



AIM Announcement

9 May 2022

## KEY ROLE FOR NATURAL POZZOLAN IN CEMENT DECARBONISATION IN WESTERN USA

Sunrise Resources plc wishes to provide the following information to shareholders regarding the importance of natural pozzolan to carbon-neutrality and sustainability in the future of the cement and concrete industries.

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### HIGHLIGHTS:

- Natural pozzolan:
    - has a key role in multiple CO<sub>2</sub> net-zero strategies in the cement and concrete industries.
    - is of interest to aspiring clean-tech cement producers as well as traditional heavy industries and building material suppliers.
    - has a role in building more durable and sustainable concrete structures.
    - will benefit from recent California State legislation and Implementation Priorities under Biden's \$1.2 trillion Infrastructure Bill.
  - Production of pozzolan cement is a win-win for cement companies looking to extend their cement production capacity.
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**Commenting today, Executive Chairman Patrick Cheetham said:** *"From my recent discussions with cement companies, it is becoming increasingly clear that a range of net-zero CO<sub>2</sub> strategies in the cement and concrete industries, the requirements for sustainability, and the long-term decline in fly ash supply are driving cement and concrete companies towards the use of natural pozzolan.*

*The manufacture of pozzolan blended cements is a win-win for the cement and concrete companies as not only does it allow them to reduce the embodied carbon in their products, it also increases their cement production per ton of cement clinker capacity at a time when they are already operating at full capacity and sold out of cement.*

*Given these drivers impacting on the US cement and concrete industries, our CS and Hazen Pozzolan Projects are well placed to help industry in pursuit of these goals."*

### The Role Of Natural Pozzolan In CO<sub>2</sub> Net-Zero Strategies

In its announcement of 4 May 2022, the Company stated that the development of its CS Natural Pozzolan-Perlite Project is taking place against a background of fundamental change in the cement and concrete industries; a change which is being driven by climate change targets to achieve net-zero CO<sub>2</sub> emissions.

After water, concrete is the most used substance on Earth. Whilst 14 billion cubic metres of concrete were poured globally in 2020, this is forecast to increase to 20 billion cubic metres annually by 2050 with continuing global urbanisation and population growth. This activity is currently responsible for 8% of the World's man-made emissions, half of which comes from the burning of fuel and the other half by direct release of CO<sub>2</sub> from burning limestone in the cement clinker making process.

Net-zero CO<sub>2</sub> targets are therefore a major challenge for the cement and concrete industries but one they must meet. In the US, as elsewhere around the World, these targets are enshrined in State legislation, industry-body commitments and are increasingly driven by cement and concrete customers and specifiers. In addition, one of the Implementation Priorities in US President Biden's November 2021 Executive Order "Implementation of the \$1.2 trillion Infrastructure Investment and Jobs Act" is "building infrastructure that is resilient and that helps combat the crisis of climate change". It seems likely then that priority will be given to greener and more sustainable building materials in contracts awarded under the Infrastructure Bill.

California is a major target market for the Company's CS Project and has the largest economy of all the US States. In September 2021, in the first law of its kind in the US, California's Carbon Cap-and-Trade scheme was signed into legislation and directly targets greenhouse gas emissions associated with the cement industry. This Cement Decarbonization legislation is focused on achieving net-zero emissions from the industry by the end of 2045. It works by putting a periodically declining limit on carbon emissions for a given entity, allows those entities to trade unused allowances but imposes fines on any entity exceeding its allowance. Experts believe this will pave the way for similar Federal legislation in the US. 2021 also saw the publication by The US Portland Cement Association of its road map to carbon neutrality. A key component for this road map is the reduction in the quantity of cement used in cement and concrete mixes through the use of supplementary cementitious materials ("SCMs") such as natural pozzolan.

It is important to understand how the cement industry is addressing net-zero carbon targets and how natural pozzolan can play a key role. There are a number of strategies currently being employed in the cement industry, including:

- *Use of alternative clean(er) fuels.* e.g. biomass, chemical and hazardous waste, and petroleum-based fuels but also natural gas; wind energy; hydroelectric power; solar energy; hydrogen; and nuclear energy.
- *Carbon capture and storage.* In its most basic form CO<sub>2</sub> is captured from the cement kiln where the fuel is burned and where CO<sub>2</sub> is released from burnt limestone. The captured CO<sub>2</sub> is stored in underground geological reservoirs such as spent oil or gas fields.
- *Carbon curing.* CO<sub>2</sub> is captured at the cement plant then liquified and transported with cement to the concrete ready-mix plant where it is reinjected into the concrete mix in the mixing truck. Here it combines with the concrete mix and becomes locked into the concrete mix and assists in concrete curing.
- *Manufacture of so-called "clean-tech" cements.* These cement technologies do not produce Ordinary Portland Cement ("OPC") but produce alternative cements by innovative carbon-neutral methods rather than OPC. These cements can be used in partial or full replacement of OPC.
- *Production of 1L (limestone) cement.* C.10% limestone blended with OPC with clinker. 10% reduction in CO<sub>2</sub> emission per ton of cement produced. An easy win for the cement companies as limestone is always available locally as the main source of cement clinker.

- *Production of cements containing natural pozzolan or slag. e.g.*
  - *1P (pozzolan) cement.* Up to 30% natural pozzolan blended with OPC. Up to 30% reduction in CO<sub>2</sub> emission per ton of cement. Natural pozzolan can replace fly ash pozzolan in cement or concrete. Fly ash supply is declining due to the ongoing closure of coal fired power stations.
  - *1S (slag) cement.* Up to 30% blast furnace slag pozzolan blended with OPC. Up to 30% reduction in CO<sub>2</sub> emission per ton of cement. Blast furnace slag is restricted in production quantities and locations.

## **The role of natural pozzolan in sustainable development**

In addition to building greener structures, a key part of sustainability in the concrete industry is the building of more durable structures with longer life.

Whereas “Roman concrete” structures made with natural pozzolan have survived for millennia, some concrete structures from parts of the 20<sup>th</sup> century made with OPC are susceptible to “concrete cancer”. This is due to reaction of alkalis in OPC with “reactive” silica in concrete aggregates and results in expansion, cracking and spalling of the concrete (Alkali Silica Reaction or “ASR”).

As high-quality aggregate supplies for concrete become scarcer, the concrete industry is having to use more reactive aggregates that can severely impact the quality of the resulting concrete.

The use of high quality SCMs such as natural pozzolan will mitigate ASR by tying up and immobilising the alkalis in cement, preventing their reaction with silica in the aggregates. So much so that the use of pozzolans is often mandated by State Departments of Transport for public infrastructure construction work to ensure more sustainable structures.

Sustainability, and ASR mitigation in particular, is therefore a significant factor in choosing the use of natural pozzolan in net-zero CO<sub>2</sub> strategies.

Of all the strategies being adopted by the cement and concrete industries, only the use of SCMs can mitigate ASR and so we expect to see natural pozzolan used in conjunction with other CO<sub>2</sub> reduction strategies.

## **Use of natural pozzolan is a win-win for cement companies**

In order for cement companies to reduce the embodied carbon in their cements it helps if there is a strong business case for doing so. Cap-and-Trade is a “carrot and stick” approach and customers and specifiers are increasingly looking for greener cements.

The use of 1P cement not only provides for more durable and sustainable concrete with lower embodied carbon but it also allows the cement company to sell more cement per ton of OPC clinker capacity. The production of cement clinker in the cement kiln is often the volume limiting step to cement production at a cement plant.

This is an important consideration particularly as cement companies are currently operating at capacity and are all sold out.

**These ongoing developments serve to strengthen the place of natural pozzolans in future cement formulations and the CS Project is well placed, being fully permitted and ready to mine.**

As stated in its news release of 4 May 2022, the Company is currently in discussions with two large CRMCs, one major fly ash distributor, a building materials company and a clean-tech company. Field visits were recarried out by certain interested parties at both Hazen and the CS Project in the past two weeks.

**Further information**

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