Staff Recommendation
October 25, 2018

Items 5c, 5d, 7a-b, and 8a

Proposition 84 Competitive Grant Program Funding Recommendations: Sea-Level rise Adaptation and Coastal Resilience, Coastal Sediment Management, Marine Pollution, and Marine Renewable Energy Projects Administered by the University of Southern California Sea Grant Program

Holly Wyer, Program Manager
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RECOMMENDED ACTION: Authorization for the University of Southern California Sea Grant to disburse up $3,000,000 for research projects on: (1) sea-level rise adaptation and coastal resilience, (2) coastal sediment management, (3) marine renewable energy, and (4) marine pollution to the following grantees:

Sea-Level Rise Adaptation and Coastal Resilience

- $250,000 to U.S. Geological Survey for "Coastal flooding projections and socioeconomic impacts due to sea-level rise and storms for the north coast using the Coastal Storm Modeling System (CoSMoS);"
- $250,000 to U.S. Geological Survey for "Groundwater inundation hazards and socioeconomic impacts due to sea-level rise across the California coast;"
- $249,536 to Scripps Institution of Oceanography for "Tribal Intertidal Digital Ecological Surveys (TIDES) Project: Using large-area imaging to assess intertidal vulnerability to sea-level rise with coastal indigenous nations;" and
- $250,000 to the State Coastal Conservancy for "Humboldt Coastal Resilience Project (HCRP): Analyzing beach-dune morphodynamics and vegetation controls on coastal resiliency to develop decision support tools and adaptation measures for sea-level rise and extreme events along the Eureka Littoral Cell, Northern California."

Coastal Sediment Management

- $250,000 to the Scripps Institution of Oceanography for the "Statewide assessment of California cliff erosion and retreat;" and
- $249,949 to Coastal Environments, Inc. for "Using green engineering techniques to restore coastal sand dunes at Border Field State Park, San Diego."

Marine Renewable Energy

- $222,824 to the University of California, Santa Cruz for "Wave Energy Conversion in California under the present and future Climate and economic feasibility analysis of different technologies (WE3C);" and
- $243,750 to the University of California, Berkeley for the "California Offshore Wind: Workforce and Grid Integration Analysis."

Marine Pollution

- $250,000 to the University of California, Santa Cruz for "Linking Terrestrial Pollution to Estuarine Water Quality: Quantification of the role of groundwater in the transport, transformation, and removal of agricultural pollutants in Elkhorn Slough;"
- $238,601 to the University of Southern California for "Multiple Stressors and Toxic Pseudo-nitzschia Blooms in California Waters: Understanding the Complex Interactive Impacts of Nutrients, Temperature, and Carbonate Chemistry;"
- $247,410 to San Jose State University for "Advancing Portable Detection Capabilities of Harmful Algal Bloom Species in California Waters;" and
- $249,065 to the University of California, Davis for "Interaction between microplastics and pathogen pollutants in marine ecosystems: Implications for seafood safety."

This staff recommendation authorizes up to $3,000,000 for research projects on sea-level rise adaptation and coastal resilience, coastal sediment management, marine renewable energy, and marine pollution to be administered by the University of Southern California Sea Grant Program. The accompanying Proposition 84 staff recommendation for agenda items 5b and 6a authorizes up to $3,000,000 for research projects on ocean acidification, hypoxia, and other changes in ocean conditions from a changing climate, and sustainable fisheries and aquaculture projects to be administered by the California Sea Grant Program. Together, this represents a total Ocean Protection Council (OPC) Proposition 84 investment of up to $6,000,000 not including administrative costs for both Sea Grant Programs. This Competitive Proposition 84 Grant Program was approved by the Council at its August 7, 2017 meeting.

LOCATION: Statewide

STRATEGIC PLAN OBJECTIVES: Climate Change, Coastal and Ocean Impacts from Land-Based Sources, Existing and Emerging Ocean Uses, Science-based Decision Making

EXHIBITS

Sea-Level Rise Adaptation and Coastal Resilience

Exhibit 5c1 "Coastal flooding projections and socioeconomic impacts due to sea-level rise and storms for the north coast using CoSMoS" – Letters of Support

Exhibit 5c2 "Groundwater inundation hazards and socioeconomic impacts due to sea-level rise across the California coast" – Letters of Support

Exhibit 5c3 "TIDES Project: Using large-area imaging to assess intertidal vulnerability to sea-level rise with coastal indigenous nations" – Letters of Support

Exhibit 5c4 "HCRP: Analyzing beach-dune morphodynamics and vegetation controls on coastal resiliency to develop decision support tools and adaptation measures for sea-level rise and extreme events along the Eureka Littoral Cell, northern California" – Letters of Support

Coastal Sediment Management

Exhibit 5d1 "Statewide assessment of California cliff erosion and retreat" – Letters of Support

Exhibit 5d2 "Using green engineering techniques to restore coastal sand dunes at Border Field State Park, San Diego" – Letters of Support

Marine Renewable Energy

Exhibit 7a1 "Wave Energy Conversion in California under the present and future Climate and economic feasibility analysis of different technologies (WE3C)" – Letters of Support

Exhibit 7b2 "California Offshore Wind: Workforce and Grid Integration Analysis" – Letters of Support

Marine Pollution

Exhibit 8a1 Linking Terrestrial Pollution to Estuarine Water Quality – Letters of Support

Exhibit 8a2 Multiple Stressors and Toxic Pseudo-nitzschia Blooms in California Waters – Letters of Support

Exhibit 8a3 Advancing Portable Detection Capabilities of Harmful Algal Bloom Species in California Waters - Letters of Support

Exhibit 8a4 Interaction Between Microplastics and Pathogen Pollutants in Marine Ecosystems - Letters of Support

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FINDINGS AND RESOLUTION:

Staff recommends that OPC adopt the following findings and direct it to file all relevant notices of exemption:

"Based on the accompanying staff report and attached exhibit(s), OPC hereby finds that:

1. The proposed projects are consistent with the purposes of Division 26.5 of the Public Resources Code, the Ocean Protection Act;
2. The proposed projects are consistent with OPC's Proposition 84 grant guidelines (Interim Standards and Protocols, August 2013); and Staff further recommends that OPC adopt the following resolution pursuant to Sections 35500 *et seq.* of the Public Resources Code:
3. The following proposed projects are not 'legal projects' that trigger the California Environmental Quality Act (CEQA) pursuant to Public Resources Code section 21068 and Title 14 of the California Code of Regulations, section 15378, because they will not cause a direct physical change or reasonably foreseeable indirect physical change in the environment:

- Coastal flooding projections and socioeconomic impacts due to sea-level rise and storms for the north coast using the Coastal Storm Modeling System (CoSMoS);
- Groundwater inundation hazards and socioeconomic impacts due to sea-level rise across the California coast;
- Statewide assessment of California cliff erosion and retreat;
- Wave Energy Conversion in California under the present and future Climate and economic feasibility analysis of different technologies;
- California Offshore Wind: Workforce and Grid Integration Analysis;
- Advancing Portable Detection Capabilities of Harmful Algal Bloom Species in California Waters; and
- Interaction between microplastics and pathogen pollutants in marine ecosystems: Implications for seafood safety.

4. The following proposed projects are categorically exempt from review under CEQA pursuant to Title 14 of the California Code of Regulations Section 15306 - Information Collection, because they involve basic data collection, research, experimental management, and resource evaluation activities that will not result in a serious or major disturbance to an environmental resource
    - Tribal Intertidal Digital Ecological Surveys (TIDES) Project: Using large-area imaging to assess intertidal vulnerability to sea-level rise with coastal indigenous nations;
    - Humboldt Coastal Resilience Project (HCRP): Analyzing beach-dune morphodynamics and vegetation controls on coastal resiliency to develop decision support tools and adaptation measures for sea-level rise and extreme events along the Eureka Littoral Cell, northern California;
    - Linking Terrestrial Pollution to Estuarine Water Quality: Quantification of the role of groundwater in the transport, transformation, and removal of agricultural pollutants in Elkhorn Slough; and
    - Multiple Stressors and Toxic Pseudo-nitzschia Blooms in California Waters: Understanding the Complex Interactive Impacts of Nutrients, Temperature, and Carbonate Chemistry.
5. The following proposed project is categorically exempt from review under CEQA pursuant to Title 14 of the California Code of Regulations section 15333 - Small Habitat Restoration Projects, because it will restore habitat, will be carried out by manual labor, not mechanized equipment, and will not exceed five acres in size:
    - Using green engineering techniques to restore coastal sand dunes at Border Field State Park, San Diego."

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

"OPC hereby approves the disbursement of up to $3,000,000 to 12 grantees as follows:

1. $250,000 to U.S. Geological Survey for "Coastal flooding projections and socioeconomic impacts due to sea-level rise and storms for the north coast using the Coastal Storm Modeling System (CoSMoS)"
2. $250,000 to U.S. Geological Survey for "Groundwater inundation hazards and socioeconomic impacts due to sea-level rise across the California coast"
3. $249,536 to Scripps Institution of Oceanography for "Tribal Intertidal Digital Ecological Surveys (TIDES) Project: Using large-area imaging to assess intertidal vulnerability to sea-level rise with coastal indigenous nations"
4. $250,000 to the State Coastal Conservancy for "Humboldt Coastal Resilience Project (HCRP): Analyzing beach-dune morphodynamics and vegetation controls on coastal resiliency to develop decision support tools and adaptation measures for sea-level rise and extreme events along the Eureka Littoral Cell, northern California"
5. $250,000 to the Scripps Institution of Oceanography for the "Statewide assessment of California cliff erosion and retreat"
6. $249,949 to Coastal Environments, Inc. for "Using green engineering techniques to restore coastal sand dunes at Border Field State Park, San Diego"
7. $222,824 to the University of California, Santa Cruz for the Wave Energy Conversion in California under the Present and Future Climate and Economic Feasibility Analysis of Different Technologies (WE3C) Project;
8. $243,750 to the University of California, Berkeley for the California Offshore Wind: Workforce and Grid Integration Analysis;
9. $250,000 to the University of California, Santa Cruz for the Linking Terrestrial Pollution to Estuarine Water Quality: Quantification of the role of groundwater in the transport, transformation, and removal of agricultural pollutants in Elkhorn Slough Project;
10. $238,601 to the University of Southern California for the Multiple Stressors and Toxic Pseudo-nitzschia Blooms in California Waters: Understanding the Complex Interactive Impacts of Nutrients, Temperature, and Carbonate Chemistry Project;
11. $247,410 to San Jose State University for the Advancing Portable Detection Capabilities of Harmful Algal Bloom Species in California Waters Project; and
12. $249,065 to the University of California, Davis for the Interaction between microplastics and pathogen pollutants in marine ecosystems: Implications for seafood safety.

COMPETITIVE PROPOSITION 84 PROGRAM BACKGROUND:

The proposed projects were selected through a competitive grant process, which will be funded through OPC's Proposition 84 funds. OPC approved the initiation and implementation of the Proposition 84 competitive grant program at its August 2017 meeting.[1] The Proposition 84 Competitive Grant Program has involved a close partnership between California Sea Grant, the University of Southern California Sea Grant (Sea Grant Programs), and OPC staff. OPC staff worked with the Sea Grant Programs to develop a pre-proposal solicitation, assemble the review committees, and develop the full proposal solicitation.[2] The review committees were composed

[1] The staff recommendation is available here. OPC staff provided additional detail on the competitive grant program at the November 2017 meeting, and the staff memo with additional information is available here.
[2]Full Request for Proposals (RFP) is available here, which includes the priority topic areas and selection criteria.

of academic scientists, subject matter experts, and state and federal agency staff. OPC staff participated in the review committee meetings; however, OPC staff did not provide a score for the proposals. The review committee recommended a ranked list of projects for funding to OPC staff and final funding recommendation decisions were made by the OPC Executive Director to be provided to OPC. If the projects are approved by OPC, the Sea Grant Programs will administer the awards to the project applicants.

AGENDA ITEM 5(c): SEA-LEVEL RISE ADAPTATION AND COASTAL RESILIENCE [3]

Agenda Item 5(c)(1) PROJECT SUMMARY: Coastal flooding projections and socioeconomic impacts due to sea-level rise and storms for the north coast using the Coastal Storm Modeling System (CoSMoS) -- U.S. Geological Survey

Project Description
The goal of this project is to apply U.S. Geological Survery's Coastal Storm Modeling System (CoSMoS: http://walrus.wr.usgs.gov/coastal_processes/cosmos/index.html) to deliver a single robust and consistent methodology and set of products for assessing coastal vulnerability to climate change for the final stretch of California that has not yet been modeled by the USGS team (from the Golden Gate to the CA/Oregon border, including all coastal embayments and harbors). CoSMoS provides hazard exposure information to help communities conduct vulnerability assessments necessary for Local Coastal Program updates, local hazard mitigation plans, climate adaptation plan development and other coastal-related planning efforts. CoSMoS was developed to support federal and state-supported climate change guidance (e.g., the recently updated 2018 State of California Sea-Level Rise Guidance Document and the California Coastal Commission's Sea-Level Rise Policy Guidance). Through the Our Coast, Our Future (OCOF: www.ourcoastourfuture.org) web tool and extensive outreach and stakeholder engagement, the CoSMoS model results are made accessible to a broad swath of coastal professionals and the interested public. In addition, the project team will use CoSMoS results to assess socioeconomic impacts of coastal hazard exposure using the Hazard Exposure Reporting and Analytics (HERA: https://www.usgs.gov/apps/hera/) web tool. The State Coastal Conservancy and the OPC previously funded the development of CoSMoS for Southern California and the California Central Coast.

Project Site
North Coast of California, from the Golden Gate Bridge to Oregon

Project Timeline
This is a 3-year project that would end in December of 2021.

Project Financing
Staff recommends that OPC approve disbursement of up to $250,000 from Sea Grant to the U.S. Geological Survey to implement "Coastal flooding projections and socioeconomic impacts due

[3] Agenda Item 5(b), addressing ocean acidification, and Agenda Item 6, addressing sustainable fisheries, are included in a separate staff recommendation for competitive Prop. 84 projects being administered by California Sea Grant.

to sea-level rise and storms for the north coast using the Coastal Storm Modeling System (CoSMoS)".

Agenda Item 5(c)(2) PROJECT SUMMARY: Groundwater inundation hazards and socioeconomic impacts due to sea-level rise across the California coast

Project Description
Coastal communities need a comprehensive assessment of future hazards to mitigate and adapt to the effects of climate change. Coastal erosion, cliff retreat, and storm/sea-level rise (SLR)-induced overland flooding are being addressed through the state-supported Coastal Storm Modeling System (CoSMoS). However, SLR-driven coastal hazards associated with groundwater, such as inundation and salt water intrusion, have not been assessed across the state, despite the fact that investigations of a few pilot areas have shown that local impacts can be severe in some communities. This work will project the exposure of coastal communities across the entire State of California, including San Francisco Bay, to SLR-driven groundwater inundation, whereby low-lying areas are subject to permanent flooding as the water table rises with sea level and intersects the land surface. This climate change-driven coastal hazard is not regularly planned for and has already been shown to pose a major risk in certain regions decades before overland flooding due to SLR and storms become more dominant. Because engineering approaches to mitigating SLR-driven overland flooding will not affect groundwater inundation, assessment of this risk across the State of California and its 26 million coastal residents is an essential step for communities to understand and plan for the full impacts of climate change.

This project will perform sophisticated numerical modeling that will produce maps of coastal zone groundwater inundation and shoaling for all of California across the full range of the state's sea-level rise guidance scenarios. These model projections will be available for public download to support community-scale, climate adaptation planning, via the interactive web tool, Our Coast Our Future (OCOF: www.ourcoastourfuture.org). Groundwater exposure projections will be translated into socioeconomic impacts and made accessible on the Hazard Exposure Reporting and Analytics (HERA) web tool (https://www.usgs.gov/apps/hera/). By the conclusion of this study, the entire state of California will have consistent, robust projections of the full suite of coastal hazards expected over the next century, including overland flooding and beach/cliff erosion due to storms and sea level developed within CoSMoS, and groundwater inundation and shoaling, all at a scale designed to support local planning, and served up together on the widely used OCOF and HERA web tools.

Project Timeline
This is a 2-year project that would end in December of 2020.

Project Financing
Staff recommends that OPC approve disbursement of up to $250,000 from Sea Grant to the U.S. Geological Survey to implement "Groundwater inundation hazards and socioeconomic impacts due to sea-level rise across the California coast".

Agenda Item 5(c)(3) PROJECT SUMMARY: Tribal Intertidal Digital Ecological Surveys (TIDES) Project: Using large-area imaging to assess intertidal vulnerability to sea-level rise with coastal indigenous nations — State Coastal Conservancy

Project Description

Rocky intertidal ecosystems exist at the land-sea interface making them particularly vulnerable to global environmental change, especially sea-level rise (SLR). However, surprisingly little is known about how SLR will affect habitat availability and community structure in these ecosystems. This project proposes an assessment of sea-level vulnerability at three ecologically, economically (e.g., tourism) and culturally significant sites along the California coast, the Cabrillo National Monument (CNM), Scripps Coastal Reserve (SCR) and Pyramid Point State Marine Conservation Area (PPSMCA) with expansion into additional sites over the next two years. Because coastal shores around the world are under threat from rising sea-levels, there is an urgent need to quantify the potential magnitude of this threat to intertidal communities. Here, using large-area imaging, the project team will create models from the lowest low water line to beyond the spray zone. This information will be used to describe invertebrate and algal community structure from 2018-2020 at each of the sites. The team will then use high-resolution sea-level data to investigate whether inter-annual sea-level change leads to changes in habitat availability and zonation. Finally, they will combine these habitat descriptions with existing SLR projections to evaluate how future sea-level changes may affect intertidal habitat availability and thus community composition at our study sites using observed interannual trends as sensitivity indicators. This project is an interdisciplinary collaboration between academics, marine resource managers, as well as the Tolowa Dee-ni' Nation (TDN) and other coastal Indigenous nations. These collaborative partnerships will build overall capacity by combining Traditional Knowledge of historically observed patterns in intertidal communities with advanced imaging and mapping techniques that maximize data acquisition in the field. The ultimate goal of this project is to produce robust SLR vulnerability data while enabling local communities to possess and utilize the tools necessary to plan for future changes associated with SLR. This work will empower historically marginalized tribal nations to utilize cutting edge technology to visualize, archive, and provide optimal conservation measures for current and future management of important biological and cultural resources in the face of climate change.

Project Timeline

This is a 2-year project that would end in November of 2020.

Project Financing

Staff recommends that OPC approve disbursement of up to $249,536 from Sea Grant to the Scripps Institution of Oceanography to implement "Tribal Intertidal Digital Ecological Surveys (TIDES) Project: Using large-area imaging to assess intertidal vulnerability to sea-level rise with coastal indigenous nations".

Agenda Item 5(c)(4) PROJECT SUMMARY: Humboldt Coastal Resilience Project (HCRP): Analyzing beach-dune morphodynamics and vegetation controls on coastal resiliency to

develop decision support tools and adaptation measures for sea-level rise and extreme events along the Eureka Littoral Cell, northern California

Project Description
The 52-km shoreline of the Eureka littoral cell (ELC) is composed of barrier dune systems that enclose Humboldt Bay and the estuaries of the Mad, Little and Eel Rivers. This is the longest barrier system in California and includes some of the best remaining native, naturally functioning dune systems on the west coast of the US. The barriers protect not only these estuarine systems, but also neighboring communities and much critical infrastructure. The resilience of the barrier system is at risk from ongoing impacts of accelerated sea-level rise (SLR), inter-seismic subsidence, recent changes in sediment supply from rivers and dredging, and deterioration in natural dune processes resulting from invasive European beachgrass. Adequate sediment supply and functioning of beach-dune systems in the ELC can help buffer extreme events and allow for maintenance and migration of resilient, protective barrier systems with SLR.

The Humboldt Coastal Resilience Project (HCRP) builds on foundational research and exceptional expertise in beach-dune dynamics and restoration to assess vulnerabilities and increase adaptive capacity using an innovative and empirical approach. In 2015, the California State Coastal Conservancy and the Bureau of Land Management funded the first phase of the Dunes Climate Ready Project (DCRP), which collected baseline data to assess vulnerabilities and resilience of the barrier system. The HCRP will build upon those results with the goal of increasing coastal resiliency and reducing regional vulnerabilities to SLR and extreme events along the ELC by: 1) increasing understanding of sediment transport, dune barrier dynamics, and resulting shoreline responses to SLR and extreme events, 2) implementing adaptation projects and strategies informed by site specific experimentation and longer term observations and land survey datasets, and, 3) enhancing information exchange and decision-making capacity among local planners, land management agencies, and private landowners. The HCRP will: 1) complete shoreline process data collection and analyses, 2) test additional adaptive strategies and assess longer term response of existing resiliency projects, 3) update the littoral cell sediment budget, 4) complete a coastal vulnerability assessment, 5) simulate and evaluate barrier responses to SLR and increasing storminess scenarios, 6) expand stakeholder groups to inform and assist agencies in developing and updating local decision-making policies and implementation strategies for natural solutions for shoreline protection, consistent with the California Sea-level Rise Guidance, and 7) inform and involve the general public through an outreach program.

Project Site
Humboldt County / Eureka Littoral Cell

Project Timeline
This is a 3-year project that would end in November of 2021.

Project Financing

Staff recommends that OPC approve disbursement of up to $250,000 from Sea Grant to the State Coastal Conservancy to implement "Humboldt Coastal Resilience Project (HCRP): Analyzing beach-dune morphodynamics and vegetation controls on coastal resiliency to develop decision support tools and adaptation measures for sea-level rise and extreme events along the Eureka Littoral Cell, northern California".

AGENDA ITEM 5(d): COASTAL SEDIMENT MANAGEMENT

Agenda Item 5(d)(1) PROJECT SUMMARY: Statewide assessment of California cliff erosion and retreat -- Scripps Institution of Oceanography

Project Description
Eroding cliffs comprise 70% of the California coast and threaten extensive clifftop development throughout the state including Hwy 101, Hwy 1, I-5, railways, wastewater, oil, natural gas, and nuclear facilities, universities, several critical military bases, and numerous state beaches and parks. Episodic cliff failures have caused injury and several deaths in recent years. In northern and central California, sea-level rise by 2100 is projected to cause cliff retreat up to 400 m and erosion of over 50,000 acres, threatening 390 km of major highways, 16 km of railways, 14,000 residents, and 6,000 coastal workers. Estimates of related damage, land loss, and mitigation are well over $100 billion. These values do not include densely developed southern California where models indicate historical retreat could more than double by the year 2100.

Seawalls are increasingly used to prevent erosion, but eroding coastal cliffs can provide sediment to beaches, which are important cultural and economic resources that generate billions of dollars annually in California. Rising sea-levels and cliff armoring cause passive beach erosion, where beach width is reduced, sometimes to zero, because coastal cliffs are not allowed to retreat naturally. Effectively managing California's coast will become increasingly challenging as coastal populations and sea-levels continue to rise. For these reasons, it is essential to understand processes that drive cliff erosion and the rates at which they operate. Numerous studies estimate California cliff retreat rates, but are generally limited by data quality or spatial and/or temporal coverage. Specifically, data gaps exist the in the coastal areas of Monterey, Big Sur, Point Conception, and all of Northern California.

This project would do the following:

- Provide the first statewide high-resolution assessment of recent coastal cliff erosion and retreat.
- Use lidar data for the period 1998 to 2016 in southern California, and 2009 to 2016 for much of central and northern California to identify recent erosion hot-spots, detect regional or local trends, compare recent and historical cliff retreat to assess temporal changes, and provide a baseline for future high-resolution cliff studies; and
- Create a spatial analysis that would reveal relationships between cliff erosion, composition, coastal setting, and environmental factors.
- Provide results on-line format friendly to coastal managers, scientists, engineers, and the public

Project Timeline
This is a 3-year project that would end in November of 2021.

Project Financing
Staff recommends that OPC approve disbursement of up to $250,000 from Sea Grant to the Scripps Institution of Oceanography to implement the "Statewide assessment of California cliff erosion and retreat" project.

Agenda Item 5(d)(2) PROJECT SUMMARY: Using green engineering techniques to restore coastal sand dunes at Border Field State Park, San Diego -- Coastal Environments, Inc.

Project Description
The dune system Border Field State Park (BFSP) in San Diego was once large and highly developed and protected the Tijuana Estuary from storm surges and sediment overwash. It also provided high quality biological habitat for a number of sensitive species. The large land area and lack of buildings and infrastructure make the BFSP one of the few locations in southern California where a true natural dune system can be restored. Historically, the dunes were significantly disturbed by military activities and off-road vehicles. This project has the potential to help re-establish a self-sustaining dune system with high levels of ecosystem functions with large accommodation space for the future adaptation.

Coastal Environments, Inc., in partnership with BFSP and the Tijuana River National Estuarine Research Reserve, is proposing to restore the coastal dunes system along the south end of BFSP, using a "living shoreline" approach. The project would evaluate proven, innovative methods in a formal experiment design for rebuilding dune topography and restoring native vegetation. The methods being tested have been shown to be effective on the East Coast of the United States and elsewhere but have not been tested in the unique coastal dune systems of southern California. The restored dunes will increase the wetland system resilience to sea-level rise while also providing benefits for multiple rare species.

The project would assess the effectiveness of the various dune restoration techniques in an area that is currently degraded and would provide a model for habitat enhancement in an area supporting endangered and threatened species. Increasing dune stability and height through revegetation is also expected to reduce wave overwash and sand transport into the intertidal marsh habitats of Tijuana Estuary and preserve essential ecological wetland processes.

Project Site
Border Field State Park, San Diego

Project Timeline
This is a 3-year project that would end in December of 2021.

Project Financing

Staff recommends that OPC approve disbursement of up to $249,949 from Sea Grant to Coastal Environments, Inc., to implement "Using green engineering techniques to restore coastal sand dunes at Border Field State Park, San Diego".

AGENDA ITEMS 7a and 7b: MARINE RENEWABLE ENERGY

Agenda Item 7(a) PROJECT SUMMARY: Wave Energy Conversion in California under the present and future Climate and economic feasibility analysis of different technologies (WE3C) -- University of California, Santa Cruz

Project Description
Ocean energy exists in the forms of wave, tidal, marine currents, thermal (temperature gradient) and salinity. Among these forms, Wave Energy Conversion (WEC) has been identified by researchers to have significant opportunities and benefits. The Electric Power Research Institute completed a recent analysis of the United States wave energy resource potential and estimated that 2,100 TWh/year are available across the U.S., approximately half of the electricity demand in the U.S. (in 2016 the total US consumption of electricity was 4,137 TWh, based on data from the U.S. Energy Information Administration). However, the fraction of the total wave power that will be economically recoverable remains to be estimated.

Waves are emerging as a possible form of renewable energy in coastal California, but the development of this technology requires an understanding of the costs and benefits of the different technologies to assess its potential as an alternative or as a complement to other sources of energy.

The proposed project would focus on addressing these gaps for wave energy development in California. First, the characterization of the available resource and the development of technologies to harvest wave energy require long-term time series of wave parameters at locations close to shore. However, this information is usually located in deep waters (far offshore), and rarely available near shore. Second, managers and investors also require assessments of the future resource and its economic feasibility. Less developed at present than other renewables, the existing models to estimate the costs of a wave energy project are often oversimplified and rarely allow a comparison of technologies. Specifically, the proposed project would do the following:

1. Provide a region-wide first assessment of the technological and economic feasibility of wave energy conversion in California;
2. Generate historical and future nearshore wave climatologies that can be used to identify optimal locations for wave energy conversion in California; and
3. Provide the public and private sectors with state-of-the-art tools and data for other analyses and research, including the assessment of ecological and coastal impacts of potential future site-specific wave farms.

Project Timeline
This is a 3-year project that would end in November of 2021.

Project Financing
Staff recommends that OPC approve disbursement of up to $222,824 from Sea Grant to the University of California, Santa Cruz to implement the "Wave Energy Conversion in California under the present and future Climate and economic feasibility analysis of different technologies (WE3C)" project.

Agenda Item 7(b) PROJECT SUMMARY: California Offshore Wind: Workforce and Grid Integration Analysis -- University of California, Berkeley

Project Description
Offshore wind power is emerging as a potential new source of renewable energy to California, and has been touted as a significant source of high-road economic development and also as a contributor toward achieving the state's emissions goals for 2045 as set forth in California Senate Bill 100. The California Energy Commission and U.S. Bureau of Ocean Energy Management are planning for development of offshore wind energy, and have commissioned a wide range of research on the topic. As of early October 2018, it appears that the most likely near-term launch of California offshore wind will be off Humboldt Bay, where Redwood Coast Energy Authority is proposing to develop a joint wind farm with the Emeryville-based Principle Power. Proposals for development off San Luis Obispo County and Santa Barbara County are pending negotiations with the U.S. Navy.

Much useful academic and scientific research has been carried out recently around offshore wind energy development, including work by National Renewable Energy Laboratory about offshore wind costs, the Schatz Energy Research Center at Humboldt State University about North Coast infrastructure and environmental issues, and California Polytechnic University about ocean wind resource modeling. According to researchers at U.C. Berkeley, there are two significant gaps in the available research. First, the potential for offshore wind energy to create highroad employment needs to be determined – in other words, high-wage job clusters in the manufacturing supply chain, assembly, deployment, and operations of offshore wind farms. Second, little published information is available about the ways in which California offshore wind would fit into the state's future renewables supply mix, especially as the state considers legislation to adopt a clean-energy standard of 100 percent by 2045. Rigorous analysis is needed of the potential of offshore wind to bridge the so-called duck curve – the daily late-afternoon gap between fast-declining solar output and rising residential electricity consumption – thus potentially reducing the state's need to import wind power from Wyoming or other out-of-state sources, and thus avoid any grid governance problems. This project would do the following:

1. Produce and disseminate research about potential job gain, quality of jobs and employment impact on underserved communities under various offshore wind scenarios.
2. Determine the approximate price points at which offshore wind would – or would not - become a competitive alternative to other sources.

Project Timeline
This is an eight-month project that would end in July 2019.

Project Financing
Staff recommends that OPC approve disbursement of up to $243,750 from Sea Grant to the University of California, Berkeley to implement the "California Offshore Wind: Workforce and Grid Integration Analysis" project.

AGENDA ITEM 8a: MARINE POLLUTION

Agenda Item 8(a)(1) PROJECT SUMMARY: Linking Terrestrial Pollution to Estuarine Water Quality: Quantification of the Role of Groundwater in the Transport, Transformation, and Removal of Agricultural Pollutants in Elkhorn Slough, California -- University of California, Santa Cruz

Project Description
The health of California coasts and near-shore environments are in an increasingly perilous state due to increased terrestrial pollution, including nutrient inputs from agricultural lands. Estuaries are the interface between terrestrial uplands and the marine environment– intercepting, transforming, and transporting pollutants on their course to the ocean. Terrestrial nonpoint source nutrient pollution transported by rivers into estuaries has been extensively studied, but the contributions and fate of pollutants from groundwater remain largely unknown. Traditionally, measuring and tracking groundwater contaminants from uplands to the marine environment was difficult, costly, and required discipline-specific methodologies based on location (upland, estuary, or marine). Recent developments in sensor technology and cross-disciplinary integration of methodological techniques provide the opportunity to better understand both surface water-groundwater exchange in estuaries and the associated transport and processing of agricultural pollutants.

This project would investigate the extent to which groundwater contributes to nutrient pollution in Elkhorn Slough, and the extent to which biogeochemical processes are removing or transforming nutrients within the estuary. This project would then use the results of this investigation to develop a model that quantifies the nutrient removal or transport processes at an estuary scale. Specifically, this project would:

1. Use state-of-the-art technology and tools to field sample and quantify the extent to which either nutrient removal and/or transport processes are taking place along groundwater pathways and at the water-sediment interface in salt marshes;
2. Model these nutrient removal or transport processes at an estuary scale, including providing estimates of nitrate removed by each landscape zone; and
3. Disseminate the data, results and interpretation with local regional and state level water quality stakeholder agencies. Deliverables include recommendations for both local and statewide resource managers, such as whether groundwater should be included in the nutrient allocations for Elkhorn Slough by regulatory agencies or whether marsh restoration is a good strategy to enhance removal of nitrates.

This project would provide an enhanced understanding of the role of groundwater in contributing to pollution, and its role in serving as a mechanism for transformation and removal

of nitrate prior to reaching coastal surface waters. The anticipated results will help inform development of strategies to improve Elkhorn Slough water quality, including total maximum daily load regulation efforts currently being discussed for nitrate. Additionally, this project will shed light on current statewide water management strategies such as groundwater recharge and vegetation restoration that may enhance processes to remove nitrates and other damaging nonpoint source pollutants. This is a scientifically groundbreaking study because it combines multidisciplinary data collection from new, state-of-the-art sensor technology with powerful hydro-biogeochemistry methods to inform statewide efforts to address nonpoint source nutrient pollution.

Project Site
The field sampling and modelling would occur in Elkhorn Slough, but the information provided by this project would be informative for statewide management efforts.

Project Timeline
This is a 3-year project that would end in winter of 2021.

Project Financing
Staff recommends that OPC approve disbursement of up to $250,000 from Sea Grant to the University of California, Santa Cruz to implement the Linking Terrestrial Pollution to Estuarine Water Quality: Quantification of the Role of Groundwater in the Transport, Transformation, and Removal of Agricultural Pollutants in Elkhorn Slough, CA project.

Agenda Item 8(a)(2) PROJECT SUMMARY: Multiple Stressors and Toxic Pseudo-nitzschia Blooms in California Waters: Understanding the Complex Interactive Impacts of Nutrients, Temperature, and Carbonate Chemistry -- University of Southern California

Project Description
Harmful algal blooms (HABs) of several toxic diatom species within the genus *Pseudo-nitzschia* cause damage to California's coastal environment and economy almost every year, causing widespread mortality of marine birds and mammals, as well as recurring closures of valuable fisheries. *Pseudo-nitzschia* produce a toxin called domoic acid, which bioaccumulates as it moves through coastal food webs. Several environmental factors may increase *Pseudo-nitzschia's* production of domoic acid, including nutrient availability, temperature, and carbonate chemistry. Recent evidence suggests that changes in nutrient availability due to pollution, such as urea or ammonia from sewage or agricultural runoff, or climate-driven shifts in upwelling patterns (e.g. nitrate supply) can combine with individual climate change factors like ocean warming or carbonate chemistry to significantly increase the toxicity of these blooms. Despite our growing knowledge about the impacts of each of these single factors on the toxicity of *Pseudo-nitzschia* blooms, little is known about how projected simultaneous future changes in nutrients, temperature, and carbonate chemistry will together affect domoic acid levels in California coastal food webs.

This project would use multi-stressor studies to experimentally test the effects of relevant projected levels of nutrients (e.g. nitrate, ammonia, and urea), temperature, and carbonate

chemistry on the growth rates and toxin production of *Pseudo-nitzschia*. This project would use *Pseudo-nitzschia* cultures isolated from California waters, and with local natural phytoplankton communities containing toxic *Pseudo-nitzschia* species. The project would first determine how *Pseudo-nitzschia* alone responds to each of these elements by generating the full physiological response curves of *Pseudo-nitzschia* to nutrients, temperature, and carbonate chemistry and then use this information to choose levels of all three variables for the multi stressor experiments. The multi-stressor experiments would examine the interaction between all three stressors to mechanistically understand how they affect *Pseudo-nitzschia* growth and domoic acid production in every possible combination. These multi-stressor experiments will also include testing of scenarios that represent upwelling conditions off California as well as scenarios that represent non-upwelling conditions off California. Finally, to put the results of the *Pseudo-nitzschia*-only lab experiments into ecological context, this project would also conduct field incubations. The field incubations are the same multi-stressor experiment described above, but would use natural phytoplankton communities containing *Pseudo-nitzschia* species, and natural seawater, collected from the Southern California Bight.

Together, these experiments will provide information on how changes in the types of nutrients entering the coastal environment due to increases in coastal nitrogen pollution (such as urea or ammonia from sewage), and expected changes in upwelled nutrient supplies due to climate change, may interact with predicted warming and acidification to control the growth and toxin production of *Pseudo-nitzschia* species. The physiological response curves developed as part of this project are essential to construct quantitative harmful algal bloom models to predict growth and toxicity across wide environmental ranges of these interacting multiple variables.

Project Timeline
This is a 3-year project that would end in winter of 2022.

Project Financing
Staff recommends that OPC approve disbursement of up to $238,601 from Sea Grant to the University of Southern California to implement the Multiple Stressors and Toxic Pseudo-nitzschia Blooms in California Waters: Understanding the Complex Interactive Impacts of Nutrients, Temperature, and Carbonate Chemistry Project.

Agenda Item 8(a)(3) PROJECT SUMMARY: Advancing Portable Detection Capabilities of HAB Species in California Waters -- San Jose State University

Project Description
HABs are on the rise worldwide with reports of increased bloom intensities and expanded locations. California routinely experiences annual toxic HAB blooms. Genetic detection of microorganisms, including harmful algal species, in the field has long been hampered by laborious methodologies, cumbersome and expensive platforms, time lags for sample transport, and limited sampling frameworks in both time and space. Recent advances in portable instrumentation have presented new opportunities for field identification. We can now vastly improve the efficiency of HAB species detection through new handheld technology for rapid and specific analyses from shore-side to ship deployments. The project applicants were

previously awarded a handheld device (the Freedom4) for this kind of work. However, before this device can be used to identify HABs in California, Quantitative Polymerase Chain Reaction (qPCR) assays, which are used to identify HABs through their DNA markers, need to be transitioned to the portable platform for on-site detection. This project would transition qPCR assays to a portable platform for eleven HAB species including:

- Four species of *Pseudo-nitzschia*: These species are prioritized because current efforts for routine monitoring use visual microscopy counts, that cannot readily differentiate between species associated with higher domoic acid production and physically similar species that exhibit less domoic acid production.
- *Microcystis aeruginosa:* Although *Microcystis* is typically a threat in freshwater systems, recent work has led to the discovery of cells and toxin (microcystin) in brackish waters of California. The toxin has been documented throughout the foodweb, and the first reported marine mammal deaths due to consumption of contaminated prey occurred in Monterey Bay. Its cells tend to form clumps which is a challenge for visual identification via microscopy.
- *Cochlodinium fulvescens:* This alga is an emerging threat, and its mode of toxicity is unknown. However, recent blooms have been linked to mass mussel mortalities and loss of commercially farmed abalone. Its cells do not preserve well, and visual identification via microscopy cannot differentiate this species from others in the genus that are nontoxic.
- *Alexandrium catenella:* This species is common along the California coast, and shellfish monitoring documents elevated levels of its toxin (saxitoxin) annually. Human health events are uncommon, but toxin bioaccumulation throughout the food web remains a persistent threat. Visual identification through microscopy is difficult for speciation, and a qPCR assay would be able to identify the toxic species within the larger genus of non-toxic species.
- Three species of *Dinophysis spp.:* These species are also common along the California coast, but the low threshold for a bloom means that cells can easily be missed when counting complex algae assemblages under a microscope.
- *Akashiwo sanguinea:* This species is considered an emerging threat and is linked to marine bird morbidity and mortality through production of a surfactant that inhibits proper feather insulation leading to hypothermia.

This project would:

1. Validate qPCR assays for the lower limit of detection, dynamic working range, and specificity to the California species listed above.
2. Empirically determine simplistic field-based DNA extraction methods optimal for individual or groups of species; and
3. Provide instrument demonstrations to regional stakeholders through small-scale proof-of-concept field trials.

The flexibility of established, portable genetic detection technology would greatly enhance sampling efforts on relevant time and spatial scales, and would work toward overcoming challenges inherent to field monitoring (e.g. visually similar species, vertical cell migration, and

low concentrations). Near real-time results would support management efforts to identify threats, mitigate risk, and monitor the progression of a toxic bloom event.

Project Site
The proof-of-concept field trials for this project would occur in Monterey Bay, but the tools developed by this project would be of use statewide.

Project Timeline
This is a 3-year project that would end in Winter of 2021.

Project Financing
Staff recommends that OPC approve disbursement of up to $247,410 from Sea Grant to San Jose State University to implement the Advancing Portable Detection Capabilities of Harmful Algal Bloom Species in California Waters project.

Agenda Item 8(a)(4) PROJECT SUMMARY: Interaction between microplastics and pathogen pollutants in marine ecosystems: Implications for seafood safety -- University of California, Davis

Project Description
Plastic debris, in particular microplastics (i.e., particles <5mm in size), is increasingly recognized as a global contaminant that is ubiquitous in the oceans. This widespread contamination includes both fish and shellfish that we consider seafood. Compared with chemical contaminants, limited data exist on the presence of harmful pathogens as 'hitchhikers' on microplastics, and how microplastics may serve as vectors for pathogens in the marine environment. Investigating the association between pathogens and microplastics and subsequent impact on seafood safety was recently highlighted as an essential research need by the United Nations. Specifically, the potential interaction between microplastics and terrestrially derived, zoonotic pathogens, which can infect both animals and humans, is completely unknown. Notably, unlike water-loving bacteria that can multiply in the environment (e.g. *Vibrio*), the transmission of terrestrial protozoan parasites in the aquatic environment is solely a function of their transport and survival. Thus, the distribution of microplastics may be a key feature that impacts the transmission of these pathogenic agents from land to aquatic wildlife and to people via seafood. Zoonotic protozoans such as *Cryptosporidium*, *Giardia*, and *Toxoplasma* are of concern in the shellfish industry due to their environmental persistence, low infective dose, and increasing reports of shellfish testing positive for these parasites – including in California.

This project would:

1. Evaluate whether select zoonotic protozoa can adhere to microplastic particles, including both microplastics fragments and fibers;
2. Investigate the whether these pathogens can survive well on microplastics, especially in seawater; and

3. Investigate if microplastics enhance the acquisition of these pathogens by oysters, and the length of time it will take for oysters to pass microplastics and pathogens through their digestive system and tissues.

Overall, this project would provide needed information on the degree to which microplastics may be transporting and distributing zoonotic protozoan pathogens in the marine environment, and would identify how the presence of microplastics may enhance the ability of these pathogens to infect marine wildlife. This project would also provide valuable information to shellfish producers and agencies charged with food safety, such as the Office of Environmental Health Hazard Assessment, particularly in respect to the length of time needed for oysters to clear the microplastics and pathogens from their tissues.

Project Timeline
This is a 2.5-year project that would end in summer of 2021.

Project Financing
Staff recommends that OPC approve disbursement of up to $249,065 from Sea Grant to the University of California, Davis to implement the Interaction between microplastics and pathogen pollutants in marine ecosystems: Implications for seafood safety project.

FUNDING SOURCE FOR ALL PROJECTS AND CONSISTENCY WITH PROPOSITION 84: (Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006)
The anticipated source of funds for these projects is OPC's appropriation pursuant to 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 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 OPC that are identified as appropriate Trust Fund purposes, as specified. The project is consistent with the Trust Fund purposes as discussed in the following section.

Summary of Recommended Proposition 84 Projects (by Priority Topic Area)	Recommended OPC Funding from Prop 84
Sea-level rise Adaptation and Coastal Resilience	
Coastal flooding projections and socioeconomic impacts due to sea-level rise and storms for the north coast using the Coastal Storm Modeling System (CoSMoS)	$250,000
Groundwater inundation hazards and socioeconomic impacts due to sea-level rise across the California coast	$250,000

Tribal Intertidal Digital Ecological Surveys (TIDES) Project: Using large-area imaging to assess intertidal vulnerability to sea-level rise with coastal indigenous nations	$249,536
Humboldt Coastal Resilience Project (HCRP): Analyzing beach-dune morphodynamics and vegetation controls on coastal resiliency to develop decision support tools and adaptation measures for sea-level rise and extreme events along the Eureka Littoral Cell, northern California	$250,000
Coastal Sediment Management	
Statewide assessment of California cliff erosion and retreat	$250,000
Using green engineering techniques to restore coastal sand dunes at Border Field State Park, San Diego	$249,949
Marine Renewable Energy	
Wave Energy Conversion in California under the present and future Climate and economic feasibility analysis of different technologies (WE3C)	$222,824
California Offshore Wind: Workforce and Grid Integration Analysis	$243,750
Marine Pollution	
Linking terrestrial pollution to estuarine water quality: Quantification of the role of groundwater in the transport, transformation, and removal of agricultural pollutants in Elkhorn Slough	$250,000
Multiple Stressors and Toxic Pseudo-nitzschia Blooms in California Waters: Understanding the Complex Interactive Impacts of Nutrients, Temperature, and Carbonate Chemistry	$238,601
Advancing Portable Detection Capabilities of Harmful Algal Bloom Species in California Waters	$247,410
Interaction between microplastics and pathogen pollutants in marine ecosystems: Implications for seafood safety	$249,065
SUBTOTAL	**$2,951,135**
Recommended in other staff recommendations for Items 5b & 6	$2,953,650
Competitive Prop 84 Grant Program projects recommended at this meeting – TOTAL	**$5,904,785**

CONSISTENCY WITH CALIFORNIA OCEAN PROTECTION ACT:

The proposed projects are consistent with the Ocean Protection Act, Division 26.5 of the Public Resources Code, because they are consistent with trust-fund allowable projects, defined in Public Resources Code Section 35650(b)(2) as projects which:

- Eliminate or reduce threats to coastal and ocean ecosystems, habitats, and species; and
- Improve coastal water quality.
- Allow for increased public access to, and enjoyment of, ocean and coastal resources, of those resources
- Improve management, conservation, and protection of coastal waters and ocean ecosystems
- Provide monitoring and scientific data to improve state efforts to protect and conserve ocean resources
- Protect, conserve, and restore coastal waters and ocean ecosystems
- Provide funding for adaptive management, planning, coordination, monitoring, research, and other necessary activities to minimize the adverse impacts of climate change on California's ocean ecosystem

CONSISTENCY WITH OPC'S STRATEGIC PLAN:
Together, all of the staff-recommended projects implement Climate Change, Coastal and Ocean Impacts from Land-Based Sources, Existing and Emerging Ocean Uses, Science-based Decision Making focal areas from OPC's Strategic Plan.

CONSISTENCY WITH OPC'S GRANT PROGRAM FUNDING GUIDELINES:
The proposed project is consistent with OPC's interim Grant Program Funding Guidelines for the update to prop 84, in the following respects:

Required Criteria

1. Directly relate to the ocean, coast, associated estuaries, or coastal-draining watersheds: *All projects directly relate to the ocean, coast, associated estuaries and/or coastal-draining watersheds and the suite of research projects will improve understanding of ocean and coastal resources and may lead to improved resources management.*
2. Support of the public: *See Exhibits 5c1 through 8a4.*
3. Greater-than-local interest: *Many of these projects are statewide or regional in nature with the potential to inform other regions or localities.*

Additional Criteria

1. Improvements to management approaches or techniques: *The suite of research projects in this staff recommendation are innovative because they require researchers to directly link their work to management issues and therefore could result in more swift management improvements or techniques.*
2. Resolution of more than one issue: *Given the diversity of projects listed above, this funding has the ability to advance understanding across a range of issues and offer potential solutions.*
3. Leverage: *Many projects leverage current, ongoing work or field experiments, and some projects build upon previous OPC-funded projects and investments.*

4. Coordination: *Links are necessary between university natural and social scientists, state resource managers and policy makers to ensure that research informs long-term policies that lead to the recovery and sustainability of the state's coastal resources. OPC staff and the Sea Grant programs will work closely with the grantees throughout the projects as appropriate to share findings and deliverables.*

Additionally, evaluation of all aforementioned projects by the review committees was based on the following criteria, as stated in the Request for Proposals:

1. **Project Rationale and Relevance:** The degree to which the proposed project addresses an important issue, scientific problem, information gap, or opportunity in the health, development, use or management of marine or coastal resources and ecosystems, as stated in the list of priority topic areas.
2. **Research/Scientific Merit:** The degree to which the proposed project will advance the state of the science or discipline through use of state-of-the-art robust methods.
3. **Innovativeness**: The degree to which new approaches to solving problems and exploiting opportunities in resource management or development will be employed in the proposed project
4. **User Relationships:** The degree to which the users or potential users of the proposed project's results have been brought into the planning of the proposed project, will be brought into the execution of the proposed project or will be kept apprised of progress and results.
5. **Qualifications of Investigators:** The degree to which investigators are qualified by education, training and/or experience to execute the proposed project. Evidence of any record of achievement with previous funding.

COMPLIANCE WITH THE CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA):

The following proposed projects are not 'legal projects' that triggers the California Environmental Quality Act (CEQA) pursuant to Public Resources Code section 21068 and Title 14 of the California Code of Regulations, section 15378, because they will not cause a direct physical change or reasonably foreseeable indirect physical change in the environment:

- Coastal flooding projections and socioeconomic impacts due to sea-level rise and storms for the north coast using the Coastal Storm Modeling System (CoSMoS);
- Groundwater inundation hazards and socioeconomic impacts due to sea-level rise across the California coast;
- Statewide assessment of California cliff erosion and retreat;
- Wave Energy Conversion in California under the present and future Climate and economic feasibility analysis of different technologies;
- California Offshore Wind: Workforce and Grid Integration Analysis;
- Advancing Portable Detection Capabilities of Harmful Algal Bloom Species in California Waters; and
- Interaction between microplastics and pathogen pollutants in marine ecosystems: Implications for seafood safety.

The following proposed projects are categorically exempt from review under CEQA pursuant to Title 14 of the California Code of Regulations Section 15306 - Information Collection, because

they involve basic data collection, research, experimental management, and resource evaluation activities that will not result in a serious or major disturbance to an environmental resource. Staff will file Notice of Exemptions for these projects upon approval by OPC:

- Tribal Intertidal Digital Ecological Surveys (TIDES) Project: Using large-area imaging to assess intertidal vulnerability to sea-level rise with coastal indigenous nations;
- Humboldt Coastal Resilience Project (HCRP): Analyzing beach-dune morphodynamics and vegetation controls on coastal resiliency to develop decision support tools and adaptation measures for sea-level rise and extreme events along the Eureka Littoral Cell, northern California;
- Linking Terrestrial Pollution to Estuarine Water Quality: Quantification of the role of groundwater in the transport, transformation, and removal of agricultural pollutants in Elkhorn Slough; and
- Multiple Stressors and Toxic Pseudo-nitzschia Blooms in California Waters: Understanding the Complex Interactive Impacts of Nutrients, Temperature, and Carbonate Chemistry.

The following proposed project is categorically exempt from review under CEQA pursuant to Title 14 of the California Code of Regulations section 15333 - Small Habitat Restoration Projects, because it will restore habitat, will be carried out by manual labor, not mechanized equipment, and will not exceed five acres in size. Staff will file a notice of exemption for this project upon approval by OPC:

- Using green engineering techniques to restore coastal sand dunes at Border Field State Park, San Diego.