

### Industrial minerals business

#### Speculative Buy

Price: 0.11p

Target Price: 0.32p

Sector: Metals & Mining

#### Share Price Performance



Source: London Stock Exchange

#### Key Data

Market:	AIM
TIDM:	<u>SRES..L</u>
1 Year Hi/Lo:	0.3p/0.1p
Existing Shares:	1804m
Market Cap:	£1.65m
ISIN:	GB00B075Z681
SEDOL:	B075Z68
Co. Website:	<a href="http://sunriseresourcesplc.com">sunriseresourcesplc.com</a>

Sunrise's historical strategy was mostly project incubation. It would peg unclaimed prospective ground, invest in early stage field work, and look to farm out a project's later and more costly phases of development.

Recently Sunrise changed focus and is now concentrating on the CS Project, a perlite and pozzolan deposit in Nevada which has the potential to underpin a profitable industrial minerals business. Based on regional supply and demand (mainly California and Nevada) dynamics, we believe the CS Project could generate annual sales of c.\$15m and have a 30 - 40% operating margin.

Although the CS Project is not without risk, Sunrise's modest market value doesn't reflect its potential. There are no comparable companies on AIM (i.e. industrial minerals supplying a regional market) and we recommend a Speculative Buy.

#### CS Project - two products

Sunrise's main focus is the CS Project in Nevada, which contains large areas of glassy volcanic rock with pozzolan and perlite properties. Pozzolans are milled and mixed with cement to make concrete and mortar stronger and 'greener'. Perlite has water inside and when heated expands like popcorn to make an ultra-light white material used in industry and horticulture.

#### Processing – positive testwork

Sunrise has retained a California based industrial minerals consultant with extensive pozzolan and perlite experience (the principal previously worked for Hess Pumice). All material tested thus far performs well as a pozzolan (cement strength tests) and large areas have produced high quality expanded perlite.

#### Pozzolan market potential

Sunrise and its consultant have investigated the regional pozzolan markets – mainly California. California manufactures 9.6Mt of cement of which >1.0 million tonnes is pozzolan. Most cement manufacturers use fly-ash type pozzolan from coal power stations, but supplies of quality fly-ash are declining due to environmental regulations and the closure the coal fired power stations. When the local Navajo Power Plant retires in 2019 it will remove 500kt of supply from the western U.S. Sunrise plans to fill the gap.

#### Perlite market potential

The perlite market is smaller than pozzolan but higher value per tonne. In western U.S. there are a few operating mines selling perlite ore at the mine gate into a circa 200kt regional market. We believe Sunrise will target initial annual sales of 25kt rising to 50kt.

#### Potential economics

We have built a conceptual financial model based on a 275kt operation producing 225kt of pozzolan and 25kt of perlite ore. We assume a 5-year period to achieve these volumes. We estimate Pozzolan production costs at \$40/t (delivered) versus a \$65/t sales price, perlite ore should sell for \$75/t at the mine gate.

#### Valuation and recommendation

Our valuation is based on our CS Project risked adjusted cashflow model. We have used a 67.5% risk factor and -\$2.5m to cover G&A. We calculate a \$7.5m NAV which equates to a 0.32p target price and Speculative Buy.

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Investment summary

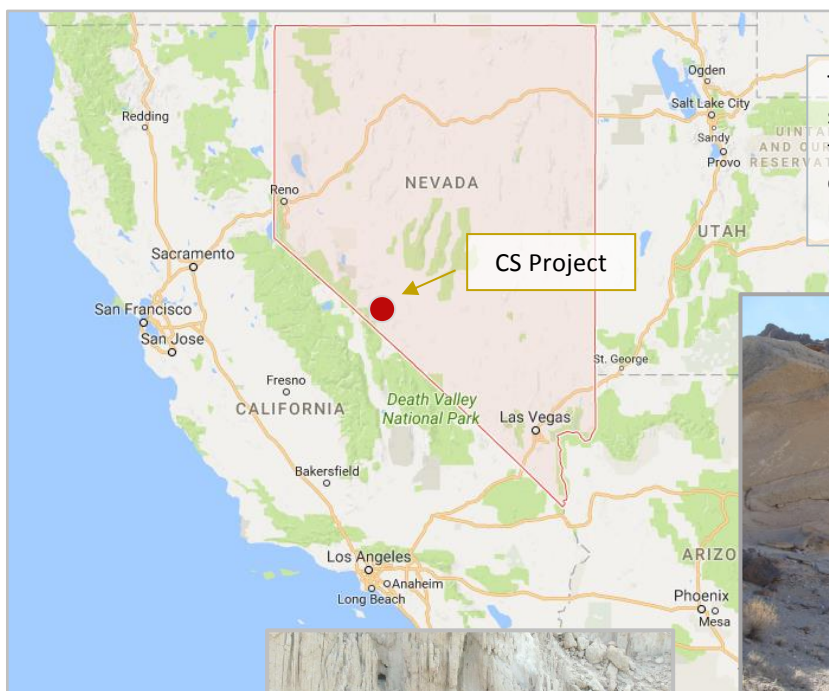
Nevada – safe jurisdiction, mining friendly

In 2014 Sunrise entered Nevada with its ‘project incubator’ strategy, seeking early stage exploration projects with either a history of mining or previous positive exploration results. It was also on the hunt for near term cashflow opportunities. Over the next 12 months Sunrise pegged one silver project, two copper-gold projects and a diatomite (used in filtration) project, its first exposure to industrial minerals.

CS Pozzolan and Perlite Project

In 2016 Sunrise identified and pegged two volcanic deposits with the potential to produce pozzolan for cement. The first project has a high clay content but will not be dropped just yet. The second called the CS Project is now the focus and in addition to pozzolan, it should also produce perlite ore.

Geographical location:



The CS Project or CS Pozzolan-Perlite Project is in south west Nevada, approximately 200 miles from Los Angeles. Road haul transport costs to a cement plant around Los Angeles, we estimate to be \$25 per tonne.



The CS Project is a thick volcanic deposit, very similar to pumice.



Source: Google.co.uk

Change of focus – opportunistic

Sunrise had been looking for near term cashflow opportunities since 2014 and the CS Project fits well. Management recognises the low capex, long mine life potential of the CS Project. It would be an open pit, quarry type, operation with a very low (>0.25:1.0) strip ratio. A pozzolan perlite operation does not require complex processing facilities or a costly tailings dam. Its closest comparator would be aggregates, where quarries typically supply a regional market over a long period. Because of these dynamics (especially the long-life potential) an operational CS Project should be very valuable. Once up and running, we would regard an EV/EBITDA multiple of at least 5 x as a reasonable valuation methodology.

## What is pozzolan?

Pozzolan is added to mortars and concrete to reduce the (higher cost) Portland Cement content and improve long-term durability. Concrete manufacturers mostly use fly-ash type pozzolans due to its historically wide availability and low cost.

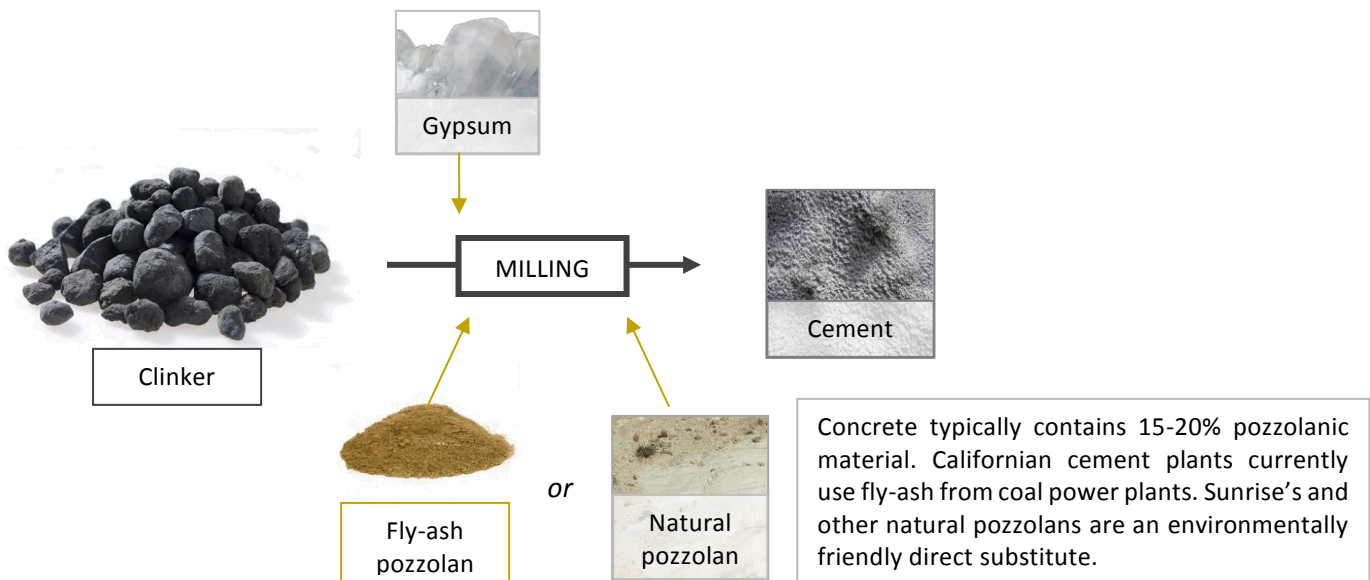
In addition to compressive strength, Pozzolan-cement mixes also have the following advantages over ordinary Portland Cement:

1. Resistance to Alkaline Silica Reaction
2. Resistance to Sulphate Attack
3. Resistance to chlorides
4. Resistance to freezing and thawing
5. Reduced water demand and improved pumpability
6. Higher density

Pozzolans are typically mixed with Portland Cement clinker and gypsum during the milling stage, either as a crushed ore or pre-milled powder. Approximately 50% of cements in the US contain pozzolan, typically in the form of fly-ash from coal fired power plants.

In the UK, a standard cement such as Blue Circle cement is ordinary Portland Cement (95-100%) and the end-user either adds pozzolan according to the specifications or pays more for a Portland Fly Ash Cement or specialist Pozzolanic Cement.

### Cement manufacturing:



*Note: pozzolan is a mineral that when mixed with lime and water acts as a cement. It must contain silica, aluminium and iron. Silica must be amorphous and there must be no alkaline*

Hess Pozz specification:

*Amorphous Aluminium Silicate*

<i>Silicon Dioxide - 76.2%</i>	<i>Potassium Oxide - 1.8%</i>
<i>Aluminium Oxide - 13.5%</i>	<i>Calcium Oxide - 0.9%</i>
<i>Ferric Oxide - 1.1%</i>	<i>Titanium Oxide - 0.2%</i>
<i>Ferrous Oxide - 0.1%</i>	<i>Sulfate - 0.0043%</i>
<i>Sodium Oxide - 1.6%</i>	<i>Magnesium Oxide - 0.05%</i>

## What is perlite?

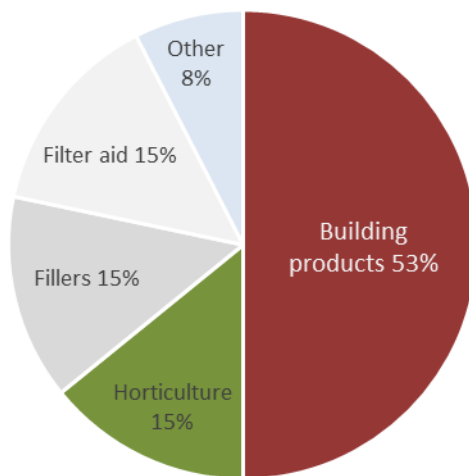
Perlite ore is natural silica glass with water inside and when heated it expands like popcorn to make an ultra-light white material called Expanded Perlite. Amongst other applications, this is used in high end insulation (e.g. LNG tankers), filtration, fillers and grouts, ceiling tiles, paint/coatings, drilling mud, lightweight concrete and horticulture.

### Expanded perlite:



Source: Perlite Institute

### Perlite uses – mainly building products:



Source: Company

## CS Project – positive testwork and government approval

During 4Q16 and 1Q17 Sunrise mapped, sampled and tested samples from the CS Project. Results were good and suggest the deposit is very homogenous for pozzolan and has large areas of perlitic material. Note that CS Project's perlite material can be used for both expanded perlite and pozzolan, but some pozzolanic material is not perlitic.

Sunrise will soon begin a drilling programme to further the understanding of the deposit's variability. More samples will be tested for both pozzolan and expanded perlite.

### Government accreditation - pozzolan

Sunrise needs to get its pozzolan on the Department of Transport's (DOT) approved list in California. This list ensures the quality of the product for civil engineering projects and would give Sunrise strong access to the California market. Currently there is only one pozzolan on the DOT list – Nevada Cement's Reno pozzolan.

Three key tests are required. Assuming the CS Project passes all three it would automatically join the California DOT list. Once the samples have been collected (we estimate 4Q17), the testing process should take a maximum 6 months:

1. ASTM C618            Fineness, water demand, strength activity index
2. ASTM C1567        Alkaline mitigation
3. ASTM C1012        Sulphate mitigation

### Pozzolan test results - very good

Early indications suggest CS Project pozzolan will pass all three tests and show CS Project pozzolan has a particularly good (i.e. low) water demand. This differentiates CS Project from other development stage natural pozzolan projects.

During 4Q16 pozzolan samples were taken from across the known deposit area, blended together to make a composite sample, and tested at CTL Thompson an independent cement laboratory. The sample was used to make a mortar as a 20% replacement with Portland Cement and tested under ASTM C618 conditions.

- The 7-day Strength Against Index was 88%
- The 28-day SAI was 97% (minimum 75%)
- The samples will be tested for SAI after longer curing periods

*N.B. pozzolanic cements are typically slightly weaker (albeit within acceptable standards) in the early stages of curing but once fully cured are comparable or stronger than 100% Portland Cement.*

### Cement testing:



**Perlite test results – also very good**

Sunrise’s technical consultants recognised the CS Project material as potential perlite ore. More samples were collected in 1Q17, heated to produce Expanded Perlite and tested for yield, density and whiteness. The table below shows CS Project perlite compares well with benchmark Expanded Perlite brands.

**Perlite results – compares very well to Socorro**

Sample	Yield (%)	Density (Lbs/ft <sup>3</sup> )	Brightness (old)	Brightness (new)	Sinks
Socorro (benchmark)	91.9%	1.81	85.4	79.5	3.30%
CS Sample 1	87.6%	1.6	86.0	80.0	0.60%
CS Sample 2	95.0%	2.25	84.9	78.9	0.20%
CS Sample 2 (duplicate)	94.8%	2.32	85.3	79.3	0.20%

Source: Company

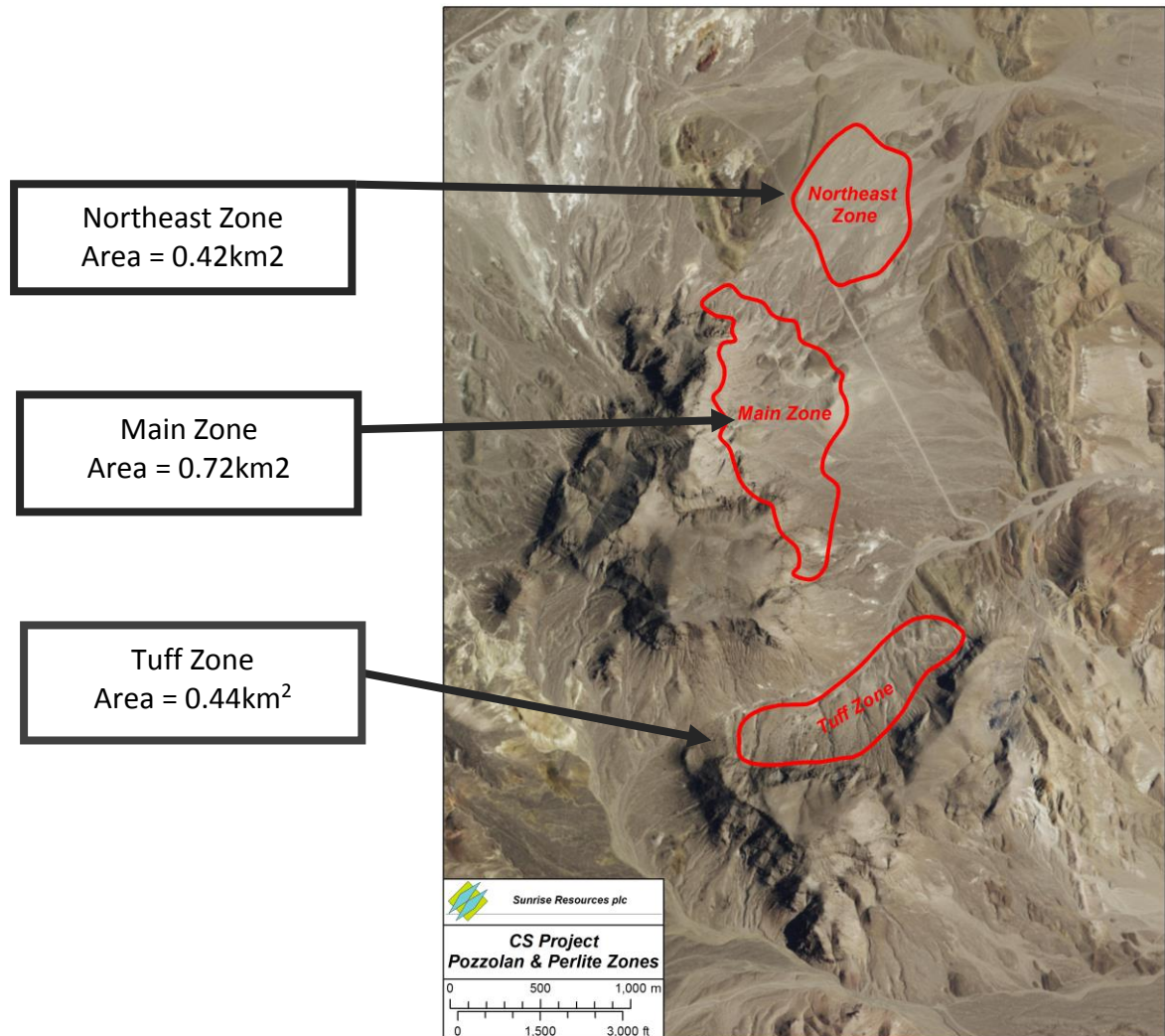
Note: Perlite density ranges from 1.0 lbs to 20 lbs per ft<sup>3</sup>

Expanded Perlite is a very light weight, white glassy silica particle with holes throughout. In the table above, yield measures the % of perlite ore which is collected from the furnace, density needs to be between 1lb/ft3 and 20 lbs/ft3 (so 2.3 lbs/ft3 is very good). Brightness is how white, bright white perlites are suitable for white fillers and speciality concretes. Sinks measures the % of unexpanded perlite (that is still heavy).

## Work programme - drilling and sampling in 2017

Sunrise will soon begin a drilling, trenching and sampling campaign at the CS Project to better understand the variability across the deposit and at depth. This will involve 5 holes at 200m spacing and 3 trenches. Ten tonnes of material will be collected for pozzolan and perlite testwork.

Sunrise has received the necessary permit from the US Bureau of Land Management and recently completed a £300k fundraise to pay for ongoing work.



## Large resource and long life potential

The CS deposit consists of three zones.

- Main Zone: Samples tested thus far indicate almost all material is pozzolanic and large areas are perlitic.
- Northeast Zone: Recently awarded ground. Similar to the Main Zone.
- Tuff Zone: Mainly pozzolanic, not regarded as perlitic.

The deposit is pre-resource however it has a large surface area. We anticipate a mineral deposit of >20Mt, although note that it is not Sunrise's objective to delineate a JORC compliant Minerals Resource in the next drill programme.

## Pozzolan

Pozzolanic cement is one of the earliest and strongest types of cement. Discovered by the Romans who added crushed volcanic ash to lime, and named after the village Pozzuoli near Vesuvius where the volcanic ash came from. Natural pozzolans have been used since the Romans since 1<sup>st</sup> Century BC and by the Greeks for thousands of years before that.

- Ancient Egypt cement – calcined (cooked) gypsum
- Greek and Roman cement – calcined limestone = lime
- Roman pozzolana cement – lime + volcanic ash

### Reference to pozzolan in Roman text:

*"There is also a kind of powder from which natural causes produces astonishing results. This substance, when mixed with lime and rubble, not only lends strength to buildings of other kinds, but even when piers are constructed of it in the sea, they set hard under water."* Marcus Vitruvius Pollio 1st Century

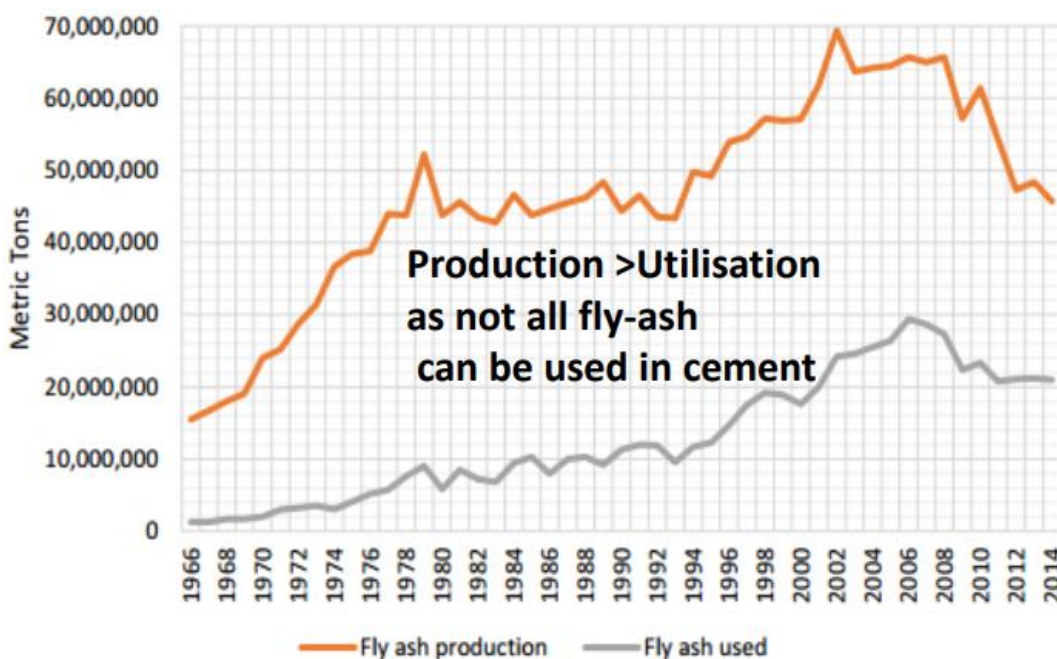
## Natural pozzolan, fly-ash type and others

Concrete manufacturers and cement users sometimes mix pozzolan into a cement mix to enhance its performance. Pozzolan is also sold as an admixture and mixed-in according to the architect's specification. Most manufacturers use fly-ash due to 1) its historically wide availability and 2) historically low costs. The chart below shows the USGS estimate of fly-ash used in cement as 20 million tonnes in 2014, compared with 80 million tonnes of Portland Cement. Manufacturers also use ground blast furnace slag and silica fume from ferrosilica plants.

## Fly-ash usage and declining supply

Fly-ash is a waste product from coal power stations and manufacturers typically use locally (or regionally) produced fly-ash. This is only possible so long as the regional power plants continue to operate. However, in the US fly-ash production has been declining in line with coal power station retirements. Cement manufacturers fly-ash consumption has seen a related decline and natural and other pozzolans are potential substitutes.

### U.S. fly-ash production and consumption:



Source: USGS, Company



**USGS comment on supplementary cement materials i.e. fly-ash pozzolans:**

“A number of materials, especially fly ash and ground granulated blast furnace slag, develop good hydraulic cementitious properties by reacting with the lime released by the hydration of portland cement. Where readily available (including as imports), these SCMs are increasingly being used as partial substitutes for portland cement in many concrete applications, and are components of finished blended cements.” USGS, 2016

**Cheap gas, declining coal**

The main reasons for falling fly-ash production are coal power plant retirements (due to old age and state legislation) , the availability of cheap gas due to the shale revolution and environmental regulation. This trend is expected to continue. Two of the main environmental regulations which have caused coal power retirements are the Clean Air Interstate Rule and Cross State Air Pollution Rule.

**Natural pozzolan – growing market**

Natural pozzolans such as the CS deposit or Hess Pumice ‘s pumice pozzolan are currently a small part of the global pozzolan market, mainly due to the wide availability of fly-ash. However, the decline in fly-ash production is expected to continue (despite President Trump’s pro-coal agenda) and this will lead to increased demand in natural pozzolans such as the CS material.

**Green credentials**

Natural pozzolan provides the following sustainable advantages:

1. Reduced CO2 emissions through replacement of Portland Cement, the manufacture of which is responsible for 5% of global CO<sub>2</sub> emissions
2. Not a by-product of a polluting process (i.e. coal power)
3. No heavy metal content (found in fly-ash)

**Western US pozzolan market**

The CS Project’s value is dependent on regional market supply-demand dynamics. This is based on the Californian cement manufacturing industry which consumes approximately 1-2 million tonnes of pozzolan per year in a 9.5Mt cement industry. The US wide trend of falling supplies of coal fly ash pozzolan is more acute in California due to its distance from sources of fly-ash and the retirement of the Navajo power plant in 2019. The map below shows the location of the main cement plants and the location of Navajo Generating Station, Page, Arizona.



## Regional market and Navajo Power Station

The Navajo Generating Station outside Page in Arizona supplies Western US with approximately 500kt of fly-ash used in cement/concrete mixes. This 2,250-megawatt plant has faced increasing financial pressure in the face of record-low natural gas prices, and the decision was made to retire the plant before the end of 2019.

## Legacy portfolio

Sunrise has a number of exploration project in its portfolio, in the U.S., Ireland and Australia. We regard the diatomite project in Nevada as the most likely source of value going forward, although recognise that Sunrise may find earn-in partners for its precious and base metals projects.

## Risks – marketing and unknown competition

Our main concern is known and unknown pozzolan competition in the region. NYSE listed Purebase has a pozzolan project in California but has not yet released any testwork to demonstrate that it is a credible material. Usefully for Sunrise, getting permitted in California is extremely challenging so Purebase and any other natural pozzolan projects in California are likely to be a low threat.

Nevada is generally regarded as a good jurisdiction for mining. It sits at number 4 on the Fraser Institute mining jurisdiction table 2016 (versus 49 for California) However, permitting a mine in the U.S can become a long process should anti-mining NGO's attempt to prevent a mine's development. This remains a risk even in a mining friendly state such as Nevada.

## Catalysts and recommendation

### ***Upcoming catalysts:***

- ASTM testwork results
- Marketing studies results
- Bulk sampling for customer trials

## Valuation

### Potential economics

Our \$7.5m risked valuation is based on our conceptual model of a CS Project pozzolan and perlite operation. The model assumes production and sales of 225kt pozzolan and 25kt perlite ore.

Ore with both perlitic and pozzolanic quality would be surface mined and crushed. Perlite size fractions would be separated out for sale to perlite expanders. The perlite material would be sold at a mine gate price.

The majority of production would be sold in bulk as pozzolan delivered to cement manufacturers in the California Basin (surrounds Los Angeles).

### Longer term potential – adding value

Sunrise's initial plan is to produce raw crushed pozzolan and perlite ore products. The cement manufacturer customer(s) would mill Sunrise's pozzolan product with Portland Cement clinker, the perlite customer(s) would expand the perlite material in its own furnace.

Longer term (or medium term if the economics are compelling), Sunrise could become involved in this downstream processing of pozzolan and perlite, adding significantly to revenues.

For pozzolan there is potential to establish milling facilities and sell specific sized pozzolan to ready-mix companies, and specialist products for grouts and mortars such as for oilfield cements. For perlite, there is potential to become an expander of perlite. Both are relatively low capital investments but would add significantly to the top line and profit margins.

#### Risked NAV:

Description				
CS Deposit NPV	\$m	29.1	£m	22.4
Risk factor	%	67.5%		
CS risked NPV	\$m	9.5	£m	7.3
G&A	\$m	-2.5	£m	-1.9
Legacy assets	\$m	0.5	£m	0.4
<b>Total</b>	<b>\$m</b>	<b>7.5</b>	<b>£m</b>	<b>5.7</b>

Price target	(p)	0.32
Current share price	(p)	0.11

### Risk factor

Our risk factor is imperfect because one factor (such as permitting or economics) has the potential of killing the project alone. However, we feel a near 70% risk factor fairly reflects the CS Project's early stage of development.

Description	Risk weighting
Permitting	20.0%
Project economics/transport	20.0%
Department of Transport list	10.0%
225kt market size demonstrated	17.5%
<b>Total risk factor</b>	<b>67.5%</b>

## Strengths and Weaknesses

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• <b>Industrial minerals projects</b> – We think industrial minerals such as the CS Project are a good fit for a junior miner. The CS Project sits on surface so is easy to mine with simple processing, and should be low capex (sub \$5m). It's a project Sunrise could develop itself.</li> <li>• <b>Pozzolan market fundamentals</b> – The retirement of the Navajo coal power plant in 2019 which supplies the western US with pozzolan is key to the Sunrise investment case.</li> <li>• <b>Low cost corporate cost</b> – Sunrise generates projects such as the CS Project and its Diatomite project for very low cost. It then evaluates the project before dropping it, farming-out or progressing it itself. We support Sunrise's low cost corporate structure.</li> <li>• <b>Friendly jurisdictions</b> – Sunrise focuses on low risk countries and regions. Its current focus is Nevada.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Funding risk remains</b> – As a pre-revenue company Sunrise requires new equity capital to fund its activities. However, last year its annual G&amp;A cost was a reasonable £285k.</li> <li>• <b>Marketing risk</b> - The CS Project has low exploration risk, but higher marketing risk i.e. it could be competing with other natural pozzolan companies for California's 1-2Mt annual market.</li> <li>• <b>Metallurgy risk</b> – with industrial minerals such as pozzolan or perlite the rock has to have just the right physical and chemical characteristics to be saleable. Testwork thus far shows CS Project material to be good quality but this needs to be proven across larger areas of the deposit and to depth.</li> <li>• <b>Transport costs</b> – The CS Project is in Nevada, approximately 200 miles from the nearest cement plant. We estimate transport costs of \$20/t, but regard higher transport costs as a risk. This is a low to medium value product.</li> </ul>

## Recommendation Breakdown

During the three months to end-June 2017, the number of stocks on which Beaufort Securities published recommendations was 195, and the recommendations were as follows: Buy – 73; Speculative Buy – 109; Hold – 11; Sell – 2.

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