



November 30, 2022

Mark Sippola, PhD  
California Air Resources Board  
1001 I Street  
Sacramento, CA 95814

**Re: Blue Planet Comments on SB 596 Workshop and Cement Sector Net-Zero Emissions Strategy**

Dear Dr. Sippola:

Thank you for the opportunity to comment on the Kick-off Workshop for the SB 596 Cement Sector Net-Zero Emissions Strategy (SB 596 Strategy). The production and use of cement and concrete offers a tremendous opportunity to not just transform a sector and achieve net-zero emissions, but also to develop a fully scalable carbon sink in our built environment. We encourage CARB to think holistically about the opportunity to advance the State's climate goals through the use of climate friendly cement and concrete, including strategies to sequester CO<sub>2</sub> in aggregates and concrete, and to identify steps in the SB 596 Strategy to enable and advance these opportunities.

**About Blue Planet**

Blue Planet is a California company developing technology and products related to economically sustainable carbon capture. Our goal is to solve the carbon capture problem by converting CO<sub>2</sub> into high-value building materials. Our technology can be deployed at cement facilities or other difficult-to-decarbonize industries and can capture not only CO<sub>2</sub>, but also particulate matter, NO<sub>x</sub>, SO<sub>x</sub> and other pollutants hazardous to surrounding communities. It can also be coupled with direct air capture facilities and deployed as a carbon dioxide removal strategy. We are currently constructing and beginning operations of a plant in Pittsburg, California on the Sacramento Delta, and our carbon-sequestered aggregate has been utilized at San Francisco International Airport where carbon-sequestered concrete is specified.

Blue Planet's technology produces coarse and fine limestone aggregate made from sequestered CO<sub>2</sub> utilizing the carbon mineralization process. It allows lower-cost carbon capture, including from direct air capture, by avoiding the need to purify and enrich captured CO<sub>2</sub> before use, which reduces the cost and energy needs associated with carbon capture. It is also fully scalable

and can be applied to any facility in any part of the state where concrete is utilized, regardless of its proximity or access to a geological sequestration site.

### **Carbonate mineralization offers a significant and permanent carbon storage and utilization solution**

Almost all of earth's carbon – about 99 percent – is stored naturally through the process of mineralization in limestone rock. In fact, trillions of tons of CO<sub>2</sub> have been safely and naturally stored as carbonate mineral in the lithosphere for over 100 million years. As described in our July 9, 2021 comments related to the Scoping Plan kickoff workshops,<sup>1</sup> and validated in peer-reviewed research,<sup>2</sup> the mineralization process permanently stores carbon in rock, which can then be used in concrete and stored in our built environment.

Concrete is the most widely used building material on earth, and every year, California (and the world) uses enough rocks in concrete that we could store all emissions from major industrial sources in our buildings and roads. Compared to geological sequestration, which only entails cost and requires ongoing public subsidy,<sup>3</sup> carbon capture and conversion – in particular carbon storage in concrete – provides a value-added market that can make carbon capture cost effective without additional public subsidy.

While several technical, legal, and economic questions remain related to geologic sequestration, many of which CARB and other agencies will address through implementation of SB 905 (Caballero, Chapter 359, Statutes of 2022), carbonate mineralization offers a fully scalable, permanent carbon storage solution, ready for deployment today. We appreciate the state recognizing this opportunity, including:

- In the Final 2022 Scoping Plan Update, CARB discusses the role of carbon capture and carbonate mineralization in the context of decarbonizing cement and other sector transitions, stating “Direct air capture and carbon mineralization have high potential capacity for removing carbon...”<sup>4</sup>
- The CEC identifies carbonate mineralization, including carbon storage in aggregates, as one of the most promising strategies for decarbonizing the cement sector:<sup>5</sup>

Capturing carbon from industrial processes and then utilizing it in a product is considered one of the essential components for mitigating CO<sub>2</sub> emissions since it can achieve net

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<sup>1</sup> <https://www.arb.ca.gov/lists/com-attach/73-sp22-kickoff-ws-UTMGbFEIVGJQCQd3.pdf>

<sup>2</sup> For example, see: Xi, F., Davis, S., Ciais, P. et al. Substantial global carbon uptake by cement carbonation. *Nature Geosci* 9, 880–883 (2016). <https://doi.org/10.1038/ngeo2840>

<sup>3</sup> Unless it is used for enhanced oil recovery, which is unlikely in California given prohibitions included in SB 905 (Caballero, Chapter 359, Statutes of 2022) and SB 1341 (Limón, Chapter 336, Statutes of 2022).

<sup>4</sup> CARB (2022) 2022 Scoping Plan for Achieving Carbon Neutrality, California Air Resources Board, November 16, pg. 221. <https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp.pdf>

<sup>5</sup> See pg. 10 at: [https://esd.dof.ca.gov/Documents/bcp/2223/FY2223\\_ORG3360\\_BCP5441.pdf](https://esd.dof.ca.gov/Documents/bcp/2223/FY2223_ORG3360_BCP5441.pdf)

negative emissions, especially for sectors that are unable to achieve zero emissions. For example, carbon capture and utilization appear to be a pathway to achieve significant decarbonization of the cement industry where 60 percent of the carbon dioxide is from process emissions... For instance, carbon capture and utilization in the cement industry has recently emerged with sustainable techniques to use carbon emissions in concrete production. Some emerging utilization techniques, such as mineral carbonation, includes adding carbon into cement to enhance the concrete's compressive strength. With almost 4 billion tons of construction aggregate produced in North America, mineral carbonation could be the most efficient route to CO<sub>2</sub> utilization.

- In the final clean energy budget, SB 209 (Committee on Budget, Chapter 251, Statutes of 2022), the legislature includes carbonate mineralization in concrete as an eligible industrial decarbonization strategy, while excluding geologic sequestration.<sup>6</sup>

### **Enable carbonate mineralization as a decarbonization strategy for the cement sector by incorporating it into the CCS Protocol, Low Carbon Fuel Standard, and Cap-and-Trade**

In order to unleash this promising strategy to decarbonize the cement sector and other industries, CARB should formally incorporate carbonate mineralization into the CCS Protocol and Low Carbon Fuel Standard (LCFS) during upcoming amendments to the LCFS program. Additionally, CARB should adopt the CCS Protocol, including carbonate mineralization and storage in concrete aggregate, into the Cap-and-Trade Program when the program is next amended. We look forward to working with CARB staff regarding any technical or accounting questions that would support these efforts.

### **Greenhouse gas accounting should quantify embodied carbon and the amount of carbon stored in concrete**

As CARB considers a metric for greenhouse gas intensity pursuant to SB 596, we hope you will consider and reflect the carbon sequestered in concrete in the accounting. Doing so will accurately value the potential for carbon sequestering materials to contribute to concrete as a potential net-negative emissions carbon sink, and support broader goals identified in the Final 2022 Scoping Plan Update related to industrial decarbonization/sector transitions and carbon dioxide removal.

### **Support additional strategies to decarbonize cement and concrete, including through Buy Clean and/or a Low Carbon Product Standard**

Last, in the SB 596 Strategy, we encourage CARB to evaluate and highlight the need to adopt measures to support not just the production of low carbon cement, but the ability of carbon

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<sup>6</sup> Under the Industrial Grid Support and Decarbonization Program, eligibility is defined to include projects that “Develop and deploy novel decarbonization technologies and strategies, including carbon capture for use in products, such as carbonate mineralization and carbon curing of concrete that reduces or eliminates the emissions of greenhouse gases, except geologic storage.”

[https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=202120220AB209](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB209)

sequestering concrete materials to lower the carbon footprint of concrete overall. The two strategies go hand-in-hand, as demonstrated by Senator Becker carrying Buy Clean legislation in addition to SB 596, and other state policies that focus on advancing clean energy markets though both supply and demand side policies.<sup>7</sup>

A critical market mover will be public procurement, since Caltrans and other state agencies constitute the largest users of cement and concrete in the State. State agencies already tout their use of recycled materials and low carbon cement and concrete,<sup>8,9</sup> and they should take those efforts further to utilize building materials with carbon neutral/net-negative greenhouse gas emissions, when and where available and cost effective. One powerful tool for developing the most innovative technologies could be forward procurement of materials with the greatest greenhouse gas benefits, to support emerging technologies and companies in securing financing and scaling operations in the State.

The State should further support these efforts by formally incorporating cement and concrete into its Buy Clean framework, which could be done without legislation under Executive Order N-19-19,<sup>10</sup> and similar to recent actions at the federal level under President Biden.<sup>11</sup> Finally, we encourage you to consider a Low Carbon Product Standard, and how it might be leveraged to decarbonize cement and concrete production, and potentially other building materials or sectors.

Thank you for your consideration of these comments, and we look forward to working with you to implement SB 596 and the Scoping Plan in the coming months.

Sincerely,

Laura Berland-Shane  
Vice President, Government Affairs  
Blue Planet Systems Corp.

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<sup>7</sup> For example, CARB is supporting the development of zero emission trucks through both its Advanced Clean Trucks rule, which requires OEMs to sell increasing numbers of electric trucks, and the Advanced Clean Fleets rule, which requires fleets to increasingly buy them. CalRecycle has established a similar framework under its SB 1383 regulations, requiring jurisdictions to divert organics from landfills and procure products produced from diverted organics.

<sup>8</sup> <https://dot.ca.gov/news-releases/news-release-2022-003>

<sup>9</sup> <https://water.ca.gov/News/Blog/2022/Nov-22/Sustainable-Techniques-Bring-Concrete-Results-Making-DWR-Infrastructure-Carbon-Friendly>

<sup>10</sup> <https://www.gov.ca.gov/wp-content/uploads/2019/09/9.20.19-Climate-EO-N-19-19.pdf>

<sup>11</sup> <https://www.whitehouse.gov/briefing-room/statements-releases/2022/09/15/fact-sheet-biden-harris-administration-announces-new-buy-clean-actions-to-ensure-american-manufacturing-leads-in-the-21st-century/>