently published (May 2017) initial results from the FEED optimisation work that it is undertaking, which liberated another 47Ktpa of SOP capacity for stage 1 and 94Ktpa for stage 2, taking planned capacity to 472Ktpa in stage 1 and 944Ktpa in stage 2. This extra capacity came from debottlenecking of the plant configuration and should be realised for no increase in capex. We have utilised the higher production assumptions in our model but have not made alterations for production costs which may be lower on a per tonne of SOP basis given the impact on the fixed cost base of higher utilisation rates.

The DFS's capital cost forecasts include a 15% contingency cost which we find to be conservative. We would normally apply a 10-15% contingency cost estimate for a new project. The DFS capital cost assumptions are shown below.

Figure 9: DFS capital cost assumptions



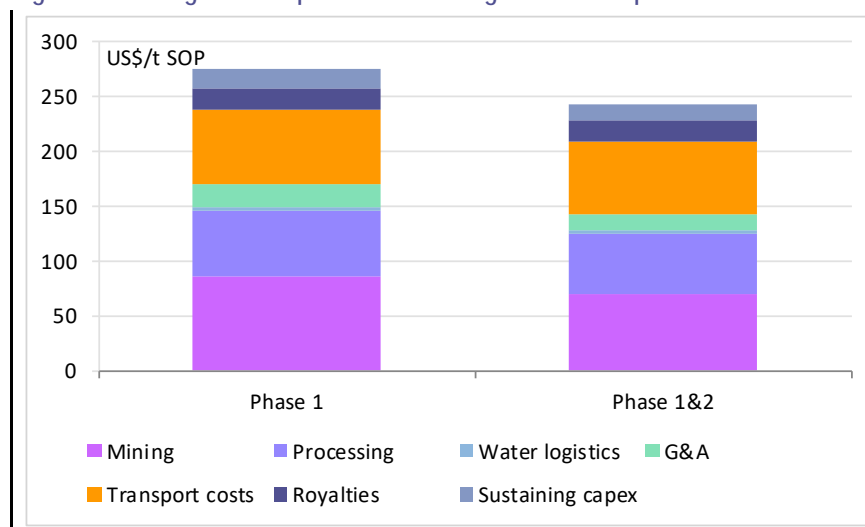
Source: Company data

As noted, the company intends to use contract mining and transportation for the early years of the project. As such we believe that there is reasonably good visibility on prices and we have used the DFS assumptions in our model.

For the processing component we have used the DFS assumptions (US\$58/t of SOP and US\$53/t SOP) as the basis for our model but have assumed some inflation of costs over time. As a result our base-case LOM model assumptions are slightly higher than the DFS assumptions at US\$61/t and US\$54/t respectively, with the Phase 1 assumptions higher because of the impact of ramp-up on the fixed cost base. A 3.5% royalty translates into a US\$19/t charge at our forecast SOP price of US\$550/t giving total cash costs of US\$256/t for stage 1 and US\$230/t for stage 2.

Sustaining capex of US\$18.91/t for stage 1 and US\$15.24/t for stage 1&2 gives an all-in sustaining cost of US\$275/t for stage 1 and US\$246/t for stage 2, firmly within the bottom quartile for global SOP operations.

Figure 10: Arlington Group all-in sustaining cost assumptions



Source: Company data, Arlington Group estimates

### *DNK to fund Government's equity contribution*

The company entered into a Mining Agreement with the Eritrean government (via the Eritrean National Mining Company (ENAMCO)) to form a 50/50 JV to mine the Colluli project on 1<sup>st</sup> February 2017. The JV company is called the Colluli Mining Share Company (CMSC). Danakali has three board seats in CMSC and ENAMCO two.

Per the agreement CMSC will seek to fund the initial project development costs with a mixture of third party secured debt (up to 70%) and shareholder contribution. Danakali is obligated to make the shareholder contribution (50/50 debt/equity) and any shortfall in the 70% third party debt component which it can do via an interest-bearing loan.

Depending on the final mix of funding Danakali can preferentially receive up to 75% of the project cashflow until the loans are paid back.

### *Comparison with peer group*

Danakali is not the only company which is currently trying to develop an SOP project. In fact Colluli is one of seven current SOP projects under development, while there are a number of other MOP or MOP/SOP projects.

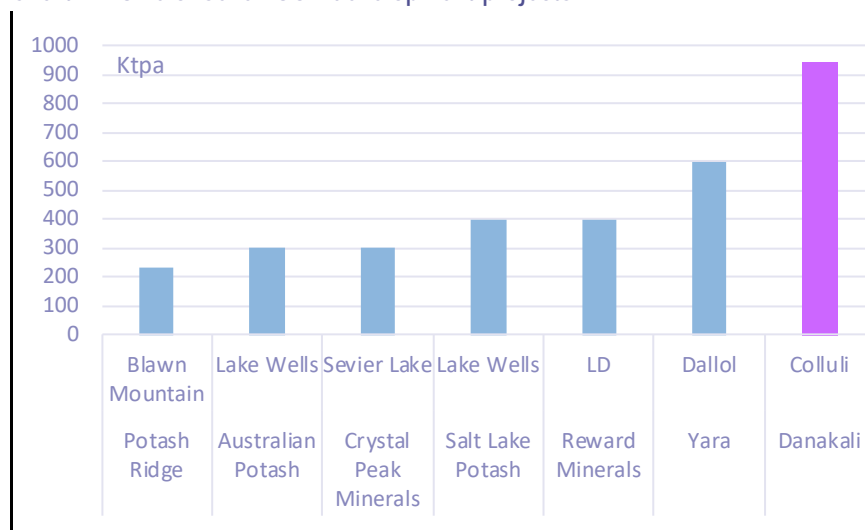
We have conducted a peer group comparison for the seven SOP projects, although we have not included Israel Chemicals' project in Ethiopia because it looks to have been shelved for the time being and we have also not included Circum Minerals' combined MOP/SOP project in Ethiopia because it is not a direct comparative.

We also note that Colluli is by far the most advanced SOP project in development currently, with a full DFS and in the process of FEED. Some of the projects, particularly the Australian projects, only have Scoping Studies/PEAs and, as such, the data supplied should be taken with a pinch of salt.

Of the seven projects considered in our analysis, Colluli is the largest at full production of 944Ktpa with only Yara's Dallol project in Ethiopia being larger than even stage 1 at Colluli. Given that Yara has written down its carrying value

for the Dallol project and that it reduced its ownership in the project to 51.8% from 69% in 2015 we are not convinced that this project will go ahead in its current incarnation.

Chart 11: Size of seven SOP development projects

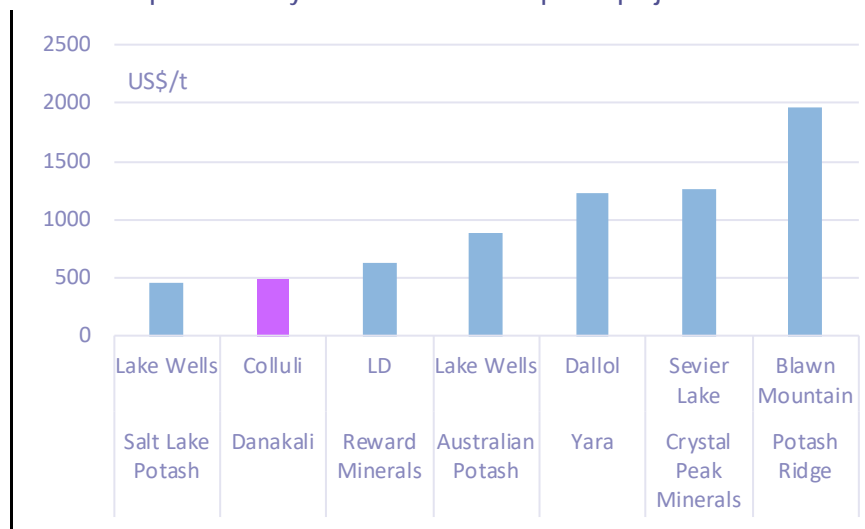


Source: Company data, Arlington Group estimates

### Capital intensity

Colluli stacks up very well in terms of capital intensity. Comparing all seven projects by their total production and total capex (combined stages 1 and 2), Colluli is the second lowest capital intensity of the group and *we have material concerns* about the capital cost estimates for Salt Lake Potash’s Lake Wells project, which appear to be extremely low.

Chart 12: Capital intensity of seven SOP development projects

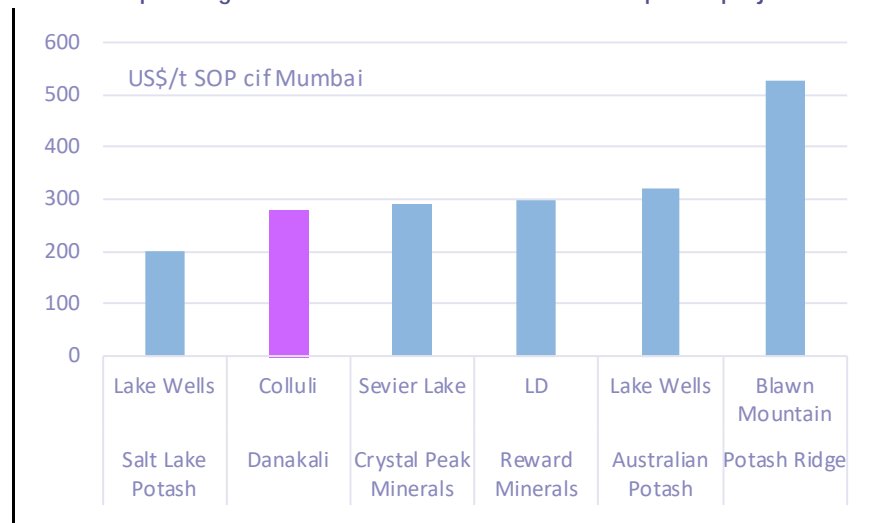


Source: Company data, Arlington Group estimates

### Operating costs

Colluli also compares favourably in terms of operating costs (although Colluli is the only project with DFS level opex data). We have omitted Dallol from the comparison because it is not a pure SOP project in this context and we did not want to include by-product credits.

Chart 13: Operating costs CIF Mumbai of six SOP development projects



Source: Company data, worldfreightrates.com, Arlington Group estimates

It should be noted that the comparison is not quite comparing apples with apples because the geographical positioning of projects, and hence the freight exposure of potential buyers, impacts the relative profitability of projects.

For instance, a customer in California buying material from Mine A in Utah in the US would sustain materially lower freights costs than from Mine B in Western Australia, even though the mine-gate selling price of both products may be similar. Likewise, Colluli has a significant geographical advantage for the supply of product to Europe, Middle East, Africa and India.



## A short introduction to SOP

### *What are fertilisers?*

Fertilisers are nutrients which help to maximise crop yields and ensure that a plant grows in a healthy way. Although nutrients exist naturally in soil, they may become depleted or they may not be present in the right concentrations to grow particular plants.

There are two types of fertilisers; **organic** fertilisers such as manure or compost, and **inorganic** ones derived from non-living sources, which are generally man-made.

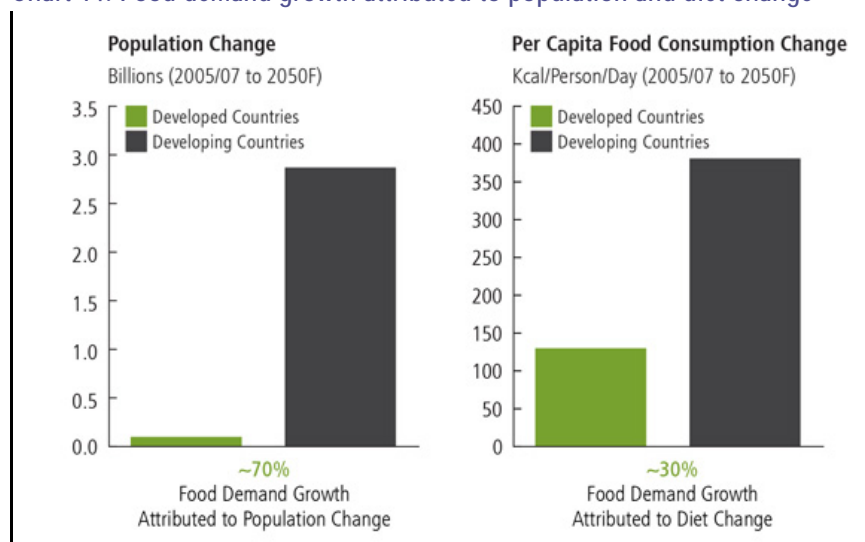
The primary nutrients used by plants are nitrogen (N), Phosphorus (P) and Potassium (K). Other nutrients required in less high concentrations include: Sulphur (S) and Magnesium (Mg).

### *Fertilisers increase crop yields*

In today's world, there are three key trends that affect agriculture:

- Global population is increasing; it is rising at a rate of c.75m people each year and the global population is expected to reach 9.3bn by 2050. Food production will need to increase by nearly 50% to satisfy food needs by that time.
- People's dietary preferences are changing. Urbanisation and the impact of rising incomes leads to people wanting to consume more high value crops such as fruits and vegetables, and consume more protein (meat). Production of a kg of beef is highly grain-intensive and might consume up to 20kg of grain. While chicken and pork production are less-intensive (consuming 2-3kg of grain per kg of meat) they are still impactful. Fruits and vegetables are highly fertiliser-intensive.

Chart 14: Food demand growth attributed to population and diet change

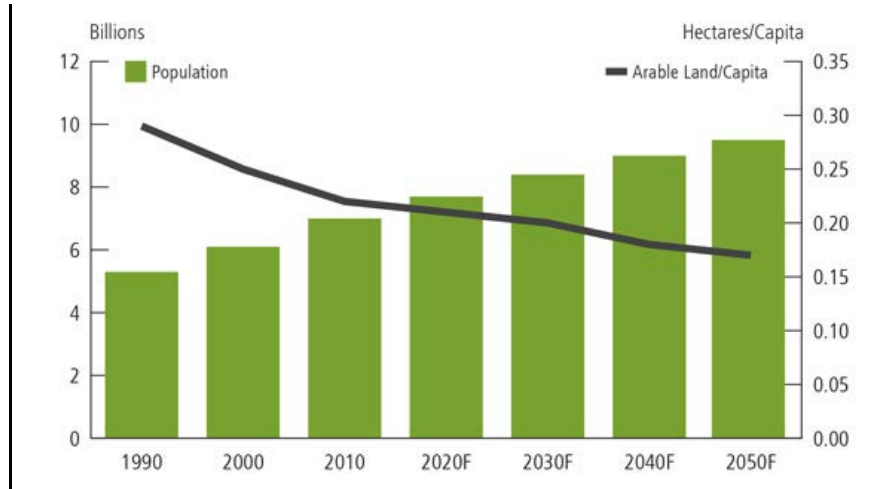


Source: FAO, Potash Corp

- The amount of agricultural land available to produce crops is decreasing. The growth of cities and towns (urbanisation) in key farming areas such as India, China, Africa and Asia is destroying large tracts of land previously used for agriculture. Agriculture either has to move to other, less fertile areas, or cease completely. Movement to

less fertile areas means more fertilisers are necessary to maintain production levels.

Chart 15: Global population and arable land per capita



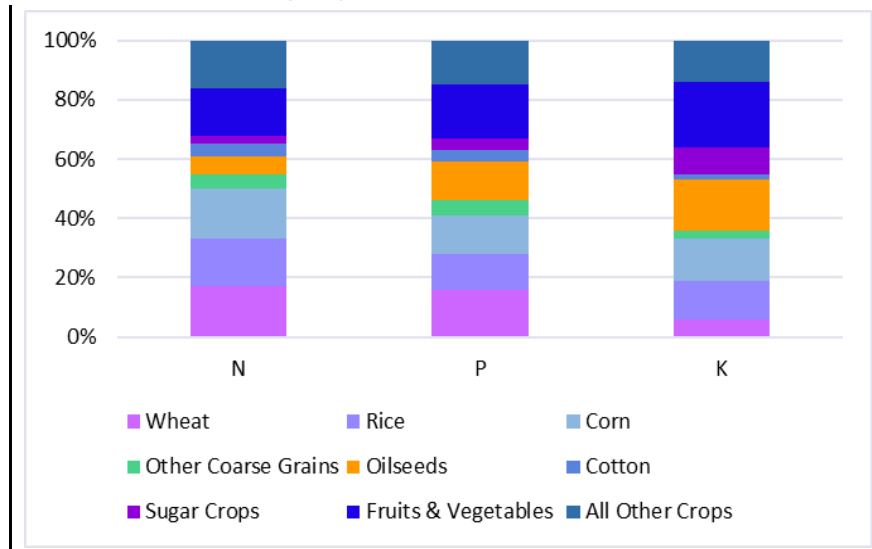
Source: FAO, Potash Corp, United Nations

Hence it is important that farmers maximise the productive potential of their land and fertilisers are a key component of this move. In short, fertilisers help to increase a crop’s **yield** (ie the production of the crop per unit of area).

*Different nutrients support different crops*

Different crop types require different applications of fertilisers to produce the highest yield. For instance wheat requires large amounts of N, smaller amounts of P and K. Soybeans require a higher weighting of K compared to N and P and potatoes and many other fruits and vegetables require large amounts of K.

Chart 16: Fertiliser use by major crop



Source: Potash Corp

*Potash – MOP and SOP*

Potash is the generalised term used for potassium containing fertiliser. When most people refer to potash they are actually referring to Muriate of Potash (MOP) which is also known as potassium chloride (KCl). However other variants of potassium fertilisers exist including potassium sulphate (sulphate of potash,

SOP), potassium magnesium sulphate (sulphate of potash magnesia, SOPM) and potassium nitrate (nitrate of potash, NOP).

While MOP is the most widely used potash variant it has a major drawback; some crops, particularly fruits, are intolerant of soluble chloride (salt) and need to access potassium a different way. Enter SOP. SOP has a much lower salinity index than MOP and is ideal for use with chloride-intolerant crops, in low rainfall regions and regions trying to combat soil salinity.

Chart 17: Oranges with and without SOP

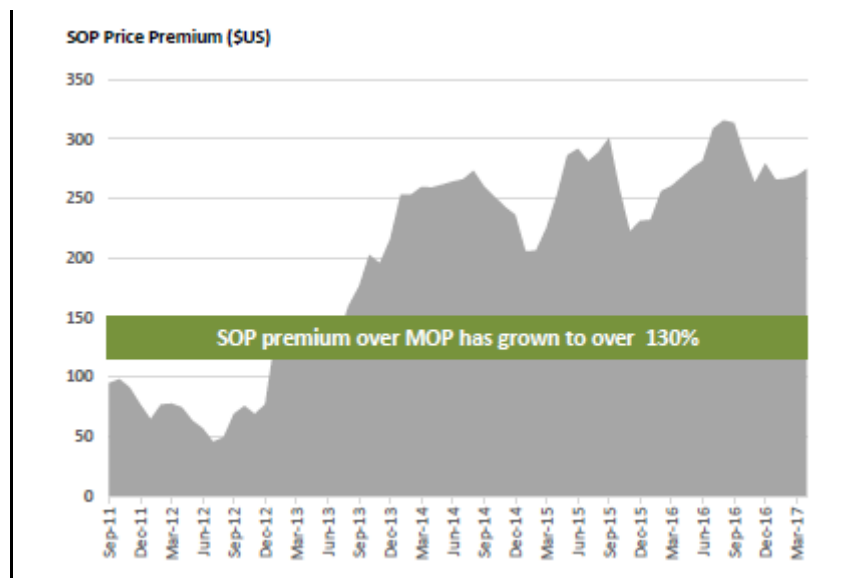


Source: Company data

SOP is primarily used on high value crops such as fruit, nuts, vegetables and coffee, while MOP is used on commodity crops such as wheat and oats. SOP may be substituted for MOP but not vice versa.

Given its usage patterns, the relative scarcity of SOP deposits and the much higher cost of production of SOP, it generally trades at a significant premium to MOP prices.

Chart 18: Premium of SOP vs MOP over time



Source: Company data, Greenmarkets

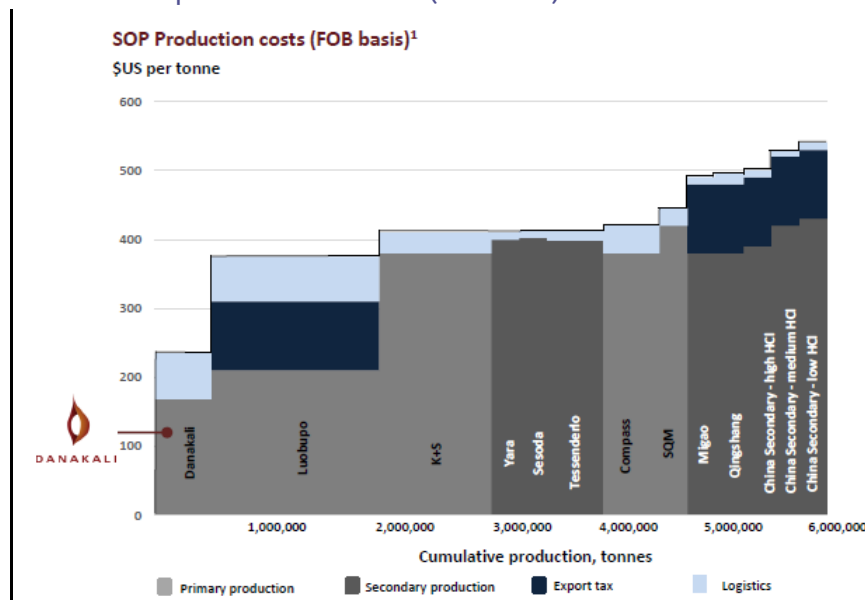
### *Economics of the SOP market*

SOP may be produced via either primary or secondary methods. Over 50% of global SOP production is via the Mannheim Process which requires a high temperature thermal reaction between potassium chloride and sulphuric acid to produce SOP. Acquisition, management and disposal of acid, as well as high

logistics costs, make this a high-cost production method with production costs generally averaging US\$400-500/tonne.

Primary production (as is planned to be utilised at Colluli) is the lowest cost production method but less than 30% of production utilises this method.

Chart 19: SOP production cost curve (FOB basis)



Source: Company data, CRU, Integer Research

### SOP demand set to increase

According to the FAO, the global potash market totals c. 64Mt, with MOP contributing 55Mt and SOP 7Mt. SOP production has doubled over the past 10 years with the bulk of the additional supply coming from high-cost secondary sources. This is likely to further increase towards 2020E due to the scarcity of advanced primary production projects. The IFA and the UN suggest that demand for SOP is set to continue to increase, rising by over 2Mtpa over the next 10 years.

Key centres for demand growth are expected to be Africa, India and Latin America and with its exceptional geographic location, Colluli is well-positioned to benefit from growth in Africa and India.

## Eritrea – really such a risk?

Eritrea is one of Africa's poorest nations and has a reputation as a tough place to do business. It has a population of only 3.6m and is sandwiched between Ethiopia and the Red Sea.

The threat from Ethiopia, from whom it won independence in 1991 and fought a border war with in 1998-2000, is fading and investors are starting to bring money to the region. The African Development Bank suggests GDP growth is of the order of 2% pa.

The Eritrean government is now focusing on the mining industry as a key driver of earnings. Currently Nevsun's Bisha and SFECO's Zara mines are the only mines in production. The Asmara project is currently under construction and Colluli construction could start in 2018. The projects will be major contributors of foreign currency earnings for the country, and income for the population.

The Bisha mine provides a good guide of what to do and what not to do for mine development in Eritrea. The company did not seem to carry out human rights due diligence at the time of the mine's development in 2008-11 but, on being made aware of the allegations, conducted thorough human rights audits in 2014 and 2015 and implemented the recommendations.

Danakali has carried out a significant Social and Environmental Impact Assessment on its development and we do not believe that social factors will be such a significant risk.

We do not expect any issues with the Eritrean Government; the Government is incentivised to support the development given its 50% holding in the project and the aforementioned need for foreign currency earnings.

In addition, we note the high standing of Eritrea in the Fraser Institute's Investment Attractiveness Index; the country is ranked 33 and is sixth among African countries, outperforming major mining countries such as South Africa and Tanzania.

In short, we acknowledge that Eritrea is in Africa, and hence a more risky investment destination than Australia, Europe or Canada, but we do not believe that it is more risky than other African countries.

We have applied a 10% discount rate to the project at this stage to reflect its early degree of development and geographical location. We would expect to lower that to 8-9% as the project progresses into production. For a developed world operation we would tend to use an 8% discount rate.

## Valuation

We value Danakali using a Sum of the Parts valuation based on a DCF of the Colluli project (10% discount rate), an EV/resource tonne multiple for the salt resource and we include the current net cash position.

**DCF:** As noted in the previous section we use a 10% discount rate for the Colluli project which is the normal discount rate that we would apply for a development stage mining company in Africa. Once the project enters production, and is thus significantly de-risked, we would expect to lower our discount rate to 8-9%.

Our model base case includes the following sources of funding:

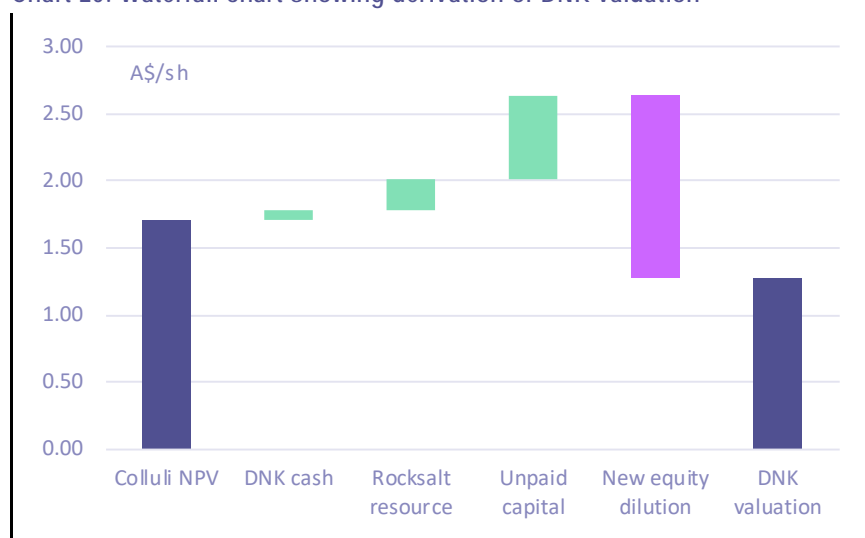
- Third party debt US\$180m
- DNK interest bearing loan US\$30m
- DNK interest-free loan US\$45m
- DNK equity US\$45m

Our DCF model considers Colluli on both a 100% basis and on the basis of what is attributable to Danakali shareholders. On a 100% basis we believe that the NPV of the project is US\$867m at an IRR of 40%. However, given DNK's need to source the equity component of ENAMCO's portion of the project, DNK's attributable share of the valuation at this point in time is materially less than 50%. Our model gives a NPV for DNK's share of the project currently of US\$326m (A\$424m) at an IRR of 26%.

**Salt resource:** We apply a multiple of US\$0.25/resource tonne to DNK's 50% of the salt resource, giving a calculated value of US\$43m (A\$56m). While we believe that this understates the potential of the salt and other chemical resources, we believe that it is a reasonably conservative valuation of the potential optionality of the resource at this point in time.

We have modelled Colluli on a fully-financed basis. As a result of this we have decided to include the potential impact of an equity fundraising in our DNK model. We have assumed that DNK need to raise US\$120m of equity and, taking a raising price of A\$0.62/sh (a c. 10% discount to the current share price), we assume that this requires the issuance of a further 251.6m shares. **This makes our calculated valuation for DNK's NAV A\$1.28/share.**

Chart 20: Waterfall chart showing derivation of DNK valuation



Source: Arlington Group estimates

### *De-risking leads to significant valuation upside*

We note the inherent conservatism of our approach. Given our experience of development projects we have been very conservative on our ramp-up estimates and on our start-up operating cost estimates. We also believe that we have been conservative on our LOM SOP price forecasts.

If we were to be less conservative or de-risk the project, we note significant valuation upside:

- If we increase our SOP price forecast by US\$25/t LOM (4.5%), it results in a 12% increase in our NPV to US\$365m (A\$474m).
- As we note above, if we value DNK's cash flows from the project now our calculated NPV for the project is US\$326m (A\$424m). However, in 2020E, assuming production start and full loan drawdown and with a 8% discount rate, the company's share of the project would be US\$737m, 2.3x the current level.

### *Catalysts and risks*

#### Catalysts

- Release of final FEED optimisation study with potential for lower operating costs.
- Further re-stocking in potash and increases in SOP price.
- Successful debt funding for key components of the project.
- Successful investment by strategic cornerstone investor.
- Further appointments of experienced mine development and operating staff.
- Construction start.
- Finalisation of offtake contracts.
- Further proving up of additional chemical resources.

#### Risks

- Political instability in Eritrea or along the Ethiopian border.
- Inability to source debt funding.
- Development risk – cost or time over-runs once in development.
- Strengthening of A\$ against US\$.
- Weakening of SOP price.

## Reserves and resources

Chart 21: Colluli SOP reserves and resource statement (JORC code 2012)

## JORC 2012 compliant resource

Area	Rock unit	Measured		Indicated		Inferred		Total	
		Mt	K2O equiv	Mt	K2O equiv	Mt	K2O equiv	Mt	K2O equiv
Area A	Sylvinite	66	12%	38	11%	10	8%	115	11%
	Carnallite	55	7%	190	9%	6	16%	251	9%
	Kainitite	86	12%	199	11%	1	10%	285	11%
Area B	Sylvinite	24	15%	12	13%	5	12%	150	13%
	Carnallite	25	6%	114	7%	8	7%	147	7%
	Kainitite	48	13%	289	13%	4	13%	341	13%
Total	Sylvinite	90	13%	160	13%	15	9%	265	12%
	Carnallite	80	7%	303	8%	15	11%	398	8%
	Kainitite	133	12%	488	12%	5	11%	626	12%
<b>Overall</b>		<b>303</b>	<b>11%</b>	<b>951</b>	<b>11%</b>	<b>35</b>	<b>10%</b>	<b>1,289</b>	<b>11%</b>

## JORC 2012 compliant ore reserve

Occurrence	Measured		Indicated		Total	
	Mt	20 equiv	Mt	20 equiv	Mt	20 equiv
Sylvinite	78	15%	175	12%	253	13%
Carnallite	79	7%	284	8%	363	8%
Kainitite	129	12%	368	11%	497	11%
<b>Total</b>	<b>286</b>	<b>11%</b>	<b>827</b>	<b>10%</b>	<b>1,113</b>	<b>10%</b>

As at November 2015

Source: Company data



## Board and Management

**Seamus Cornelius (Non-Executive Chairman)** is a corporate lawyer and former partner of one of Australia's leading international law firms. He has a high degree of expertise in cross-border transactions, particularly in the resources and finance sectors. He has recently relocated to London after having been based in China since 1993 and brings more than 20 years of corporate experience in legal and commercial negotiations. He has also advised global companies, including major resource companies and banks, on their investments in China and advised Chinese State-owned entities on their investments in overseas resource projects.

**Paul Donaldson (CEO)** joined Danakali in November 2012, before becoming CEO in February 2013 and Managing Director in April 2014. Prior to joining, he had a series of senior management roles spanning more than 25 years with BHP Billiton. At BHP he managed large scale, open cut mining operations, significant growth and sustaining capital projects, and complex pyro metallurgical, beneficiation and manufacturing processes. He headed the BHP Carbon Steel Materials Technical Marketing Team, managed the Port Hedland iron ore facility as well as occupying key roles in product and infrastructure planning across large scale supply chains. He also brings extensive experience in high-level business improvement and logistics from base metal operations and a high degree of integrated supply chain management, technical operational management and frontline leadership experience in the steel industry.

**Stuart Tarrant (CFO)** re-joined Danakali in June 2017 as CFO having previously served as Head of Finance between 2014 and 2016. Prior to that he was Finance Manager at BHP Billiton's Mining Area C for three years and has significant experience in Finance positions for other mining operations.

**Danny Goeman (Head of Marketing)** joined Danakali in August 2016. Prior to that he spent 13 years at Rio Tinto, latterly General Manager Marketing for Rio Tinto Iron Ore Asia and then as GM Marketing & Industry Analysis.

**Tony Harrington (Project Construction Manager)** joined Danakali in May 2017. Prior to joining he had over 35 years' experience managing the delivery of EPC, lump sum and EPCM projects across a diverse range of commodities, mineral processing units and jurisdictions including East Africa, West Africa, Southern Africa, China, Europe, UK and Australia.

**James Durrant (Study Manager)** has managed the Colluli feasibility studies, joining the company in May 2014. Prior to that he spent seven years with BHP Billiton's Iron Ore division.

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Prices as of close on 10 October 2017

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