

CALIFORNIA OCEAN PROTECTION COUNCIL

Staff Recommendation

June 24, 2010

Aerial coastal topographic LiDAR and imagery project

File No.: 09-008

Project Manager: *Doug George*

RECOMMENDED ACTION: Authorize the disbursement of an amount not to exceed \$2.75 million to the National Oceanic and Atmospheric Administration for the aerial collection and processing of LiDAR elevation data and imagery along the coast of California.

LOCATION: Statewide

STRATEGIC PLAN OBJECTIVE: Research and Monitoring; Physical Processes and Habitat Structure

EXHIBITS

Exhibit 1: [Project Location and Site Map](#)

Exhibit 2: [Letters of Support](#)

Exhibit 3: [California Coastal LiDAR Project Report](#)

RESOLUTION AND FINDINGS:

Staff recommends that the Ocean Protection Council adopt the following resolution pursuant to Sections 35500 *et seq.* of the Public Resources Code:

“The Ocean Protection Council hereby approves the disbursement of an amount not to exceed \$2,750,000 (two million seven hundred fifty thousand dollars) to the National Oceanic and Atmospheric Administration (NOAA) for the aerial collection and processing of LiDAR elevation data and imagery along the coast of California. Prior to disbursement of any funds, NOAA shall submit for the review and approval of the Secretary to the Council:

1. A statement of work or work plan, including schedule and budget.
2. The names of any contractors to be retained by NOAA to undertake work.
3. Evidence that all permits and approvals necessary to undertake the work have been obtained.”

Staff further recommends that the Council adopt the following findings:

“Based on the accompanying staff report and attached exhibits, the Council hereby finds that:

1. The proposed project is consistent with the purposes of Division 26.5 of the Public Resources Code, the Ocean Protection Act.
2. The proposed is consistent with the Ocean Protection Council's grant program funding guidelines.”

PROJECT SUMMARY:

Governor’s Executive Order (EO) S-13-08 of November 2008 directs state government to consider sea level rise during the design of projects and orders the Office of Planning and Research to provide state land-use guidance related to climate change. However, California currently lacks a single, high resolution topographical map of its coastal areas. Elevation data are essential for more accurate predictions of the effect of sea level rise on our coast, and this statewide dataset would serve as a permanent record of California’s current coastal elevations. Detailed elevation data along the California coast using LiDAR (Light Detecting And Ranging) technology will allow resource managers and coastal community planners to assess and plan for impacts from sea level rise, as well as sudden inundation, such as tsunamis or storm surges. It will also contribute to planning wetland restoration, floodplain management, storm water management, coastal development, and rapid post-event (e.g., large storms) responses.

PROJECT DESCRIPTION:

Project Background: Rising sea levels of up to 1.4 m by 2100 will have significant impacts on California’s coastline. While bays and estuaries are expected to experience the most dramatic modifications in the coming century, changes are expected far inland from the immediate shoreline zone (e.g., the upland migration of vegetation and sensitive habitat zones, or the relocation of coastal population, development and infrastructure). Elevation of the land surface is a primary factor in determining the magnitude of sea level rise impacts. Light Detecting And Ranging (LiDAR) is a rapid, cost-effective remote sensing technology that uses lasers to generate much needed high-quality topographic elevation information.

The collection of elevation data should be performed and documented to allow repeatable LiDAR surveys, assuring this survey is useful in the future. The data from this project will support the development of seamless onshore-offshore elevation maps, which will be essential to understand and model the land-sea interface. This proposed LiDAR survey constitutes the topographic, or onshore, component. Surveying up to an elevation of 10 meters (from mean sea-level) is necessary to adequately assess potential impacts and hazards associated with future sea level rise.

The U.S. Army Corps of Engineers (USACE) began collecting coastal LiDAR in summer 2009 as part of the National Coastal Mapping Program (NCMP). The mission of the NCMP is to support regional sediment management, construction, operations, and regulatory functions in the coastal zone. Under the NCMP, topographic data are collected from the shoreline to 0.5 km onshore at 1 m intervals (bathymetric data are also collected with LiDAR from the shoreline to 1 km offshore at 5 m intervals). The technical specifications for the NCMP are different from the

standards required by California state agencies that would utilize LiDAR data and imagery. State agencies require topographic data that are collected to an elevation of 10 meters from mean sea level, for the reasons stated in the paragraph above. In many California coastal areas, meeting this state standard would require shoreline data collected further inland than the NCMP standard of 0.5 km from the shoreline.

By October 2009, when the federal program was temporarily stopped due to winter weather, LiDAR surveys done to NCMP standards had been completed of shorelines (and nearshore bathymetry) of San Diego, Orange, Los Angeles, Ventura, and Santa Barbara counties. In addition, portions of San Luis Obispo (62%) and Monterey (43%) counties had also been surveyed to NCMP standards. The remaining coastline (San Luis Obispo County to Del Norte County) will be surveyed with LiDAR under the NCMP starting in June 2010. With the additional funding provided under the proposed authorization, the USACE collection of data from San Luis Obispo County to Del Norte County would be enhanced so that it meets the state standards. In addition, the proposed authorization would provide funding to complete LiDAR data collection to state standards for the remaining shoreline portions of the California coast that have not yet been surveyed to those standards. By the end of 2010, the entire California coastline would be surveyed to state standards and data would be available for public use.

In addition to the elevation data, the proposed project would collect digital images of the coast. This imagery will complement and enhance interpretation of the LiDAR data by supporting data classifications (e.g. bare-earth, water, vegetation) and derivation of break lines. The imagery will also provide a statewide baseline of coastal land use data that can be used to compare with future imagery surveys. Funding under the proposed authorization will also be used to ground truth the data collection in order to ensure that the information and products developed from the data collection are of good quality.

Project Details and Scope of Work:

The proposed project will authorize the disbursement of funds to the National Oceanic and Atmospheric Administration (NOAA), which will administer the work through its Coastal Services Center (NOAA CSC). NOAA CSC will ensure that the LiDAR shoreline data and imagery will be collected to meet state standards that have been developed by a consortium of state agencies. The data will then be processed for use by the public. In addition, imagery will be collected according to the state standards and processed for release with the elevation data. Lastly, quality assurance/quality control of the data will be undertaken to ensure that the requisite standards are being met.

The project would commence as soon as possible with the goal of completing the data collection and making the data available by the end of 2010. The timing of the collection will leverage the existing USACE project by using a portion of the funds under the proposed authorization to augment the work that is being completed by the USACE contractor. This will result in cost savings to the State. The remaining funds would then be used to survey the portions of the state that the USACE contractor has already surveyed, but using a higher accuracy and covering up to the 10 m topographic contour.

PROJECT GRANTEE:

The proposed project will provide funds to NOAA, through its CSC, based in Charleston, South Carolina with an office in Oakland, California. The disbursement to NOAA will be made under the existing agreement between the State Coastal Conservancy (for the Ocean Protection Council) and NOAA by which NOAA provides Coastal Geospatial Services through contractors previously selected by NOAA CSC under a competitive process. The advantages of partnering with NOAA include:

- NOAA can provide contracting services at no cost to the OPC
- NOAA can provide technical oversight and aid quality control of the data collection
- NOAA management of industry contracts can relieve OPC staff of an enormous amount of administrative work
- Pre-qualified firms and contracts are already in place, so collection can start quickly
- Data can be archived in national data centers (e.g. NOAA's National Geophysical Data Center and USGS's Earth Resources Observation and Science Center) and served through NOAA CSC's Digital Coast. NOAA will also ensure that the data meet the standards set for incorporation into the National Elevation Dataset.

The mission of the NOAA's CSC is to support the environmental, social, and economic well being of the coast by linking people, information, and technology. CSC was established in 1994 with headquarters in Charleston, South Carolina. CSC has a West Coast office located in Oakland. CSC staff has supported the Ocean Protection Council in developing and implementing various projects, including the California Seafloor Mapping Program, the Coastal Ocean Currents Monitoring Program, and the West Coast Governors' Agreement on Ocean Health, as well as providing the funding and technical support for the northern half of the San Francisco LiDAR data collection and technical support for the proposed LiDAR and imagery project.

Data from the proposed project will be incorporated into the Digital Coast, an information delivery system that could efficiently serve data, and provide the training, tools, and examples needed to turn data into useful information for the use and management of coastal resources, including climate change planning and coastal inundation analyses. The primary customers of the CSC are state and local coastal resource managers as well as other federal agencies and non-governmental and non-profit organizations. One of the CSC's primary principles is to look at projects with a national scope but to focus its efforts on local initiatives. CSC has collaborated in more than 100 ongoing nationwide projects geared to resolve coastal issues from hazards and climate adaptation to competing coastal and ocean uses.

SITE DESCRIPTION:

The data will be collected along the coastline between Oregon and Mexico, extending from the waterline (mean low low water) to the 10-m topographic contour, and covering portions of San Francisco Bay to the eastern jurisdictional boundary of BCDC (Exhibit 1). Low tide collection will be preferred to maximize coverage in bays and coastal estuaries with extensive tidal flats (e.g., Humboldt Bay). Part of the San Francisco Bay region is excluded because a joint USGS/NOAA LiDAR project has covered this area up to the 5 m elevation; the remaining

portions between 5 and 10 m elevation would be acquired. Imagery would be collected from the waterline to the 10-m contour throughout the same coastal and San Francisco Bay zones.

PROJECT HISTORY:

In 2009, OPC staff worked with coastal agencies and the Natural Resources Agency to develop a Climate Adaptation Strategy for Ocean and Coastal Resources (one sector in the statewide strategy). This project addresses one of the key recommendations from the strategy to support research on data gaps. Data about coastal elevation and land-use are critical pieces of information to determine future adaptation and mitigation strategies regarding sea level rise. Currently there is no coastal statewide elevation map built from a consistent method that can be used for this purpose. Some areas have been routinely mapped during the last decade using cutting edge technology such as LiDAR while others have not been mapped with modern approaches. This proposed project seeks to remedy this deficiency.

The project builds from a multi-agency¹ OPC-organized meeting on December 18, 2008, to assist in planning the California Coastal LiDAR Project (CCLP). The meeting gathered agency needs for a LiDAR dataset, discussed technical and geographic specifications, and determined how to obtain the most widely accessible and useful dataset. Collection of agency uses continued through February 2009 and identified many overlapping and complementary needs among the agencies. Some participating agencies detail their needs in their letters of support for this project (Exhibit 2). The top most commonly requested needs for a modern topographic dataset were related to sea level rise inundation studies, tsunami studies, beach morphology studies (e.g., beach erosion, accretion, dune migration), and detection of invasive species. Other uses included updating coastal flood hazard, infrastructure, and National Wetland Inventory maps, identifying shoreline change, and assisting in setting jurisdictional boundaries.

In April 2009, representatives from the Department of Water Resources (DWR), California Coastal Commission, Bay Conservation and Development Commission, and the OPC produced a set of state standards for the CCLP to satisfy the compiled agency needs. These specifications match those used by DWR for LiDAR collection in the Sacramento-San Joaquin Delta and in the Central Valley in 2007. The standards were developed in consultation with experts from NOAA, USGS, and SIO. The CCC, BCDC, OPC, the Department of Fish and Game (DFG) and the National Park Service (NPS) also constructed a statewide map identifying areas from the shoreline to the 10 m topographic contour, encapsulating bays, estuaries, and coastal watersheds. The CCLP map encircles areas that may be subject to large potential threats due to inundation from sea level rise and tsunamis. A more detailed summary of the activities of OPC staff with respect to developing this project was published in February 2010 (Exhibit 3).

Connecting the CCLP data to the OPC-funded California Seafloor Mapping Program (CSMP) maximizes the efficacy of a seamless onshore-offshore elevation map. The CSMP is producing high-resolution maps of the state's waters from 10 m water depth to 3 nautical miles. The proposed LiDAR and imagery project would extend the current high-quality mapping efforts to

¹ Attendees: *State* - Bay Conservation and Development Commission, California Coastal Commission, State Parks, State Lands Commission, Natural Resources Agency, State Coastal Conservancy, Department of Fish and Game, Department of Water Resources, Ocean Protection Council

Federal - Federal Emergency Management Agency, National Oceanic and Atmospheric Administration, U.S. Army Corps of Engineers, U.S. Geological Survey

Non-governmental and academic - Ocean Science Trust, Scripps Institution of Oceanography

incorporate the coastal zone, although any gaps between the terrestrial and seafloor maps will need to be addressed in a future project. The combination of the products from the two projects would aid in planning for Marine Protected Areas (MPAs), Areas of Special Biological Significance (ASBSs), and other State Lands projects. Research into the impacts from tsunamis would also be improved by providing a modern consistent dataset for run-up models.

PROJECT FINANCING

Ocean Protection Council	\$2,750,000.00
Total Project Costs	\$2,750,000.00

The anticipated source of funds will be the fiscal year 2008 appropriation from the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Proposition 84). Proposition 84 authorizes the use of these funds for purposes consistent with Section 35650 of the Public Resources Code, establishing the California Ocean Protection Trust Fund (Pub. Res. Code § 75060(g)). Under Section 35650(b), Ocean Protection Trust Fund monies may be expended for projects authorized by the OPC that are identified as appropriate Trust Fund purposes. The project is consistent with the Trust Fund purposes as discussed in the following section.

This project is also appropriate for prioritization under the selection criteria set forth in Section 75060(g). Section 75060(g) provides that the Council give priority to projects which develop scientific data needed to adaptively manage the state's marine resources and reserves, in this case, by improving basic knowledge of estuaries vital as breeding areas and places of refuge.

CONSISTENCY WITH CALIFORNIA OCEAN PROTECTION ACT:

This project is consistent the Ocean Protection Act, Division 26.5 of the Public Resources Code, in the following respects:

The Ocean Protection Act (Pub. Res. Code §§ 35500 et seq.) identifies projects for which the Ocean Trust Fund may be used. Under Section 35650 (b)(2)(J) the Trust Fund may be used for research, and other necessary activities that assist in minimizing the adverse impacts of climate change on California's ocean ecosystem and that are designed to improve the management of coastal and ocean resources. The LiDAR project will provide tools that will achieve just this objective, as discussed in the Project Description section, above. The proposed project also carries out Trust Fund purposes identified in Section 35650 (b)(2)(G), by providing monitoring and scientific data to improve state efforts to protect and conserve ocean resources. This project will yield vital elevation maps to plan for impacts from sea level rise and support both the Climate Adaptation Strategy for Ocean and Coastal Resources and Executive Order S-13-08.

CONSISTENCY WITH OPC'S STRATEGIC PLAN:

Goal B (Research and Monitoring) Objective 2: Map and monitor the ocean environment to provide data about conditions and trends

Develop and maintain state and federal partnerships to leverage investment in mapping projects.

This project builds on partnerships with NOAA, and develops a relationship with USACE. Efforts by the OPC to assist in a joint USGS/NOAA LiDAR project in the San Francisco Bay area established new connections among the agencies. These federal agencies constitute most of the primary agencies responsible for mapping the United States coastal zone.

Goal D (Physical Processes and Habitat Structure) Objective 3: Understand impacts of climate change

Support state efforts to detect the impacts of climate change and to develop strategies to respond to them.

This project would provide some of the most important and basic information to plan for the impacts of sea level rise by generating a modern, high-resolution topographic dataset for the coastal region of the entire state.

CONSISTENCY WITH OPC'S GRANT PROGRAM FUNDING GUIDELINES:

The proposed project is consistent with the OPC's Grant Program Funding Guidelines adopted November 20, 2008, in the following respects:

Required Criteria

- 1. Directly relate to the ocean, coast, associated estuaries, or coastal-draining watersheds:**
The proposed collection area of the project covers the entire California coast, estuaries, bays and into the coastal watersheds.
- 2. Support of the public:** See Exhibit 2, Letters of Support from the California Coastal Commission, San Francisco Bay Conservation and Development Commission, State Lands Commission, State Parks, Coastal Sediment Management Workgroup, California Geological Survey, Department of Fish and Game, Scripps Institution of Oceanography, United States Geological Survey, Federal Emergency Management Agency, and Department of Water Resources.
- 3. Greater-than-local interest:** The specifications of this project ensure that all qualifying portions of the state would be mapped to identical standards. This will remove a data barrier to planning climate change adaptation strategies and provide a uniform baseline dataset for the entire state.

Additional Criteria

- 5. Improvements to management approaches or techniques:** Better knowledge about coastal elevations will greatly improve planning, adaptation and restoration efforts.
- 6. Resolution of more than one issue:** A complete LiDAR dataset for the California coast would benefit resource managers and coastal communities by providing information that can be applied to tsunami hazard assessment and planning, coastal storm surge hazard modeling and mitigation, wetland restoration, floodplain management, storm water management and coastal development planning or response initiatives. This dataset also would support the goals of the Governor's Executive Order S-13-08 that directs all construction projects to

consider sea level rise during design and the Office of Planning and Research to provide state land-use guidance related to climate change.

7. **Leverage:** Coupling the enhanced LiDAR data collection needed for State purposes with the pending USACE NCMP LiDAR surveys will achieve substantial cost-savings.
8. **Timeliness or Urgency:** Two complementary mapping efforts are occurring simultaneously – the Coastal Seafloor Mapping Program (CSMP) and the USACE nearshore bathymetry mapping. The collection of the topographic LiDAR within the same time frame ensures that all three datasets can be joined to create a valuable high-resolution elevation map from land to the extent of the state’s waters. In addition, the Sacramento-San Joaquin Delta was mapped in 2007, which adds more territory that would fit into a modern California “watershed to ocean” map.
9. **Coordination:** As seen from the partnerships, federal agencies are heavily invested in this project.

CONSISTENCY WITH OPC’S PROGRAM PRIORITIES FOR 2009 THROUGH 2010:

Climate Change Mitigation and Adaptation

The OPC will promote actions that mitigate climate change impacts and will develop adaptation policies to address impacts, consistent with maintaining natural coast and ocean processes. Coastal managers have expressed a need for statewide LiDAR data to produce high-resolution coastal inundation maps, better erosion models and predictions, and greater understanding of beach processes and sediment dynamics in light of changing sea levels.

COMPLIANCE WITH CEQA:

The proposed project is categorically exempt from review under the California Environmental Quality Act (“CEQA”) pursuant to 14 Cal. Code of Regulations Section 15306 because the project involves only data collection, research, and resource evaluation activities that will not result in a serious or major disturbance to an environmental resource. Staff will file a Notice of Exemption upon approval by the council.