

NOTICE OF PERMIT APPLICATIONS AND TENTATIVE DETERMINATIONS

U.S. ENVIRONMENTAL PROTECTION AGENCY

Notice of Applications and Tentative Determinations for Marine Protection, Research and Sanctuaries Act Research Permits to Conduct a Two-Phased Ocean Alkalinity Enhancement Research Study Offshore of Massachusetts

Tentative Research Permits: EPA-HQ-MPRSA-2024-001 and EPA-HQ-MPRSA-2024-002

The EPA is providing notice of its tentative determinations to issue two research permits pursuant to the *Marine Protection, Research and Sanctuaries Act* to Woods Hole Oceanographic Institution for the transportation and disposition of materials into ocean waters to conduct a two-phased research study of a potential marine carbon dioxide removal technique referred to as ocean alkalinity enhancement. The EPA invites public comment for 30 days, until July 1, 2024, on the tentative determinations and the proposed tentative terms of the research permits.

Marine carbon dioxide removal refers to an ocean-based process or technique designed to mitigate the adverse effects of climate change by removing excess carbon dioxide from the atmosphere and storing it for long periods of time in the ocean. Ocean alkalinity enhancement is a category of marine carbon dioxide removal that may result in an increased uptake of atmospheric carbon dioxide into ocean water, where it would be stored primarily as bicarbonate ions.

The proposed research activities would involve the transportation and controlled release of 50% sodium hydroxide (alkaline solution) and Rhodamine Water Tracer dye into surface waters at two locations offshore of Massachusetts. The proposed stepwise study would be split into two 18-month permit periods to allow time for the results of Phase 1 to be thoroughly evaluated before conducting Phase 2 and to provide scheduling flexibility for the researchers to conduct both phases during summer months.

Under the *Marine Protection, Research and Sanctuaries Act*, the EPA may issue research permits for a period up to 18 months for the transportation and disposition of materials into the ocean as part of a research study when it is determined that the scientific merit of the proposed research study outweighs the potential environmental or other damage that may result from the activities. Research permits allow the permittees to transport and release material into ocean waters to conduct their research activities and require monitoring for potential adverse impacts to the marine environment, human health and other uses of the ocean due to the research study.

More information about the *Marine Protection, Research and Sanctuaries Act* and permitting of marine carbon dioxide removal activities is available on the EPA's website at <https://www.epa.gov/ocean-dumping/permitting-mcdr-and-msrm>.

DESCRIPTION OF THE PROPOSED RESEARCH ACTIVITIES, INCLUDING MONITORING

The proposed research is part of Woods Hole Oceanographic Institution's "Locking Ocean Carbon in the Northeast Shelf and Slope Project" (LOC-NESS Project). The applicant and a team of researchers has proposed a two-phased study to collect information on the feasibility and potential beneficial and adverse impacts of a ship-based ocean alkalinity enhancement technique.

The proposed study locations were chosen based upon an evaluation of baseline environmental data and specific environmental criteria required for the research activities while minimizing effects on other ocean uses. Phase 1 of the proposed research study would take place during the summer of 2024

outside of state waters south of Martha's Vineyard, approximately 9.5 miles south of the nearest shoreline in Nomans Land Island, Massachusetts. During Phase 1, up to 6,600 gallons of sodium hydroxide solution would be gradually released over a 90-minute period to create a patch of alkalinity on the ocean surface and then monitored for up to 5 days by an on-site scientific research team. Phase 2 of the study would take place during the summer of 2025 in the Wilkinson Basin, approximately 38 miles from the nearest shoreline in Cape Cod, Massachusetts. During Phase 2, up to 66,000 gallons of sodium hydroxide solution would be gradually released over a few hours and monitored for up to 14 days.

The applicant's proposed research study is designed to (1) evaluate the effectiveness of the research team's approach to monitor changes in ocean alkalinity and subsequent carbon dioxide uptake by the ocean resulting from the alkaline solution additions and (2) collect scientific information to better understand any potential adverse impacts to human health, the marine environment or other uses of the ocean resulting from the applicant's proposed ship-based ocean alkalinity enhancement technique. Depending on the results of the study, larger scale studies may be needed to further assess the effectiveness of the technique for removing significant amounts of carbon dioxide from the atmosphere.

Phase 1 is designed to evaluate the monitoring methods and environmental impacts from a small-scale alkalinity addition, and Phase 2 (up to ten times the scale of Phase 1) is designed to assess the scalability of the alkalinity addition and monitoring methods. A tracer dye would be released along with the alkaline solution to allow the researchers to track the movement and dispersion of the alkalinity patch over time.

Monitoring activities would include collecting environmental samples and scientific measurements to meet the research objectives and evaluating environmental impacts. During monitoring phases of the research study, continuous measurements of chemical, physical and biological parameters would be collected using various techniques and tools, such as satellites, autonomous underwater vehicles and profiling sensors. Monitoring activities would cease once environmental conditions have returned to the baseline conditions and the tracer dye is no longer detectable. Measurements would be taken both inside and outside of the alkalinity patch to characterize the effect of the ocean alkalinity enhancements compared to baseline ocean water chemistry and other environmental conditions. The applicant relies on prior laboratory studies, field studies and relevant scientific literature to support their assessment that the proposed activities should result in minimal adverse impacts to the marine environment.

SUMMARY OF THE EPA'S ASSESSMENT AND TENTATIVE DETERMINATIONS

The proposed research activities would result in localized changes in the carbonate chemistry of the surface ocean waters in and surrounding the release location for up to a few days during the summer of 2024 (Phase 1) and for up to a couple of weeks during the summer of 2025 (Phase 2). Within 2 minutes of the initial release of the alkaline solution, seawater pH within the alkalinity release path is expected to return to levels within the EPA's National Recommended Water Quality Criteria for saltwater aquatic life. The temporary changes in carbonate chemistry may result in localized adverse impacts to the plankton community, but these impacts are not expected to be severe or long-lasting within the environment. The tracer dye used in the study would appear as a red color on the surface of the water during the initial portion of the study but would dissipate as the tracer dye mixes with surrounding water. The tracer dye is commonly used in oceanographic research to study the movement and dispersion of matter in the marine environment and is not expected to adversely affect the marine environment or other uses of the ocean. Due to the locations, currents and other oceanographic conditions at the proposed study areas, the proposed activities are not expected to reach any shorelines, beaches or in-shore waters. The EPA does not expect the proposed activities to cause long-range or long-term effects to commercial or recreational fishing; navigation; recreational use of shorelines or beaches; use of living or non-living

marine resources (including offshore energy development or exploration); or scientific research and study. The results of the research study would inform an understanding of the safety, efficacy, feasibility and the potential for scalability of similar ocean alkalinity enhancement projects designed to mitigate the adverse effects of climate change.

Based on the supporting record, including the permit applications and the EPA's own assessment, the EPA tentatively determines that the research study is not likely to result in significant adverse impacts to water quality, marine ecosystems, human health or other uses of the ocean. The EPA tentatively determines that the scientific merit of the proposed research study outweighs the potential adverse impacts. The EPA evaluated the need to conduct the proposed research activities in ocean waters, as opposed to further lab or mesocosm research, and tentatively determines that the proposed study is scientifically justified. In making these determinations, the EPA considered several factors including: the physical, chemical and biological characteristics of the material to be released; the amount of material and rate of release; the location and timing of the activities; the methods of transporting and releasing the materials; assessments of any anticipated environmental impacts resulting from the proposed activities; and the scientific merit and appropriateness of the applicant's research plans and environmental monitoring plans.

Under the *Marine Protection, Research and Sanctuaries Act*, the EPA may alter or revoke partially or entirely the terms of permits issued if the factors or other criteria in the permit requirements cannot be met. For example, the EPA may consider whether the results of Phase 1 warrant alteration or revocation of the Phase 2 permit.

TENTATIVE CONDITIONS FOR THE PERMITS

The tentative conditions for the permits were selected to allow the researchers to conduct the proposed research activities while ensuring protection of human health, the marine environment and other uses of the ocean. The tentative permits for both activities are available in the public dockets. The EPA may add, remove or revise conditions to ensure compliance with other federal statutes or in response to comments received during the public comment period. Coordination and consultation actions in accordance with federal statutes and the EPA's policies are ongoing.

During the term of each of the research permits, the permittee would be required to follow specific conditions described in that permit. The permit conditions include the description and volume of the material allowed to be released, the timing and location where the activities would occur, the maximum rate at which the material would be released and the methods for transporting and releasing the material into ocean waters. The permittee would confirm the characteristics, including pH, of the sodium hydroxide solution prior to releasing it into the ocean. Environmental monitoring must be conducted as described in the applications. The permittee would follow the contingency plans including maintaining a certain distance from any protected species such as sea turtles, whales or other marine mammals and postponing or pausing the release of the material if these protected species are spotted. The permittee would take action, such as reducing the release rate or increasing vessel speed, to prevent the pH of seawater within the alkalinity patch from being above pH 9 for more than 1 hour. The permittee would postpone or cancel the transportation and release of materials if ocean conditions are not conducive to safely conducting the activities, such as rough seas, poor weather conditions and any other such conditions that the master of the vessel deems unsafe. In the case of a spill or a containment failure, all actions would focus on risk mitigation and spill cleanup. Along with maintaining radio communication with any vessels in the vicinity of the activities, the permittee must notify the U.S. Coast Guard before

leaving the port of departure and if any emergency actions are taken. The permittee would submit to the EPA reports on the operational, research and monitoring activities and outcomes.

ADDITIONAL INFORMATION, INCLUDING HOW TO SUBMIT COMMENTS OR REQUEST A HEARING

The EPA is hosting a virtual listening session on June 17, 2024, from 6:00pm to 7:30pm EDT to share information on both phases of the proposed research activities and the EPA's tentative determinations. All persons who wish to participate in the listening session must register in advance. The registration link can be found at www.epa.gov/mcdr-mprsa-permits. Please submit any requests for language translation or other accommodations through the registration form no later than June 7, 2024.

Additional information, including the tentative permits and an EPA Fact Sheet, is available in the public dockets at www.regulations.gov identified by Docket ID Nos. EPA-HQ-OW-2023-0591 (Phase 1) and EPA-HQ-OW-2024-0189 (Phase 2). Through the dockets, any person may submit written comments or request a public hearing on either of these tentative determinations by July 1, 2024. Requests for a public hearing must include: the name of the person requesting the hearing; a discussion of any specific objections to the issuance or conditions of the tentative permit; and the specific issues that the person proposes to be raised for consideration at a hearing.