THE IMPACTS OF SEA-LEVEL RISE ON THE CALIFORNIA COAST

A Paper From:

California Climate Change Center

Prepared By:

Matthew Heberger, Heather Cooley, Pablo Herrera, Peter H. Gleick, and Eli Moore of the Pacific Institute DISCLAIMER

This paper was prepared as the result of work funded by the California Energy Commission, the California Environmental Protection Agency, Metropolitan Transportation Commission, California Department of Transportation, and the California Ocean Protection Council (collectively "the funding agencies"). It does not necessarily represent the views of the funding agencies, their respective officers, agents and employees, or the State of California. The funding agencies, the State of California, and their respective officers, employees, agents, contractors, and subcontractors make no warrant, express or implied, and assume no responsibility or liability for the results of any actions taken or other information developed based on this paper; nor does any party represent that the uses of this information will not infringe upon privately owned rights. This paper is being made available for informational purposes only and has not been approved or disapproved by the funding agencies, nor have the funding agencies passed upon the accuracy, currency, completeness, or adequacy of the information in this paper. Users of this paper agree by their use to hold blameless each of the funding agencies for any liability associated with its use in any form. This work shall not be used to assess actual coastal hazards, insurance requirements or property values, and specifically shall not be used in lieu of Flood Insurance Studies and Flood Insurance Rate Maps issued by the Federal Emergency Management Agency (FEMA).

FINAL PAPER

Arnold Schwarzenegger, *Governor* May 2009 CEC-500-2009-024-F

Acknowledgments

Major funds for this report were made through the California Energy Commission's Public Interest Energy Research (PIER) Program. Additional support was provided by the Metropolitan Transportation Commission and the Ocean Protection Council. We thank them for their generosity and foresight.

The scientists and engineers at Philip Williams and Associates provided us with information and analysis on coastal flood and erosion hazards. Thanks to Dr. David L. Revell, Robert Battalio, Jeremy Lowe, Justin Vandever, Brian Spear, and Seungjin Baek. For additional information about their work on this project, please see www.pwaltd.com/resources/resource_publications.html.

Many individuals, organizations, and agencies helped make this work possible by providing data, information, and input and review of the final report. We owe thanks to Will Travis, director of the Bay Conservation and Development Commission, for initiating the study and suggesting our involvement and to staff members Leslie Lacko, Tim Doherty, Adam Parris, and Steve Goldbeck, who worked closely with us as we prepared this report.

We thank Dr. Noah Knowles, Dr. Dan Cayan, Mary Tyree, and Dr. Peter Bromirski of Scripps

Institution of Oceanography for much of the oceanographic data. Dr. Reinhard Flick at Scripps also provided useful data on historical tide trends.

Thanks to Doug Kimsey and his staff at the Metropolitan Transportation Commission for providing accurate transportation data. Thanks to Reza Navai, Vahid Nowshiravan, and Barry Padilla at the California Department of Transportation for many helpful conversations. Special thanks to the staff at the National Oceanic and Atmospheric Administration's (NOAA) Coastal Services Center, Kirk Waters and Keil Schmid, for helping us obtain several gigabytes of LIDAR data. Abby Sallenger at the United States Geological Survey gave additional advice and insights about the Coastal Change program's LIDAR data. Thanks to Mark Sanchez, geographic information system (GIS) wizard at the State of Oregon, for help in figuring out how to handle all those gigabytes!

Brian Fulfrost at the University of California (UC) Santa Cruz, now at DCE Planning, helped us locate several helpful GIS datasets. We thank Robert Colley, GIS Manager for Santa Clara County, for providing data and for recognizing that the free and open sharing of public data is so valuable to researchers and the public. Ray McDowell, GIS Data Coordinator at the California Resources Agency, helped locate and obtain still more GIS data. At the Federal Emergency Management Agency (FEMA), Eric Simmons and Ray Lenaburg engaged us in helpful discussion and gave pointers to the spatial data from recent FEMA mapping studies. Staff at California's Resources Agency engaged us in a number of insightful and provocative discussions. Thanks to Sam Schuchat, Brian Baird, Tony Brunello, John Ellison, and Abe Doherty. Special thanks to Christine Blackburn at the Ocean Protection Council (OPC) for