



100 Great Oaks Blvd., Suite 120  
San Jose, CA 95119

September 7, 2023

McKenzie Smith  
Climate Action Reserve  
600 Wilshire Blvd., Suite 202  
Los Angeles, CA 90017

RE: Climate Action Reserve U.S. Low Carbon Cement Protocol Version 1.0

Dear Ms. Smith:

Arelac Inc., dba Fortera ("Fortera") writes in support of the Climate Action Reserve ("CAR") U.S. Low Carbon Cement Protocol Version 1.0 (the "Protocol"). As a novel solution in cement, Fortera appreciates the opportunity to share its perspective on the Protocol's structure. Fortera is committed to commercializing practical decarbonization solutions and supports CAR's leadership in defining clear, ambitious accounting methodologies to spur confident investment in low-carbon cement projects.

Fortera is an innovator in low-carbon, non-clinker cement. Fortera markets Reactive Calcium Carbonate ("RCC") - a precipitated calcium carbonate polymorph, which can be blended into ASTM C150, C595, or C1157 cements or blended into the concrete mixture. Fortera products remineralize industrial (e.g. kiln) carbon dioxide ("CO<sub>2</sub>") rich waste streams thereby reducing CO<sub>2</sub> emissions by 60-70% over existing portland cements ("PC"), while improving overall cement yield. Addressing the significant emissions impact of calcination allows Fortera to establish a credible development roadmap to "net zero" cement. Fortera will demonstrate commercial production in Redding, CA in 2024 and is in active discussions with commercial partners that have full-scale projects, globally.

As such, Fortera's experience in developing, commercializing, and scaling viable lower-carbon cement technologies informs its support for the Protocol and the recommended enhancements below.

- 1. To support CAR's intention to create pathways for high-quality, low-carbon cement credits, Fortera recommends the Protocol directly address CO<sub>2</sub> mineralization in baseline and project emissions in the production of Supplementary Cementitious Material ("SCM") and Alternative Cementitious Material ("ACM").**

Broadly, Fortera supports CAR's focus on SCM/ACMs as a signal to cement stakeholders that investing in solutions with cementitious performance shifts the industry away from compositional definitions. However, in its current form, the Protocol's underlying decarbonization mechanism is the *material displacement* of PC - measuring the reduction of net CO<sub>2</sub> emissions via the inclusion of SCM/ACMs in a blended product compared to equivalent PC yield. This displacement is meant to be verified commercially, as the Protocol suggests using the quantity of SCM backed by evidence of commercial sales and a technical weight adjustment factor to verify the counterfactual amount of PC displaced.

SCM use is a commercial practice, and as a "supplementary" product, inherently displaces PC when incorporated and does so in ASTM-standardized ratios<sup>1</sup>. While CAR identifies reported

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<sup>1</sup>[U.S. DOT SUPPLEMENTARY CEMENTITIOUS MATERIALS](#)



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barriers to SCM adoption (e.g. capex requirements and feedstock availability) in section A.3, given the long-standing practice of SCM use, Fortera sees these adoption risks as unrelated to the frontier of CO<sub>2</sub> management in the sector. For the mechanism of *material displacement* in PC to be an effective approach to verifying CO<sub>2</sub> reduction, standards allowing larger SCM ratios (up to and including a full “ACM” as defined by CAR in this Protocol) would need to be incentivized through the Protocol.

Global cement demand is increasing and PC is the predominant global cement production method, reinforcing the emissions problem of PC calcination. SCM use is supplementary within an uncapped supply of PC, posing the risk of inter- and intra-market leakage from preference for, or availability of, SCMs that would inhibit the displacement of PC (as considered in section 5.3).

As the Protocol is intended to operate within the existing commercial SCM regime, Fortera believes a CO<sub>2</sub> reduction mechanism would be more effective if it included the quantification of the *carbon captured within* the SCM. Mineralization addresses the chemically inherent and majority of PC CO<sub>2</sub> emissions, thereby minimizing the Protocol’s leakage risk. Through its experience in commercializing RCC, Fortera has demonstrated that mineralization presents a unique opportunity for permanent CO<sub>2</sub> avoidance as a scalable, value-adding process step, and thus encourages CAR to consider this dynamic in an enhanced final Protocol.

Further, the Protocol establishes multiple calculation pathways to baseline PC production CO<sub>2</sub> yet SCM/ACM production emission calculations are limited to fuel and grid emission factors. While Fortera is encouraged by the inclusion of CO<sub>2</sub> on the positive list of ACM materials, the quantitative scope of the Protocol reinforces a *correlative* relationship between the project and CO<sub>2</sub> reductions. Fortera believes that accounting for carbon emission mineralization within the assessment boundary is a method to ensure a *causal* CO<sub>2</sub> reduction by the project SCM/ACM may be established by the credit.

Fortera understands CAR is considering a dedicated Protocol draft focused on carbon capture, utilization and sequestration (CCUS) projects. CCUS technologies are vital investments in the pathway to achieve zero carbon cement. However, Fortera believes the breadth of CCUS technologies obscures the specific opportunity of mineralization as a carbon management solution in cement. In most applications, the CCS portion of the stack is a cost center that creates a challenging investment environment for businesses with high margin pressure. Utilization is also a broad space<sup>2</sup>, and one where Fortera anticipates rigorous cement decarbonization methodologies would be crowded out. Therefore, Fortera believes mineralization in a SCM/ACM is an industry-specific solution and thus a valid inclusion in a low-carbon cement methodology.

With the right cement production technologies, the carbon emissions are the product. Fortera would welcome the opportunity to work with CAR on structuring baseline and project calculations that reflect this opportunity.

- 2. Fortera encourages CAR to consider a two-tier structure within the Protocol to capture the frontier opportunity of permanent carbon capture alongside carbon avoidance through the standard use of SCM/ACMs.**

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<sup>2</sup>[DOE's Carbon Utilization Program](#)



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Fortera shares CAR's vision in the need for high-quality carbon credits targeting the cement sector. As reported widely, the impact of voluntary carbon markets (VCMs) is critically linked to the integrity of the credit as verified through registry methodologies. Issues with permanence, additionality and leakage<sup>3</sup> are actively devaluing investments<sup>4</sup> in these markets and threaten the fundamental concept of VCMs.<sup>5</sup> Separately, Fortera notes increasing interest from sophisticated corporate buyers in high-quality CO<sub>2</sub> reductions within their value chains<sup>6</sup>, and carbon removal firms looking to establish alternative registries in order to maintain effective price signals between lower and higher quality credits.

Fortera believes a two-tier credit approach allows CAR to offer VCM products that effectively differentiate credit assets in a manner specific to buyer interests. As mentioned, CO<sub>2</sub> mineralization presents a compelling opportunity for permanent CO<sub>2</sub> avoidance within a ubiquitous element of corporate value chains - cement. As a performance-enhancing SCM/ACM, the commercial uptake of Fortera's RCC positions CO<sub>2</sub> mineralization as the foundation for a project pipeline where permanent avoidance credits may be generated (and retired) in increasing scale, representing a confident investment in value chain decarbonization, akin to CCUS removal credits.

Fortera recognizes the range of SCM/ACM options and agrees incremental decarbonization is an important objective. Fortera does not believe a two-tier Protocol would diminish the value of non-mineralized SCM/ACMs as access to a "non-permanent" credit in the cement sector would remain available to corporate buyers. Alternative low-carbon cement accreditation efforts currently fall short, as they artificially limit the definition of mineralization in commercially viable and impactful low-carbon cement products by over-specifying the end-products (e.g. ready mix) or the production step (e.g. injected in concrete). Therefore, Fortera believes the Protocol is well-positioned to effectively incentivize the valuable and permanent utilization of CO<sub>2</sub> unique to cement production.

### **3. Fortera encourages CAR to consider a project capital expenditure threshold in the Protocol Performance Standard Test.**

VCMs drive private financing to CO<sub>2</sub> reduction projects underpinned by the concept of additionality. As suggested in this comment, SCM/ACM displacement of PC is an industry-standard practice with a well-understood business case. On the topic of SCM/ACM marketing, Fortera recognizes that capital expenditures are required to promote low-penetration SCM/ACM availability. Investments in these activities through the Protocol would thus be reframed by the CO<sub>2</sub> reduction attributes of SCM/ACM use.

Fortera is actively engaged in financing discussions for carbon capture in cement, and shares in the Protocol working group's interest in increasing investment in the cement industry. As a permanent CO<sub>2</sub> reduction solution, Fortera believes the Protocol's pursuit of quality accreditation would be strengthened by adding a minimum investment threshold to ensure capital flows to projects that support additionality and impact through sufficient industry scale.

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<sup>3</sup> [Assessing the State of the Voluntary Carbon Market in 2022](#)

<sup>4</sup> [Barclays says VCM market value is just \\$500m this year amid price collapse](#)

<sup>5</sup> Are carbon offsets unscalable, unjust, and unfixable—and a threat to the Paris Climate Agreement?, Romm

<sup>6</sup> [Meta looks to invest in value chain GHG reduction projects](#)




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Fortera would welcome further engagement with CAR on shaping this threshold.

Fortera appreciates the opportunity to share its business and technical perspective on how the Protocol achieves its cement decarbonization goals and would welcome continued dialogue on shaping the above recommendations. Fortera is encouraged by the existing Protocol draft and looks forward to supporting CAR and the Protocol working group as a partner in further iterations.

Sincerely,

DocuSigned by:  
  
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Ryan Gilliam, Ph.D  
Chief Executive Officer  
Fortera