December 21, 2022

Cheryl Laskowski, Ph.D.
California Air Resources Board (CARB)
1001 I Street
Sacramento, CA 95814

RE: Low Carbon Fuel Standard (LCFS) targets should align with Final Scoping Plan and support continued innovation in carbon dioxide removal (CDR)

Dear Dr. Laskowski:

Brimstone appreciates the opportunity to comment on the November 9, 2022 LCFS workshop. We support amendments to the program that align with the State's climate neutrality goals and maintain a strong and consistent market signal to drive continued innovation around climate change solutions, including CDR strategies. As CARB continues evaluating scenarios for strengthening carbon intensity reduction targets, we encourage ongoing analysis to ensure targets align with the State's climate change goals, including CDR goals identified in the Final 2022 Scoping Plan Update (Final Scoping Plan).

About Brimstone

Brimstone is a California-based company, headquartered in Oakland, that developed a carbon-negative process for producing regulatory-compliant ordinary portland cement. Cement is responsible for about the same amount of greenhouse gas emissions as all of the world's cars on the road today. It has traditionally been one of the most difficult materials to decarbonize – until now. We have invented a way to make carbon-negative portland cement that is identical to conventional cement and lower in cost. Simply put, our process will turn one of the most intractable climate problems into a carbon-negative climate solution.

Our process also produces a magnesium byproduct that serves as a direct air capture sorbent to mineralize CO_2 from the ocean or air and permanently store it as magnesite rock. This is a promising, lower-cost CDR strategy that could allow Brimstone to eventually remove up to one ton of CO_2 per ton of cement produced. Our approach also could be used as pure carbon sequestration without cement production if a strong market for CDR were developed.

LCFS critical to support CDR, carbon intensity targets should reflect CDR goals

We were excited to see Governor Newsom's July letter to Chair Randolph calling for increased climate ambition – including more stringent LCFS targets and new CDR targets, including 20 $MMTCO_2$/year by 2030 and 100 $MMTCO_2$/year by 2045 – and to see those items reflected in the Final Scoping Plan. While we hope the State will take additional steps to support market development and scale of CDR, including through implementation of SB 27 (Skinner) and inclusion of mineralization in that program, the LCFS is currently the only policy mechanism in place to support CDR strategies. The strong market signal provided by the LCFS is essential for deploying CDR at necessary levels to achieve carbon neutrality and meet the Governor's CDR goals. Until other mechanisms are adopted, the LCFS program will need to serve as the primary mechanism for achieving these goals.

Accordingly, we encourage CARB to take steps to support innovation and market scalability of CDR strategies through the LCFS, and in particular:

- **Develop new Carbon Capture and Sequestration (CCS) protocols that incorporate mineralization of carbon dioxide from the air and ocean water using magnesium species to form magnesium carbonates and bicarbonates, and adopt those protocols in the LCFS.** Achieving significant scale of CDR will require deploying a wide array of solutions above and beyond natural and working lands strategies and direct air capture with geologic sequestration. Mineralization is a very promising and scalable strategy to achieve low cost and low energy use CDR and permanent sequestration, and CARB should enable its use in the LCFS. Durable and verifiable mineralization pathways – specifically those that do not rely on "looping" and re-gasifying CO_2 – avoid the need to identify injection sites for gaseous CO_2, the risk of accidental release, and the energy and carbon cost associated with underground sequestration. CARB should also define CDR to include carbon dioxide removal from both air and ocean water. Removing carbon from the ocean may offer lower cost and additional CDR opportunities, including from mineralization of magnesium species.

- **Set carbon intensity reduction targets for 2030 and beyond that align with the Final Scoping Plan and CDR goals, and account for the necessary role the LCFS will play in achieving them.** We support carbon intensity reduction targets at least as ambitious as included in Alternative C presented at the workshop. We note, however, that the scenario analysis presented at the workshop relied on the Draft Scoping Plan for many of its input assumptions, which notably does not include a number of relevant items that will affect the LCFS market moving forward, including the State's new CDR goals. The Final Scoping Plan does include those items, including about 18 $MMTCO_2e$/year of CDR from LCFS-related activities in 2030 and 76 $MMTCO_2e$/year from those activities in 2045 – primarily from direct air capture.[1] CARB should continue to evaluate appropriate carbon intensity reduction targets that align with the Final Scoping Plan, including the need to achieve significant levels of CDR, and propose targets accordingly. We expect that such an analysis likely would suggest even greater carbon intensity reductions than those identified in Alternative C to be appropriate.

Thank you again for the opportunity to comment on the workshop proposals. We look forward to working with you and other stakeholders in the coming months to support a strengthened LCFS that will keep the state on track to meet and exceed its climate goals. Please do not hesitate to reach out if you have any questions about Brimstone or these comments.

Thank you,

Cody Finke
Co-Founder and CEO
Brimstone

[1] LCFS-related carbon removal strategies as identified in the Final Scoping Plan include carbon capture and sequestration (CCS) at refineries, biomass-based hydrogen production with CCS and direct air capture of CO_2. According to the Final Scoping Plan analysis, direct air capture reaches 2.3 $MMTCO_2e$/year in 2030 and 64.4 $MMTCO_2e$/year in 2045.