

San Francisco Bay Conservation and Development Commission

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TO: Commissioners and Alternates

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SUBJECT: San Francisco Bay Sand Studies and Findings Report
(For Commission consideration on June 20, 2024)

Summary

Over the past six years, an Independent Science Panel of distinguished scientists along with researchers, regulatory and resource agencies, and sand mining industry representatives, all worked cooperatively to study, analyze, and develop new scientific information about the Bay's little studied sand system and how sand mining in Central Bay and Suisun Bay affects it. The outcome of this work is provided in the attached report "*San Francisco Bay Sand Budget, Transport, Provenance, and Bathymetric Change Studies and Potential Physical Effects of Sand Mining Activities.*" Key findings include, but are not limited to: sand is being mined faster than it is replenished; sand is a finite resource; sand from the Sacramento and San Joaquin Rivers is no longer a significant source of sand to the Bay; the Bay sand is relic; and the Central Bay and the Pacific Ocean share a common pool of sand.

Staff Report

In 2015, the San Francisco Bay Conservation and Development Commission (Commission) issued three permits for sand mining from San Francisco Bay. These ten-year permits were issued to: Hanson Marine Aggregates (now Martin Marietta) for mining up to 1.141 million cubic yards (Mcy) annually from Central Bay lease areas (BCDC Permit No. 2013.004.00); Lind Marine for mining up to 100,000 cubic yards (cy) annually from Middle Ground Shoal lease area in Suisun Bay (BCDC Permit No. 2013.003.00); and Suisun Associates (a Martin Marietta and Lind Marine joint venture) for mining up to 185,000 cy annually from Suisun Channel (BCDC Permit No. 2013.005.00). Cumulatively, these permits allow mining of up to 1.426 Mcy annually.

When considering the permit applications, Commissioners had several questions about the Bay's sand system and whether the mining was having an impact on the Bay, the outer coast, and beaches. These and other questions went unanswered as little was known about the physical processes in the Bay affecting sand. To address some of the unknowns, the Commission required the miners as part of permit conditions to contribute \$1.2 million over four years to study the potential effects of sand mining on the sand budget, transport, and geomorphology of the Bay's sandy areas. The State Coastal Conservancy agreed to administer the funds and contract with researchers to study these questions.



A Sand Technical Advisory Committee (STAC), consisting of representatives from the regulatory and resource agencies, the sand mining industry, and Bay Keeper, an interested party was formed. They worked together to refine and further develop questions about this activity and the Bay processes.

The three overarching management questions asked include:

1. Is sand mining at permitted levels in existing lease areas, having a measurable or demonstrable impact on sediment transport and supply within San Francisco Bay?
2. What are the anticipated physical effects of sand mining at permitted levels on sand transport and supply within San Francisco Bay and the outer coast? and
3. Are there other feasible sand mining approaches to consider in San Francisco Bay?

Additional tiers of questions were asked, which can be found in Appendix D.

An Independent Science Panel of distinguished experts in the sediment, hydrology, and oceanography fields was formed, including David Schoellhamer and Paul Work, both Emeritus from the US Geological Survey (USGS); John Largier, University of California, Davis, Bodega Marine Lab; Bob Battalio, Environmental Science Associates; and Craig Jones, Integral Consulting. They assisted the STAC in development, review, and selection of study scopes to answer the management questions. Three research teams were selected, consisting of several scientists from the San Francisco Estuary Institute (SFEI), the US Geological Survey (USGS), Deltares, Anchor QEA, and University of Texas at Austin. During the past four years, the research teams conducted work pursuant to the study scopes to address several of the Commission's questions. The studies resulted in new provenance information about the Bay sand; a new Bay sand budget; an analysis of the replenishment of sand in mined areas; modeling of the primary sand transport processes controlling the directionality of sand transport, and changes to the Bay's bathymetry. The complete set of studies and their key findings are included in Appendix G.

The Independent Science Panel met regularly with the researchers to review progress and provide advice and direction. Once the studies were complete, the Panel reviewed and discussed the synthesis of the studies and their key findings. They considered how the findings addressed the management questions and made overarching findings of the new body of work as well as regional findings. It is also important to note that Stantec, a consulting firm, was hired to draft the findings report under the Independent Science Panel's direction and oversight.

The STAC members were invited to, and most did, attend the Independent Science Panel meetings. They were also invited to review the findings report and provide a letter of comment. The Coastal Commission and the sand mining representatives provided comment letters, which are included in Appendix H.

The attached report is a summary of the Independent Science Panel's findings from review of the studies, along with several appendices containing the studies and additional important supporting documentation. While the amount of work conducted is impressive, not all of the management questions could be addressed. To address each of the questions, additional time and funding would be needed. Nonetheless, significant new information is provided within the report and appended studies.

A summary of key observations from this work include:

1. The volume of mined sand is significant relative to the Bay sand budget (it represents the largest outflow of sand from the Bay), larger than the net sand discharge to the ocean. Additionally, sand is mined faster than it is replenished; therefore, Bay sand is a non-renewable resource over the long term.
2. Suisun Bay sand is not replenished; thus, it is a finite resource, and the sand bed is being lowered. The bathymetric, modeling, and budget studies all support this. Sand mining effects in lease areas appear to be highly localized, with effects diminishing with distance from the event location. The effect is more pronounced in areas of negligible sand transport such as Suisun Bay, where the depressions caused by mining persist in the bed over time.
3. Central Bay sand is relic (i.e., deposited between 20,000 and 6,000 years ago as sea levels rose, and the river discharge point migrated through the Bay to its present location in the Delta) and is part of a large bay-ocean reservoir of sand. Sands derived from the watersheds of the Sacramento and San Joaquin Rivers are no longer a significant source to the Bay and ocean, and large volumes of sand do not move through the system during times of high flows (e.g., wet winters), as was previously assumed. Effects of mining to beaches and ecologically important shoals remain unquantified.
4. San Francisco Bay and the Pacific Ocean share a common pool of sand which sand mining reduces. In each tidal cycle, a huge amount of sand is transported between the Bay and the ocean effectively linking the two sand deposits into a shared pool. The size of this shared pool of sand, and thus the significance of the reduction due to mining, is unknown.