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July 8, 2021

Ms. Shelby Livingston
Mr. Matthew Botill
Industrial Strategies Division
California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: Pew Comments on Development of the 2022 Scoping Plan Update to Achieve Carbon Neutrality by 2045 (Natural and Working Lands)

Dear Ms. Livingston and Mr. Botill:

On behalf of The Pew Charitable Trusts (Pew), thank you for the opportunity to provide input into the development of the California Air Resources Board's (CARB) 2022 Scoping Plan Update. This update can provide a more comprehensive accounting of the ability of California's natural and working lands to capture and store carbon, and advance specific policy pathways to bolster this important ecosystem service, in support of state goals to achieve carbon neutrality by the mid-century. The 2022 Scoping Plan Update presents an opportunity for CARB to incorporate the latest science, data, and methodologies to ensure more precise carbon accounting and improved management of natural and working lands, including the state's coastal ecosystems.

Pew's data-driven conservation efforts—both in the U.S. and abroad—help to preserve wild places and rivers, restore biodiversity, and increase understanding of ocean ecology. On land, we focus on conserving wildlife corridors, coastal ecosystems, and pristine landscapes. Pew also works to minimize the consequences of overfishing, pollution, warming waters, and loss of habitat.

Pew's interests relative to the 2022 Scoping Plan Update, and the focus of our comments, is to advance protection and restoration of California's iconic and vital coastal ecosystems, including tidal marsh and submerged aquatic vegetation like eelgrass beds, as a key component of the state's climate response policies. Although their extent has been reduced to a fraction of historic levels, these habitats sequester and store significant amounts of carbon; form natural defenses against erosion, sea level rise, and flooding; increase biodiversity; support economically and culturally important wildlife species; and provide open space and educational opportunities for communities – both urban and rural – up and down the coast.

As CARB develops new strategies and targets focusing on natural and working lands, we recommend consideration of the following with respect to coastal ecosystems:

- **Improve quantification of carbon sequestration and storage** provided by coastal habitats as part of the natural and working lands (NWL) greenhouse gas (GHG) inventory, using best available science and established methodologies that are consistent with the Intergovernmental Panel on Climate Change (IPCC) 2013 Wetlands Supplement and the U.S. Inventory of Greenhouse Gas Emissions and Sinks.
- Incorporate a **blue carbon lens to the state's policy frameworks** governing coastal wetlands and eelgrass, including consideration of carbon losses and gains resulting from management decisions, to **protect and maintain the state's existing blue carbon stocks**.
- Propose specific targets and regions for **habitat migration zones** in coastal and subtidal areas to avoid destruction of wetlands and eelgrass beds from sea level rise impacts such as drowning and conversion to open water.
- Set **ambitious conservation and restoration targets** that leverage existing goals from the Ocean Protection Council's 2020-2025 Strategic Plan and build upon new research on carbon-focused restoration opportunities.

In sum, protecting California's existing coastal resources, expanding their extent through restoration, and planning for future habitat needs, are no-regret measures that will yield measurable carbon sequestration, climate resilience, and biodiversity benefits for California's coastal communities. Our detailed comments are provided below.

Background – Coastal Habitats as Climate Allies

From the small "pocket" estuaries of Southern California to the extensive wetlands of the San Francisco Bay and Sacramento-San Joaquin Delta, California's coastal ecosystems provide critical ecosystem services for communities and nature alike. They are recognized biodiversity hot spots, supporting birds, aquatic populations including salmon and Dungeness crab, and other wildlife that drive local tourist economies and sport and commercial fisheries. These areas also play a significant role in helping communities adapt to and mitigate the impacts of climate change, and for this reason, should be a key part of California's climate response policies.

Coastal Blue Carbon

Tidal wetlands and eelgrass beds found along coasts and in estuaries are globally recognized for their ability to capture carbon dioxide (CO2) and store the resulting "blue carbon" in their vegetation and soils for millennia at rates (per unit area) exceeding tropical forests. Conversely, their destruction releases this stored carbon back into the atmosphere. Across the globe, an estimated 0.45 billion tons of CO2 is emitted from the destruction of coastal wetlands annually,[1] the equivalent of over 97 million cars' worth of CO2 in one year.[2]

Coastal wetlands are currently the only marine ecosystem recognized by the United Nations Framework Convention on Climate Change for the measurable contribution they can provide to

[1] L. Pendleton et al., (2012) "Estimating Global "Blue Carbon" Emissions from Conversion and Degradation of Vegetated Coastal Ecosystems," PLOS ONE 7, no. (9): (2012): e43542, https://doi.org/10.1371/journal.pone.0043542.

[2] United States Environmental Protection Agency, "Greenhouse Gas Emissions from a Typical Passenger Vehicle" (2021), https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle.

achieving climate mitigation goals. Researchers are also working to quantify the role of other marine ecosystems, such as kelp forests, to capture and sequester carbon.[3]

Since 2017, the United States Environmental Protection Agency (USEPA), working with the National Oceanic and Atmospheric Administration (NOAA) and blue carbon experts, has accounted for the role of coastal wetlands in GHG emissions and removals in the "land use/land use change and forestry" sector. According to the Inventory of U.S. Greenhouse Gas Emissions and Sinks (National Greenhouse Gas Inventory, or NGGI)[4] released in April 2021, coastal wetlands in the lower 48 states sequester 8.8 metric tons of carbon dioxide equivalent (CO2e) per year and store 2.9 billion tons of CO2 in their soils.

With over 1,200 km^2 of tidal marshes and 60 km^2 of seagrass,[5] California still has a relatively large area of coastal blue carbon ecosystems despite historic losses. As the science to quantify carbon storage provided by nearshore ecosystems like kelp forests and the seabed improves, this number could grow. Accordingly, conserving these areas and expanding their extent represents an important pathway for climate mitigation in the state. Further, because coastal habitats can become sources of GHG emissions if degraded, the avoided emissions associated with protecting coastal habitats should also be a key part of California's carbon calculus.

Climate adaptation and resilience

Coastal ecosystems help promote coastal adaptation and resiliency to the impacts of climate change. They also help protect communities from climate-related threats, including buffering against damaging waves during severe storms, absorbing excess flood waters, and stabilizing shorelines. Nationally, storm damage services related to coastal wetlands have been valued at over $23 billion dollars annually.[6]

According to reports produced for the Governor's Climate Adaptation Strategy, sea level rise, coastal flooding, and coastal erosion pose major threats to California's coastal communities, where nearly 85% of the state's population live and work. The reports show that sea level rise is projected to advance by as much as 55 inches by the end of the century, an increase that could put nearly half a million people at risk of flooding and threaten $100 billion in property and infrastructure. Coastal ecosystems like kelp forests, eelgrass beds, and tidal marsh provide important nature-based defenses against these climate impacts.

In coastal waters, eelgrass and kelp forests also help draw down excess CO2 in the nearby water column, thereby reducing the impacts of ocean acidification, a global threat stemming from increasing levels of carbon dioxide. A recent study[7] of seagrass meadows along California's coast indicates that these habitats provide localized amelioration of ocean acidification,

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[3] J. Howard et al., (2017) "Clarifying the Role of Coastal and Marine Systems in Climate Mitigation," Frontiers in Ecology and the Environment 15, no. (1)(2017): 42-50, https://doi.org/10.1002/fee.1451.

[4] https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks

[5] Wedding, L.M., Moritsch, M., Verutes, G., Arkema, K., Hartge, E., Reiblich, J., Douglass, J., Taylor, S. and Strong, A.L. (2021). Incorporating blue carbon sequestration benefits into sub-national climate policies. *Global Environmental Change*. 102206.

[6] https://www.fisheries.noaa.gov/national/habitat-conservation/coastal-wetlands-too-valuable-lose

[7] A.M. Ricart et al., (2021) "Coast-Wide Evidence of Low Ph Amelioration by Seagrass Ecosystems," *Global Change Biology*, https://doi.org/10.1111/gcb.15594.

providing critical climate refugia for marine wildlife including valuable fish and shellfish, birds, and other species, in the face of acidifying waters.

The need for action

California has lost an estimated 90% of its wetlands across the state: the tidally influenced Sacramento-San Joaquin Delta has only 3% of historical freshwater emergent wetlands; the San Francisco Bay has only 15% of historical estuarine wetlands; and between 75 and 85% of historical wetlands in Southern California watersheds have been lost.[8] This extensive loss can be attributed to past land use practices including diking, draining and filling of wetlands; cutting off sediment and water flows through damming and other barriers; and pollution. Today, California's rate of loss has significantly slowed thanks to strict regulations and landmark laws like the California Coastal Act and the Porter-Cologne Water Quality Act. However, the impacts of past land use practices, as well as on-going and accelerating threats posed by development pressure and sea level rise, continue to put these ecosystems at risk.

Eelgrass, California's native seagrass habitat, has also faced extensive loss in the state due to excess sedimentation resulting from land use practices, pollution, and direct impacts from coastal infrastructure. Globally, scientists rank seagrass as one of the most threatened ecosystems on earth, with almost 30% of the known seagrass coverage vanishing since the 19th century, a loss that parallels those of mangroves and coral reefs.[9] Morro Bay, home to a National Estuary Program, has experienced a massive die-off in eelgrass habitat, with declines of more than 90% since 2007.[10] Sea level rise, which impacts light penetration in nearshore waters, will accelerate this loss if eelgrass beds are unable to migrate shoreward.

Finally, bull kelp off California's north coast has collapsed by 95% since 2014, a loss described by scientists as "unprecedented;"[11] giant kelp is also showing signs of stress and decline in other parts of the state.[12] These declines, the most severe of which are found off Sonoma and Mendocino counties, are driven by marine heat waves and their cascading effects, prompting concerns about the longer-term impacts of climate change on kelp forests.[13] The increased frequency of such warm water events along California's coast underscores the urgent need to conserve existing kelp beds, restore depleted ones, and bolster kelp's resilience to climate impacts.

The extensive loss faced by California's coastal habitats can result in a "shifting baselines" dilemma. Because the extensive loss and resulting limited spatial footprint (relative to historic extent) are now the "new normal," these habitats can be overlooked in the policy realm related to prioritizing and advancing nature-based solutions. Accordingly, a key policy need is to elevate

[8] See https://mywaterquality.ca.gov/eco_health/wetlands

[9] See https://tinyurl.com/494mtzy5

[10] See https://calpolynews.calpoly.edu/news_releases/2020/july/estuary

[11] McPherson, Meredith L. et al. (2021), "Large-scale shift in the structure of a kelp forest ecosystem co-occurs with an epizootic and marine heatwave." Communications Biology vol. 4(1): 298. 5 Mar. 2021, doi:10.1038/s42003-021-01827-6

[12] California Ocean Protection Council. 2021. Interim Action Plan for Protecting and Restoring California's Kelp Forests.

[13] Arafeh-Dalmau, N. et al. (2020) "Marine heat waves threaten kelp forests." Letters in Science. Vol. 367, Issue (6478): 635. 7 Feb. 2020. DOI: 10.1126/science.aba5244

the importance of maintaining and expanding functioning, intact coastal ecosystems as part of the state's climate calculus with relevance to mitigation, adaptation, and resilience.

Recommendations

Improve quantification of blue carbon sequestration and storage

The 2022 Scoping Plan update presents an opportunity for California to emerge as a national leader in accounting for blue carbon in GHG reduction efforts. Currently, California is one of only a handful states with an NWL GHG inventory, and the most recent (2018) inventory[14] includes "Tier 1" estimates of GHG emissions and removals from tidal wetlands, using default values from the Intergovernmental Panel on Climate Change (IPCC).[15]

The 2018 CARB NWL inventory includes a snapshot of coastal wetlands for the year 2016, describing these areas as a small source of emissions, in contrast to other studies. For example, the state-level breakdown from the NGGI, which includes California specific emissions and removals data, shows that these ecosystems are a small net sink for the state. Accordingly, we recommend that the Scoping Plan Update prioritize moving the coastal wetlands GHG inventory from Tier 1 to Tiers 2 and 3 status by leveraging the growing body of research quantifying blue carbon in California, as well as newly available data from the NGGI. In doing so, the state will have a more accurate picture of baseline carbon sequestration and storage found in coastal ecosystems that can then inform management measures to maintain and expand the blue carbon contribution to the state's GHG reduction efforts.

The timing is ripe for improving the state's NWL inventory for coastal wetlands. This year (2021), the U.S. government released a breakdown of state level NGGI data from 1990-2019, which includes emissions and removals for coastal wetlands remaining wetlands, coastal wetlands converted to open water, open water converted to coastal wetlands, and land converted to coastal wetlands, creating an opportunity for states to incorporate this information into their own inventories. This development is particularly important for states that want to recognize the role of coastal wetlands in their GHG inventories and lack resources and/or robust state level data, particularly land cover change data. For coastal counties in the conterminous U.S., a time-series of land use change data starting in 1996 and updated most recently in 2016 is provided by the NOAA Coastal Change Analysis Program (C-CAP) and forms the basis of the NGGI.[16] The C-CAP land cover classifications include estuarine and palustrine emergent, scrub-shrub, and forested wetlands, among 21 other land cover classes.

Leveraging federal data sets would have the additional benefit of creating consistency between California's NWL inventory and the NGGI, allowing the state to improve national GHG accounting in future updates through refined state-level data. Given that the NGGI is the basis by

[14] An Inventory of Ecosystem Carbon in California's Natural and Working Lands, 2018 Edition. https://ww3.arb.ca.gov/cc/inventory/pubs/nwl_inventory.pdf

[15] Tier 1 represents the minimum set of information needed to complete inventories based on default values from global literature reviews, while Tiers 2 and 3 represent marked improvements over Tier 1 estimates in terms of certainty and sophistication through the use of national, regional and localized data sets. Tiers represent options for national and state entities to incorporate coastal wetlands into GHG inventories without the need to wait for all key data gaps to be filled. As more complete data become available, these entities can work to achieve greater certainty in GHG emissions and removals estimates.

[16] See: https://coast.noaa.gov/digitalcoast/data/ccapregional.html

which the U.S. measures its contribution to global climate change, helping inform more accurate accounting at the national level could improve national and international efforts to reduce the global threat of climate change.

In addition to leveraging this newly available data from the NGGI, CARB experts can incorporate new research conducted in California to improve the coastal wetlands inventory. In a recent assessment commissioned by Pew and conducted by the Smithsonian Environmental Research Center based on the Coastal Carbon Atlas, California is in the top tier of all U.S. coastal states in terms of blue carbon data quantity and quality.[17] CARB can also refer to the California Ocean Science Trust's (OST) Carbon Accounting Methods and Sequestration Benefits of California Wetlands, which provides an overview of the latest blue carbon science in the state related to salt marsh, seagrass and kelp.

Pew also recommends the inclusion of eelgrass habitats in upcoming NWL inventory improvements and the Scoping Plan Update. Although spatially limited (approximately 60 square kilometers[18]), eelgrass habitats are a known carbon sink. In its "Carbon Accounting Methods and Sequestration Benefits of California Wetlands" report, OST provides initial estimates of sequestration at the equivalent of 550 cars off the road per year.[19] The report further highlights the need for increased assessment of carbon storage, export, and sequestration rates in eelgrass, as these figures could potentially be undercounting blue carbon.

Finally, with its extensive ocean area, California can be a leader in advancing research into the role of nearshore ecosystems as a carbon sink. Ocean ecosystems are the focus of a growing body of research to quantify carbon benefits that may in the future lead to carbon accounting methodologies. The OST report includes a robust list of research areas that should be highlighted in the Scoping Plan, including (for example) kelp detritus stored in the seabed that may represent an important (and unaccounted for) carbon pool for the state.[20] The Bren School at the University of California, Santa Barbara is also engaged in innovative research into carbon stored in the seabed and related management implications.[21]

Incorporate a blue carbon lens to the state's policy frameworks to protect existing stocks

California's coastal habitats provide carbon sequestration and storage services that should be accounted for in the policy frameworks governing management of these ecosystems. We suggest that the 2022 Scoping Plan Update recommend incorporating carbon services more explicitly into policy making and implementation with respect to land use, permitting, and associated compensatory mitigation and protected area designations to conserve blue carbon stocks. Research on mainstreaming coastal blue carbon in select federal regulations[22] demonstrates the

[17] The Smithsonian report is undergoing final QA/QC reviews. Pew is happy to share the report once it is finalized.

[18] California Department of Fish and Wildlife. 2015. Marine Region GIS Downloads. Marine Regions GIS Downloads.

[19] https://www.oceansciencetrust.org/wp-content/uploads/2021/02/Carbon-Accounting-_State-of-the-Science_-report_External_Draft_Feb2021.pdf

[20] Ibid

[21] See: https://advances.sciencemag.org/content/6/44/eabb4848

[22] Sutton-Grier, A.E. et al. Amber K. Moore, Peter C. Wiley, Peter E.T. Edwards, (2014) Incorporating ecosystem services into the implementation of existing U.S. natural resource management regulations: Operationalizing carbon sequestration and storage., Marine Policy, Volume 43, 2014, Pages 246-253, ISSN 0308-597X, https://doi.org/10.1016/j.marpol.2013.06.003

feasibility of accounting for this ecosystem service within existing policy frameworks. This approach could help inform management decisions in known blue carbon hotspots such as Humboldt Bay, which supports the state's most expansive and intact eelgrass beds and is under growing pressure from competing uses.

Develop buffers and migration zones

California's coastal habitats provide front line defenses against current and emerging threats related to climate change, including sea level rise. However, these resources are also threatened by the very phenomena that they can help to alleviate. When coastal habitats like wetlands are overtaken by rising waters, they release stored carbon, and the state loses a significant carbon sink.

California is fortunate to have some of the most robust information in the nation on the vulnerability of coastal habitats to sea level rise to help guide planning.[23] According to research conducted by The Nature Conservancy and the State Coastal Conservancy, California has close to 200 km^2 of potential future habitat (largely in agriculture and developed open space) that could help mitigate the potential loss of vulnerable habitats to sea level rise.[24] The 2022 Scoping Plan should prioritize implementation of the recommendations put forward in this research and include the 200km^2 as a specific target for protecting these areas as buffers and migration zones. This process will require community-based planning coupled with financial incentives and other innovative solutions focused around forging "win-win" partnerships between the state, local governments, and the private sector.

Pew also recommends focused strategies on eelgrass beds relative to sea level rise. As waters get deeper, eelgrass can shift shoreward to shallower areas with better light penetration. Similar to marsh and other wetlands, these subtidal habitats can be blocked from migration by coastal development (e.g., grey infrastructure, docks, piers, aquaculture facilities). This "coastal squeeze" threatens already depleted eelgrass habitat and the ecosystem services this resource provides for fisheries, birds, water quality, shoreline stabilization, and carbon storage. To preserve the blue carbon potential of this resource, the 2022 Scoping Plan should recommend protection of mudflats and other areas that can provide suitable future habitat for eelgrass.

Set ambitious restoration targets

Restoring the health and extent of degraded coastal wetlands would increase blue carbon sequestration and storage services, as well as advance numerous co-benefits for communities and nature. Accordingly, the Scoping Plan update should include specific quantitative targets and approaches for restoring historic or degraded wetlands, such as (where feasible) restoring tidal influence, a strategy that could result in short term emissions reductions in addition to rebuilding carbon sinks.[25]

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[23] Heady, W.N. et al. (2018). Conserving California's Coastal Habitats: A Legacy and a Future with Sea Level Rise. The Nature Conservancy, San Francisco, CA; California State Coastal Conservancy, Oakland, CA. 143 pages.

[24] Ibid, page 4

[25] Kroeger, K.D., Crooks, S., Moseman-Valtierra, S. et al. (2017). Restoring tides to reduce methane emissions in impounded wetlands: A new and potent Blue Carbon climate change intervention. Sci Rep 7, 11914 (2017). https://doi.org/10.1038/s41598-017-12138-4

The tidally-influenced Sacramento-San Joaquin estuary represents an extensive portion of California's historic coastal wetland footprint.[26] Currently, almost 2 million metric tons of carbon are emitted annually from this region, the equivalent of about 500,000 motor vehicles' emissions.[27] The area has been identified as a potential restoration opportunity that could deliver shorter term emissions reduction and longer term carbon storage for the state.[28] The 2022 Scoping Plan Update can identify opportunities to expand and fund pilot, partnership-based efforts that restore currently degraded and leveed areas back to functioning wetlands as a pathway for advancing climate mitigation while also delivering significant co-benefits related to flood protection, water quality, and biodiversity. Incentives to facilitate public private partnerships with landowners, such as payments for ecosystem services, should be advanced.

The 2022 Scoping Plan Update should also highlight and leverage the climate mitigation potential of restoration efforts underway in San Francisco Bay and Southern California's pocket estuaries like Los Cerritos wetlands. In addition to rebuilding carbon sequestration and storage services, these restoration efforts advance coastal resilience and provide open "blue" space for urban communities. Other restoration opportunities that could provide significant blue carbon opportunities include the Eel River and Humboldt Bay estuaries. The update can recognize the role these wetland restoration efforts play in building back the state's blue carbon sinks and prioritize research and funding to support carbon-related measurements and projections related to these efforts.

In addition to emergent coastal wetlands, a focus on submerged aquatic vegetation, particularly restoration of the state's depleted eelgrass beds, could increase blue carbon sinks while also helping address climate-related ocean acidification. We would like to note recent research[29] supported by Pew that synthesizes best practices for eelgrass restoration along the west coast; as well as a study conducted by researchers from the University of California, Davis, showing that seagrasses can reduce local acidity by up to 30 percent.[30]

Finally, in terms of quantitative targets, the ambitious goals proposed in the Draft Natural and Working Lands Implementation Plan relative to coastal wetlands, the Sacramento Delta, and seagrass meadows should serve as a starting point for CARB as it considers quantitative targets.[31] The 2022 Scoping Plan can also leverage the Ocean Protection Council's strategic plan for 2020-2025, which establishes robust and quantified goals for protecting and restoring tidal wetlands, including creating an additional 1,000 acres of eelgrass, as well as protecting, restoring, or creating 10,000 new acres of coastal wetlands.[32] In addition to setting targets, the

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[26] Brophy LS, Greene CM, Hare VC, Holycross B, Lanier A, Heady WN, et al. (2019)) Insights into estuary habitat loss in the western United States using a new method for mapping maximum extent of tidal wetlands. PLoS ONE 14(8): e0218558. https://doi.org/10.1371/journal.pone.0218558

[27] https://www.watereducation.org/western-water/can-carbon-credits-save-sacramento-san-joaquin-delta-islands-and-protect-californias

[28] https://caseagrant.ucsd.edu/sites/default/files/Hemes-profile-2018.pdf

[29] Beheshti, K. and Ward, M. 2021. Eelgrass Restoration on the U.S. West Coast: A Comprehensive Assessment of Restoration Techniques and Their Outcomes. Prepared for the Pacific Marine and Estuarine Fish Habitat Partnership. See also: https://www.pewtrusts.org/en/research-and-analysis/articles/2021/06/17/eelgrass-study-shows-location-matters-more-than-method-in-restoration-efforts

[30] A.M. Ricart et al., (2021). https://doi.org/10.1111/gcb.15594.

[31] California Air Resources Board (2019). Draft California 2030 Natural and Working Lands Climate Change Implementation Plan. https://ww2.arb.ca.gov/resources/documents/nwl-implementation-draft

[32] Ocean Protection Council (2020). Strategic Plan to Protect California's Coast and Ocean 2020-2025. http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20200226/OPC-2020-2025-Strategic-Plan-FINAL-20200228.pdf

2022 Scoping Plan can lay out pathways for interagency collaboration on efforts to restore these habitats in a way that maximizes state goals relative to biodiversity, resilience and adaptation, and blue carbon.

In conclusion, by prioritizing coastal habitats in its 2022 Scoping Plan Update, California can deliver a triple win for people and nature through climate mitigation, resilience, and biodiversity. The state can be a national leader in protecting and restoring coastal blue carbon habitats and help drive improvements in national GHG accounting for blue carbon. Pew welcomes the opportunity to help build knowledge and advance science-based policies in support of California's coastal habitats.

We thank you for the opportunity to comment on the development of the 2022 Scoping Plan Update and look forward to engaging as the work progresses.

Sincerely,

Gilly Lyons
Officer

Sylvia Troost
Sylvia Troost
Senior Manager

Cc: Ms. Rajinder Sahota, Deputy Executive Officer, Climate Change and Research, CARB
Mr. Richard Corey, Executive Officer, CARB