



HE'EIA NATIONAL ESTUARINE RESEARCH RESERVE FINAL ENVIRONMENTAL IMPACT STATEMENT

NOAA OFFICE FOR COASTAL MANAGEMENT
DECEMBER 07, 2016

TO ALL INTERESTED GOVERNMENT AGENCIES AND PUBLIC GROUPS:

Under the National Environmental Policy Act (NEPA), an environmental review has been performed on the following action:

TITLE: He'eia National Estuarine Research Reserve
Final Environmental Impact Statement and Final Management Plan

LOCATION: State of Hawai'i, Island of O'ahu. He'eia watershed in the
Kāne'ohe Bay region.

SUMMARY: The He'eia National Estuarine Research Reserve would be the nation's 29th National Estuarine Research Reserve, administered by the Hawai'i Institute of Marine Biology, as designated by the State of Hawai'i. The reserve would facilitate new partnerships and research on estuarine systems in Hawai'i to support improved coastal management and local community sustainability and resilience. Additionally, a reserve would offer NOAA and state and local partners a collaborative platform for research, monitoring, stewardship, and education, offering additional opportunities for Hawai'i citizens to become stewards of our nation's coastal resources.

The nominated site by the State of Hawai'i and other alternatives have identified a preferred site alternative that represents an expansion of the nominated site boundary. The proposed site encompasses 1,385 acres of coastal habitats, including uplands (i.e., grasslands and shrublands), wetlands (i.e., streams, ponds, and freshwater and estuarine wetlands), and marine habitats (i.e., patch reefs, sandy bottoms, and seagrass beds). In addition to the preferred alternative, four other alternatives were considered, including a no action alternative.

The draft plan/EIS was available for public and agency review and comment from September 2, 2016 to October 30, 2016 with a public hearing held on October 6, 2016, at He'eia State Park in He'eia, Hawai'i, to take public comments on that decision. Copies of the document were distributed to individuals, agencies, organizations, and local businesses and made available at [regulations.gov](https://www.regulations.gov) (Docket ID: NOAA-NOS-2016-0114). This final plan/EIS provides responses to substantive stakeholder and public comments, incorporates those comments and suggested revisions where necessary, and provides copies of relevant comment letters. Once this document is released and a Notice of Availability (NOA) is published by the Environmental Protection Agency, a 30-day required waiting period will follow. Following the 30-day period, the alternative or actions constituting the approved designation will be documented in a record of decision that will be signed by the NOS Assistance Administrator. For further information regarding this document, please contact:

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Although NOAA is not soliciting comments on this completed EA/FONSI, we will consider any comments submitted that would assist us in preparing future NEPA documents. Please submit any written comments to the responsible official named above.



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LIST OF ACRONYMS AND ABBREVIATIONS

ACE	Ashepoo-Combahee-Edisto	KEEP	K-12 Estuary Education Program
ACS	American Community Survey	MCBH	Marine Corps Base Hawai'i
AICUZ	Air Installations Compatible Use Zones	MMPA	Marine Mammal Protection Act
BMP	Best Management Practice	MOA	Memorandum of Agreement
C-CAP	Coastal Change Analysis Program	MPA	Marine Protected Area
C&CH	City and County of Honolulu	MSD	Marine Sanitation Device
CDD	Community Development District	MUS	Management Unit Species
CDUP	Conservation District Use Permit	NAAQS	National Ambient Air Quality Standards
CEQ	Council on Environmental Quality	NCCOS	National Centers for Coastal Ocean Science
CIA	Cultural Impact Assessment	NEPA	National Environmental Policy Act
CMP	Coastal Zone Management Program	NERR	National Estuarine Research Reserve
CZMA	Coastal Zone Management Act	NERRS	National Estuarine Research Reserve System
DAR	Division of Aquatic Resources	NFIP	National Flood Insurance Program
DBEDT	Department of Business, Economic Development, and Tourism	NHPA	National Historic Preservation Act
DEIS	Draft Environmental Impact Statement	NMFS	National Marine Fisheries Service
DHHL	Department of Hawaiian Home Lands	NMSA	National Marine Sanctuaries Act
DLNR	Department of Land and Natural Resources	NOAA	National Oceanic and Atmospheric Administration
DMP	Draft Management Plan	NRCS	Natural Resources Conservation Service
DNL	Day-Night Average Sound Level	OCM	Office for Coastal Management
DOBOR	Division of Boating and Ocean Recreation	OHA	Office of Hawaiian Affairs
DOC	Department of Commerce	OP	Office of Planning
DOFAW	Division of Forestry and Wildlife	PCB	Polychlorinated Biphenyls
DOH	Department of Health	RAB	Reserve Advisory Board
EA	Environmental Assessment	SCP	Sustainable Communities Plan
EFH	Essential Fish Habitat	SHPD	State Historic Preservation Division
EIS	Environmental Impact Statement	SMA	Special Management Area
ENOW	Economics: National Ocean Watch	SWMP	System-Wide Monitoring Program
ESA	Endangered Species Act	TMDL	Total Maximum Daily Load
FEIS	Final Environmental Impact Statement	TN	Total Nitrogen
FEMA	Federal Emergency Management Agency	TOTE	Teachers on the Estuary
FMP	Final Management Plan	TRI	Toxic Release Inventory
HAPC	Habitat Areas of Particular Concern — Hawai'i Administrative Rules	USACE	United States Army Corps of Engineers
HCDA	Hawai'i Community Development Authority	USDA	United States Department of Agriculture
HIMB	Hawai'i Institute of Marine Biology	USEPA	United States Environmental Protection Agency
HRS	Hawai'i Revised Statute	USFWS	United States Fish and Wildlife Service
IPaC	Information for Planning and Conservation	USMC	United States Marine Corps
IPCC	Intergovernmental Panel on Climate Change	ZCTA	Zip Code Tabulated Area

EXECUTIVE SUMMARY

The proposed federal action considered by the National Oceanic and Atmospheric Administration (NOAA) under this environmental review is the designation of the nation's 29th research reserve. This action would take the form of a formal designation by the NOAA Administrator and joint declaration by the NOAA Administrator and the Governor of Hawai'i.

On May 21, 2014, Hawai'i Governor Neil Abercrombie submitted a nomination to NOAA for the designation of a portion of the Kāne'ohe Bay estuary on the island of O'ahu as the He'eia National Estuarine Research Reserve (nominated site). The State of Hawai'i has proposed that the Hawai'i Institute of Marine Biology serve as the lead state agency for the proposed He'eia research reserve. As such, NOAA's proposed action would be consistent with the recommendation from the State of Hawai'i.

The National Estuarine Research Reserve System is a partnership program between NOAA and coastal states that protects more than 1.3 million acres of coastal and estuarine habitat. Established by the Coastal Zone Management Act (CZMA) in 1972, NOAA provides funding, national guidance, and technical assistance for the research reserves, while a state partner manages each site on a daily basis with input from local partners. The reserve system protects estuarine areas, provides educational opportunities, facilitates research and monitoring, and facilitates the transfer of relevant information to coastal communities.

Representing different estuarine types and biogeographic regions, there are currently 28 reserves in 22 states and one territory. The focus is on research and education. The goals, as identified in the system's strategic plan, are provided here:

- Estuaries and coastal watersheds are better protected and managed by implementing place-based approaches at reserves;
- National Estuarine Research Reserve System scientific investigations improve understanding and inform decisions affecting estuaries and coastal watersheds; and
- National Estuarine Research Reserve System education and training increases participants' environmental literacy and ability to make science-based decisions related to estuaries and coastal watersheds.

An analysis of the nominated site and other alternatives has identified a preferred site alternative that represents an expansion of the nominated site boundary. This alternative is described below.

The He'eia estuary is located within the Kāne'ohe Bay region on the windward side of O'ahu and is the largest sheltered body of water within the main Hawaiian Islands. Unique within the reserve system, the proposed He'eia Reserve would represent the only reserve within the Hawaiian Islands and the insular biogeographic region. The native flora and fauna, rich cultural traditions and practices, historical attributes, diverse habitats, and existing and potential future impacts of multiple coastal stressors come together to create a compelling addition to the National Estuarine Research Reserve System.

The proposed site encompasses 1,385 acres of coastal habitats including uplands (i.e., grasslands and shrublands), wetlands (i.e., streams, ponds, and, freshwater and estuarine wetlands), and marine habitats (i.e., patch reefs, sandy bottoms, and seagrass beds). The four main components are profiled below:

- Upland areas (447 acres) fall within the Hawai'i Community Development Authority parcel in He'eia (419 acres), He'eia State Park (19 acres), and the uplands associated with the He'eia Fishpond (9 acres). The development authority parcel lands are a mix of wetlands and forested land. Proposed activities within this parcel would include demonstration lo'i kalo (taro patches)

cultivation and aquaponics. He'eia State Park protects historic and cultural sites and provides public access and recreational opportunities. The uplands by He'eia Fishpond represent an area between the fishpond and a residential neighborhood.

- Marine areas (822 acres), the largest component of the proposed reserve, are managed by the State of Hawai'i, Department of Land and Natural Resources, and are composed primarily of patch and fringing coral reefs and sand flats.
- He'eia Fishpond (88 acres) is owned by the Kamehameha Schools and is in pre-existing use in the area being restored to promote food security and education through traditional aquaculture.
- Moku o Lo'e (Coconut Island — 28 acres) is owned by the University of Hawai'i Foundation and operated by the University of Hawai'i as a research lab under the Hawai'i Institute of Marine Biology. The Hawai'i Marine Laboratory Refuge surrounds the island and is the most protected habitat within the proposed reserve.

The reserve would be administered by the Hawai'i Institute of Marine Biology, designated the lead administrative agency by the State of Hawai'i for the proposed reserve. The Institute would be supported by additional state, local, and Native Hawaiian Organizations, plus partners including the State of Hawai'i Office of Planning, Hawai'i Department of Land and Natural Resources, Kāko'o 'Ōiwi, Paepae o He'eia, Ko'olaupoko Hawaiian Civic Club, Kama'aina Kids, and Ko'olau Foundation. (Additional information regarding administration and management of the proposed He'eia Reserve can be found in the proposed He'eia National Research Reserve Management Plan found in Appendix A. The plan includes information about goals and objectives; administration; boundaries and acquisition; facilities and construction; public access; resource protection, and restoration and manipulation; as well as an orientation to the reserve and its unique historical land tenure system.)

In addition to the proposed He'eia research reserve, this document analyzes several alternatives within Kāne'ohe Bay, including a "no action" alternative. Under the no action alternative, the lands within the proposed research reserve boundary would continue to be managed separately by the various landowners and their lessees, where applicable; however, no additional Coastal Zone Management Act Section 315 federal funds, including grants, would be awarded to manage these lands and waters or to conduct research and education programs. Although these lands would continue to be protected and managed, they would be managed in accordance with the different resources and priorities of the respective landowning entities and lessees.

The proposed designation action would provide a more coordinated approach to management that encourages reserve partners to create a management structure that fosters collaboration among the landholding entities and other interested parties to work toward common goals for research, education, and resource stewardship.

Designation of a He'eia research reserve does not alter existing state or federal regulations and authorities of the resource agencies and landowners within the proposed He'eia research reserve. However, as a reserve, certain activities that are inconsistent with the reserve program or applicable National Estuarine Research Reserve System regulations may not be implemented as part of the NOAA-approved management plan.

Native Hawaiian Organizations were involved throughout the reserve development and designation process, including scoping and management plan development. These entities would continue to be engaged through implementation of the management plan. If a research reserve is designated here, these entities would be among the community members that benefit from the reserve.

As discussed throughout this document, the proposed designation of a He'eia research reserve within the Kāne'ohe Bay area of O'ahu and the implementation of the proposed management plan would be expected to provide environmental, social, and economic benefits to the region. An improved understanding of Hawaiian Island estuaries and the traditional ahupua'a system of resource management would be enhanced by linking research and educational efforts, natural and cultural resources, and people. It is expected that physical alterations and impacts would be restricted to limited areas and associated with the construction of facilities supporting research and education activities and public access sites associated with future growth and potential acquisition. Environmental reviews would be conducted for individual facilities development and land acquisition projects.

Overall, it is expected that the natural resources found within the proposed reserve would benefit from coordinated and integrated conservation and management, and the reserve would serve surrounding communities by improving public understanding of Hawaiian estuaries, their benefits, and needs for stewardship.

CHAPTER 1: NATIONAL CONTEXT

Estuaries provide a vast array of resources and services to people. An estuary is an ecosystem, comprising both the biological and physical environment, that has developed in a region where rivers meet the sea and fresh-flowing river water mingles with tidal salt water to become brackish, or partly salty. The transport of sediments and nutrients at the interface between the land and water supports a diverse array of habitats and species. Providing food, fresh water, habitat, flood regulation, nutrients, recreational opportunities, soils, aesthetics and other values, estuaries have long been a focal point of human activity. As a consequence, they have been heavily exploited throughout our history for natural resources, commerce, tourism and a host of other purposes. Within the Hawaiian Islands, the ahupua'a system¹ has traditionally been used to manage natural resources, using local knowledge and community-based efforts to make collective decisions for the benefit of individuals, society, and future generations (Blane et al. 2000).

Nationally, 52% of the U.S. population resides within coastal watershed counties (NOAA, 2016). Population and development pressures on our coasts and estuaries as well as economic activities have subjected these areas to continuous degradation. As compared to other regions of the United States, estuaries within the Hawaiian Islands are relatively small in size, but still ecologically significant components of the state's coastal resources, providing direct benefits to fisheries, tourism, and recreation. The United States Environmental Protection Agency (USEPA) National Coastal Conditions Report notes that changing land uses, such as reduction of land used for agriculture and increases in residential and commercial development, may be altering the magnitude and types of stressors impacting estuaries and coastal areas of Hawai'i (USEPA, 2012). Within the Hawaiian Islands, O'ahu has both the largest population and highest population density, which can influence the alteration of natural estuarine systems.

1.1 THE COASTAL ZONE MANAGEMENT ACT

In 1972, Congress passed the National Coastal Zone Management Act (P.L. 92-583, as amended, hereinafter the "act" or "CZMA"). Congress recognized the significance of coastal resources and the importance of these resources to the national, regional, and local economies. The act further recognized the interrelationships between the land, water, and transitional areas between them. These relationships are reflected in the act's 1996 reauthorization, which referenced the increasing and competing demands upon the lands and waters of our coastal zone, which have resulted in the loss of living marine resources, wildlife, and nutrient-rich areas; permanent and adverse changes to ecological systems; decreased open space; and shoreline erosion (16 U.S.C. § 1451(c)). The reauthorization further notes that the habitat areas of the coastal zone, along with the fish, shellfish, other living marine resources, and wildlife therein, are ecologically fragile and consequently extremely vulnerable to destruction due to alterations by humans (16 U.S.C. § 1451(d)). In recognition of these issues, the act established a national policy to preserve, protect, develop, and, where possible, to restore and enhance the resources of the Nation's coastal zone for this and succeeding generations (16 U.S.C. § 1452(1)). The act supports coastal states, territories and local governments in developing tools and programs to improve their management capabilities in the rapidly developing coastal zone,

to help protect, preserve, develop and restore fragile natural resources such as the bays and estuaries, beaches, dunes and wetlands, as well as the flora and fauna that are dependent on those habitats. Congress also recognized that scientific knowledge of our coastal zone was often limited. However, local decision-makers, developers and the public need to understand how the coastal ecosystems work and the consequences associated with development activities on these systems. To improve our understanding of these ecosystems and support coastal management, Congress provided an additional incentive in the act with the establishment of the National Estuarine Research Reserve System (here after “reserve system” but see NERRS in next paragraph) (16 U.S.C. § 1461) as amended in the Coastal Zone Management Reauthorization Act of 1985. See Public Law 99-272, 100 STAT. 82. The reserve system provides states and territories (hereafter, states) opportunities to seek answers to important questions about our nation’s estuaries through a network of protected areas.

1.1.1 NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM

The mission of the National Estuarine Research Reserve System (NERRS) is stated in its implementing regulations (15 C.F.R. § 921.1) as the following: the establishment and management, through federal-state cooperation, of a national system of Estuarine Research Reserves representative of the various regions and estuarine types in the United States. Pursuant to these implementing regulations, habitats within healthy estuaries that typify different estuarine types within the U.S. can be designated as a system reserve. Reserves are operated for long-term research and monitoring, estuarine education, training, and interpretation. The national system provides a framework to conduct research; monitor estuarine health and conditions; model restoration techniques; and disseminate information for estuarine education, interpretation, or decision-maker training.

1.1.2 NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM ADMINISTRATIVE FRAMEWORK

The NERRS is a partnership program between the National Oceanic and Atmospheric Administration (NOAA) and the coastal states. NOAA provides funding, national guidance, and technical assistance through the Office for Coastal Management (OCM). OCM plays four important roles in operating the reserve system. First, it supports the NOAA Administrator’s review and approval in the designation of individual reserves. Second, it disburses and oversees expenditures of federal funds for research, monitoring, education, land acquisition, facilities construction, and operation of reserves, as well as for the development of future reserves. Third, it coordinates and provides policy guidance for the system. Finally, as required by federal law, OCM periodically evaluates the operation of research reserves for compliance with applicable federal requirements and with a reserve’s approved five-year management plan. OCM’s Stewardship Division has day-to-day responsibility for the implementation of the system. Each research reserve is managed on a daily basis by a lead state agency or university, with input from local partners

¹ Refer to the Preamble to the He’eia NERR Management Plan, Appendix A

² Per 15 C.F.R. 921.2(d), State agency means an instrumentality of a coastal state to whom the coastal state has delegated the authority and responsibility for the creation and/or management/operation of a National Estuarine Research Reserve. Factors indicative of this authority may include the power to receive and expend funds on behalf of the Reserve, acquire and sell or convey real and personal property interests, adopt rules for the protection of the Reserve, enforce rules applicable to the Reserve, or develop and implement research and education programs for the reserve. HIMB is part of the University of Hawai’i System, a public (state) institution of higher learning.

Figure 1.1 Map of biogeographic regions of the United States and National Estuarine Research Reserves

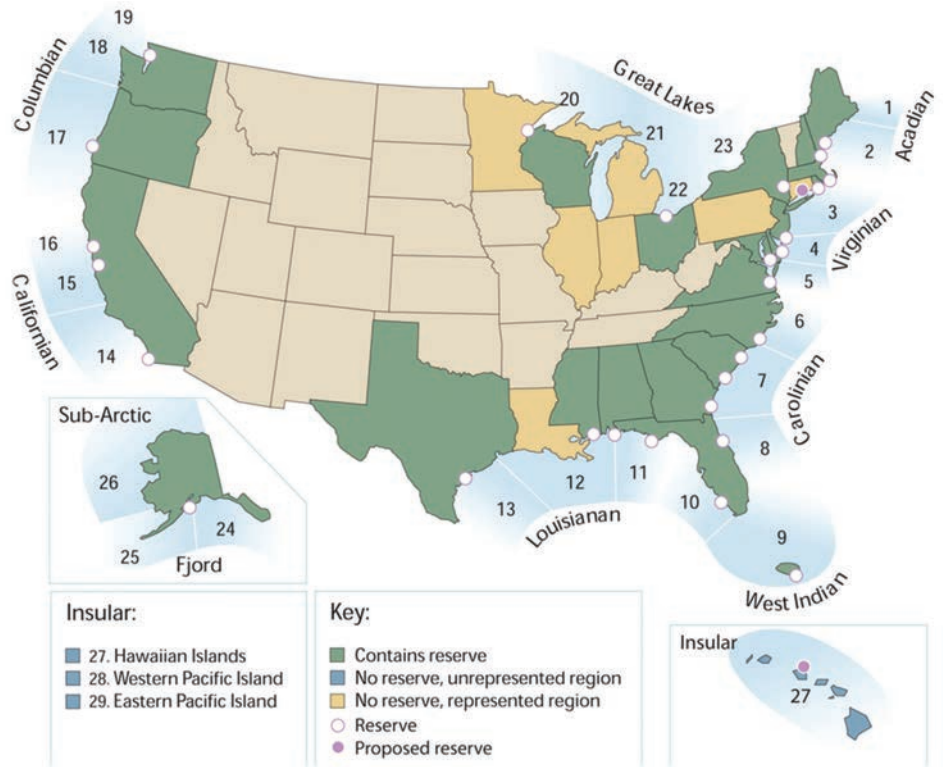


Table 1.1 Biogeographic regions and subregions of the National Estuarine Research Reserve System

1. Acadian – Northern Gulf of Maine*	16. Californian – San Francisco Bay
2. Acadian – Southern Gulf of Maine	17. Columbian – Middle Pacific
3. Virginian – Southern New England	18. Columbian – Washington Coast*
4. Virginian – Middle Atlantic	19. Columbian – Puget Sound
5. Virginian – Chesapeake Bay	20. Great Lakes – Lake Superior
6. Carolinian – North Carolina	21. Great Lakes – Lakes Michigan and Huron*
7. Carolinian – South Atlantic	22. Great Lakes – Lake Erie
8. Carolinian – East Florida	23. Great Lakes – Lake Ontario *
9. West Indian – Caribbean	24. Fjord – Southern Alaska *
10. West Indian – West Florida	25. Fjord – Aleutian Islands
11. Louisianan – Panhandle Coast	26. Sub-Arctic – Northern Alaska *
12. Louisianan – Mississippi Delta	27. Insular – Hawaiian Islands*3
13. Louisianan – Western Gulf	28. Insular – Western Pacific Island *
14. Californian – Southern California	29. Insular – Eastern Pacific Island *
15. Californian – Central California	

*No reserve

Note: biogeographic regions and subregions based on classification scheme described in Appendix I to 15 C.F.R. 921

1.1.3 NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM BIOGEOGRAPHIC REGIONS

In the more than 40 years since Section 315 of the Act established the NERRS, the system has grown into a national network of 28 protected estuaries that serve as reference sites for research, education and stewardship. Reserves represent different biogeographic regions of the United States. A biogeographic region is defined by a geographic area with similar dominant plants, animals and prevailing climate. Regions are classified by ecosystem type (e.g., maritime forest, coastal mangroves) and physical characteristics (i.e., geologic, chemical, or hydrographic). As depicted in Figure 1.1, there are 11 major biogeographic regions around the coast, with 29 subregions. The reserve system currently represents nine of the major biogeographic regions and 20 of those subregions and is designed to include sites representing all 29 biogeographic subregions (Table 1.1). In the near term, priority for federal designation of new NERRS sites is given to coastal states that are in unrepresented biogeographic regions.

1.2 A POTENTIAL HE'ĒIA NATIONAL ESTUARINE RESEARCH RESERVE AS PART OF A NETWORK OF RESERVES

The State of Hawai'i proposed the He'ēia National Estuarine Research Reserve (He'ēia Research Reserve, or He'ēia NERR) on May 21, 2014. The Hawai'i Institute of Marine Biology (HIMB) has been identified as the lead state agency² for the proposed reserve. Operating under a proposed five-year management plan (Attachment A), reserve staff would work with resource managers, Native Hawaiian groups, local communities and regional groups to address natural resource management issues, such as nonpoint source pollution, toxics contamination, habitat restoration, climate change, and invasive species.

Under the preferred alternative described below, the proposed He'ēia Research Reserve would include 1,385 acres of wetlands, marine waters, and upland areas in the He'ēia estuary, becoming the only National Estuarine Research Reserve within the insular biogeographic region and the 29th in the nation. The table below (Table 1.2) shows the other reserve sites along with their year of designation and area. In total, the system represents a wide diversity of coastal ecosystems and physical characteristics found within the United States. The proposed He'ēia NERR site would represent a significant addition to the reserve system by increasing its biogeographic representation and adding new resources and capabilities to the national system.

³The Waimanu Valley on the windward coast of Hawai'i Island was designated as a National Estuarine Research Reserve in 1978 but the site was de-designated in 1993. Presently, there is no designated National Estuarine Research Reserve within the Insular biogeographic region.

Table 1.2 Reserve designation dates (year), area, and biogeographic region

RESERVE	YEAR	ACRES	SQUARE MILES	SQUARE KILOMETERS	REGION
South Slough, OR	1974	4,771	7.5	19.3	Columbian (17)
Sapelo Island, GA	1976	6,110	9.5	24.7	Carolinian (7)
Rookery Bay, FL	1978	110,000	171.9	445.2	West Indian (10)
Apalachicola Bay, FL	1979	234,715	366.7	949.9	Louisianian (11)
Elkhorn Slough, CA	1979	1,439	2.2	5.8	Californian (15)
Padilla Bay, WA	1980	12,100	18.9	49.0	Columbian (19)
Narragansett Bay, RI	1980	4,259	6.7	17.2	Virginian (3)
Old Woman Creek, OH	1980	573	0.9	2.3	Great Lakes (22)
Jobos Bay, PR	1981	2,883	4.5	11.7	West Indian (9)
Tijuana River, CA	1982	2,293	3.6	9.3	Californian (14)
Hudson River, NY (4 components)	1982	4,838	7.6	19.6	Virginian (3)
North Carolina (4 components)	1985 1991	10,568	16.5	42.8	Carolinian (6)
Wells, ME	1986	2,250	3.5	9.1	Acadian (2)
Chesapeake Bay, MD (3 components)	1985 1990	6,249	9.8	25.3	Virginian (5)
Weeks Bay, AL	1986	6,525	10.2	26.4	Louisianian (11)
Waquoit Bay, MA	1988	2,804	4.4	11.3	Virginian (3)
Great Bay, NH	1989	10,235	16.0	41.4	Acadian (2)
Chesapeake Bay, VA (4 components)	1991	3,072	4.8	12.4	Virginian (5)
Ashepoo-Combahee- Edisto (ACE) Basin, SC	1992	99,308	155.2	401.9	Carolinian (7)
North Inlet Winyah Bay, SC	1992	18,916	29.6	76.6	Carolinian (7)
Delaware	1993	6,206	9.7	25.1	Virginian (4)
Jacques Cousteau, NJ	1998	114,873	179.5	464.9	Virginian (4)
Kachemak Bay, AK	1999	371,950	581.2	1,505.2	Fjord (25)
Grand Bay, MS	1999	18,049	28.2	73.0	Louisianian (12)
Guana Tolomato Matanzas (GTM), FL	1999	73,352	114.6	296.8	Carolinian (8)
San Francisco Bay, CA	2003	3,710	5.8	15.0	Californian (16)
Mission-Aransas, TX	2006	185,708	290.2	751.1	Louisianian (13)
Lake Superior, WI	2010	16,697	26.1	67.6	Great Lakes (20)
*He'eia, HI	Proposed 2016	1,385	2.2	5.6	Insular (27)
*Connecticut, CT	TBD	TBD	TBD	TBD	Virginian (3)
Total		1,335,839	2,088	5,406	

* Proposed reserve

CHAPTER 2: PURPOSE OF AND NEED FOR ACTION

2.1 PURPOSE OF PROPOSED ACTION

The purpose of the action is to designate a National Estuarine Research Reserve (here after “research reserve”) (NERR) in Hawai‘i as the 29th reserve in the National Estuarine Research Reserve System (here after “reserve system”) within portions of the He‘eia estuary and adjacent Kāne‘ohe Bay waters. As required by 15 C.F.R. § 921.20, the proposed action will also include the National Oceanic and Atmospheric Administration’s (NOAA) approval of a management plan developed by the state, provided the plan meets the required elements described in the applicable reserve system regulations. If all requirements of the process are met and there is a designation of the proposed He‘eia NERR, the state and NOAA will partner in the operation and management of the reserve in accordance with 15 C.F.R. § 921.32. Therefore, the purpose of the proposed action includes both the designation of the proposed reserve, including NOAA approval of the He‘eia NERR Final Management Plan (FMP), and the subsequent implementation of plan management elements resulting from a NERR designation.

The proposed reserve will involve the cooperation and interaction of a unique combination of federal, state, local and private partners. In this instance federal-state and state-community partnerships have been developed to support the enhancement of representative natural habitats and to collaborate on operations and management plans that will increase our understanding, awareness and stewardship of the resources. These partnerships assure benefits that can be enjoyed by the people of Hawai‘i and visitors to the area, including across environmental, economic, and social domains.

As part of the national system of estuarine research sites, each reserve is part of the reserve system long-term water quality, biotic, and land use and habitat change monitoring programs that represent an unprecedented effort to compare data across a network of sites. The ability to leverage the long-term datasets of the national network would be especially relevant at a new research reserve estuarine representative of the Hawaiian Islands and the insular biogeographic region. Some additional benefits of a becoming a new research reserve include opportunities to:

- Establish baseline data for environmental conditions, species (both endemic and not), and archaeological resources at the site.
- Create a research program that examines how different ecosystem-based management strategies contribute to a healthy and sustainable estuarine ecosystem in the face of ongoing anthropogenic impacts, and human use demands.
- Integrate traditional cultural knowledge and practices with contemporary science and research to sustainably manage resources in the vicinity of the reserve site.
- Increase understanding of natural and anthropogenic processes, restoration efforts and their impacts to the estuary, and key ecosystem services.
- Inform resource management decisions enabling local communities to effectively address key coastal issues like climate change, habitat restoration, and water quality.

2.2 NEED FOR PROPOSED ACTION

The need for the proposed action is to fill a currently unrepresented gap in the national system identified as the Insular biogeographic region and Hawaiian Islands sub-region. The Insular bioregion is comprised of three subregions: the Hawaiian Islands, the Western Pacific Islands, and the Eastern Pacific Islands. With the designation of a reserve in Hawai'i, the system would have a tenth region (of eleven total regions) and a twenty-first sub-region (of 29 total subregions) represented. The proposed He'eia Research Reserve would further the national goal to ensure that the system reflects the wide range of estuarine types within the United States. It would also represent a significant addition to the National Estuarine Research Reserve System (NERRS) because of its unique estuarine type that, since 1996, has not been represented in the system.

In evaluating potential designation of a new reserve in Hawai'i, NOAA is also acting upon the nomination of a site by former Governor Neil Abercrombie of Hawai'i for inclusion within the national system. Given the site nomination submitted by Hawai'i, careful consideration of existing land uses and community support was integral to selecting alternatives that would enable the creation of a successful research reserve in this biogeographic region. For the national system, a successful site designation takes into account the area's ecological characteristics; its value for long-term research and monitoring; how well natural resources and habitats are protected; suitability for education, training and outreach; and local management considerations.

A new research reserve would coordinate existing, and establish new, research, education, and management programs to address coastal management issues within the state. Its designation would also further the national goal to ensure that the system reflects the wide range of estuarine types within the United States. A new reserve would also use existing authorities to ensure a stable environment for long-term research and provide a coordination and oversight mechanism for achieving reserve goals.

Key considerations with respect to establishing a research reserve include its long-term viability, its ability to promote collaboration among entities conducting research in the area, and the availability of facilities (e.g., laboratories, dormitory space, monitoring infrastructure).

As described within the research and monitoring program within the FMP, the proposed He'eia NERR presents an opportunity to contribute to an ongoing debate about ecosystem-based best management practices through research activities which are expected to contribute to the coastal management needs of the State of Hawai'i and other Pacific Island systems. The proposed He'eia NERR seeks to provide a unique perspective on how different ecosystem-based management strategies influence a broad array of ecosystem services that contribute to a healthy and sustainable estuarine ecosystem in the face of ongoing anthropogenic impacts, and human use demands. The reserve plans to examine the ecosystem services provided by two management strategies:

- 1) an approach based on contemporary ecological restoration techniques to increase native species biodiversity, ecological resilience, and ecosystem integrity; and
- 2) an approach that embraces traditional Native Hawaiian management practices to return the ecosystem to a state that was realized within the traditional ahupua'a system.

Both strategies seek to integrate the concerns of the environment, society, economy, and human institutions, but focus on different aspects of each (He'eia NERR FMP, 2016).

Establishment of a Research Reserve in Hawai'i would allow for the development of interpretive and educational programs that would be attractive to local and state-wide school systems. Schools of all levels (K–12, colleges and universities) would be encouraged to use existing education facilities at the reserve site for educational programs (He'eia NERR FMP, 2016); participate in wetlands or marine field experiences; and help restore native habitats, species and traditional Hawaiian agricultural and fishing sites managed by local community partners.

In addition, there is a strong potential for the development of water-based investigations (e.g., boat or canoe tours through the site) with a new He'eia NERR through which ocean literacy and traditional ecological knowledge could be incorporated with research. Local schools could be encouraged to use reserve facilities, habitats, and restoration landscapes as sites for long-term monitoring and ecological studies that could be coordinated with He'eia NERR educational programs. Schools could, for example, work with local partners and the reserve to assist with restoration efforts, and that students could revisit the site(s) throughout the academic year.

Students could participate in making observations about the environment, collecting water quality data, learning about traditional knowledge, and applying their training to impact resource stewardship.

CHAPTER 3: STATE CONTEXT

3.1 HE'EIA NERR SITE SELECTION AND NOMINATION PROCESS AND HISTORY

Based on former Hawai'i Governor Neil Abercrombie's site nomination and further recommendations from the Hawai'i Institute of Marine Biology, acting as the lead state agency, the National Oceanic and Atmospheric Administration (NOAA) proposes that a National Estuarine Research Reserve (hereafter "research reserve" or "He'eia NERR") be established at the He'eia estuary and include portions of Kāne'ōhe Bay on O'ahu in the Hawaiian Islands. A nomination proposal for the establishment of this research reserve was submitted by the State of Hawai'i and approved by NOAA in 2014. NOAA is following the procedures for nominating and designating a research reserve in accordance with the established regulations 15 CFR Part 921 — National Estuarine Research Reserve System Regulations.

At the outset, former Governor Abercrombie identified the State of Hawai'i Office of Planning as the lead agency in the site selection phase, with University of Hawai'i becoming the lead state agency to coordinate the management of He'eia NERR upon designation. The Hawai'i Coastal Zone Management Program, located within the Hawai'i Office of Planning, created a three phased site selection approach (Figure 3.1), culminating with the development of a reserve management plan and support for NOAA's environmental compliance review. Phase I involved developing site selection criteria; forming site selection and site evaluation committees; managing a public solicitation for proposed sites; examining and analyzing proposed sites; and forwarding a short list of potential sites to support Phase II. During Phase II, a preferred site was selected from the short list of proposed sites; public meetings in the vicinity of the preferred site were held to solicit public feedback and to educate local communities, stakeholders, and individuals about the reserve system and the site; and a proposed site was forwarded to the Governor for nomination. The final phase of the process involved working with site partners with input from the broader community to develop a site management plan and to support the environmental review required under National Environmental Policy Act (NEPA).

Beginning in February 2013, Hawai'i Office of Planning (OP) initiated Phase I by developing selection criteria. The criteria were used to support an online solicitation seeking proposals for reserve sites from educational or research institutions, community organizations, and the public. Two calls for proposals took place between April and June 2013. Several inquiries from agencies and community groups were made via phone and email to the Hawai'i Coastal Zone Management Program during the solicitation periods resulting in two formal proposal submissions. These were identified as the He'eia estuary in Kāne'ōhe Bay on the island of O'ahu and Hilo Bay on Hawai'i Island.

Following the submission of the proposed sites, the Hawai'i OP, with contractor support, coordinated two committees — the Site Evaluation Committee and the Site Selection Committee — and managed the process on behalf of the state.

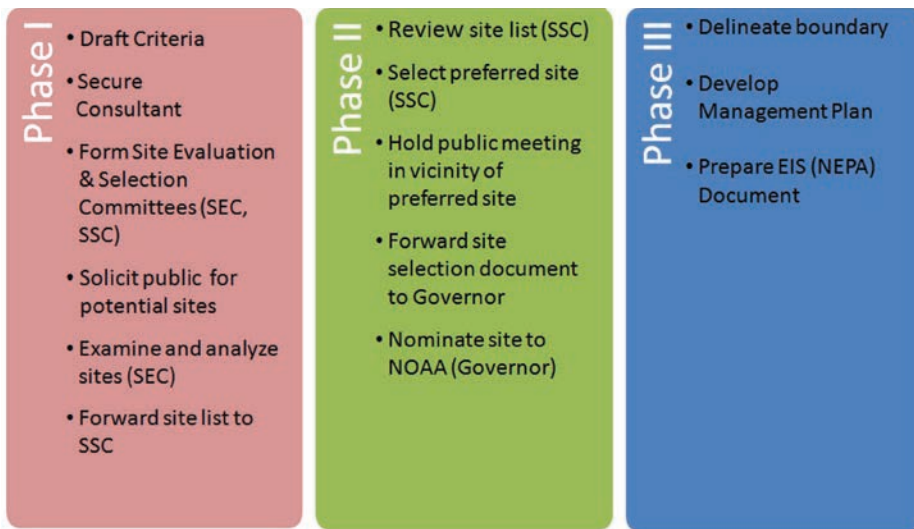


Figure 3.1. Hawai'i National Estuarine Research Reserve site selection process (from Hawai'i NERR Site Nomination Document May 2014)

SITE EVALUATION COMMITTEE

The Site Evaluation Committee consisted of representatives from nine agencies and organizations who were charged with evaluating submitted proposals against specific selection criteria approved by NOAA and the Site Selection Committee. The Site Evaluation Committee provided local expertise and advice on the technical aspects of the site selection process. Members reviewed the site selection criteria and evaluated the proposed estuary sites in Hawai'i using the criteria. Each of the Site Evaluation Committee's member organizations were invited based on their technical expertise and/or local knowledge of Hawaiian estuaries.

Site Evaluation Committee Representatives included:

- County of Kaua'i
- County of Hawai'i
- Marine and Coastal Zone Advisory Council
- National Oceanic and Atmospheric Administration
- Office of Hawaiian Affairs
- State of Hawai'i Department of Health
- State of Hawai'i Department of Land and Natural Resources
— Division of Aquatic Resources
- University of Hawai'i Mānoa
- U.S. Fish and Wildlife Service

SITE SELECTION COMMITTEE

The Site Selection Committee consisted of representatives from eight agencies and organizations who were charged with reviewing and approving the site selection criteria developed by a Hawai'i Coastal Zone Management Program-led group of technical experts. Another role of the Site Selection Committee was to ensure that the National Estuarine Research Reserve site selection process was consistent with regulatory requirements, and involved both the public and partner organizations. The Site Selection Committee was also responsible for selecting a preferred site for the Governor to consider for nomination to NOAA.

Site Selection Committee Representatives included:

- City and County of Honolulu
- County of Kaua'i
- County of Hawai'i
- County of Maui
- Marine and Coastal Zone Advisory Council
- National Oceanic and Atmospheric Administration
- State of Hawai'i Department of Land and Natural Resources – Division of Aquatic Resources
- University of Hawai'i Mānoa

The Site Evaluation Committee evaluated both site proposals using the approved selection criteria and found both to be strong candidate sites. As a result, both site proposals were forwarded to the Site Selection Committee for consideration under Phase II. The final selection of the He'eia estuary by the Site Selection Committee was based on the compiled site scores of the approved site selection criteria, updated site information and presentations by the proposal authors.

3.2 HE'EIA: THE PROPOSED SITE

The proposed He'eia NERR site as defined in this document consists of multiple habitat types generally categorized as upland, coastal and oceanic areas (Figure 3.2 and Table 3.1) found in Kāne'ohe Bay, on the northeastern or windward shore of the island of O'ahu (PBR 2014). In accordance with the National Estuarine Research Reserve System Habitat and Land Cover Classification Scheme (Kutcher 2008), these habitats are described as marine, estuarine, palustrine, upland, and cultural habitats. The site includes 822 acres of marine intertidal and subtidal habitats, including seagrass, sand, mud, patch and fringing reefs. Just outside the proposed boundary is the only barrier reef in U.S. waters (PBR 2014). The barrier reef has a major influence on bay circulation, and the relatively large freshwater inputs from numerous streams have created diverse marine habitats.

A significant portion of the wetland and terrestrial areas within the proposed He'eia NERR site are identified as areas managed for traditional agricultural or fisheries uses. This includes one of the largest fishponds in the Hawaiian Archipelago (88 acres) at its estuarine border and 447 acres of upland habitats. A large taro cultivation site and a native wetland restoration upland of the fishpond are currently being implemented or planned, which are anticipated to support ecological functions of the watershed. The site's estuarine waters from the He'eia Stream are directly influenced by runoff from the surrounding watershed as well as by the exchange of seawater from the ocean (PBR 2014). Finally, 28 acres of uplands are found on Moku o Lo'e, home of the Hawai'i Institute of Marine Biology.

The proposed He'eia NERR components are a combination of state, private, and university owned properties that would allow for shared resources (e.g., personnel, technical assistance) among respective partners. Other governmental agencies, non-governmental organizations, Native Hawaiian Organizations, other organizations, industries, and citizen groups have expressed interest in providing additional resources, such as labor and funds, to support a new reserve. To date, these groups have supported the designation process through their participation in the nomination and site selection efforts. NOAA intends to continue to engage these groups throughout the designation and the future operation of a reserve.

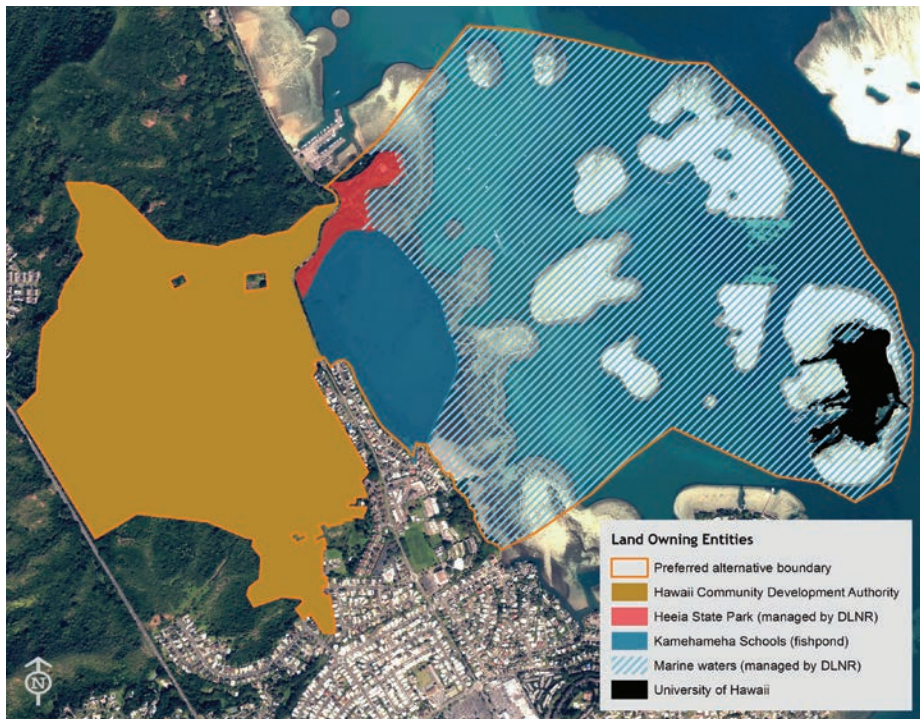


Figure 3.2. Land owning entities within the proposed preferred alternative for the He'eia National Estuarine Research Reserve

Table 3.1 He'eia National Estuarine Research Reserve preferred alternative He'eia National Estuarine Research Reserve site acreage (from Hawai'i Office of Planning 2016).

LAND OWNING ENTITIES	AREA (ACRES)
Hawai'i Community Development Authority	419
University of Hawai'i	28
Marine Water Areas*	822
He'eia State Park*	19
Kamehameha Schools	97
Total Area (acres)	1,385

* State of Hawai'i owned, managed by the Hawai'i Department of Land and Natural Resources

The proposed He'eia NERR components are a combination of state, private, and university owned properties that would allow for shared resources (e.g., personnel, technical assistance) among respective partners. Other governmental agencies, non-governmental organizations, Native Hawaiian Organizations, other organizations, industries, and citizen groups have expressed interest in providing additional resources, such as labor and funds, to support a new reserve. To date, these groups have supported the designation process through their participation in the nomination and site selection efforts. NOAA intends to continue to engage these groups throughout the designation and the future operation of a reserve.

3.3 SCOPING

This Final Environmental Impact Statement (FEIS) has been developed to provide information to decision-makers and the interested public on the potential impacts associated with designation of the He'eia NERR under federal authorities. The FMP in Appendix A describes an organizational framework for the proposed He'eia NERR and articulates approaches that are intended to protect the ecological integrity of the proposed He'eia Research Reserve while improving its value for research, monitoring, education, and stewardship purposes. The FMP will provide guidance on the development of the He'eia Research Reserve, and will remain in effect until the FMP is revised and updated pursuant to the five-year plan cycle.

In an effort to better understand what the concerns of interested parties might be with respect to the designation of the proposed He'eia NERR, considerable effort was made to include broad and diverse public and private participation through the National Environmental Policy Act (NEPA) scoping process. Groups and individuals had the opportunity to provide input and support in the process from the beginning. This approach was designed to develop among the participatory groups a sense of "ownership" in the process and the future of the proposed He'eia NERR.

Federal regulations (15 C.F.R. § 921.13(c)) require at least one public scoping meeting. Two scoping meetings were held to meet the requirements of this regulation: one in the vicinity of the proposed reserve site in He'eia; and one in Honolulu, the state capital. The first scoping meeting was held on December 17, 2014, at 5 p.m. at the King Intermediate School in Kāne'ohe. The second scoping meeting was held on December 19, 2014, at 5 p.m. at the NOAA Fisheries Honolulu Service Center in Honolulu. The public was provided notice of the meetings in the Federal Register and through an advertisement in a local newspaper. The Federal Register notice was posted on November 24, 2014 (79 Fed. Reg. 69838), 23 days in advance of the first scoping meeting. A newspaper advertisement was posted in the largest paper in the state, the Honolulu Star-Advertiser, on November 26, 2014, 21 days in advance of the first scoping meeting. The Honolulu Star-Advertiser serves the Honolulu-area as well as the entire State of Hawai'i.

The scoping meetings were attended by a diverse set of stakeholders including interested citizens and representatives of local, state, federal, and non-governmental organizations. In total, more than 20 individuals from the public attended the two scoping meetings.

The participating public heard presentations about the reserve system from NOAA and about the proposed He'eia NERR by Ku'iwalu Consulting, on behalf of the Hawai'i Office of Planning. Overall, participant comments were supportive of the proposed nomination; however, the scoping meeting raised several issues presented in the DEIS and DMP. These are addressed in in Table 3.2 of this FEIS/FMP.

Consistently mentioned throughout scoping was the interest in incorporating traditional Hawaiian knowledge and ahupua'a management into the development of a Research Reserve in Hawai'i.

It was also noted that the proposed He'eia NERR boundary discussed during the scoping meetings differed from an earlier tentative boundary presented at a public meeting hosted by Hawai'i OP. The prospective boundary as presented by the State in a September 2013 meeting included several reefs

which were not included in the state site nomination package. Inclusion of these reefs within the proposed He'eia NERR is evaluated as part of alternative B within this environmental analysis (see Chapter 4).

In addition, members of the public also suggested that additional uplands, including He'eia Stream tributaries, be considered for inclusion within the proposed reserve due to their cultural and natural resources and potential research value, as well as that additional public access points (including He'eia Kea Small Boat Harbor) be included. Section 4.2 presents several boundary alternatives based, in part, on input from the public scoping process. Section 4.4 of this document further discusses proposed boundary considerations that were proposed, but not further developed and the reason(s) why they were not fully developed into alternatives.

Section 106 of the National Historic Preservation Act (NHPA) requires that federal agencies identify historic properties that may be impacted by federal undertakings, and to seek to protect those properties that are listed, or eligible for listing, on the National Register of Historic Places. NHPA regulations at 36 CFR Part 800 identify a process to determine site eligibility, to evaluate potential impacts, and to identify impact avoidance or mitigation actions. Pursuant to NHPA, NOAA's Office for Coastal Management (OCM) reached out to Native Hawaiian Organizations⁴ in correspondences dated June 18, 2015 to gain assistance with identifying properties within the area of potential effect that may be eligible for the National Register listing and to provide information related to religious and cultural significance that these organizations attach to the areas that would be affected by the proposed action. NOAA's OCM also requested assistance identifying additional organizations to involve in the process. Two responses were received which identified a total of eight historic sites, all of which were already identified by NOAA for consideration within the impact analysis. These responses also identified nine organizations to engage, all of which have participated in some portion of the process to date (Appendix G).

Finally, multiple comments regarding concerns about new fishing and resource usage regulations were received. These concerns have been addressed within the reserve management plan.

⁴ Notifications were distributed to all organizations on the Native Hawaiian Organization Notification List, maintained by the U.S. Department of Interior, Office of Native Hawaiian Relations and accessible via <https://www.doi.gov/hawaiian/NHOL>.

Table 3.2 Issues raised during scoping

ISSUE MENTIONED BY THE PUBLIC IN SCOPING PROCESS	WHERE DISCUSSED: ENVIRONMENTAL IMPACT STATEMENT (EIS) OR MANAGEMENT PLAN
Public Access	EIS and Management Plan
Native Hawaiian traditional cultural heritage	EIS and Management Plan
Recreation/public use	EIS and Management Plan
Future land acquisition and boundary expansions	Management Plan
Public participation	EIS and Management Plan
Stewardship/Ecological restoration activities	EIS and Management Plan
Educational opportunities	EIS and Management Plan
Engagement with state agencies	Management Plan
Research opportunities throughout watershed	Management Plan
Community group coordination	Management Plan

⁵Hawaiian counties participating in site consideration: Hawai'i County, City and County of Honolulu, Kaua'i County, and Maui County. Given the unique governing structure of Kalawao County, this county was not included in this listing of Hawai'i counties.

3.4 ALTERNATIVE ESTUARIES CONSIDERED DURING SITE SELECTION

The preferred alternative of the proposed He'eia Research Reserve resulted from a review of two proposals: He'eia estuary, O'ahu, and Hilo Bay, Hawai'i Island. Additionally, exploratory review of sites in each of Hawai'i's four counties were considered⁵ (Table 3.3).

Table 3.3 Inquiries and proposals resulting from request for solicitation

POSSIBLE PROPONENT	CONCEPTUAL SITE	PROPOSAL SUBMITTED
Kona Community Cultural and Educational Foundation	Keauhou Bay, Hawai'i	No
Mālama Maunalua	Maunalua Bay, O'ahu	No
Wailuku Community Management Makai Area	Wailuku, Maui	No
Hanalei Watershed Hui	Hanalei Bay, Kaua'i	No
University of Hawai'i Hilo	Hilo Bay, Hawai'i	Yes
Kaua'i Westside Watershed Council	Hanapēpē estuary, Kaua'i	No
Hawai'i Pacific University	Hawai'i Watershed, O'ahu	No
Hawai'i Wetland Joint Venture	No specific site	No
Hawai'i Institute for Marine Biology/ Kāko'o 'Ōiwi	He'eia estuary, O'ahu	Yes

Two proposals were submitted during a public solicitation between April and June of 2013. The Site Evaluation Committee recommended both proposals for further consideration by the Site Selection Committee. The He'eia estuary was chosen by the Site Selection Committee and further developed into a site nomination. Hilo Bay was eliminated from further consideration after selection of He'eia estuary (see PBR 2014 for information on-site selection criteria and committee notes).

3.5 DOCUMENTS THAT INFLUENCE THE SCOPE OF THE FEIS

The scope of this FEIS is supported by a wide range of key documents. Some of these documents are either pre-existing or were created specifically in support of the proposed He'eia Research Reserve designation as part of the preliminary impact analysis. The most important ones include the Hawai'i NERR Site Nomination; Kāne'ohe Bay Master Plan; Kāne'ohe Bay, He'eia Estuary NERR Site Proposal; Natural, Cultural, and Socioeconomic Impact Analysis for the Proposed He'eia NERR; Gap Analysis for the Proposed He'eia NERR EIS; and the proposed He'eia NERR FMP 2016-2021.

3.6 PERMITS, LICENSES, AND ENTITLEMENTS ASSOCIATED WITH THE ACTION

The proposed He'eia Research Reserve is located within various land use districts, including the State Land Use Conservation District, the He'eia Community Development District, and the City and County of Honolulu's special management area (SMA). Any future reserve facilities development, installation of long-term monitoring or research equipment, or the disturbance of important natural or cultural resources on either Moku o Lo'e, upland areas, and the He'eia Fishpond, would require a Conservation District Use Permit (CDUP) from Hawai'i Department of Land and Natural Resources (DLNR), a Use or Development Permit from the Hawai'i Community Development Authority (HCDA), and/or an SMA permit from the City and County of Honolulu's Department of Planning and Permitting. For the marine waters of the proposed He'eia Research Reserve (marine waters seaward of the certified shoreline), the installation of long-term monitoring or research equipment would require a CDUP from DLNR. In addition, Hawai'i Institute of Marine Biology (HIMB) has a special activities permit from DLNR for the collection of marine organisms within the 64-acre Hawai'i Marine Laboratory Refuge surrounding Moku o Lo'e. The collection of marine organisms for research purposes in the rest of the proposed He'eia Research Reserve's marine waters would require a special activities permit issued by DLNR.

Other permits for activities associated with the study of fish, wildlife (including birds), threatened or endangered species, or marine mammals could require consultations with or permits issued by NOAA's National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending on the type of activity proposed and the species potentially affected. All required permits will be obtained and/or consultations carried out in accordance with all applicable requirements. See Section 5.3 for more information.

As needed, impacts to cultural and historic resources from reserve activities will be considered. Consultations about future activities will be carried out, if needed, with appropriate entities, including DLNR's State Historic Preservation Division.

An agreement, finalized prior to designation, that describe the roles and responsibilities between the University of Hawai'i and landholders or their lessees including HIMB, DLNR, Hawai'i Community Development Authority (Kāko'o 'Ōiwi), Kama'aina Kids, and Kamehameha Schools (Paepae o He'eia) will be available with publication of the Final Environmental Impact Statement (Appendix C).

CHAPTER 4: ALTERNATIVES INCLUDING THE PROPOSED ACTION

4.1. DESCRIPTION OF ALTERNATIVES

The federal action proposed by the National Oceanic and Atmospheric Administration (NOAA) is the establishment of a National Estuarine Research Reserve (NERR) in the He'eia estuary of O'ahu, based on the proposal for designation from the State of Hawai'i. This proposed action includes formal designation by the NOAA Administrator and joint declaration by the NOAA Administrator and the Governor of Hawai'i. This would result in eligibility, as funding allows, for the awarding of annual financial assistance from NOAA for up to 70 percent of operation and program costs, and additional potential funding for acquisition and construction of facilities through a competitive award process. The alternatives described below and summarized in Table 4.1 include the preferred alternative (i.e., to designate the proposed He'eia National Estuarine Research Reserve (He'eia Research Reserve, reserve, or He'eia NERR) and support management plan implementation), a review of possible alternative boundary configurations (i.e., larger or smaller boundaries than currently proposed), and the no action alternative (i.e., not designating the proposed reserve). Each alternative has programmatic impacts and impacts on the environment (with physical, biologic, and socioeconomic effects) that inform the analysis of the different reserve configurations reviewed and described in Chapter 6.3.

Under scenarios other than the no action alternative, the University of Hawai'i Institute of Marine Biology (HIMB) would be the lead management agency for the proposed reserve. The university would employ the He'eia NERR Manager and staff to assist in implementing the day- to-day activities of the reserve. Reserve staff will initially include education and research coordinators who implement reserve programs and receive advice from various advisory groups. The proposed He'eia National Estuarine Research Reserve Final Management Plan (FMP) indicates that as the reserve builds capacity, it is anticipated that stewardship/cultural resource and training coordinators would be added to support evolving programs. Reserve partners, including the land owners and key collaborators would engage with reserve staff to address the goals and objectives identified in the FMP and through a reserve advisory board or other mechanisms identified in a multi-party agreement in Appendix A.

Within the FMP, two key management strategies have been identified that will guide the future direction of the reserve. The first management strategy of ecological restoration is typical of contemporary conservation projects where the primary goal is to restore a damaged or degraded ecosystem to its historical trajectory by using pre-human conditions as the starting point for restoration design (Society for Ecological Restoration 2004). This is a generally accepted approach that is advocated by most federal and state agencies, and is on a continuum of ecosystem-based management approaches with an emphasis on ecosystem recovery (Society for Ecological Restoration 2004).

The second management strategy based on the ahupua'a system is an ecosystem-based management approach successfully employed by Native Hawaiian cultural practitioners in He'eia for at least 600 years prior to Western contact. Its essential premise is to care for the land and water so that it can in turn care for human sustenance (Jokiel 1991, Bahr et al. 2015).

The proposed He'eia Research Reserve seeks to understand how different ecosystem-based management strategies influence a broad array of services that contribute to a healthy and sustainable estuarine ecosystem

in the face of ongoing anthropogenic impacts and human use demands. The reserve plans to examine the ecosystem services provided by two management strategies: (1) an approach based on contemporary ecological restoration techniques and (2) an approach that embraces traditional Hawaiian management practices (see Section 4 of FMP for more detail on the management strategies and ecosystem services). This approach will not only direct management strategies of the reserve's natural resources, but will also influence the reserve's programmatic areas of research and monitoring; education, training, and interpretation; and public outreach and engagement.

The mission of the proposed He'eia Research Reserve is:

Kuleana (privilege and responsibility): To practice and promote responsible stewardship and outreach consistent through the principles and values of the ahupua'a land management system. Our efforts will be supported by traditional knowledge, innovative research, education, and training that nourishes healthy and resilient ecosystems, economies, and communities.

To meet this end, the FMP (Appendix A) for the proposed He'eia Research Reserve identifies the goals and objectives to support both the goals of the National Estuarine Research Reserve System (NERRS), 15 C.F.R. § 921.1(b), and advance our understanding of Hawaiian Island estuaries and their stewardship. The proposed goals of the He'eia Research Reserve are:

- **Research and Monitoring:** Promote directed and applied scientific investigations, including research and monitoring and traditional knowledge, through the He'eia Research Reserve to increase our understanding of the effects of human activities and natural events to improve informed decision-making affecting the He'eia estuary, coastal ecosystems, and ultimately the entire ahupua'a of He'eia.
- **Education, Training, and Interpretation:** Develop a place-based education and training program for the He'eia Research Reserve that inspires and educates the community about estuaries, coastal ecosystems, and traditional Hawaiian practices, such as lo'i (taro patches) and loko i'a (fishponds), that mālama (nurture) these systems sustainably.
- **Public Outreach and Resource Management:** The He'eia Research Reserve will engage various communities to create opportunities for collaboration to practice and promote stewardship that sustains cultural, biological, and natural resources.

4.2 BOUNDARY ALTERNATIVES

Once the He'eia estuary was nominated by the Governor of Hawai'i, several alternative reserve configurations were identified for analysis and consideration. Each of the potential boundary alternatives analyzed encompass a smaller geographic area than contained within the preferred alternative with the exception of alternative A as shown in Table 5. However, this section briefly describes the distinct differences between each of the three potential boundary alternatives and the preferred alternative.

As required under the Council on Environmental Quality Regulations for implementing the National Environmental Policy Act (NEPA), a "no action" alternative is also considered in this analysis. The "no action" alternative is simply what would happen if the agency did not act upon the proposal for agency action. Table 4.1 summarizes the alternatives considered. Each of the potential boundary alternatives analyzed encompass a smaller geographic area than contained within the preferred alternative with

the exception of alternative A as shown in Table 5. However, this section briefly describes the distinct differences between each of the three potential boundary alternatives and the preferred alternative.

As required under the Council on Environmental Quality Regulations for implementing the National Environmental Policy Act (NEPA), a “no action” alternative is also considered in this analysis. The “no action” alternative is simply what would happen if the agency did not act upon the proposal for agency action. Table 4.1 summarizes the alternatives considered.

Table 4.1 Summary of alternatives

ALTERNATIVES	ALTERNATIVE SIZE (ACRES)
Preferred Alternative (Nominated site with the addition of the entire HCDA parcel boundary; marine reefs 7, 8, 9, and 10; and implementation of a management plan)	1,385
Boundary Alternative A (Nominated site with land additions including the entire HCDA parcel, City and County of Honolulu parcel, and the town pier; and implementation of a management plan)	1,759
Boundary Alternative B (Nominated site with the addition of the marine water areas centered around reefs 7, 8, 9, and 10; and implementation of a management plan)	1,685
Boundary Alternative C (Nominated Site Boundary and the implementation of a management plan)	1,070
No Action Alternative (Proposed He’eia site is not designated as a National Estuarine Research Reserve)	0

4.2.1 PROPOSED ACTION (PREFERRED ALTERNATIVE)

The preferred alternative identified for the He’eia Research Reserve site consists of designating the nominated site boundary with the addition of the remaining portion of the Hawai’i Community Development Authority (HCDA) parcel and additional marine waters comprising of reefs 7, 8, 9, and 10 and their surrounding waters owned by the State and managed by the State of Hawai’i Department of Land and Natural Resources (Figure 4.1). This alternative also includes implementing on FMP.



Figure 4.1. Boundary map of the preferred alternative for the He'eia National Estuarine Research Reserve

The site provides many of the beneficial attributes including:

- Willing local and state partners committed to working together to form a He'eia National Estuarine Research Reserve;
- An area representative of the diverse challenges facing coastal areas across the Hawaiian Islands ranging from invasive species;
- New opportunities to conduct research, monitoring, education, cultural and restoration activities in an estuarine setting; and
- A venue for incorporating traditional Hawaiian cultural ecological practices into reserve activities.

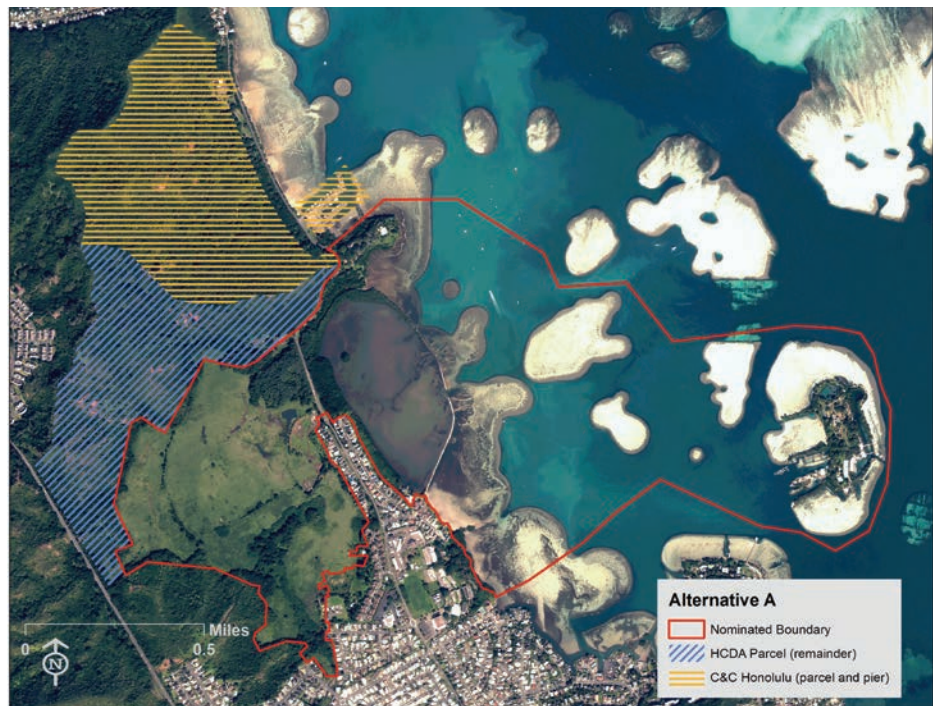
NOAA requires applicants to go through a rigorous site selection and evaluation process to evaluate the best site to meet the requirements of the Coastal Zone Management Act (CZMA) and implementing regulations (Appendix A of FMP). The site selection process the State of Hawai'i Office of Planning undertook is summarized in Chapter 2 and can be found in their site nomination (May 2014). The proposed site and implementing an FMP are described at length in Appendix A and are summarized in the following section.

4.2.2 ALTERNATIVE A — NOMINATED SITE WITH LAND ADDITIONS INCLUDING ENTIRE HCDA PARCEL, C&CH PARCEL AND THE SMALL BOAT HARBOR AND PIER

In this alternative, the total land area of the He'eia Research Reserve would be expanded to include additional land parcels on the north side of the final configuration (Figure 4.2) of the nominated site boundary. The additional parcels included are the City and County of Honolulu (C&CH) parcel and the He'eia Kea Small Boat Harbor and pier that are owned and operated by the State of Hawai'i Department of Land and Natural Resources (DLNR) Division of Boating and Ocean Recreation (DOBOR).

The C&CH parcel is an approximately 210 acre undeveloped area contiguous to the northern boundary of the proposed reserve (i.e., the HCDA parcel and He'eia State Park). The land is zoned primarily as preservation and has been investigated by the C&CH as the location of a future He'eia Kea Valley Nature Park. In 2012, a conceptual master plan was developed for the site that includes botanical gardens and open space for passive recreation (e.g., hiking). The parcel is relatively flat. Despite current plans, it is potentially developable as indicated by the zoning of a portion of the parcel for residential units (e.g., R-10). As public land, the R-10 portion of the parcel could be rezoned in the future to provide additional opportunities to support future reserve facility needs, especially considering the limited availability of land at He'eia State Park. The C&CH parcel is within the He'eia ahupua'a, but does not physically drain into the He'eia Stream.

Figure 4.2. Map of Alternative A (nominated site with land additions including entire HCDA parcel, C&CH parcel and the He'eia Kea Small Boat Harbor and pier)



Including the C&CH parcel in the final boundary configuration would not be expected to affect the current status of the site or impact future programmatic activities within the preferred boundary. Despite not being critical to the designation of the proposed He'eia Research Reserve, this area, if developed as a nature park, could provide expanded opportunities for cultural and educational programming at the reserve. Ecologically, the parcel is dominated by 'alien' or non-native forest and grassland habitats according to the land cover map of the He'eia Research Reserve Watershed (Hawai'i Office of Planning 2016). The parcel could provide additional areas to implement upland forest restoration in support of relevant ecosystem services. As a result, inclusion of the parcel could need additional investment of reserve resources to restore the area to more natural habitat dominated by native species. These restoration efforts may result in dilution of the funds available for other programmatic activities in the future reserve.

The smaller parcel includes the He'eia Kea Small Boat Harbor, owned and operated by the Hawai'i DLNR DOBOR. This parcel includes a 1 acre pier and 13 acres of water and is directly adjacent to He'eia State Park at the park's northern border. This parcel could provide additional water access within the

Reserve to the proposed marine areas in support of reserve-related research, education and stewardship activities. However, it has multiple current commercial entities using the facilities and requires periodic maintenance dredging to keep boat access open for commercial fishing and ecotourism vessels. Were this parcel to be included within the reserve boundaries, these current uses would need to be reevaluated for consistency with the applicable NERRS regulations.

Alternative A would also create partnerships, represent diverse challenges, and provide new opportunities for research, monitoring, education/outreach, restoration, and cultural practices similar to those outlined under the preferred alternative.

4.2.3 ALTERNATIVE B — NOMINATED SITE WITH INCLUSION OF ADDITIONAL WATER COMPONENTS CENTERED AROUND REEFS 7, 8, 9, AND 10

Focusing on expansion of marine water area beyond the nominated site boundary, this alternative would add 292 acres to the proposed He'eia NERR's marine waters including patch reefs and sand flats known as reefs 7 through 10 (Figure 4.3). The patch reefs within this expanded area are subject to several different management regimes and are regulated under different DLNR divisions. DLNR's DOBOR manages an area around reefs 7 and 8 for recreational purposes as an Ocean Recreational Management Area, reserved for motorized activities (e.g., personal watercraft, water skiing). Just south of reef 10, DOBOR has designated 32 acre rectangular area as a boat mooring area. Throughout this area, especially around reef 8, recreational activities like kayaking, fishing, snorkeling, and boating occur frequently.

Additional users include commercial fisherman catching species like Papio (*Travally Caranx spp.*), Hawaiian bonefish (*Albula spp.*) and mullet (*Mugil cephalus*) and ecotourism operators using the reefs and sand flats.



Figure 4.3. Map of Alternative B (nominated site with inclusion of additional water components centered around reefs 7, 8, 9, and 10)

Reefs 9 and 10 are currently being considered for inclusion within a proposed coral reef mitigation bank. In Kāneʻohe Bay, the proposed mitigation bank would restore a number of patch reefs by controlling invasive algae (*Eucheuma spp.* and *Kappaphycus spp.*) populations. One reef is being considered to serve as a control reef and one a restoration reef.

The additional water area considered under alternative B has sufficient State control to warrant inclusion within an expanded boundary. This water area was previously identified and included by HIMB and local community partners in their original site proposal to the State. However, the State’s nomination to NOAA failed to include these additional water areas centered on patch reefs 7, 8, 9 and 10.

Alternative B would also create partnerships, represent diverse challenges, and provide new opportunities for research, monitoring, education/outreach, restoration, and cultural practices similar to those outlined under the preferred alternative.

4.2.4 ALTERNATIVE C – NOMINATED SITE BOUNDARY

This alternative is comprised exclusively of the nominated site. The site configuration includes Heʻeia State Park (18.5 acres) on its northern coast; the Heʻeia Fishpond, one of the largest fishponds in the Hawaiian Archipelago (88 acres) at its estuarine border; and an upland area wetland and agricultural restoration project (405 acres) on HCDA land. The proposal also includes the HIMB (28 acres) on Moku o Loʻe (Coconut Island) and 530 acres of marine water area including patch and fringing reefs (not reefs 7, 8 9 or 10). The entire site is located in Kāneʻohe Bay, on the northeastern or windward shore of the island of Oʻahu. Kāneʻohe Bay is the largest sheltered body of water in the Hawaiian Island chain. This alternative’s total acreage is 1,070 acres (Figure 4.4) and is protected by the only barrier reef in U.S. waters (PBR 2014).

Alternative C would also create partnerships, represent diverse challenges, and provide new opportunities for research, monitoring, education/outreach, restoration, and cultural practices similar to those outlined under the preferred alternative.

Figure 4.4. Map of Alternative C (nominated site)



4.2.5 NO ACTION ALTERNATIVE

Nationally, there are several types of estuarine areas not represented in the National Estuarine Research Reserve System (NERRS). The greatest gaps in the system as of 2015 are within the Great Lakes, northern Alaska and the Pacific Islands. Potential future NERR sites can be found in the numerous biogeographic subregions of these broad areas. While NOAA provides funding to applicants to undertake a site evaluation process, there are no guarantees that a site will be selected, thus the no action alternative is considered a viable alternative. Under this option no portion of the He'eia estuary on the island of O'ahu would be designated as part of the NERRS. There would be no change in current management of the areas associated with the proposed reserve. Publicly and privately owned lands and waters would maintain their current status.

The marine waters, including the patch and fringing coral reefs and sand flats (i.e., reefs 2–10), would continue to be managed by the State of Hawai'i through DLNR. The He'eia Fishpond would continue to be managed under a lease from Kamehameha Schools. Moku o Lo'e (Coconut Island) would continue as a marine laboratory under HIMB and the University of Hawai'i property with the island's fringing reef would remain part of the Hawai'i Marine Laboratory Refuge. On land, He'eia State Park would continue to be operated by Kama'aina Kids under a lease from DLNR, and the HCDA parcel would continue to be managed by Kāko'o 'Ōiwi as the lessee.

4.3 DETAILED DESCRIPTION OF THE PREFERRED ALTERNATIVE BOUNDARY

The He'eia estuary is located in the southern portion of Kāne'ohe Bay, the largest sheltered body of water in the Hawaiian Island chain, on the windward shore of the island of O'ahu. The site includes the He'eia Stream, uplands, traditional agricultural and cultural heritage lands, wetlands, a large fishpond and marine waters that include reefs, sand flats, and Moku o Lo'e (Coconut Island). The site totals 1,385 acres of land and water areas. The major components of the site are:

- **Upland Areas (447 acres):** The portion of the preferred alternative that is referred to as the “upland” areas are primarily comprised of a mix of public and private lands mostly west of the Kamehameha Highway (H830) including HCDA lands, He'eia State Park and a portion of a property owned by Kamehameha Schools through the Bishop Trust.
- **Hawai'i Community Development Authority (419 Acres):** This area encompasses the entire HCDA parcel, a mix of wetlands and forested land that includes demonstration lo'i (taro) fields in the southwestern part of the wetland complex. This parcel is managed by Kāko'o 'Ōiwi, a local non-profit. Also, two privately owned Hawaiian homestead lots (e.g., kuleana parcels) and a future health center location are found within this area, but are specifically excluded from the proposed Reserve boundaries. These exclusions are identified in Figure 4.5. In the State nomination, only a portion of the HCDA parcel was included. Through the public scoping process and in consultation with DLNR, the decision to include the entire parcel, less the homestead lots, as a preferred alternative was made. These additional lands provide a buffer for core estuarine and marine habitats (see FMP Section 1 for additional discussion of reserve core and buffer areas). NERRS regulations define

the core area as “key land and water areas” so vital to the functioning of the estuarine ecosystem that it must be under a level of control sufficient to ensure the long-term viability of the Reserve for research on natural processes. And core areas must also be ecological units of a natural estuarine system which preserve, for research purposes, a full range of significant physical, chemical and biological factors contributing to the diversity of fauna, flora and natural processes occurring within the estuary. While buffer areas are considered areas adjacent to or surrounding key land and water areas and essential to their integrity. These buffer zones protect the core area and provide additional protection for estuarine-dependent species, including those that are rare or endangered (NERRS Regulations 15 C.F.R. § 921.11(c) (3)).

- **He’eia State Park (19 acres):** Also located in the upland portion of the preferred alternative is a State Park which protects some key historic and cultural sites. It borders the HCDA parcel to the west, the He’eia Fishpond and stream to the south and the marine areas of the reserve to the east. Just north of the State Park, and not included within the preferred alternative boundary, is the He’eia Kea Small Boat Harbor and fishing pier.
- **He’eia Fishpond Uplands (9 acres):** The Upland of the He’eia Fishpond is 9 acres of terrestrial habitat that buffer the fishpond from the adjacent residential neighborhood.
- **Marine Areas (822 acres):** Making up the largest component of the preferred alternative boundary, the marine area is managed by the DLNR and comprised primarily of patch and fringing coral reefs and sand flats. This area is bordered on the west by the He’eia Fishpond and fully surrounds Moku o Lo’e (Coconut Island). The marine area is part of Kāne’ohe Bay and is protected by an outer barrier reef that strongly influences habitat diversity. Some of the most pristine coral reef habitat

Figure 4.5. Kuleana parcels and health center within the preferred alternative boundary



within the proposed Reserve are found in the waters around Moku o Lo'e and comprise the 64 acres of the Hawai'i Marine Laboratory Refuge.

- **He'eia Fishpond (88 acres):** This culturally and historically significant fishpond is privately owned and leased to Paepae o He'eia, a local non-profit, by Kamehameha Schools through the Bishop Trust. It is one of the largest remaining intact fishponds in the Hawaiian Islands.
- **Moku o Lo'e (Coconut Island) (28 acres):** The island is owned by the University of Hawai'i Foundation and operated by the University of Hawai'i as a research lab under the HIMB (PBR 2014). The Hawai'i Marine Laboratory Refuge surrounds the island and is the most protected habitat within the reserve with no fishing or taking of marine resources allowed. The refuge is entirely within the reserve boundary core area due to its higher level of protection.

Within the preferred alternative, the FMP (see Section 1.2.4 He'eia NERR Boundary Description) delineated the proposed core and buffer areas of the site (Figure 4.6). Federal regulations (15 CFR 921.11) state that reserve boundaries generally encompass two areas: core and buffer areas. The regulations define key or "core" land and water areas as containing ecological units of a natural estuarine system which preserves, for research purposes, a full range of significant physical, chemical, and biological factors contributing to the diversity of fauna, flora, and natural processes occurring within the estuary.

The He'eia NERR core areas were selected based on the following criteria:

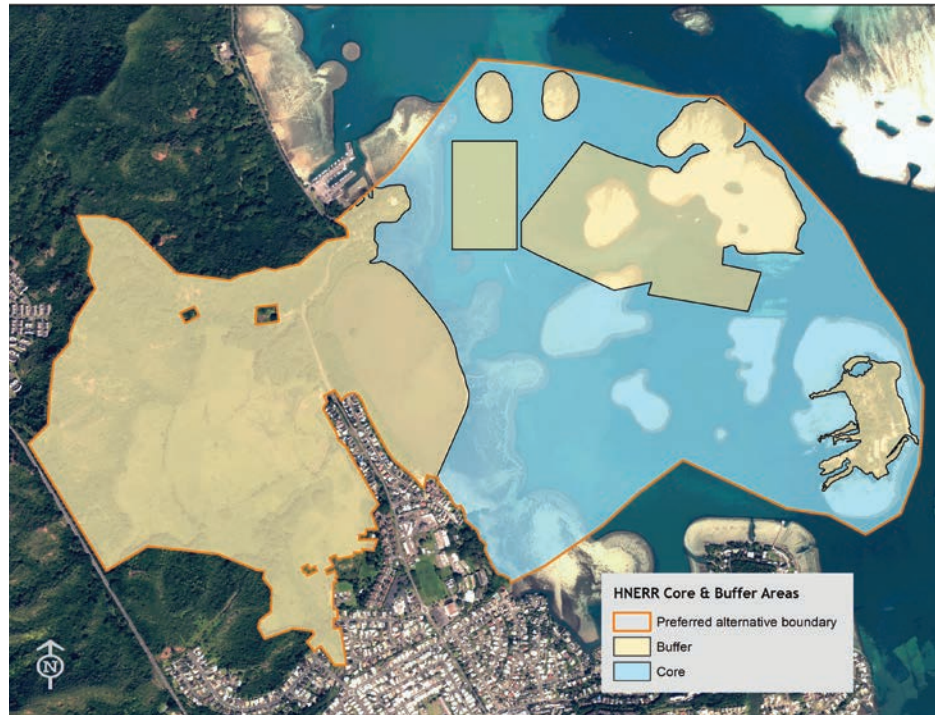
- 1) They are vital to the function of the He'eia estuary.
- 2) The State can maintain a sufficient level of control over the areas to ensure the long-term viability of the He'eia estuary for research and natural processes.
- 3) The areas encompass resources representative of the He'eia estuary system.
- 4) The preservation of the core areas will contribute to the preservation of a full range of significant physical, chemical, and biological factors essential to the diversity of fauna, flora, and natural processes occurring within the He'eia estuary, as informed by:
 - the Recovery Plan for Hawaiian Waterbirds (U.S. Fish and Wildlife Service 2011),
 - the Kāne'ohe Bay Master Plan (OP 1992), and
 - the Atlas of Hawaiian Watersheds and Their Aquatic Resources, Bishop Museum and Division of Aquatic Resources (Parham et al. 2008).

The federal regulations (15 CFR 921.11) define a buffer area as an "area adjacent to or surrounding key lands and water areas and essential to their integrity. Buffer zones protect the core area and provide additional protection for estuarine-dependent species." The buffer area may include areas for research and education facilities (see Sections 1.2.4.3 and 1.2.4.4 for descriptions of the core area and buffer area in the He'eia NERR, respectively).

The He'eia NERR buffer areas were selected based on the following criteria:

- 1) The areas are able to protect the core area and provide additional protection for species that rely on the core area.
- 2) The areas are located adjacent to or surrounding, or are essential to the integrity of, the core area.
- 3) The buffer areas provide an opportunity to accommodate future shifts in the core area as a result of successful restoration or climate impacts.
- 4) Managers can maintain a level of control over the areas sufficient to support the long-term viability of the He'eia NERR for the recovery of natural processes, as well as for research and education

Figure 4.6. Preferred alternative reserve core and buffer



Core areas are exclusively found in the marine portion of the proposed site, encompassing about 624 acres of aquatic habitats including the reef immediately surrounding Moku o Lo'e and additional portions of the coral reefs and waters in Kāne'ohe Bay. The 475 acres of land in the He'eia NERR buffer area consist of HCDA's He'eia lands, the He'eia Fishpond, He'eia State Park, and Moku o Lo'e. The 286 acres of aquatic areas in the He'eia NERR's buffer consist of the He'eia Fishpond; patch reefs 7, 8, 9, and 10; about 111 acres of water immediately surrounding patch reef 7; and about 32 acres of water to the south of patch reef 10.

4.4 OTHER ALTERNATIVES PREVIOUSLY CONSIDERED, BUT ELIMINATED

4.4.1 AREAS WITHIN HE'EIA ESTUARY

In addition to supporting the overall mission and goals of the NERRS program, the proposed He'eia Research Reserve will support the practice and promotion of responsible stewardship consistent with the principles and values of the traditional ahupua'a land management system supported by innovative research, traditional knowledge, education, and training that supports a healthy and vibrant ecosystem that, in turn, nourishes the community. As such, many factors were considered when developing the proposed He'eia Research Reserve boundary. A consistent message received during the public scoping process was to include additional portions of the ahupua'a, which were not included in the State's nomination package. Including the entirety of the ahupua'a within the reserve boundary, however, would not be feasible due, in part, to the types of ownership (e.g., private property) and types of existing uses (e.g. commercial, residential) that would prevent the State from meeting the requirements of the NERRS regulations related to having adequate state control over key land and water areas sufficient to provide long-term protection for reserve resources to ensure a stable environment for research (NERRS Regulations 15 C.F.R. § 921.30(a) (2)). In addition, NOAA believes that the preferred alternative is adequate to accomplish the identified purpose of and need for the proposed action without inclusion of the entire ahupua'a. Accordingly, expansion of the proposed reserve boundary to fully encompass the ahupua'a was considered, but not fully developed.

As discussed above, several areas that expanded the original nomination boundary to include additional portions of the ahupua'a were developed and are analyzed herein (see Chapter 3.4 and Table 5).

4.4.2 HE'EIA UPLANDS CONTROLLED BY DEPARTMENT OF HAWAIIAN HOME LANDS

An option to create a reserve that included the 138 acres of the ahupua'a upland forests controlled by the Department of Hawaiian Home Lands (DHHL) was also considered for inclusion in a proposed He'eia Research Reserve (Figure 4.7). This 138-acre parcel, however, is not contiguous with the nominated site, with private property existing between land within the boundary of the preferred alternative and this upland area. The addition of this parcel would provide additional cultural resources for a proposed reserve and protect watershed areas that could influence water quality. There are several burial sites and other historically significant cultural resources within these land holdings. The remnants of a military radio navigation station are found in this parcel. Much of the upland forest is dominated by non-native vegetation. Also, this parcel would provide visitors with an opportunity to view the entire watershed and gain a perspective on the physical ahupua'a, from mauka to makai (from the mountains to the sea). Finally, there are some existing structures that could be repurposed for reserve activities to support the goals and objectives of the FMP.

Figure 4.7. Potential Areas for Future Reserve Expansion



Several potential management issues have been identified, however, which make this parcel unsuitable for inclusion within the proposed reserve at this time. There is no current management plan in place for the area and there are issues of trespassing on the property and vandalism at the former radio navigation station, which suggest a lack of adequate control over human activities occurring within the area (see NERRS Regulations 921.20). Finally, given the current structural deterioration of the former radio navigation station, there would be safety concerns for reserve staff and the public visiting this site. For these reasons, the inclusion of these He'eia uplands is not further considered as part of an alternative for this environmental analysis. The DMP, however, does include discussion on this area for a possible future boundary expansion (Section 9 — Land Acquisition Plan).

4.4.3 TRIBUTARIES OF HE'EIA STREAM

There are at least three tributaries to He'eia Stream, including Ha'ikū Stream, Ioleka'a Stream, and the main stem of He'eia Stream, that were considered for inclusion in the proposed He'eia NERR (Figure 4.8). Consideration of this option was based, in part, on the public's expressed desire to include monitoring sites along these streams and tributaries in order to conduct research on water quality within the watershed. While DLNR has jurisdiction over these waters, the tributaries flow through properties owned by various state entities (DHHL and Office of Hawaiian Affairs), the City and County of Honolulu, and private citizens. This mixed ownership would add additional complexity to management of a reserve that included these tributaries. Due to the added complexity, combined with the fact that inclusion of these tributaries is not necessary to meet the purpose of and need for the proposed action, the inclusion of these He'eia Stream tributaries will not be further considered in this environmental analysis.

⁶Although, the majority of research activities of any single research project funded under this subpart may be conducted within Reserve boundaries. See 15 C.F.R. § 921.50(a).

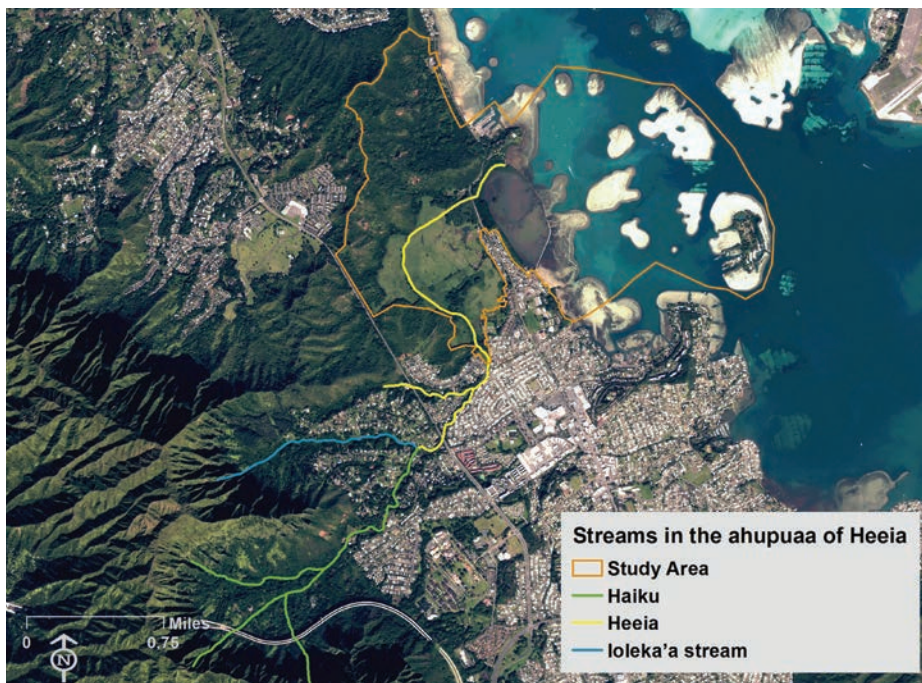


Figure 4.8. Streams in the Ahupua'a of He'eia

With respect to the anticipated benefits from water quality research that could be conducted on these tributaries, it should be noted that Section 921.50(a) of the NERRS regulations provides that: “research may be conducted within the immediate watershed of the reserve.”⁶ Therefore, water quality research and monitoring could occur along the He'eia tributaries without the need to include these areas within the proposed reserve boundary. In this way, HIMB would need only to enter into individual agreements with landowners at discrete monitoring sites, as necessary.

4.4.4 MŌKAPU PENINSULA

A portion of the Marine Corps Base Hawai'i (MCBH) on Mōkapu peninsula is included within the He'eia ahupua'a. There are important cultural and natural resources in the peninsula area. These include traditional salt ponds and the Nu'upia Ponds Wildlife Management Area, an important habitat for the federally endangered Hawaiian stilt (*Himantopus mexicanus knudseni*).

MCBH maintains and operates an airfield in the ahupua'a section of the peninsula and conducts training activities from this military installation. As such, there are public access restrictions to the air station and public use restrictions in some of the water areas surrounding MCBH (due to a 500-yard security buffer around the base). These uses and restrictions are not consistent with the purpose of and need for the proposed action.

NOAA, HIMB, and the United States Marine Corps (USMC) have discussed the proposed designation of the proposed He'eia Research Reserve and potential partnerships in education and outreach and resource management. NOAA and HIMB intend to continue communication with USMC in the operation of any future research reserve in He'eia to raise awareness of reserve activities and provide for coordination, where appropriate. Including portions of the airfield are not under further consideration given the types of activities occurring within, and the limited public access to this area.

4.4.5 ALTERNATIVE MANAGEMENT STRATEGIES

An alternative considering management strategies focused more exclusively on natural resources, with a reduced focus on cultural resources and traditional practices, was considered but not further developed, as it contradicts the stated mission and goals of the proposed He'eia Research Reserve as laid out in the DMP. In this alternative management strategy, contemporary natural resource restoration and research activities would be the focus of the reserve. While there is merit to understanding such natural processes as the ecological role of invasive mangroves with respect to shoreline stabilization and sediment management or the ecological restoration of tidal wetlands to a state that excludes traditional uses, this type of approach would not meet the stated research, education, and stewardship goals and objectives of the proposed reserve nor did it receive broad support from the public or community.

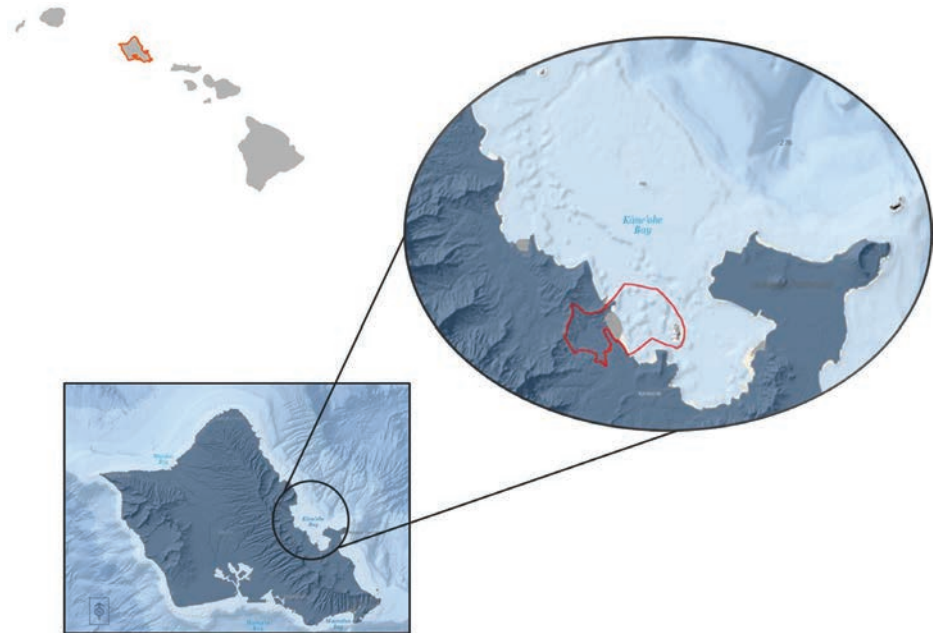
CHAPTER 5: AFFECTED ENVIRONMENT

This chapter provides an environmental baseline for the proposed site and surrounding area that are potentially impacted by the proposed action to designate a reserve. Each of the following subsections provides an overview of the current conditions found in the area of the proposed action.

5.1 NATURAL ENVIRONMENT

The proposed site is located on the windward (east) side of O‘ahu, and is situated along the southern coastline of Kāne‘ohe Bay (Figure 5.1). The steep, grooved cliffs of the Ko‘olau Mountain Range are the dominant topographic features that define Windward O‘ahu and form the region’s scenic background. Low ridges that shape He‘eia Valley stretch makai (toward the ocean) from the base of the Ko‘olau Mountains and gradually fade into the lower reaches of the coastal plains, spreading out into Kāne‘ohe Bay. While the upper section of He‘eia Valley is narrow and hilly, similar to other Windward O‘ahu mountain areas, the lower section becomes an extremely flat coastal plain covered almost entirely by marshland. Lae o Ke ‘Alohi, or Kealohi Point, which is a peninsula formed by the northern ridge of He‘eia Valley that measures 55 feet above mean sea level at its summit, is located to the north of the fishpond.

Figure 5.1. Location of project area within the Island of O‘ahu



Kāne‘ohe Bay is the largest sheltered body of water in the Hawaiian Islands. The bay, at its longest points, is about 12.7 km (8 miles) long and about 4 km (2.6 miles) wide, with a total surface area of 18 square miles (11,000 acres) and an average depth of 8 meters. The salinity of the bay water normally ranges from 33 to 35, and the variation in water temperature is usually between 60 to 80 °F (Tanaka et al. 2005) (Figure 5.2).

The proposed site is located along the southern portion of Kāne‘ohe Bay. The proposed He‘eia National Estuarine Research Reserve (NERR) features both terrestrial and marine components. The marine portions of the site include patch and fringing reefs and marine areas surrounding an island. Kāne‘ohe

Bay is protected by an outer barrier reef. The barrier reef has a major influence on bay circulation and the relatively large freshwater inputs from numerous streams have created diverse marine habitats. The site's estuarine waters are directly influenced by runoff from the surrounding watershed as well as by the exchange of seawater from the ocean.



Figure 5.2: Kāneʻohe Bay, Oʻahu (credit: DigitalGlobe and Hawaiʻi Data Clearinghouse).

5.1.1 PHYSICAL ENVIRONMENT

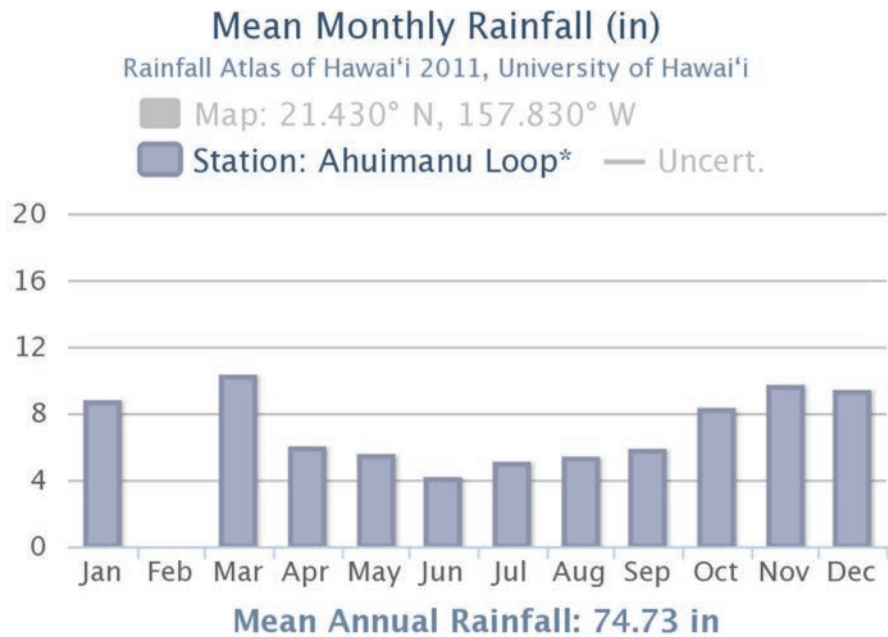
5.1.1.1 CLIMATE

5.1.1.1.1 WEATHER AND CLIMATE

Hawai'i has a semitropical climate, with a rainy season lasting from October to May; the wettest months of the year are during November through February. Many high volume rain events happen during the rainy season (Figure 5.3). The islands have steady trade winds that blow from the northeast a majority of the time at approximately 20 km per hour (10–11 knots). Trade wind patterns have a significant effect on Windward O'ahu's climate. The trade winds bring warm moist air from the ocean onto the land, which is deflected up along the Ko'olau Mountains. As the air is deflected up the mountains, it cools, forms clouds, and releases rain onto the land below.

The mountainous regions of Windward O'ahu experience the most frequent rainfall and are often covered by clouds. Fog drip at higher elevations also contributes to overall precipitation. The coastal areas and central plains of Windward O'ahu have moderate to frequent rainfall (Honolulu Board of Water Supply, 2012), with an annual average total precipitation of 76.03 in. (Hawai'i Institute of Marine Biology, 2016). The average rainfall in the He'eia watershed is 94 inches annually. The average annual temperature in Kāne'ohe ranges from 68.8 to 79.8°F (Hawai'i Institute of Marine Biology, 2016). Figure 5.3 displays annual rainfall data for the 'Āhuimanu Loop rain gauge located in close proximity to the proposed site (Giambelluca 2013).

Figure 5.3. Mean annual rainfall
Ahuimanu Loop, Kāne'ohe



5.1.1.1.2 CLIMATE CHANGE

Within the proposed He'eia National Estuarine Research Reserve Final Management Plan (FMP) (Appendix A), the impacts of climate change to Hawai'i and Pacific Islands are considered. These impacts include increased air temperatures and warmer oceans, changes to precipitation and freshwater supplies, sea level rise, coral bleaching, and ocean acidification. See [Climate Change Impacts in the United States report \(Melillo et al. 2014\)](#) for additional

information on climate change impacts in the Hawaiian Islands. The Climate Sensitivity of the National Estuarine Research Reserve System (Robinson et al. 2013) report discusses climate change vulnerability of the estuaries of the National Estuarine Research Reserve System (NERRS) and the communities dependent on the estuarine resources of the research reserves. This report could provide a framework for the proposed He'eia NERR to understand the sensitivity and vulnerability of the He'eia wetland and Kāne'ohe Bay to climate change impacts.

5.1.1.1.3. AIR QUALITY

The State of Hawai'i Department of Health (DOH) monitors air quality on a continuous basis on each of the four main Hawaiian Islands at specific stationary monitoring stations⁷. As required under the Clean Air Act, the DOH notifies the public of an exceedance of a National Ambient Air Quality Standard (see Chapter 7 for additional information on the Clean Air Act and its relevance to the proposed action). There are no DOH monitoring stations on the windward side of O'ahu. Long-term air quality data for the Kāne'ohe Bay area is not available.

The USEPA's Toxic Release Inventory (TRI) tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. Within the project area, Marine Corps Base Hawai'i (MCBH) on the Mōkapu peninsula is the only TRI facility and as such must report annually how much of each chemical is released⁸ to the environment and/or managed through recycling, energy recovery and treatment. For 2014, MCBH⁹ has reported releases of ethylene glycol, copper, lead, and nitrate compounds, although none of these are reported as air emissions.

Additional sources of air pollution within the project area include vehicle emissions and noise pollution from road and boat traffic as well as from the military aircraft using MCBH on the Mōkapu peninsula.

5.1.1.2 WATER RESOURCES

5.1.1.2.1 WATER QUALITY

Primary pollutants identified by the State of Hawai'i Department of Health in the project area include nutrients, suspended solids and sediment, turbidity, polychlorinated biphenyls (PCBs), bacteria, and phosphorus. Pollutants of concern identified at the monitoring station closest to the preferred alternative (He'eia Kea Small Boat Harbor Station 000362) consist of pathogens, nutrients, and nitrogen (Helber Hastert and Fee Planners 2007). There are additional DOH marine recreation water quality monitoring site at Kāne'ohe Beach Park (Station 000190) and Kokokahi Pier (Station 000191). These monitoring sites are in the southern portion of Kāne'ohe Bay, south of the project area of the proposed action.

Hawai'i Administrative Rules (H.A.R.) on Water Quality Standards define both the classification of State waters (H.A.R. §11-54.2) and the classification of water uses (H.A.R. §11-54.3) for inland and marine waters. Table 5.A identifies the classification and uses of bodies of water within the project area.

The Clean Water Act (33 U.S.C. § 1251) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. See Chapter 7 for more information on the Clean Water Act and its relevancy to the proposed action.

⁷ Near-real time air quality data at monitoring stations available <http://emdweb.doh.hawaii.gov/air-quality/>

⁸ A "release" of a chemical means that it is emitted to the air or water, or placed in some type of land disposal. See USEPA's Toxic Release Inventory website for additional information

⁹ 2014 Toxic Release Inventory Facility Report for Marine Corps Base Hawai'i Kāne'ohe Bay <https://myrtk.epa.gov/info/report.jsp?IDT=TRI&ID=96863SMRNCMAGAZ>

Within Hawai'i, certain types of water quality standards for surface water bodies, which are based on the state's intended uses for the water body (e.g., swimming or fishing), are used to help states identify target levels for water quality indicators and prioritize which water bodies are most in need of water pollution reduction plans, called Total Maximum Daily Loads (TMDLs). Data collected and reported for that purpose, among others, are available for several locations in Kāne'ohe Bay, including the Central Bay, He'eia Kea Small Boat Harbor, and He'eia Stream. As presented in the State of Hawai'i Department of Health *2014 State of Hawai'i Water Quality Monitoring and Assessment Report*, the types of pollutants exceeding applicable water quality standards for the following sampling locations are:

- a) He'eia Kea Small Boat Harbor (wet season) — total nitrogen (TN), chlorophyll a
- b) Kāne'ohe Bay Central Region (includes He'eia Fishpond and Moku o Lo'e, wet season) — TN, nitrate+nitrite-nitrogen (NO3+NO2), ammonia (NH3), and turbidity
- c) He'eia Stream — NO3+NO2 (both wet and dry seasons), total phosphorus (wet season only), and turbidity (wet season only)

He'eia Kea Small Boat Harbor, Kāne'ohe Bay Central Region, and He'eia Stream are on the list of impaired water bodies due to non-attainment of one or more of the applicable water quality standards (Hawai'i State Department of Health 2014) (Table 5.1).

Table 5.1 Water quality classification and impairment status for bodies of water within the project area

BODY OF WATER	CLASSIFICATION OF STATE WATERS	CLASSIFICATION OF WATER USES	DEFINITION OF WATER USES (FROM H.A.R. §11-54.3, SEE RULES FOR MORE DETAILS).	IMPAIRMENT STATUS*
Moku o Lo'e	Inland waters	Class 1	Remain in their natural state as nearly as possible with an absolute minimum of pollution from any human-caused source.	Yes+ (wet season)
He'eia Stream	Inland waters	Class 2	To protect use for recreational purposes, the support and propagation of aquatic life, agricultural and industrial water supplies, shipping, and navigation.	Yes (both wet season and dry season)
Kāne'ohe Bay, Central Region (includes He'eia Fishpond)	Marine waters	Class AA	Remain in natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused sources or actions.	Yes (wet season)
He'eia Kea Small Boat Harbor	Marine waters	Class A	Protect for use for recreational purposes and aesthetic enjoyment. Any other use shall be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters.	Yes (wet season)

*Impairment meaning at least one use of water body not obtained

+Impairment and non-attainment for Moku o Lo'e based on findings for Kāne'ohe Bay Central Region

5.1.1.2.2 HYDROLOGY

The He'eia Stream, which runs through the site and discharges into the bay, is a perennial stream formed from two upland streams, Ha'ikū and Ioleka'a. Ha'ikū Stream and Ioleka'a Stream converge upstream of the wetlands of He'eia to form He'eia Stream. The He'eia Stream drainage basin is 3.6 square miles in area and extends 3.2 miles from the ocean to the summit of the Ko'olau Mountains.

Flooding in the He'eia Stream is restricted almost entirely to the low-lying area starting at approximately 40 feet above mean sea level (the wetlands of the He'eia region). Most of the wetlands of the He'eia region are within the Federal Emergency Management Agency (FEMA) AE flood zone, and a large portion of the wetlands are also within the floodway (Figure 5.4). The City and County of Honolulu (C&CH) participates in the FEMA National Flood Insurance Program (NFIP)¹⁰. See the [State of Hawai'i DLNR Engineering Division](#) for additional information on the State's participation in NFIP.

¹⁰ FEMA Community Status Book Report for Hawai'i <https://www.fema.gov/cis/Hi.html>

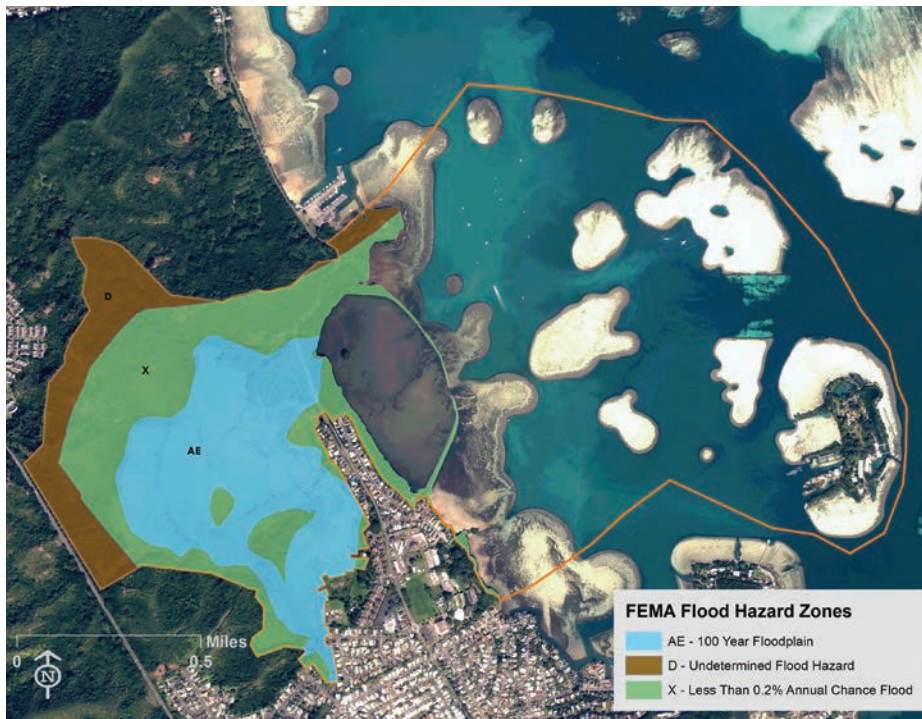


Figure 5.4. FEMA Flood Hazard Zones within the project area (data source FEMA 2011)

Discharge records from Ha'ikū Stream and Ioleka'a Stream date back to 1915 and 1941, respectively. The largest flood on record at both the Ha'ikū and Ioleka'a United States Geological Survey stations occurred in May 1965. The peak discharge was estimated to be 5,740 cubic feet per second (cfs) at the Ha'ikū station and 797 cfs at the Ioleka'a station. FEMA estimated the 100-year flood peak discharge at He'eia wetlands to be approximately 9,500 cfs. Dense growths of mangrove at the outlet of He'eia Stream restrict water flow and form small ponds. Increasing silt loads in He'eia Stream (as a result of urban development in the watershed) and decreasing groundwater levels have reduced the amount of open water in the wetlands of He'eia. Open-water areas remaining in the wetlands of He'eia generally range in depth from 6 inches to 3 feet, but can increase to more than 6 feet in depth after rain events (Townscape 2011).

The He'eia Fishpond is an 88-acre brackish-water pond that extends from the shoreline out into Kāne'ohe Bay. It is enclosed by a 7,000-foot long wall built from volcanic rock and coral. This wall is 12–15 feet wide. Kāne'ohe Bay is semi-enclosed by a barrier reef, restricting some ocean/sea water circulation and, therefore, heavily influenced by freshwater inputs. He'eia Stream is a relatively minor source of freshwater input to Kāne'ohe Bay, as it is only one of 11 streams that discharge into the bay. Kāne'ohe Stream, just south of the nominated site, is the largest source, accounting for more than 75% of the discharge into the southern section of the Kāne'ohe Bay (Hawai'i Office of Planning, 2015a).

5.1.1.2.3 GROUNDWATER

The aquifer beneath the area is within the Ko'olaupoko Aquifer System of the Windward Aquifer Sector. This aquifer mainly consists of high level dike-impounded groundwater. There are many groundwater seeps and springs in the wetlands of He'eia. There are no groundwater wells located on site or in the vicinity of the property. The nearest groundwater wells are located in Upper Ha'ikū Valley, on the mountainside end of He'eia watershed. These wells are not listed as having contaminants (PBR 2014).

5.1.1.3 GEOLOGY

The steep, grooved cliffs of the Ko'olau Mountain Range are the dominant topographic feature that defines Windward O'ahu, forming the region's scenic background. While the upper section of the He'eia area is narrow and hilly, similar to other Windward O'ahu mountain areas, the lower section becomes an extremely flat coastal plain covered almost entirely by marshland. The topography of the region contributes to the rapid runoff and low infiltration rates.

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) characterized the soils in the wetlands of He'eia in 2011 (Figure 5.5). The majority of the area has Hanalei silty clay and Marsh soils. In a typical profile, Hanalei silty clay is composed of poorly drained silty clay and silty clay loam from 0 to 36 inches in depth. Marsh soil is composed of mucky peat from 0 to 60 inches in depth. Hanalei silty clay is poorly drained, with frequent flooding, occasional ponding, and a moderate available water capacity. Marsh soils are very poorly drained, with frequent flooding and ponding, and a very high available water capacity (Hawai'i Office of Planning 2015a).

The uplands within the He'eia watershed that are to the north of the wetland area are characterized as Waikāne silty clay, 25 to 40% slopes, and 'Alaeloa silty clay, 15 to 70% slopes. These soils are silty and well-drained, although they have less available water capacity than the soil in the wetland areas. These hillside soils are classified as highly erodible (Hawai'i Office of Planning 2015a).

5.1.2 BIOLOGICAL ENVIRONMENT

The proposed He'eia NERR includes a number of different habitat systems represented generally by terrestrial, estuarine and marine areas (Figure 5.6), which are discussed below, along with some of the species each habitat supports. 5.1.2.1 Terrestrial Habitats.

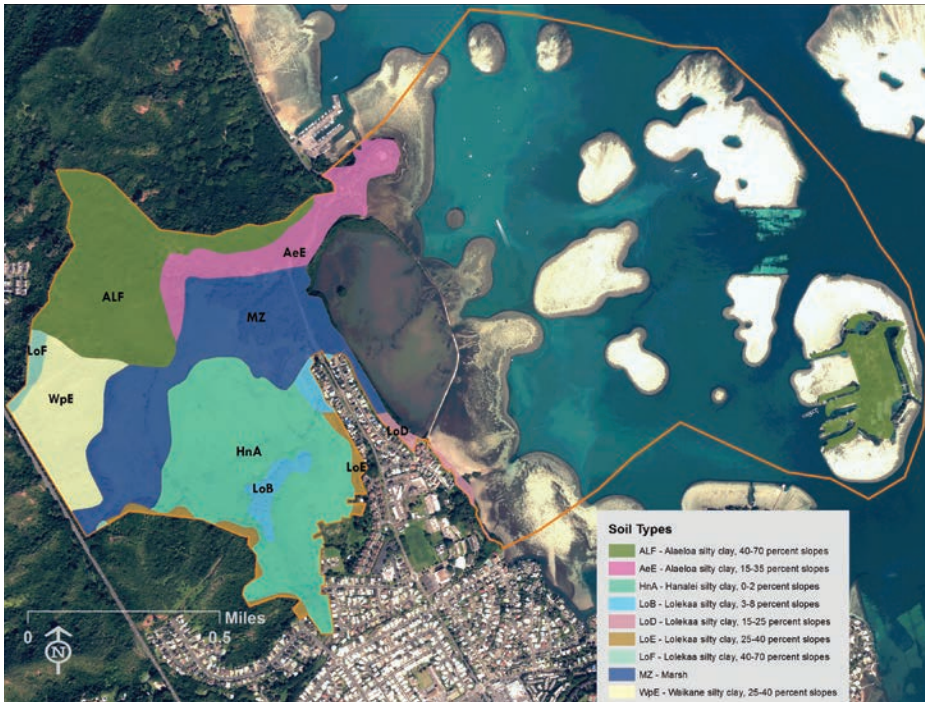


Figure 5.5. Soil types within the project area (Data source: NRCS, 2013)

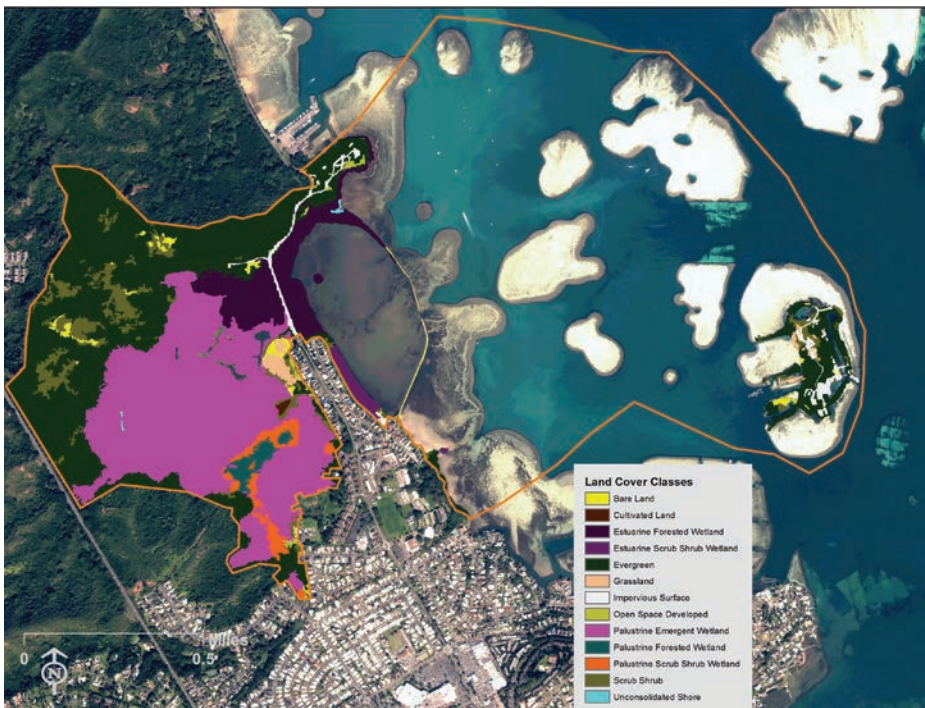


Figure 5.6. Land cover classes within the project area (Data Source: NOAA OCM C-CAP, 2011)

5.1.2.1 TERRESTRIAL HABITATS

The terrestrial areas in project for the proposed He'eia Research Reserve are a mosaic of built-up or developed areas and undeveloped or natural areas. The undeveloped or natural uplands occur in He'eia State Park, areas between the He'eia Fishpond and the residential neighborhood, emergent lands on Moku o Lo'e, uplands within the C&CH parcel, and upland areas surrounding the wetlands and forested land at the foothills of the Ko'olau Mountains on the Hawai'i Community Development Authority (HCDA) property. These uplands are dominated by invasive plant species with few native species in the forested areas (see Section 5.1.3.1 Living Resources — Flora for more description of terrestrial plants). The more developed sites include facilities at the He'eia Fishpond, He'eia Kea Small Boat Harbor, and the campuses of He'eia State Park and of the HIMB on Moku o Lo'e.

5.1.2.2 RIPARIAN AND FRESHWATER HABITATS

The riparian and freshwater habitats of the project area include streams and associated riparian buffer areas, freshwater emergent wetlands, freshwater forested/shrub wetland, and freshwater ponds. Ha'ikū Stream and Ioleka'a Stream converge in the upland portion of the project area to form He'eia Stream. As He'eia Stream flows through the HCDA parcel, it forms freshwater forested/shrub wetlands. Freshwater emergent wetlands are located throughout the HCDA parcel and immediately upstream from the mangrove swamp. He'eia Stream flows through these wetlands and discharges into Kāne'ohe Bay. Surface water flow is often restricted by the presence of thick, non-native vegetation, such as California grass (*Urochloa mutica*). Similarly, the floodplain along the stream, identified as marsh habitat, is overgrown with California grass.

5.1.2.3 ESTUARINE HABITATS

The wetlands of He'eia are fed by the waters of Ha'ikū Stream and Ioleka'a Stream, which converge upstream of the wetlands to form the He'eia Stream. NOAA's Coastal Change Analysis Program (C-CAP) land cover dataset (2011) identifies five wetland types that occur within the project areas preferred alternative: (1) estuarine forested, (2) estuarine scrub shrub, (3) palustrine emergent, (4) palustrine forested, and (5) palustrine scrub shrub. Most of the wetlands occur on HCDA lands to the west of Kamehameha Highway, along the banks of the He'eia Stream in He'eia State Park, and along the northwestern, western, and southwestern walls of the fishpond (Hawai'i Office of Planning 2015).

The estuarine wetlands occur in the northern part of the HCDA wetland area, and largely comprise thick mangrove swamp (Calvin Kim and Associates 1990, Brooks 1991, PBR Hawai'i 1993, USDA 2011). Red mangrove (*Rhizophora mangle*), introduced to the area around 1910, is the dominant species, followed by the oriental mangrove (*Bruguiera sexangula*) and black mangrove (*Bruguiera gymnorhiza*), both of which are introduced species as well. The expansion of mangroves and deposition of sediments over time has reduced the estuarine environment and altered water flow patterns with respect to both the stream channel locations and the extent of tidal water incursions (Hawai'i Office of Planning 2015). The estuarine and freshwater wetlands are inundated with waters from He'eia Stream as well as sea water when the tide is high. This results in large fluctuations in water conditions, including dissolved oxygen, pH,

and temperature. The mangroves capture sediment and organic material from the stream flow, which creates a silty mud bottom along the coast.

In addition to the sedimentation and water quality impacts described above, mangroves have impacts on habitats for native and non-native species. Although the mangroves are not native to Hawai'i, they are known to provide habitat to a variety of marine and estuarine organisms (albeit mostly non-native species). These areas act as breeding grounds and a nursery for marine life, and many associated resident coastal species are tolerant to changes in salinity (Hawai'i Office of Planning 2015). However, mangroves have colonized important foraging and nesting habitat of four endemic (and endangered) Hawaiian waterbird species, overgrown Native Hawaiian archaeological sites, invaded anchialine pools, and caused localized drainage and aesthetic problems (Allen, 1998). In addition, invasive mangroves facilitate the persistence and spread of introduced species, which may ultimately impact the ~500 estuarine and marine endemic species in Hawai'i. Facilitation of exotic species and especially the reduction of available habitat for native species (e.g. waterbirds) by invasive mangroves are likely to become significant problems if subtropical regions and associated new mangrove habitats expand due to global warming (IPCC 2007) (Demopoulos and Smith, 2010).

He'eia Fishpond is the largest inland body of water in the proposed action area. This 88-acre seashore pond is located on the shoreline of Kāne'ohe Bay and is completely surrounded by a rock wall. The waters of the pond receive freshwater input from the He'eia Stream, which drains the He'eia watershed and empties into the northwestern corner of the fishpond. The fishpond retains a brackish character resulting from tidal flux of seawater from the adjacent Kāne'ohe Bay. Water flux into and out of the fishpond is regulated by a series of eight sluices. The pond has been used primarily as a site to promote aquaculture using Native Hawaiian resource management practices.

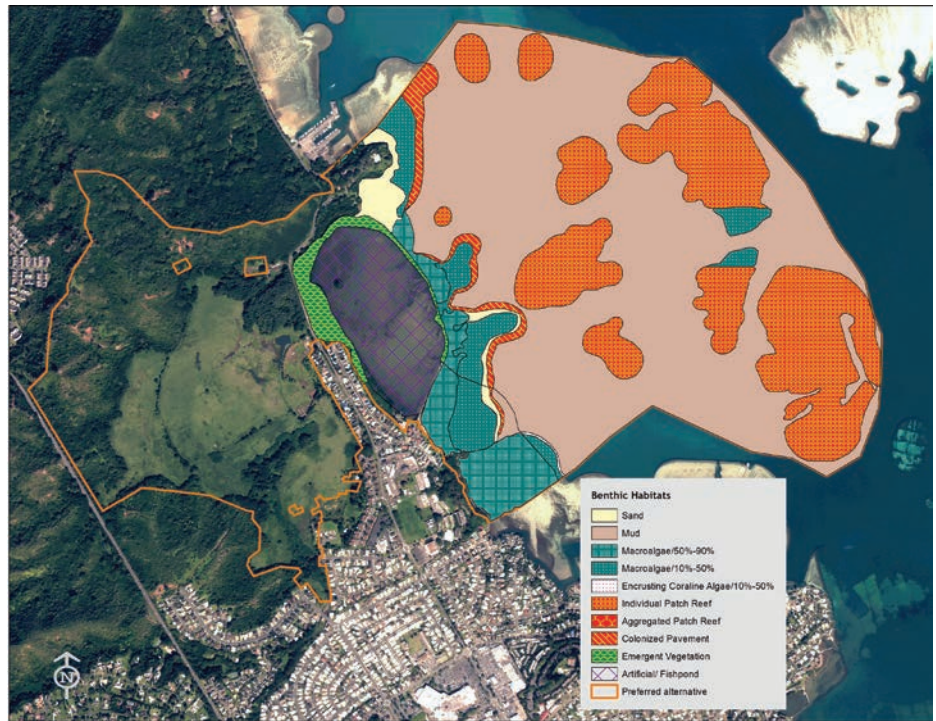
5.1.2.4 MARINE HABITATS

NOAA's National Centers for Coastal Ocean Science (NCCOS) identified 29 different habitats in the bay, including emergent vegetation, sand, mud, seagrass, macroalgae, encrusting coralline algae, linear reef, spur and groove reef, patch reef (individual and aggregated), coral head (individual and aggregated), scattered coral rock, and colonized volcanic rock/boulder (NOAA 2003). Figure 5.7 depicts the major marine habitats present within the preferred alternative boundary.

Kāne'ohe Bay has three reef zones: a fringing reef zone, a lagoon zone, and a barrier reef complex. Fringing reefs are present along most of the shoreline, except where freshwater streams enter the bay or where the reefs have been dredged. A large barrier reef covers the middle portion of Kāne'ohe Bay, channeling the movement of water from the open ocean into the northern Mokoli'i Passage and southern Sampan Channel. This barrier reef protects the bay from tradewind swells, making the bay conducive for extensive coral reef development. The southernmost embayment of Kāne'ohe Bay is home to extensive coral reefs, which provide important breeding areas for fish and other marine life. The southern basin of Kāne'ohe Bay is isolated from direct exchange of water with the open ocean; thus, pollutants are trapped in the southern area of Kāne'ohe Bay for longer periods of time than in other areas of the bay.

¹¹Flora species lists are not comprehensive. List include common and dominant species, invasive species, rare species, and protected species (i.e., species listed as threatened or endangered under the Endangered Species Act).

Figure 5.7. Benthic marine habitats within the project area (Data Source: NOAA NCCOS, 2003)



5.1.3 LIVING RESOURCES

5.1.3.1 FLORA¹¹

Terrestrial plant species present within the uplands of the project area (He'eia State Park, areas between the He'eia Fishpond and the residential neighborhood, emergent lands on Moku o Lo'e, and upland areas surrounding the wetlands and forested land at the foothills of the Ko'olau Mountains on the HCDA property) are listed in Table 5.2. They include a variety of plants that are native to the Hawaiian Islands (e.g., 'ahu'awa sedge), introduced species (e.g., Indian fleabane), decorative trees (e.g., plumeria), and important food sources (fruit trees like banana, guava, and papaya). This variety of plants reflects the nature of the area as a mosaic of developed areas and undeveloped natural areas.

The estuarine area where the He'eia Stream meets the He'eia Fishpond is dominated by a red mangrove (*Rhizophora mangle*) forest. This introduced species will be removed from the estuarine wetlands near the mouth of He'eia Stream on the HCDA parcel. It is the focus of a habitat restoration project led by reserve partner Kāko'o 'Ōiwi. Plant species of the estuarine habitats in the project area are listed in Table 5.3.

California grass (*Brachiaria mutica*) is an important invasive species within the riparian and freshwater areas of the project area. This species can affect (i.e., restrict) water flow through the stream and wetlands. Reserve partner Kāko'o 'Ōiwi is leading an extensive invasive species removal and habitat restoration project to control invasive California grass and create a natural riparian buffer around He'eia Stream in the HCDA parcel. Riparian and freshwater flora species are listed in Table 5.4.

Table 5.2. Terrestrial flora found within the project area

COMMON NAME	SCIENTIFIC NAME	FAMILY	COMMON NAME FOR FAMILY
Hala	<i>Pandanus tectorius</i>	Pandanaceae	(none)
'Ahu'awa	<i>Cyperus javanicus</i>	Cyperaceae	Sedges
Basket grass	<i>Oplismenus hirtellus</i>	Poaceae	Grasses
Bermuda grass	<i>Cynodon dactylon</i>	Poaceae	Grasses
Hilo grass	<i>Paspalum conjugatum</i>	Poaceae	Grasses
Pitted beardgrass	<i>Bothriochloa pertusa</i>	Poaceae	Grasses
Coconut	<i>Cocos nucifera</i>	Arecaceae	Palm trees
Loulu	<i>Pritchardia sp.</i>	Arecaceae	Palm trees
Phoenix palms	<i>Phoenix sp.</i>	Arecaceae	Palm trees
Red ginger	<i>Alpinia purpurata</i>	Zingiberaceae	Ginger family
Banana	<i>Musa x paradisiaca</i>	Musaceae	(none)
'Āhinahina (chaff flower)	<i>Achyranthes splendens var. rotunda</i>	Amaranthaceae	Amaranth family
Indian fleabane	<i>Pluchea indica</i>	Asteraceae	Daisy family
Wedelia	<i>Sphagneticola trilobata</i>	Asteraceae	Daisy family
Naupaka	<i>Scaevola taccada</i>	Goodeniaceae	(none)
Chinese violet	<i>Asystasia gangetica</i>	Acanthaceae	Acanthus family
Naio	<i>Myoporum sandwicense</i>	Scrophulariaceae	Figwort family
Ixora	<i>Ixora sp.</i>	Rubiaceae	Coffee, madder, or bedstraw family
Maile pilau	<i>Paederia foetida</i>	Rubiaceae	Coffee, madder, or bedstraw family
Plumeria	<i>Plumeria pudica</i>	Apocynaceae	Dogbane family
Octopus tree	<i>Schefflera actinophylla</i>	Araliaceae	Ivy family
Ironwood	<i>Casuarina equisetifolia</i>	Casuarinaceae	She-oak or ironwood family
Koa haole	<i>Leucaena leucocephala</i>	Fabaceae	Legume (pea or bean) family
Red powderpuff	<i>Calliandra haematocephala</i>	Fabaceae	Legume (pea or bean) family
Bauhinia	<i>Bauhinia purpurea</i>	Fabaceae	Legume (pea or bean) family
Milo	<i>Thespesia populnea</i>	Malvaceae	Mallows
Hau	<i>Hibiscus tiliaceus</i>	Malvaceae	Mallows
'Ākia	<i>Wikstroemia uva-ursi</i>	Thymelaeaceae	(none)
Allspice	<i>Pimenta dioica</i>	Myrtaceae	Myrtle family
Guava	<i>Psidium guajava</i>	Myrtaceae	Myrtle family
Java plum	<i>Syzygium cumini</i>	Myrtaceae	Myrtle family
Strawberry guava	<i>Psidium guajava</i>	Myrtaceae	Myrtle family
Christmas berry	<i>Schinus terebinthifolius</i>	Anacardiaceae	Cashew family
Mango	<i>Mangifera sp.</i>	Anacardiaceae	Cashew family
'A'ali'i	<i>Dodonaea viscosa</i>	Sapindaceae	Soapberry family
Kukui	<i>Aleurites moluccana</i>	Euphorbiaceae	Spurge family
Spurges	<i>Euphorbia sp.</i>	Euphorbiaceae	Spurge family
Papaya	<i>Carica papaya</i>	Caricaceae	(none)
Star fruit	<i>Averrhoa carambola</i>	Oxalidaceae	Wood sorrel family
Silver oak	<i>Grevillea robusta</i>	Proteaceae	Protea, Banksia, and grevillea

Table 5.3. Estuarine flora found within the project area

COMMON NAME	SCIENTIFIC NAME	FAMILY	COMMON NAME FOR FAMILY
Swordfern	<i>Microsorium scolopendria</i>	Polypodiaceae	Ferns (epiphytes)
Basket grass	<i>Oplismenus hirtellus</i>	Poaceae	Grasses
Job's tears	<i>Coix lachrymal-jobi</i>	Poaceae	Grasses
Sedge	<i>Frimbristylis littoralis</i>	Cyperaceae	Sedges
'Aki 'aki	<i>Schoenoplectus tabernaemontani</i>	Cyperaceae	Sedges
Umbrella sedge	<i>Cyperus alternifolius</i>	Cyperaceae	Sedges
Arrowhead	<i>Sagittaria sagittaeifolia</i>	Alismataceae	Water-plantains
'Ape	<i>Xanthosoma robustum</i>	Araceae	Arum family
Dumb cane	<i>Dieffenbachia sp.</i>	Araceae	Arum family
Honohono	<i>Dendrobium anosmum</i>	Orchidaceae	Orchids
Sensitive plant	<i>Mimosa pudica</i>	Fabaceae	Legume (pea or bean) family
Kāmole	<i>Ludwigia octovalvis</i>	Onagraceae	Evening primrose family
Rose apple	<i>Eugenia jambos</i>	Myrtaceae	Myrtle family
Red mangrove	<i>Rhizophora mangle</i>	Rhizophoraceae	Mangrove trees
Oriental mangrove	<i>Bruguiera sexangula</i>	Rhizophoraceae	Mangrove trees
Black mangrove	<i>Bruguiera gymorrhiza</i>	Rhizophoraceae	Mangrove trees
Macranga	<i>Macaranga grandifolia</i>	Euphorbiaceae	Spurge family
Wedelia	<i>Sphagneticola trilobata</i>	Asteraceae	Daisy family

The dominant marine flora are various algal species found on the shallow reefs, reef flats, and mud flats in the near vicinity of He'eia Fishpond and Hawai'i Institute of Marine Biology (HIMB). Of particular note is gorilla ogo, an invasive species within the reef habitats of Kāne'ohe Bay and other parts of Hawai'i that is the target of extensive restoration projects by the Division of Aquatic Resources (DAR) within the Hawai'i Department of Land and Natural Resources (DLNR). Marine flora species are listed in Table 5.5.

Table 5.4. Riparian and freshwater flora found within the project area

COMMON NAME	SCIENTIFIC NAME	FAMILY	COMMON NAME FOR FAMILY
Neke fern	<i>Cyclosorus interruptus</i>	Thelypteridaceae	Ferns (terrestrial)
California grass	<i>Brachiaria mutica</i>	Poaceae	Grasses
Makaloa	<i>Cyperus laevigatus</i>	Cyperaceae	Sedges

Table 5.5. Marine flora found within the project area

COMMON NAME	SCIENTIFIC NAME	PHYLUM/DIVISION
Gorilla ogo	<i>Gracilaria salicornia</i>	Rhodophyta (red algae)
Tambalang	<i>Eucheuma spinosum</i>	Rhodophyta
n/a	<i>Acanthophora spicifera</i>	Rhodophyta
Green bubble algae	<i>Dictyosphaeria cavernosa</i>	Chlorophyta (green algae)
n/a	<i>Dictyota sp.</i>	Heterokontophyta
n/a	<i>Padina sp.</i>	Heterokontophyta

¹² Fauna species lists are not comprehensive. List include common and dominant species, invasive species, rare species, and protected species (i.e., species listed as threatened or endangered under the Endangered Species Act).

5.1.3.2 FAUNA¹²

The fauna found in the terrestrial areas includes coastal native birds (e.g., black noddy) and introduced birds (e.g., cardinal and dove species) and mammals (e.g., rats and feral cats) typically found in beachside areas, gardens, parklands, and agricultural areas on O’ahu. Migratory bird species, such as Pacific golden plover and wandering tattler, are also present. Feral cats and other introduced mammalian predators of native bird species will be a target of predator control activities proposed by reserve partner Kāko’o ‘Ōiwi. Terrestrial fauna are listed in Table 5.6.

Table 5.6. Terrestrial fauna found within the project area

COMMON NAME	SCIENTIFIC NAME	PHYLUM	CLASS
Cane spider	<i>Heteropoda sp.</i>	Arthropoda	Arachnida
Honeybee	<i>Apis mellifera</i>	Arthropoda	Insecta
Globe skimmer dragonfly	<i>Pantala flavescens</i>	Arthropoda	Insecta
Monarch butterfly	<i>Danaus plexippus</i>	Arthropoda	Insecta
Cane toad	<i>Rhinella marina</i>	Chordata	Amphibia
Bullfrog	<i>Rana catesbiana</i>	Chordata	Amphibia
Great frigatebird	<i>Fregata minor</i>	Chordata	Aves (birds)
Black noddy	<i>Anous minutus</i>	Chordata	Aves
Black-crowned night heron	<i>Nycticorax nycticorax</i>	Chordata	Aves
Cattle egret	<i>Bubulcus ibis</i>	Chordata	Aves
Mallard-koloa hybrid	<i>Anas wyvilliana x A. platyrhynchos</i>	Chordata	Aves
Pacific golden plover	<i>Pluvialis fulva</i>	Chordata	Aves
Wandering tattler	<i>Tringa incana</i>	Chordata	Aves
Red-crested cardinal	<i>Paroaria coronate</i>	Chordata	Aves
Northern cardinal	<i>Cardinalis cardinalis</i>	Chordata	Aves
Red-vented bulbul	<i>Pycnonotus cafer</i>	Chordata	Aves
Shama thrush	<i>Copsychus malabaricus</i>	Chordata	Aves
Common myna	<i>Acridotheres tristis</i>	Chordata	Aves
Common waxbill	<i>Estrilda astrild</i>	Chordata	Aves
Spotted dove	<i>Streptopelia chinensis</i>	Chordata	Aves
Zebra dove	<i>Geopelia striata</i>	Chordata	Aves
Japanese white-eye	<i>Zosterops japonicas</i>	Chordata	Aves
Hawaiian hoary bat*	<i>Lasiurus cinereus semotus</i>	Chordata	Mammalia
House mouse	<i>Mus musculus</i>	Chordata	Mammalia
Rat	<i>Rattus sp.</i>	Chordata	Mammalia
Feral cat	<i>Felis catus</i>	Chordata	Mammalia

*Protected under the Endangered Species Act

The diversity of fauna species found within the estuarine areas of the project site reflects the variety of habitats within these areas. Additionally, as estuarine areas represent areas where fresh and salt water meet, certain species (e.g. barracuda) may be found both within estuarine and marine habitats and others could be found in both freshwater and estuarine areas (e.g. anchialine shrimp of the genus *Atyidae*). Estuarine species of the tidal wetlands and fishpond are listed in Table 5.7.

Similar to some estuarine species described above, some species of riparian or freshwater animals can be found within both the freshwater and estuarine habitats. A list of species which are primarily associated with riparian and freshwater habitats in the project area presented in Table 5.8.

Kāneʻohe Bay offers a diverse array of habitats for marine organisms, ranging from intertidal to pelagic, within only a few kilometers. Kāneʻohe Bay is famous for its abundant coral habitats, and one reef alone may support as many as

Table 5.7. Estuarine fauna found within the project area

COMMON NAME	SCIENTIFIC NAME	PHYLUM	CLASS
Shrimp	<i>Atyidae sp.</i>	Arthropoda	Crustacea [sub-phylum]
Moray eel	<i>Gymnothorax sp.</i>	Chordata	Actinopterygii (ray-finned fishes)
Barracuda	<i>Sphyræna barracuda</i>	Chordata	Actinopterygii
Dussumier’s surgeonfish	<i>Acanthurus dussumieri</i>	Chordata	Actinopterygii
Porcupinefish	<i>Diodontidae sp.</i>	Chordata	Actinopterygii
Threadfin	<i>Polydactylus sexfilis</i>	Chordata	Actinopterygii
Hawaiian flagtail	<i>Kuhlia xenura</i>	Chordata	Actinopterygii
Hawaiian lady fish	<i>Elops hawaiiensis</i>	Chordata	Actinopterygii
Milkfish	<i>Chanos chanos</i>	Chordata	Actinopterygii

Table 5.8. Riparian and freshwater fauna found within the project area

COMMON NAME	SCIENTIFIC NAME	PHYLUM	CLASS
Dragonfly	<i>Pantala flavescens</i>	Arthropoda	Insecta
Blackline Hawaiian damselfly*	<i>Megalagrion nigrohamatum nigrolineatum</i>	Arthropoda	Insecta
Stream gobi	<i>Awaou guamensis</i>	Chordata	Actinopterygii (ray-finned fishes)
Hawaiian moorhen*	<i>Gallinula chloropus sandvicensis</i>	Chordata	Aves (birds)
Hawaiian stilt*	<i>Himantopus mexicanus knudseni</i>	Chordata	Aves
Hawaiian coot*	<i>Fulica americana alai</i>	Chordata	Aves
Hawaiian duck*	<i>Anas wyvilliana</i>	Chordata	Aves

*Species protected under the Endangered Species Act

3,000 species (HIMB 2016). The coral reef systems serve as breeding grounds and nursery areas for many other marine species. He'e (day octopus, *Octopus cyanea*) is an important recreational fishery within Kāne'ohe Bay. See Section 5.2.3 for more information on fisheries within the project area of the proposed action. Marine species are listed in Table 5.9.

5.1.3.3 SPECIAL-STATUS SPECIES AND HABITATS

Within the project area there are many special-status species that may be affected by the proposed action. Listed species, and in some cases their habitats, are protected under the Endangered Species Act, Marine Mammal Protection Act, Magnuson-Stevens Fishery Conservation and Management Act, and the Migratory Bird Treaty Act. Additional species considered here are proposed for listing or candidate species for listing. See Chapter 7 for detail on these laws and relevancy to the proposed action.

5.1.3.3.1 THREATENED AND ENDANGERED SPECIES

There are several species protected pursuant to the federal Endangered Species Act (ESA) that are present within or near the boundary of the proposed He'eia NERR which could be impacted by the proposed action. See Chapter 7 for a discussion on the ESA and relevancy to the proposed action.

The State of Hawai'i automatically lists any species that are listed on the federal Endangered Species List on the State Endangered Species List and provides these species with state protection in addition to federal protection. HRS §§ 195D-1 et seq.

In addition to considering threatened and endangered species, species proposed for listing, candidate species, and Species of Concern were also considered. Additionally, where designated, the critical habitats for listed species are considered as part of the effected environment. The below subsections discuss the species afforded recognition under the ESA that could be found within the project area.

5.1.3.3.1.1 ENDANGERED SPECIES ACT — LISTED SPECIES

Within the project area, there are 11 endangered species and 2 threatened species that are known to occur or have the potential to occur (Table 5.10).^{13,14} Critical habitat within the Hawaiian Islands has only been designated for two species, the blacklined Hawaiian damselfly (*Megalagrion nigrohamatum nigrolineatum*) and the Hawaiian monk seal (*Neomonachus schauinslandi*).

Blackline Hawaiian Damselfly (*Megalagrion nigrohamatum nigrolineatum*)

This endemic damselfly was once widespread across O'ahu, found from sea level to 2,400 feet on both the windward and leeward sides of the Ko'olau and Waianae mountain ranges. This species' range has been restricted to 11 streams in the Ko'olau Mountains and is threatened by predation from non-native species and habitat loss (71 Fed Reg. 53756). Within the project area of the proposed action, the blackline Hawaiian damselfly was recorded within the middle reach of He'eia Stream during surveys conducted between 1975 and 2003 (Parham et al. 2008).

Critical habitat has been designated for the blackline Hawaiian damselfly (77 Fed. Reg. 57648). All designated critical habitat is west of the Kahekili Highway (Hawai'i Route 83) and is beyond the scope of any of the alternatives considered within this analysis.

Table 5.9. Marine fauna found within the project area

COMMON NAME	SCIENTIFIC NAME	PHYLUM
Sponges	<i>Porifera</i>	Porifera
Zoanthids	<i>Zoanthidea</i>	Cnidaria
Sea anemones	<i>Anemonia sulcate</i>	Cnidaria
Hawaiian reef coral*	<i>Montipora dilatata</i>	Cnidaria
Rice coral	<i>Montipora capitata</i>	Cnidaria
Mushroom coral	<i>Fungia scutaria</i>	Cnidaria
Ocellated coral	<i>Cyphastrea ocellina</i>	Cnidaria
Corrugated coral	<i>Pavona varians</i>	Cnidaria
Cauliflower coral	<i>Pocillopora damicornis</i>	Cnidaria
Finger coral	<i>Porites compressa</i>	Cnidaria
Inarticulated brachiopod†	<i>Lingula reevii</i>	Brachiopoda
Collector urchins	<i>Tripnuestes gratilla</i>	Echinodermata
Long spined urchin	<i>Echinothrix diadema</i>	Echinodermata
Red slate pencil urchin	<i>Heterocentrotus mammillatus</i>	Echinodermata
Short spined urchins	<i>Echinometra mathaei</i>	Echinodermata
Blue pincher crabs	<i>Callinectes sapidus</i>	Arthropoda
Hermit crab	<i>Paguroidea sp.</i>	Arthropoda
Ghost crabs	<i>Ocypode ceratophthalma</i>	Arthropoda
Mantis shrimp	<i>Gonodactylus glabrous</i>	Arthropoda
Black nerite shells	<i>Nerita picea</i>	Mullosca
Periwinkle shells	<i>Littorina littorea</i>	Mullosca
Little necks clams	<i>Mercenaria mercenaria</i>	Mullosca
He'e (day octopus)	<i>Octopus cyanea</i>	Mullosca
Bristle worms	<i>Polychaeta sp.</i>	Annelida
Tunicates	<i>Tunicata sp.</i>	Chordata (tunicate)
Hammerhead shark	<i>Sphyrna lewini</i>	Chordata (cartilaginous fishes)
Tiger shark	<i>Galeocerdo cuvieri</i>	Chordata (cartilaginous fishes)
Whitetip reef shark	<i>Trianodon obesus</i>	Chordata (cartilaginous fishes)
Butterflyfish	<i>Chaetodontidae sp.</i>	Chordata (ray-finned fishes)
Damselfish	<i>Pomacentridae sp.</i>	Chordata (ray-finned fishes)
Goatfish	<i>Mullidae sp.</i>	Chordata (ray-finned fishes)
Gobies	<i>Gobiidae sp.</i>	Chordata (ray-finned fishes)
Parrotfish	<i>Scaridae sp.</i>	Chordata (ray-finned fishes)
Surgeonfish	<i>Acanthuridae sp.</i>	Chordata (ray-finned fishes)
Wrasse	<i>Labridae sp.</i>	Chordata (ray-finned fishes)
Green sea turtle†	<i>Chelonia mydas</i>	Chordata (reptilia)
Hawksbill sea turtle†	<i>Eretmochelys imbricata</i>	Chordata (reptilia)
Hawaiian monk seal**	<i>Neomonachus schauinslandi</i>	Chordata (mammalia)

* Species identified by NOAA NMFS as a “Species of Concern” under the Endangered Species Act.

† Species listed as Threatened or Endangered under the Endangered Species Act.

• Species protected under the Marine Mammal Protection Act.

Table 5.10. Threatened and endangered species known to occur or have the potential to occur within or near the proposed He'eia National Estuarine Research Reserve project area

THREATENED OR ENDANGERED SPECIES UNDER THE ENDANGERED SPECIES ACT	SCIENTIFIC NAME	HAWAIIAN NAME	STATUS	CRITICAL HABITAT DESIGNATION (IN HAWAI'I)
Blackline Hawaiian damselfly	<i>Megalagrion nigrohamatum nigrolineatum</i>	None	Endangered	Yes
Anthriscin yellow-faced bee	<i>Hylaeus anthracinus</i>	Nalo meli maoli	Endangered	None
Assimulans yellow-faced bee	<i>Hylaeus assimulans</i>	Nalo meli maoli	Endangered	None
Easy yellow-faced bee	<i>Hylaeus facilis</i>	Nalo meli	Endangered	None
Hawaiian yellow-faced bee	<i>Hylaeus kuakea</i>	Nalo meli maoli	Endangered	None
Hawaiian yellow-faced bee	<i>Hylaeus longiceps</i>	Nalo meli maoli	Endangered	None
Hawaiian yellow-faced bee	<i>Hylaeus mana</i>	Nalo meli maoli	Endangered	None
Hawaiian hoary bat	<i>Lasiurus cinereus semotus</i>	'Ōpe'ape'a	Endangered	None
Newell's shearwater	<i>Puffinus auricularis newelli</i>	'A'o	Threatened	None
Hawaiian coot	<i>Fulica americana alai</i>	'Alae kea	Endangered	None
Hawaiian duck	<i>Anas wyvilliana</i>	Koloa	Endangered	None
Hawaiian gallinule (moorhen)	<i>Gallinula chloropus sandvicensis</i>	'Alae 'ula	Endangered	None
Hawaiian stilt	<i>Himantopus mexicanus knudseni</i>	Ae'o	Endangered	None
Hawaiian goose	<i>Branta (=Nesochen) Sandvicensis</i>	Nēnē	Endangered	None
Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	Honu 'ea	Endangered	None [®]
Green sea turtle (central north pacific distinct population segment)	<i>Chelonia mydas</i>	Honu	Threatened	None ^{®^}
Hawaiian monk seal*	<i>Neomonachus schauinslandi</i>	'Ilio-holo-i-ka-uaua or Na mea hulu	Endangered	Yes
False killer whale (main Hawaiian island insular)*	<i>Pseudorca crassidens</i>	None	Endangered	None

* Species is also protected under the Marine Mammal Protection Act.

[®] Critical habitat for the hawksbill sea turtle and green sea turtle has been designated in the Caribbean. No critical habitat for these species has been designated in Hawai'i. See 63 Fed. Reg. 46693.

[^] Critical habitat for the green sea turtle Central North Pacific distinct population segment is under consideration for future rulemaking. See 81 Fed. Reg. 20058.

Hawaiian yellow-faced bees, Nalo meli maoli (*Hylaeus* spp.)

In September 2015 (80 FR 58819), seven species of yellow-faced bees (*Hylaeus* spp.) were proposed for listing as endangered under the Endangered Species Act. All but one of these seven species is found on O'ahu. *H. hilaris* is only found on Moloka'i and is historically known from Maui and Lāna'i. This species will not be considered further in this analysis. In September 2016 (81 FR 67786), the six species of yellow-faced bees found on O'ahu were listed as endangered under the ESA. These species are found within habitat types that are included within the project area. According to the U.S. Fish and Wildlife ecosystem classification scheme, these six species occur in either coastal ecosystems or lowland Mesic ecosystems (a variety of grasslands, forests, and shrublands generally found below 3,300 ft. in elevation and receives between 50 and 75 in. of precipitation annually) (80 FR 58819).

Hawaiian hoary bat, 'Ōpe'ape'a (*Lasiurus cinereus semotus*)

The Hawaiian hoary bat or 'ope'ape'a (*Lasiurus cinereus semotus*) can be found in several different habitat types, using forested areas for roosting and foraging over open areas adjacent to forests or over open water. Habitat requirements for roosting and breeding are unknown; bats are most frequently observed in association with non-native vegetation, not native vegetation (USFWS 1998), such as coconut palms (*Cocos nucifera*) and pandanus trees (*Pandanus tectorius*) (Hawai'i Department of Land and Natural Resources 2005), both of which are found within the project area. In the He'eia estuary, invasive mangrove areas within wetlands and along the He'eia Fishpond wall provide potential roosting habitat for the Hawaiian hoary bat. Open areas above the fishpond and wetlands are potential foraging areas for this species. Critical habitat has not been designated for this species.

Newell's Shearwater, 'A'o (*Puffinus auricularis newelli*)

Like several other Hawaiian seabirds, Newell's shearwater nest in mountainous areas and feed out to sea in open water. Although historically found on all major Hawaiian Islands (USFWS 1983), the most recent U.S. Fish and Wildlife Status Review (USFWS 2011a) of this species does not document any presence of this species on O'ahu. Fledging and adult birds traverse portions of the islands to reach their nesting and feeding grounds. Within the project area of the proposed action, Newell's shearwaters may traverse this area during breeding season (between September 15 and December 15). Major threats to this threatened species include predation by introduced mammalian species (e.g., rats and feral cats) and light pollution, which affect the bird's nocturnal flight navigation.

Hawaiian Waterbirds

Hawaiian coot, 'Alae kea (*Fulica americana alai*)

Hawaiian duck, Koloa (*Anas wyvilliana*)

Hawaiian gallinule (moorhen),

'Alae 'ula (*Gallinula chloropus sandvicensis*)

Hawaiian stilt, Ae'o (*Himantopus mexicanus knudseni*)

Of the vegetated habitats in the project area, the wetlands offer the greatest potential to support or attract special-status species. Biannual waterbird counts conducted at He'eia marsh confirm that the site is used by the Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian moorhen (*Gallinula chloropus sandvicensis*), Hawaiian coot (*Fulica americana alai*), and Hawaiian duck (*Anas wyvilliana*).

¹³ The federally-endangered chaff flower or 'ahinahina (*Achyranthes splendens* var. *rotunda*) has been reported as cultivated in the residential neighborhood near the fishpond (Hawai'i Office of Planning 2015). The provenance of these individuals could not be determined and, therefore, the same protection status afforded under the Endangered Species to wild plants is not conferred to these cultivated plants (Hawai'i Administrative Rule Section 13-107-7). No further consideration or analysis to 'ahinahina as an endangered species is included for this environmental assessment.

¹⁴ List of species based upon review of draft management plan (Hawai'i Office of Planning 2016) and gap analysis (Hawai'i Office of Planning 2015a), field observations, and technical assistance from USFWS Pacific Islands Fish and Wildlife Office and NOAA National Marine Fisheries Service Office of Protected Resources and NOAA National Marine Fisheries Service Pacific Islands Fisheries Science Center in June 2016

Critical habitat has not been designated for any of the listed waterbird species, and the He'eia marsh was not identified as one of the "core" wetlands in the most recent recovery plan for endangered Hawaiian waterbirds. However, He'eia marsh was identified as a "supporting" wetland (USFWS 2011). The USFWS recovery plan describes He'eia as a site that historically had value as a complex of tidal marshes and open-water areas, but which has been substantially modified and presently consists of non-native mangroves, remnants of ponds, and wet pasture. The recovery plan recommends that He'eia be restored and managed by the State to provide enhanced habitat for endangered waterbirds.

Hawaiian goose, Nēnē (*Branta (=Nesochen) sandvicensis*)

The Hawaiian goose or nēnē is known to occur on the Islands of Kaua'i, Maui, Moloka'i, and Hawai'i. Although nēnē are not known to occur on O'ahu, habitat types found within the project area of the proposed action are suitable for this endangered species. Non-native grasslands, such as those found in the He'eia HCDA parcel, are potentially a suitable habitat for nēnē. Recovery objectives in the draft revised recovery plan for nēnē include the restoration and maintenance of self-sustaining populations on Kaua'i, Maui Nui (Maui, Moloka'i, Lāna'i, and Kaho'olawe), and the Island of Hawai'i (See 69 Fed. Reg. 57356).

Sea Turtles

Hawksbill sea turtle, Honu 'ea (*Eretmochelys imbricate*)

Green sea turtle, Honu (*Chelonia mydas*)

Hawksbill sea turtles utilize the coral reef habitats within Kāne'ōhe Bay for foraging, where they primarily feed on sponges, invertebrates (crabs), and algae. Within the Hawaiian Islands, hawksbill sea turtles nest primarily on the Island of Hawai'i, but a few females nest on the beaches of Maui and Moloka'i and possibly O'ahu¹⁵. This species of turtle is threatened by habitat loss (beach erosion and coastal construction), tourism development, and nest predation (NOAA and USFWS 1998). NOAA NMFS reports that the Hawai'i population of hawksbill sea turtles is isolated from all other hawksbills in the Pacific Ocean (NOAA 2016b).

Green sea turtles live in nearshore coastal habitats throughout Hawai'i. Most of their time is spent at depths less than 100 feet, but they can dive to depths of over 500 feet when migrating. During the breeding season, males and females swim 500–800 miles from their feeding grounds in the main Hawaiian Islands to their nesting beaches, primarily at French Frigate Shoals, in the Northwest Hawaiian Islands (NOAA 2016b).

The green sea turtle is present year-round in the waters of Kāne'ōhe Bay, including the marine environments of the proposed He'eia NERR (Hawai'i Office of Planning, 2015). No critical habitat in the Hawaiian Islands has been designated by the USFWS for this species in Hawai'i. However, critical habitat for the green sea turtle Central North Pacific distinct population segment is under consideration for future rulemaking. See 81 Fed. Reg. 20058.

Hawaiian monk seal, 'Ilio-holo-i-ka-uaua, or

Na mea hulu (*Neomonachus schauinslandi*)

Hawaiian monk seals may travel through Kāne'ōhe Bay or utilize portions of Kāne'ōhe Bay for foraging, using bottom habitats to flush or pin their prey. However, this species is not documented as present in Kāne'ōhe Bay

according to HIMB's Kāne'ōhe Bay Taxonomic Information List (HIMB 2016). Most foraging occurs at depths less than 200 meters, which encompasses the entirety of Kāne'ōhe Bay. Hawaiian monk seals use terrestrial areas with adjacent shallow, sheltered aquatic areas for pupping and nursing and use additional terrestrial areas for hauling out, resting, and molting.

Within the Kāne'ōhe Bay area, Hawaiian monk seals have been observed on the ocean side beaches of the Mōkapu peninsula at Marine Core Base Hawai'i (MCBH 2016). Critical habitat for the Hawaiian monk seal was recently revised (effective September 21, 2015), expanding the previous designation in the Northwestern Hawaiian Islands and identifying new key beach areas and marine-foraging areas in the main Hawaiian Islands.

See 80 Fed. Reg. 50925 for additional information on critical habitat for Hawaiian monk seals. (Figures 5.8 and 5.9). The project area does not contain terrestrial habitat or key beach areas for the monk seal; however, the marine component of the proposed He'eia NERR site does include marine critical habitat. Hawaiian monk seal marine critical habitat extends from the shoreline out to the 200 meter depth contour, but only includes the seafloor and marine habitat that extends 10 meters in height from the sea floor.

False killer whale (*Pseudorca crassidens*), Main Hawaiian Island Insular Stock

Of the three stocks¹⁶ of false killer whale found within the Hawaiian Islands, the main Hawaiian Island insular stock has the potential to occur within Kāne'ōhe Bay. This stock has been declining over the past two decades (Reeves et al. 2009, Baird 2009). The main Hawaiian Island stock is a distinct population from other false killer whales based on the uniqueness of their behavior related to habitat use patterns and their existence in a unique ecological setting (Oleson et al. 2010). Additionally, the Hawaiian insular false killer whale is distinguishable from other false killer whales based on significant difference in DNA (Oleson et al. 2010). The main Hawaiian Island insular stock is the only stock listed as a Distinct Population Segment under the ESA. Significant risks to this population include modification of habitat, overfishing and prey reduction, and risks inherent to small populations. NMFS indicates that occurrence information for this species within the Kāne'ōhe Bay region are lacking.

¹⁵ U.S. Fish and Wildlife Service Pacific Islands Fish and Wildlife Office notes that nesting occurs on O'ahu (<https://www.fws.gov/pacificislands/fauna/hawksbillturtle.html>) but NOAA National Marine Fisheries Service Pacific Islands Regional Office does not identify O'ahu has a nesting site for hawksbill sea turtles http://www.fpir.noaa.gov/PRD/prd_hawksbill.html

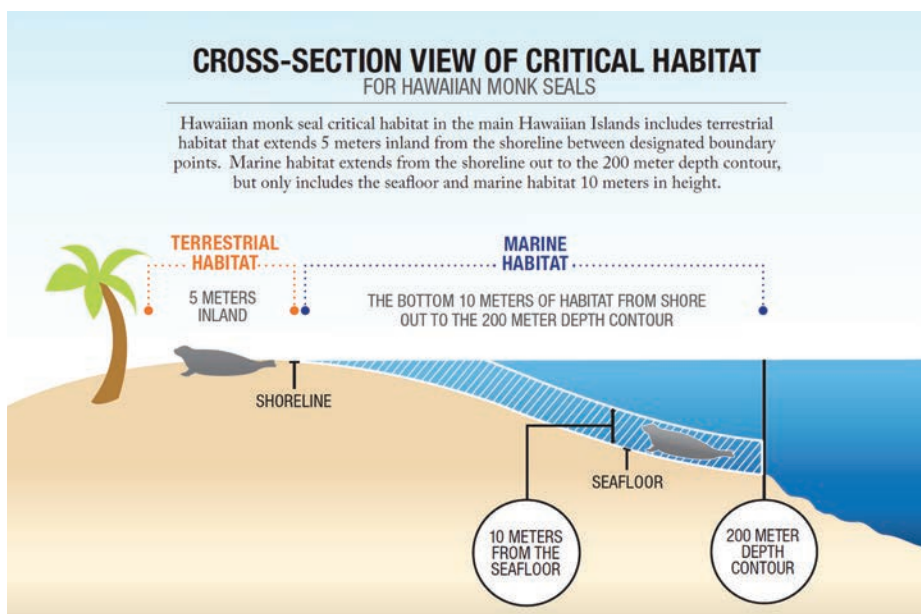


Figure 5.8. Cross-section of Hawaiian monk seal critical habitat (from National Marine Fisheries Service)

¹⁶ The Marine Mammal Protection Act defines stock as a group of marine mammals of the same species or smaller taxa, in a common spatial arrangement, that interbreed when mature. (16 U.S.C. 1362(11))

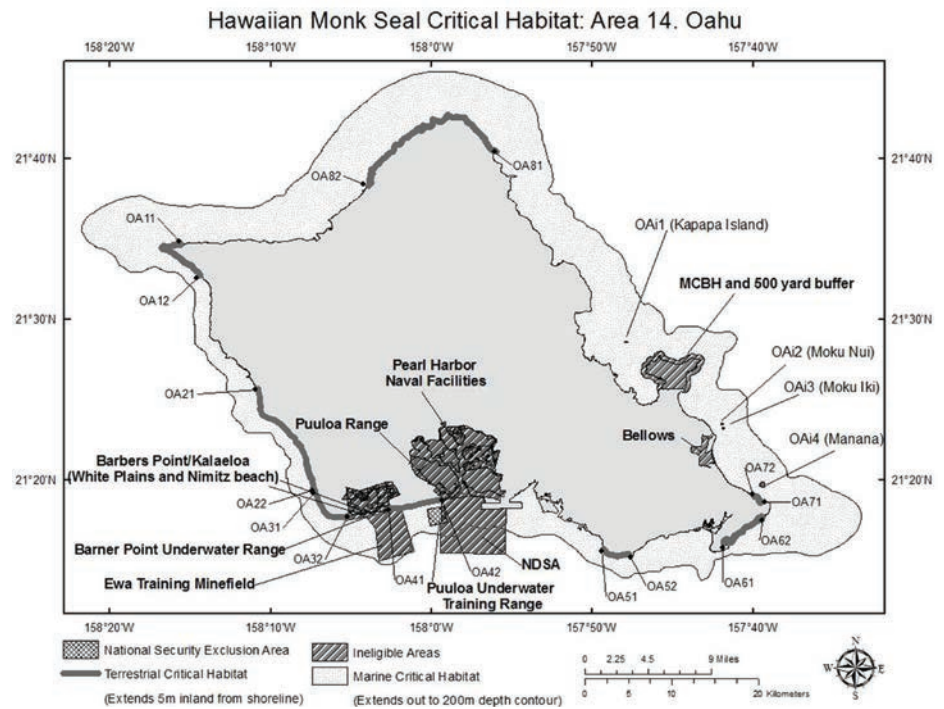


Figure 5.9. Hawaiian monk seal critical habitat in O’ahu (80 Fed. Reg. 50925)

Candidate and proposed species for listing under the Endangered Species Act¹⁷

There are two candidate species whose range includes the Hawaiian Islands: two species of manta ray (giant manta ray, *Manta alfredi*, and reef manta ray, *M. birostris*). Neither of these species is documented as present in Kāne’ohe Bay according to HIMB’s Kāne’ohe Bay Taxonomic Information List (HIMB 2016). However, these species are known to occur in the Hawaiian Islands.

There is one species proposed for listing under the ESA, which could be found within the windward side of O’ahu. Since the publication of the DEIS, the U.S. Fish and Wildlife Service announced a 12-month finding on a petition to list the ‘i’iwi (*Drepanis coccinea*) as a threatened species under the Endangered Species Act and found the listing of the ‘i’iwi as a threatened species under the Act is warranted (81 FR 64414). The ‘i’iwi is a bird species native to the Hawaiian Islands and was once widespread across the major Hawaiian Islands, including O’ahu (Banko 1981), and could have been found in habitat similar to that which was found within the uplands of the project area. In recent decades, only a few individuals have been sporadically detected on O’ahu. Currently, the species is restricted to elevations above which the transmission of avian malaria readily occurs. Such habitat is not found within the project area.

Table 5.11 lists both the candidate and proposed species for listing under the Endangered Species Act that could be found within the project area.

Table 5.11. List of candidate species and species proposed for listing found within or near the boundary of the proposed He’eia National Estuarine Research Reserve project area which are under consideration for listing under the Endangered Species Act

COMMON NAME	SCIENTIFIC NAME	HAWAIIAN NAME	STATUS	FEDERAL REGISTER NOTICE
Giant manta ray	<i>Manta birostris</i>	Hāhālua	Candidate for listing	81 Fed. Reg. 8874
Reef manta ray	<i>Manta alfredi</i>	Hāhālua	Candidate for listing	81 Fed. Reg. 8874
‘I’iwi	<i>Drepanis coccinea</i>	‘I’iwi	Proposed threatened	81 FR 64414

Fifteen species of Indo-Pacific corals were designated as threatened or endangered under the Endangered Species Act in 2014. See 79 Fed. Reg. 53851. This was part of a larger consideration for species proposed for listing that included coral species which are found within the Hawaiian Islands. However, none of the 15 designated species are known to occur in the Hawaiian Islands. An additional three foreign species of Indo-Pacific corals were designated in 2015, none of which occur in Hawai'i. See 80 Fed. Reg. 60560.

5.1.3.3.2 SPECIES OF CONCERN UNDER THE ENDANGERED SPECIES ACT

There are two National Marine Fisheries Service-identified Species of Concern present in the marine component of the proposed reserve: Hawaiian reef coral (*Montipora dilatata*) and inarticulated brachiopod (*Lingula reevii*) (Table 5.12). Species of Concern¹⁸ are “those species about which there are some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the Endangered Species Act. Species of Concern status does not carry any procedural or substantive protections under the ESA but draws proactive attention and conservation action to these species.” NMFS identifies several benefits to identifying Species of Concern. These include:

- Identifies species potentially at risk,
- Identifies data deficiencies and uncertainties in species’ status and threats,
- Increases public awareness about those species,
- Stimulates cooperative research efforts to obtain the information necessary to evaluate species status and threats, and
- Fosters voluntary efforts to conserve the species before listing becomes warranted.

The designation of a species as a Species of Concern does not carry any procedural or substantive protections under the ESA.

¹⁷List of candidate and proposed species developed based on technical assistance with U.S. Fish and Wildlife Service Pacific Islands Fish and Wildlife Office and NOAA National Marine Fisheries Service Office of Protected Resources and NOAA National Marine Fisheries Service Pacific Islands Fisheries Science Center (June 2016).

¹⁸For more information on Species of Concern, visit the National Marine Fisheries Service website at <http://www.nmfs.noaa.gov/pr/species/concern/>

Table 5.12. NOAA NMFS-designated Species of Concern found within or near the boundary of the proposed He’eia National Estuarine Research Reserve project area

COMMON NAME	SCIENTIFIC NAME	STATUS
Hawaiian reef coral	<i>Montipora dilatata</i>	Not warranted for listing under Endangered Species Act 79 Fed. Reg. 53852
Inarticulated brachiopod	<i>Lingula reevii</i>	Not formally evaluated for listing

5.1.3.3.3 OTHER MARINE MAMMALS

All marine mammals are protected under the federal Marine Mammal Protection Act (16 U.S.C. §§ 1361 – 1423h). For additional information on the Marine Mammal Protection Act (MMPA) and its relevancy to the proposed action, see Chapter 7. In addition to the marine mammals considered under the Endangered Species Act (Hawaiian monk seal and false killer whale), there are eight additional species of marine mammals that could be found in Kāneʻohe Bay and the proposed project area¹⁹, but which are not protected under the Endangered Species Act (Table 5.13).

It is likely that some species (e.g. Pacific bottlenose dolphin and spinner dolphin) may be present in the project area due to the availability of preferred habitat or food sources (e.g., shallow inshore waters). For other marine mammal species, it is unlikely that they would be present within the project area or immediate region given the lack of suitable habitat (i.e., deep water areas). None of these cetacean species are documented as present in Kāneʻohe Bay according to HIMB’s Kāneʻohe Bay Taxonomic Information List (HIMB 2016). However, that list is not comprehensive. Regardless of presence or absence within the immediate project area, all marine mammals listed in Table 5.13 will be considered as part of the affected environment as they could be present or the activities taking place under the proposed action could affect marine mammal species beyond the project area or Kāneʻohe Bay

Table 5.13. Marine mammals found within or near the boundary of the proposed Heʻeia National Estuarine Research Reserve project area that are not listed under the Endangered Species Act

COMMON NAME	SCIENTIFIC NAME	HAWAIIAN NAME
Humpback whale (Hawaiʻi distinct population segment)	<i>Megaptera novaeangliae</i>	Koholā
Pacific bottlenose dolphin	<i>Tursiops truncatus truncatus</i>	Naiʻa
Spinner dolphin	<i>Stenella longirostris longirostris</i>	Naiʻa
Striped dolphin	<i>Stenella coeruleoalba</i>	
Rough-toothed dolphin	<i>Steno bredanensis</i>	
Melon-headed whale	<i>Peponocephala electra</i>	
Pygmy killer whale	<i>Feresa attenuata</i>	
Short-finned pilot whale	<i>Globicephala macrorhynchus</i>	

Humpback whale (Hawaiʻi Distinct Population Segment), Koholā (*Megaptera novaeangliae*)

The Hawaiʻi Distinct Population Segment of the humpback whale was listed as threatened under the ESA until September 2016 when NMFS announced a change in status designation for the species not listed (81 FR 62260). Four DPSs maintain a threatened or endangered status, but the Hawaiʻi DPS does not have a designation under ESA. The Hawaiian population has been determined to be discrete based on significant genetic differentiation from other populations within the North Pacific and evidence of low rates of movement among breeding areas in the North Pacific (Bettridge et al. 2015). In 2015, NMFS announced that the Hawaiian Distinct Population Segment was under review for de-listing. See 80 FR 22303. Based on a NMFS status review, NMFS concluded that the Hawaiʻi DMS is not at risk for extinction with high certainty (Bettridge et al. 2015).

The humpback whale is known to be present on the seaward side of the Mokapu Peninsula, which separates the marine portion of the project area of the proposed action within Kāneʻohe Bay from the open ocean. Through their Sanctuary Ocean Count project, the Hawaiʻi Humpback Whale National Marine Sanctuary engages the public to conduct whale counts during peak whale season (January through March) each year on Oʻahu, Hawaiʻi, and Kauaʻi. Two monitoring sights are at either end of Kāneʻohe Bay: Kualoa Ranch (near Chinaman’s Hat) at the northwest end of Kāneʻohe Bay and Pyramid Rock on the ocean side of Marine Corps Base Hawaiʻi on the Mokapu Peninsula at the southeast end of Kāneʻohe Bay. The results of the counts of the Sanctuary’s project are evidence that humpback whales are utilizing the open ocean environment adjacent to Kāneʻohe Bay (NOAA 2016c). However, there are no survey points within Kāneʻohe Bay, so this survey project cannot determine whether the interior of Kāneʻohe Bay is utilized by this species. Kāneʻohe Bay is relatively shallow, with a mean depth of 10m (33 feet) (Jokiel 1991). Although humpback whales utilize deeper water habitats, humpback whale cows and newborn calves are known to use shallow water, presumably to separate them from mating activity and harassment of males, more turbulent offshore conditions, and predators (Darling 2001). While humpback whales could use the shallower marine habitats of Kāneʻohe Bay, Kāneʻohe Bay has not been identified as a biologically important area (see data summarized in Chapter 6). Regardless, an analysis of the actions that may occur within the project area under the proposed action should consider the potential effects to humpback whale in or near Kāneʻohe Bay.

Pacific bottlenose dolphin, Nai’a (*Tursiops truncatus truncatus*)

Within the Hawaiian Islands, Pacific bottlenose dolphins are found in shallow inshore waters, such as those within Kāneʻohe Bay, and deeper water. As reported in a stock assessment conducted by NOAA NMFS, there is limited movement of bottlenose dolphins between islands and offshore waters, suggesting the existence of demographically distinct resident populations, including one population designated as an Oʻahu stock. Threats to Pacific bottlenose dolphins include mortality from fishing gear and they are known to steal bait and catch from sport and commercial fisheries (NMFS 2014a).

Spinner dolphin, Nai’a (*Stenella longirostris longirostris*)

Spinner dolphins use sheltered bays as rest areas during the day. Although not recorded from Kāneʻohe Bay, the day-time habitat used by spinner dolphins is present within Kāneʻohe Bay, but not within the project area of the proposed action. A stock assessment by NOAA NMFS identifies six distinct stocks of spinner dolphin within the Hawaiian Islands, which include an Oʻahu/4-islands²⁰ stock. For the Oʻahu/4-islands stock, there are increasing concerns of potential effect of swim-with-dolphin programs and other tourism activities (NOAA 2012).

Striped dolphin (*Stenella coeruleoalba*)

Striped dolphins are unlikely to occur within the project area of the proposed action though may be found in the open ocean areas adjacent to Kāneʻohe Bay (NOAA 2014f). Foraging zones for this species are pelagic to benthopelagic zones, to depths as deep as 200–700m, in continental slope or oceanic regions (Hammond et al. 2008). These habitat types do not occur within the project area.

¹⁹Based on technical assistance from NOAA National Marine Fisheries Service Office of Protected Resources and Pacific Islands Fisheries Science Center (June 2016 and July 2016).

²⁰4-islands refers to the four major islands that constitute Maui Nui (or Greater Maui): Maui, Molokaʻi, Lānaʻi, and Kahoʻolawe

²¹ Discussion is based on draft Fishery Ecosystem Plan for the Hawai'i Archipelago, Western Pacific Regional Fishery Management Council (2016). This section will be updated based on a finalized version of that document if or when such document becomes available.

²² The Pelagic and Hawai'i Archipelago FEPs are available via the Western Pacific Regional Fishery Management Council website. See <http://www.wpcouncil.org/fishery-plans-policies-reports/>

Rough-toothed dolphin (*Steno bredanensis*)

Rough-toothed dolphins prefer deep water areas of tropical and warmer temperate areas where their prey of squid and fish are concentrated. This habitat type is not found within the project area nor within Kāne'ōhe Bay, although suitable habitat may be found off the windward coast of O'ahu. The NMFS stock assessment of this species (NOAA 2014d) considers this species as a single stock within the Hawaiian Islands although there are scientific studies that suggest there may be at least two stocks within the main Hawaiian Islands. Threats to this stock include mortality or serious injury from interaction with sport and commercial fisheries and infection from the bacteria *Brucella* and virus *Morbillivirus*.

Melon-headed whale (*Peponocephala electra*)

Melon-headed whales are found in moderately deep water where their prey (fish, squid, and some crustaceans) are found, foraging near cold and warm-core eddies (Woodworth et al. 2012). Within the Hawaiian Islands, satellite telemetry data showed distant offshore movements for this stock, nearly to the edge of the U.S. Exclusive Economic Zone (NOAA 2014). NOAA NMFS stock assessment (2014b) reports sightings for melon-headed whales along the leeward (west) coast of O'ahu, with no observations on the windward (east) coast. Active sonar, seismic operations, and other loud underwater sounds are increasing concerns for melon-headed whales (Southall et al. 2006).

Pygmy killer whale (*Feresa attenuata*)

Pygmy killer whales in Hawai'i are found in deep water, generally within 20km of shore (Baird et al. 2011) and are rarely encountered during nearshore surveys (Baird et al. 2013). NOAA NMFS stock assessment identifies one stock in Hawai'i, which is resident to the main Hawaiian Islands (NOAA 2014c). Active sonar, seismic operations, and other loud underwater sounds are increasing concerns for pygmy killer whales (Brownell Jr et al. 2009).

Short-finned pilot whale (*Globicephala macrorhynchus*)

Short-finned pilot whales are generally found offshore in moderately deep water in areas with high densities of squid. Photo-identification and telemetry studies suggest that there may be inshore and pelagic populations of short-finned pilot whales in Hawai'i (NOAA 2014e). NOAA NMFS stock assessment identifies commercial longline fisheries as a source of incidental mortality and serious injury for the short-finned pilot whale (NOAA 2014e).

5.1.3.3.1.1 ESSENTIAL FISH HABITAT²¹

Under the Magnuson-Stevens Fishery Conservation and Management Act, Fishery Management Councils identify Essential Fish Habitat for marine and anadromous species, as defined in 16 U.S.C. § 1855(b). See Chapter 7 of this document for additional discussion on the Magnuson-Stevens Fishery Conservation and Management Act and its relevance to the proposed action.

Essential Fish Habitat (EFH) includes all waters and substrate necessary for fish for spawning, breeding, feeding, or growth to maturity. Pursuant to the act, the marine water column and seafloor in and surrounding the project area of the proposed action have been designated as EFH, which supports various life stages of management unit species (MUS) identified in the Western Pacific Regional Fishery Management Council's Pelagic and Hawai'i Archipelago Fishery Ecosystem Plans.²²

In particular, Kāneʻohe Bay has been designated as part of the EFH for Hawaiʻi Bottomfish (Figure 5.10), Hawaiʻi Coral Reef Ecosystems (Figure 5.11), Hawaiʻi Crustacean Fishery (Figure 5.12), and the Hawaiʻi Pelagic Group. The MUS and life stages found in these waters include eggs, larvae, juveniles and adults of Coral Reef Ecosystem MUS (CRE-MUS); eggs, larvae, juveniles and adults of Bottomfish MUS (BMUS); eggs, larvae, juveniles and adults of Crustacean MUS (CMUS); and eggs, larvae, juveniles, and adults of Pelagic MUS (PMUS). Habitat areas of particular concern are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation. The Habitat Area of Particular Concern (HAPC) designation does not confer additional protection or restrictions upon an area, but can help prioritize conservation efforts. Kāneʻohe Bay has also been designated a HAPC for coral reef ecosystems. In February 2016, the Western Pacific Fishery Management Council announced that its proposed Amendment 4 to the Fishery Ecosystem Plan for Fisheries of the Hawaiian Archipelago would also designate Kāneʻohe Bay as Habitat Area of Particular Concern for Bottomfish. See 81 Fed. Reg. 7494. The proposal has not yet gone into effect. No HAPC has been designated in Kāneʻohe Bay under either Hawaiʻi Crustacean or Hawaiʻi Pelagic FEPs.

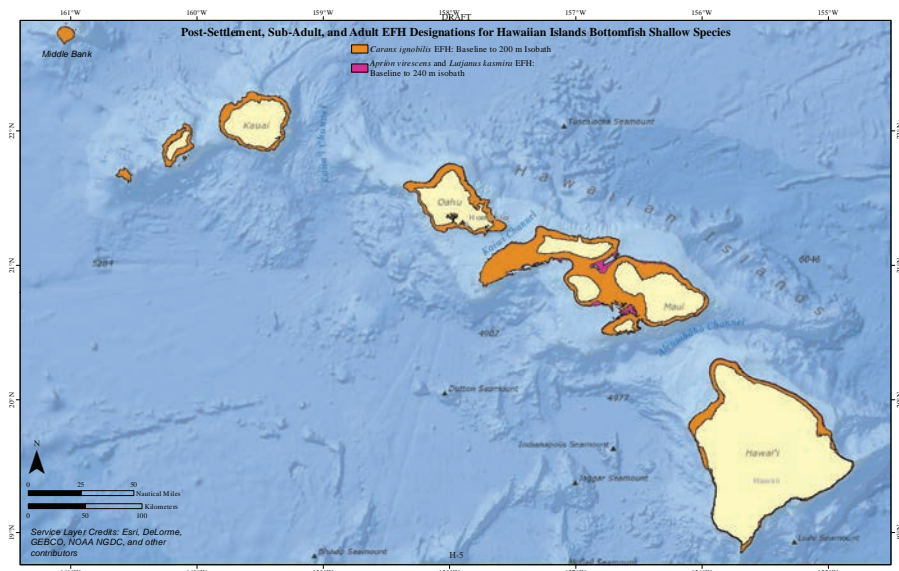


Figure 5.10. Hawaiian Archipelago Fishery Ecosystem Plan for Hawaiian Islands Bottomfish Shallow Species (from draft Fishery Ecosystem Plan for the Hawaiʻi Archipelago, Western Pacific Regional Fishery Management Council, 2016)

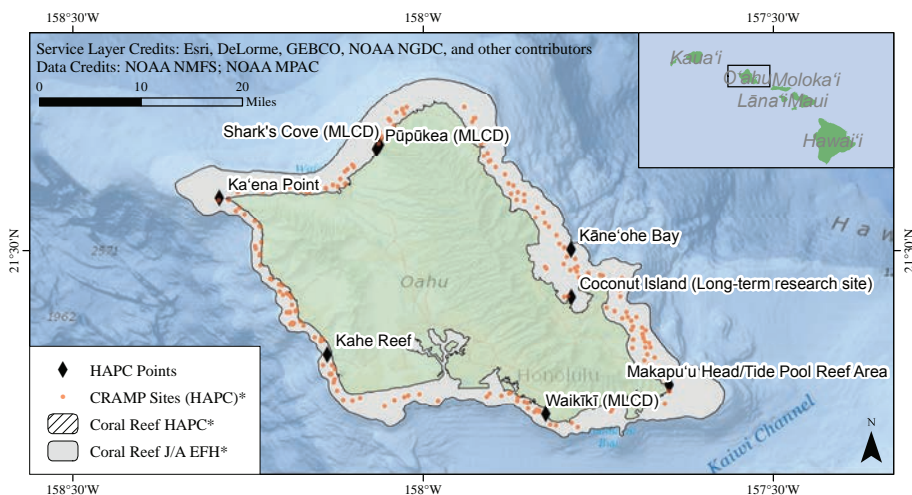
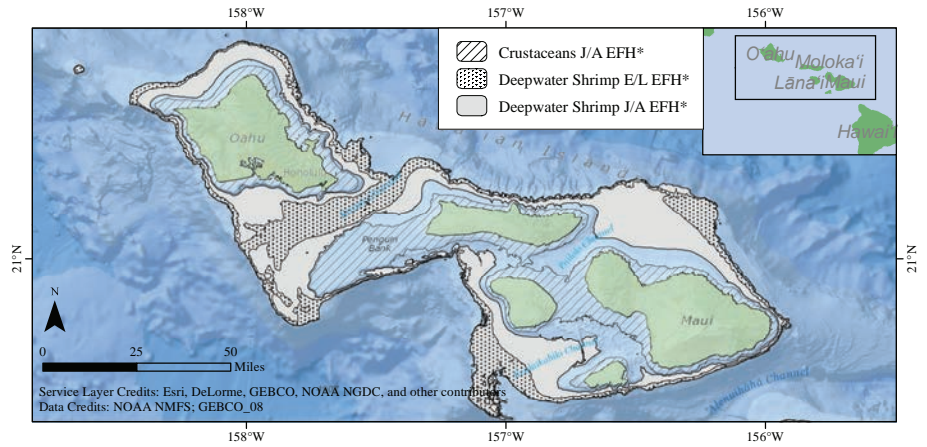


Figure 5.11. Hawaiian Archipelago Fishery Ecosystem Plan, Coral Reef Essential Fish Habitat: Oʻahu (from draft Fishery Ecosystem Plan for the Hawaiʻi Archipelago, Western Pacific Regional Fishery Management Council, 2016)

*The geographic extent of juvenile/adult (J/A) EFH is shown. EFH for eggs and larvae is the water column to a depth of 100 m from the shoreline to the outer boundary of the EEZ, while J/A EFH is all bottom habitat and the adjacent water column to a depth of 100 m to the extent shown. The type of bottom habitat varies by family. HAPC in the MHI includes all CRAMP sites.

Figure 5.12. Hawaiian Archipelago Fishery Ecosystem Plan, Crustaceans Essential Fish Habitat: O’ahu to Maui Nui (from draft Fishery Ecosystem Plan for the Hawai’i Archipelago, Western Pacific Regional Fishery Management Council, 2016)



*The geographic extent of EFH is shown. EFH for crustaceans eggs and larvae (E/L) is the water column to a depth of 150 m from the shoreline to the outer boundary of the EEZ, while juvenile/adult (J/A) EFH is all bottom habitat to a depth of 100 m to the extent shown. HAPC is all banks in the NWHI with summits shallower than 30 m. Deepwater shrimp E/L EFH is the water column and outer reef slopes between 550 m and 700 m to the extent shown, while deepwater shrimp J/A EFH is the outer reef slopes between 300 and 700 meters to the extent shown.

5.1.3.3.1.1 MIGRATORY BIRDS

A number of migratory birds have been recorded as visiting the study area. The USFWS has statutory authority and responsibility for enforcing the Migratory Bird Treaty Act. Chapter 7 describes in more detail the Migratory Bird Treaty Act and its relevancy to the proposed action. Numerous species protected under the act may be found within the project area and these species will be considered collectively for the impact analysis.

Several migratory birds could potentially be found in the project area (Table 5.14). According to USFWS Information for Planning and Conservation (IPaC) report, there are eight migratory birds that could potentially be found in the affected environment.

Two of these species have been documented by HIMB as found within Kāne’ohe Bay and its adjacent watersheds, the Laysan albatross and the black-footed albatross (HIMB 2016).

However, the majority of black-footed albatross nest in the Northwest Hawaiian Islands; they are not reported as nesting on O’ahu, although O’ahu is within their range. In 2011, USFWS found that the black-footed albatross did not warrant listing under the ESA. See 76 Fed. Reg. 62504. The Laysan albatross attempts to nest in a few parts of O’ahu, including at MCBH Kāne’ohe

Table 5.14. List of bird species protected under the Migratory Bird Treaty Act that have the potential to be found within or near the boundary of the proposed He’eia National Estuarine Research Reserve project area

COMMON NAME	SCIENTIFIC NAME	HABITAT	SEASON/ACTIVITY
‘Apapane	<i>Himatione sanguinea</i>	On land	Year-round
Bar-tailed godwit	<i>Limosa lapponica</i>	At sea	Migration
Black-footed albatross	<i>Phoebastria nigripes</i>	At sea	Migration
Christmas shearwater	<i>Puffinus nativitatis</i>	On land	Breeding
Laysan albatross	<i>Phoebastria immutabilis</i>	On land	Breeding, wintering
Tahiti petrel	<i>Pseudobulweria rostrata</i>	On land	Wintering
Tristram’s storm-petrel	<i>Oceanodroma tristrami</i>	On land	Wintering
Whimbrel	<i>Numenius phaeopus</i>	On land	Wintering

Bay, the island of Moku Manu (which means bird island and is approximately 2km from the Mōkapu peninsula), and four other sites. In fact, Laysan albatross still try to nest near an active runway at MCBH and, sometimes, in an active firing range. When this occurs, all adults and eggs are removed from MCBH to discourage nesting and reduce the chance of aircraft strikes (Young et al. 2009). It is possible that Laysan albatross that nest at Moku Manu forage in Kāneʻohe Bay.

Kāneʻohe Bay contains other areas that migratory birds might prefer over the areas within the study area, including uninhabited islands.²³ OCM compared the list of birds identified by USFWS to other available data sources about birds present in the project area. The Kāneʻohe Bay Information System lists two migratory birds identified by USFWS and numerous other seabirds as using the bay and its watersheds. Because the area that the information system covers is broad, the birds it lists do not necessarily use the areas that would be affected by the preferred alternative and alternatives A, B, or C. An environmental assessment for the Coconut Island Infrastructure Rehabilitation and Replacement Project summarized a bird survey conducted at HIMB in September 2013 and other data when it identified the following species as found on and adjacent to Moku o Loʻe:

- Wandering tattler (*Tringa incana*),
- Pacific golden plover (*Pluvialis fulva*),
- Great frigatebird (*Fregata minor*), and
- Black noddy (*Anous minutus*).

That report also noted the black noddy is known to forage in Kāneʻohe Bay, including in and along the nearshore waters of HIMB. All four of these birds are protected under the Migratory Bird Treaty Act. Another report, which summarizes the birds seen at Heʻeia Fishpond, also mentions the latter three birds and two native waterbirds as having been reported in the area around the fishpond: black-crowned night heron (*Nycticorax nycticorax*) and Hawaiian stilt (*Himantopus mexicanus knudseni*) (Helber Hastert and Fee Planners 2007). In short, while data on migratory birds potentially present in the study area vary, none mention migratory bird nesting within the study area, but they do confirm that some migratory birds sometimes visit the study area. Some migratory birds, on the other hand, are not anticipated to use the habitat within the study area. For example, the ʻapapane (*Himatione sanguinea*) is the most abundant and widely distributed Hawaiian honeycreeper. It is found in native forests dominated by ʻōhiʻa and koa trees, primarily at elevations greater than 300 meters (975 feet), which is a higher altitude than any of the land currently being considered for inclusion in the reserve.

²³ According to <https://sites.google.com/site/kbisathimb/biology/seabirds-shorebirds>, the bay contains three bird sanctuaries, an offshore island, and two wildlife refuges associated with the MCBH. Moku Manu is a seabird refuge, used by rare and native birds of numerous species as a nesting and breeding ground. Seabirds also nest on other islands within the bay, including Kapapa Island.

5.2 HUMAN ENVIRONMENT

5.2.1 ECONOMIC SETTING

5.2.1.1 POPULATION

Kāneʻohe experienced a major population increase between the years of 1940–1960; in that time period, it is estimated that the local population expanded from approximately 5,000 to 30,000 residents. By 1980, the population of Kāneʻohe had further increased to 47,000. More recently, by 2010, it had risen to roughly 54,000 individuals (Department of Business, Economic Development and Tourism 2013, Hawaiʻi Office of Planning 1992).

Concurrent with the population boom, many changes were occurring in and around Kāneʻohe Bay. Starting in 1918, the U.S. Navy constructed a military base on Mōkapu Peninsula (now known as the Marine Corps Base Hawaiʻi (MCBH)). The Navy dredged over 15 million cubic yards of reef from the bay to use as fill, used across approximately 280 acres of land. Corresponding with the population increase, urbanization began to affect the local environment. Eight of the nine streams that drain into Kāneʻohe Bay were altered in some fashion (e.g. diverted or channelized), mostly between 1960 and 1973. By 1993, it was estimated that some form of shoreline modification, including sea wall construction, harbor creation, dredging, fill, or fishpond creation or maintenance, had affected 58% of the bay shoreline. Approximately 14% of the total fringing reef had been dredged or filled, and 19 of the original 28 fishponds built by early Hawaiians were partially or completely destroyed to create more land for housing development (Hunter 1995).

Demographic characteristics of residents of the Kāneʻohe Zip Code Tabulated Area (ZCTA) are shown in Table 5.15, based on data from the American Community Survey (ACS) for 2009 through 2013. Comparing the demographic profiles of the ZCTA with those of the City and County of Honolulu as a whole illuminates distinctive qualities of the local population, such as:

- Kāneʻohe's age structure is a little older than that of the State as a whole, with a median age of 41.8 years old.
- Nearly 71% of residents are Hawaiʻi-born, a higher percentage than in the State as a whole.
- The ethnic mix of the population is similar to that across the State as a whole.

Table 5.15. Demographic characteristics for the State of Hawai'i and Kāne'ohe Zip Code Tabulated Area (ZCTA)
(data source American Community Survey for 2009 through 2013)

	STATE OF HAWAI'I	KĀNE'OHE
POPULATION		
Total Population	1,376,336	52, 509
Under 5 years	89,223	3,218
5 to 9 years	81,708	2,998
10 to 14 years	83,842	2,954
15 to 19 years	83,355	3,002
20 to 24 years	99,953	3,583
25 to 34 years	193,523	6,945
35 to 44 years	175,079	6,454
45 to 54 years	188,425	8,171
55 to 59 years	91,805	3,843
60 to 64 years	85,466	3,254
65 to 74 years	107,791	4,927
75 to 84 years	63,137	3,160
85 years and over	32,991	1,309
Median age (years)	38.3	41.8
RACE		
White	25.00%	21.6%
Black or African American	1.80%	0.8%
American Indian and Alaska Native	0.20%	0.3%
Asian	38.30%	36.2%
Native Hawaiian and Other Pacific Islander	9.80%	8.9%
Hispanic	9.30%	9.1%
Two or more races	23.80%	23.1%
PLACE OF BIRTH		
Hawai'i	54.50%	71.1%
Other state	24.70%	18.4%
US Island	2.90%	2.7%
Foreign born	17.90%	7.8%

5.2.1.2 EMPLOYMENT

The military maintains a large presence in the bay area due to the continued existence of the MCBH, located on Mōkapu Peninsula. Portions of the bay and Mōkapu Peninsula are used for military training and research activities; thus, public use (e.g., fishing and surfing) is restricted. The largest employer on the windward side of O'ahu is MCBH. MCBH's presence has a significant impact on individuals and businesses in the local community. In 2012, MCBH employed more than 14,000 military and civilian personnel. It is estimated that the spending by base employees and spending by base suppliers generated more than 2,280 jobs in local communities that surround the base. In all, base personnel generated an estimated \$1.1 billion in economic output retained within the neighboring communities (Marstel-Day 2014).

Another important community resource located in Kāne'ōhe Bay is the HIMB. HIMB is a world- renowned marine biology research institute. Programs at the facility are organized across five broad areas of research: coral physiology and ecology; behavior, physiology, and population dynamics of fish; marine endocrinology and aquaculture; marine mammal research; and environmental toxicology. Moku o Lo'e (Coconut Island) serves as an education center for undergraduate and graduate students from the University of Hawai'i, as well as other institutions. The facility also hosts approximately 4,000 primary and secondary students through field trips each year (Hawai'i Institute of Marine Biology).

Table 5.16 highlights the economic characteristics of the region. The median household income (\$85,608) in the Kāne'ōhe ZCTA is 127% higher than the state median. The unemployment rate in the Kāne'ōhe ZCTA 5.8%, which is 22% lower than the State-wide rate of 7.1%. Major industries in the Kāne'ōhe ZCTA area include retail, educational services, and public administration (Hawai'i Office of Planning 2016).

5.2.1.3 OCEAN ECONOMY

This section will provide a summary analysis of the ocean economy for He'eia and the neighboring communities. The information provided was created using NOAA's Digital Coast Economics: National Ocean Watch (ENOW) methodology. ENOW is a nationally consistent time series data that describes six economic sectors that depend on ocean resources:

- Living Resources,
- Marine Construction,
- Marine Transportation,
- Offshore Mineral Resources,
- Ship and Boat Building, and
- Tourism and Recreation.

This report uses 2014 Zip Code Business Pattern data produced by the U.S. Census Bureau (U.S. Census 2014). Although this dataset does not include self-employed workers, this report provides a general overview in a small and more localized scale of the ocean economics using ENOW framework and the Zip Code Business Patterns to derive ocean economic data for Kāne'ōhe zip code 96744 (Figure 5.13).

Table 5.16. Selected economic characteristics for the State of Hawai'i and Kāne'ohe Bay Zip Code Tabulated Area (ZCTA) (data source: U.S. Census)

	STATE OF HAWAI'I	KĀNE'OHE ZCTA 96744
EMPLOYMENT STATUS		
Population 16 years and over	1,104,534	43,953
In labor force	728,795	29,478
Civilian labor force	688,820	28,534
Percent unemployed	7.10%	5.80%
INDUSTRY		
Civilian employed population 16 years and over	640,072	26,878
Agriculture, forestry, fishing and hunting, and mining	1.50%	0.60%
Construction	7.00%	9.20%
Manufacturing	3.10%	2.90%
Wholesale trade	2.40%	2.50%
Retail trade	11.80%	10.20%
Transportation and warehousing, and utilities	5.80%	6.90%
Information	1.60%	1.90%
Finance, insurance, real estate, rental and leasing	6.50%	5.80%
Professional, scientific, and management	10.10%	9.90%
Educational services, health care and social assistance	20.90%	25.00%
Arts, entertainment, recreation, accommodation and food services	16.20%	9.40%
Other services, except public administration	4.50%	5.10%
Public administration	8.60%	10.60%
MEDIAN HOUSEHOLD INCOME (DOLLARS)	\$67,402	\$85,608



Figure 5.13. Boundary map of Kāne'ohe Bay zip code 96744

Data derived from 2014 Zip Code Business Pattern data, for zip code 96744, revealed nine ocean industries reported in the area (Table 5.17). The data includes number of establishment and total employment for these nine different industries reported to U.S. Census.

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Table 5.18 represents the distribution of the ocean economic activities in the shore adjacent to the zip code 96744 (Kāneʻohe). There are 109 business establishments, employing 1,886 people that are dependent on ocean resources. “Eating and Drinking” places are the most dominant industry, accounting for over 82.12% of the establishments, and 80.73% of the employment. The ocean economy in the shore adjacent to Kāneʻohe, including restaurants and tourism related activities, accounts for 4.47% or about 1 in 25 employees in the county.

Table 5.17. Ocean sectors and industries for zip code 96744

OCEAN SECTOR	OCEAN INDUSTRY
Marine Transportation	Other support activities for Water Transportation
Ship and Boat Building	Ship Building and Repair
Tourism and Recreation	<ul style="list-style-type: none"> • Boat Dealers • Eating and Drinking Places Marinas • Scenic Water Tours Sporting Goods • Amusement and Recreational Services • Zoos and Aquaria (Including recreational parks)

Table 5.18. Overview of the ocean economy in zip code 96744

OCEAN INDUSTRY	TOTAL BUSINESS ESTABLISHMENTS	BUSINESS ESTABLISHMENT AS A PERCENT OF TOTAL BUSINESS	TOTAL EMPLOYMENT	EMPLOYMENT AS A PERCENT OF TOTAL EMPLOYMENT
Amusement and Recreation Services	8	12.33%	233	7.34%
Boat Dealer	1	0.11%	2	0.92%
Eating and Drinking Places	88	82.12%	1,552	80.73%
Marinas	1	0.79%	15	0.92%
Marine Transportation Services	1	0.11%	2	0.92%
Scenic Water Tours	5	3.49%	66	4.59%
Ship Building and Repair	1	0.11%	2	0.92%
Sporting Goods	2	0.21%	4	1.83%
Zoos and Aquaria	2	0.74%	14	1.83%
OCEAN INDUSTRY TOTALS	109	100%	1,890	100%

5.2.2 NATURAL AND HISTORIC SETTING

5.2.2.1 CULTURAL HISTORY AND LAND USE

The ahupua'a of He'eia is located in the Moku (district) of Ko'olaupoko. The neighboring ahupua'a of Kahalu'u is located to the north and by Kāne'ohe in the south, and extends eastward across Kāne'ohe Bay to include the tip of the left lobe of Mōkapu Peninsula. Historically, He'eia sustained a dense human population based on a robust and flourishing agricultural and aquacultural community (Figure 5.14). Owing to the frequent rainfall, abundant water resources, and flatlands, the area also is known to have contained the most extensive early wetland agricultural complex on O'ahu (Cruz et al. 2012).

The early land division records indicate that the area included numerous shoreline fisheries and extensive lo'i kalo. Between 1840 and 1850, more than 60 land commission awards were issued for the area, reflecting the ability of the ahupua'a of He'eia to support a vibrant and self-sustaining community. He'eia is associated with wahi pana (sacred places), akua ki'i (guardians), demigods, and goddesses. Traditional accounts and several former and existing archaeological features, such as burial grounds and heiau, also indicate the cultural significance of the ahupua'a as a favored and important place during traditional Hawaiian times (Cruz et al. 2012).



Figure 5.14. Kāne'ohe circa 1880 (source Bishop Museum)

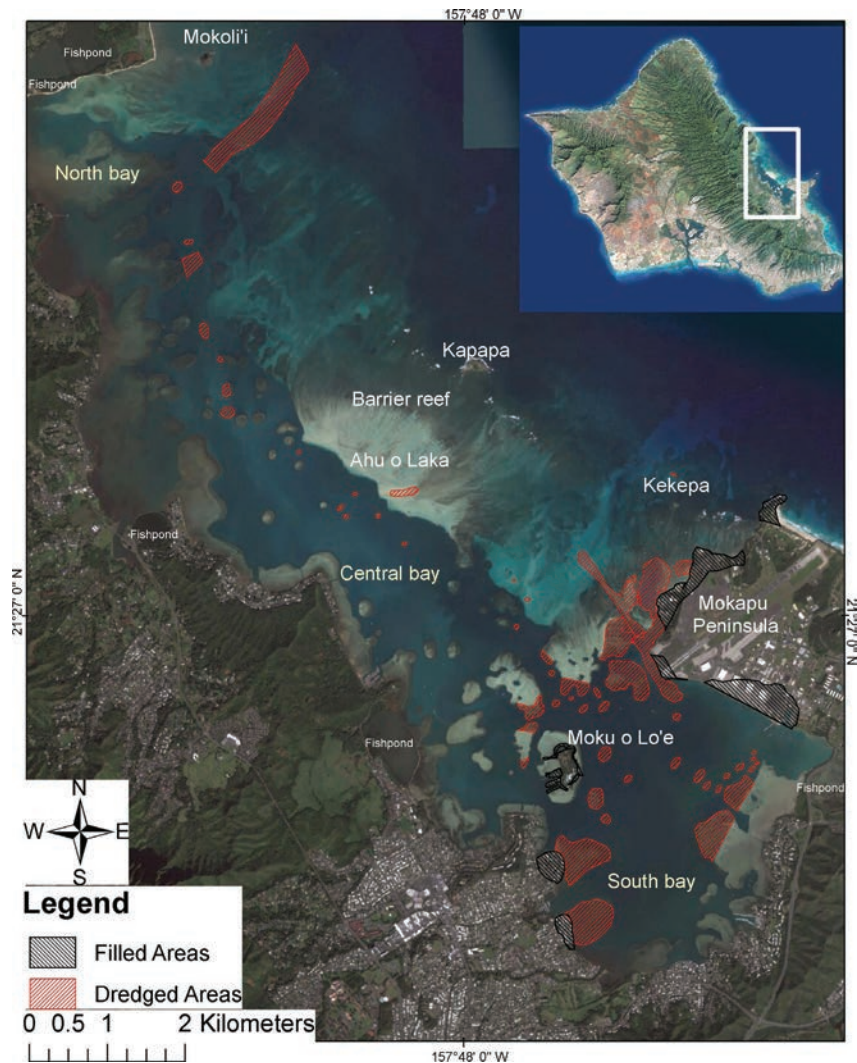
A shift in land use patterns throughout Kāne'ohe Bay began to occur in the 1880s to the 1920s; many of the abundant taro patches were converted to rice. Although abundant throughout the Kāne'ohe Bay, taro farming occurred in relatively small areas. In contrast, rice was cultivated in large plantations, necessitating the construction of large irrigation channels. By about 1910, rice farming had declined, making way for the pineapple industry. Where taro and rice were confined to the low flat lands, pineapple could be cultivated in steeper areas. As a result, the agriculture expanded into the upper slopes of Kāne'ohe Bay. By the 1920s, a majority of the pineapple industry had moved to central O'ahu. Thus, Kāne'ohe Bay's pineapple fields were converted to pasture or became uncultivated land (Hawai'i Office of Planning 1992).

From the 1920s to the 1950s, impacts such as dredging, sedimentation, and sewage discharge had profound effects on Kāne'ohe Bay's marine environment. Prior to 1930, the reefs of Kāne'ohe Bay were in excellent condition (Bahr et al. 2015). Around the time of the pineapple industry's

decline, there was an increase in military presence. In 1918, Fort Hase was established on Mōkapu peninsula (the current location of the MCBH), becoming one of O‘ahu’s oldest military bases. Between 1939–1945 extensive dredging occurred throughout the bay to support military activity. Bahr et al. (2015) estimate that during this period, 25 of the 79 patch reefs within Kāne‘ohe Bay experienced some degree of dredging, affecting 5% of the total patch reef area (Figure 5.15). Notable long-term impacts from the large scale dredging effort include significant changes to the depth and bathymetry of the bay, as well as extensive coral damage. An estimate of the total volume of dredged material removed from the bay was 11,616,300 m³, and surveys have revealed an average decrease of 1.7m in the depth of the bay between 1927 through 1969 (Bahr et al. 2015).

As noted previously, the rapid urbanization occurred in Kāne‘ohe Bay between 1940 and 1960. During this timeframe, increased sedimentation and sewage discharge further impacted the marine environment within Kāne‘ohe Bay. Estimates from 1970 state that 70% of sediment in the bay was derived internally (from dredging and breakdown of calcium carbonate materials) and 30% of the sedimentation came from terrestrial-based sources (Roy 1970). Bahr et al. (2015) note prior to 1963 the community within Kāne‘ohe largely used private septic tanks and cesspools, both of which the effluent of ended up in the bay. The net effect of the sewage effluent discharge into the bay included “decreased species diversity, increased eutrophication, and substantially altered ecosystem structure.” (Bahr et al. 2015)

Figure 5.15. Dredge and fill areas in Kāne‘ohe Bay (credit: Bahr et al. 2015)



5.2.2.2 HISTORIC AGRICULTURE

Taro was a staple in the diet of the early Hawaiians, and in Kāneʻohe Bay there was a significant amount of land dedicated to the cultivation of taro (Hawaiʻi Office of Planning, 1992). The environmental conditions that define Heʻeia, such as frequent rainfall, numerous streams, broad valleys and flatlands, all helped to establish the area as a productive agricultural region. A prominent natural feature in historic Heʻeia was a large wetland complex where taro was traditionally grown.

Taro remained the dominant crop through the 1870s; however, crop production began to shift to rice and sugar cultivation. During the 1880s, there was an influx of Chinese and a decline in native Hawaiians in Heʻeia, and this population change was an underlying factor in the large scale conversion from taro to rice cultivation (Bahr et al. 2015). As sugarcane production gained momentum, immigrant farm workers (mostly of Asian descent) were brought to the area. Heʻeia Sugar Plantation was established in 1869 and an associated sugar mill was also constructed around that time. Around 1880, Heʻeia Rice Plantation was established and a rice mill was built (of which remaining historic relics, such as the concrete foundation and access road, exist within the affected environment). Heʻeia Kea pier was constructed in the 1880's to support the sugar industry's need to transport product and materials to and from Honolulu Harbor. Heʻeia Sugar Plantation ceased operations in 1903 and the date that Heʻeia Rice Plantation ceased operations is unknown (Faʻanunu 2009).

The rice industry took a big hit in the early 1900's; largely, this industry began to relocate to ʻEwa, and local production declined. Similarly for the pineapple industry, which peaked from about the early 1900s to the mid-1920s, the lands around Heʻeia did not prove to be extremely productive for this crop, and the industry left Heʻeia to relocate to ʻEwa. Between the 1920s and 1940s there was a resurgence of taro planted within the Heʻeia's wetlands and many of the other agricultural areas within the vicinity of the affected environment were either converted to pasture or became uncultivated land. This is a summary of the major agricultural shifts that affected lands within the vicinity of Heʻeia,. For a more detailed summary please see Devaney et al. (1976) and Faʻanunu et al. (2009).

5.2.2.3 HISTORIC AQUACULTURE

Fishponds, a traditional form of aquaculture, were used to ensure a consistent protein supply from culturing and harvesting fish from an enclosed system. It is estimated that throughout the 1800s, there were roughly 28 fishponds dispersed around Kāneʻohe Bay. By early 1900, only 16 were in commercial use. In the present day, there are approximately 12 fishponds in the bay, in varying degrees of inactiveness and productivity (Jokiel 1991).

Fishponds were often constructed around sheltered areas of the coastline and made from coral and basalt. The constructed walls extended from the shoreline and enclosed shallow bodies of water. Gates (mākāhā) were built into the walls to help control water depth and salinity, and also capture the fish. The size of fishponds varied greatly, ranging from 0.5 to over 500 acres (Stone 1989). The most common cultured fish were ʻanae (mullet, *Mugil cephalus*) and awa (milkfish, *Chanos chanos*). Fishponds were very efficient and productive aquaculture systems, which when operating at peak performance could yield an average of 400-600 pounds per acre per year, which is significant considering the limited amount of input required to run the system (Keala 2007).

Loko i'a o He'eia (He'eia Fishpond) is both an archaeological and a cultural resource, and it is one of the largest intact and operating fishponds in Hawai'i. It was listed on the National Register of Historic Places (50-80-10-327) in 1973 (USACE 2012a). The fishpond wall measures approximately 7,000 feet in length, encircling nearly 88 acres of water area. Although the original construction date of He'eia Fishpond is unknown, it is likely that the fishpond was constructed sometime between AD 1400 to 1600 (Kelly 1975). The first recorded owner of the fishpond was High Chief Abner Paki (1893). Paki was the konohiki of He'eia and thus owned all lands within the ahupua'a. After his passing, Paki's daughter, Princess Bernice Pauahi, received the lands of He'eia. Princess Pauahi married Charles Reed Bishop, and before her passing established the Bishop Estate. In present day the fishpond is owned by Kamehameha Schools, which was formerly called the Kamehameha Schools Bishop Estate.

He'eia Fishpond was operational until a large storm, in 1965, caused widespread damage to the intact Fishpond wall. The Keapuka Flood of 1965 was responsible for destroying over 200 feet of the previously intact wall. When the wall was damaged, the pond was exposed to tidal fluctuations, making it nearly impossible to control salinity levels and water depth. Thus, the pond was deemed unusable at that time (Jokiel 1991). He'eia Fishpond went mostly unused for almost 25 years. During this time, mangrove introduction and its widespread growth further damaged the fishpond's productive potential (Paepae o He'eia 2016). Restoration efforts began around 1988 and continue today, largely through the work of Paepae o He'eia (a local non-profit group) (Keala 2007).

5.2.2.4 MOKU O LO'E — COCONUT ISLAND

Moku o Lo'e, commonly referred to as Coconut Island and the current home of the HIMB, was once owned by Hawaiian royalty (including Kamehameha I and Princess Bernice Pauahi). Similar to the fishpond, Moku o Lo'e was incorporated into the holdings of the Bishop Estate. However, in 1933, it was purchased by Christian Holmes with the intention of transforming the island into a tuna packing factory. Holmes was responsible for major landscape changes to the island, such as physically enlarging the island, building fishponds, harbors and the seawall that surrounds the island. At the time of purchase, the island was 12 acres in size; however, after the physical changes were complete, the island expanded to nearly 28 acres. Much of the fill material for the expanded island came from a sandbar in Kāne'ohe Bay (HIMB 2016).

After Holmes passed away in 1944, Coconut Island was used as a rest and relaxation post for Army officers. The Army built many of the barracks that now serve as HIMB's marine labs. In 1947, Edwin Pauley became the sole owner of the island, and in 1951, Pauley helped establish the Hawai'i Marine Lab on the island, now known as HIMB (Jokiel 1991).

5.2.2.5 KE'ALOHI POINT — HE'EIA STATE PARK

As noted previously, Ke'alohi Point was said to be the dividing point between He'eia Uli (dark He'eia) from He'eia Kea (white He'eia), where these two worlds came together and from the point, dead souls would leap into their deemed afterlife (either He'eia Uli or He'eia Kea). Ke'alohi Point was also the home of ancient heiau, called Kalae'ula'ula, which was destroyed and replaced by a sugar mill sometime around 1880 during the peak of sugar production in the area (He'eia State Park 2016). After the sugar cultivation decline, Ke'alohi

Point was used for pineapple cultivation and as a cattle ranch. Around 1960, interest spurred to develop the marine areas around the point into a marina; however, the plan never came to fruition. In 1963, a cultural center, named Ulumau Village, was relocated from Ala Moana Park to Ke‘alohi Point. The State of Hawai‘i acquired the 14 acres at the point to be used as a state park in 1976. From 1982–2010, the State granted a non-profit educational organization, Friends of He‘eia, a 28-year lease to run its programs. In 2010, a similar lease was established with Kama‘aina Kids, also a non-profit educational organization, for an additional 25-year period (He‘eia State Park 2016).

5.2.2.6 CULTURAL RESOURCES

Within the area under consideration, cultural resources range from tangible historic structures (e.g., He‘eia Fishpond) and other historic sites (e.g., bridge, distillery, roads, etc.) to the intangible rich cultural legends (mo‘olelo) which pervade the natural environment. For a more detailed description, see He‘eia NERR FMP (Appendix A), Cruz and Hammatt (2012), Fa‘anunu et al. (2009) and Pukui et al. (1974).

Place names, such as He‘eia, Ke‘alohi Point, Ko‘amano Reef, and Luamo‘o, reveal the strong cultural connection. He‘eia was named after the foster child of the goddess Haumea and grandson of ‘Olopana. The name He‘eia means “washed out to sea,” in reference to a tidal wave that washed locals out to sea, and back, after a victorious battle. Ko‘amano reef is located close to He‘eia Fishpond. The term Ko‘amano can be translated to mean “many shrines,” shedding light on the abundant underwater caves found in that reef. He‘eia fishpond is said to have been guarded by Meheanu, the mo‘o (water spirit). Meheanu lived at Luamo‘o, which is also in close proximity to the fishpond. For additional information, refer to the references listed in the previous paragraph.

The area under consideration has been subject to numerous archaeological and cultural resource studies (McAllister 1933, Yent and Griffin 1977, Kawachi 1990, Nagata 1992, Henry

1993, Freeman and Hammatt 2004, Carson 2006, Altizer et al. 2011, Cruz and Hammatt 2012, Groza and Monahan 2012, Soltz et al. 2014). McAllister (1933) was the first to document the major sites around O‘ahu in 1933; with regard to He‘eia, he documented three cultural sites: He‘eia Fishpond, Kaulaukī Heiau, and the dwelling place of Meheanu at Luamo‘o.

The He‘eia Fishpond was listed on the National Register of Historic Places (50-80-10-0327) in 1973. An archaeological assessment associated with the replacement of the caretaker’s house at He‘eia Fishpond did not identify any surface or subsurface cultural resources (Carson 2006). A literature review and field inspection for a He‘eia Fishpond wall repair project identified no potential adverse effects on cultural resources and recommended no further archaeological work (Groza and Monahan 2012). A separate cultural impact assessment (CIA) done for the He‘eia Fishpond involved community consultation and formal interviews (Cruz and Hammatt 2012). This CIA discussed the important relationship between He‘eia Fishpond and inland taro lo‘i, which mitigated the effects of flooding on the fishpond. The CIA concluded that the fishpond wall repairs would not adversely affect cultural practices and resources. Surface and subsurface archaeological surveys of He‘eia State Park in 1977 (Yent and Griffin 1977) did not report any significant findings. However, relevant to the area, a 1982 report documented ancestral remains at He‘eia State Park, which was confirmed by a 1992 (Nagata 1992) archaeological survey of the same parcel. An archaeological and cultural impact study

Figure 5.16. Location of archaeological features found on He'eia Community Development District parcel (Soltz et al. 2014)



Table 5.19. Archaeological features found on He'eia Community Development District (CDD) parcel

SIHP SITE	DESCRIPTION	SIHP SITE	DESCRIPTION
50-80-10-7521	Plantation-era road	50-80-10-7530	Complex of five terraces and two mounds
50-80-10-7522	Basalt quarry with traditional debitage	50-80-10-7531	World war ii-era earthen terrace and foxhole depressions
50-80-10-7523	Concrete foundation, possibly	50-80-10-7532	Plantation-era road, possibly
50-80-10-7524	Ranching-era enclosure	50-80-10-7533	Plantation-era bridge
50-80-10-7525	Ranching-era enclosure	50-80-10-7534	Plantation-era 'auwai
50-80-10-7526	Glass and ceramic fragment scatter	50-80-10-7535	Two concrete foundations, possibly for rice mill
50-80-10-7527	Glass and ceramic fragment scatter and three depression features	50-80-10-7536	Ranching-era wooden and metal cattle run
50-80-10-7528	Four plantation-era depressions with glass and ceramic fragments	50-80-10-7537	Subsurface lo'i and rice berms
50-80-10-7529	Stone and mortar		

conducted for the Kamehameha waterline project did not identify any historical properties or traditional cultural practices, and Ke‘alohi Point was noted as leina ‘uhane (leap of the soul) (Freeman and Hammatt 2004).

Literature and field review for portions of Kāko‘o ‘Ōiwi’s Māhuhua ‘Ai o Hoi project documented a pre-contact (i.e., predating 1778) basalt quarry, the foundation of an ‘ōkolehao distillery, two ranching enclosures, fences and roads possibly related to agriculture, and possible subsurface lo‘i berms (Altizer 2011). Work conducted at the Kāko‘o ‘Ōiwi property identified the following 17 sites (Soltz et al. 2014) (see Figure 5.16 and Table 5.19 for the sites’ State Inventory of Historic Places number, location and description):

The Office of Hawaiian Affairs (OHA) Kipuka Database (Office of Hawaiian Affairs 2016), an online resource providing historic data and geographic locations, features additional sites found in the vicinity of the affected environment. The Kipuka database provides the State Inventory of Historic Place numbers for each site as well as brief descriptions (Table 5.20 and Figure 5.17).

Table 5.20. Archaeological features listed in the Kipuka Database

SIHP SITE	DESCRIPTION	SIHP SITE	DESCRIPTION
50-80-10-00327	He‘eia Fishpond	50-80-10-04141	He‘eia Kea agriculture terrace
50-80-10-04135	He‘eia Kea terrace	50-80-10-04142	Historic agriculture complex
50-80-10-04137	He‘eia Kea platform	50-80-10-04143	He‘eia Kea WWII bunkers
50-80-10-04138	He‘eia Kea Road retaining wall	50-80-10-04144	He‘eia Kea Shrine
50-80-10-04139	He‘eia Kea mound/platform	50-80-10-04264	Historic ‘auwai
50-80-10-04140	He‘eia Kea terrace/retaining wall		



Figure 5.17. SIHP sites features in OHA’s Kipuka Database

5.2.2.7 MARITIME HERITAGE RESOURCES

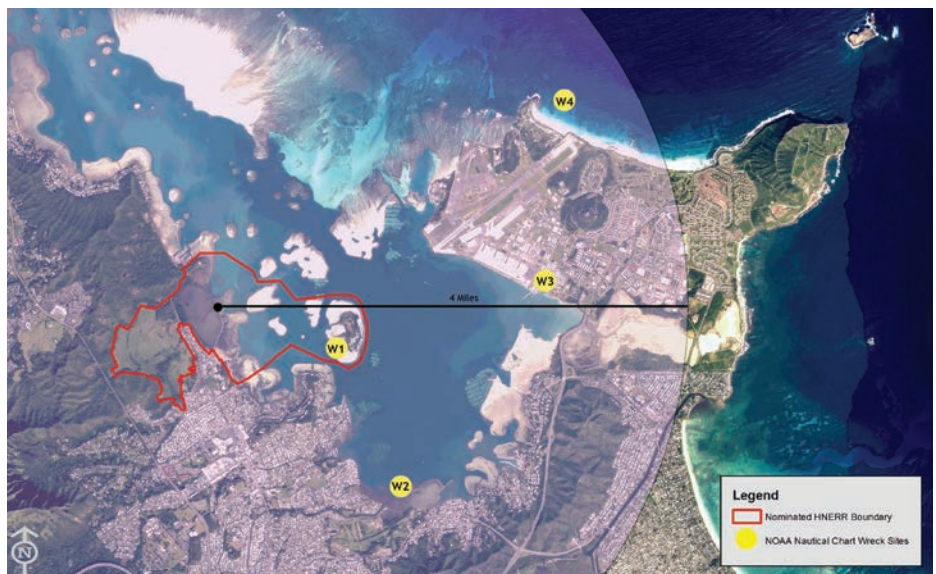
This section provides a brief overview of the known submerged artifacts that exist in the vicinity of the affected environment within Kāneʻohe Bay. Existing knowledge is rather limited about these resources because there has yet to be a comprehensive assessment of relevant resources within the waters of Kāneʻohe Bay. The information gathered in this document comes from two main sources: NOAA Office of Coast Survey’s nautical charts and informal consultations with NOAA Office of National Marine Sanctuaries staff. The NOAA Office of National Marine Sanctuaries’ Marine Heritage Program supports maritime heritage discover and resource preservation. Although Kāneʻohe Bay is outside any official sanctuary boundaries, their staff is knowledgeable about relevant resources throughout the State.

Hawaiʻi’s maritime resources generally fall into three broad categories relating to traditional aquaculture production (e.g., fishponds), plantation and ranching-era artifacts, and military (Van Tilburg 2014). Maritime heritage resources within the affected environment are predominately military related. The exceptions to this are historic fishponds in the vicinity of the affected environment, which includes Heʻeia Fishpond as well as three others identified by McAllister (1933), Oʻohoepo Fishpond and two smaller unknown named fishponds (Faʻanunu 2009). The data gathering effort for this FEIS analysis did not identify any information describing submerged historic aquaculture-related artifacts for any of these fishponds.

NOAA Office of Coast Survey’s nautical chart identifies four wrecks within a four-mile radius of the proposed site, three of which are located within the bay (Figure 5.18). The wrecks labeled W1 and W3 are noted as visible wrecks, “partially submerged at high water.” Wreck W2 is identified as the “distributed remains” of a wreck and is always submerged under water. Record W4 is noted as a “submerged dangerous wreck;” however, it is not considered a navigation hazard because of its location within a prohibited area around Mōkapu Peninsula. All of these wrecks are military-related relics.

NOAA’s Office of Marine Sanctuaries Marine Heritage Program’s internal database includes four additional wrecks within a four-mile radius of the nominated boundary for the proposed site. However, location information for these resources are estimates, and NOAA does not have permission to release the information to the public. These sites are not featured in Figure 5.18.

Figure 5.18. Wreck sites within a four-mile radius of the nominated site boundary (credit NOAA Office of Coast Survey)



5.2.3 HUMAN USES

5.2.3.1 AGRICULTURE

Kāko'o 'Ōiwi, through its Māhuhua 'Ai o Hoi (To Restore the Fruit of Hoi) project (see FMP Section 6.3.1), plans to establish a land management program to return the wetlands of He'eia to productive agricultural, cultural, and educational use. In cooperation with the Natural Resources Conservation Service (NRCS), the group has developed a detailed conservation plan (Townscape 2011), the implementation of which is in progress. This work includes rehabilitating wetlands to taro patches (lo'i kalo). As part of the rehabilitation of organic lo'i kalo in the wetlands of He'eia, historic kuāuna (taro patch walls) have been identified by a certified archaeologist as part of an archaeological inventory survey and will be restored to the extent possible. New kuāuna that will be constructed to replace kuāuna from earlier times are no longer present. Kuāuna will be built by excavating soil from within the lo'i and using this soil to create the kuāuna. The lo'i kalo will be used to grow different varieties of taro and will also serve as habitat for native birds. Presently, approximately 12 acre of the wetlands within the HCDA parcel have been converted to lo'i kalo. Kāko'o 'Ōiwi ultimately plans to convert 176 acres into a working agricultural landscape.

5.2.3.2 AQUACULTURE

The 600 to 800 year old He'eia Fishpond went mostly unused for almost 25 years, and during this time, mangrove introduction and widespread growth further damaged the fishpond's productive potential (Paepae). Paepae o He'eia aims to rehabilitate the ancient kuapā (fishpond wall) and manage the fishpond to support a unique cultural, educational, and aquacultural program (Paepae o He'eia 2016). To rehabilitate the ancient kuapā, Paepae o He'eia volunteers, using simple handsaws, loppers, and later chainsaws, working tens of thousands of labor hours, have been removing mangroves over the years. As of 2014, Paepae o He'eia had physically removed mangroves from approximately 3,500 feet of the 7,000-foot-long kuapā. In the future, Paepae o He'eia intends to conduct ongoing maintenance of the rehabilitated fishpond wall and removal of invasive seaweed within the fishpond, as fragments of three species of invasive seaweed periodically enter the pond during high tide events. The fishpond is currently being used to produce the aquacultural products listed below as part of a community-based economic development program to research, develop, and feature various products and services from the He'eia Fishpond and make them available to the public.

- **Moi** (Pacific threadfin) — Paepae o He'eia has been successfully raising moi since 2006 and will continue to do so. The fish are offered for sale to restaurants and the public.
- **'Ama'ama** (Striped or Grey Mullet) — Ama'ama is one of the historic fishpond species and an important food fish in ancient Hawai'i. A very choice indigenous food fish that Paepae o He'eia will continue to raise and offer for sale to restaurants and the public.
- **Limu as food** (Gorilla ogo — *Gracilaria salicornia*) — Despite being an invasive pest, this seaweed is closely related to the native manaua (*Gracilaria coronopifolia*) and common ogo species (*Gracilaria parvisipora*) that are commonly eaten. This product is not actively cultivated in the fishpond, but once removed as part of the invasive species eradication efforts, it is offered for sale to restaurants and the public.

- Limu as fertilizer — Farmers have successfully used the invasive limu that grows in the fishpond to fertilize gardens and lo'i. Individual farmers and members of the public are encouraged to gather limu themselves. If self-picked, limu is given away rather than sold.
- Oysters (Pacific (*Crassostrea gigas*) and Hawaiian (*Dendroostrea sandvicensis*)) — In collaboration with University of Hawai'i Hilo and the Pacific Aquaculture and Coastal Resources Center, Paepae o He'eia is researching the survivability and growth rates of two species of edible oysters in He'eia Fishpond.
- Mangrove firewood — Paepae o He'eia occasionally gives away mangrove wood. The dense hard wood is useful as fuel for barbeques, imu (underground oven), smoke houses, and other such purposes.
- Mangrove wood for construction — Mangrove wood is resistant to termites and bugs and can be used for hālau (meeting house) construction, hula implements, picture frames, lomi (massage) sticks, and other work. It is also given away rather than sold.

Kāko'o 'Ōiwi is also planning to reestablish historic loko i'a kalo (a different style of aquaculture system that combines a fishpond with taro patch) in the wetter parts of the wetlands in the makai portion of the property. The loko i'a kalo, which was historically present in the area, will serve several purposes, including production of fish and taro for consumption, trapping of sediment during rain events, and provision of native bird habitat. Aquaponics, much like the loko i'a kalo, will be used to cultivate and support fish stocks, which will then be placed in the stream. The aquaponics system will also support the growth of native limu. Water used for the aquaponics system will be well or tap water, and will not be taken from or added to the stream. Kāko'o 'Ōiwi is expected to convert approximately 1.8 acres of the wetlands to loko i'a kalo.

5.2.3.3 FISHING

Historically, fishing within Kāne'ohe Bay and the larger Hawaiian Islands played a central role in the harvesting and conservation of marine resources. It was considered a primary protein source in the Native Hawaiian diet. Within the ahupua'a management system, fishing was carefully regulated with harvests adaptively managed according to changes in the ecosystem. In the past 200 years, western fisheries management approaches have gradually replaced the traditional Hawaiian system (Bahr et al. 2015). In addition, three non-endemic fish species were introduced to the region in the 1950's as a harvestable food source.

The peacock grouper (*Cephalopholis argus*), introduced in 1956 from Mo'orea, is a predatory fish that preys on native reef fish species, but is not consumed by other endemic piscivores. This grouper is known to have high instances of ciguatera, a common marine toxin disease, known to cause debilitating gastrointestinal, neurologic, and cardiovascular symptoms within a few hours of consuming contaminated fish. The other two introduced species are the Blacktail snapper (*Lutjanus fulvus*) and the Blueline snapper (*Lutjanus kasmira*), both considered aggressive reef fish predators. These introduced species are not preferred by Hawaiian fishers and, as a result, all three are threatening the balance of natural marine systems in Hawai'i (HIMB 2016).

A historical fishery that is nonexistent in modern times was the black-lipped pearl oyster (*Pinctada margaritifera*). Originally introduced from the Northwest Hawaiian Islands in the 1930's, Kāneʻohe Bay annual harvests of the black-lipped pearl oyster were up to 21 tons by 1938. By the 1990's, less than 200 of these oysters remained in the entire bay due to overharvesting (HIMB 2016).

Today, there are significant commercial, recreational and subsistence fisheries found within Kāneʻohe Bay. As recently as 2014, landings of fish and invertebrate species for Kāneʻohe Bay were 168,549 lbs. out of a total of 29,391,287 lbs. for the entire island of Oʻahu. Data from 2010 to 2014 indicate that the fisheries landings fluctuate from year to year (Table 5.21). Historical trends in landings and catch per unit effort for have characterized the bay's fisheries as overfished (Bahr et al. 2015).

Table 5.21. Commercial fishing — Kāneʻohe Bay landings by year, in pounds (Division of Aquatic Resources 2014b)

	2010	2011	2012	2013	2014
For Oʻahu	25,238,873	26,411,330	28,063,170	29,900,365	29,391,287
For Kāneʻohe	158,991	362,724	228,415	274,692	168,549

The reported 2014 landings identified yellowfin tuna and Mahi Mahi as the top two species harvested in the bay. Other species of significance harvested in Kāneʻohe Bay included Aku (Skipjack tuna — *Katsuwonus pelamis*), Bigeye tuna (*Thunnus obesus*), Kawakawa (Mackerel tuna — *Euthynnus affinis*), and Ono (Wahoo — *Acanthocybium solandri*) primarily caught by trolling (15,570 lbs. in 111 trips (140.3 lbs./trip)). No other data was available on gear type due to low levels of reporting for other fishing methods. And catch data on other fisheries was unavailable for the area.

One previously significant fishery for Kāneʻohe Bay, unaccounted for in recent catch data, is the Day Octopus (*Octopus cyanea*). According to catch data, the Day Octopus comprised 44.7% (25,851 lbs.) of the estimated total annual harvest of fishes and invertebrate species in Kāneʻohe Bay during the period of March 1991 to February 1992 (Everson 1994). At the time, this was considered a major fishery within the bay and most of the catch was reported as not being sold for commercial use. A 1998 study of population densities of Day Octopus in the bay found higher densities of octopi within the protected Coconut Island Refuge than in other areas of the bay (Sims 1998). No additional data was discovered on current harvest trends.

In 1991–1992, Kāneʻohe Bay supported a recreational or subsistence harvest of multiple species, including Jacks (*Carangidae*), Crabs (*Brachyura*), Goatfishes (*Mullidae*), Sharks (primarily hammerheads — *Sphyrna spp*), Bigeye scad (*Selar crumenophthalmus*), Giant herring (*Elops hawaiiensis*), and Parrotfish (*Scaridae*). These were caught using a variety of methods, including spearing, line fishing, trolling, throw netting, and crab netting. However, gill and surround netting accounted for half the fish species catch. No data was discovered on current harvests or trends for these species.

Overall, it is generally agreed that the bay's fish populations are considered stressed and largely depleted from historical levels (HIMB 2016).

5.2.3.4 TOURISM AND RECREATION

Tourism and recreational activities have been a key sector of Hawai'i's economy since Statehood in 1959 and is a primary source of revenue and jobs. In 2005, the State Department of Business, Economic Development, and Tourism (DBEDT) reported nearly 7.5 million visitors visited the State and visitor expenditures totaled \$11.5 billion. Tourism and recreation are the main generator of employment in the State and account for 22.3% of all Hawai'i jobs (Hawai'i Tourism Authority 2006).

The island of O'ahu receives the largest number of overall visitors, first time visitors, and international travelers of all the Hawaiian Islands (Table 5.22). Many of these visitors focus on the attractions around Honolulu and specifically at Waikiki. Specific information on tourism and recreational activities for Kāne'ohe Bay are limited.

Kāne'ohe Bay supports a variety of tourism and recreational activities that include snorkeling, kayaking, stand-up paddle boarding, outrigger canoe sailing, catamaran sailing, guided kayak and snorkeling tours organized through several ecotour operators in the area. The primary access point for the majority of these recreational activities is the He'eia Kea Small Boat Harbor.

An example of a typical ongoing ecotour activity in the area is the "Kāne'ohe Bay Kayak and Snorkel tour to Coconut Island" provided by Holokai Kayak and Snorkel Adventure. The kayak tour includes a 6-hour eco-adventure that includes professional instruction with certified guides for a maximum of 16 participants. The 6-hour ecotour includes approximately 3 hours on water and 3 hours on land. Participants paddle to Coconut Island, once a filming location for the TV show Gilligan's Island, as the guides interpret the natural and cultural history of the island, Kāne'ohe Bay and its unique reefs, and the different types of marine life you may encounter. Later, participants set out on a snorkeling tour in a pristine section of fringe coral reef around the island's edge (Tripadvisor 2015). However, no specific ecotourism data was discovered for the bay.

Another tourism and recreational destination is the He'eia State Park. The park has spectacular views of Kāne'ohe Bay and is situated on a peninsula jutting out into the bay called Ka Lae o Kealohi, which means "the point of shimmering light". A large hall for luaus, wedding, and special events is available to the public and organizations for rent. Kama'aina Kids, a non-profit organization, manages the park for DLNR and offers guided tours, interactive classes on canoe building (with the Puakea Foundation), and kayaking and snorkeling tours to Moku o Lo'e (e.g., Coconut Island) (He'eia State Park 2016).

5.2.3.5 EDUCATION

Several existing education and community programs are offered through HIMB and community partners (Table 5.23). These range from formal classroom instruction for students, programs for school groups and community groups, and community engagement through "workdays," whereby participants learn the ecological and cultural foundations of the natural environment as well as the traditional agriculture and aquaculture practices of Hawai'i. See the reserve's FMP for more detail on the education and outreach activities underway at the proposed site.

Table 5.23. Examples of existing education and outreach programs at the proposed He'eia National Estuarine Research Reserve

SITE PARTNER	EXAMPLES OF EDUCATION AND OUTREACH PROGRAMS
Hawai'i Institute of Marine Biology	<ul style="list-style-type: none"> • Undergraduate and graduate courses • Educational programs to individuals, families, and school and community groups • Guided walking tours of Moku o Lo'e • Moku o Lo'e Marine Science Overnights
Paepae o He'eia	<ul style="list-style-type: none"> • Ka 'Ai Kamaha'o program • He'eia Ahupua'a Internship program • Educational field programs for K-12 and college students
Kāko'o 'Ōiwi	<ul style="list-style-type: none"> • Māhuahua 'Ai o Hoi (Regrowing the Fruit of Hoi) • Community work days
Kama'āina Kids	<ul style="list-style-type: none"> • Before and after school programs • Environmental education programs

5.2.3.6 RESEARCH AND MONITORING

The University of Hawai'i's HIMB has been conducting ecological research and monitoring in Kāne'ohe Bay since its establishment in 1951 (HIMB 2015). Located on Moku o Lo'e, HIMB is surrounded by 64 acres of coral reef designated by the State of Hawai'i as the Hawai'i Marine Laboratory Refuge, which is used for research activities only. HIMB offers cutting edge research facilities for faculty, students, and visiting scientists. Research that HIMB is conducting in Kāne'ohe Bay covers a broad range of topics, such as coral bleaching and disease, symbiosis, ocean acidification, marine microbial ecology, fisheries and top predator research, aquaculture and fish physiology, and biogeochemistry and biophysical analysis of reef systems. See He'eia NERR FMP (Appendix A) for additional information.

5.2.3.7 MILITARY

In 1994, the Marine Corps consolidated all of its properties under a new name, "Marine Corps Base Hawai'i" (MCBH), which now includes all Marine Corps installations in the Hawaiian Islands, and seven of the eight Marine Corps Installations are on O'ahu. MCBH-Kāne'ohe Bay is the largest of the installations and serves as the main headquarters. MCBH-Kāne'ohe Bay is located on Mōkapu Peninsula, covering 2,951 acres. MCBH-Kāne'ohe Bay is also one of the largest employers on the windward side of O'ahu with roughly 14,000 active duty personnel and civilian employees (Marstel-Day 2014).

MCBH-Kāne'ohe Bay holds a notable historical significance, being the first location on O'ahu to be attacked by the Japanese military on December 7, 1941. Seven minutes prior to the attack on Pearl Harbor, Japanese forces attacked hangars at the Naval Air Station on base, and the air strike left 19 dead and 67 wounded. The hangars were destroyed, as were three American aircrafts. One Japanese plane was shot down, crashing down on the northwest side of the peninsula (Tomonari-Tuggle and Arakaki 2014). For a detailed historical account of the Mōkapu Peninsula, please see Tomonari-Tuggle and Arakaki (2014).

CHAPTER 6: ENVIRONMENTAL CONSEQUENCES

Most impacts of designating the proposed He'eia estuary and adjacent Kāne'ohe Bay waters as a National Estuarine Research Reserve (NERR), as well as implementing a reserve management plan, are expected to be environmentally beneficial and result in positive social, cultural, economic and ecological impacts. From a national perspective, this action will result in the establishment of the 29th National Estuarine Research Reserve. The proposed He'eia NERR will fill a critical gap in the National Estuarine Research Reserve System (NERRS), supporting a more complete network of estuarine systems representing the array of biologically and geomorphologically diverse estuaries found in the U.S. and its territories. Hawaiian estuaries have a long history of human-influenced impacts on their natural processes and functions (Maragos 1975). The proposed He'eia NERR will focus estuarine research, traditional ecological knowledge, and educational opportunities toward improving our understanding of these unique estuaries. The reserve could help Hawai'i work toward achieving the goals set forth in the Coastal Zone Management Act (CZMA) — namely, to provide a stable environment for research and enhance public awareness and understanding of estuarine areas. The proposed He'eia NERR is planning to conduct and coordinate applied research and long-term environmental monitoring of the He'eia ahupua'a and its various ecological components; develop training and educational programs that inspire and educate local communities about coastal ecosystems; and collaborate with local communities to incorporate local traditional ecological knowledge in stewardship activities that work to sustain the cultural and natural resources of the area. Federal funds, along with matching funds provided by the University of Hawai'i Institute of Marine Biology (HIMB), would support increased and more coordinated efforts with partners toward these goals and create opportunities to improve our understanding and appreciation of the role and health of estuaries in the Ko'olaupoko region of the island of O'ahu (Hawai'i Office of Planning 2015a). Some of these activities may result in relatively minor adverse impacts (such as potential sedimentation, traffic, or habitat modification), as discussed below.

6.1 AFFECTED RESOURCES AND POTENTIAL IMPACTS

The National Environmental Policy Act (NEPA) requires federal agencies to prepare an EIS for any action that may significantly affect the quality of the human environment. The Council on Environmental Quality (CEQ) regulations implementing NEPA state that an EIS should discuss the significance, or level of impact, of the direct and indirect impacts of the proposed alternatives (40 C.F.R. § 1502.16), and that significance is determined by considering both the context in which the action will occur and the intensity of the action (40 C.F.R. § 1508.27).

Effects and impacts used in this environmental analysis are synonymous. Effects/impacts may include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. For this analysis, the potential impacts, both beneficial and adverse, have been evaluated using the criteria or characteristics identified in Table 6.1 and subsequently described below. The criteria or characteristics of type, magnitude, duration, and the implementation of mitigation measures are used to determine whether an impact is significant under NEPA.

Table 6.1. Summary of evaluation criteria and characteristics

TYPE OF IMPACT	DURATION OF IMPACT	MAGNITUDE OF IMPACT	MITIGATION	SIGNIFICANCE
No effect	Short-term	Negligible	Reduce	Less than significant
Direct	Long-term	Minor	Avoid	Significant
Indirect		Moderate		
Cumulative		Major		

6.1.1 TYPES OF POTENTIAL IMPACTS

Type of potential impact refers to the various components of the affected environment in which the proposed action to designate parts of He'eia estuary and adjacent Kāne'ohe Bay waters as a NERR will occur. Direct and Indirect impacts are defined in 40 C.F.R. § 1508.8, and are described below. Cumulative impacts are defined at 40 C.F.R. § 1508.7, and also described below as well as in subchapter 6.4. The categories of potential impacts to the affected environment used in the analysis include:

- **No effect:** No known or potential impacts caused by the proposed action.
- **Direct Impacts:** Are known or potential impacts caused by the proposed action and occur at the same time and place. This could include impacts that are an immediate result of project-related activities (e.g., direct mortality of species or removal of vegetation and habitat) and are reversible or permanent and irreversible.
- **Indirect Impacts:** Are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. These effects tend to be diffuse, resource-specific, and less amenable to quantification or mapping than direct effects.
- **Cumulative impacts:** Are the known or potential impacts on the environment that results from the incremental effects of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time.

6.1.2 DURATION OF POTENTIAL IMPACTS

The duration of a potential impact or effect is defined by two periods of time (short or long-term) and refers to the temporal nature of the impact resulting from the proposed action. The duration of each potential impact is defined as:

- **Short-term:** A known or potential impact of limited duration of 6 months or less depending on the specific impact and affected environment.
- **Long-term:** A known or potential impact of extended duration of more than 6 months depending on the specific impact and affected environment.

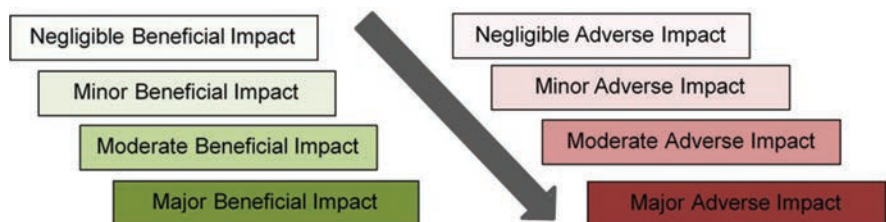
6.1.3 MAGNITUDE OF POTENTIAL IMPACTS

The magnitude or intensity refers to the severity of the impact and is defined on a spectrum ranging from negligible impacts to major impacts. For the purpose of this analysis, potential adverse and beneficial impacts are qualitatively assessed by their relative magnitude according to the criteria defined below and are identified using color coding depicted in Figure 6.1:

- **Negligible:** No impact to resources or the impact would be at or below levels of detection.
- **Minor:** A detectable change to resources; however, the impact would be small, localized, and of little consequence. Generally, minor impacts do not have the potential to satisfy the considerations of 'significance' set forth in regulations (40 C.F.R. § 1508.27) or NOAA guidance (NAO 216-6A).
- **Moderate:** A readily apparent change to the resource that would not constitute a major change. Generally, moderate impacts could possibly be measured or quantified and do not have the potential to satisfy the considerations of 'significance' set forth in regulations (40 C.F.R. § 1508.27) or NOAA guidance (NAO 216-6A).
- **Major:** A substantial change to the character of the resource over a large area. Generally, major impacts are quantifiable changes that have the potential to satisfy the considerations of 'significance' set forth in regulations (40 C.F.R. § 1508.27) or NOAA guidance (NAO 216-6A).

The assessment of the magnitude or intensity of potential impacts is based on a review of available and relevant references and resource materials, and is based on the professional judgment of NOAA staff using the criteria previously described as well as the potential that mitigation measures can either avoid or reduce significant impacts.

Figure 6.1. Relative magnitude of beneficial and adverse impacts



6.1.4 POTENTIAL IMPACT MITIGATION MEASURES

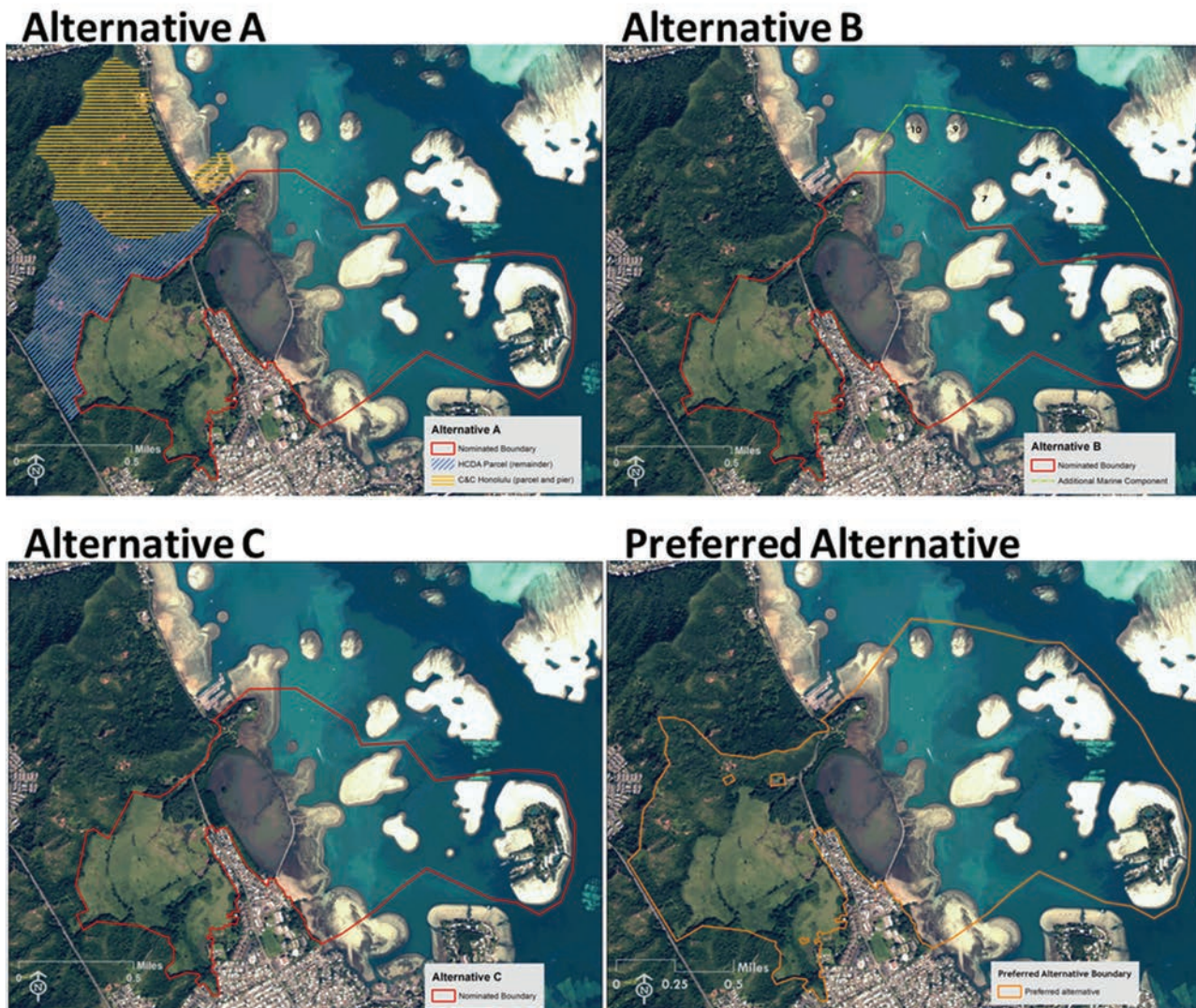
Mitigation measures refer to actions that either avoid or reduce potentially significant impacts. The general categories of mitigation approaches for impacts or effect described under this analysis are defined as:

- **Reduce:** A mitigation approach used to lessen the significance of action's impact to the natural or human environment.
- **Avoid:** A mitigation approach used to preclude an action's otherwise significant impact or effect on the natural or human environment.

6.1.5 ALTERNATIVE BOUNDARY CONFIGURATIONS

The subsequent sections in this chapter will evaluate the impacts associated with the implementation of each of the alternatives (previously discussed in Chapter 4). Figure 6.2 shows the boundaries side by side to serve as a visual reminder of different configurations for the action alternative.

Figure 6.2. He'eia National Estuarine Research Reserve boundary configurations



6.1.6 SUMMARY OF IMPACTS

Table 6.2. Summary of impacts for He'eia National Estuarine Research Reserve designation and management plan implementation

IMPACTED RESOURCE	ALTERNATIVES				TYPE OF IMPACT	DURATION OF IMPACT	MAGNITUDE OF IMPACT	MITIGATION
	PREFERRED	A	B	C				
Air Quality	x	x	x	x	Direct	Long-term	Negligible	None
Water Quality	x	x	x	x	Indirect	Long-term	Moderate	None
	x	x	x	x	Direct	Long-term	Minor	None
Hydrology	x	x	x	x	Direct	Long-term	Major	None
Terrestrial	x				Indirect	Long-term	Minor	None
		x			Direct	Long-term	Moderate	None
			x	x	Indirect	Long-term	Moderate	None
Estuarine	x	x	x	x	Indirect	Long-term	Minor	None
Riparian/Freshwater	x	x	x	x	Indirect	Long-term	Minor	None
Marine	x		x	x	Indirect	Long-term	Minor	None
		x			Direct	Short-term	Minor	None
Flora	x	x	x	x	Indirect	Short- and Long-term	Moderate	None
		x			Direct	Long-term	Minor	None
Fauna	x	x	x	x	Indirect	Long-term	Minor	None
	x	x	x	x	Direct	Short- and Long-term	Minor	None
Threatened and Endangered Species	x	x	x	x	Indirect	Short- and Long-term	Minor	None
	x	x	x	x	Indirect	Short- and Long-term	Negligible	BMPs
Candidate or Proposed Species	x	x	x	x	Indirect	Short-term	Negligible	BMPs
	x	x	x	x	Indirect	Short-term	Negligible	BMPs
Species of Concern	x	x	x	x	Indirect	Long-term	Minor	BMPs
Other Marine Mammals	x	x	x	x	Indirect	Long-term	Minor	BMPs
	x	x	x	x	Indirect	Short-term	Negligible	BMPs
EFH	x	x	x	x	Indirect	Long-term	Minor	None
Migratory Birds	x	x	x	x	Indirect	Long-term	Minor	None
	x	x	x	x	Indirect	Short-term	Negligible	None
Employment	x	x	x	x	Direct	Long-term	Minor	None

IMPACTED RESOURCE	ALTERNATIVES				TYPE OF IMPACT	DURATION OF IMPACT	MAGNITUDE OF IMPACT	MITIGATION
	PREFERRED	A	B	C				
Ocean Economy		x			Indirect	Long-term	Minor	None
	x		x	x	Indirect	Long-term	Negligible	None
Cultural History and Land Use	x	x	x	x	Indirect	Long-term	Minor	None
Cultural	x	x	x	x	Indirect	Long-term	Minor	Reduce
Maritime Heritage	x	x	x	x	Direct	Long-term	Moderate	None
Agriculture	x	x	x	x	Indirect	Long-term	Minor	None
Aquaculture	x	x	x	x	Indirect	Long-term	Minor	None
Fishing	x		x	x	Indirect	Long-term	Moderate	None
		x			Indirect	Long-term	Minor	None
Tourism and Recreation	x	x	x	x	Indirect	Long-term	Moderate	None
Research and Monitoring	x	x	x	x	Indirect	Long-term	Minor	None
	x	x	x	x	Direct	Short- and Long-term	Negligible	None
Education	x	x	x	x	Direct	Long-term	Moderate	None
Military	x	x	x	x	Indirect	Long-term	Negligible	None

6.2 NATURAL ENVIRONMENT

6.2.1 PHYSICAL ENVIRONMENT

6.2.1.1 CLIMATE

1. Weather and Climate

As described in Chapter 5, “Affected Environment,” Hawai‘i has a semitropical climate, with a rainy season lasting from October to May. Kāne‘ohe Bay is located on the windward side of O‘ahu, which experiences moderate to frequent rainfall (Townscape 2012), with an annual average total precipitation of 76.03 in. (HIMB 2016). The area in proximity to the proposed He‘eia NERR averages 94 in. of precipitation annually and the average annual temperatures range from 68.8 to 79.8°F (HIMB 2016). Resulting impacts to weather and climate from the range of alternatives analyzed are provided in Table 6.3.

Table 6.3. Impacts to weather and climate

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Weather and Climate	No direct or indirect impacts are expected	Same as no action alternative	Same as no action alternative	Same as no action alternative	Same as no action alternative

No Action Alternative

Under this alternative, the various areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners currently represented within the He‘eia estuary. No direct or indirect impacts (beneficial or adverse) on the weather and climate of the area are expected. It is expected that any future changes to weather and climate would be the result of larger regional and global factors that are independent of the local conditions and changes.

Preferred Alternative, Alternatives A, B, C

None of the alternatives analyzed are expected to result in any direct or indirect impacts (beneficial or adverse) on the weather and climate of the area. It is expected that any future changes to weather and climate would be the result of larger regional and global factors that are independent of the local conditions and changes.

2. Climate Change

A. Effects on the Alternatives from Climate Change

No Action Alternative

As noted in the Management Plan and in Chapter 5, potential changes to the environment associated with climate change in the region could include:

- 1) increasing air and water temperatures, which can stress vegetation and animals, alter habitat suitability, and lead to changes in species distribution;
- 2) ocean acidification and coral bleaching;
- 3) increase in the frequency or intensity of tropical cyclones and storms;

- 4) increased threats from diseases, illnesses, invasive species, and pests;
- 5) potential changes in atmospheric and/or oceanic circulation;
- 6) a decrease in total rainfall and stream flow;
- 7) sea-level rise;
- 8) salt-water intrusion into coastal aquifers, water bodies, wetlands and low-lying fields;
- 9) increases in erosion, flooding, and sedimentation during storms and high tides, which can affect infrastructure, habitat, and coastal uses (including cultural practices, tourism and agriculture/aquaculture).

See Melillo *et al.* (2014) for additional information on climate change impacts in the Hawaiian Islands. The *Climate Sensitivity of the National Estuarine Research Reserve System* report (Robinson *et al.* 2013) identified in Chapter 5 could provide a framework for the proposed He'eia NERR to understand the sensitivity and vulnerability of the He'eia wetland and Kāne'ohe Bay to climate change impacts.

Designation of a Reserve and implementation of its Management Plan is not expected to result in significant changes to land management strategies. All the major resource management activities planned would occur under all alternatives. However, climate change could alter some of the effects of the land management strategies over time. In particular, climate change may cause certain environmental management strategies, such as managing low-lying areas for agriculture or aquaculture, to become more difficult to sustain over time. For example, taro grows in water at temperatures up to 77°F, according to the National Park Service, and rising temperatures could lead water temperatures to exceed that threshold at times. To maintain taro plants exposed to temperature stress, higher irrigation rates would be needed (National Park Service 2011). Insufficient data is available to project potential changes to species composition or range as a result of climate change.

If the current wetland plants are salt-tolerant, they may be more resilient to sea-level rise and saltwater intrusion than taro fields would be. Kāko'o 'Ōiwi is testing salt-tolerant species of taro, which would increase the crop's resilience to sea-level rise. The group indicates that fishponds downstream of taro patches may initially function as a physical barrier to prevent saltwater intrusion from affecting areas immediately upstream. To withstand future sea-level rise, walls around taro fields and fishponds might have to be built higher. On the other hand, coastal wetlands in the region might be able to build themselves up vertically (by accreting sediment) at a rate that keeps pace with sea-level rise and avoid becoming submerged over time without human intervention (Recent research indicates that most coastal wetlands build up vertically at rates similar to or exceeding rates of historical sea level rise. See, e.g., Kirwan and Megonigal 2013). Other ecosystem services wetlands can potentially provide include reducing flooding and buffering storm surge.

Preferred Alternative and Alternatives A, B and C

The impacts of climate change could present possible areas of research for Reserve partners and scientists affiliated with the Reserve. For example, research might address the extent to which species and ecosystems in the area might be able to adapt to climate change. Few studies on this topic specific to Kāneʻohe Bay and vicinity currently exist. It is possible that additional funding or technical assistance for research that the Reserve might be able to offer could potentially help local partners monitor, anticipate and plan for climate change impacts, which could contribute to resilience in the region, to the extent that it spurs adoption of new management strategies.

B. Effects from the Alternatives on Climate Change and Greenhouse Gas Emissions

The effects the alternatives could have on climate change derive from the greenhouse gas emissions and sequestration associated with the activities described under each alternative. The potential impacts that can be envisioned at this time are summarized in Table 6.4. Some of the projected changes, particularly those associated with land cover change, would occur under all of the alternatives, because Reserve partners are already planning for those activities. As reflected below, it is expected that the vast majority of visitors are already participating in existing programs, and would not be visiting the area as a result of Reserve designation. If a Reserve were designated, it is likely that the primary effect on emissions would be associated with additional researchers and visitors traveling to the site. For this reason, the potential greenhouse gas implications from increased traffic to the area are addressed first. To the extent designation is expected to result in changes to land cover and vegetation the climate change implications of these changes are also discussed. Finally, the potential impacts of future facilities projects, are evaluated.

Table 6.4. Impacts to climate change

	NO ACTION	PREFERRED ALTERNATIVE AND ALTERNATIVES A-C
Staff and Visitor Transportation	NOAA used a variety of assumptions to estimate the potential order of magnitude of current emissions associated with transportation for staff members and participants in activities associated with existing facilities and programs in the area. If those assumptions reflect actual conditions, then transportation associated with the groups listed below produce on the order of 500 metric tons of carbon dioxide emissions per year. This represents a negligible contribution to the approximate 6.6 million metric tons of carbon dioxide equivalents emitted through transportation-related activities in Hawai'i annually.	NOAA projected that, in the near term, at least three new staff and four new visitors might travel to the Kāne'ohe Area or Moku o Lo'e five days per week. Using assumptions about average distance they might travel, the fuel efficiency of their vehicles, and emissions per gallon of fuel used, NOAA estimated that an additional approximately 15 metric tons of carbon dioxide would be produced per year if a Reserve is designated and assumptions about associated transportation prove correct. This represents a negligible contribution to transportation-related emissions in the local area. It is also anticipated that the level of vessel usage in the area may increase at some negligible level, which could result in additional emissions of carbon dioxide.
Changes to Land Cover and Vegetation	Data are not available to detail precise plans for how many acres, with what type of ground cover, will be replaced with what other types of vegetation by existing entities controlling land use within parcels proposed for inclusion within the Reserve. Thus, NOAA could not quantitatively estimate associated changes to greenhouse gas storage or release, but analyzed the types of potential changes likely. Mangrove removal at the fishpond and along He'eia Stream would likely reduce greenhouse gas sequestration. Reforestation at the HCDA parcel might increase greenhouse gas sequestration, whereas conversion of existing wetlands to fields (and fishponds) for crops would likely release sequestered greenhouse gases. It is possible there would be a net increase in greenhouse gas emissions, which would be small compared to existing greenhouse gas flux from vegetation in the region, because the largest impact will probably come from converting wetlands (albeit already degraded) to agricultural uses.	Same as No Action.
Future Facilities	NOAA is aware of a community/health center proposed for construction by Kāko'o 'Ōiwi within the HCDA parcel (in an inholding which is not included in any of the boundary alternatives). NOAA does not have detailed information on this future facility and cannot conduct an analysis at this time. HIMB recently renovated some of its facilities and infrastructure. Similar renovation projects might occur at other facilities and might result in negligible changes to total greenhouse gas emissions. If new buildings were to be constructed by Reserve partners to support their existing activities, short-term, negligible releases of greenhouse gases might occur in connection with the construction process, and negligible increases in emissions over the long-term would occur if total energy use increases and fossil fuels are used to provide energy to any new buildings.	To be determined once any new proposals are developed for future facilities to support Reserve activities. However, there would likely be a negligible increase in the amount of emissions associated with any construction activities. Whether operation of new facilities creates additional emissions is dependent on the type of energy that they use. Even if greenhouse gas emissions were to increase, on balance, as a result of constructing facilities for the Reserve, associated emissions would be negligible given the relatively small scale of any such construction.

Table 6.5. Existing staff and visitor transportation emission impacts

ORGANIZATION	COMMUNITY MEMBERS (PER YEAR) ^A	MEANS OF TRANSPORT (ASSUMED)	ESTIMATED BUS TRIPS	ESTIMATED CAR AND SUV TRIPS
Visitation associated with Kāko'o 'Ōiwi (typically at HCDA parcel)	4,000	½ by car, ½ by bus	31	667
Visitation associated with Kama'āina Kids (typically at He'eia State Park)	40,000	all by bus	616	0
Other visitation to He'eia State Park	200,000	½ by car, ½ by bus	1,539	33,334
Visitation associated with Paepae O He'eia (typically at He'eia Fishpond)	6,000	½ by car, ½ by bus	47	1,000
Visitation associated with Ko'opaupoko Hawaiian Civic Club	1,000	all by car	0	334
Visitation to HIMB	15,000	½ by car, ½ by bus	116	2,500
Visitation associated with Papahana Kuaola	30,000	½ by car, ½ by bus	231	5,000
Visitation associated with The Nature Conservancy	300	all by car	0	100
TOTALS	296,300		2,580	42,935

^A = Source: R. Toonen, HIMB, personal communication, November 17, 2016.

Staff and Visitor Transportation

No Action Alternative

Existing non-profit and educational institutions run numerous programs that bring students and other visitors to the area surrounding the He'eia estuary. The estimated number of community members served annually by these entities is shown in Table 6.5. To estimate the greenhouse gas emissions associated with these existing programs, it is necessary to estimate the number of individual vehicle trips associated with the educational and community events. In some cases, visitors might travel in private passenger vehicles, and in other cases, they might be transported in school buses. School buses typically have 13 rows, and 4 to 6 people can sit in each row (depending on the size of the individuals). If, on average, 5 people sit in each row of a school bus, then the average bus can be estimated to carry 65 passengers. For purposes of this analysis, it will be assumed that private light-duty vehicles (cars and SUVs) carry an average of 3 people per trip to events in the region. There is no data on the total number of different types of vehicles that actually travel to programs offered by the below-listed groups and no data on the number of passengers actually carried per vehicle. Thus, it must be acknowledged that the actual number of trips and distribution of vehicles likely differs from this estimate.

Table 6.6. Approximate greenhouse gas emissions associated with transportation sources

Average miles per gallon (according to the <u>Department of Energy</u>)	School buses: 6.3	Cars and SUVs: 21.6
Total fuel use (for trips averaging 20 miles roundtrip) to transport participants to existing community programs	8,190 gallons of diesel	39,754 gallons of gas
Average CO ₂ emissions per gallon, in pounds (according to the <u>Energy Information Administration</u>)	22.4 ^a	19.6
Total CO ₂ emissions per year, in pounds	183,460	799,200
Total CO ₂ emissions per year, in metric tons	83	353

^a = This does not include emissions during the time a bus is idling (e.g., while passengers are getting on and off).

Using the estimated number of trips derived above, Table 6.6 estimates the approximate greenhouse gas emissions associated with current school bus, car, and SUV trips. These calculations suggest that visitations associated with programs run by the above-referenced entities generate on the order of 500 metric tons of carbon dioxide each year. It is very important to realize, however, that many factors determine the miles a vehicle can travel per gallon of fuel and the amount of greenhouse gases emitted per gallon of fuel burned. Those factors include the age of the vehicle, vehicle maintenance history, how the vehicle is driven (e.g., its speed and amount of time idling), engine size, vehicle weight, etc.

Additional emissions are produced by vehicles driven by staff associated with the above-referenced non-profit and educational organizations commuting to work in the Kāne'ohe area. Table 6.7 estimates associated emissions, assuming that staff commute to work approximately 250 days per year. For the purposes of developing a rough estimate, 80% of these personnel are estimated to travel approximately 5 miles and 20% are estimated to travel approximately 15 miles, resulting in an average commute length of 7 miles in one direction or 14 miles per day. All these individuals are estimated to travel in their own automobile or SUV, which may overestimate the total vehicle-miles driven to work, as some employees might use transit or carpool.

Table 6.7. Kāneʻohe area educational organization vehicle miles

ORGANIZATION WITH OFFICE NEAR HE'EIA	CURRENT NUMBER OF EMPLOYEES ^A	TOTAL NUMBER OF VEHICLE-MILES TRAVELED ON COMMUTES, PER YEAR
Kāko'o 'Ōiwi	5	17,500
Kama'āina Kids	5	17,500
Paepae O He'eia	12	42,000
Ko'olaupoko Hawaiian Civic Club	0 ^c	0
HIMB	13	22,750
Papahana Kuaola	3	10,500
The Nature Conservancy	0 ^d	0
TOTAL	38	110,250

^A = These figures are drawn from the websites of the organizations.

^b = Source R. Toonen, HIMB, Personal Communication, December 5, 2016.

^c = The organization is operated by officers and directors, not employees who commute daily.

^d = The Nature Conservancy's staff are not included because its O'ahu office is in Honolulu, not in the He'eia area.

The above table yields an estimate of approximately 110,000 miles driven to work by employees who work for non-profit and educational organizations in the Kāneʻohe area, who would likely partner with the Reserve. Assuming the average light-duty vehicle (car or SUV) can travel 21.6 miles per gallon, approximately 5,100 gallons of gas would be needed by these commuters every year, which would produce approximately 100,000 pounds of carbon dioxide or approximately 45 metric tons of carbon dioxide. That would mean that employees and participants of the programs run by the non-profit and educational organizations listed above, combined, would be responsible for causing the release of roughly 480 metric tons of carbon dioxide per year from cars, SUVs, and buses, using the assumptions outlined.

There are additional means of transportation required to access HIMB, which is located on Moku o Lo'e (Coconut Island). Small groups of visitors (up to six at a time) can take a quick ride on a Boston Whaler to HIMB from Lilipuna Pier. Many of them park at the Windward Mall and take an HIMB shuttle van to Lilipuna Pier, as parking within walking distance of the pier is limited. A rough estimate of emissions associated with shuttle van and boat trips aboard a Boston Whaler can be derived. The shuttle van, which can hold 6 people, operates approximately 4 times per day during the week (R. Toonen, HIMB, personal communication, November 17, 2016). The distance the shuttle van travels is approximately 1.25 miles or 2.5 miles round trip. Thus, to transport people from the Windward Mall to Lilipuna Pier, the van covers approximately 10 miles per day on weekdays or approximately 2,600 miles per year. The average minivan made in 2010 and 2011 was able to travel approximately 17.5 miles per gallon in city driving conditions, according to the U.S. Department of Energy's fueleconomy.gov website, which means that the shuttle van would require approximately 150 gallons to make these trips, emitting approximately 2,900 pounds (or 1.3 metric tons) of carbon dioxide per year, assuming it operates 20 times per week.

HIMB's 17-foot Boston Whalers shuttle people from Lilipuna Pier to HIMB on demand for at least 11 hours per day on weekdays. The boat shuttles operate hourly for 9 hours on weekends. Additional boat trips can also be arranged in the evening, seven days per week. To develop an estimate of emissions from boat trips, it is assumed that there are, on average, 14 round trips per day on weekdays and 12 round trips per day on weekends. The distance between Moku o Lo'e and Lilipuna Pier is less than one-third of a mile. HIMB's 17-foot Boston Whalers typically operated in Kāne'ohe Bay have 40-horsepower, 4-cylinder engines. According to an article published in Boating Life magazine in 1998, running a 40-horsepower, 4-cylinder engine for 5 minutes (the approximate length of a round trip) would consume 0.14 gallons of fuel, if the boat were operating at full speed (Becker 1998). That is a very conservative estimate that overestimates fuel use because the engines on the Boston Whalers would not typically operate at full speed. Also, the estimate assumes the boat engines were built prior to 1990; newer engines would be more fuel efficient. However, even if the motors were built prior to 1990, the 94 trips per week would consume at most 13.5 gallons of fuel per week or 700 gallons per year, resulting in, at most, 13,500 pounds (or 6.1 metric tons) of carbon dioxide emissions per year. Thus, together, these two shuttles operated by HIMB would contribute an estimated 7.4 metric tons of carbon dioxide per year. If additional data become available about the fuel efficiency of either the shuttle van or the Boston Whalers, this estimate could be refined. In all, the total carbon dioxide emissions from transportation via shuttle boat, shuttle van, car, SUV, and/or school bus for existing staff and visitors contributes on the order of 490 metric tons of carbon dioxide per year to the atmosphere.

It should be noted that large groups visiting HIMB have historically been transported to Moku o Lo'e on the Honu Kai, the HIMB cargo vessel, which picks up passengers at He'eia Pier and has a diesel inboard motor. HIMB recently purchased a new, more efficient vessel, which would be used for most of its educational cruises. The new vessel holds approximately 49 passengers, whereas the Honu Kai holds approximately 40 people. No data is available at this time regarding how many of the 15,000 visitors per year to HIMB have been transported to the island via a vessel larger than a 17' Boston Whaler (typically on the Honu Kai, in the past). Without information on the number of direct trips the Honu Kai makes between He'eia Pier and the island, how many additional hours it is operated for educational field trips or research purposes, and the average fuel efficiency of the vessel, it is impossible to estimate its carbon footprint. If this data becomes available, it would be possible to estimate emissions from the Honu Kai. In addition, the fuel efficiency of the new vessel and number of trips it is projected to make, of what duration, would be needed to estimate its greenhouse gas emissions.

Preferred Alternative and Alternatives A, B and C

Under scenarios involving designation of a He'eia Reserve, additional trips to the area by new Reserve staff would be anticipated to cause a very slight increase in the amount of greenhouse gas emissions from motor vehicle and boat engines. At the outset, the Reserve would be expected to hire at least three additional staff members, as noted in the Management Plan. Once hired, these individuals could commute from the Kāne'ohe Bay area (within 5 miles), Honolulu (approximately 15 miles away), or elsewhere. For the purposes of estimating increased vehicle emissions, it will be assumed that two new staff members commute on weekdays from the Kāne'ohe Bay or Kailua area, within 5 miles, and two commute from Honolulu, approximately 15 miles away.

If a Reserve were designated, there would be additional trips to the area by visitors as well. No additional trips by school groups to the Reserve would be anticipated, according to information in the Reserve Management Plan. This is because Reserve staff would coordinate and bring together the partners providing educational opportunities and help them develop more comprehensive, cohesive programs. However, there would likely be some increase in visits to the different components of the Reserve by families or researchers who hear about the Reserve as a result of Reserve publicity. In addition, Reserve partners might come together to meet in person as a result of designation.

Because the vast majority of visitors to the area are participating in other, ongoing activities, the number of additional trips to the area following designation are expected to be low. For the purposes of this analysis, NOAA assumed there would be 20 additional trips to the Reserve by visitors per week, including 5 trips from the Honolulu area or another part of O’ahu that is, on average, 15 miles away; another 15 trips per week are projected to be an average of 5 miles each (from the immediate Kāne’ohe area). It should be noted that staff, visitors, or partners might occasionally need to travel to the Reserve on weekends, but for the purposes of this analysis, the weekend trips are assumed to be offset by reductions in weekday trips. Also, the number of Reserve visitors might not be as high as these long-term estimates initially, but visitation would be expected to grow over time. The implications of these additional trips in private cars or SUVs, with respect to fuel use and carbon dioxide emissions, are shown in Table 6.8.

Table 6.8. Estimated future reserve vehicle use impacts

VARIABLE	TRIPS AVERAGING 10 MILES ROUNDTRIP	TRIPS AVERAGING 30 MILES ROUNDTRIP
Trips in cars or SUVs by new He’eia Reserve staff and additional He’eia Reserve visitors per year	1,300 (520 by staff and 780 by visitors)	780 (520 by staff and 260 by visitors)
Total vehicle-miles per year of above trips	13,000	23,400
Average miles per gallon for cars and SUVs	21.6	21.6
Total gallons of gas used by cars and SUVs	602	1,083
Total CO ₂ emissions per year, in pounds	11,800	21,230
Total CO ₂ emissions, in metric tons	5.4	9.6

Since there are already, on average, 4 shuttle van trips that run each weekday and HIMB currently has only 13 faculty and staff members, it is estimated that only 1 additional shuttle van trip would be required for the new staff members and visitors per weekday. One more shuttle van trip each weekday would result in an additional 650 miles traveled per year, or approximately 37 gallons of gasoline used (assuming the van gets 17.5 miles per gallon), leading to 730 pounds of carbon dioxide emissions per year or 0.3 metric tons per year. The additional trips to the Reserve by staff and visitors would probably not require any additional shuttle boat trips per day, because the frequent shuttle boats are likely not operating at capacity.

To the extent that these projections about the increased number of commuters and visitors to the Reserve and the distance they travel (and average fuel economy of the vehicles used) approximate actual conditions, it is possible to estimate potential increased greenhouse gas emissions associated with Reserve designation. These estimates indicate that new trips via car, SUV, and shuttle van associated with the proposed Reserve would be projected to contribute to emissions of approximately 15 metric tons of carbon dioxide per year. That represents a negligible contribution towards greenhouse gas emissions (less than 1%) compared to the almost 2,000 metric tons produced by travel of staff and visitors for existing programs operated by the above-referenced organizations via car, bus, shuttle van, and shuttle boat (but not trips in HIMB's larger vessels because of insufficient data to estimate associated emissions, as noted above). By comparison, in 2007, throughout the State of Hawai'i, ground and marine transportation combined contributed an estimated 6.6 million metric tons of carbon dioxide equivalents to the atmosphere (ICF International 2008), which makes 2,000 metric tons appear negligible by comparison. (The approximately 2,000 metric tons of carbon dioxide estimated above would represent three-thousandths of a percent of these emissions.) More recently, the Energy Information Administration reported that, in 2013, emissions equal to 9.6 million metric tons of carbon dioxide were associated with all types of transportation in the State of Hawai'i (U.S. Energy Information Administration 2015).

Changes to Land Cover and Vegetation

No Action Alternative

Under this alternative, the various areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners currently represented within the He'eia estuary. There are some potential greenhouse gas implications of land cover change and changes to vegetation communities planned or proposed by these entities. The potential effects associated with these changes can only be discussed qualitatively because, to date, most have not been planned in sufficient detail to allow for estimates of how many acres of one type of land cover would be converted to other specific types (e.g., species) of land cover. For example, removal of the invasive mangroves in He'eia Stream and along the He'eia Fishpond could contribute to greenhouse gas emissions, but the amount of carbon being stored by these mangroves (and the soils beneath them) is unknown, particularly given that they are an invasive species in Hawai'i and were introduced into the area within the last 100 years. Established mangroves are one of the most carbon-rich forests in the tropics and therefore their destruction can have significant greenhouse gas emissions (Pendleton et al. 2012). However, carbon emissions resulting from converting mangroves to other types of land cover are not well understood (Donato et al. 2011). This is particularly the case for mangroves that have only relatively recently been established that, therefore, have not likely accumulated the same deep, organic-rich soils as more mature mangrove forests. On the other hand, reforestation efforts planned on the HCDA parcel could potentially result in increased carbon storage in the long run, depending on the characteristics and distribution of the vegetation planted and the vegetation removed. Given the lack of specific information about the current vegetation distribution across the 196 acres where reforestation is proposed, as well as information on the types of vegetation that will be planted, it is not possible to estimate quantitatively the net effect of this reforestation on carbon storage at this time.

Conversion of wetlands to fields, manipulation of hydrology or topography, and/or other changes to land management directly adjacent to wetlands might make it difficult for wetlands to migrate inland as sea-level rises, which can occur when wetlands are adjacent to undeveloped areas. On the other hand, active management of areas bordering wetlands can allow land management practices to be adjusted over time. Also, replacing wetland plants with taro and other crops on the HCDA parcel could increase emissions because the existing wetlands likely sequester more carbon than taro fields, assuming the soils in taro fields would be exposed to more oxygen than the wetland soils and that the taro plants are not as productive as wetland species, particularly given that the taro will be harvested. While carbon sequestered in wetlands would be lost in the short term, vegetation planted in its place would store some carbon, and later crop harvesting would release carbon. To estimate potential changes to greenhouse gas emissions associated with vegetation change and soil disturbance, additional research would be needed on gas fluxes, soil carbon levels before and after the land use change, and carbon sequestration rates before and after the land use change. (For example, the fact that the area in question was formerly used for agriculture probably means that it stores less carbon than a pristine wetland would store, but data reflecting actual carbon storage by wetlands in this area are lacking.)

Wetlands both sequester carbon dioxide and are a natural source of methane. To project potential effects of wetlands conversion on greenhouse gas flux, it would be helpful to identify or conduct research on how traditional taro cultivation and management impacts soil carbon levels, given that taro beds could be exposed to more oxygen or oxygenated water (which would stimulate decomposition and affect carbon storage). NOAA could not identify publications identifying either emission factors for taro fields or changes to greenhouse gas release and storage resulting from converting wetlands to taro fields. To the extent that wetlands or uplands are converted to land uses with standing freshwater (including ponded water on taro fields or combination taro patches and fishponds), that could affect the rate of methane emissions. Other data gaps precluding the quantification of emissions associated with ground cover include information on specific plans associated with land use change on the HCDA parcel, including the size of the areas expected to have standing water in the future.

Overall, it is possible there would be a net increase in greenhouse gas emissions from vegetation, which would probably be small compared to existing greenhouse gas flux from vegetation in the region, but that is not certain given the number of variables that are unknown at this time (including the amount of greenhouse gas flux from vegetation elsewhere in the region). The primary driver (i.e., the largest contributor to greenhouse gas flux) is likely to be converting wetlands (albeit already degraded) to taro patches and fields for other crops. It should be noted that, while planned land cover changes could lead to increases in carbon emissions, these land management decisions offer other benefits to the community, including a wide variety of other ecosystem services and the ability to engage in traditional cultural Hawaiian practices. Many factors must be considered; the climate change impacts are only one facet of complex decisions that are pending for potential Reserve partners.

Preferred Alternative and Alternatives A, B and C

If designated, He'eia Reserve could contribute site-specific research that would help local communities better understand the impact of land use and landscape changes that could result in releasing or sequestering carbon. Some of the data gaps that additional research might be able to address have been described above, including measurements of changes in greenhouse gas flux associated with converting wetlands to taro fields. Reserve staff and affiliates might be able to provide technical assistance to local entities responsible for resource management decisions and could potentially recommend mitigation strategies for activities being considered that could serve to decrease the greenhouse gas emissions associated with these activities. For example, some taro could be cultivated in uplands areas instead of in wetlands; taro cultivation in upland areas is reportedly increasing in Hawai'i and would be anticipated to result in lower emissions than growing taro in wetland areas that would be waterlogged for extended periods. Reserve staff could also promote research into better quantifying climate change implications associated with the Reserve designation.

Future Facilities Projects

No Action Alternative

Existing entities already have facilities that allow them to provide programming for large numbers of participants. NOAA is aware of a community/health center proposed for construction by Kāko'o 'Ōiwi within the HCDA parcel (in an inholding that is not included in any of the boundary alternatives). NOAA does not have detailed information on this future facility and cannot conduct an analysis at this time. There may be additional future facilities that existing groups are planning to construct for which NOAA is not aware. HIMB recently renovated buildings containing teaching and laboratory space and carries out other projects to repairs or replace existing infrastructure. It also opened a new research learning center in 2010. Repairs to the banquet hall at He'eia State Park are planned in the very near future, as bids were solicited in the fall of 2016; a request for proposals for work on the service road at the park was also published in 2016. Regular maintenance of infrastructure at He'eia Kea Small Boat Harbor would also be anticipated. NOAA is not aware of any changes to buildings (or other hard infrastructure) planned adjacent to He'eia Fishpond or at the HCDA parcel. The carbon emissions associated with facility renovation projects that NOAA is aware of are likely to be very small given the limited scope of these renovations, but NOAA does not have sufficient data to develop quantitative estimates of any associated emissions. If new buildings were to be constructed by Reserve partners to support their existing activities, short-term releases of greenhouse gases might occur in connection with the construction process. Also, if total energy use increases as a result of construction of new facilities, and if fossil fuels are used to provide energy, additional greenhouse gas emissions might be produced at any new facilities over the long-term.

Preferred Alternative and Alternatives A, B and C

The Management Plan identifies a few potential Reserve-related facility needs (e.g., office space on the mainland); however, the Management Plan also indicates that a more formal facilities needs assessment would be prepared soon after designation. In the meantime, no plans have been developed yet for either construction of new facilities for the Reserve or modifications to existing facilities to support Reserve activities. Thus, potential greenhouse gas implications associated with Reserve-related facility needs cannot be analyzed at this time. In general, facilities construction can produce greenhouse gas emissions during the construction process and while facilities operate (unless fueled by renewable energy). To the extent NOAA's Office for Coastal Management has made federal funding available to Reserves for construction projects in recent years, the office has given priority to projects that incorporate sustainable design principles (consistent with the NERRS Sustainable Design Guidelines, issued in 2004), optimize energy performance (e.g., energy efficiency), and/or reduce Reserve-related greenhouse gas emissions (e.g., by retrofitting infrastructure at existing facilities). To the extent these criteria continue to apply in the future, it is anticipated that similar preference will be given to sustainability designed facilities at the future Reserve. The NERRS Sustainable Design Guidelines recommend, for example, adherence to Leadership in Energy and Environmental Design (LEED) "green" building standards. If Reserve operation results in energy-efficiency retrofits or powering facilities with renewable sources of energy (e.g., solar power) instead of fossil fuels, the net effect of Reserve designation could be to reduce the carbon footprint of existing facilities. Even if greenhouse gas emissions were to increase, on balance, as a result of future facility development and operation, the emissions would represent only a tiny percentage of total emissions associated with buildings in the Kāne'ohe area. NOAA will analyze the potential impacts of any federally-supported proposals to renovate existing facilities or construct new facilities to support Reserve activities once specific proposals are developed, prior to approving construction.

3. Air Quality

As described in Chapter 5, "Affected Environment," air quality is monitored on each of the four main Hawaiian Islands by the State of Hawai'i Department of Health (DOH) on a continuous basis. On O'ahu, none of the DOH's stationary air quality monitoring stations are located on the windward side. As a result, localized long-term air quality data for the Kāne'ohe Bay area is not available. For the County of Honolulu, all air quality parameters were in attainment in 2016 according to USEPA air quality statistics. Resulting impacts to air quality from the range of alternatives analyzed are provided in Table 6.9.

Table 6.9. Impacts to air quality

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Air Quality	Negligible adverse impacts from road and boat traffic-related emissions in the area as well as from military aircraft on the Mōkapu peninsula are expected.	Negligible adverse impacts from increased vehicle traffic in the area as reserve activities and programs are implemented.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under this alternative, the various areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners currently represented within the He'eia estuary. However, continued negligible adverse impacts to air quality from vehicle emissions and noise pollution from road and boat traffic in the area as well as from the military aircraft using Marine Corps Base Hawai'i (MCBH) on the Mōkapu peninsula are expected.

Preferred Alternative, Alternatives A, B, C

Each of the proposed alternatives analyzed are expected to result in long-term negligible minor direct adverse impacts to local air quality as vehicle and boat traffic increases to the area in connection with reserve implemented activities and programs. All vehicles would be expected to be operated in accordance with applicable air quality requirements.

6.2.1.2 WATER RESOURCES

1. Water Quality

As described in Chapter 5, "Affected Environment," the He'eia Kea Small Boat Harbor, Kāne'ohe Bay Central Region, and He'eia Stream have been identified by the Hawai'i Department of Health as impaired water bodies due to non-attainment of one or more of the applicable water quality standards based on their classification for water use. The primary pollutants in the area that were identified in Table 5.1 by the State from the Clean Water Act Section 303(d) list of impaired waters include nutrients in the form of total nitrogen (TN), nitrate+nitrite nitrogen (NO₃+NO₂), ammonia (NH₃), total phosphorus (TP); sediments in the form of total suspended solids (TSS) and turbidity; chlorophyll a; and bacteria. Historically, these water quality impacts have been linked to soil erosion, fertilizer, pesticides and wastewater discharges in the He'eia estuary and Kāne'ohe Bay. A summary of the expected impacts to water quality from the range of alternatives analyzed is provided in Table 6.10.

Table 6.10. Impacts to water quality

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Water Quality	Changes to nutrient levels in receiving waters from manipulation and restoration activities. Short-term adverse increases in sedimentation from harbor dredging, upland and estuarine habitat manipulations, or restorations. Beneficial long-term improvements to water filtration, infiltration, and retention of soils.	In addition to the ongoing impacts from site partners, there are potential long-term beneficial improvements through enhanced water infiltration, filtration, and soils retention from hybrid upland forest restoration and the implementation of BMPs associated with the restoration of the stream buffer.	In addition to the impacts identified for the preferred alternative, expanded geographic scope of moderate beneficial impact from additional acreage under upland restoration.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under the no action alternative, the expected habitat manipulation activities by site partners such as those related to wetland agriculture, fishpond reconstruction and aquaculture, and the rehabilitation of maintenance roads and water conveyances would continue as planned. In addition, wetland, upland forest, riparian area, and coral reef restoration activities, identified in the final management plan, are expected to be implemented as future funding is secured by those partner organizations. Furthermore, areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners represented within the He'eia estuary. Additional analysis of the anticipated effects of the site partner-led ongoing or planned manipulation and restoration activities are described below as well as other ongoing activities in the vicinity of the proposed reserve.

Currently, within the uplands and estuarine habitats, significant wetland manipulations, and forest, stream, and wetlands restoration efforts are anticipated to have both direct beneficial and adverse impacts to the water quality of the area's receiving water bodies. An important beneficial water quality impact from the reestablishment of the historic loko i'a kalo (e.g., taro patches) agricultural areas on the Hawai'i Community Development Authority (HCDA) parcel includes the trapping and retention of sediments taro patches during rain events. A recent research study in Palau compared sediment accumulation rates for taro lo'i. The study showed that three different types of taro fields have the capacity to trap up to 90% of sediments, as compared to roughly 30% by mangroves. The authors concluded that sediment trapping of taro lo'i was a critical aspect of mitigating water quality impacts on nearshore reef communities (Koshiba et al. 2013). In Hawai'i there are a number of similar, but non peer-reviewed, studies for comparison. Active construction or poorly designed taro lo'i may not retain sediment under baseflow conditions (Tiffany 2013), but even under these conditions, they still show a positive impact on retaining nutrients (Falinski, unpubl. data). Preliminary data from Tropical Storm Darby, during which the floodwater pulse in the He'eia wetlands rose two meters above baseline flow indicates that significant storm generated sediments were deposited in the taro lo'i (Falinski, unpubl. data). Despite limited information, available evidence indicates that taro lo'i have beneficial impacts to water quality, but may be most effective at reducing nutrient loading during baseflow conditions and in lessening sediment impacts during flood conditions. Given the planned extent of this activity identified by Kāko'o 'Ōiwi and the BMPs identified in their Nationwide Permit 27 preconstruction notification documentation (USACE 2012c), the reductions in sediment loads to the receiving estuarine and marine waters could be significant.

Upland forest restoration through improved forest management by Kāko'o 'Ōiwi is expected to have positive long-term water quality benefits, including increased water infiltration, reduced erosion and improved retention of upland soils, and improved water filtration during rain events. Similarly, restoration of the He'eia Stream channel by replacing invasive vegetation with native plants is anticipated to have minor to moderate beneficial effects over the long term.

Over time, the diversity of site partner-led manipulation and restoration activities are anticipated to support improvements in local aquatic habitat conditions and ecosystem services. Notwithstanding the overall beneficial impacts, short-term, but minor, adverse water quality impacts might occur as a result of these activities. The physical reconstruction of the taro patches could have short-term impacts to elements of water quality, including higher

nutrient levels downstream of the taro patches and increased turbidity and sedimentation to the receiving marine waters. Removal of current plant cover from the uplands, riparian areas and the estuarine wetlands may also result in short-term water quality impacts, including increased turbidity and sedimentation from surface waters as invasive flora holding soils in place is removed and replaced with appropriate native plants. In addition, fish waste byproducts of the ongoing aquaculture at the fishpond may also affect nutrient levels, as water is exchanged with adjacent marine waters.

He'eia Kea Small Boat Harbor, located northeast of He'eia State Park and the fishpond, is a high-use facility for fishermen, tour operators, and other user groups. Vessels operating out of the harbor are expected to continue causing minor adverse impacts to water quality through minor fuel or sewage spills either directly to the marine waters or through surface runoff from the harbor. To mitigate the potential impacts of sewage releases, the harbor has a marine sanitation device (MSD) pump out station. According to the DLNR's Division of Boating and Ocean Recreation (DOBOR), MSDs are designed to prevent the overboard discharge of untreated sewage (Department of Land and Natural Resources 2001).

Additionally, the harbor conducts regular maintenance dredging. Increased turbidity and disturbance of bottom sediments from the dredging produces sedimentation impacts that affect local water quality and the coral reef habitats within Kāne'ohe Bay. These periodic impacts have a moderate short-term adverse water quality impact to the marine waters immediately adjacent to the harbor. According to previous environmental analysis of the activity, as periodic maintenance dredging occurs, coordination between appropriate state and federal agencies occurs to ensure that impacts to the marine water are either avoided or reduced. As a result, the maintenance dredging was found to result in no significant impact to the environment (Department of Land and Natural Resources 2001).

Lastly, a portion of the City and County of Honolulu (C&CH) upland parcel within the project area is currently zoned for residential development. This part of the parcel has the potential, if developed, to have minor adverse impacts to water quality through nonpoint sources (i.e., landscaping runoff; leaking septic; or imperious surfaces) or construction-related sediment loading from surface runoff to Kāne'ohe Bay. The likelihood of residential development on this parcel is highly speculative. Further study would be needed to identify the nature of the potential environmental impacts associated with development in the area. As such, the potential impacts of residential development were not considered under this analysis.

Preferred Alternative

Designation of a reserve under the preferred alternative boundary could potentially result in minor to moderate beneficial impacts to the water quality within the affected environment. As outlined in the proposed He'eia Reserve's final management plan (Appendix A), specific estuarine research, education and stewardship activities, including technical and planning assistance, are expected to occur within the preferred alternative boundary in the years subsequent to designation. The activities identified are not intended to result in significant effects on water quality, but prior to being awarded federal funds, will be evaluated individually for their significance when more details are available.

Including the previously identified habitat manipulation and restoration activities conducted by site partners under the no action alternative, additional

or expanded restoration activities identified under the final management plan are expected to support improvements to quality and extent of the affected habitats and ecosystem processes that could have measurable long-term water quality benefits.

Under the preferred alternative, the upland forest restoration on the HCDA parcel is expected to be enhanced as described in the final management plan. In the short-term, the removal of invasive non-native plant species and the planting of native forest species could adversely affect water quality by increasing soil erosion that could lead to sedimentation (TSS and turbidity) impacts on receiving waters downstream. Some of these potential erosional impacts are expected to be mitigated through the implementation BMPs described in the Kāko'o 'Ōiwi Nationwide Permit 27 pre-construction notification (USACE 2012c). These include conducting the activities outside of the wettest months of the year or on days when no significant rainfall is expected (USACE 2012c). These reflect only a portion of the BMP's or conservation practices identified by the sites partners that could be used to reduce soil erosion impacts and improve water quality. Over time, the establishment of significant hybrid forest cover along the higher sloped upland areas is expected to have generally positive long-term water quality benefits as a restored forest structure from the canopy to the ground cover increase water infiltration, retention of upland soils, and improve water filtration during rain events. Similarly, restoration of a 100 foot buffer around the He'eia Stream channel by replacing invasive vegetation with native plants is anticipated to have short-term minor adverse impacts on water quality during the implementation phase, and minor to moderate beneficial effects over the long term. In addition, the establishment of a stream buffer is expected to have minor to moderate beneficial effects on adverse sediment and possibly nutrient loadings to the He'eia stream and receiving water body.

In addition to the water quality impacts associated with reforestation efforts, implementation of the preferred alternative is also expected to have long-term minor beneficial impacts to water quality that are directly associated with potential programmatic activities as outlined in the proposed He'eia Reserve's final management plan. Upon designation, the initial buildout of research and monitoring infrastructure within the preferred alternative boundary is anticipated to produce water quality data that establish baseline conditions and measure short- and long-term changes to key water quality parameters. These parameters are monitored at continuous 15 minute intervals or monthly for key nutrients as part of the proposed He'eia Reserve's System Wide Monitoring Program. Included within the parameters monitored under SWMP are those identified on the 303(d) list with the exception of bacteria (e.g., enterococci). Based on experience with other reserves in the NERRS, water quality data derived from research and monitoring efforts could support reserve staff and site partners to adaptively manage current and planned habitat manipulation and restoration activities by setting water quality performance targets and habitat design parameters (NOAA 2005). Monitoring changes in salinity, nutrient loading, and sedimentation rates as these activities are managed is anticipated to result in long-term beneficial water quality impacts in the vicinity of the reserve.

Notwithstanding these beneficial impacts, short-term, minor, adverse water quality impacts might occur from the installation and use of instruments for scientific research and water quality data gathering (instrumentation required as part of the NERRS System-Wide Monitoring Program). Minor sedimentation

may occur during the installation of monitoring infrastructure and instruments, such as data sondes, meteorological stations, surface elevation tables, nets, or grab samplers. Based on previous analysis of reserve operational funding awards in the NERRS, installation of research and monitoring infrastructure could be done in a manner designed to minimize adverse water quality impacts and occupy a small footprint (i.e., one piling with instrument attached), and thereby reduce any potential adverse impacts to water quality from the installation of monitoring infrastructure. In addition, given that traffic increases associated with potential reserve programs are expected to be negligible as discussed under 'Population' in subchapter 6.1.1.1, any road pollutant related impacts to water quality are also expected to be negligible.

Alternatives A, B and C

The water quality impacts (adverse and beneficial) described under both the preferred and no action alternatives apply to the boundaries identified under each of the other alternatives unless subsequently noted. Under alternative A, an additional 200 acres of land could be included for upland forest restoration and stewardship activities related to reserve designation. This could potentially expand the anticipated benefits of planned restoration activities to water quality over a larger geographic area. As previously noted, these moderate beneficial impacts include improved water infiltration, filtration, and soil retention. Thus, there would potentially be additional beneficial impacts, especially related to sedimentation beyond those described under the preferred alternative to water quality under alternative A.

2. Hydrology

As described in Chapter 5, "Affected Environment," the He'eia Stream, which runs through the project area and discharges into Kāne'ohe Bay, is a perennial stream that drains into a 3.6 square mile area and extends 3.2 miles from the summit of the Ko'olau Mountains to the ocean. The stream partially discharges into the 88-acre fishpond that extends from the shoreline out into Kāne'ohe Bay. The rest of the stream flow discharges directly into the bay. The bay itself is semi-enclosed by a barrier reef, restricting some ocean/sea water circulation and therefore heavily influenced by freshwater inputs. A summary of the resulting impacts to site hydrology from the range of alternatives analyzed is provided in Table 6.11.

Table 6.11. Impacts to hydrology

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Hydrology	Restoration of natural hydrologic flows through the area. Long-term major increases in water infiltration, improved groundwater recharge, and reduced sediment loadings to receiving waters. Short-term minor adverse impacts from increased surface runoff and sediment loads.	Increased geographic extent of the impacts described in the no action alternative and enhanced beneficial impacts. Moderate long-term beneficial impacts from increasingly stabilized He'eia streambanks.	Increased geographic extent of the reforestation related impacts described in the no action and preferred alternative.	Same as no action alternative.	Same as no action alternative.

No Action Alternative

Under the no action alternative, the planned habitat manipulation activities by site partners such as those related to wetland agriculture, fishpond reconstruction and aquaculture, and the rehabilitation of maintenance roads and water conveyances would be expected to remain in place and continue to cause minor effects on hydrologic flows through the watershed as water flows are managed through traditional land management practices. As these habitat manipulations, as well as planned habitat restoration activities (i.e., upland reforestation, estuarine wetland, and the He'eia Stream channel) are implemented, short-term adverse effects, as well as major long-term and primarily beneficial impacts to the hydrology of the watershed are expected to occur. Additional analysis of the intended hydrological effects of these ongoing or planned manipulation and restoration activities are described below.

The planned restoration of the estuarine habitat and the He'eia Stream channel by Kāko'o 'Ōiwi is intended to have positive long-term hydrologic benefits for the watershed as invasive species, like mangroves, are removed and replanted with habitat appropriate native plants. These actions will open up previously choked water channels and create a more stable floodplain. With a more natural and meandering estuarine floodplain and stream channel, the intensity of runoff and flooding during precipitation events may be moderated, resulting in a more stable hydrologic system over time.

The reestablishment of the historic agricultural areas and the upland forest restoration on the HCDA parcel is also expected to have positive long-term major hydrologic benefits to the He'eia watershed by moderating peak flood discharge to estuarine wetlands and retaining silt loads from the He'eia Stream within the taro patches during rain events. This is accomplished by the trapping and retention of sediments within the taro patches or the forested areas during rain events. Given the planned extent of these activities identified by Kāko'o 'Ōiwi, the reductions in delivery of water quantity and sediment loads to the receiving estuarine and marine waters could be significant. Over time, the range of planned site partner-led manipulation and restoration activities are anticipated to support sustained major improvements to the local hydrology of the He'eia watershed by retaining more water, nutrients and sediments on the land and moderating the impacts of storm events.

Notwithstanding the overall beneficial impacts, minor adverse and short-term hydrologic impacts to the He'eia watershed may occur. For example, temporary water diversions may be used during the rehabilitation of maintenance roads and water conveyances supporting the reestablishment of the historic loko i'a kalo. Also, removal of existing vegetative cover could adversely impact rainfall infiltration within the affected area and increase surface water runoff to receiving waters downstream. Overall, during the implementation of these activities, short-term increased intensity of stream flows that are not absorbed could adversely impact sediment loads and stream channel shape.

Preferred Alternative

In addition to the impacts described in the no action alternative, designation of the preferred alternative is anticipated to have major long-term beneficial and minor short-term adverse impacts to the surface water hydrology of the He'eia watershed as new habitat restoration activities are implemented by the reserve and its site partners.

As described in the proposed He'eia National Estuarine Research Reserve Final Management Plan (FMP), additional restoration activities are expected to be implemented if a reserve is designated. Two of these activities directly affect the hydrological conditions of the He'eia watershed. The first of these restoration activities is the extensive hybrid native forest restoration of upland areas within the HCDA parcel and is an extensive enhancement and geographic expansion of Kāko'o 'Ōiwi's reforestation efforts described under the no action alternative. This restoration calls for the removal of invasive non-native plant species, the planting of native forest species, and the retention of select non-native species that have significant cultural values using contemporary restoration science approaches. Similar to the no action alternative, the removal of existing vegetative cover could adversely impact rainfall infiltration and increase surface water runoff in the short-term. This could result in increased soil erosion and water flows through the watershed during storm events, causing sedimentation and flooding impacts that could adversely affect hydrological conditions within the watershed. However, over time, the establishment of significant native forests along the higher sloped upland areas is anticipated to have positive major long-term hydrologic benefits, including increased water infiltration, improved groundwater recharge and reduced sediment loadings downstream during rain events.

In addition to the stream channel restoration already planned by Kāko'o 'Ōiwi, restoration of a 100-foot native vegetative buffer on either side of the He'eia Stream channel is planned by replacing invasive vegetation with native plants and is anticipated to have minor short-term adverse impacts to watershed hydrology during the implementation phase as invasive plants are removed and replaced with native species. Moderate long-term beneficial effects are expected to increase over time as the buffer becomes established. The beneficial impacts to the affected hydrology are expected to include slowing down floodwaters, improved groundwater recharge, and trapping of sediments that would stabilize streambanks.

Furthermore, as described in the FMP, the proposed He'eia NERR would be expected to provide technical assistance, environmental monitoring, and planning support for the site partners as they implement habitat restoration and manipulation activities within the site boundaries. The restoration and manipulation activities may themselves result in minor adverse and short-term impacts to the hydrology of the He'eia ahupua'a, mostly during project implementation, for example, due to temporary water diversions. However, reserve involvement with these activities through additional contributions of reserve funding, technical assistance, and other programmatic activities is expected to enhance beneficial, and reduce adverse, effects on the hydrology of the He'eia watershed. As a result, the preferred alternative is expected to mitigate adverse impacts on affected hydrology by reducing the anticipated minor negative effects associated with the site partners' planned restoration and manipulation activities.

For example, a planned hydrology and hydraulic study implemented with site partners is anticipated to increase knowledge and understanding of the He'eia watershed hydrology under varying flow conditions and provide new data on short- and long-term trends. Data derived from this study, combined with the development of new monitoring infrastructure (i.e., pore water samplers, flow meters, etc.) typically found at reserves in the NERRS, should enable reserve staff to monitor short- and long-term hydrologic changes within the He'eia ahupua'a. The long-term beneficial impact of this information will be to inform future management decisions (i.e., channel design for the estuarine wetland restoration) related to the different habitat manipulation and restoration efforts.

Alternatives A, B and C

The hydrological impacts described under the preferred and no action alternatives apply to the boundaries identified under each of the other alternatives unless subsequently noted. Under alternative A, an additional 100 acres of land with the C&CH parcel could be targeted for upland forest restoration and stewardship activities related to reserve designation. Expansion of the forest restoration would be expected to mirror the anticipated major benefits of the planned restoration activities to the hydrologic conditions by expanding the geographic footprint of the impact despite this area not be hydrologically connected to the He'eia Stream.

Additionally, a portion of this 210 acre undeveloped parcel fronting the King Kamehameha Highway is zoned as residential (e.g., R-10). If developed, potentially minor adverse impacts to the local hydrology in the immediate vicinity could occur. Similar to the construction and impervious surface impacts typically associated with residential development, the area could experience increased surface runoff and flooding to receiving waters and a reduced capacity for groundwater recharge. Any impact from the boat harbor included in alternative A would be negligible.

3. Ground Water

As described in Chapter 5, "Affected Environment," the area of the proposed He'eia NERR lies over the Ko'olaupoko Aquifer System of the Windward Aquifer Sector. As a primarily high level dike-impounded groundwater, many seeps and springs have been found in the wetlands of He'eia. Resulting impacts to ground water resources from the range of alternatives analyzed are provided in Table 6.12.

Table 6.12. Impacts to ground water

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Ground Water	No direct or indirect impacts are expected	Same as no action alternative	Same as no action alternative	Same as no action alternative	Same as no action alternative

No Action Alternative

Under this alternative, the various areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners currently represented within the He'eia estuary. No direct or indirect impacts (beneficial or adverse) on ground water resources in the area are expected. Previous studies have found that the groundwater recharge area for this system is found in the Ha'ikū Valley at the base of the Ko'olau range. Future changes to ground water resources could be expected if expanding populations result in increased demand for freshwater resources. No additional studies were found for the Hawaiian Islands that considered the effects of land cover changes on ground water resources.

Preferred Alternative, Alternatives A, B and C

None of the alternatives analyzed are expected to result in any direct or indirect impacts (beneficial or adverse) to the ground water resources of the area.

6.2.1.3 GEOLOGY

As described in Chapter 5, "Affected Environment," the steep, grooved cliffs of the Ko'olau Mountain Range are the dominant topographic feature that defines Windward O'ahu. Similar to other Windward O'ahu mountain areas, there is a short transition from the steep mountains to an extremely flat coastal plain covered almost entirely by marshland. Within this topography, silty clay and marsh soils dominate. Resulting impacts to the area geology from the range of alternatives analyzed are provided in Table 6.13.

Table 6.13. Impacts to geology

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Geology	No direct or indirect impacts are expected	Same as no action alternative	Same as no action alternative	Same as no action alternative	Same as no action alternative

No Action Alternative

Under this alternative, the various areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners currently represented within the He'eia estuary. No direct or indirect impacts (beneficial or adverse) to the geology of the area are expected.

Preferred Alternative, Alternatives A, B and C

None of the alternatives analyzed are expected to result in any direct or indirect impacts (beneficial or adverse) to the geological conditions of the area.

6.2.2 BIOLOGICAL ENVIRONMENT

6.2.2.1 TERRESTRIAL HABITATS

Terrestrial habitats within the study area include upland forest and shrub areas. These upland areas are mostly dominated by non-native invasive species, with few native species present (see Section 5.1.3.1 Living Resources — Flora for more description of terrestrial plants). Resulting impacts to terrestrial habitats from the range of alternatives analyzed are provided in Table 6.14.

Table 6.14. Impacts to terrestrial habitats

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Terrestrial Habitats	Improved habitat from partner reforestation activities. Short-term and long-term, moderate, direct beneficial impacts including enhanced habitat for native species, removal of certain invasive species, and increased biodiversity. Short-term, direct, negligible adverse impact from soil disturbance and erosion.	Minor, indirect, beneficial over the long-term resulting from implementation of reserve programs (e.g., staff provides technical assistance and coordination, and increased community support and participation in restoration efforts). Installation of research and monitoring infrastructure leading to short-term, direct, negligible, adverse impacts such as sedimentation, habitat loss, or habitat modification.	Additional 200 acres of terrestrial habitat included in the boundary (compared to the preferred alternative). Long-term, direct, moderate, beneficial impacts resulting from the inclusion of the additional terrestrial habitat in reforestation effort (described under the no action alternative). Short-term, direct, negligible adverse impact from soil disturbance and erosion.	Significantly less terrestrial habitat included in the reserve boundary. When compared to the preferred alternative, lack of research, coordination and monitoring in terrestrial areas would be expected to limit the overall impact and efficacy of these reserve programs and reduce the total benefits to the terrestrial habitat of the affected environment.	Significantly less terrestrial habitat included in the reserve boundary. When compared to the preferred alternative, lack of research, coordination and monitoring in terrestrial areas would be expected to limit the overall impact and efficacy of these reserve programs and reduce the total benefits to the terrestrial habitat of the affected environment.

No Action Alternative

Under the no action alternative, there would be no changes to the local partners' existing or planned activities within the terrestrial areas of the affected environment. The uses of He'eia State Park are primarily low impact. The park contains a large hall that can be rented for lū'aus, wedding and special events. In addition, Kama'aina Kids offers guided tours (on land and in the water) and interactive classes. The primary impacts to terrestrial habitats in the park are from human visitors and the traffic coming through the park, which has only a negligible adverse effect because the land is already developed. On Moku o Lo'e (Coconut Island), all visitors to terrestrial areas must have an HIMB-affiliated host. Because of HIMB's commitment to sustainability and environmental quality, regular human use of the island (apart from any new construction projects) likely does not have any appreciable impacts in already-developed areas.

In the upland forested area of the He'eia CDD parcel (sometimes called instead the HCDA parcel), Kāko'o 'Ōiwi is planning to implement a 196-acre reforestation project; the timeline for the implementation of this activity is

unknown at this time. The upland reforestation would include removal of invasive non-native plant species, but also allow for select non-native plants to remain, particularly those species that provide key forest structural attributes, have cultural relevance, or provide an important ecosystem service.

Once implemented, it is anticipated that the reforestation effort could result in both short-term and long-term moderate beneficial impacts to terrestrial habitats. As detailed in the FMP, this restoration activity would be implemented with the intention of ultimately providing increased or enhanced habitat for native species and improving the ecological function of the site's terrestrial habitats. In the short-term, removal of the invasive non-native plant species could increase potential habitat that could be colonized or planted with appropriate native or select non-native plant species. In the long-term, it is anticipated that the reforestation effort could lead to measured improvements in the ecosystem services provided by the reforested terrestrial habitat. Potential beneficial ecosystem services may include increased biodiversity, increased native species presence, and increased natural resources that support cultural traditions and practices. Any potential erosion impacts associated with the reforestation efforts, as invasive species are removed and replaced with new species, are expected to be, at most, short-term, direct, and negligible because best management practices will be used to minimize sediment transport that could result from plant removal or the planting of new ones. These activities will occur over time, broken up across small segments of the total area, allowing impacts to be better controlled and mitigated. Erosion control measures could include diverting or controlling drainage, as well as preparing and stabilizing disturbed soil areas. Mulching, geotextiles mats, fiber rolls, and temporary drainage swales are examples of best management practices that could be applied to mitigate potential adverse impacts.

Preferred Alternative

Under the preferred alternative, the planned reforestation effort, described under the no action alternative, would continue. The designation of a research reserve would, however, add an additional layer of research, coordination, and monitoring to existing or planned activities. It is anticipated that, under the preferred alternative, the research reserve-related activities of research, coordination, monitoring, and education could have minor, indirect, beneficial impacts to terrestrial habitats over the long-term and temporary, direct, negligible, adverse impacts over the short-term.

As detailed in the FMP, it is anticipated that reserve staff would potentially provide technical assistance, environmental monitoring and/or planning support, which would tie directly to the proposed reserve's ecosystem-based management research activities occurring within the terrestrial areas. Future reserve staff could potentially work with site partners to initiate monitoring programs during project implementation to allow for adaptive management of these restoration efforts, as needed. Environmental compliance reviews would be carried out in advance of each project, and all necessary permits and authorizations would be obtained. With technical assistance and/or other support from reserve staff, it is anticipated that the terrestrial habitat restoration effort could bring about, in the long-term, minor, indirect, beneficial impacts, particularly to species and ecosystems. For example, reserve staff could work with site partners to identify and implement appropriate mitigation measures so that the planned terrestrial habitat restoration activities will be achieved in a manner that minimizes negative impacts to sensitive environments and species. Mitigation measures may include working with

site partners to ensure that the various projects are implemented using best management practices to minimize erosion and sediment loss (e.g., using erosion control blankets on steep-sloped areas during construction).

In addition to providing technical assistance and environmental monitoring support to site partners, it is anticipated that reserve staff would play a key role in coordinating external research, monitoring, education and outreach efforts occurring throughout the terrestrial areas. Thus, reserve designation could improve coordination of these efforts, and thereby, provide support to the reserve and site partners' programs aimed at promoting, understanding and improving terrestrial habitats. This support, in turn, is expected to provide long-term, minor, and indirect beneficial impacts to affected terrestrial habitats.

Reserve-specific research and monitoring efforts would focus, at least initially, on developing baseline habitat and ecosystem service data related to terrestrial habitats. Designation of the proposed He'eia NERR would result in the installation and use of instruments for scientific research and data gathering. These instruments could include, for example, meteorological stations or soil monitoring systems. It is expected that their installation and use could result in temporary, direct, adverse impacts to terrestrial habitats, such as negligible sedimentation, habitat loss, or habitat modification. These impacts are expected to be negligible because the instruments will be placed and used in a manner designed to minimize negative impacts to sensitive environments, and in compliance with all environmental, historic preservation, and other applicable mandates.

Implementation of the proposed He'eia NERR's education, and outreach programs could help site partners and key audiences improve their understanding of the ecological value the terrestrial habitats provide. Reserve outreach efforts are anticipated to result in increased participation in community restoration and stewardship activities intended to improve the ecological character and functionality of the terrestrial habitats. This increased participation, in turn, is expected to provide long-term, minor, and indirect beneficial impacts to affected terrestrial habitats. It is for these reasons that, if designated, the reserve's research, education, and outreach efforts would be expected to have long-term, minor beneficial impacts and would not be expected to have any significant adverse impacts on affected terrestrial habitats.

Alternative A

Implementation of alternative A would add approximately 200 acres of terrestrial habitat to the proposed He'eia NERR beyond those included in the preferred alternative. The FMP describes this additional land as "mixed native and non-native forest," and it would likely be targeted for inclusion in the reforestation effort described under the no action alternative. The restoration of degraded upland forest habitat could result in measurable improvements to specific ecosystem services, as well as improve habitat and ecosystem function, and could potentially result in long-term, direct, moderate, beneficial impacts to these additional terrestrial habitats, depending on the nature and extent of the forest restoration. Any potential erosion impacts associated with the reforestation efforts as invasive species are removed and replaced with new species are expected to be at most negligible because best management practices will be used to minimize sediment transport that could result from plant removal or the planting of new ones. These activities will occur over time, broken up across small segments of the total area, allowing impacts to be controlled and mitigated. Erosion control measures could include diverting or controlling drainage, as well as preparing and stabilizing disturbed soil areas.

Mulching, geotextiles mats, fiber rolls, and temporary draining swales are examples of best management practices that could be applied to mitigate potential adverse impacts. For the same reasons described above, erosion-related adverse impacts are anticipated to be short-term, direct, and negligible.

Alternatives B and C

Implementation of alternatives B and C contain limited terrestrial habitats within the research reserve’s boundary, and these areas have some degree of development on them (e.g., He’eia State Park, or the staging/staff offices on the HCDA parcel). The reforestation effort described under the no action alternative would still be implemented. However, the additional long-term, moderate, beneficial impacts that could result from the research reserve program’s (e.g., research, coordination, and monitoring) would not be expected to occur within the terrestrial habitats because these areas would be outside the boundary of the proposed site. When compared to the preferred alternative, lack of research, coordination and monitoring in terrestrial areas would be expected to limit the overall impact and efficacy of these reserve programs and reduce the total impacts (beneficial and adverse) to the terrestrial habitat of the affected environment.

6.2.2.2 ESTUARINE HABITATS

The estuarine habitats within the study area include tidally influenced wetlands, a mangrove forest, and He’eia Fishpond. On the makai (seaward) part of the HCDA parcel, an invasive mangrove forest has altered the He’eia estuarine habitat and is choking the He’eia Stream. Resulting impacts to estuarine habitats from the range of alternatives analyzed are provided in Table 6.15.

Table 6.15. Impacts to estuarine habitats

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Estuarine Habitats	Improved habitat from partner restoration activities (mangrove and invasive algae removal). Long-term, direct, major, beneficial impacts resulting from the restoration of native habitat. Potential short-term minor adverse impacts sedimentation and habitat loss during the implementation of mangrove removal and construction of the loko ‘a kalo. Short-term, direct, negligible adverse impacts resulting from invasive algae removal.	Minor, indirect, beneficial impacts over the long-term resulting from implementation of reserve programs (e.g., staff provide technical assistance and coordination, and increased community support and participation in restoration efforts). Installation of research and monitoring infrastructure leading to short-term, direct, negligible, adverse impacts such as sedimentation, habitat loss, or habitat modification.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under the no action alternative, there would be no changes to the local partners' existing or planned activities within the estuarine areas of the affected environment. As indicated in the FMP, Kāko'o 'Ōiwi intends to remove the invasive mangroves and replace them with approximately 20 acres of native wetland sedges and open-water pools, which will serve as habitat for native birds and as a nursery for juvenile fish. During the implementation of the mangrove removal effort, potential short-term minor adverse impacts could occur. During the removal, increased sediment and debris could enter He'eia Stream, thereby temporarily affecting the overall water quality of the stream and other downstream habitats (e.g., the fishpond). However, it is anticipated that the project would be implemented in a manner designed to reduce such adverse effects. Kāko'o 'Ōiwi identified multiple BMPs to limit and mitigate potential impacts to the estuarine areas and is working in cooperation with The Nature Conservancy, the U.S. Fish and Wildlife Service and the Natural Resource Conservation Service to create a detailed restoration plan for the wetlands portion of the estuary (USACE 2012c). Additionally, The U.S. Army Corps of Engineers (USACE) issued a permit in 2012 to Paepae o He'eia to close an 80-foot breach in the wall of He'eia Fishpond and associated sluice gate (makaha). The permit required the restored wall to have the same alignment and footprint as the original fishpond wall. Restoration was to be accomplished by hand, using hand tools, without mortar. Most stone and rocks were to come from the site; some pieces of dead coral came from a local quarry. No heavy equipment was used below the high-water mark; in some cases, floating pontoon flat beds were to be used to transport stone. The permit also covers 10 years of maintenance work, including manual replacement of dislodged stone, as well as removal by hand and with hand tools (but without pesticides) of invasive mangroves, invasive algae, and other invasive plants. Paepae o He'eia proposed a series of best management practices (BMPs) for its restoration efforts, incorporated into the permit (USACE 2012b). The restoration work at He'eia Fishpond could also modify the natural environment leading to temporary habitat loss and reduced habitat value in discrete areas, but these adverse effects are expected to be generally minor given that mobile species such as Hawaiian hoary bats and migratory shorebirds could potentially relocate to nearby habitats with similar characteristics. All necessary permits and authorizations for the proposed projects in estuarine habitats would be secured prior to their implementation. The long-term goal and beneficial impact of replacing the mangrove forest with approximately 20 acres of native wetland sedges and open-water pools would be to improve the function of the currently degraded estuarine environment, and the anticipated long-term, direct, major, beneficial impacts would be of a larger magnitude than anticipated short-term adverse impacts.

In the brackish wetland, Kāko'o 'Ōiwi also plans to implement a historic loko i'a kalo, a traditional combined taro patch and fishpond. It is anticipated that establishing a loko i'a kalo in the brackish wetlands will help restore the degraded ecosystems and ultimately improve habitat and ecosystem function. Although the exact size and depth of the planned loko i'a kalo is unknown at this time, the FMP identifies an approximate area where this activity will occur (see Section 10.2, Figure 10.1). Due to the proximity of the planned area to the mangrove forest, the implementation of this activity is expected to occur after the removal of the mangrove forest. All necessary permits and authorizations will be obtained prior to establishing a new loko i'a kalo system. The loko i'a kalo is anticipated to yield direct beneficial impacts to the estuarine environment (primarily through improved habitat for select native fish species

and other ecosystem services). However, the implementation and construction of the loko i'a kalo may result in short-term, minor adverse impacts, as some plants or animals that currently inhabit the brackish wetlands might not survive once the conversion of this ecosystem is completed. In addition, adverse impacts would be contained to a specific area and located within an environment that is currently degraded.

Within the He'eia Fishpond, the removal of invasive limu (seaweed) is another restoration activity currently underway, which is expected to continue. This activity improves the estuarine environment within the fishpond by supporting the growth of native seaweed species (e.g., manaua and common ogo). The invasive limu grows in large dense mats, spreading quickly, and essentially out-competes the native algae species, preventing the native algae species from colonizing potentially-habitable areas. As previously described, the invasive limu is gathered by hand or net, placed into large bags, removed from the site, and taken to local farms to be used as organic fertilizer. No mechanical equipment is used to remove the invasive limu. The short-term, direct, adverse impacts of gathering the limu are so limited, primarily affecting aquatic invertebrates in the estuarine habitat, that they would be negligible. There would be no anticipated long-term adverse impacts associated with this activity.

Preferred Alternative and Alternatives A, B and C

Under the preferred alternative, the planned restoration and manipulation activities described under the no action alternative would continue. The designation of a proposed He'eia NERR would, however, add the elements of dedicated research, coordination, monitoring, and education to existing or planned activities that, collectively, are expected to have indirect, minor, beneficial impacts to estuarine habitats over the long-term.

As detailed in the FMP, it is anticipated that reserve staff would potentially provide technical assistance, environmental monitoring and/or planning support, which would benefit the proposed reserve's ecosystem-based management research activities occurring within the estuarine areas. Future reserve staff could potentially work with site partners to initiate monitoring programs during project implementation to allow for adaptive management of these restoration and manipulation efforts, as needed. Any necessary environmental compliance reviews would be carried out in advance of each project, and all necessary permits and authorizations would be obtained. With technical assistance and/or other support from reserve staff, it is anticipated that the estuarine habitat restoration effort would result in additional long-term, indirect, minor, beneficial impacts, particularly to species and ecosystems. For example, reserve staff could work with site partners to identify and implement appropriate mitigation measures so that the planned activities described above will be achieved in a manner that minimizes negative impacts to sensitive environments and species. Mitigation measures may include actively monitoring for the presence of protected species during the planning and implementing of site partner activities or working with site partners to ensure that the various projects are implemented using best management practices to minimize potential water quality and sedimentation impacts (e.g., using erosion control blankets on the shallow slopes of the estuarine areas).

In addition to providing technical assistance and environmental monitoring support to site partners, it is anticipated that, once hired, reserve staff would play a key role in coordinating external research, monitoring, education and outreach efforts occurring throughout the estuarine areas. Thus, reserve designation could

improve coordination of these efforts, and thereby, provide support to the reserve and site partners' programs aimed at promoting, understanding and improving terrestrial habitats. This support, in turn, is expected to provide long-term, minor, and indirect beneficial impacts to affected estuarine habitats.

Reserve-specific research and monitoring efforts would focus, at least initially, on developing baseline habitat and ecosystem service data related to estuarine habitats. Designation of a proposed He'eia NERR would result in the installation and use of instruments for scientific research and data gathering. These instruments include data sondes, meteorological stations, surface elevation tables, nets, and grab samplers. It is expected that their installation and use could result in temporary adverse impacts to estuarine habitats, such as negligible sedimentation, habitat loss, or habitat modification. These impacts are expected to be negligible because the instruments will be placed and used in a manner designed to minimize negative impacts to sensitive environments, and in compliance with all environmental, historic preservation, and other applicable mandates.

Implementation of the research reserve's education, and outreach programs could help site partners and key audiences improve their understanding of the ecological value the estuarine habitats provide. Reserve outreach efforts are anticipated to result in increased participation in community restoration and stewardship activities intended to improve the ecological character and functionality of the terrestrial habitats. This increased participation, in turn, is expected to provide long-term, minor, and indirect beneficial impacts to affected terrestrial habitats. It is for these reasons that, if designated, the reserve's research, education, and outreach efforts would be expected to have long-term, minor beneficial impacts and would not be expected to have any significant adverse impacts on affected estuarine habitats.

6.2.2.3 RIPARIAN AND FRESHWATER HABITATS

The riparian and freshwater habitats of the project area include streams and associated riparian buffer areas, and freshwater wetlands. These habitats are all located within the HCDA parcel. Resulting impacts to riparian and freshwater habitats from the range of alternatives analyzed are provided in Table 6.16.

Table 6.16. Impacts to Riparian/ freshwater habitats

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Riparian/ freshwater habitats	Improved habitat from partner activities. Long-term, direct, major, beneficial impacts from rehabilitation of the lo'i kalo and restoration of He'eia Stream and buffer. Short-term, direct, and negligible adverse impacts from erosion and sedimentation.	Minor, indirect, beneficial impacts over the long-term from implementation of reserve programs (e.g., staff provide technical assistance and coordination, and increased community support and participation in restoration efforts). Installation of research and monitoring infrastructure leading to short-term, direct, negligible, adverse impacts, such as sedimentation, habitat loss, or habitat modification.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under the no action alternative, there would be no changes to the local partners' existing or planned activities within the freshwater and riparian areas of the affected environment. In the freshwater wetlands, Kāko'o 'Ōiwi, through its Māhuhua 'Ai o Hoi project plans to establish a land management program to return the wetlands of He'eia to productive agricultural, cultural, and educational use. In cooperation with the Natural Resources Conservation Service, the group has developed a detailed conservation plan, the implementation of which is in progress (Townscape 2011). This work includes rehabilitating wetlands to lo'i kalo. The lo'i kalo will be used to grow different varieties of taro and will also serve as habitat for native birds. Presently, approximately 12 acres of the freshwater wetlands within the HCDA parcel has been converted to lo'i kalo. Kāko'o 'Ōiwi ultimately plans to convert 176 acres into a working agricultural landscape. Also proposed is potentially restoring a historic poi mill, which would occur only after any consultations required under applicable federal and/or state law.

As part of the rehabilitation of lo'i kalo in the wetlands of He'eia, historic kuāuna (taro patch walls) has been identified by a certified archaeologist as part of an archaeological inventory survey and will be restored to the extent possible. New kuāuna will be constructed to replace kuāuna from earlier times no longer present. Kuāuna will be built by excavating soil from within the lo'i and using this soil to create the kuāuna. In addition, historical agricultural roads and 'auwai (water conveyance channels) also remain within freshwater wetlands. It is anticipated that the roads will be rehabilitated and reinforced with geotextile material and 'auwai will be restored and vegetated with native riparian plants (USACE 2012c). As needed, consultation with the State Historic Preservation Division will be conducted.

These planned activities could have potential long-term, direct, major, beneficial impacts resulting from the rehabilitation of the lo'i kalo including providing native wildlife habitat, soil and nutrient retention, clean groundwater, and restored water flow. In the short-term, direct, and negligible adverse impacts could occur, such as increased erosion and sedimentation as soil is displaced and relocated within an individual lo'i kalo (e.g., to reinforce kuāuna or historic roads). Water quality impacts resulting from erosion and sedimentation could be an issue. To mitigate potential water quality impacts, rehabilitation of the lo'i kalo, historic kuāuna and agricultural roads is expected to occur on clear days when no heavy precipitation is forecasted and not during the winter months (December through March) when significant precipitation can be expected (USACE 2012c). It is anticipated that, during the rehabilitation or construction of lo'i kalo, the waters coming from He'eia Stream could be temporarily diverted, minimizing risk of affecting water quality within the stream. Loose soil and debris would be confined to the lo'i kalo, a relatively closed unit, and resulting adverse impacts are expected to be manageable. The rehabilitation of lo'i kalo will occur over time, broken up across small segments of the total area, allowing impacts to be controlled and mitigated.

In the He'eia Stream channel, California grass and other invasive plants dramatically reduce water flow and adversely affect water quality. Water quality samples collected by the HIMB in areas of the stream overgrown with California grass suggest that the oxygen content of the water is so low that it cannot support aquatic animals. Kāko'o 'Ōiwi plans to replace the current California grass and other invasive plants in the stream with native plants as well as within a 100 ft. wide buffer along both sides of the stream. The stream

channel and riparian area will be restored to improve water quality and flow and provide better habitat for native aquatic plant, invertebrate, and bird species. Direct, major, beneficial impacts to riparian habitats are likely to occur over the long-term. These beneficial impacts could include increased native species abundance and diversity, increased habitat suitable for native species, and improved water quality.

During the implementation of the restoration effort, it is possible that potential erosion, sedimentation, and water quality-related impacts could occur when removing the California grass and replacing it with new species. However, these potential adverse impacts are expected to be, at most, short-term, direct, and negligible because best management practices will be used to minimize sediment transport that could result from plant removal or the planting of new ones. These activities will occur over time, broken up across small segments of the total area, allowing impacts to be controlled and mitigated. Erosion control measures could include avoiding work during rain events, diverting or controlling drainage, as well as preparing and stabilizing disturbed soil areas. Mulching, geotextiles mats, fiber rolls, and temporary drainage swales are examples of best management practices that could be applied to mitigate potential adverse impacts.

Preferred Alternative and Alternatives A, B and C

Under the preferred alternative, the site partners' planned restoration and manipulation activities described under the no action alternative would continue. The designation of a proposed He'eia NERR would, however, add a more comprehensive regional perspective of research, coordination, and monitoring to existing or planned activities. It is anticipated, that under the preferred alternative, research reserve-related research, coordination, monitoring, and education could have indirect, minor, beneficial impacts to riparian and freshwater habitats over the long-term.

As detailed in the FMP, it is anticipated that reserve staff would potentially provide technical assistance, environmental monitoring and/or planning support, which would tie directly to the proposed reserve's ecosystem-based management research activities occurring within the riparian and freshwater wetland areas. Future reserve staff could potentially work with site partners to initiate monitoring programs during project implementation to allow for adaptive management of these restoration and manipulation efforts, as needed. Environmental compliance reviews would be carried out in advance of each project, and all necessary permits and authorizations would be obtained. With technical assistance and/or other support from reserve staff, it is anticipated that the estuarine habitat restoration effort could bring about, in the long-term, indirect, minor beneficial impacts, particularly to species and ecosystems. For example, reserve staff could work with site partners to identify and implement appropriate mitigation measures so that the planned activities described above will be achieved in a manner that minimizes negative impacts to sensitive environments and species. Mitigation measures may include actively monitoring for the presence of protected species during the planning and implementing of site partner activities or working with site partners to ensure that the various projects are implemented using best management practices to minimize potential water quality and sedimentation impacts (e.g., using erosion control blankets on the banks of He'eia Stream).

In addition to providing technical assistance and environmental monitoring support to site partners, it is anticipated that, once hired, reserve staff would

play a key role in coordinating external partners' research, monitoring, education and outreach efforts occurring throughout the research reserve. Thus, reserve designation could improve coordination of these efforts, and thereby, provide support to the reserve and site partners' programs aimed at promoting, understanding and improving riparian and freshwater wetland habitats. This support, in turn, is expected to provide long-term, minor, and indirect beneficial impacts to affected estuarine habitats.

Reserve-specific research and monitoring efforts would focus, at least initially, on developing baseline habitat and ecosystem service data related to riparian and freshwater habitats. Designation of a proposed He'eia NERR would result in the installation and use of instruments for scientific research and data gathering. These instruments include data sondes, meteorological stations, surface elevation tables, nets, and grab samplers. It is expected that their installation and use could result in temporary adverse impacts to riparian and freshwater habitats, such as negligible sedimentation, habitat loss, or habitat modification. These impacts are expected to be negligible because the instruments will be placed and used in a manner designed to minimize negative impacts to sensitive environments, and in compliance with all environmental, historic preservation, and other applicable mandates.

Implementation of the research reserve's education, and outreach programs could help site partners and key audiences improve their understanding of the ecological value the riparian and freshwater wetland habitats provide. Reserve outreach efforts are anticipated to result in increased participation in community restoration and stewardship activities intended to improve the ecological representativeness and functionality of the riparian and freshwater habitats. This increased participation, in turn, is expected to provide long-term, minor, and indirect beneficial impacts to affected riparian and freshwater habitats. It is for these reasons that, if designated, the reserve's research, education, and outreach efforts would be expected to have long-term, indirect, minor, beneficial impacts to riparian and freshwater habitats and would not be expected to have significant adverse impacts on affected areas. It is anticipated that the community restoration and stewardship events would be (e.g., assisting with building lo'i kalo or removing California grass) carried out using the best management practices described above and led by experienced and knowledgeable staff. It is anticipated that potential adverse impacts would be short-term, direct, and negligible.

6.2.2.4 MARINE HABITATS

The affected environment features six major habitat classes within the marine environment: sand, mud, macroalgae, coralline algae, patch reef, and colonized pavement. Of these habitat classes, the shallow patch reefs provide the highest ecological value and are the targets of the marine-based restoration efforts within the study area. However, other habitat classes provide important areas for a variety of different species during different stages of their life cycles. Resulting impacts to marine habitats from the range of alternatives analyzed are provided in Table 6.17.

Table 6.17. Impacts to marine habitats

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Marine habitats	Long-term, direct, minor to moderate, beneficial impacts from partner restoration activities. Short-term, direct, negligible, adverse impacts from algae removal (e.g. accidental damaging of coral). Direct adverse impacts from boat traffic (e.g. pollution) and indirect adverse impacts waves created by motorized vessels.	Minor, indirect, beneficial impacts over the long-term from implementation of reserve programs (e.g., staff provide technical assistance and coordination, and increased community support and participation in restoration efforts). Installation of research and monitoring infrastructure leading to short-term, direct, negligible, adverse	Less marine habitat acreage could dilute the benefits described in the preferred alternative. Direct adverse impact on the marine habitat (e.g., loss of coral reef habitat), which could be temporary or long-term depending on the severity of the disturbance. Increased turbidity could result in short-term, direct, adverse impact. Negligible, short-term, indirect, beneficial impacts could result from implementing mitigation strategies	Same as preferred alternative.	Less marine habitat acreage could dilute the benefits described in the preferred alternative.

No Action Alternative

Under the no action alternative, there would be no changes to the public’s or local partners’ existing or planned activities within the marine areas of the affected environment. Kāne’ohe Bay is the site of varied and, in places, intense use by humans and other species. Boat traffic in the bay can have adverse effects on the habitat from spills of oils, fuels, pollutants, and other wastes, as well as other indirect adverse impacts, such as from the waves created by motorized vessels. HIMB has its own fleet, which includes a few 17-foot Boston Whalers that have Honda 40-horsepower outboard engines, one or two 22-foot Boston Whalers with twin Yamaha 90- horsepower outboard engines, and one 40-foot support vessel that can transport up to 10,000 pounds of passengers and cargo (and is available for scientific research and educational project support, as needed). The 40-foot vessel sometimes picks people up from and drops them off at a pier at the He’eia Kea Small Boat Harbor. One HIMB boat inventory also references a community education program boat that can hold up to 49 people that HIMB is expecting to put into service. The other reserve partners do not report owning motorboats in the inventory of existing facilities and equipment (Table 8.1) in the FMP.

The boat harbor requires periodic maintenance dredging. This activity is coordinated with appropriate state and federal agencies to ensure that impacts to marine substrate and coral are avoided or minimized. Dredging could result in physical removal of substrate and potentially increase sedimentation. Increased sedimentation could, in turn, increase turbidity levels, temporarily reducing visibility within the water column. The physical removal of substrate could have a direct adverse impact on the marine habitat (e.g., loss of coral reef habitat), which could be temporary or long-term depending on the severity of the disturbance. Increased turbidity could result in short-term, direct, adverse impact on the marine habitats by temporarily reducing the amount of sunlight entering the water column and affecting coral health.

The Department of Land and Natural Resource's (DLNR) Division of Aquatic Resources (DAR) is implementing a program to control alien algae on coral reefs in Kāne'ohe Bay. The DAR staff uses a mechanical suction device called the "Super Sucker" (i.e., an underwater vacuum system) while snorkeling to collect invasive algae removed by hand from the reefs in Kāne'ohe Bay. The algae are collected aboard a barge anchored near the site of collection. After the removal, captive-reared sea urchins are released to graze on the remaining algae and thereby slow the regrowth of the infestation. The algae is removed from the bay, and given to local farmers. The algae are high in nutrients and used by the farmers as a natural fertilizer to support healthy crop growth.

In addition, the DAR is proposing to establish a coral reef mitigation bank on several patch reefs within Kāne'ohe Bay, including patch reef 10. DAR is also proposing to use patch reef 9 as a "control" or reference area to which results in the mitigation bank area could be compared (U.S. Army Corps of Engineers 2014). In other words, no management or restoration would occur in patch reef 9. For additional details regarding the mitigation bank process, including how it is established, used, and managed, refer to the U.S. Army Corps of Engineers Public Notice, 2014. If established, the coral mitigation bank would contribute to the restoration of degraded patch reefs within the proposed boundaries where invasive algae have taken over and caused partial or full mortality of live corals. The mitigation bank will direct additional financial resources to support future efforts to mechanically remove invasive algae and out-plant sea urchins to patch reef 10.

Finally, the study area also includes 64 acres of coral reefs immediately surrounding Moku o Lo'e, which comprise the Hawai'i Marine Laboratory Refuge. This refuge is highly protected by limitations on public access and a prohibition on the removal of marine organisms, except for research purposes. Also, in support of the restoration activities described previously an in-situ pilot coral nursery is currently proposed for a small area off Moku o Lo'e. The nursery, covering an area of approximately 5 meters², is intended to provide source material for DAR-led restoration efforts by collecting corals damaged by ship groundings and other adverse impacts (NOAA 2016d). The activity has undergone an environmental compliance review by NMFS, which found that this activity does not adversely affect listed species or critical habitats. In addition, NMFS also determined that the activity will have no adverse effect to EFH given the best management practices being implemented for the activity, such as avoiding the placement of any coral nursery related equipment and materials, such as concrete blocks on substrate colonized by coral. Placement should ideally be on sand only. The impacts of this activity could potentially have minor beneficial impacts to marine habitats depending on the success of the project.

Overall, the restoration efforts in the marine habitats are anticipated to result in long-term, direct, minor to moderate, beneficial impacts, depending on the success of the efforts. The removal of the algae results in immediate short-term benefits (e.g., improved habitat); however, the long-term success is contingent on the urchin's presence and survival. If the urchin populations decline (e.g., disease or reproduction challenges), this would inhibit the sustained pressure the urchins place on algae growth, and the algae could return to their dominating state. Potential, short-term, direct, negligible, adverse impacts could occur during the algae removal efforts. Corals could be inadvertently damaged during the algae removal process. However, damage of this nature is temporary (i.e., the coral is not expected to die) and is not likely to occur often.

Preferred Alternative and Alternative B

In this section, the Preferred Alternative and Alternative B will be addressed because they contain the same marine habitats. Under the Preferred Alternative and Alternative B, the planned restoration activities described under the no action alternative would continue. There would not be any expected changes in permitted human use of the different marine areas included within the reserve. It is possible there might be a very small increase in the number of boat trips within the bay associated with future reserve visitors, likely practically imperceptible in terms of the effects on marine habitats given the large volume of existing boat traffic and the fact that no new types of boats are anticipated to be introduced into the marine landscape with impacts different from those of current boats used. The designation of a proposed He'eia NERR would, however, add a more comprehensive regional perspective of research, coordination, and monitoring to existing or planned activities. It is anticipated that under the Preferred Alternative and Alternative B research reserve-related research, coordination, monitoring, and education could have indirect, minor, beneficial impacts to marine habitats over the long-term.

As detailed in the FMP, it is anticipated that reserve staff would potentially provide technical assistance, environmental monitoring and/or planning support, which would tie directly to the proposed reserve's ecosystem-based management research activities occurring within the marine areas. Future reserve staff could potentially work with site partners to initiate monitoring programs during project implementation to allow for adaptive management of these restoration and manipulation efforts, as needed. Environmental compliance reviews would be carried out in advance of each project, and all necessary permits and authorizations would be obtained. With technical assistance and/or other support from reserve staff, it is anticipated that the marine habitat restoration effort could bring about, in the long-term, indirect, minor, beneficial impacts, particularly to marine species and ecosystems. For example, reserve staff could work with site partners to identify and implement appropriate mitigation measures so that the planned activities described above will be achieved in a manner that minimizes negative impacts to sensitive environments and species.

In addition to providing technical assistance and environmental monitoring support to site partners, it is anticipated that, once hired, reserve staff would play a key role in coordinating external partners' research, monitoring, education and outreach efforts occurring throughout the marine habitats. Thus, reserve designation could improve coordination of these efforts, and thereby, provide support to the reserve and site partners' programs aimed

at promoting, understanding and improving marine habitats. This support, in turn, is expected to provide long-term, minor, and indirect beneficial impacts to affected marine environment.

Reserve-specific research and monitoring efforts would focus, at least initially, on developing baseline habitat and ecosystem service data related to marine habitats. Designation of a proposed He'eia NERR would result in the installation and use of instruments for scientific research and data gathering. These instruments include data sondes, meteorological stations, surface elevation tables, nets, and grab samplers. It is expected that their installation and use could result in short-term adverse impacts to marine habitats, such as negligible sedimentation, habitat loss, or habitat modification. These impacts are expected to be negligible because the instruments will be placed and used in a manner designed to minimize negative impacts to sensitive environments, and in compliance with all environmental, historic preservation, and other applicable mandates.

Implementation of the research reserve's education, and outreach programs could help site partners and key audiences improve their understanding of the ecological value the marine habitats provide. Reserve outreach efforts are anticipated to result in increased participation in community restoration and stewardship activities intended to improve the ecological character and functionality of the marine habitats. This increased participation, in turn, is expected to provide long-term, minor, and indirect beneficial impacts to affected marine habitats. It is for these reasons that, if designated, the reserve's research, education, and outreach efforts would be expected to have long-term, indirect, minor, beneficial impacts marine habitats and would not be expected to have significant adverse impacts on affected areas.

Alternative A

The implementation of alternative A would result in approximately 300 acres of marine habitats being excluded from the research reserve boundary compared to the preferred alternative. The boundary of alternative A excludes reef patches targeted for the coral mitigation bank and associated control reefs (i.e., reefs 9 and 10). Therefore, under the implementation of alternative A, the linkage between the research reserve's programs and the proposed coral mitigation bank would not be cohesive. The potential long-term, direct, minor, beneficial impacts that could result from the partnership between the research reserve and the DAR, with overlapping boundaries of the research reserve and the proposed coral mitigation bank, may be lessened (compared to the preferred alternative). Also, inclusion of the boat harbor within the proposed He'eia NERR boundary might have negligible, short-term, indirect, beneficial impacts to the marine environment in that reserve staff would be able to work with managing authorities to implement additional mitigation strategies to reduce impacts, such as providing monitoring data that informs approaches to dredging, which could reduce adverse impacts.

Alternative C

The implementation of alternative C would result in approximately 300 acres of marine habitats being excluded from the research reserve boundary (compared to the preferred alternative). The boundary of alternative C excludes reef patches targeted for the coral mitigation bank and associated control reefs (i.e., reefs 9 and 10). Therefore, under the implementation of alternative C the linkage between the research reserve's programs and the proposed coral mitigation bank would not be cohesive. The potential long-term, indirect, minor,

beneficial impacts that could result from the partnership between the proposed He'eia NERR and the DAR, with overlapping boundaries of the research reserve and the proposed coral mitigation bank, may be lessened (compared to the preferred alternative). There would be no anticipated additional impacts to the marine environment under this alternative.

6.2.3 LIVING RESOURCES

The discussions below analyze the potential impacts to living resources of the five alternatives evaluated. The FMP describes the types of activities that reserve partners are working on or planning that affect flora and fauna, as well as how reserve activities would support efforts to study and restore different environments and species. If there is any need for scientific collection or destructive sampling of aquatic flora, fauna, coral, or other living organisms, researchers might be required to obtain permits from the Hawai'i DAR or the Hawai'i Division of Forestry and Wildlife (DOFAW), in the case of birds, for example. If there were a need for scientific collection or destructive sampling of federally protected species, authorizations would be obtained, if needed, from the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS).

6.2.3.1 FLORA

6.2.3.1.1 TERRESTRIAL FLORA

Individual projects that have the potential to impact terrestrial flora have been summarized above. For more information about potential habitat manipulations, see above subchapter on "Terrestrial Habitats." Resulting impacts to terrestrial flora from the range of alternatives analyzed are provided in Table 6.18.

Table 6.18. Impacts to terrestrial flora

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Terrestrial Flora	Minor to moderate, direct, beneficial impacts to some species over the long-term from restoration projects. Minor indirect and direct adverse impacts to some plants removed (largely invasive species). Adverse, short- and long-term impacts to species not targeted for removal from proposed projects vary, but would typically be minor. Other stressors could also have moderate adverse effects on plant species, e.g., hydrologic alterations and introduction of invasive species.	Minor, long-term benefits from reserve support for research, planning, and observations, which could support integration of BMPs and adaptive management into projects, producing long-term, minor, indirect, beneficial effects. Minor indirect benefits from reserve education efforts. Installing monitoring devices could cause short-term, negligible adverse impacts.	Same as preferred alternative, except another 200 acres of land would be included in the reserve, adding impacts of the types described under the preferred alternative from Reserve-initiated activities in that parcel (including restoration of forested areas).	Same as preferred alternative, except for effects of including a smaller terrestrial area in the reserve. Benefits to flora from reserve research, coordination, and monitoring could be reduced, limiting the impact and efficacy of reserve programs and reducing reserve benefits compared to the preferred alternative.	Same as alternative B.

No Action Alternative

There could be minor to moderate, direct, beneficial impacts to some terrestrial flora species over the long term from restoration projects. Some of these projects and other activities could directly and indirectly impact plants by modifying such characteristics as light availability, soil-water regimes, nutrient cycling and species composition (e.g., replacing invasive species that dominate terrestrial areas with native species). Minor indirect and direct adverse impacts to some plants removed (largely invasive species). Adverse, short- and long-term impacts to species not targeted for removal would vary, but typically be minor. For more information about habitat modifications planned, see above subchapter on “Terrestrial Habitats.” Other stressors could also have moderate adverse effects on plant species (e.g., hydrologic alterations, introduction of invasive animal species).

Preferred Alternative

The preferred alternative is expected to include the same activities described in the no action alternative, plus additional support from reserve staff for research, planning and coordination, monitoring, etc., which could facilitate integration of best management practices (BMPs), mitigation measures, monitoring, and adaptive management into projects, producing long-term, minor, indirect, beneficial effects. Additional indirect benefits would be expected to derive from reserve education efforts. New reserve initiatives could have negligible to minor adverse effects to some species from restoration, manipulation, and/or monitoring efforts. There could also be impacts to localized areas of developing spaces in which visitors could congregate; potential impacts of any such projects would be analyzed in the future, as part of the environmental compliance process.

Alternative A

Under alternative A, the consequences in terrestrial areas would be similar to those under the preferred alternative, except another 200 acres of terrestrial areas would be included within the reserve, and there could be additional minor adverse and beneficial impacts of Reserve-initiated activities in that area, such as those that could result from regularly bringing visitors to the additional parcel, restoring it (e.g., reducing the number of invasive plants), and conducting research there.

Alternatives B and C

The impacts to terrestrial flora of alternative B are expected to be the same as those under the preferred alternative, except that there would be reduced impacts associated with including a smaller terrestrial area in the reserve, such as reducing the adverse and beneficial impacts from reserve staff involvement in projects affecting flora. The benefits to flora from reserve research, coordination, and monitoring would be expected to be less widespread under these two alternatives than they would be under the preferred alternative, limiting the impact and efficacy of these reserve programs and providing reduced benefits to terrestrial flora compared to the preferred alternative.

6.2.3.1.2 ESTUARINE FLORA

Individual projects that have the potential to impact estuarine flora have been summarized above. For more information about potential habitat manipulations, see above subchapter on “Estuarine Habitats.” Resulting impacts to estuarine flora from the range of alternatives analyzed are provided in Table 6.19.

Table 6.19. Impacts to estuarine flora

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Estuarine Flora	Effects from efforts to manipulate estuarine systems, including restoring the fishpond, nearby wetlands, and a historic taro patch and fishpond. Minor to moderate, long-term, direct and indirect adverse and beneficial effects to some flora and associated ecosystem services. Other stressors include nonpoint source pollution and climate change.	Adds minor, long-term, indirect benefits from reserve support for research, planning, and observations, which could facilitate integration of BMPs and adaptive management into projects, producing long-term, minor, indirect, beneficial effects. Minor, indirect benefits from reserve education efforts. Installing monitoring devices could cause short-term, negligible adverse impacts.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under baseline conditions, there are already plans to further restore or modify estuarine systems, including at the fishpond (including to remove invasive species within it) and in other areas dominated by mangroves. These manipulations could cause negligible to moderate, short-term (e.g., during construction phases) or long-term, direct and indirect adverse and beneficial effects to some flora species (e.g., from changes to competition, predation, or composition). For example, there would be adverse impacts to the invasive species removed from the fishpond. Changes wrought by manipulations could enhance ecosystem services (Hawai‘i Office of Planning 2016). Of the changes to estuarine systems underway and planned, recreating loko i‘a kalo and efforts to remove invasive species from estuarine systems might have the most perceptible effects on the distribution, abundance, and health of plant species. Other stressors affecting estuarine areas include nonpoint source pollution, development, and climate change.

Preferred Alternative and Alternatives A, B and C

Under this alternative, all the same activities would be expected to occur as under the no action alternative, plus additional support from reserve staff for research, planning and coordination, monitoring, etc., which could facilitate integration of BMPs, mitigation measures, monitoring, and adaptive management into projects, producing additional long-term, minor, indirect, beneficial effects. Additional indirect benefits are expected from reserve education efforts about native and invasive plant species, for example. New reserve initiatives could have negligible to minor adverse effects to some plant species from restoration, manipulation, and/or monitoring efforts. There

could also be adverse impacts to plants in localized areas where facility development occurs to allow visitors and staff to congregate and work. The potential impacts of any such projects would be analyzed in the future, as part of the environmental compliance process.

6.2.3.1.3 RIPARIAN AND FRESHWATER FLORA

Individual projects that have the potential to impact riparian and freshwater flora have been summarized above. For more information about potential habitat manipulations, see above subchapter on “Riparian and Freshwater Habitats.” Resulting impacts to riparian and freshwater flora from the range of alternatives analyzed are provided in Table 6.20.

Table 6.20. Impacts to riparian and freshwater flora

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Riparian and Freshwater Flora	Species composition would change along He’eia Stream and in the He’eia wetlands. Where invasive plants are removed and replaced with native or naturalized flora, there would be negligible to minor, short-term, adverse impacts to flora removed and moderate to major, long-term, beneficial impacts to species present post-restoration. Short-term, indirect, negligible adverse impacts to flora could occur from foot traffic in riparian areas, restoration of the taro patch walls, and road rehabilitation. Long-term, major, direct benefits would arise from the ecosystem services provided by the species planted (including taro). Another stressor is reduced stream flow.	Adds minor, long-term, indirect benefits from reserve support for research, planning, and observations, which could facilitate integration of BMPs and adaptive management into projects, producing long-term, minor, indirect, beneficial effects on plants. Minor, indirect benefits from reserve education efforts. Installing monitoring devices could cause short-term, negligible adverse impacts.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Stressors affecting plants under the no action alternative include development and invasive species that compete with and/or prey on plants. Because of activities already underway or planned by Kāko’o ‘Ōiwi, species composition is expected to change along He’eia Stream and in the He’eia wetlands on the HCDA parcel. Where invasive plants are removed and replaced with native or naturalized flora, minor or negligible, short-term adverse impacts to flora removed and major, long-term, direct, beneficial impacts to the species present post-restoration are expected. Native species abundance and diversity would be expected to grow as a result of the stream restoration project. Also, long-term, major, direct benefits from the ecosystem services provided by the species planted (including the taro to be cultivated in the restored lo’i kalo or taro patches) would be expected, such as providing habitat suitable for native animal species. Any adverse impacts to some plants in the taro patches from the efforts to restore to lo’i kalo, including the taro patch walls and the maintenance roads, are expected to be short-term and negligible, primarily during the rehabilitation efforts. There are a number of other relevant stressors, such as reduced stream flow.

Preferred Alternative and Alternatives A, B and C

The preferred alternative is expected to include the same activities as the no action alternative, plus additional support from reserve staff for research, planning and coordination, monitoring, etc., could facilitate integration of BMPs, mitigation measures, monitoring, and adaptive management into projects, producing long-term, minor, indirect, beneficial effects. Additional indirect benefits would be derived from reserve education efforts about native and invasive plant species, for example. New reserve initiatives could have negligible to minor adverse effects to some plant species from restoration, manipulation, and/or monitoring efforts. There could also be adverse impacts to plants in localized areas where any future facility development occurs. The potential impacts of any such projects would be analyzed in the future, as part of the environmental compliance process.

6.2.3.1.4 MARINE FLORA

Individual projects that have the potential to impact terrestrial flora have been summarized above. For more information about potential habitat manipulations, see above subchapter on “Marine Habitats.” Resulting impacts to marine flora from the range of alternatives analyzed are provided in Table 6.21.

No Action Alternative

Under current conditions, boat traffic, fishing, other recreational use, sediment transport, and other anthropogenic activities would continue to have minor long-term adverse impacts on marine flora. Climate change is an example of another stressor. In addition, practices designed to remove alien algae from coral reefs (e.g., use of a “Super Sucker” and introduced urchins) would have minor to moderate, long-term, beneficial impacts to native algae and potentially other marine flora, but could also have negligible, short-term adverse impacts on alien algae and potentially other marine flora. The State of Hawai'i would continue to manage different marine areas for different uses, including in the Ocean Recreational Management Area and Marine Laboratory Refuge. See above for more information about marine habitat modification. For example, the He'eia Kea Small Boat Harbor requires periodic maintenance dredging, which removes flora and fauna that live on the seafloor of the areas dredged and has the potential to cause other effects described above.

Preferred Alternative and Alternative B

Impacts of the preferred alternative are expected to be similar to those described under the no action alternative, plus there could be additional minor to moderate, long-term beneficial impacts from reserve support for research, planning, coordination, and monitoring of the types of projects underway and proposed. This assistance could support integration of BMPs, mitigation measures, monitoring, and adaptive management into projects, producing long-term, minor, indirect, beneficial effects. Reserve education efforts could bring additional possible minor indirect benefits. Future reserve initiatives could have negligible to minor adverse effects to some plant species where habitats are manipulated, infrastructure is installed, or additional boating associated with reserve researchers, managers, or visitors occurs. The preferred alternative would also be expected to bring additional moderate, long-term, beneficial effects to some plant species, particularly those that provide ecosystem services, such as in coral reefs.

Table 6.21. Impacts to marine flora

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Marine Flora	Human activities in marine areas have minor long-term adverse impacts on marine flora. Removal of alien algae would have moderate, long-term, beneficial impacts to native algae and potentially other marine flora (and negligible, short-term adverse impacts on the invasive algae removed). If approved, the coral reef mitigation bank would result in restoration of patch reef 10. Dredging at the boat harbor and boat traffic throughout the bay have the potential to have direct, minor adverse effects on plants that are damaged or destroyed during dredging, the transits of boats (e.g., by their propellers), etc. Climate change is an example of another stressor.	Adds minor to moderate, long-term beneficial impacts to some plant species from reserve support for research, planning, and observations, which could support integration of BMPs and adaptive management into projects, producing long-term, minor, indirect, beneficial effects. Minor indirect benefits from reserve education efforts. Negligible to minor adverse effects to some plant species in areas where there are additional boat trips. Installing monitoring devices could cause short-term, negligible adverse impacts.	Some of the same impacts as under the preferred alternative, without the benefits reserve staff could bring to work in reefs 7–10 by assisting with coordination and monitoring, because those reefs would not be part of the reserve. If the boat harbor were included within the reserve, it is possible that reserve staff could provide technical assistance about additional ways to mitigate the adverse effects of dredging.	Same as preferred alternative.	Similar minor beneficial effects as under alternative A from possible Reserve-supported restoration and possible minor adverse effects from increased boating. Since reefs 7–10 would not be included within the reserve, those areas would benefit from funding or technical assistance related to research, monitoring, education, and habitat restoration that could be associated with reserve designation.

Alternative A

Under alternative A, there would be some of the same impacts as under the preferred alternative, without the benefits reserve staff could bring to work in reefs 7–10 by assisting with coordination and/or monitoring, because those reefs would not be included within the reserve. If the boat harbor were included in the He'eia Reserve, staff affiliated with the reserve could potentially work with harbor management to implement additional mitigation strategies to reduce impacts of dredging. Although it is possible that reserve staff could still work with harbor management to reduce potential marine flora impacts, it could be expected that greater collaboration or opportunities to address these impacts would be available if the harbor is included within the proposed boundaries.

Alternative C

Under alternative C, there could be some of the same impacts as under the preferred alternative, without the benefits reserve staff could bring to work in reefs 7–10 by assisting with coordination and/or monitoring, because those reefs would not be included within the reserve.

6.2.3.2 FAUNA

6.2.3.2.1 TERRESTRIAL FAUNA

Individual projects that have the potential to impact terrestrial fauna have been summarized above. For more information about potential habitat manipulations, see above subchapter on “Terrestrial Habitats.” Resulting impacts to terrestrial fauna from the range of alternatives analyzed are provided in Table 6.22

Table 6.22. Impacts to terrestrial fauna

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Terrestrial Fauna	Potential minor to moderate, direct, beneficial impacts to some species over the long term from habitat restoration efforts, particularly upland reforestation. Possible indirect and direct, short- and long-term, negligible to minor, adverse impacts to any fauna species displaced. Other stressors could also have moderate to major effects, e.g., habitat fragmentation.	Adds minor, indirect, long-term benefits from reserve support for research, planning, and observations, which could support integration of BMPs and adaptive management into projects, producing long-term, minor, indirect, beneficial effects. Minor indirect benefits to some species from reserve education efforts. Installing monitoring devices could cause temporary, negligible adverse impacts to some species by modifying habitats.	Same as preferred alternative, except another 200 acres of land would be included in the reserve, adding impacts of the types described under the preferred alternative from Reserve-initiated activities in that parcel (e.g., long-term, indirect, minor beneficial impacts from habitat restoration).	Same as preferred alternative, except for effects of including a smaller terrestrial area in the reserve. Benefits to fauna from reserve research, coordination, and monitoring could be reduced, limiting the impact and efficacy of these reserve programs and reducing reserve benefits compared to the preferred alternative.	Same as alternative B.

No Action Alternative

Potential minor to moderate, direct, beneficial impacts to some species could result over the long term from habitat restoration efforts, particularly upland reforestation. There might also be indirect and direct, short- and long-term, negligible to minor, adverse impacts to any fauna species displaced during manipulation and restoration projects. Stressors outside the control of reserve partners could have moderate to major effects (e.g., changes to numbers or types of predators and habitat fragmentation).

Preferred Alternative

This alternative is expected to have the same impacts as the no action alternative, plus additional minor, indirect and long-term benefits from reserve support for research, planning, coordination, and observations. This assistance could support integration of BMPs, mitigation measures, monitoring, and adaptive management into projects in the study area. There might also be some minor indirect benefits to some animal species from reserve education efforts, associated with public awareness, understanding and subsequent action (e.g., to protect sensitive species). Installation of monitoring devices could potentially have temporary, negligible adverse impacts to some species by slightly modifying habitat in localized areas. To the extent that there might be additional impacts in localized areas from future, in-situ reserve projects or development of additional facilities, potential impacts would be analyzed in the future as part of environmental compliance processes, after projects are proposed.

Alternative A

This alternative is expected to have the same consequences as the preferred alternative, but another 200 acres of land would be included within the reserve. Thus, there could be additional long-term, indirect, minor beneficial impacts from improvements to fauna habitat resulting from restoration and indirect short-term adverse effects from manipulation activities related to reserve support for activities on the additional parcel.

Alternatives B and C

The consequences of this alternative are expected to be similar to those under the preferred alternative, except for the consequences of including a smaller terrestrial area in the reserve, which could reduce the impacts (both adverse and beneficial) resulting from reserve staff involvement in projects affecting fauna. The benefits to fauna from reserve research, coordination, and monitoring could be reduced, limiting the impact and efficacy of these reserve programs and providing reduced benefits to terrestrial fauna compared to the preferred alternative.

6.2.3.2.2 ESTUARINE FAUNA

Individual projects that have the potential to impact estuarine fauna have been summarized above. For more information about potential habitat manipulations, see above subchapter on “Estuarine Habitats.” Resulting impacts to estuarine fauna from the range of alternatives analyzed are provided in Table 6.23.

Table 6.23. Impacts to estuarine fauna

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Estuarine Fauna	Effects from efforts to manipulate estuarine systems, including restoring the fishpond, nearby wetlands, and a taro patch and fishpond, could result in minor to moderate, long-term, direct and indirect beneficial effects to some fauna species, as well as minor adverse effects to other species that use these habitats. Other stressors include disease and predation.	Adds minor, indirect long-term benefits from reserve support for research, planning, and observations, which could support integration of BMPs and adaptive management into projects, producing long-term, minor, indirect benefits. Minor indirect benefits from reserve education efforts. Installing monitoring devices could cause short-term, negligible adverse impacts by modifying habitats.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

A number of efforts are underway or planned that are expected to result in modification of estuarine systems, including efforts to restore the fishpond and the mangroves along its perimeter, to remove invasive species as part of restoring nearby wetlands, and to recreate a loko i’a kalo (combined taro patch and fishpond) in brackish wetlands. These restoration projects have the potential to cause direct and indirect, moderate, short- and long-term beneficial impacts to fauna, including birds and fish (potentially yielding major benefits to the habitat as a whole, as described under the “Estuarine Habitats” subchapter). There could also be some additional minor, short-term and/or long-term, direct and indirect, adverse effects to some fauna species that

utilize existing habitats that are undergoing or will undergo alteration. Other stressors that affect estuarine fauna include disease and predation.

Preferred Alternative and Alternatives A, B, and C

Beyond the impacts described above under the no action alternative, this alternative is expected to bring about additional minor, indirect and long-term benefits to some species from reserve support for research, planning, coordination, and observations. This assistance could support integration of BMPs, mitigation measures, monitoring, and adaptive management into projects. In addition, there could be minor, indirect benefits to some species from reserve education efforts, associated with subsequent behavior modification efforts (e.g., to protect sensitive species). Installation of monitoring devices could potentially have temporary, negligible adverse impacts to some species by slightly modifying habitat in localized areas. To the extent that there might be additional impacts in localized areas from future, in-situ reserve projects or development of additional facilities, potential impacts would be analyzed in the future as part of environmental compliance processes, after projects are proposed.

6.2.3.2.3 RIPARIAN AND FRESHWATER FAUNA

Individual projects that have the potential to impact riparian and freshwater fauna have been summarized above. For more information about potential habitat manipulations, see above subchapter on “Riparian and Freshwater Habitats.” Resulting impacts to riparian and freshwater fauna from the range of alternatives analyzed are provided in Table 6.24.

Table 6.24. Impacts to riparian and freshwater fauna

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Riparian and Freshwater Fauna	Efforts to enhance habitat for fish and other fauna along He'eia Stream and in the He'eia wetlands would lead to negligible, short-term adverse impacts to fauna present while restoration (of taro patch walls, roads, etc.) is underway, followed by moderate to major long-term, beneficial impacts to some of the species that use the habitat after restoration, including fish in the stream and waterbirds drawn to areas with lo'i kalo (taro patches). Another stressor is reduced stream flow.	Adds minor, long-term, indirect benefits from reserve support for research, planning, and observations, which could facilitate integration of BMPs and adaptive management into projects, producing long-term, minor, indirect, benefits to some species. Minor indirect benefits to some species from reserve education efforts. Installing monitoring devices could cause temporary, negligible adverse impacts by modifying habitats.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Efforts to enhance habitat for fish and other fauna along He'eia Stream and in the He'eia wetlands are expected to lead to negligible, short-term, adverse impacts to fauna present while restoration is underway. The restoration efforts are expected to be followed by moderate to major long-term, beneficial impacts to some of the animal species that use the habitat, including fish in the stream and waterbirds drawn to areas with restored lo'i kalo (taro patches). An example of another stressor affecting riparian and freshwater fauna is reduced stream flow.

Preferred Alternative and Alternatives A, B and C

These alternatives are expected to have the same impacts as the no action alternative, plus there would be additional minor, indirect long-term benefits to some species from reserve support for research, planning, coordination, and observations. This assistance could support integration of BMPs, mitigation measures, monitoring for target species, and adaptive management into projects, leading to long-term, minor, indirect, beneficial effects on some species. There could also be minor, indirect benefits to some species from reserve education efforts, associated with public awareness, understanding and subsequent action (e.g., to protect sensitive species). In addition, installation of monitoring devices could cause temporary, negligible adverse impacts to some species by slightly modifying habitat in localized areas. To the extent that there might be additional impacts in localized areas from future, in-situ reserve projects or development of additional facilities, potential impacts would be analyzed in the future as part of environmental compliance processes, after projects are proposed.

6.2.3.2.4 MARINE FAUNA

Individual projects that have the potential to impact terrestrial fauna have been summarized above. For more information about potential habitat manipulations, see above subchapter on "Marine Habitats." Resulting impacts to marine fauna from the range of alternatives analyzed are provided in Table 6.25.

No Action Alternative

Under current conditions, boat traffic, fishing, other recreational uses (including snorkeling and diving), sediment transport, and other anthropogenic activities have moderate to major short- and long-term adverse impacts on a variety of marine fauna. For example, dredging (including at the boat harbor) and vessels that traverse the bay have the potential to have direct and indirect, moderate to major adverse effects on fauna, e.g., causing adverse behavioral changes or mortality to some fauna. Other stressors include climate change. Uses within different portions of the study area are subject to some restrictions, most notably in the Hawai'i Marine Laboratory Refuge. The proposed 5-square meter in-situ pilot coral nursery is unlikely to have more than negligible impacts to fauna in the vicinity, but could offer major benefits to reefs outside the study area to which coral is transplanted in the future. Removal of alien algae from coral reefs would have minor to moderate, long-term, beneficial impacts to coral reefs and species dependent on these habitats, but could also have negligible, short-term adverse impacts on any coral accidentally damaged. If approved, the coral reef mitigation bank is expected to result in restoration of patch reef 10, which would have moderate, long-term, direct benefits to the reef community.

Table 6.25. Impacts to marine fauna

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Marine Fauna	Human activities in marine areas have moderate to major, short- and long-term adverse impacts on fauna. Removal of alien algae would have moderate, long-term, beneficial impacts to reef-dwelling species, but could also have negligible, short-term adverse impacts on any coral accidentally damaged. The proposed 5-square meter in-situ pilot coral nursery is unlikely to have more than negligible impacts to fauna in the Hawai'i Marine Laboratory Refuge. The coral reef mitigation bank would enable restoration of patch reef 10, which would have moderate, long-term, direct benefits to the reef community. Dredging at and boat traffic throughout the bay have the potential to have direct and indirect, moderate to major adverse effects on fauna (e.g., because behavioral patterns can be altered by dredging, the transits of boats etc.). Other stressors include climate change.	Adds minor, indirect, long-term benefits to some species from reserve support for research, planning, and observations, particularly related to species targeted for protection. Reserve assistance could integrate BMPs and adaptive management into projects, leading to long-term, minor, indirect benefits to some species, particularly those targeted for restoration. Minor indirect benefits from reserve education efforts. Installing monitoring devices could cause short-term, negligible adverse impacts by modifying habitats. Negligible to minor adverse effects to some species in areas where there are additional boat trips.	Some of the same impacts as under the preferred alternative, without the benefits reserve staff could bring to work in reefs 7–10 by assisting with coordination and/or monitoring, because those reefs would not be part of the reserve. Additional minor, adverse, short- and long-term effects to fauna near the small boat harbor if it were within the reserve because it is heavily trafficked and regularly dredged.	Same as preferred alternative.	Similar effects as listed under the preferred alternative. However, because reefs 7–10 would not be included within the reserve, those areas would not receive benefits that derive from the funding and technical assistance related to research, monitoring, education, and habitat restoration associated with reserve designation.

Preferred Alternative and Alternative B

These alternatives are expected to have the same impacts as the no action alternative, plus additional minor to moderate, indirect, long-term benefits to some species from reserve support for research, planning, coordination, and observations, particularly animal populations targeted for enhancement or protection. Reserve assistance could support integration of BMPs, mitigation measures, monitoring for target species, and adaptive management into projects, leading to long-term, minor, indirect, beneficial effects on some species. There could be moderate, long-term, indirect benefits to some species from reserve education efforts, associated with public awareness, understanding and subsequent action (e.g., to protect sensitive species). Installation of monitoring devices could cause temporary, negligible adverse impacts to some species by causing habitat modifications in localized areas. To the extent that there might be additional impacts in localized areas from future, in-situ reserve projects or development of additional facilities, potential impacts would be analyzed (as part of environmental compliance reviews), after projects are proposed. In addition, there could be negligible to minor adverse effects to some species in areas where there are additional boat trips or where infrastructure is installed.

Alternative A

This alternative is expected to result in some of the same impacts as the preferred alternative, without the benefits reserve staff could bring to work in reefs 7–10 by assisting with coordination and/or monitoring, because those reefs would not be part of the reserve. If the boat harbor were included in the reserve, it is possible that reserve staff might be able to offer technical assistance regarding additional mitigation measures that could reduce the adverse effects of dredging in the boat harbor.

Alternative C

This alternative is expected to result in effects similar to those listed under the preferred alternative. However, because reefs 7–10 would not be included within the reserve, those areas would not receive the benefits (most of them indirect) that derive from funding or technical assistance related to research, monitoring, education, and habitat restoration that could be associated with reserve designation.

6.2.3.3 SPECIAL-STATUS SPECIES AND HABITAT

The following discussions address species and habitats with special status pursuant to the Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and Management Act. The descriptions of effects relating to species protected under ESA and critical habitat use several terms defined by NMFS and USFWS. They are as follows (NOAA 2011, NOAA 2014g):

No Effect: The action will have no direct or indirect effect on the species or critical habitat.

May Affect, But Not Likely to Adversely Affect: All effects of the action on listed species or critical habitat will be discountable, insignificant, or completely beneficial.²⁴ With respect to critical habitat, this determination applies if defined essential features of the critical habitat are not present or if essential features are present, but the action cannot plausibly affect them.

Likely to Adversely Affect: Adverse effects on listed species or critical habitat may occur (including take) as a direct or indirect result of the proposed action, and the effects are not discountable, insignificant, or completely beneficial. This determination applies even if the overall effect of the proposed action is beneficial.

Insignificant Effects: The action could plausibly affect species, but the effects cannot be meaningfully detected, measured, or evaluated. Any effect will not harm, harass, or otherwise result in take of a listed species. With respect to critical habitat, insignificant effects may be temporary or minor, but cannot have a discernible impact on the conservation function of the essential features of the critical habitat unit.

Discountable Effects: Potential effects that are extremely unlikely to occur.

Completely Beneficial Effects: All potential effects that might result to individual plants or animals are positive.

²⁴ For more information about possible rationales for this determination, see <http://www.fpir.noaa.gov/Library/PRD/ESA%20Consultation/pdf%20files%20of%20word%20docs/Effects%20Determination%20Guidance%20-%2006.14.11.pdf>

6.2.3.3.1 THREATENED AND ENDANGERED SPECIES

Based on initial technical assistance from the USFWS and NMFS, the Office for Coastal Management (OCM) does not anticipate that reserve designation would adversely impact endangered or threatened species potentially present in the study area. During the public comment period for this final EIS, OCM plans to consult with NMFS and USFWS, pursuant to Section 7 of the ESA; the results of the consultations will be published in the Final EIS and information summarized herein will be updated, if needed. If a reserve is designated, OCM would expect reserve staff to work with partners, members of the community, and visitors to ensure they are aware of BMPs to be followed when their activities could impact any threatened or endangered species. For instance, reserve staff can refer to BMPs for marine protected species, such as those in a handbook jointly developed by NOAA and Hawai'i DLNR in 2007 (NOAA and DLNR 2007). There are BMPs distributed by USFWS for species under its jurisdiction, as well. Reserve designation could have beneficial effects on species protected under ESA by addressing recovery strategies that align with the proposed reserve's FMP. OCM developed a preliminary evaluation of the potential consequences to listed species of the alternatives considered, which suggested reserve implementation would not be likely to result in adverse impacts to species. If a reserve is designated, future federal actions (including actions funded through NOAA cooperative agreements) would be evaluated individually to determine any necessary compliance activities pursuant to applicable mandates, including ESA. Resulting impacts to threatened and endangered species from the range of alternatives analyzed are provided in Table 6.26.

Table 6.26. Impacts to threatened and endangered species

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Threatened and Endangered Species	Depending on the species, potential impacts from existing activities range from having no effect, to completely beneficial effects, to adverse impacts on the species.	Depending on the species, potential impacts range from no effect, to completely beneficial effects, to not likely to adversely affect the species, based on the expectation that applicable BMPs will be followed.	Depending on the species, potential impacts range from no effect, to completely beneficial effects, to not likely to adversely affect the species, based on the expectation that applicable BMPs will be followed.	Depending on the species, potential impacts range from no effect, to completely beneficial effects, to not likely to adversely affect the species, based on the expectation that applicable BMPs will be followed.	Depending on the species, potential impacts range from no effect, to completely beneficial effects, to not likely to adversely affect the species, based on the expectation that applicable BMPs will be followed.

Based on technical assistance from USFWS and NMFS, OCM has identified a number of species listed as threatened or endangered under the ESA that could potentially be affected by the proposed action (even if they are not within the immediate project area). The alternatives are expected to impact each species (or group of species) differently. The anticipated effects to threatened and endangered species from reserve designation are summarized in Table 6.27, then discussed in greater detail below.

Table 6.27. Potential effects of reserve designation on listed species

LISTED SPECIES	POTENTIAL EFFECTS OF RESERVE DESIGNATION
Blackline Hawaiian damselfly	May affect, but is not likely to adversely affect
Hawaiian Yellow-faced Bees (six species)	May affect, but is not likely to adversely affect
Hawaiian hoary bat	May affect, but is not likely to adversely affect
Newell's shearwater	No effect
Endangered Hawaiian waterbirds (four species)	May affect, but is not likely to adversely affect
Hawaiian goose	No effect
Sea turtles (green and hawksbill)	May affect, but is not likely to adversely affect
Hawaiian monk seal	May affect, but is not likely to adversely affect
Main Hawaiian islands insular false killer whale	May affect, but is not likely to adversely affect

While there would be no anticipated effects to listed species associated with designation of a reserve in and of itself, designation would set in motion a number of potential future activities that may affect listed species. For example, an assessment of future facility needs would be conducted for the proposed He'eia Reserve, if designated. The needs assessment would identify future facility requirements and potential sites and that could potentially be followed by construction of new facilities. Additionally, future research and monitoring actions could potentially affect threatened or endangered species. OCM intends to complete the required environmental compliance evaluations, including consultations under Section 7 of the ESA, after individual actions are proposed, when OCM has sufficient details about the methods and locations of the activities.

The research objectives of proposed He'eia NERR, as described in the FMP, are guided by the underlying view that baseline environmental data and reference conditions will help researchers to understand the magnitude of change in the various He'eia ecosystems. It is possible that research at the proposed reserve will need to go beyond passive activities such as ecological and water quality monitoring information obtained through instruments and observations, to more active fieldwork that may involve experimentation and manipulation in order to meet the broader research objectives of the proposed reserve. If future research activities will require consultation under Section 7 of the ESA or other consultations under state or federal laws, as appropriate, OCM will carry out the consultations, and researchers may be required to obtain the appropriate authorizations. Environmental compliance reviews occur during review of federal financial assistance actions.

A. Blackline Hawaiian damselfly (*Megalagrion nigrohamatum nigrolineatum*)

As noted in Chapter 5, the blackline Hawaiian damselfly was reportedly observed within the middle reach of He'eia Stream during at least one previous survey (Parham et al. 2008). The map in the associated report shows the species was found in He'eia Stream upstream of the parcels being considered for inclusion in the proposed reserve. OCM did not identify any other reports of the species in the study area. The blackline Hawaiian damselfly prefers headwaters and mid-reach portions of perennial slow-moving streams and associated or seep-fed pools. The species is found along portions of streams not occupied by non-native predatory fish, typically the headwaters or upper reaches of streams that are separated from the sea by some barrier to fish passage. Threats to the species include predation by non-native fish and other insects, conversion of habitat for urban or agricultural uses, and stream diversions or modifications (Department of the Interior 2011). Critical habitat for the species has been designated in the upper reaches of He'eia Stream (and in other locations outside the study area).

No Action Alternative

When OCM requested technical assistance from USFWS, the service did not report the blackline Hawaiian damselfly as occurring within the study area. Non-native fish that could prey on the damselfly are known to occur in, at least, the lower reaches of the stream, according to the proposed He'eia NERR's FMP. However, the FMP also notes that some portions of He'eia Stream are so choked by California grass that the oxygen content of the stream is so low it cannot support aquatic animals. The main types of anthropogenic activities that can adversely affect the blackline Hawaiian damselfly are changes to stream flow, other habitat alterations, and introductions of non-native species that prey on or compete with the Hawaiian blackline damselfly. Extant blackline Hawaiian damselfly populations are located upstream of the parts of He'eia Stream being modified, but the exact location in the middle reach of He'eia Stream where it was found was not published. (The middle reach of the stream extends from Interstate H3 to where an unnamed tributary joins He'eia Stream east of Kahekili Highway.) The no action alternative could have an impact on the blackline Hawaiian damselfly if there are no impediments to fish passage in the stream between where it is restored and where it serves as blackline Hawaiian damselfly habitat once California grass is removed and the stream contains enough oxygen to support aquatic animals. However, in its 2012 rule announcing the final listing of the blackline Hawaiian damselfly as endangered, USFWS indicated that funding was provided to restore habitat for the blackline Hawaiian damselfly and native fish at the lower elevations of He'eia Stream in 2010 and 2011. The rule further noted that USFWS would pursue funding to construct a barrier into the upper elevation of the He'eia watershed (77 Federal Register 57648 and 57656). Through the National Fish Passage Program, which will allow for migration of native fish and invertebrates (while excluding non-native fish) into essential headwater stream reaches, once such a barrier is constructed, restoration of the lower reach of He'eia Stream will not affect the blackline Hawaiian damselfly.

Preferred Alternative and Alternatives A, B, and C

The blackline Hawaiian damselfly is not present in the lower portions of He'eia Stream, and it is not known exactly where and when the species was reported in the middle reach of the stream. Neither the preferred alternative, nor alternatives A, B, or C would be expected to have any direct or indirect

effects on the species. He'eia Stream restoration is going to be carried out independent of reserve designation. However, under the proposed He'eia NERR's first goal listed in the FMP, Objective 1 indicates that the reserve hopes to conduct research on hydrology of He'eia estuary and survey its biodiversity. Thus, if a proposed He'eia NERR were designated, researchers affiliated with the reserve could help monitor for the presence of blackline Hawaiian damselfly within the reserve and/or conduct other research related to the species. This research would not directly affect the species, but could lead to indirect benefits, such as enhanced conservation of the species if the damselflies are discovered in habitats not previously documented by reserve staff. Thus, reserve designation is not likely to adversely affect the species. If new information becomes available that suggests blackline Hawaiian damselfly are present within the portion of He'eia Stream proposed for inclusion within the reserve, OCM will contact USFWS, if needed (i.e., if reserve activities have the potential to affect the species). Reserve staff, in partnership with Kāko'o 'Ōiwi could monitor the status of plans to construct a barrier to non-native fish passage in He'eia Stream to ensure that non-native species of fish that enter the stream cannot reach blackline Hawaiian damselfly populations.

B. Hawaiian Yellow-faced bees, *Nalo meli maoli (Hylaeus spp.)*

- Anthracinan yellow-faced bee (*Hylaeus anthracinus*)
- Assimulans yellow-faced bee (*H. assimulans*)
- Easy yellow-faced bee (*H. facilis*)
- Hawaiian yellow-faced bee (*H. kuakea*)
- Hawaiian yellow-faced bee (*H. longiceps*)
- Hawaiian yellow-faced bee (*H. mana*)

The six species commonly known as yellow-faced bees that are or were found on O'ahu (*Hylaeus anthracinus*, *H. assimulans*, *H. facilis*, *H. longiceps*, *H. kuakea*, and *H. mana*) prefer coastal ecosystems, lowland dry ecosystems, and lowland mesic ecosystems. Habitat destruction and modification threatens yellow-faced bees, reducing the availability of and fragmenting habitat used for foraging and nesting. Loss of native vegetation has also reduced the availability of habitats that yellow-faced bees prefer. In particular, California grass is known to adversely affect habitats for some of the yellow-faced bees. Predation by and competition with non-native insects also threatens these species. Some of the species have only been identified at higher elevations than are found in the study area. *H. anthracinus* and *H. assimulans* appear to be closely associated with plants in the genus *Sida*, particularly *Sida fallax* (Department of the Interior 2015). (Since yellow-faced bees prefer native species, it is unclear whether *H. assimulans* (and, potentially, other bee species) is only closely associated with native plants in the *Sida* genus, however.) USFWS reports that some of the yellow-faced bee species can be found in the study area.

Recommended BMPs to minimize the potential for adverse effects to these species provided by USFWS include restricting vehicle use to existing roads and trails, as well as limiting areas in which vegetation is cut so that they are no more than 3 meters (10 feet) wide. Outside existing developed areas, USFWS recommends clearing fewer than 5 acres. If vegetation must be cut or removed from outside of existing developed areas, the Service encourages people to avoid cutting or removing plants in the *Sida* genus. Finally, USFWS also recommends restoring cleared areas using native vegetation, when possible (D. Bruns, USFWS, personal communication, June 30, 2016).

No Action Alternative

It is unknown whether there are any yellow-faced bees in the project area. The primary threat to these bee species is habitat degradation, including reduced native plant populations. Thus, development has adversely impacted the species. California grass degrades habitat for these bee species, and effort by Kāko'o 'Ōiwi to remove it from the He'eia Stream channel and a buffer surrounding the stream could have beneficial impacts on any bees in the area. There are Cuba jute (*Sida rhombifolia*) trees, which are in the *Sida* genus on the upland portion of the HCDA parcel, mixed in with other non-native species. Efforts by Kāko'o 'Ōiwi to remove invasive species and plant native species could have beneficial and/or adverse impacts on the bee species. The final Management Plan indicates that the plant species to be targeted for removal will be determined after a more thorough evaluation of existing conditions. The USFWS BMPs indicate that, if vegetation must be cut or removed, disturbing trees in the *Sida* genus should be avoided. (That suggestion is probably linked to the fact that multiple bees are associated with the ilima (*Sida fallax*), and one bee species is associated with multiple species in the *Sida* genus.) Without further information on use by yellow-faced bees of Cuba jute, it is difficult to assess the effects of future restoration efforts on the bees, including removing Cuba jute on the HCDA parcel; however, adverse effects to yellow-faced bees are possible. Otherwise, Kāko'o 'Ōiwi's efforts to remove some invasive plants and replace them with native plants could potentially beneficially impact the bees. The specific species to be removed and planted are to be determined.

Preferred Alternative and Alternatives A, B and C

Reserve operation might lead to the identification of the need to improve public access to habitats or other future needs that might necessitate vegetation management. OCM will convey the USFWS BMPs to Reserve partners and encourage that they be followed to protect these bee species. If the BMPs are followed, restoration activities could be expected to have insignificant effects, allowing vegetation management activities to avoid adverse effects to species proposed for listing. OCM will submit this determination to USFWS for its concurrence during the public comment period for this Final EIS.

C. Hawaiian Hoary Bat, 'Ōpe'ape'a (*Lasiurus cinereus semotus*)

The federally endangered Hawaiian hoary bat is known to inhabit forested areas on the island of O'ahu. According to USFWS, it roosts in both exotic and native woody vegetation (USFWS 1998). While it is thought to favor trees at least 15 feet high, little is known about its distribution because it is a solitary species that is difficult for biologists to find (Department of Land and Natural Resources 2015). If trees or shrubs suitable for bat roosting are cleared during the breeding season, there is a risk that young bats could inadvertently be harmed or killed, especially because adults leave young unattended in "nursery" trees and shrubs when they forage. Young bats, typically born in June, cannot fly during the first few months of their lives.

OCM did not identify any reports of locations within the study area where the presence of the Hawaiian hoary bat has been confirmed. However, because the species could be found in woody portions of the terrestrial, estuarine, and riparian habitats, the potential for it to be impacted in the study area is summarized below.

No Action Alternative

A 1993 Environmental Impact Statement for He'eia State Park mentions a variety of tree species present and states that there are no threatened or endangered species known to be present at the park (PBR Hawai'i 1993). Nearby, Paepae o He'eia is working on restoring the walls of He'eia Fishpond and promoting fishpond aquaculture. A final environmental assessment for Aquaculture Support Facilities at He'eia Fishpond stated that it was possible for the Hawaiian hoary bat to occur on occasion in the area, in part because it forages over bays and ponds and tends to roost in dense forests, including areas with mangroves, which are present near the fishpond. However, the species was not identified during a one-day survey of birds and mammals in 2006 that was summarized in the final environmental assessment (Helber Hastert and Fee Planners 2007). In 2012, when USACE issued a permit to Paepae o He'eia for restoration of He'eia Fishpond, the USACE identified a few threatened and endangered species potentially affected by the restoration project, but did not include the Hawaiian hoary bat among them (USACE 2012b).

Kāko'o 'Ōiwi is planning habitat restoration projects that could affect tree species that might potentially provide habitat for Hawaiian hoary bats. For example, the group plans to restore 20 acres of native wetland habitat on the HCDA parcel, following the He'eia Stream downstream of the taro fields, where an invasive mangrove forest would be replaced with native wetland sedges and open-water pools. Kāko'o 'Ōiwi intends to schedule removal of invasive mangroves and native wetland habitat restoration to avoid June 15 through September 15, during the bat's breeding season. Kāko'o 'Ōiwi is also planning to restore taro patches on the HCDA property and has consulted USACE about the initial portions of that project (USACE 2012c). The Corps notified Kāko'o 'Ōiwi that it would not need a permit for that portion of the project, but should reconsult USACE once its plans for the portions of the project that include floodplain restoration, estuarine wetland restoration, and detention pond construction have been further developed. Additional roosting habitat is potentially available for the Hawaiian hoary bat in the forested uplands of the HCDA parcel, adjacent to some open wetlands. However, it is not known whether the Hawaiian hoary bat uses the upland forest area of the HCDA parcel. Kāko'o 'Ōiwi is also planning to restore this area, including removing some invasive plant species, while allowing select non-native plants to remain, particularly those offering key structural attributes to the forest or important ecosystem services. The trees to be planted will mainly be native species; appropriate species will be determined after further study. Restoration of the upland area is not sufficiently far along in the planning process for Kāko'o 'Ōiwi to have determined what authorizations will be needed. If any portion of the upland forest restoration is federally-funded or federally-permitted, Kāko'o 'Ōiwi would likely be subject to any BMPs identified by USFWS. In the long-term, upland forest restoration could create additional habitat for the species, a potential moderate beneficial effect. In the short run, the removal of mangroves or other non-native trees throughout the HCDA parcel could result in a reduction of roosting habitat for the hoary bat. However, the impacts would be insignificant because they cannot be meaningfully detected or evaluated because so little is known about the habitats preferred by the species and individuals are difficult to locate. If tree removal is conducted outside the bat's breeding season, it would probably have no more than a negligible effect.

In sum, there are a number of activities that are already being conducted in the study area under the no action alternative. There have been no reports of Hawaiian hoary bats within the study area, but the species is difficult to detect and solitary. Activities planned under the no action alternative are conducted pursuant to consultations with federal and state agencies, when appropriate. Both USFWS and the Hawai'i DOFAW have recommended avoiding tree removal or trimming during the time when bat pups are most vulnerable. These recommendations would be expected to be followed on State lands, such as He'eia State Park. Kāko'o 'Ōiwi has already indicated that it is committed to avoiding taking down trees in estuarine mangrove forests during the time when bat pups would be most vulnerable. Kāko'o 'Ōiwi is likely to also plan to avoid cutting down trees during the bat's breeding season when it restores the upland forest portion of the HCDA parcel and when it restores taro lo'i. Work conducted on and around He'eia Fishpond by Paepae o He'eia is subject to the conditions of the USACE permit described above. The fact that endangered species section of the USACE permit addresses sea turtles and Hawaiian monk seals, but not hoary bats, suggests the Corps determined the actions it permitted would have no effect on hoary bats.

As long as the time of year restrictions suggested by state and federal fish and wildlife agencies are followed, the no action alternative would not be expected to result in adverse effects on Hawaiian hoary bats. It is unknown whether removing mangroves and other invasive trees and replacing them with native species will have any beneficial effects on the bat species, since some habitat will be removed, whereas other habitat would be created, and the species is not known to prefer native trees over exotic trees. Nonetheless, beneficial effects from efforts to restore uplands are possible.

Preferred Alternative and Alternatives A, B and C

Reserve designation could lead to reserve staff providing technical assistance for projects that are already planned under the no action alternative. There could be habitat for the hoary bat within the areas proposed for inclusion within the reserve under each of the alternatives. It is unknown whether reserve implementation would have any effect on Hawaiian hoary bats. OCM will carry out informal consultation for its own proposed action during the public comment period for this final EIS. USFWS identified four actions within its Hawaiian hoary bat recovery plan that would be needed to delist this species (U.S. Fish and Wildlife Service 1998). None of the recommendations and proposals within the proposed He'eia NERR's FMP directly address these recovery actions, many of which are beyond the programmatic scope of the proposed He'eia NERR. However, if a reserve were designated, reserve staff might provide additional technical assistance or research and monitoring capacity to support habitat and species restoration efforts, which could result in beneficial effects to the species. In addition, there might be future projects, not yet proposed, that require tree removal. Future activities with the potential to impact any threatened or endangered species, including the Hawaiian hoary bat, will be evaluated pursuant to the applicable fish and wildlife laws and regulations. If there is any potential for a federally-funded or federally authorized project to affect a listed species, the responsible federal agency would be required to consult with the USFWS, as needed, prior to approving the action. Similarly, state agencies would be likely to consult with the State Division of Forestry and Wildlife, as needed, and follow its recommendations as part of approving or conducting activities on State lands.

OCM received technical assistance from USFWS in June 2016 regarding Hawaiian hoary bats and other species, in advance of carrying out informal consultation under the ESA. USFWS recommended that, to minimize potential impacts to the bat, woody plants greater than 15 feet tall not be disturbed or removed during the bat birthing and pup rearing season, which it indicates is from June 1 through September 15. USFWS also indicated that Hawaiian hoary bats forage for insects in a broad area, as low as 3 feet from the ground to more than 500 feet aboveground. Hawaiian hoary bats can become entangled in barbed wire used for fencing, so USFWS recommends barbed wire not be used for fencing (and, if it must be used, it only be used within 2 inches of the ground surface) (D. Bruns, personal communication, June 30, 2016). OCM will convey these recommendations to its reserve partners. NOAA's preliminary determination is that, if restoration efforts are conducted in such a way as to avoid disturbing Hawaiian hoary bats from June 1 to September 15, the restoration work would not be likely to adversely affect the bats. In addition, in the long-term, restoration efforts might create new suitable habitat for the bats, which would be a minor beneficial effect.

D. Newell's Shearwater, 'A'o (*Puffinus auricularis newelli*)

USFWS published a status review of this species in 2011, and another such review is underway. The 2011 status review indicated that 75%–90% of the population of Newell's shearwaters is found on Kaua'i. The birds tend to nest in mountainous areas and feed in pelagic areas. Nonetheless, USFWS indicated, when it provided technical assistance to OCM, that the species could be present in the study area. Major threats to the species include predation from introduced mammals and adverse effects from outdoor lighting. Artificial outdoor lighting can both attract and disorient seabirds, which can result in their falling to the ground, injury, or mortality. (Once the birds are on the ground, they are subject to increased mortality due to collisions with vehicles, starvation, and predation.) Fledglings take their first flights from their nests to the sea between September 15 and December 15, when they are particularly vulnerable to disorientation from outdoor lighting. USFWS recommended that, between September 15 and December 15, nighttime construction be avoided and outdoor lights be only used when necessary and fully shielded, which allows the bulb to be seen from below bulb height, but not above it (D. Bruns, USFWS, personal communication, June 30, 2016).

No Action Alternative

The best available data about the population of this species is currently being analyzed so that a new 5-Year Status Review can be published by USFWS. OCM has not identified publicly- available documentation of this species' use of the study area. If it were present, Newell's shearwater could potentially be adversely affected by light pollution and, potentially, predation.

At this time, OCM does not have information about whether any construction is being carried out in the study area at night, nor information about whether and where outdoor lights are shielded. It is OCM's expectation that not all lights in the study area are shielded, given the cost of replacing existing outdoor light fixtures. Thus, the potential for minor to moderate adverse impacts to this species cannot be ruled out.

Preferred Alternative and Alternatives A, B and C

None of the alternatives that involve reserve designation are expected to affect this species. Reserve implementation would make use of existing facilities, at the outset. Thus, reserve implementation would not have any

effects beyond those existing under the baseline that exists under the no action alternative. There is insufficient information about future construction plans to analyze their potential effects at this time. OCM will ensure appropriate ESA compliance activities are carried out for future federally supported projects. OCM will communicate the USFWS BMPs to Reserve partners, including those related to shielding outdoor lights, minimizing their use between September 15 and December 15, and avoiding nighttime construction during that time.

E. Endangered Hawaiian Waterbirds

- Hawaiian stilt, Ae'ō (*Himantopus mexicanus knudseni*)
- Hawaiian gallinule (moorhen), 'Alae 'ula (*Gallinula chloropus sandvicensis*)
- Hawaiian coot, 'Alae kea (*Fulica americana alai*)
- Hawaiian duck, Koloa (*Anas wyvilliana*)

The vegetated wetlands of He'eia estuary are known to attract and support four endangered species of Hawaiian waterbird. Biannual waterbird counts conducted at He'eia marsh confirm that all four species use habitat in the vicinity of the study area. Critical habitat has not been designated for any of the listed waterbird species, and the He'eia marsh was not identified as one of the "core" wetlands in the most recent recovery plan for endangered Hawaiian waterbirds. However, He'eia marsh was identified as a "supporting" wetland. The USFWS recovery plan describes He'eia as a site that historically had habitat value because of the complex of tidal marshes and open-water areas, but which has been substantially modified and presently consists of non-native mangroves, remnants of ponds, and wet pasture. As of 2011, there had been few confirmed sightings of all four species at the He'eia marsh site (U.S. Fish and Wildlife Service 2011b). OCM staff have observed Hawaiian stilt within the taro fields of He'eia estuary over the past two years (personal observations, Chasse and Migliori, April 2016). Areas adjacent to man-made low-lying bodies of freshwater, such as taro patches, have been identified as Hawaiian stilt nesting areas.

The Recovery Plan for Hawaiian Waterbirds recommends that He'eia waterbird habitat be restored and managed by the State of Hawai'i to provide enhanced habitat for endangered waterbirds. In the past, important factors contributing to the reductions in the size of populations of endangered Hawaiian waterbirds included loss of wetland habitat and altered hydrology, water quality degradation, and hunting. Other contributing factors include predation by introduced animals (currently the most significant threat to most of these species) and habitat alteration (including by non-native plants and disease). Hybridization with the mallard duck is also a threat to the Hawaiian duck.

No Action Alternative

Under this alternative, within the study area, removing invasive plant species from waterbird habitat and other wetland restoration efforts that are already underway and planned could have a minor, beneficial, indirect impact on the endangered waterbirds. For example, California grass and mangrove outcompete native species and eliminate open-water, exposed mudflats, or shallows, which these waterbirds use. For the most part, there would be no anticipated significant increases in the above-listed factors that have contributed to reduced Hawaiian waterbird populations. Hawaiian stilts are an exception, because they tend to nest on human-maintained wetlands, because others tend to be too overgrown; the stilts use taro ponds in their wet fallow

and early stages of planting (before the plants form a canopy), but harvest and flooding of the taro patches can adversely affect reproduction, according to the recovery plan. Some of the other waterbirds use taro fields for feeding. Table 6.28 identifies recommendations made by USFWS in the Recovery Plan for Hawaiian Waterbirds that could potentially be supported by reserve designation and operation. The table identifies actions included in the FMP for the reserve, most of which would be carried out under the no action scenario.

Preferred Alternative and Alternatives A, B and C

Available data suggest that reserve designation may affect, but is not likely to adversely affect, endangered Hawaiian waterbird species because designation would have completely beneficial impacts to the species. The management strategies, objectives, and activities outlined in the FMP for the activities at the reserve, such as wetland and stream restoration, water quality monitoring, and predator control (most of which would occur under the no action scenario), are consistent with specific recommendations made by the USFWS to support Hawaiian waterbird recovery. If there are any effects from the Preferred Alternative or Alternatives A–C on this species, the effects would likely be minor and beneficial (e.g., associated with landscape-scale planning under the auspices of the reserve, technical assistance reserve staff might provide associated with the removal of invasive species and restoration of habitat features needed by Hawaiian waterbirds, and/or any data collection on waterbird use of habitat within the reserve).

Table 6.28. Actions proposed in the He'eia NERR Final Management Plan which support Hawaiian waterbird recovery needs

USFWS HAWAIIAN WATERBIRD RECOVERY RECOMMENDATION FOR HE'EIA MARSH	ALIGNED OBJECTIVES IDENTIFIED IN HE'EIA RESERVE FINAL MANAGEMENT PLAN
1.1 Develop management plans for core and supporting wetlands.	Development of (and regular updates to) a reserve MP (preferred alternatives and alternatives A, B, and C).
1.3.1 Secure water sources and manage water levels to maximize nesting success, brood survival, food availability, and recruitment of waterbirds.	Although water levels will not necessarily be managed for these species, the reserve plans to conduct research on hydrology of He'eia estuary and survey its biodiversity (Goal 1, Objective 1) (under the preferred alternatives and alternatives A–C). The reserve will also support existing and future efforts to restore and manage wetland resources (Goal 3, Objective 10) (Reserve support for plans under no action alternative).
1.3.2 Manage vegetation to maximize nesting success, brood survival, food availability, and recruitment of waterbirds.	Although plant composition will not be managed solely to benefit waterbirds, the reserve will provide technical assistance and support for restoration activities planned by Kāko'o 'Ōiwi to encourage desirable plants and manage invasive/non-native plant species (Goal 3, Objective 10) (Reserve support for plans under No Action alternatives).
1.3.3 Eliminate or reduce and monitor predator populations.	Kāko'o 'Ōiwi will develop and implement a predator control program for rats, mongooses, cats, and dogs, in cooperation with USFWS and DOFAW (Goal 3, Objective 10) (Reserve support for plans under no action alternative).
1.3.5 Minimize human disturbance to waterbirds and their habitats.	Develop a public access plan (see Section 7 of final MP for details) and identify allowable uses within the reserve (preferred alternatives and alternatives A–C). HIMB, Paepae o He'eia and Kāko'o 'Ōiwi restrict access to the areas they manage, which limits human disturbances to those they approve (no action alternative).
1.3.6 Monitor and control avian disease.	Kāko'o 'Ōiwi will develop a plan for early identification of and response to avian botulism (no action alternative).
1.3.7 Minimize contamination of waterbird habitat by toxic substances/contaminants.	Develop a restoration and monitoring plan (preferred alternative and alternatives A–C). Support management of resources to improve ecosystem services, including water quality (Goal 3, Objective 10) (Reserve support for plans under no action alternative).

²⁵ If a Nēnē appears within 100 feet (30.5 meters) of ongoing work, all activity should be temporarily suspended until the animal leaves the area of its own accord. Moreover, if any number of Nēnē are observed loafing or foraging within the project area during the Nēnē breeding season (October through March), a biologist familiar with the nesting behavior of Nēnē should survey in and around the project area prior to the resumption of any work, or after any subsequent delay of work of three or more days (during which the birds may attempt to nest). If a nest is discovered within a radius of 150 feet of proposed work, or a previously undiscovered nest is found within said radius after work begins, all work should cease immediately and the Service will be contacted for further guidance. (D. Bruns, USFWS, personal communication, June 30, 2016).

F. Hawaiian Goose, Nēnē (*Branta sandvicensis*)

As noted in Chapter 5, Nēnēs are not known to occur on O‘ahu, and the recovery plan for the species does not call for reestablishing it on O‘ahu (Department of Interior 2004). It is not well-documented what areas the species uses outside the nesting season, but non-native grasslands, including those found within the HCDA parcel in the study area, could potentially be suitable habitat for Nēnē (Department of Interior 2004).

No Action Alternative, Preferred Alternative, and Alternatives A, B, and C

None of the alternatives are expected to have any effect on Nēnēs, because they are not present in the study area. USFWS has identified BMPs for avoiding adverse effects to Nēnēs. If a reserve is designated, OCM will share these BMPs with reserve staff, but they only apply when Nēnēs are visible in a project area while work is being conducted, and that is considered very unlikely.²⁵

G. Sea Turtles

There are two species of sea turtles that could potentially be found in Kāne‘ohe Bay, hawksbill and green, but, of the two, only the green sea turtle is known to frequent the bay. After specific information is presented about the two species, the potential effects of the alternatives are presented for both, as there is considerable overlap in the impact on both species.

Green Sea turtle, Honu (*Chelonia mydas*)

The threatened green sea turtle is present year-round in and around the waters of Kāne‘ohe Bay (Hawai‘i Office of Planning 2015b). Behaviors that occur within Kāne‘ohe Bay could include resting and foraging on algae and seagrass. Turtles rest in underwater refugia, where they are relatively free from strong currents and disturbance; in Hawai‘i they typically choose areas with fine-grained sand or powdery silt. Turtles need to periodically swim to the surface to breathe, or they can float at the surface to thermoregulate and rest. Technical assistance from NMFS in 2016 indicates that Kāne‘ohe Bay is considered an important foraging area and refugia for the species. One study tracked 12 juvenile turtles in the bay for approximately 2 weeks. These juveniles used patch reefs within the study area, as well as sandy reef flats, the large sandbar, and other parts of Kāne‘ohe Bay, most of them just northwest of Moku o Lo‘e (Brill et al. 1995). There are no sea turtle nesting beaches in the study area (and few beaches of any kind within the study area). No critical habitat has been designated to date for green sea turtles in Hawai‘i. Designation of critical habitat for the green sea turtle Central North Pacific Distinct Population Segment is under consideration (see 81 Fed. Reg. 20058).

Hawksbill Sea Turtle, Honu ‘ea (*Eretmochelys imbricata*)

Hawksbill turtles feed primarily on sponges, invertebrates, and algae. Hawksbills prefer to forage in shallow water (not more than 65 feet deep) around reefs, bays and inlets. Key foraging habitat can be found around most of the main Hawaiian Islands, especially the north coasts. Fewer than 30 hawksbill turtles are known to nest in Hawai‘i, primarily on the Island of Hawai‘i (NOAA and USFWS 1998). Nesting on O‘ahu is infrequent and has not been reported in Kāne‘ohe Bay (Parker and

Balazs 2015). Also, HIMB reports that hawksbill turtles are rarely seen in Kāneʻohe Bay (HIMB 2016). However, since Kāneʻohe Bay could offer foraging habitat, potential hawksbill turtle impacts are addressed. No critical habitat for hawksbill turtles has been designated in the Pacific.

Threats to sea turtles include harvesting (of eggs, juveniles, or adults); degradation of foraging habitat; degradation and loss of nesting habitat; beachfront development and lighting; nest predation and vandalism; disease; marine debris and pollution; watercraft strikes; and incidental take from commercial fishing. Actions called for in the Recovery Plans for both species of sea turtle that address conservation of foraging habitat include preventing degradation or destruction of reefs and seagrass beds caused by upland erosion and siltation, trampling by fisherman and divers, boat groundings and anchoring, environmental contaminants, dredging and improper disposal practices, and other threats. The Recovery Plans for both species recommend actions to protect and manage sea turtle populations, including by eliminating directed take; determining the species' distribution, abundance, and status in the marine environment; reducing adverse effects from entanglement and ingestion of marine debris; reducing incidental mortality due to fishing; and eliminating the harassment of turtles at sea through education and enforcement (NOAA and USFWS 1998 and 1998b).

No Action Alternative

As there are no known terrestrial habitats (i.e., beaches) used by these species within the study area, activities in upland areas, estuarine areas, and riparian areas are not expected to directly impact sea turtles. One potential indirect effect, however, is transport of sediment or pollutants to sea turtle habitats. Because of modern point source and nonpoint source pollution control requirements, the types of activities underway in the study area are not likely to affect sea turtles. In the marine environment, threats to sea turtles in the study area include direct and indirect incidental harm from recreational boaters and from fishing activities. Direct impacts could occur from injury from boats, fishing line or nets, or other equipment used for recreation. Indirect effects could occur from damage to habitats preferred by turtles, including near reefs, and from disruption of behavior patterns due to human use of the area. For example, some resting or foraging turtles are disturbed by human activity, including boating, and try to swim away from the source of disturbance. Human activities could, therefore, disrupt their ability to feed and rest (NOAA NMFS unpublished data). There is already a great deal of activity in Kāneʻohe Bay. Thus, the potential for adverse impacts to sea turtles under the no action alternative cannot be ruled out. However, because it is well known that sea turtles are protected under the ESA, it is likely that some of the education and outreach that is already ongoing contributes to educating people about protecting and avoiding harassment of sea turtles. Also, while it is possible that there could be temporary disturbances caused by people studying reefs and removing invasive algae (including when invasive algae is fed into the "Super Sucker"), projects requiring federal approval or federal funding would be subject to applicable requirements under ESA. (NOAA funds some use of the Super Sucker in Kāneʻohe Bay.) The long-term effect of removing invasive algae would be to improve habitat for sea turtles.

Preferred Alternative and Alternatives A, B and C

Designation and implementation of a proposed He'eia NERR could result in increased research, boating, and/or recreational use of Kāne'ohe Bay (e.g., use of motorboats, fishing, or diving), in part because designation could increase the number of visitors and recreational users to the study area. Increased research and monitoring efforts by reserve staff and partners could also increase the amount of in-water activities for research purposes, and it is possible that the number of educational tours on boats owned by reserve partners could also increase. However, it should be noted that the same boats already used by reserve partners would continue to be used for research and educational purposes, at least in the near term. In addition, there is already extensive human use of Kāne'ohe Bay, including in the areas designated for motorized recreation.

Impacts from reserve-related boating are expected to be negligible because reserve partners would be expected to adhere to BMPs identified by NOAA for in-water activities. Those BMPs include maintaining a vigilant watch for turtles (and other protected marine species), particularly in areas of suspected turtle activity. Observers and boats should keep their distance from turtles, even if that means altering their course. No one should attempt to feed, touch, ride, or otherwise intentionally interact with any listed species, including sea turtles. See Appendix I for additional BMPs. Reserve staff and other educators should inform visitors to the reserve and researchers about applicable BMPs.

Adherence to these BMPs is intended to ensure that while reserve activities may affect listed sea turtles, they are not likely to adversely affect sea turtles. Some of the management strategies identified within the FMP are intended to enhance marine habitats, providing an indirect benefit to sea turtles and other marine species. In addition, some of the reserve's education and outreach activities would improve the understanding of reserve visitors about their interactions with marine species. Those efforts would improve public awareness of BMPs to follow when they encounter sea turtles and other special-status species, which could reduce the amount of disturbance to these species, another potential beneficial impact. OCM plans to consult with NMFS regarding the potential for its action to affect sea turtles during the public comment period for this final EIS; the results of the consultation will be published in the Final EIS and the information summarized herein will be updated, if needed.

H. Hawaiian Monk Seal, *ilio-holo-i-ka-uaua* or *Na mea hulu (Monachus schauinslandi)*

Between 1985 and 2015, NMFS received 23 reports of Hawaiian monk seals in Kāne'ohe Bay. In most instances, the monk seals were observed in the water. Twice, monk seals were reported as having hauled out on land, including once on Moku o Lo'e. (In general, Hawaiian monk seals prefer to haul out on sandy beaches and lava benches.) Of the 23 Hawaiian monk seals reported, 7 were reported in the vicinity of Moku o Lo'e, 2 were in the vicinity of He'eia Kea Small Boat Harbor, 2 were in the vicinity of He'eia State Park, and the other 12 were elsewhere in Kāne'ohe Bay (but not necessarily the portion of Kāne'ohe Bay in the study area). Between 2005 and 2015, there were a total of six sightings, four of them in Kāne'ohe Bay, one on Moku o Lo'e, and one at He'eia State Park. These data represent only the instances when NMFS was notified of

the presence of a monk seal, whereas actual monk seal use could be more frequent. In addition, some monk seals are monitored using telemetry (a subset of the total monk seal population), but none have been tracked in Kāneʻohe Bay, although they do use nearby areas (NOAA and DLNR 2007). In short, while Hawaiian monk seals are observed rarely in Kāneʻohe Bay, they are known to use the study area. As noted in Chapter 5, Hawaiian monk seals travel through Kāneʻohe Bay and can use portions of the bay for foraging or resting, but they are not known to use Kāneʻohe Bay for pupping or nursing. The primary threats to the species in the main Hawaiian Islands include entanglement in marine debris and fishing gear, disease, habitat loss, and human disturbance. Monk seals prey on a wide variety of bottom-dwelling species, including fish, eels, octopus, squid, and crustaceans (NOAA and DLNR 2007).

Critical habitat for the Hawaiian monk seal (*Monachus schauinslandi*) was revised in 2015, in response to the identification of key beach areas and marine-foraging areas in the main Hawaiian Islands. Although the study area does not contain terrestrial habitat or key beach areas for the monk seal, the marine component of the area does include marine critical habitat (which extends from the shoreline out to the 200 meter depth contour, but only includes the seafloor and marine habitat that extend 10 meters in height from the sea floor). The physical and biological features that must be present in marine areas essential to the conservation of Hawaiian monk seals have been defined as, “[m]arine areas from 0 to 200 m in depth that support adequate prey quality and quantity for juvenile and adult monk seal foraging...[including] submerged reefs and banks, nearby seamounts, barrier reefs, and slopes of reefs and islands...[where conditions support] the growth and recruitment of bottom-associated prey species that support monk seals” (80 Fed. Reg. 50925).

No Action

Visitors to Kāneʻohe Bay have the potential to encounter Hawaiian monk seals. Depending on the type of encounter, it can result in harassment during human-seal interactions (e.g., due to intentional efforts to approach, feed or swim with monk seals); seals becoming “conditioned” or used to humans; injuries from boating and fishing (including from hooking/entanglement); or even monk seal death. Given that monk seals have been reported in Kāneʻohe Bay in fewer than half of the past 30 years, human-monk seal encounters would be expected to be infrequent (NOAA and DLNR 2007). However, there is already considerable human activity in and around Kāneʻohe Bay, including by users with commercial, fishing, recreational, research, and educational interests, as well as by users associated with the marine corps base. Some of these human activities could also have indirect effects on Hawaiian monk seals, such as on their behavior. Given efforts on the part of multiple entities to educate the public, including by reserve partners, about the protections afforded to Hawaiian monk seals under the ESA and Marine Mammal Protection Act (MMPA), most visitors probably know that they should keep their distance from any monk seals they see and avoid intentional, direct impacts to the species. However, the potential for take of Hawaiian monk seals under the no action alternative cannot be ruled out.

Preferred Alternative and Alternatives A, B and C

If a reserve were designated (under the Preferred Alternative or Alternatives A, B, or C), increased visitation to the study area would be expected to increase the frequency and number of researchers and visitors to the portion of Kāneʻohe Bay in the study area. This could potentially have direct or indirect impacts, but their magnitude is expected to be insignificant in the context of all the other activity within the bay. It is theoretically possible that reserve operation could increase the frequency of encounters between humans and Hawaiian monk seals, but Hawaiian monk seals have only been reported in this area in 4 of the last 10 years (NOAA and DLNR 2007). Thus, Hawaiian monk seal encounters are expected to continue to be very rare. In addition, many of the same BMPs for marine species listed in the appendix would apply to anyone who sees Hawaiian monk seals. The reserve would be expected to publicize those BMPs and any other applicable NOAA BMPs. Adherence to the BMPs will reduce the likelihood of any monk seal harassment or take by reserve staff, researchers, or visitors.

Whether any future human-monk seal encounters in Kāneʻohe Bay would be attributable to the reserve or other recreational activities in the bay would be hard to discern. In other words, any potential adverse effects of reserve operation to Hawaiian monk seals would be insignificant (as defined under ESA, i.e., difficult to detect and not of a magnitude that would be expected to cause take). In addition, any researchers whose work requires authorization from NMFS (including researchers studying endangered species) will be expected to obtain the authorization before the beginning the research. NERRS research policy requires researchers to have secured all necessary approvals and permits prior to obtaining written approval from a NERR research coordinator. In addition, environmental compliance reviews will be carried out by OCM prior to further federal actions at the reserve site. After future actions are proposed, when appropriate, OCM will consult with NMFS to evaluate the potential impacts to protected species and critical habitat and to ensure compliance with the Marine Mammal Protection Act and ESA.

Under the ESA, federal actions must avoid destruction or adverse modification of critical habitat defined for a listed species. Destruction or adverse modification means “a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.” See 50 C.F.R. § 402.02. With respect to Hawaiian monk seal foraging areas, OCM must evaluate the effect of its federal action on the characteristics of Kāneʻohe Bay that allow it to support adequate prey quality and quantity for monk seal foraging and that facilitate the growth and recruitment of seal prey. OCM does not anticipate that its proposed action would adversely affect the species in Kāneʻohe Bay upon which monk seals might prey. Therefore, it appears that the proposed action may affect, but is not likely to adversely affect, Hawaiian monk seal critical habitat.

I. Main Hawaiian Islands Insular False Killer Whale (*Pseudorca crassidens*)

This endangered species, which is in the dolphin family, ranges widely throughout the main Hawaiian Islands. Tagged individuals have been tracked over a broad range of depths, from shallow (< 50 m) to very deep (> 4000 m), using both the windward and leeward sides of all the islands. One of the characteristics that distinguishes the main Hawaiian Island insular false killer whale from other related species is that it tends to stay close to the shoreline, typically within 40 km. Major threats to the species include reduced prey, injury from fishing gear, anthropogenic pollution, and reduced genetic diversity. Since the species uses echolocation for such activities as navigation and foraging, noise can also affect the species.

No Action Alternative

Under the no action alternative, marine animal species, including cetaceans, are chronically exposed to underwater noise resulting from human activities in and around Kāneʻohe Bay. Many of the boats in the bay may be relatively small, but large military watercraft sometimes transit the bay, and planes also fly overhead. The discussion in the Final Rule to list the species as endangered highlighted, in particular, potential impacts of noise from sonar and seismic exploration from military, oceanographic, and fishing sonar sources, because these types of intense sounds can cause permanent or temporary hearing loss, which can interfere with navigation, foraging, communication, and other behaviors (NOAA 2012b). For more information on the effects of noise on marine mammals, see <http://www.nmfs.noaa.gov/pr/acoustics/> and the Kāneʻohe Bay Information System webpage at https://sites.google.com/site/kbisathimb/human-dimensions/acoustics-sonar/kbis_references_acoustics-sonar. There is one false killer whale in captivity at HIMB, but OCM did not identify any reports of wild false killer whales in Kāneʻohe Bay or in bays in Hawaiʻi generally. However, technical assistance from NMFS indicates the species could visit Kāneʻohe Bay. In short, because of the human activity in and around Kāneʻohe Bay, the potential for adverse effects to this species from existing activities cannot be ruled out.

Preferred Alternative and Alternatives A, B and C

Under the preferred alternative and alternatives A, B, and C, the effect of increased underwater noise from increased boating in Kāneʻohe Bay on main Hawaiian Island insular false killer whales is likely insignificant, as with humpback whales. For the reasons summarized above, reserve operations under any of these alternatives would not be likely to adversely impact the false killer whales. If there are any research activities that have the potential to adversely affect listed species or marine mammals proposed by the reserve in the future, they will be subject to future environmental compliance reviews, and consultation with NMFS will occur, when appropriate. OCM will carry out an informal consultation with NMFS during the public comment period for this EIS to confirm the determination that the reserve designation and implementation is not likely to adversely affect this species.

CANDIDATE AND SPECIES PROPOSED FOR LISTING UNDER ESA

Individual projects that have the potential to impact candidate species and species proposed for listing under ESA have been summarized above. Resulting impacts to candidate species and species proposed for listing under ESA from the range of alternatives analyzed are provided in Table 6.29.

Table 6.29. Impacts to candidate species and species proposed for listing under ESA

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Candidate Species (Manta Rays)	Current human uses of Kāneʻohe Bay could potentially adversely affect this species.	Slight increases in human activity would have no effect on the species.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.
Proposed Threatened ('I'iwi)	No impacts as species is not found in project area and there are no existing plans to create appropriate habitat.	No impacts as species is not found in project area and there are no proposed plans to create appropriate habitat.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

A. Manta Rays (Candidate Species)

Giant Manta Ray (*Manta birostris*)

Giant manta rays are widely distributed and inhabit tropical to temperate waters worldwide. These rays have been observed visiting portions of shallow reefs where “cleaner fish” will remove parasitic copepods and other unwanted materials from their body. Sometimes, giant manta rays are found in areas with sandy bottoms and in seagrass beds, which are present in Kāneʻohe Bay.

Reef Manta Ray (*Manta alfredi*)

This species of manta ray is observed in inshore portions of tropical areas, near coral and rocky reefs, as well as along productive coastlines. Its range includes the Hawaiian Islands. The species sometimes moves between areas diurnally, using shallower waters (feeding grounds less than 10 meters deep and locations frequented by cleaner fish) during the day and deeper habitats further offshore at night.

No Action Alternative

One of the major threats to both species of manta rays is directed fishing to satisfy demand for their gill-rakers, which are used in Asian medicine. Other threats include injury or death when the rays are caught as bycatch, damage from marine debris, and destruction or modification of their habitat, including coral reefs. NMFS is in the process of reviewing available information about the two species to determine whether they merit listing as threatened or endangered. There is no significant fishing effort for this species in Hawaiʻi (NOAA 2016f). There is a possibility that current human use of Kāneʻohe Bay could adversely affect these species, e.g., via effects related to coral reef degradation, marine debris, or fishing.

Preferred Alternative and Alternatives A, B and C

Any increased use of Kāneʻohe Bay under these alternatives would be not be likely to adversely affect manta rays, because the increased human activity would likely have either no effect or insignificant effects on the species. NMFS does not consult on candidate species, but these species are to be considered when making natural resource decisions. Candidate species have no legal protection under the ESA.

B. 'Ī'iwi (Proposed Threatened)

Hawaiian Honey creeper, 'Ī'iwi (*Drepanis coccinea*) U.S. Fish and Wildlife Service announced in 2016 the intention to list the 'Ī'iwi as a threatened species under the Endangered Species Act (81 FR 64414). Currently, 90% of the populations of 'Ī'iwi are found on the island of Hawai'i. The species is found primarily in montane elevations between 4,265 and 6,234 ft (1,300 and 1,900 m), composed of 'ōhi'a (*Metrosideros polymorpha*) or 'ōhi'a and koa (*Acacia koa*) tree mixed forest. The current number of 'Ī'iwi is estimated at 605,418 individuals. 90% of all 'Ī'iwi now occur on Hawai'i Island, followed by east Maui (about 10%), and Kaua'i (less than 1%) (Paxton et al. 2013). The population distribution of 'Ī'iwi corresponds with areas that are above the elevation at which the transmission of avian malaria readily occurs. Several 'Ī'iwi populations, including those on Moloka'i, Kaua'i, West Maui, and possibly O'ahu — all lower in elevation than East Maui and Hawai'i Island — are already extremely small in size or are represented by only a few occasional individuals, due to the loss of disease-free habitat. 'Ī'iwi may face extirpation in these places due to the inability to overcome the effects of malaria. The current abundance of 'Ī'iwi rangewide is estimated at 605,418 individuals. The distribution of 'Ī'iwi corresponds with areas that are above the elevation at which the transmission of avian malaria readily occurs. The species is expected to first become restricted to Hawai'i Island, perhaps by the year 2040.

Threats to the 'Ī'iwi populations include habitat degradation and loss, avian disease and climate-related stressors. Based on the USFWS analysis on 'Ī'iwi (81 FR 64414):

invasive, non-native plants and feral ungulates have major, adverse impacts on ohia forest habitat. Feral ungulates, particularly pigs (*Sus scrofa*), goats (*Capra hircus*), and axis deer (*Axis axis*), degrade 'ōhi'a forest habitat by spreading non-native plant seeds and grazing on and trampling native vegetation, and contributing to erosion (Mountainspring 1986; Camp et al. 2010). The introduction of avian diseases transmitted by the introduced southern house mosquito (*Culex quinquefasciatus*), including avian malaria (caused by the protozoan *Plasmodium relictum*) and avian pox (*Avipoxvirus sp.*), has been a key driving force in both extinctions and extensive declines over the last century in the abundance, diversity, and distribution of many Hawaiian forest bird species, including declines of the 'Ī'iwi and other endemic honeycreepers (e.g., Warner 1968; Van Riper et al. 1986; Benning et al. 2002; Atkinson and LaPointe 2009a; Atkinson and LaPointe 2009b; Samuel et al. 2011; LaPointe et al. 2012; Samuel et al. 2015).

The impacts of other stressors to 'Ī'iwi, such as impacts due to non-native species, predation by rats and small population dynamics, are unknown. However, any stressors that increase degradation of the forests, mortality or decrease reproduction, are likely to compound the impacts of disease and the effects of climate change.

No Action Alternative

90% of all 'i'iwi now occur on Hawai'i Island, followed by east Maui (about 10%), and Kaua'i (less than 1%) (Paxton et al. 2013). The distribution of 'i'iwi corresponds with areas that are above the elevation at which the transmission of avian malaria is most prevalent. OCM has not identified publicly available documentation of this species' use of the project area. There currently are no plans for the project area to contain 'ōhi'a or 'ōhi'a/koa forests that would potentially support 'i'iwi foraging and breeding habits. As described in Table 6.28, the no action alternative includes recommendations from the U.S. Fish and Wildlife Service Hawaiian Waterbird Recovery Recommendation for He'eia Marsh to monitor and control avian diseases, including development of a plan for early identification of and response to avian botulism by Kāko'o 'Ōiwi.

Preferred Alternative and Alternatives A, B and C

None of the alternatives that involve reserve designation are expected to affect this species. Reserve implementation would make use of existing facilities, at the outset. Thus, reserve implementation would not have any effects beyond those existing under the baseline that exists under the no action alternative. OCM will ensure appropriate ESA compliance activities are carried out for future federally supported projects. OCM will communicate the USFWS BMPs to Reserve partners, including those related to ohia and ohia koa forest conservation measures if those habitats become established in the project area.

SPECIES OF CONCERN UNDER THE ESA

Reserve designation could have beneficial impacts on the two Species of Concern identified by NMFS as occurring within Kāne'ohe Bay. Resulting impacts to the Species of Concern under the ESA from the range of alternatives analyzed are provided in Table 6.30.

A. Hawaiian reef coral (*Montipora dilatata*)

NMFS listed the Hawaiian reef coral, *Montipora dilatata*, as a Species of Concern due to its rarity (though it was formerly abundant), restricted distribution, and vulnerability to several threats (coral bleaching, thermal kills, freshwater kills, habitat degradation, and damage by anchors, swimmers, fishers, and other human activities). This species was considered for listing under the ESA; however, NMFS determined that *M. dilatata* did not meet the definition of a threatened or endangered species, so it was not listed (79 Federal Register 53851). Within the main Hawaiian Islands, the species has only been observed at Kāne'ohe Bay, where it is rare. A bay-wide snap assessment survey conducted for the U.S. Army Corps of Engineers identified invasive algae and coral species present at 41 patch reefs in 2014, including patch reefs 2, 4, 7, 9 and 10. No Hawaiian reef coral were found in reefs 2, 4, 7, 9 and 10, whereas the species was found in one of the other reefs surveyed (USACE 2014). This species is difficult to distinguish from other species in the same genus. In 2008, one colony was identified by a coral reef expert in reef 8 (Hunter 2009). However, in 2010, no *M. dilatata* colonies were identified on reefs 1, 3, 8, 9, or 10; and all the colonies identified at that time were in reefs more than 1.8 miles (3,000 meters) further to the north. The 2010 study reported 43 colonies of *M. dilatata* in Kāne'ohe Bay (Hunter 2011). These studies suggest that the distribution of the species is not well known, though there are habitat variables conducive to its occurrence, such as areas protected from wave action. The species is restricted to shallow reef environments, with low wave motion, which can be found in the study area.

Table 6.30. Impacts to Species of Concern under ESA

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Hawaiian Reef Coral (<i>Montipora dilatata</i>)	Minor, indirect benefits from coral reef research, monitoring, and restoration, including efforts to remove invasive alga species. If this species occurs in areas used for motorized recreation, fishing, or swimming, potential moderate or major direct, adverse effects from physical damage to the coral. Potential moderate, indirect, adverse effects from pollution, sedimentation, boating, and introduction of non-native alga species.	The same potential beneficial effects related to coral reef research, monitoring, and restoration and the same adverse effects from human uses described under the no action alternative, plus additional beneficial effects from research, monitoring, and technical assistance or other support for alien algae removal projects.	Likely the same as under the no action alternative, unless the species is found within the reefs included under this alternative.	Same as preferred alternative.	Likely the same as under the no action alternative, unless the species is found within the reefs included under this alternative.
Inarticulated Brachiopod (<i>Lingula reevii</i>)	Moderate adverse impacts from habitat degradation and human activities, as well as minor to moderate beneficial impacts from ongoing research, husbandry, and efforts to remove invasive algae from brachiopod habitat.	The same potential impacts as the no action alternative, plus potential additional, minor benefits through reserve coordination of research and monitoring efforts relevant to humans' understanding of this species and support for invasive algae removal efforts.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Existing restoration efforts, including those intended to reduce invasive algae present in Kāneʻohe Bay, could potentially have minor, indirect, beneficial impacts on *M. dilatata*, if carried out in areas where the species is present. In addition, some of the research and monitoring already conducted within the bay has the potential to offer minor, indirect benefits to coral reef species, including *M. dilatata*, especially if the research and monitoring help resource managers understand the spatial distribution of the species and the variables that affect its distribution. In addition, the only place within the study area where the species has been identified to date is within reef 8, also known as Checker's Reef. The State of Hawai'i manages the area around that reef (and reef 7) for recreational use, particularly for motorized on-water activities (including personal watercraft and water skiing). These uses and other uses of Kāneʻohe Bay have the potential to adversely affect the coral directly. For example, coral can sustain moderate or major damage directly, from anchors, fish pots, swimmers, and divers. Coral can also be moderately affected indirectly, such as through habitat degradation and modification from sedimentation, pollution, boating, and introduction of non-native alga species.

Preferred Alternative and Alternative B

Proposed reserve boundaries under the Preferred Alternative and Alternative B would include reef 8. Under these alternatives, reserve designation could increase human understanding of *M. dilatata* and potentially lead to the collection of more definitive information about where the species exist within the parts of Kāneʻohe Bay included in the reserve under these alternatives, as well as the factors contributing to its abundance. Thus, reserve designation could have a minor, beneficial, indirect impact on this species. While not developed to directly address needs associated with this particular species, some of the activities identified in the proposed Heʻeia NERR FMP related to research, monitoring, and coral reef restoration are consistent with the management needs identified for the species by NMFS. See Table 6.31, which is derived from the proposed Heʻeia NERR FMP and a detailed fact sheet developed by NMFS that identifies management needs for the species, published in 2015 (NOAA 2015). Reserve designation would not change the way marine areas are managed by the State, so the potential adverse effects identified under the no action alternative from human uses could also occur under this alternative.

Table 6.31. Heʻeia NERR Final Management Plan objectives aligned with management needs for Hawaiian reef coral (*Montipora dilatata*)

APPLICABLE MANAGEMENT NEED IDENTIFIED BY NMFS	ALIGNED OBJECTIVES IN HEʻEIA NERR FINAL MANAGEMENT PLAN
Quantitative surveys of Kāneʻohe Bay to monitor reported location and abundance and measure variables such as temperature, salinity, pH, reef size, currents, and sedimentation to further an understanding of the environmental variables driving spatial patterns	Support environmental monitoring and biodiversity baseline studies (Goal 1, Objectives 1 and 2)
Expand efforts to out-plant additional sea urchins, particularly smaller individuals that might be better able to move into areas between colony plates and branches, to facilitate biocontrol of invasive algae and improve coral survival	Support coral reef restoration activities conducted by Hawaiʻi DLNR Division of Aquatic Resources (Goal 3, Objective 10)

Alternatives A and C

Under these alternatives, patch reef 8 would not be included within the reserve, but other reefs would be. The only reef being considered for possible inclusion within the reserve where *M. dilatata* has been documented to date is reef 8. Thus, there would only be indirect benefits to the species from alternatives A and C. However, it is possible *M. dilatata* could be identified in the future in the marine area that would be included within the reserve under these scenarios. In addition, reserve operation could also increase human understanding of the species, if reserve staff or researchers become more involved in *M. dilatata* research.

B. Inarticulated brachiopod (*Lingula reevii*)

The inarticulated brachiopod has been identified as a Species of Concern by NMFS because it is rare and it is only known to occur in Kāneʻohe Bay, in shallow (intertidal and subtidal), sandy reef flats. It is a sessile species, and its density affects its success propagating. Its density is declining (from a high of 500 per square meter in the 1960s to less than 5 per square meter in the last 10 years). Threats to the species include habitat degradation and alteration, overexploitation, pollution, sedimentation, a vulnerable life history, and limited distribution. The inarticulated brachiopod retracts into the sediment when the surrounding benthos is disturbed, which reduces the amount of time it can spend feeding. Also, non-native alien algae species have invaded habitat for inarticulated brachiopods and form mats that make the habitat much less suitable for brachiopods (NOAA 2015b). The species has been identified around the perimeter of Moku o Loʻe, as well as in other locations, including reef flats to the west of the island (including within areas that would be within the reserve's boundaries under the preferred alternative and alternatives A-C) (Hunter 2009b).

No Action Alternative

There are a number of activities that occur in Kāneʻohe Bay that are thought to contribute to the decline of the inarticulated brachiopod population. These include human activities, reduced levels of nutrients being introduced into the bay, and habitat disturbance due to invasive algae. Human uses of the bay could continue to have adverse effects on the species through disturbance (causing individuals to retract and therefore spend less time filter feeding), but the sandbars that the species use are more protected from recreational boating than some other areas. The extent to which current human activities are currently affecting the species is not well understood, but is estimated to be moderate for the purposes of this assessment, especially compared to the changes to the species' habitat over time. Another factor that could be affecting the habitat's suitability for the species is the spread of invasive algae. Under the no action alternative, efforts to remove invasive algae by reserve partners and others will continue, although the extent to which invasive algae removal activities are occurring in inarticulated brachiopod habitat versus in other parts of reefs may be limited. Research on the inarticulated brachiopod and its habitat requirements is also anticipated to continue under the no action alternative, to the extent funding allows. The research and conservation activities already underway and planned could have minor to moderate beneficial impacts (including limited removal of invasive algae by researchers and efforts to make it possible for the species to propagate in captivity so that additional individuals could potentially be reintroduced into the bay in the future).

Preferred Alternative and Alternatives A, B and C

The species has been documented in the areas proposed for inclusion within the reserve under all four of these alternatives. Under the preferred alternative and alternatives A-C, proposed Heʻeia NERR activities could advance efforts to study and potentially alleviate some of the threats to the inarticulated brachiopod (e.g., by supporting research, restoration and management strategies detailed in the FMP that result in improving habitat suitability for the species). See Table 6.32, which lists the management needs NMFS identified that could potentially be supported by reserve designation and operation. The

²⁶ There are also three Pacific bottlenose dolphins and one false killer whale in captivity, where researchers from HIMB's Marine Mammal Research Program study the two species.

research, management, and restoration efforts supported by the reserve under its FMP could provide minor benefits to this species (to the extent these efforts are conducted in the shallow, sandy reef flats that provide suitable habitat for the inarticulated brachiopod, especially efforts to remove invasive algae in areas where they reduced habitat suitability for this species).

Table 6.32. He'eia NERR Final Management Plan objectives aligned with management needs for inarticulated brachiopod (*Lingula reevii*)

APPLICABLE MANAGEMENT NEED IDENTIFIED BY NMFS	ALIGNED OBJECTIVES IN HE'EIA RESERVE DMP
Continue quantitative surveys of Kāne'ohe Bay to monitor reported abundance and location	Conduct baseline studies (Goal 1, Objectives 1 and 2)
Preserve habitat and water quality in Kāne'ohe Bay	Support resource management and restoration activities that seek to improve ecosystem services, including water quality (Goal 3, Objective 10)
Further refine research on habitat preferences (e.g., effects of salinity, pH, water quality, water depth, sediment depth, and alien algal species on <i>L. reevii</i>)	Not directly addressed in proposed He'eia Reserve final MP, but consistent with Goal 1, Objective 2 (coordinating independent research and monitoring); researchers visiting the reserve could advance this work

6.2.3.3.2 MARINE MAMMALS

There is no mention of plans for any marine mammal research or monitoring in the FMP for the proposed He'eia NERR. However, there are a number of marine mammals that could occur in Kāne'ohe Bay. Chapter 7 describes the responsibilities and restrictions that apply to persons and federal entities, respectively, with species protected under the ESA and the restrictions under the MMPA with respect to human interactions with any marine mammal. The MMPA makes it unlawful for any person subject to the jurisdiction of the United States to take (meaning to hunt, harass, capture, or kill) any marine mammal within U.S. waters or on the high seas (16 U.S.C. § 1372(a)). Regulations adopted under the MMPA also prohibit harassment, defined as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering" (16 U.S.C. § 1362(13) and (18)(A)). There are some exceptions to the prohibitions, including for directed research on marine mammals and a mechanism for obtaining authorization from NMFS for "incidental," but not intentional, taking, of small numbers of marine mammals.

As discussed above, the marine mammal species that are protected under the ESA that could be present in Kāne'ohe Bay include the Hawaiian monk seal and main Hawaiian Islands insular false killer whale. However, the Hawaiian monk seal is the only wild marine mammal known to regularly occur in the project area. Since those two species are discussed above, they are not specifically addressed in this subchapter. Rather, this subchapter analyzes the potential effects of the alternatives on other marine mammal species that could be present in the study area. According to NMFS, two cetacean species that are potentially regularly present in Kāne'ohe Bay are spinner dolphins and Pacific bottlenose dolphins.²⁶ Technical assistance from NMFS

also indicates that striped dolphins and a number of whale species (humpback whales, killer whales, melon-headed whales, and short-finned pilot whales) could also potentially pass through Kāneʻohe Bay, but would be unlikely to spend much time there because those species prefer other habitat types.²⁷ Resulting impacts to marine mammals other than the Hawaiian monk seal, main Hawaiian Islands insular false killer whale, and humpback whale from the range of alternatives analyzed are provided in Table 6.33.

²⁷ This technical assistance was provided by a representative of the Cetacean Research Program at the Pacific Islands Fisheries Science Center in July 2016.

Table 6.33. Impacts to Species of Concern under ESA

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Other Marine Mammals ²⁸	No changes to human-marine mammal interactions in Kāneʻohe Bay. Restrictions under the MMPA make it unlikely that marine mammals would be taken in the study area	The proposed action would not be expected to result in the incidental take of marine mammals. Implementation of the reserve’s FMP could lead to an increased number of boat trips in areas already used extensively for boating, as well as additional research projects. Safeguards used to protect threatened and endangered species would, in general, be expected to protect any marine mammals in the area. If there were any adverse impacts to marine mammals, they would likely be short-term, indirect, and negligible, and they could be mitigated to avoid take by following BMPs. ²⁹ Future reserve actions will be evaluated individually with respect to their potential impacts and to identify any procedures that might be needed to protect marine mammals. For example, applicable NOAA BMPs for in-water work should be followed to reduce the potential for any incidental marine mammal take.	Impacts would be similar as those in the preferred alternative, but within a larger area, including the small boat harbor.	Same as preferred alternative.	Impacts would be similar to those in the preferred alternative, but within a smaller area.

A. Humpback whale, Koholā (*Megaptera novaeangliae*)

Humpback whales are considered separately from the other marine mammals within this section. A detailed impact analysis was provided under the Final EIS, while the other marine mammals in this section were considered as a cohort. Even though the humpback whale has been delisted under the ESA and is not grouped with the other marine mammals for this environmental analysis, the detailed information provided in the FEIS is still relevant and valid.

In Hawaiʻi, it is not permitted to come within 100 yards of whales at sea or 1,000 feet of whales while in the air, unless authorized under a permit. In addition, it is unlawful to disrupt the normal behavior or prior activity of a whale by any other act or omission (50 C.F.R. § 224.103). The humpback whale mates, calves, and nurses its young in Hawaiʻi, usually during the winter. In the spring and summer, the species migrates to feeding areas beyond Hawaiʻi. Threats to the species include ship strikes, entanglement in fishing gear or with marine debris, acoustic disturbances, and illegal whaling (NOAA and DLNR 2007). Vessels in Kāneʻohe Bay create noise that may be audible to marine mammals.

²⁸ This assessment focuses on marine mammals potentially present in Kāneʻohe Bay other than Hawaiian monk seals, humpback whales, and Main Hawaiian Islands insular false killer whales because those three species were discussed above. Technical assistance from NMFS suggests the other marine mammals that could use the bay include spinner dolphins, Pacific bottlenose dolphins, striped dolphins, pygmy killer whales, melon-headed whales, and short-finned pilot whales.

²⁹ The word negligible, as used throughout this chapter, was defined in Chapter 6.11. This use of the word negligible is different from how negligible is defined under the MMPA at 50 C.F.R. § 216.103; no reference to that definition is implied.

However, as noted in Chapter 5, while whales are known to use oceanic areas just outside of Kāneʻohe Bay, they have not been reported to date inside of Kāneʻohe Bay. That does not mean, however, that whales could not enter Kāneʻohe Bay or that noise from within Kāneʻohe Bay could not impact whales outside the bay.

No Action Alternative

Potential impacts to humpback whales under all the alternatives, including the No Action Alternative, include chronic exposure to underwater noise resulting from human activities in Kāneʻohe Bay, including recreational and commercial vessel traffic (Bettridge et al. 2015). Other threats to humpback whales include ship strikes, which have the greatest potential to be an issue for large vessels, which are not typically found in Kāneʻohe Bay. Large military water-craft sometimes transit the bay. There are already numerous sources of noise, primarily from boat engines on vessels (and other vehicles, such as personal watercrafts) in Kāneʻohe Bay. A typical fishing vessel radiates noise at a source level of about 158 decibels (referenced to 1 micropascal). There are also natural, ambient sounds in Kāneʻohe Bay and other marine areas produced by snapping shrimp and other marine life. For example, the sound produced from individual snaps from snapping shrimp in Kāneʻohe Bay produced almost 190 decibels referenced to 1 micropascal at 1 meter (Au and Banks 1998). When sound is generated in air, it travels through the water primarily in the narrow area right below the aircraft. The U.S. Navy's Hawai'i-Southern California Training and Testing EIS/OEIS notes, "A sound wave propagating from an aircraft must enter the water at an angle of incidence of 13° or less from the vertical for the wave to continue propagating under the water's surface. At greater angles of incidence, the water surface acts as an effective reflector of the sound wave and allows very little penetration of the wave below the water..." Even a F/A-18 Subsonic plane at 1,000 feet and a H-60 Helicopter hovering at 50 feet generate less sound below the water surface than a typical fishing vessel and snapping shrimp, respectively (Rim of the Pacific 2002). Since there are Biologically Important Areas identified by NMFS for humpback whales along the northeastern coast of Oʻahu, to the northwest and southeast of Kāneʻohe Bay, humpback whales probably favor those habitats over the bay (NOAA 2016e). The boundaries of the Hawaiian Islands Humpback Whale National Marine Sanctuary in the waters offshore of Oʻahu extend to the 100-fathom isobaths, from Puaʻena Point eastward to Māhie Point (on the north shore of Oʻahu) and from the Ala Wai Canal eastward to Makapuʻu Point (on the southeastern side of Oʻahu). The Sanctuary's boundaries include some of the areas mapped as Biologically Important Areas, but do not include Kāneʻohe Bay. However, the potential for adverse effects to humpback whales, particularly any that enter Kāneʻohe Bay, from existing activities cannot be ruled out.

Preferred Alternative and Alternatives A, B and C

Potential impacts to humpback whales are expected to be similar under all the alternatives. The incremental increase in boat noise under any of the alternatives that involve designation and operation of a Reserve, as currently understood, would likely not be perceptible given the large volume of existing boating and the fact that, at least initially, reserve visitors and researchers would likely use the same boats that are already used by Reserve partners for existing activities. Shipping and commercial activity would not be affected by Reserve designation or operation. Therefore, the effect of increased underwater noise from increased vessel traffic on humpback whales from the Preferred Alternative and Alternatives A, B or C is likely insignificant, and

the proposed action may affect, but is unlikely to adversely affect humpback whales. OCM will carry out an informal consultation with NMFS during the public comment period for EIS to confirm this assessment.

B. Other Marine Mammals

No Action Alternative

Various activities supporting tourism, recreation, education, industry (including fishing), commerce, military needs, maritime transportation, and other sectors occur in and along Kāneʻohe Bay. Military overflights and significant boating, diving, snorkeling, fishing, research, and restoration efforts occur within the study area; however, a detailed assessment of the impacts of current activities on marine mammals in Kāneʻohe Bay is outside the scope of this document. Under the no action alternative, there are expected to be no change to human-marine mammal interactions in Kāneʻohe Bay. While the MMPA reduces the likelihood that marine mammals would be killed, captured, or harassed in Kāneʻohe Bay and other settings, the potential for marine mammal impacts in any location cannot be ruled out. Restrictions on take of marine mammals under the MMPA would reduce the likelihood that marine mammals would be killed, captured, or harassed.

Preferred Alternative and Alternative B

These alternatives are discussed together, because the boundaries of marine areas included within the reserve and the reserve activities conducted therein would be the same, and thus, the expected impacts to marine mammals are also expected to be the same. The main activity that can be anticipated to result from reserve operation that has the potential to increase human-marine mammal interactions would be a greater number of boat trips for research or educational purposes. At this time, it is anticipated that reserve partners would use existing small boats for these purposes, just as they currently use such boats and other equipment for research and educational tours in areas that are already used extensively by humans. Marine research and restoration activities, including research that requires swimming or diving, already underway or planned by reserve partners would also continue and might have the potential to result in human-marine mammal interactions. New in-water activities might occur as a result of designation, such as installation and monitoring instruments that collect data as part of the System-Wide Monitoring Program (SWMP).

The incorporation of the safeguards used to protect threatened and endangered species into future reserve efforts would, in general, also help protect any marine mammals in the area. Thus, any potential adverse effects to marine mammals from reserve operations would be negligible. Future actions will be evaluated individually with respect to their potential impacts and to determine applicable procedures and BMPs to protect marine mammals. For example, applicable NOAA BMPs for in-water work should be followed. (See, for example, “Best Management Practices (BMPs) for General In-Water Work Including Boat and Diver Operations,” published by the NMFS Protected Resources Division.) reserve designation could provide site partners with opportunities to reach broader audiences to educate them about marine mammals and appropriate BMPs to avoid harassment of marine mammals.

Because HIMB is a reserve partner, it would be expected to advise on the potential for any reserve-related activities to affect the marine mammals housed by the HIMB Marine Mammal Research Program located within an enclosure pen approximately 220 feet (70 meters) from Lighthouse Pier on Moku o Loʻe

(Community Planning and Engineering, Inc. 2014). Because most of the motor boats used for reserve activities are already owned by HIMB, impacts to these marine mammals from additional boat trips are not expected to be significant, especially in light of all the other noise these animals are exposed to, including overflights of planes from MCBH. Although not anticipated, any incidental take of marine mammals is to be reported to NMFS promptly.

Alternative A

Impacts would be similar as those in the preferred alternative, but within a larger area, including the small boat harbor.

Alternative C

Impacts would be similar as those in the preferred alternative, but within a smaller area. That would reduce the footprint of reserve-related activities, would concentrate use by reserve staff, researchers, teachers, and other visitors in locations where they might interact with marine mammals in a smaller area.

6.2.3.3.3 ESSENTIAL FISH HABITAT

As noted in Chapter 5, Kāne’ohe Bay has been designated as Essential Fish Habitat (EFH) for Hawai’i Bottomfish, Hawai’i Coral Reef Ecosystems, the Hawai’i Crustacean Fishery, and the Hawai’i Pelagic Group. For more information about the Magnuson-Stevens Fishery Conservation and Management Act and EFH consultation requirements, see Chapter 7. In brief, federal agencies must consult NMFS regarding actions proposed, authorized, funded, or undertaken that may adversely affect (i.e., reduces the quality or quantity of) EFH. Resulting impacts to EFH from the range of alternatives analyzed are provided in Table 6.34.

Table 6.34. Impacts to Essential Fish Habitat

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Essential Fish Habitat	No impacts beyond those contributing to the current baseline. For information about the current baseline, see preceding subchapters on the marine environment.	Reserve designation and approval of the FMP are not expected to adversely affect EFH. There is insufficient information at this time to determine whether future in-water activities at the reserve would have any adverse effects on EFH. After federally supported projects within EFH are proposed and at other appropriate times, OCM will consult with NMFS, when needed, to avoid, minimize, or offset any adverse effects on EFH.	Impacts are expected to be similar to those from the preferred alternative, but within a larger area. Availability of a spot from which reserve visitors and staff could board boats at the small boat harbor might reduce the potential for the reserve to need a new dock or pier elsewhere, which could affect EFH.	Same as preferred alternative.	Impacts would be similar to those in the preferred alternative, but within a smaller area corresponding to the boundary of this alternative.

No Action Alternative

The marine water column and seafloor in Kāneʻohe Bay, including the entire study area, have been designated as EFH and, for some ecosystems, Habitat Area of Particular Concern (a subset of EFH). The above discussions of the no action alternative, marine habitats, marine flora and marine fauna summarize the types of impacts on Kāneʻohe Bay from existing and planned activities. For more information about the effects of existing and planned activities on the marine environment in Kāneʻohe Bay, see preceding subchapters, particularly those devoted to marine habitats, marine flora, and marine fauna. Because that information is presented above, it is not summarized again here.

Under the no action alternative, some of the current and planned restoration and research activities in Kāneʻohe Bay, including those implemented by site partners, do or would result in EFH restoration and enhancement. For example, the invasive algae removal efforts on patch reefs are intended to have beneficial impacts on EFH. Other activities in the study area would have no effects on EFH. Since an adverse effect on EFH is defined as any reduction in the quality or quantity of EFH, it is likely that there also are and will be adverse effects from ongoing and planned non-federal actions to EFH under the no action scenario. (The EFH consultation provisions only apply to federal actions.) It is beyond the scope of this analysis for OCM to provide a more thorough analysis of the impacts to EFH of activities under the no action alternative.

Preferred Alternative and Alternative B

Reserve designation and approval of the reserve management plan would not in and of themselves be expected to adversely affect EFH. OCM will review potential future activities that are federally-funded or authorized to determine whether future activities associated with reserve implementation may adversely impact EFH. The management plan does not contain sufficient detail about in-water activities planned for OCM to reveal any potential for adverse effects to EFH. At this time, there is insufficient data to determine whether future in-water activities at the reserve would have any adverse effects to EFH, but some potential methods for securing access to and placement of equipment or personnel have the potential to adversely affect EFH, depending on how they are implemented. What is known is that designating a reserve would result in installing monitoring (and potentially other) equipment in support of research efforts. It has not been determined where and how equipment needed for research and monitoring will be installed. If a reserve is designated, reserve staff and partners will need to determine what in-water activities to propose and whether there is a need for equipment to be anchored in Kāneʻohe Bay (and whether that would require new or could use existing moorings, pilings or piers). Because of the requirements of the Magnuson-Stevens Fishery Conservation and Management Act, reserve staff would be expected to seek options that would minimize or avoid potential adverse effects to EFH. Similarly, the specific details associated with future education, research, restoration and other efforts are unknown, so their potential impacts to EFH cannot be evaluated at this time. Once specific activities are proposed, they will be subject to environmental compliance reviews.

The Preferred Alternative and Alternative B would be likely to have some long-term, minor beneficial impacts on EFH because the alternatives would result in enhanced coordination and scientific knowledge associated with restoring and enhancing EFH, as well as the role and status of EFH. After projects that are to be federally authorized, funded, or undertaken are proposed (and at other

appropriate times), OCM will assess potential effects to determine whether consultation with NMFS is needed and then initiate dialogue, as necessary. Information gleaned from EFH consultations with the Pacific Islands Regional Office Habitat Conservation Division will allow partners to avoid, minimize, or offset any adverse effects on EFH. (After receiving an EFH assessment, NMFS has an opportunity to offer EFH conservation recommendations, including measures to avoid, minimize, or offset any adverse impacts associated with an activity.)

Alternative A

The potential impacts on EFH under this alternative are expected to be very similar to those described under the Preferred Alternative and Alternative B, but under alternative A, they would extend across a larger area. In short, it is difficult to assess all the indirect effects on EFH of Reserve designation and FMP approval at this time.

Alternative C

Potential effects on EFH under alternative C are expected to be quite similar to those described under the Preferred Alternative and alternative B, but under alternative C, they would extend across a smaller area.

6.2.3.3.4 MIGRATORY BIRDS

OCM analyzed potential effects of the alternatives on migratory birds. Resulting impacts to migratory birds from the range of alternatives analyzed are provided in Table 6.35.

The Migratory Bird Treaty Act prohibits the take of migratory birds unless it is authorized by USFWS. In addition, USFWS can offer recommendations related to projects undertaken or funded by federal agencies. USFWS typically offers recommendations at the same time as it comments on Endangered Species Act Section 7 consultation letters. OCM will send out a consultation letter during the public comment period for this Final Environmental Impact Statement and will identify any recommendations USFWS offers with respect to migratory birds in the Final Environmental Impact Statement.

Table 6.35. Impacts to migratory birds

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Migratory Birds	A range of human activities could have minor to moderate direct or indirect effects on foraging habitats for migratory birds, but would not be expected to cause direct migratory bird take. Restoration of some environments, such as the fishpond, could benefit any migratory birds for which the habitat is suitable.	Reserve operation could have indirect, negligible, adverse effects or negligible to minor beneficial effects on migratory birds, but would not be expected to cause migratory bird take. Potential indirect, minor benefits to migratory birds due to reserve education, monitoring, research and restoration projects that enhance their habitat. Potential negligible adverse effects from increased human use.	Same as preferred alternative, except this alternative would also include the City and County of Honolulu parcel on land and the small boat harbor. If migratory birds occur within those parcels, reserve staff would be expected to ensure that reserve activities would not result in take of migratory birds and to comply with other provisions of the Migratory Bird Treaty Act.	Same as preferred alternative, although this alternative includes a smaller land area.	Same as preferred alternative, although this alternative includes a smaller land area.

No Action Alternative

Historically, development patterns, habitat alteration, and other human activities may have adversely affected the suitability of the areas along the coast of Kāneʻohe Bay for migratory birds. Most migratory birds that nest in the vicinity of Kāneʻohe Bay would probably nest on uninhabited islands, where there are fewer stressors, such as domesticated or feral animals. Certain migratory birds sometimes forage in and along Kāneʻohe Bay. OCM's research indicates that feeding within the study area would be more likely than nesting. Under the no action alternative, the various areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners currently represented within the Heʻeia estuary. Restoration projects, including those focused on Heʻeia Fishpond or upland forested areas, could have potential beneficial impacts to any migratory birds for which the habitat is suitable for feeding or other behaviors. Other human activities in the study area could have minor to moderate direct or indirect adverse effects to foraging habitats for migratory birds, but would not be expected to cause direct migratory bird take. Future changes to migratory bird populations or ranges could result from larger regional or global factors, such as climate change.

Preferred Alternative and Alternatives A, B, and C

Reserve operation could have negligible, indirect, adverse effects or negligible to minor beneficial effects to migratory birds, depending on how exactly the reserve operations. No new restoration or alteration of habitats suitable for migratory birds has been proposed under the Reserve FMP, beyond restoration expected under the no action alternative. (Alternative A could potentially result in restoration of the C&CH parcel, but it is unlikely that the parcel provides suitable habitat for migratory birds. The Apapane, the only forest bird listed as potentially present in the vicinity of Heʻeia, would use areas higher in elevation than the C&CH parcel.) Additional visitor use from reserve designation would not have any more than negligible adverse effects to migratory birds because the only migratory birds known to use the area forage, but do not nest, in the areas considered for inclusion within the reserve. If disturbed while they are foraging, birds could temporarily forage elsewhere until visitors leave the area. No migratory bird take would be expected to result from reserve operation, as described under the FMP. Potential impacts from future federal actions related to developing facilities for reserve staff and visitors, installing monitoring platforms or other reserve infrastructure, or otherwise addressing research needs will be analyzed once proposed to assess effects on migratory birds and ensure that they do not cause migratory bird take. Technical assistance and other support provided by the reserve and its affiliates for research, monitoring, education, and restoration projects related to migratory birds and their habitat could result in indirect, minor benefits to migratory birds, particularly if this support led to incorporating into the proposed Heʻeia NERR's operational plans additional ways to protect migratory birds.

6.3 HUMAN ENVIRONMENT

6.3.1 HUMAN AND ECONOMIC SETTING

6.3.1.1 POPULATION

As described in Chapter 5, “Affected Environment,” between the years of 1940–2010, the Kāne’ohe region experienced a major population increase expanding from approximately 5,000 to 54,000 individuals (Department of Business, Economic Development and Tourism 2013). Kāne’ohe residents are a little older than that of the State as a whole, with a median age of 41.8 years old with nearly 71% of residents are Hawai’i-born. The ethnic mix of the population is similar to that across the state as a whole.

Corresponding with the population increase, urbanization began to impact the local environment. Eight of the nine streams that drain into Kāne’ohe Bay were altered (e.g. diverted or channelized) and by 1993, 58% of the bay shoreline was modified, including sea wall construction, harbor creation, dredging, fill, or fishpond creation or maintenance, and 19 of the original 28 fishponds built by early Hawaiians were partially or completely destroyed to create more land for housing development (Hunter 1995). Resulting impacts to area population from the range of alternatives analyzed are provided in Table 6.36.

Table 6.36. Impacts to population

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Population	Negligible long-term adverse indirect impacts from traffic increases. Potential adverse environmental impacts and beneficial socioeconomic benefits from the development of residential parcels.	Negligible long-term adverse indirect impacts from traffic increases.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under this alternative, ongoing and planned habitat manipulation activities by site partners such as those related the wetland agriculture, fishpond reconstruction and aquaculture, and the rehabilitation of maintenance roads and water conveyances would remain in place. In addition, wetland, forest, riparian, and coral reef restoration activities, identified in the final management plan, are expected to be implemented as future funding is secured by those partner organizations. No direct or indirect impacts (beneficial or adverse) to the area’s population are anticipated at this time from these activities, and the lands and waters of the area would continue to be protected and managed by the various site partners currently represented within the He’eia estuary.

Based on historical data, continued population increases in the Kāne’ohe Bay area are expected and may result in additional vehicle and boat traffic and potentially affect property values over the long-term. The Kamehameha Highway, one of the area’s major roadways, crosses through the He’eia estuary as a two lane road. Despite being a major transportation corridor, current traffic on this portion of the highway is light in comparison to other major roadways around the Kāne’ohe Bay area. Traffic volume data from 2013 showed that a larger volume of vehicular traffic moves toward the center of Kāne’ohe versus moving north toward He’eia (Hawai’i Office of Planning

2015b). The highway has the capacity to handle the added vehicle traffic generated by forecasted population increases to the area (Hawai'i Office of Planning 2015b). Any indirect impacts (beneficial or adverse) to the population of the area are anticipated to be negligible.

The 210 acre C&CH parcel, fronting Kamehameha Highway, is partially zoned residential (e.g., R-10) but undeveloped at this time. These lots could be developed in the future, and it is anticipated that the development would result in potential adverse environmental impacts and beneficial socioeconomic impacts.

Preferred Alternative, Alternatives B and C

Designation of a reserve under the preferred alternative boundary could potentially result in negligible adverse impacts to the population surrounding the proposed reserve. As outlined in the proposed He'eia Reserve's final management plan (Appendix A), specific estuarine research, education and stewardship activities, including technical and planning assistance, are expected to occur within the preferred alternative boundary in the years subsequent to designation. In addition to the previously identified habitat manipulation and restoration activities conducted by site partners under the no action alternative, none of the programs or additional activities identified are expected to result in significant effects on the area population.

Similar to the no action alternative, vehicle and boat traffic within the boundaries is expected to increase based on anticipated area population increases. Additional traffic increases are anticipated as a result of adults and school groups participating in reserve education and outreach programming. However, neither is expected to result in additional traffic or boat congestion as Kamehameha Highway has the capacity to handle the anticipated added vehicle traffic as do the identified boat launch areas. As a result, no direct or indirect impacts (beneficial or adverse) to the area's population are expected.

6.3.1.2 EMPLOYMENT

As described in Chapter 5, "Affected Environment," the largest employer on the windward side of O'ahu is MCBH. In 2012, MCBH's more than 14,000 military and civilian personnel generated more than 2,280 jobs in local communities that surround the base. In all, base personnel generated an estimated \$1.1 billion in economic output retained within the neighboring communities (Marstel-Day 2014).

Another important employer in Kāne'ohe Bay is the HIMB. Known as a world-renowned marine biology research institute, HIMB serves as an education center for undergraduate and graduate students from the University of Hawai'i, as well as other institutions. The facility also hosts approximately 4,000 primary and secondary students through field trips each year (HIMB 2016). Other major industries in the Kāne'ohe area include retail, educational services, and public administration (Hawai'i Office of Planning 2016). The area's unemployment rate is 5.8%, which is 22% lower than the state-wide rate. Resulting impacts to area employment from the range of alternatives analyzed are provided in Table 6.37.

Table 6.37. Impacts to employment

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Employment	No direct or indirect impacts	Minor beneficial impact from the hiring of reserve staff to support the implementation of reserve programs and activities. Long-term, negligible, direct beneficial impacts form new employment opportunities in fields dependent on well-functioning ecosystems.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under this alternative, the various areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners currently represented within the He‘eia estuary. No direct or indirect impacts (beneficial or adverse) to employment in the area are expected. Future changes to area employment could occur as a result of changes in the size and activities of the area’s largest employers (e.g., MCBH and HIMB) or other factors that are independent of the local employment conditions.

Preferred Alternative, Alternatives A, B and C

Designation of a reserve under the preferred alternative boundary and implementation of the proposed He‘eia National Estuarine Research Reserve Final Management Plan is expected to have minor long-term beneficial impacts to employment in the Kāne‘ohe area. The initial hiring of up to five reserve staff to implement the programs and activities described in the final management plan is expected to be the most direct impact to employment.

In the long-term, the reserve’s activities to help address current watershed, water quality, habitat, and other local coastal management issues, as well as, facilitating a better understanding of traditional Hawaiian land use management and stewardship practices could lead to new employment opportunities in natural resources (i.e., fishing and agriculture), ecotourism, and other fields dependent on a well-functioning estuarine ecosystem. Overall these beneficial impacts to the employment of the Kāne‘ohe area are expect to be negligible and indirect over the long-term.

6.3.1.3 OCEAN ECONOMY

As described in Chapter 5, “Affected Environment,” the National Ocean Watch (ENOW) analysis revealed that three of the six ocean-dependent economic sectors, are represented in the Kāne‘ohe area (i.e., marine transportation, ship and boat building, and tourism and recreation). Within these three sectors, nine ocean industries ranging from *Ship Building and Repair to Scenic Water Tours* were reported to the U.S. Census totaling 109 businesses employing 1,886 people. “*Eating and Drinking*” places accounts for over 80 percent of the reported establishments and employment. Resulting impacts to the ocean economy from the range of alternatives analyzed are provided in Table 6.38.

Table 6.38. Impacts to the ocean economy

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Ocean Economy	No direct or indirect impacts	Negligible, indirect, beneficial impacts over the long-term from increased patronage to specific ocean economy-related industries.	Negligible, indirect, beneficial impacts from increased visitors and associated commerce at the harbor. Long-term, adverse, indirect impacts from increased vehicle and vessel congestion at the harbor.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under this alternative, the various areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners currently represented within the He'eia estuary. No direct or indirect impacts (beneficial or adverse) on the ocean economy of the area are expected. Any potential future changes to the ocean economy are expected to be the result of larger regional and global factors or other changes to local economic conditions.

Preferred Alternative, Alternatives B and C

Under the preferred alternative, designation of the proposed He'eia NERR is anticipated to have negligible, indirect, beneficial impacts over the long-term. As the research reserve programs mature, and the site evolves (e.g. construction of new facilities), it is anticipated that additional visitors (e.g., researchers, students, interested members of the public, etc.) will come to the site and patronize business establishments within the vicinity of the research reserve. The dominant ocean economy industries (as defined by ENOW) likely to be positively affected by the influx of visitors include “*Eating and Drinking Places,*” “*Scenic Water Tours,*” and “*Amusement and Recreational Services.*”

Alternative A

The He'eia Kea Small Boat Harbor is the primary access point for a majority of the recreational and commercial activities that occur within Kāne'ohe Bay. Under alternative A, inclusion of the harbor within the reserve boundaries would expand access to the Bay for reserve activities and could be expected to potentially have some negligible, indirect, beneficial impacts over the long-term. The proposed He'eia NERR would likely leverage the harbor as a gathering place for Reserve-based programs and as a key area for education and outreach efforts (e.g., installing relevant signage). This could attract additional visitors to the harbor and as a result, establishments such as the restaurant in the harbor could receive additional business. Although negligible, this would positively affect the ocean economy of the affected environment.

It is anticipated that increased visitor use to the reserve under alternative A could result in long-term, indirect, minor adverse impacts from increased vessel and vehicle congestion in and around the harbor. With the inclusion of the harbor as a primary access point in the reserve, the development and implementation of marine-oriented research and education programs associated with the reserve would add additional users to the harbor and within the neighboring waters. However it is anticipated that reserve staff and site partners are expected to conduct their programs in a manner which attempts to minimize any potential adverse impacts from the additional vehicle and boat traffic to commercial and recreational users of the harbor.

6.3.2 CULTURAL AND HISTORIC SETTING

6.3.2.1 CULTURAL HISTORY AND LAND USES

As described in Chapter 5, “Affected Environment,” the He’eia area has historically had a robust and flourishing agricultural and aquacultural community. He’eia also has a strong cultural legacy. Starting in the early 1900s, land-use related impacts resulting from activities like dredging, sedimentation, and sewage discharge had profound effects on Kāne’ohe Bay’s marine environment. Resulting impacts to the cultural history and land use of the area from the range of alternatives analyzed are provided in Table 6.39.

Table 6.39. Impacts to cultural history and land use

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Cultural History and Land Use	Long-term, direct, moderate beneficial impacts from the rehabilitation of historic agricultural and aquacultural practices by site partners.	Minor long-term benefit of improved baseline information on archaeological, historic, and cultural resources.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under this alternative, activities proposed under the proposed He’eia NERR’s FMP related to wetland agriculture, fishpond reconstruction and aquaculture, and the rehabilitation of maintenance roads and water conveyances that are already underway and planned by local partner organizations would remain in place. Implementation of these activities is anticipated to convert the existing land uses (i.e., fallow lands overrun with invasive flora species) within the estuary back to a traditional Hawaiian land management system that is firmly linked to the cultural history of the area. According to plans from the site partners, it is expected that these activities would continue following the historic land use footprint of taro patches and the fishpond. Reestablishing these traditional Hawaiian practices will result in direct, moderate, beneficial impacts to the historic land use over the long-term.

Preferred Alternative, Alternatives B and C

Under the preferred alternative, reserve research and monitoring, education, and outreach programmatic efforts are expected to have beneficial, long-term minor indirect impacts to the cultural history and land use of the He’eia estuary. As described below, Reserve-supported activities are anticipated to have positive benefits on the existing efforts of site partners to restore culturally significant traditional Hawaiian agricultural (e.g., taro patches) and aquaculture (e.g., fishpond) practices to the site.

Reserve-supported research and monitoring activities are expected to create a baseline of archaeological, historic, and cultural resource information for the estuary. It is expected that this effort could result in minor beneficial indirect impacts to the cultural history and land use of the area through improved documentation about the area that can inform the future placement of reserve infrastructure or by influencing the location and extent of reserve and partner activities within the estuary over time, thereby minimizing any potential adverse impacts.

In addition, implementation of the preferred alternative is expected to lead to a fuller appreciation by a wider audience of the cultural history and land use resources and their collective contribution to the history of He'eia. As such, minor beneficial impacts to the cultural history and land uses in the area are expected as the heightened public awareness has the potential to translate to greater public support for these aspects of the human environment in He'eia.

Alternative A

In addition to the impacts described in the preferred alternative and the no action alternative, the inclusion of the C&CH parcel (i.e., He'eia Kea Valley) to the north and the He'eia Kea Small Boat Harbor could potentially yield some beneficial impacts to the cultural history and land use of the area. He'eia Kea Valley is thought to have close spiritual ties to the neighboring Ke'alohe Point (currently He'eia State Park), the He'eia Fishpond, and the wetlands along the lower reaches of He'eia Stream. Collectively, these geographic landmarks play a major role in the myths and legends for the ahupua'a of He'eia. Inclusion of this area within a reserve could enable greater education and outreach opportunities, through the proposed He'eia NERR, to explore the cultural significance of this portion of the estuary. If He'eia Kea Valley were incorporated into a designated reserve, additional studies would be needed to determine the magnitude of the potentially beneficial impact this area could offer in bolstering community understanding of the cultural history and land use resources of the area.

6.3.2.2 HISTORIC AGRICULTURE

There are no impacts to historic agricultural practices. The environmental consequences relating to implementing contemporary interpretations of historic or traditional agricultural practices will be discussed in subchapter 6.3.3.1 Agriculture.

6.3.2.3 HISTORIC AQUACULTURE

There are no impacts to historic aquaculture practices. The environmental consequences relating to implementing contemporary interpretations of historic or traditional aquaculture practices will be discussed in subchapter 6.3.3.2 Aquaculture.

6.3.2.4 CULTURAL RESOURCES

As described in Chapter 5, "Affected Environment," cultural resources found in the He'eia area range from tangible historic structures (e.g., He'eia Fishpond) and other historic sites (e.g., bridge, distillery, roads, etc.) to the intangible rich cultural legends (mo'olelo) which pervade the natural environment. Several significant cultural sites have been documented in the area including the He'eia Fishpond, Kaulaukī Heiau, Keaholi Point, and the dwelling place of Meheanu at Luamo'o. The He'eia Fishpond, listed on the National Register of Historic Places (50-80-10-0327), is the most visible historic structure in the estuary. Given the number of cultural resources found in the area, resulting impacts to these resources from the range of alternatives analyzed are provided in Table 6.40.

Table 6.40. Impacts to cultural resource

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Cultural Resources	Direct, moderate long-term beneficial impacts of rehabilitated taro patches and the fishpond to support traditional Hawaiian practices. And improved long-term community connections to the traditional cultural knowledge and minor long-term beneficial impacts of forest restoration that supports plant species valued for their cultural significance. Minor indirect beneficial impacts from partner educational programs. Potential negligible adverse impacts from inadvertent disturbance of archaeological resources.	Long-term, indirect, beneficial impacts from reserve staff-directed coordination and technical assistance. Potential long-term minor adverse visitor use impacts are mitigated.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under the no action alternative, there would be no changes to the local partners’ existing or planned activities and the areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners.

In the upland areas, Kāko’o ‘Ōiwi is supporting manipulative activities to restore He’eia’s traditional agricultural landscape (i.e., taro fields). Part of this includes rehabilitating the historical agricultural roads and water conveyance channels that support the agricultural landscape. Currently, this historical and culturally significant resource is in poor condition. Rebuilding the taro patches and supporting infrastructure to its historical footprint are anticipated to have no adverse impacts on the cultural resources. Any potential adverse impacts to these cultural resources, from the implementation of these activities, are expected to be mitigated using best management practices identified through consultations with the State Historic Preservation Division and the Office of Hawaiian Affairs prior to commencing.

As Kāko’o ‘Ōiwi implements these different efforts, its activities are expected to have moderate long-term direct beneficial impacts to the cultural resources of the area by restoring the traditional agricultural landscape of the area, and strengthening community connections to the traditional cultural knowledge of the He’eia estuary.

Additional beneficial impacts are expected to be derived from the restoration of the upland forest areas. For example, within the upland forest areas that are restored, many of the restored plant species are valued for their cultural significance (e.g. traditional use of certain native tree species for making houses, canoes, tools, etc., or various plants and herbs gathered for medicinal and ceremonial purpose). As a result, the upland restoration effort is expected to provide minor beneficial impacts by retaining and improving the inventory of cultural relevant plant species in the estuary.

Site partner, Paepae o He’eia, is currently rehabilitating and maintaining the historic fishpond wall as part of a larger restoration of the He’eia Fishpond and traditional Hawaiian aquaculture. This restoration effort is anticipated to result in direct, moderate, beneficial impacts to the traditional Hawaiian practice.

The fishpond wall rehabilitation entails Paepae o He'eia removing invasive mangrove vegetation and manually rebuilding compromised sections using a traditional Hawaiian dry-stacking method that uses no mortar to keep the wall upright and intact. This allows the pond to maintain a base water level even at the lowest tides. And, according to Paepae o He'eia's USACE Section 404 permit, BMPs, such as, the hand removal of mangroves and use of traditional Hawaiian dry-stacking are designed to avoid or minimize any short-term adverse impacts to this historic and cultural resource (USACE 2012a). Based on surveys conducted in 2012, no other historically significant cultural materials were observed in or near the immediate vicinity of this rehabilitation effort. As a result, a determination by the USACE noted that the rebuilding of the fishpond wall and associated maintenance activities will not adversely impact the historical, structural, or cultural integrity of the historic fishpond (USACE 2012a). Additionally, the rehabilitation of the historic fishpond wall is anticipated to support minor beneficial impacts to Paepae o He'eia's educational and cultural outreach programming that support traditional cultural knowledge about the fishpond.

Combined, these pre-existing and planned partner-led manipulation and restoration activities are expected to potentially have direct, moderate long-term beneficial impacts to the cultural resources of the area. There is a possibility that partner-led activities could potentially adversely impact cultural and archaeological resources found within the affected environment by inadvertent disturbance. However, based on fact that site partners described above are sensitive to the significance of resources, and the fact that appropriate consultations with relevant state agencies, anticipated adverse impacts are expected to be negligible.

Preferred Alternative, Alternative A, B and C

Implementation of the preferred alternative is expected to bring new coordination and technical assistance support to site partners and their various manipulation and restoration efforts. The added reserve support to these activities could provide some additional long-term, indirect, beneficial impacts to the cultural resources of the area. An example might include providing new opportunities for people to learn about, reconnect with, and care for the historical and cultural resources that occur within the preferred alternative boundaries. It is also anticipated that reserve staff could highlight cultural connections to specific plants (e.g., taro or koa trees) or animals (e.g., mullet) as they develop relevant education and outreach programs.

Under the preferred alternative, there could be potentially adverse impacts to archaeological, historic, and cultural resources from visitor use. As reserve and partner-led activities are implemented, increased human presence and activity has the potential to damage or otherwise diminish these resources. These potential impacts would be expected to be minor. The restoration of cultural resources (i.e., taro fields and fishpond) within the estuary is a priority for both site partners and the reserve. As a result, reserve staff, site partners, and scientists are expected to conduct their activities in such a way that minimize disturbances and protect the integrity of these and other archaeological and cultural resources. As described in the final management plan, public access to the reserve will be determined by, and be compatible with, the public access policy of each of the agencies and site partners that have title to or management responsibility for the lands (i.e., HIMB, DLNR, Kāko'o 'Ōiwi and Paepae o He'eia). This is intended to protect potentially vulnerable

archaeological and cultural assets within the preferred alternative. Despite a probable increase in visitor use, it is anticipated that site partners and reserve staff will work together to protect and minimize any potential adverse impacts to the archaeological, historic, or cultural resources of the affected environment.

Overall, impacts that result from visitor use are anticipated to be mitigated by managing public access in coordination with site partners.

6.3.2.5 MARITIME HERITAGE RESOURCES

As described in Chapter 5, “Affected Environment,” Hawai’i’s maritime resources generally fall into three broad categories relating to traditional aquaculture production (e.g. fishponds), plantation and ranching-era artifacts, and military (Van Tilburg 2014). Within the area proposed for NERR designation, the maritime heritage resources are predominately military related with the exceptions being the historic fishponds also in the vicinity (He’eia Fishpond, O’ohope Fishpond and two smaller unnamed fishponds) (Fa’anunu et al. 2009). Resulting impacts to these maritime heritage resources of the area from the range of alternatives analyzed are provided in Table 6.41.

Table 6.41. Impacts to maritime heritage

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Maritime Heritage	Moderate, direct, beneficial impacts from the restoration of He’eia Fishpond.	Same as no action alternative.	Same as no action alternative.	Same as no action alternative.	Same as no action alternative.

No Action Alternative

Under this alternative, the various areas proposed for inclusion in a proposed He’eia NERR would continue to be protected and managed by the various site partners currently represented within the He’eia estuary. There will mostly be no direct impacts (beneficial or adverse) on maritime heritage resources in the area are expected. However, He’eia Fishpond is the exception. The restoration and rehabilitation of the fishpond is expected to provide moderate, direct, beneficial impacts to this specific maritime heritage resource over the long-term.

Preferred Alternative, Alternatives A, B and C

None of the alternatives analyzed are expected to result in any additional direct impacts (beneficial or adverse) to the maritime heritage resources of the area.

6.3.3 HUMAN USES

6.3.3.1 AGRICULTURE

As described in Chapter 5, “Affected Environment,” the affected area has a rich agricultural history and this history had a large influence of the socioeconomic dynamics of the associated communities. Expected resulting impacts to the historical agriculture of the area from the range of alternatives analyzed are provided in Table 6.42.

Table 6.42. Impacts to agriculture

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Agriculture	Reestablishing historic agricultural practices and related infrastructure. Long-term, direct, major, beneficial impacts from rehabilitation of the lo’i kalo.	Minor, indirect, research reserve programs.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under the no action alternative, there would be no changes to the local partners’ existing or planned activities and areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners. Kāko’o ‘Ōiwi, through its Māhuhua ‘Ai o Hoi project (see final management plan, Section 6.3.1), plans to establish a land management program to return the wetlands of He’eia to productive agricultural, cultural, and educational use. In cooperation with the Natural Resources Conservation Service, the group has developed a detailed conservation plan, the implementation of which is in progress.

This work includes rehabilitating wetlands to lo’i kalo (taro patches). Supporting this traditional agricultural landscape, Kāko’o ‘Ōiwi is also rehabilitating historical agricultural roads, and water conveyance channels. These activities were approved under a Nationwide Permit 27 pre-construction notification to the USACE (USACE 2012c) — requiring that these activities to avoid or minimize impacts to water quality and local hydrology. Historic kuāuna (taro patch walls) have been identified by a certified archaeologist as part of an archaeological inventory survey and will be restored to the extent possible. New kuāuna will be constructed to replace kuāuna from earlier times that are no longer present. Kuāuna will be built by excavating soil from within the lo’i kalo and using this soil to create the kuāuna. The lo’i kalo will be used to grow different varieties of taro and will also serve as habitat for native birds.

Presently, approximately 12 acres of the freshwater wetlands within the He’eia HCDA parcel have been converted to lo’i kalo. Kāko’o ‘Ōiwi ultimately plans to convert 176 acres into a working agricultural landscape, much of this land is overgrown with invasive species (e.g., California grass), and offers limited ecological benefits. In addition to the lo’i kalo, Kāko’o ‘Ōiwi plans to continue practicing organic agriculture of additional crops in a relatively small area (approximately several acres) adjacent to the lo’i kalo. Also proposed is potentially restoring a historic poi mill, which would occur only after any consultations required under the state law.

Under the no action alternative, the primary impacts to agriculture are expected to be direct, long-term, major, and beneficial. Kāko’o ‘Ōiwi’s rehabilitation effort seeks to recreate a traditional Hawaiian practice and promote He’eia’s agricultural legacy. Kāko’o ‘Ōiwi is also inspired by the vision to integrate traditional ahupua’a land management practices with contemporary scientific research and knowledge, and ultimately raise awareness of stewardship principles embedded within traditional Hawaiian practices.

Preferred Alternative, Alternatives A, B and C

Designation of a reserve under the preferred alternative boundary and implementation of the proposed He’eia Reserve’s final management plan is expected to have minor, indirect, long-term, beneficial impacts to historic agriculture. As detailed in the FMP, it is anticipated that reserve staff would potentially provide technical assistance, environmental monitoring and/or planning support, which would tie directly to the proposed reserve’s ecosystem-based management research activities.

The reserve’s research will evaluate two different “ecosystem-based” management approaches — one of which “embraces traditional Native Hawaiian management practices” — and evaluate the various ecosystem services provided by each management approach. It is anticipated that historic agriculture will be a fundamental component of the proposed He’eia NERR’s research as well as other programs such as education and outreach. At a minimum, it is anticipated that the proposed He’eia NERR’s programs will highlight He’eia’s historic agricultural legacy (e.g., through education and outreach programs) and investigate the ecosystem benefits that result from the modern-day interpretation of this historic practice. The implementation of the preferred alternative is expected to result in minor, indirect, beneficial impacts to historic agriculture over the long-term. Anticipated beneficial impacts include increased awareness of the role historic agriculture played in shaping the social fabric of the study area and promoting its relevance to current natural resource management practices.

6.3.3.2 AQUACULTURE

As described in Chapter 5, “Affected Environment,” there are two historic aquacultural practices that existed within the estuarine portion of the study area: loko i’a kalo and the fishpond. The expected resulting impacts to aquaculture of the area from the range of alternatives analyzed are provided in Table 6.43.

Table 6.43. Impacts to aquaculture

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Aquaculture	Reestablishing historic aquaculture practices. Long-term, direct, major, beneficial impacts from rehabilitation of the loko i’a kalo and fishpond.	Minor, indirect, long-term beneficial impacts from research reserve programs.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under the no action alternative, there would be no changes to the local partners' existing or planned activities and areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners. Kāko'o 'Ōiwi plans to implement a historic loko i'a kalo, a traditional combined taro patch and fishpond.

In addition, Paepae o He'eia, has a long-term lease with Kamehameha Schools to restore He'eia Fishpond and practice traditional Hawaiian aquaculture. As part of its ongoing efforts, Paepae o He'eia is focused on four main activities:

- 1) Removal of introduced and invasive red mangrove that is currently threatening the fishpond wall's structural integrity;
- 2) Rehabilitation of the fishpond wall which allows the organization to operate a functioning traditional Hawaiian aquaculture site;
- 3) Invasive seaweed removal within the fishpond;
- 4) In the future, as the other activities progress, Paepae o He'eia will continue to support on-site aquaculture operations to produce a variety of local finfish and mollusks (i.e., Pacific Threadfin, Striped or Grey Mullet, Pacific and Hawaiian Oysters). Currently, some aquaculture products are produced by the pond as part of community economic development efforts focused on food security.

Under the no action alternative, the primary impacts to aquaculture are expected to be direct, long-term, major, and beneficial in nature. Through implementation of these historic aquaculture practices, Kāko'o 'Ōiwi and Paepae o He'eia are restoring a traditional aquaculture practice of cultural significance and creating an opportunity to raise awareness of the role historic aquaculture played in shaping the social fabric of He'eia, and promoting its relevance to current natural resource management practices.

Preferred Alternative, Alternative A, B and C

Designation of a reserve under the preferred alternative boundary and implementation of the proposed He'eia NERR's FMP is expected to have minor, indirect, long-term beneficial impacts to aquaculture in the affected area. As detailed in the FMP, it is anticipated that reserve staff would potentially provide technical assistance, environmental monitoring and/or planning support, which would tie directly to the proposed reserve's ecosystem-based management research activities.

As the reserve staff work with site partners to implement the restoration activities and rehabilitation of traditional Hawaiian practices such as lo'i kalo, upstream of the fishpond, it is anticipated that water quality within He'eia stream will improve. This could result in minor, indirect, long-term beneficial impacts to aquaculture, as the fish stock would likely have a positive response to the water quality improvement.

6.3.3.3 FISHING

As described in Chapter 5, “Affected Environment,” effective management of fishing activities has played a central role in conservation of marine resources within Kāne’ohe Bay and the larger Hawaiian Islands. Overfishing has been a longtime concern in the bay, even in ancient times (Bahr et al. 2015). Hawaiian fishponds are an example of management strategy used to address this issue and increase fish production. Over the past 200 years, contemporary fisheries management approaches have gradually replaced the traditional Hawaiian management system (Bahr et al. 2015).

Today, there are commercial, recreational and subsistence fisheries found within Kāne’ohe Bay with yellowfin tuna and dolphinfish (Mahi Mahi) listed as the top two species harvested in the bay (Bahr et al. 2015). As recently as 2014, landings of fish and invertebrate species for Kāne’ohe Bay were 168,549 lbs. out of a total of 29,391,287 lbs. for the entire island of O’ahu. Data from 2010 to 2014 indicate that the fisheries landings fluctuate from year to year. Historical trends in landings and more recent catch per unit effort data suggest that the bay’s fisheries may be overfished (Bahr et al. 2015). Resulting impacts to the fishing resources from the range of alternatives analyzed are provided in Table 6.44.

Table 6.44. Impacts to fishing resources

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Fishing	Indirect long-term minor adverse impacts of ongoing sediment or nutrient inputs that reduce potential harvests. Minor indirect beneficial impacts of increased fish population that use restored coral reefs.	Indirect moderate beneficial impacts as improved fisheries data informs resource management	Same as preferred alternative and negligible adverse impacts from congestion at the small boat harbor.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Marine areas within Kāne’ohe Bay are expected to continue being protected and managed by the DLNR, Division of Aquatic Resources (DAR). Despite the extensive alterations to Kāne’ohe Bay between 1960 and 1993, the calm waters and diverse marine ecosystems of the bay support important commercial, subsistence, and recreational fishing activities, such as tuna and dolphinfish (Bahr et al. 2015).

Current fisheries landing data from 2010-2014 shows fluctuating annual catches (Division of Aquatic Resources 2014b). As a result, future changes to the fisheries cannot be predicted with confidence; however, indirect long-term minor adverse impacts (i.e., reduced catches) could possibly occur due to continued environmental impacts that affect local marine habitat conditions. This could potentially include ongoing sediment or nutrient inputs to the bay or more undefined impacts as a result of larger regional and global factors. Regardless, under the no action alternative, historical trends in landings and catch per unit effort indicate the bay’s fisheries as overfished (Bahr et al. 2015).

Within the marine area, DAR is implementing a coral reef restoration project and is proposing a coral reef mitigation bank. Since 2007, DAR has been restoring the patch reefs of Kāne’ohe Bay by mechanically removing invasive algae and releasing native sea urchins for long-term biocontrol of

the remaining algae. This restoration effort is expected to have an overall beneficial impact on the health of targeted marine patch reefs. It is expected that some long-term minor benefits to fishing would also be an outcome for increased populations of harvested species that use the patch reefs during their life cycle. The coral reef mitigation bank is anticipated to build upon DAR's existing restoration efforts (USACE 2014).

Preferred Alternative, Alternatives B and C

Designation of the preferred alternative is expected to result in beneficial indirect long-term impacts to the management of local fisheries by DAR as more information is learned about the local fishery resources from reserve activities and informed resource management decisions are made. The proposed He'eia Reserve's various research, monitoring, education, and outreach capabilities are expected to have beneficial indirect impacts to local fisheries through the support these activities would provide DAR in its fishery management. Specifically, future reserve research and monitoring activities are expected to provide more baseline data on the variability and spatial distribution of nekton communities (NOAA 2005). Also, reserve led education and outreach activities may increase public support for more active fisheries and habitat conservation efforts by local communities and reserve partners.

Once the reserve's monitoring efforts are fully operational, biophysical data captured by the reserve would be expected to be used to track changes to fisheries over time documenting the impacts of the various restoration and manipulation activities to key ecosystem services that are linked to commercial and recreational fishing. Ultimately, this information is expected to enable improved management decisions that could result in increasingly sustainable fish stocks having beneficial impacts to the different fishing interests within Kāne'ohe Bay. As a result, it is expected that the preferred alternative will result in long-term moderate indirect beneficial impacts on the socioeconomic fishing resources of the affected area.

Notwithstanding these potential benefits, it is also possible that reserve research and monitoring activities may result in changing fisheries management decisions that could lead to minor adverse impacts on commercial and recreational fishers as data is used by DAR to adaptively manage local fisheries. For example, if research conducted by the reserve indicates an otherwise unknown decline in a socioeconomically relevant fish species in Kāne'ohe Bay, DAR or other regulatory agencies could use that information in a management decision to limit allowable catches for that species. Given the potential for both beneficial and adverse impacts that could result from the information generated by the proposed He'eia Reserve, and the uncertainties associated with whether and to what extent these potential effects would occur, the adverse impact of this proposed action on the fishing industry is difficult to quantify, but is generally not expected to be significant.

Alternative A

As a primary access point to Kāne'ohe Bay, the He'eia Kea Small Boat Harbor is a major source of the marine activities that occur within the Bay. These activities include commercial, subsistence, and recreational fishing, as well as other recreational activities such as sailing, personal watercraft, paddle boarding, and snorkeling. As part of alternative A, the boat harbor would be expected to play a greater role in support of future research and educational activities within the marine area of the proposed reserve, such as, coral reef restoration. Reserve-related use of the boat harbor would be expected to

have negligible long-term adverse impacts to fishing. Future congestion in the harbor could be a minor issue, especially if marine-oriented research and education programs have significant boat use components. However, reserve staff and site partners would be expected to coordinate activities at the boat harbor in a manner which minimizes any adverse impacts to commercial and recreational users of the affected environment.

6.3.3.4 TOURISM AND RECREATION

As described in Chapter 5, “Affected Environment,” tourism and recreation activities have been a key sector of the Hawai‘i’s economy since statehood in 1959 and are a primary source of revenue and jobs. This sector is the main generator of employment in the state and accounts for 22.3% of all Hawai‘i jobs (Hawai‘i Tourism Authority 2006).

Kāne‘ohe Bay supports a variety of tourism and recreational activities that include snorkeling, swimming, kayaking, stand-up paddle boarding, outrigger canoe sailing, catamaran sailing, and guided kayak and snorkeling tours organized through several ecotour operators in the area. However, specific information on tourism and recreation activities for Kāne‘ohe Bay is limited. Expected resulting impacts to the area tourism and recreation from the range of alternatives analyzed are provided in Table 6.45.

Table 6.45. Impacts to tourism and recreation

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Tourism and Recreation	No direct or indirect impacts are identified	Minor to moderate beneficial impact from ecotourism operations connected to the reserve programs. Long-term, minor, indirect beneficial impacts from improved environmental conditions. Long-term, minor adverse impacts from increased visitor use and traffic.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under this alternative, area land and waters would continue to be protected and managed by the various site partners currently represented within the He‘eia estuary. The He‘eia Kea Small Boat Harbor is the primary access point for a majority of the tourist and recreation activities that occur within Kāne‘ohe Bay. With limited available information for the Kāne‘ohe Bay specifically, no direct or indirect impacts (beneficial or adverse) on tourism and recreation within the area are expected. Future changes to tourism and recreation would be expected to be the result of targeted island-wide or state-wide efforts to boost tourism related activities within Kāne‘ohe Bay and its surroundings.

Preferred Alternative, Alternatives A, B and C

Under the preferred alternative, the lands and waters of the He‘eia estuary would continue to be protected and managed by the various site partners for specific conservation or manipulation purposes. As a site within a larger national network of Estuarine Research Reserves, knowledge of the He‘eia estuary and Kāne‘ohe Bay are expected to increase at the national level. As a result, greater visibility of the reserve could potentially provide beneficial long-term impacts to tourism and recreation as new ecotourism opportunities become available (Up a Creek Kayak Tours, Inc. 2015). Over time, the beneficial impact to local tourism and recreation, especially ecotourism, could be minor to moderate.

Reserve programs will support partner-led restoration and manipulation activities within the preferred alternative boundary. By providing technical assistance and coordination to site partners, it is anticipated that reserve programs could have indirect, beneficial impacts to tourism and recreation over the long-term. As described in the final management plan, the restoration and manipulation activities are intended to improve the overall ecological value and functionality of habitats found within the preferred alternative. With this long-term goal, it is expected that as environmental conditions improve, this could have long-term, minor, indirect, beneficial impacts to recreation and tourism (e.g., increased interest in snorkeling and exploring coral reefs within the preferred alternative boundary).

Notwithstanding this potential long-term benefit, vehicle and boat traffic within the boundaries is expected to increase as tourism and recreational opportunities associated with the reserve become known. Additional traffic increases are anticipated primarily as a result of adults and school groups participating in reserve education and outreach programming. This increase in traffic could detract from the overall tourism experience in the area. However, Kamehameha Highway has the capacity to handle the anticipated added vehicle traffic as do the identified boat launch areas. Also, reserve staff and site partners would be expected to coordinate activities at the harbor in a manner which minimizes any adverse impacts to commercial and recreational users of the affected environment. As a result, traffic-related adverse impacts to the area’s tourism and recreational sector are expected to be minor over the long-term.

6.3.3.5 EDUCATION

As described in Chapter 5, “Affected Environment,” there are existing education and community programs offered by HIMB and community partners, which include formal classroom instruction for students, programs for school groups and community groups, and community engagement through “workdays” whereby participants learn the ecological and cultural foundations of the natural environment as well as the traditional agriculture and aquaculture practices of Hawai’i. Expected resulting impacts to education in the Kāne’ohe Bay area from the range of alternatives analyzed are provided in Table 6.46.

Table 6.46. Impacts to education

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Education	Major direct beneficial impacts to area educational resources from partner-led educational programs and field-based experiences.	Long-term, direct moderate beneficial impacts from the development of new educational programs.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under the no action alternative, there would be no changes to the local partners' existing or planned activities and areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners. Similarly, local partners' ongoing education and outreach efforts within the study area would persist.

HIMB's education efforts are expected to continue to target university students, individuals, families, and both K–12 school and community groups. For university students, the Edwin W. Pauley Summer Program in Marine Biology, a graduate-level research and training program, is expected to continue. As part of the program, HIMB faculty and researchers give seminars and instruct students in field and laboratory techniques that take advantage of the HIMB campus and the surrounding marine environment.

At the high school level, students are expected to continue participating in the hands-on scientific inquiry based curriculum developed by HIMB staff at the Marine Science Research Learning Center on Moku o Lo'e. HIMB also offers innovative summer training courses, research internships, and pre- and in-service teacher workshops.

Hands-on educational programs to individuals, families, upper elementary and middle school classes and community groups are anticipated to continue to be offered by the HIMB Community Education Program. These programs include a walking tour of Moku o Lo'e that includes a guided discovery of the island's natural and human history; a family Sunday tour of the HIMB campus; expedition to Moku o Lo'e where participants become part of a marine biology research team on the water and in the lab; and their marine science overnight where participants set up a marine biology field camp (HIMB 2016).

The site partners are also expected to continue their existing educational programs. Paepae o He'eia has the most extensive educational programming where participants learn about mālama loko i'a, place-based knowledge and ecological-based studies that foster values and concepts of traditional fishpond management.

Paepae o He'eia is expected to continue its partnership with Hawaiian-based charter schools through a program that allows students visiting the He'eia Fishpond to utilize it as an outdoor classroom where they can examine the ecological life and surrounding environs of He'eia Fishpond. Other partners including Kāko'o 'Ōiwi and Kama'āina Kids have a variety of educational programming for students and the local community.

These current education and outreach efforts have major beneficial impacts to education in the area by providing world class hands-on field experiences connected to science-based inquire and place-based cultural knowledge. The ongoing educational programs provided by the site partners are expected to continue to have major beneficial impacts to the educational resources of the area.

Preferred Alternative, Alternatives A, B and C

As described in the FMP, with implementation of the preferred alternative, the proposed He'eia NERR would strive to achieve a number of goals and objectives in the first five years of operation. The FMP identifies three main goals for the site, one of which relates to education, and is stated as follows:

Develop a place-based education and training program for the He'eia NERR that inspires and educates the community about estuaries, coastal ecosystems, and traditional Hawaiian practices.

To achieve this goal, the plan identifies two main objectives: increase student, educator, and community understanding of estuaries; and provide a framework to integrate and enhance coordination and effectiveness of place-based education and training programs. With the existence of several independently organized educational programs in the area, the reserve would be expected to help the partners collaborate on and integrate their educational programs. In the long-term, it is expected that the reserve would build upon the existing resources, expertise, and facilities to create comprehensive educational programs that span the learning continuum and allows students to explore resource management and science research (Hawai'i Office of Planning 2016). Additionally, the reserve is expected to develop and implement the NERRS national educational programs such as K–12 Estuary Education Program (KEEP), Teachers on the Estuary (TOTE) program. These additional educational efforts are expected to have moderate beneficial long-term direct impacts to educational resources through the development of new programs, reductions in program duplication across partners and improved efficiencies through collaboration and coordination.

6.3.3.6 RESEARCH AND MONITORING

As described in Chapter 5, “Affected Environment,” the University of Hawai'i's HIMB is the leading entity coordinating and conducting research and monitoring activities in Kāne'ohe Bay. Resulting impacts to the research and monitoring activities in the area from the range of alternatives analyzed are provided in Table 6.47.

Table 6.47. Impacts to research and monitoring

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Research and Monitoring	Sustained research interest in the effected environment and associated habitats.	Major, direct, beneficial impacts over the long-term resulting from increased coordination of research efforts, production and analysis of baseline trends, and synthesis of research to inform resource natural resource management decisions.	Same as preferred alternative. In addition potential long-term, direct, beneficial, negligible impacts resulting from increased access to marine habitats (via the harbor), and long-term negligible adverse impacts resulting from increased visitor use.	Same as preferred alternative, only over a smaller area.	Same as preferred alternative, only over a smaller area.

No Action Alternative

Under the no action alternative, there would be no changes to the local partners' existing or planned activities and areas proposed for inclusion in a reserve would continue to be protected and managed by the various site partners. Similarly, local partners' ongoing research and monitoring efforts within the study area would persist. Largely because of the University of Hawai'i's presence in Kāne'ohe Bay, the affected environment has been, and will continue to be, an area that attracts a lot of research attention.

Hawai'i Institute of Marine Biology's research covers a broad range of topics, such as coral bleaching and disease, symbiosis, ocean acidification, marine microbial ecology, fisheries and top predator research, aquaculture and fish physiology, and biogeochemistry and biophysical analysis of reef systems. In addition to the HIMB's core research in the marine areas of the affected environment, the DLNR's DAR has conducted various research and monitoring efforts relating to coral reef restoration. Other researchers at the University of Hawai'i at Mānoa have established and ongoing projects within the estuarine and terrestrial habitats of the affected environment. Refer to the FMP Section 4.1 "Research and Monitoring Programs" for additional information.

Preferred Alternative

Based off the experience and capacity of the 28 other sites included within the National Estuarine Research Reserve System, the designation of a research reserve would likely result in long-term, direct, major beneficial impacts to research and monitoring in the affected environment. As part of the national system of estuarine research sites, each reserve contributes to a nationwide effort of collecting long-term water quality, biotic, physical, and land use and habitat change information that represents an unprecedented effort to compare data across a network of sites.

Under the preferred alternative, and as described in the FMP, the designation of a proposed He'eia NERR could also result in the additional beneficial impacts of:

- Establishing baseline data for environmental conditions;
- Creating a research program that examines how different ecosystem-based management strategies contribute to a healthy and sustainable estuarine ecosystem in the face of ongoing anthropogenic impacts, and human use demands;
- Integrating traditional cultural knowledge and practices with contemporary science and research to sustainably manage resources in the vicinity of the reserve site;
- Increasing knowledge of natural and anthropogenic processes, restoration efforts and their impacts to the estuary, and key ecosystem services; and
- Informing resource management decisions enabling local communities to effectively address key coastal issues like climate change, habitat restoration, and water quality.

As described in the FMP, with implementation of the preferred alternative, the reserve would strive to achieve a number of goals and objectives in the first five years of operation. The FMP identifies three main goals for the site, one of which relates to research and monitoring, and is stated as follows:

Research and Monitoring: Increase our understanding of the effects of human activities and natural events to improve informed decision-making affecting the He'eia estuary, coastal ecosystems, and ultimately the entire ahupua'a of He'eia.

To achieve this goal, the plan identifies three main objectives: collect baseline information, coordinate independent research and monitoring efforts, and synthesize the information gathered through the efforts to inform local management decisions.

Reserve-specific research and monitoring efforts would focus at least initially on developing baseline habitat and ecosystem service data related to terrestrial, estuarine, riparian, and marine habitats, as well as baseline cultural and archaeological information. The proposed He'eia NERR's long-term research focus will investigate two different ecosystem-based management strategies: (1) an approach based on contemporary ecological restoration techniques and (2) an approach that embraces traditional Native Hawaiian management practices. These two management strategies will be evaluated through measuring a suite of ecosystem services provided by each approach. The baseline studies will help inform future planning efforts related to the design and implementation of the long-term research focus of the research reserve.

In regards to monitoring, one of the first objectives for reserve staff would be to work with site partners to implement necessary infrastructure that would support the proposed He'eia NERR's SWMP. The SWMP tracks short-term variability and long-term changes to provide basic information characterizing how human activities and natural events can change coastal ecosystems.

Within the marine environment, it is anticipated that reserve staff would partner with the DAR, and support existing restoration-related programs in the marine habitats (e.g., algae removal and the coral mitigation bank). The reserve staff, in partnership with the DAR, would support the development and implementation of a coral reef monitoring strategy to measure the effectiveness of the restoration efforts. The designation of a reserve is expected to enhance the state-directed marine habitat restoration activities by improving coordination related to monitoring and providing additional research support resulting in minor, indirect, beneficial impacts over the long-term. This heightened coordination is expected to enhance the ability of site partners to evaluate the success of the restoration activities on the fringing and patch coral reefs on targeted ecosystem services.

Under the preferred alternative, the proposed He'eia NERR's research and monitoring programs would help facilitate increased knowledge and understanding of habitats, based on expanded and more granular data generated which will characterize baseline conditions, short and long-term ecological trends, and ecosystem services data. Most of this information would not be produced in the absence of a reserve designation. Improved localized data can be used by decision-makers and applied to inform resource management decisions within the affected environment. For example, data collected from the SWMP's instruments provide researchers and managers with valuable information on water quality and weather at frequent time intervals. Local coastal managers can use this real time, site-specific monitoring data to make informed coastal management decisions on issues of local or regional relevance.

In addition, reserve staff could play a key role in coordinating external research and monitoring efforts occurring throughout the site. Thus, reserve designation could improve coordination of these efforts. In the future, it is anticipated that, given sufficient appropriations, research reserve funds could be leveraged to construct additional facilities (e.g., research laboratories) and infrastructure (e.g., research and monitoring equipment), which could support and improve the capabilities of the research and monitoring efforts within the affected environment.

Alternative A

The environmental consequences to research and monitoring resources of alternative A are similar, for the most part, to those of the preferred alternative. However, alternative A represents a larger land area (approximately 200 acres of terrestrial habitat compared to the preferred alternative) and therefore these same impacts would inevitably occur over a larger area within the terrestrial habitats. In regards to the installation of research and monitoring equipment, it is anticipated that the additional terrestrial habitats would be targeted for reserve-related activities.

There would be no additional adverse or beneficial impacts expected with the implementation of alternative A other than what was already discussed under the preferred alternative.

Alternative B

Under the implementation of alternative B, reserve-related research and monitoring efforts would be limited to the estuarine and marine habitats of the preferred alternative (the terrestrial habitats are excluded from the boundary of this alternative). However impacts would be identical to what was identified under the preferred alternative, but would occur within a smaller footprint. The duration, magnitude, and extent of the beneficial impacts identified under the preferred alternative would not change under the implementation of alternative B.

Alternative C

When compared to all the other alternatives, alternative C encompasses the least amount of acreage. Alternative C excludes the terrestrial habitats (approximately 196 acres) and a significant portion of the marine habitats (approximately 300 acres) of marine habitats. Reserve-related research and monitoring efforts would be limited to estuarine, riparian, freshwater wetlands, and marine habitats. The impacts of implementing this alternative would be identical to the preferred alternative, but confined within the specific habitats mentioned above. The duration, magnitude, and extent of the beneficial and adverse impacts identified under the preferred alternative would not change under the implementation of alternative C.

6.3.3.7 MILITARY

As described in Chapter 5, “Affected Environment,” the 2,951 acre MCBH-Kāne’ohe Bay is located on Mōkapu Peninsula. MCBH-Kāne’ohe Bay is also one of the largest employers on the windward side of O’ahu with roughly 14,000 active duty personnel and civilian employees. Resulting impacts to the military activities in the area from the range of alternatives analyzed are provided in Table 6.48.

Table 6.48. Impacts to military

	NO ACTION	PREFERRED ALTERNATIVE	ALTERNATIVE A	ALTERNATIVE B	ALTERNATIVE C
Military	Military conducts operations in the vicinity of Mōkapu Peninsula. Potential adverse impacts from aviation operations (noise pollution).	Long-term negligible beneficial impacts resulting from increased outreach and education events for base residents.	Same as preferred alternative.	Same as preferred alternative.	Same as preferred alternative.

No Action Alternative

Under the no action alternative, MCBH-Kāneʻohe Bay will continue managing and conducting operations in and around on Mōkapu Peninsula.

Preferred Alternative, Alternative A, B, and C

Designation of the proposed Heʻeia Reserve is anticipated to have no adverse impacts to the MCBH-Kāneʻohe Bay’s programs and operations, but may have long-term negligible beneficial impacts for its residents. For example, the residents of the base could participate in future Reserve-based outreach and education events which may offer minor beneficial impacts including increased education and awareness, or improve the perceived quality of life of military personnel and their families. The MCBH-Kāneʻohe Bay is located outside the proposed alternative boundaries. As a result, designation is expected to have no impacts to the MCBH-Kāneʻohe Bay or on any of its programs.

³⁰ If a Heʻeia Reserve were designated, the Reserve would be eligible for federal funding in the future (subject to appropriations) for NERRS construction and land acquisition. The only parcels identified to date in the FMP as under consideration for future inclusion in the Reserve (see FMP Tables 9-1 and 9-2) are already publicly held by government agencies at the county and state level; none of the parcels are privately owned. However, the potential for future changes in land ownership cannot be ruled out.

6.4 CUMULATIVE EFFECTS

6.4.1 INTRODUCTION TO CUMULATIVE EFFECTS ANALYSIS

For the purpose of this analysis, a cumulative impact is an “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over time.” (40 C.F.R. § 1508.7)

Although reserve designation and approval of the proposed Heʻeia NERR’s FMP would be largely administrative actions, they would be followed by operation of a reserve, with associated education, research, stewardship, and monitoring opportunities and activities. These and other potential future management activities, including restoration projects, within the boundaries of the proposed Heʻeia NERR would likewise be expected to have a variety of either beneficial or adverse impacts of varying magnitude and duration, as discussed previously. In addition, proposed Heʻeia NERR would also be incorporated into the national system, which could bring additional research, restoration, education, and stewardship opportunities. Selection of any of the action alternatives (i.e., the Preferred Alternative or Alternatives A, B, or C) would not trigger any changes in land ownership.³⁰ Current uses of public and private lands and waters within the proposed reserve’s boundaries would continue to be managed under existing regulatory and administrative authorities.

If a reserve were designated, existing office space has been identified for it to use in its first few years of operation. A formal facilities needs assessment would be conducted, resulting in a prioritize list of needs, and then plans would likely begin to be outlined for the development of facilities to support proposed reserve activities outlined in the FMP. The facilities needs assessment would be expected to identify the types of facilities needed (e.g., office space, laboratories, and classrooms, a visitors’ center, resource library, and equipment storage), financial resources, and how existing site partners might be able to fill some of the needs by renovating existing facilities or building new ones. Future facilities, any future land acquisition proposals, and other future federal actions would be reviewed by OCM pursuant to applicable mandates (e.g., environmental and historic preservation laws, applicable executive orders, and other regulations, including NERRS regulations) and potential

Presidential budget requests, as well as within the context and scope of the analysis contained in this EIS. In general, future facilities would be expected to be developed in a manner designed to minimize adverse impacts to sensitive environments and species.

As discussed in chapters 6.2 and 6.3, designation and implementation of a proposed He'eia NERR, under all the alternatives analyzed, would not be expected to result in significant adverse impacts to either the natural or human environment. As shown in Table 6.2, many of the adverse effects would be expected to be short-term (e.g., during periods of active construction) and negligible to minor in intensity, whereas most beneficial effects would be expected to have minor to moderate impacts over the short-term and the long-term. This cumulative effects analysis notes that, even under the no action alternative, ongoing manipulation and restoration activities by local partners would be expected to have long-term beneficial impacts, which could be accompanied by (primarily minor) adverse effects. Existing and planned activities in the affected environment that are not directly connected to this action have been included in this cumulative effects analysis to the extent they are relevant.

The descriptors of intensity used earlier in this subchapter (ranging from negligible to major) are not used throughout this discussion of cumulative impacts. They were retained in some places, but did not apply in other contexts. Where omitted, information in narrative form is presented to ensure that the full range of consequences for the proposed action are considered.

According to Council on Environmental Quality guidance on "Considering Cumulative Effects under the National Environmental Policy Act," as part of determining whether cumulative effects are significant, it is appropriate to consider whether the affected environment can withstand the stress of cumulative impacts without crossing ecological thresholds. That guidance notes:

The significance of cumulative effects depend[s] on how they compare with the environmental baseline and relevant resource thresholds (such as regulatory standards)...The [action agency] must determine the realistic potential for the resource to sustain itself in the future and whether the proposed action will affect this potential...By definition, cumulative effects analysis involves comparing the combined effect[s] with the capacity of the resource, ecosystem, and human community to withstand stress. (Council on Environmental Quality 1997)

The spatial extent of the cumulative effects analysis is environment-specific and is broader for effects in some environments than it is for others. For instance, because sound may cover long distances, the spatial extent of the cumulative effects analysis for the acoustic environment is broader than for those environments where impacts are more localized. To assess potential cumulative impacts related to noise, air quality, and marine waters, OCM used a broader spatial extent (e.g., including impacts from MCBH-Kāne'ohe Bay) to evaluate relevant impacts to the affected environments. For other types of impacts (including in terrestrial areas, estuarine environments, and riparian and freshwater areas), the spatial extent is more limited; it focuses on known activities occurring or likely to occur in Moku o Lo'e and areas within the watershed of He'eia Stream.

Similarly, the temporal bounds of this analysis were selected intentionally. First, a few important "historical activities" are summarized (see Table 6.5). After that discussion, most assessments of past impacts in this subchapter

focus primarily on the 21st century. This time period was chosen because looking back over data reflecting conditions over the past approximately 5–15 years provides a baseline to which future scenarios can be compared. Similarly, this cumulative effects analysis is limited in the number of years it can look ahead. Research reserves have regular opportunities to revise their management plans to adapt to changing conditions and needs. As reserves operate, considerable new information can come to light about local conditions, constraints, and needs. Because of the potential for circumstances on the ground to evolve, federal regulations call for reserves to update their management plans every five years. Because of the many factors that are not well understood before reserve designation, this cumulative effects analysis looks ahead to the first approximately 5–15 years after reserve designation, in order to meet the mandate under NEPA to focus on future scenarios that are reasonably foreseeable.

6.4.2 MAJOR HISTORIC ACTIVITIES AFFECTING THE CURRENT ENVIRONMENT

Table 6.49 highlights some of the long-term impacts of the activities that have degraded the health and productivity of the environment of the He‘eia estuary and Kāne‘ohe Bay. Development, military buildup, and economic activities have also impacted the marine areas (e.g., dredging parts of Kāne‘ohe Bay and filling other parts of it to support expansion of MCBH). The region is now highly urbanized, which also affects ecosystems and communities.

Table 6.49. Examples of Major Historical Activities and Trends in the Region

HISTORICAL ACTIVITY	EXAMPLES OF IMPACTS
Construction of MCBH	<ul style="list-style-type: none"> • Dredging of 15 million cubic yards of reef to use as fill across approximately 280 acres of land
Urbanization	<ul style="list-style-type: none"> • 58% of shoreline modified, including sea wall construction, harbor creation, dredging or fill • 19 of the original 28 fishponds built by early Hawaiians were partially or completely destroyed • Increased eutrophication from sewage effluent discharge into the bay
Agricultural land conversion	<ul style="list-style-type: none"> • Construction of large irrigation channels • Agricultural fields converted to pasture or became uncultivated land • Sedimentation of estuarine and marine habitats
Introduction of non-native fish and algae	<ul style="list-style-type: none"> • Increased pressure on native reef fish and other species • Damage to coral reefs and associated biota

In addition, changes in agricultural use have left their mark on the landscape. Historically, one of the most prominent natural features in the He‘eia estuary was a large marshland called Hoi, where taro was traditionally grown. As described previously (under “Affected Environment”), throughout the 1800s and 1900s, agricultural activity in the estuary went through cycles of taro, sugarcane, pineapple, rice, and, later, cattle. In modern times, the intense agricultural manipulations within the wetland and its associated land use practices led to major adverse impacts on water quality, hydrology, and habitats. Specific to water quality and hydrology, these historic practices resulted in severe soil erosion in the uplands, followed by subsequent increased sedimentation, nutrient loading to receiving waters, and increased flooding in the estuarine areas during rain events.

Finally, a variety of invasive species, introduced either purposely (e.g., red mangrove, red algae, and peacock grouper) or accidentally (e.g., California grass), resulted in dramatic shifts in habitats over time. As noted above, species such as California grass and red mangrove are choking water flows in the He'eia Stream channel and reducing estuarine wetland habitat for native species. In addition, invasive algae are smothering coral reef ecosystems in Kāne'ohe Bay.

6.4.3 INTRODUCTION TO CURRENT OUTLOOK

The activities, plans, and partners identified in Figure 6.3 highlight major ongoing or planned activities that have the potential to contribute to a range of cumulative impacts that may have potential short- and long-term effects on the affected environment

However, that is not to say that other ongoing, planned, and proposed projects do not contribute to potential cumulative effects. Accordingly, individual ongoing, planned, and proposed projects are summarized below. The following subchapters retain the general organization of earlier parts of this chapter by addressing, first, cumulative impacts to the natural environment, then cumulative impacts to the socioeconomic environment. This subchapter concludes with a summary.

Figure 6.3. Major External and Partner Activities Contributing To Cumulative Impacts



6.4.4 AIR QUALITY

As noted earlier, there are no areas within the State of Hawai'i, including Kāne'ohe Bay, that are designated as non-attainment for any of the federal National Ambient Air Quality Standards (NAAQS). With respect to specific air quality impacts in and around the study area, a Final EIS published in 2012 for MCBH, describes the largest anthropogenic sources of air emissions in the state are power generating facilities on the leeward side of the island (Department of the Navy 2012). Air emissions at the base in Kāne'ohe Bay come primarily from combustion of fuel by aircraft, vehicular engines, boilers, and generators. In addition, short-term air quality impacts can result from demolition, earth-moving, and construction-related equipment, from fuel combustion and emissions of fugitive dust. Potential pollutants, including particulate matter, estimated to be associated with the proposal under review at that time — basing MV-22 and H-1 aircraft at the MCBH — are summarized in that Final EIS in its Chapter 3.4. The Navy's analysis indicated that construction-related emissions would not be significant because they would be short-term and existing requirements and other practices (e.g., fugitive dust control measures and BMPs) would minimize impacts. A summary of the air quality impacts to operational changes in stationary sources (related to power generation, which are regulated under the Clean Air Act) and mobile sources (which the Navy commented would readily disperse) is also presented in the Final EIS. In short, operational changes were determined not to have significant impacts.

Some of the environmental documents prepared in connection with other projects in the study area focus on possible dust generation as an air quality impact. Most project descriptions identify dust abatement practices planned (including some of the projects planned at Moku o Lo'e), which are common to many types of projects involving construction and demolition, in part because of applicable state requirements (see Hawai'i Administrative Rules, Title 11, Chapter 60–11.1, "Air Pollution Control"). Also, emissions from fuel combustion can potentially be reduced by minimizing idling of heavy equipment.

If designated, the primary effect a new reserve would have to air quality in the region would probably be related to vehicles driven by visitors and staff. Emissions from mobile sources, including boats, are controlled using best available technology suited to a particular engine and time period it was manufactured. These emissions would disperse into the larger environment rapidly. In addition, possible manipulation and construction projects at the proposed He'eia NERR could result in fugitive dust emissions, which would also be limited through appropriate BMPs. State requirements would be expected to ensure that cumulative impacts from individual projects in the study area, including any future reserve-related projects, would not be cumulatively significant. The use of voluntary BMPs could further reduce air quality impacts.

6.4.5 HYDROLOGY AND WATER QUALITY

As discussed, considerable changes to the hydrology of the He'eia estuary and Kāne'ohe Bay have occurred over time. In addition, many contributors to source and nonpoint source pollution degraded water quality, with major adverse impacts, sometimes compounded by invasive species. Since the advent of the Clean Water Act and modern point- and nonpoint source pollution control programs, however, water quality has been improving. In the 21st century, a number of projects already described could offer substantial benefits in terms of restoring natural hydrologic functions. For example, removing invasive

species choking He'eia Stream would greatly improve stream flow. Restoring wetland hydrology also would contribute to improved water quality. If the proposed He'eia NERR were designated, it could potentially provide technical, planning, or monitoring assistance for such projects.

At a regional level, the He'eia estuary falls within the Ko'olaupoko District. In 2012, the Ko'olau Poko Watershed Management Plan was published, in consultation with stakeholders. The plan was prepared in accordance with the State Water Code and Hawai'i Water Plan, and it is a component of the O'ahu Water Management Plan. The plan identifies a number of projects underway that address water supply and water quality needs, including projects ranging from He'eia Stream Restoration, to He'eia wetland restoration (on the HCDA parcel), to Stewardship of He'eia Fishpond, and to implementation of the MCBH Integrated Natural Resources Management Plan. It also identified a number of recommended management strategies promoting taro agriculture, mitigating impacts from feral pigs and mammals, reducing illegal dumping, and preserving forested areas above groundwater sources (Townscape 2012).

All the projects undertaken to restore wetlands, streamflow, and impairments to waterbodies by federal, state, local, non-governmental, and military officials have contributed to improved water quality and restored hydrologic functions. Nonetheless, natural hydrology has not been restored along numerous stream segments and in some wetlands. He'eia Kea Small Boat Harbor, Kāne'ohe Bay, He'eia Stream, inland waters of Moku o Lo'e, and other water bodies in the Ko'olau Poko District are still listed as impaired (at least seasonally) by the State of Hawai'i because they have not fully attained applicable water quality standards (Hawai'i State Department of Health 2014). Projects proposed by reserve partners will only seek to address some of many complex water resource management needs in the He'eia estuary, many of which may persist for more than another 15 years. Nonetheless, because of the predominantly beneficial impacts associated with these activities, cumulative impacts to hydrology and water quality are not expected to be cumulatively significant.

6.4.6 TERRESTRIAL ENVIRONMENT

Native Forest Restoration on HCDA Parcel

Kāko'o 'Ōiwi proposes to partner with other entities, including the reserve (if designated), to restore at least 150 acres of the upland areas of the HCDA parcel. As planned, restoration of the upland areas is expected to include the removal of selected invasive, non-native plant species and replanting of native forest species. This effort is expected to restore the habitat to a state characterized primarily by native tree species, which could contribute to supporting a more resilient habitat for native and endemic fauna and flora in the long term. As noted previously, there could be some short-term adverse impacts to soil, plants, and animals during the construction phase of the project. If designated, the reserve's staff could coordinate with Kāko'o 'Ōiwi on designing and implementing a monitoring strategy to assess the effects of the short- and long-term restoration, including on specific ecosystem services.

He'eia State Park

He'eia State Park was acquired by the state in 1976. The park represents the only relatively large shoreline parcel that is publicly owned, other than Kualoa Park at the northern end of the bay. Friends of He'eia, a non-profit educational organization, was granted a lease in 1980, which lasted through 2010, to manage the park. In 2010, Kama'aina Kids, another non-profit educational

organization, was granted a 25-year lease to manage He'eia State Park (He'eia State Park 2016). Kama'aina Kids and its partners operate waterfront programs for school-aged children and other visitors. Members of the public can take advantage of non-motorized boating experiences organized by Holokai Kayak and Snorkel Adventures (which passes along the proceeds from its operation to Kama'aina Kids). Each year, approximately 12,000 visitors, on average, come to He'eia State Park, according to Kama'aina Kids. Existing facilities at the state park are shown in Figure 8.3 of the FMP and summarized in Table 8.1 of the FMP. These facilities include a visitors' center where classes are sometimes held, exhibit hall, canoe hale, outdoor pavilion, two boat launch sites, maintenance buildings, parking for 80 vehicles, a trail, and shoreline access.

The most recent planning study associated with He'eia State Park appears to have been published in 1993, during the time the property was leased by Friends of He'eia. Thus, it does not reflect Kama'aina Kids' ideas for the property. However, the website for Kama'aina Kids communicates some information about its hopes to expand facilities. Most notably, it is in the process of fundraising to erect new facilities at the site of a former pavilion that was demolished by high winds, near the entrance to the park. The proposed He'eia Learning Center, as it would be called, could serve multiple purposes, including: a community center that local organizations could use for meetings; a training facility dedicated to the promotion of environmental education and exploration of coastal and marine environments; and "community office space," which organizations in the community could use to support goals related to promoting educational and cultural values. See <http://www.kamaainakids.com/purpose>. If erected, the He'eia Learning Center could theoretically potentially address, at least on an interim basis, some of the gaps in facilities for the reserve on the mainland noted in the FMP (see Section 8.2, which identifies a need for office space, a large teaching space, and meeting space). However, if Kama'aina Kids has other plans for the learning center, that might not be the case. New facilities on state park lands would require a license amendment or special use permit issued by the Division of State Parks and/ or DLNR. In addition, the habitats within the park have been affected by more than 35 years of visitor use as a state park; it is likely that any additional impacts associated with pedestrian traffic in the park would result in negligible additional impacts on its terrestrial flora and fauna. Potential impacts would be evaluated in greater detail prior to facility construction.

Facilities Projects at HIMB (on Moku o Lo'e)

Recent upgrades to HIMB infrastructure are largely driven by its vision to become an international leader of tropical marine ecosystem-related research and education, and the desire to make its facilities a model for sustainability (HIMB 2010 and University of Hawai'i 2015). The HIMB Strategic Plan (2010–2015) identifies several key upgrades to its facilities to accommodate expanding programs (e.g., education and research). For a map of the existing facilities on the island, see Figure 8-2 of the FMP.

In 2010, HIMB opened the Marine Science Research Learning Center to support its marine education program. The center is designed to serve as both a laboratory and a classroom, and it is equipped with computers, microscopes, and other research instruments. Also, the 10-year old Pauley Laboratory Building is under renovation. The renovations include constructing state of the art research and teaching laboratories, as well as general structural upgrades. HIMB is also installing a 250kW photovoltaic array on the new laboratories

to produce solar-generated electricity. It is estimated that this system of solar panels will provide 25% of HIMB's energy needs (University of Hawai'i 2012).

The University of Hawai'i is also implementing infrastructure rehabilitation and replacement projects. A "Final Environmental Assessment for the Hawai'i Institute of Marine Biology Coconut Island Infrastructure Rehabilitation and Replacement Project" contains more information about this work and is incorporated by reference (Community Planning and Engineering, Inc. 2014). The project elements are also summarized below. Although no threatened or endangered species, candidate species, or critical habitats were found in the project area, mitigation measures (such as the use of a silt-fence during trench construction and closure) and BMPs recommended by USFWS are being followed to ensure that species that have been historically observed in the area are not significantly impacted.

The portion of Infrastructure Rehabilitation and Replacement Project that impacts terrestrial environments the most is the rerouting of sewer connections on the island. A temporary, 350-foot long trench was needed on the island as part of rerouting sewer connections, so that the sewer line tie-in (to the main sewer line) could be rerouted. This could result in minor, short-term adverse effects on flora or fauna present during construction, but would have long-term beneficial impacts to the terrestrial and marine environment by ensuring that the failing utilities and infrastructure will not adversely impact habitats and species in the future. The work on Coconut Island itself would have a *de minimus* impact on the terrestrial environment, which has already been greatly modified by development on the island. Also, while the pier was out of service, boats were pulling onto land using the HIMB front loading gate to unload passengers, but HIMB identified that as presenting logistical and safety concerns, obviated once the replacement pier opened (Community Planning and Engineering, Inc. 2014).

All construction projects on Coconut Island will require a CDUP and will be reviewed by the DLNR. Overall, the facility improvements that require work outdoors could have short-term adverse effects on the surrounding environment (including flora and fauna) during construction, but would likely have negligible impacts given the fact that the university is subject to state oversight and is consulting federal agencies, when appropriate. In addition, the improvements described above will likely have long-term beneficial impacts to the human environment by providing better-equipped, spacious facilities to students and researchers and ultimately help HIMB achieve its research and education goals. From its evaluation of the reasonably foreseeable projects on Coconut Island identified by HIMB, combined with other factors affecting the terrestrial environment on the island, OCM's assessment indicates that the cumulative impacts of facilities would not be significant. If any new facilities were needed on Coconut Island, they could potentially be built in already-disturbed areas. The 40-foot shoreline setback line (inland from the certified shoreline) established by the City and County of Honolulu would also apply, unless a variance were obtained. In short, projects are subject to scrutiny by multiple entities, HIMB has shown itself to be open to implementing BMPs and mitigation measures, and OCM has not identified any evidence that ecosystems on the island are approaching any tipping points.

Future Facilities and Infrastructure to Support Reserve Programming (locations unknown)

If a research reserve were designated in He'eia, the FMP indicates that the administrative offices for the proposed He'eia NERR would initially be located on Coconut Island. These offices will provide a base of operations and logistics support to get He'eia NERR programs started. The facilities' needs assessment, which would occur within the first approximately 5 years after the reserve begins operating, would yield a prioritized list of facilities needs for the long term, some of which might be pursued as funds permit. As noted previously, if a He'eia Reserve is designated, new infrastructure will likely be needed to support the various programmatic activities, according to the FMP. Chapter 8 of the FMP describes the overall process for identifying future facility needs. Facilities would primarily be located in the "buffer areas" (not the reserve's core area) and would be implemented in ways intended to avoid significant adverse impacts to the reserve's resources and habitats. As noted, one possible site for future expansion might be He'eia State Park. On the HCDA parcel and the Kamehameha Schools parcel, there are already small outdoor pavilions; but parking areas are quite small, too small to sustain much additional visitation. As needs are assessed and projects identified and planned, OCM and reserve staff will work to conduct any required environmental reviews and obtain required clearances to implement such projects. Also, the site partners, given their missions, would be expected to implement activities that seek to minimize disturbances to sensitive habitats and species. In short, future reserve infrastructure development would be implemented to mitigate or reduce potentially adverse impacts and would promote efforts to maximize long-term benefits new facilities could offer with respect to supporting reserve programming and partner efforts. Reserve programmatic activities would be expected to draw additional visitors regardless of whether new facilities are developed.

Potential additional boat traffic is discussed below under marine environment, and potential additional pedestrian, automobile, and bus traffic is discussed below under socioeconomic effects. Most land available for development has already been developed. Given available information, the cumulative impacts to terrestrial environments from current land uses by property-owners in terrestrial areas within the He'eia region and from potential future land use related to reserve designation are not expected to be significant. This is attributable in part to the many layers of government oversight (the City and County of Honolulu, state agencies, and federal agencies, as applicable) and permitting (e.g., special management area permitting) related to different types of potential land uses. Requirements for low-impact development, BMPs, and other mitigation measures would help keep cumulative impacts from reaching the level of significance. (This threshold could be exceeded, theoretically, if landscapes or resources were not expected to be able to sustain themselves into the future or if it appeared resources might be pushed to the brink of undesirable tipping points).

All future He'eia NERR construction or acquisition projects will be reviewed by OCM. The results of the facilities needs assessment will provide a sense of the array of future facilities needed, providing all reserve partners with a better idea of their potential cumulative effects. Future updates to the proposed He'eia NERR FMP, which will be subject to OCM review and approval, will also discuss future facilities' needs, allowing many opportunities for review and discussion before new reserve-related construction projects are undertaken.

Once additional future facilities are proposed, OCM will conduct necessary NEPA and environmental compliance evaluations, including assessing how the proposed new facilities may affect the cumulative impacts analysis of this EIS. In addition, OCM expects that all consultations, authorizations, and permits required for individual construction projects will be obtained. OCM's review role will also ensure that potential construction project impacts are scrutinized from many perspectives.

6.4.7 ESTUARINE ENVIRONMENT

He'eia Fishpond Reconstruction and Aquaculture

As noted previously, Paepae o He'eia, has a long-term lease from Kamehameha Schools to restore the He'eia Fishpond and to support the practice of traditional Hawaiian aquaculture. According to Paepae o He'eia, the historic fishpond is one of the largest in the islands and its pond wall (kuapā) is possibly the longest, approximately 1.3 miles (7,000 feet) (Paepae o He'eia 2016). As part of its ongoing efforts, Paepae o He'eia has been focused on removing red mangrove threatening the fishpond wall's structural integrity, rehabilitating the fishpond wall, removing invasive algae from the fishpond, and supporting on-site aquaculture operations to produce finfish and mollusks.

The fishpond related manipulation activities do have the potential for minor and short-term adverse water quality impacts, from introducing sediment and nutrients to the adjacent marine waters. BMPs that are designed to avoid or minimize these impacts have been identified and are summarized in the USACE Clean Water Act Section 404 permit application (USACE 2012b). At the time of permitting, NMFS provided a determination that fishpond restoration would not adversely affect EFH. Furthermore, NMFS determined that the activities may affect, but are not likely to adversely affect, federally listed species, species proposed for listing, or their critical habitats.

Additionally, the USACE consulted the Hawai'i State Historic Preservation Division pursuant to Section 106 of the National Historic Preservation Act. The Corps determined that the restoration project would have no adverse impacts to the historical, structural, or cultural integrity of the fishpond (which is listed on the National Register of Historic Places).

Reserve designation could result in additional technical assistance, coordination, research, monitoring, education, and other activities at the fishpond, which could have long-term, indirect, minor beneficial effects. The FMP indicates the proposed He'eia NERR will collect baseline habitat and ecosystem service data. The only potential adverse environmental consequences from installing most types of monitoring equipment are expected to be negligible, as explained above. It is not yet known whether reserve researchers would monitor the fishpond or nearby areas.

Looked at together, the impacts to the fishpond from the activities proposed to date by Paepae o He'eia and potential reserve-related activities would not be expected to be cumulatively significant, largely because of the limited nature of the activities and plans to follow BMPs to reduce sediment or nutrient transport to a level that would be de minimus and to reduce the potential for impacts to protected species and habitat. Potential impacts of other activities to marine waters of the bay are discussed below, consistent with the convention throughout this Final EIS.

6.4.8 RIPARIAN AND FRESHWATER ENVIRONMENTS

The 38-year lease (starting in 2010) that Kāko'o 'Ōiwi has with HCDA allows the organization to alter 400 acres to “[e]stablish a land management program to feed the community and sustain its culture and economy, improve the health of coastal resources, and develop sustainable infrastructure” (Townscape 2011). Requirements specific to the He'eia Community Development District mandate that the site be used for cultural practices, culturally appropriate agriculture, education, and restoration and management of natural resources associated with the He'eia wetlands. Portions of the property are in the county's special management area.

Kāko'o 'Ōiwi has begun planning and implementing efforts to convert the He'eia uplands and wetlands into a traditional agricultural landscape and restore the wetlands, uplands, and He'eia Stream. As upland restoration efforts have been discussed above, the activities discussed below revolve around lo'i kalo restoration, restoration of associated structures and conduits, stream restoration, and wetland restoration. The consequences of the habitat conversions have been summarized above. Impacts to flora would primarily be associated with removing invasive vegetation dominating the parcel, then planting other types of vegetation. There could be minor direct impacts to non-native predator species as subsequently discussed under native wetland restoration and above under actions proposed for recovery under the waterbird action plan in Chapter 6.2.3.3.1. In addition, these activities would be expected to result in some changes to hydrology and could potentially have minor water quality impacts. BMPs could help reduce potential short-term adverse impacts, such as sediment transport. If a reserve were designated and included these lands, reserve staff could help monitor changes to the biological environment resulting from activities organized by Kāko'o 'Ōiwi. There would be expected to be socioeconomic benefits to the local economy from the restoration work and then producing taro, as well as to local communities by educating interested individuals about traditional agricultural practices.

Wetland Agriculture, Maintenance Roads and Water Conveyances

All told, Kāko'o 'Ōiwi plans to rehabilitate approximately 176 acres of organic taro patches, several acres of traditional combined taro patches and inland fishponds, and 4.6 acres of existing organic dryland food crops. Historically, these areas were part of the taro growing district called Hoi, discussed previously. Supporting this traditional agricultural landscape, Kāko'o 'Ōiwi is also planning to rehabilitate historical taro patch walls, agricultural roads, and water conveyance channels. In 2012, Kāko'o 'Ōiwi sought CWA section 404 permit coverage for its activities associated with the proposed taro lo'i restoration. The USACE determined that the work proposed would not result in the discharge of more than “incidental fallback” into the jurisdictional waters of the U.S. The USACE further found that, based on the BMPs proposed by Kāko'o 'Ōiwi, the proposed activities would neither degrade or have the effect of dredging the jurisdictional waters in the area. As a result, the USACE determined that a section 404 permit was not required (USACE 2012d).

He'eia Stream Buffer and Channel Restoration

In addition, Kāko'o 'Ōiwi is planning to restore 25 acres along the stream channel, including a 100 foot riparian buffer, which will require removing invasive California grass. Specific plans are still being developed and could potentially benefit from data from future research on He'eia streamflow and hydrology. Over the long term, restoration of the He'eia stream channel could improve habitat suitability for native aquatic and bird species (including endangered waterbirds) within the 100-foot buffer and downstream.

Native Wetland Restoration

Finally, Kāko'o 'Ōiwi is planning to restore 30 acres of wetland habitat between the taro fields and the fishpond along He'eia Stream. The aim of the effort would be to replace the invasive red mangroves dominating the area with native wetland sedges and open-water pools. The effect would be to improve habitat for native birds and nursery grounds for juvenile fish species. In addition, Kāko'o 'Ōiwi is planning to develop a predator control program for rats, mongooses, pigs, cats, and dogs to minimize future impacts on native birds that utilize wetland habitats (Hawai'i Office of Planning 2015b). To minimize potential impacts related to the Hawaiian hoary bat, Kāko'o 'Ōiwi indicates that actions requiring removing mangroves from forested areas will not be carried out between June 15 through September 15, during the bat's breeding season.

Any federally-funded activities with the potential to impact the hoary bat will be subject to further evaluation pursuant to the ESA, as needed, to reduce the potential for any adverse effects to hoary bats. Other impacts to fauna expected from the wetland habitat restoration effort would include enhancing habitat for native bird species and fish, potentially resulting in an increase in their numbers in the project area and reducing numbers of non-native animals that prey on native birds (if the predator control program is effective). Kāko'o 'Ōiwi would be expected to consult with appropriate agencies about these efforts when they are at an appropriate point in the planning process (e.g., USACE suggested it could determine the applicability of the Clean Water Act to efforts to restore the stream, floodplain, and estuarine wetlands, as well as the possible creation of a detention pond to capture sediments and debris from storm events in the southern portion of the parcel, along the He'eia Stream) (USACE 2012d).

Some of the projects underway or planned by Kāko'o 'Ōiwi could have potential short-term adverse impacts, but these will be reduced by carrying out projects without heavy machinery and in accordance with BMPs. The projects are anticipated to have long-term impacts to water quality within the watershed that are primarily beneficial, e.g., by potentially reducing sediment and nutrient loads entering surface water bodies once periods of active construction have ended. There would also be benefits to hydrology, particularly water flow, as areas are actively managed and restored. The various activities to be carried out by Kāko'o 'Ōiwi and its partners would also be expected to improve habitat for flora and fauna species (particularly native species) in the fashion summarized above. The active management of the many habitats contained within the HCDA parcel will restore fallow land to greater productivity and to uses that provide many ecosystem service benefits. The lack of development pressure would be expected to allow benefits to accrue over the long-term. If a reserve were designated, OCM, DLNR, and other partners that are not yet engaged with activities planned for the HCDA

parcel would potentially have an improved platform for coordination. As noted above, this could result in additional technical assistance, research, monitoring, and other resources beyond those expected under the no action alternative. Cumulative impacts would include both potential adverse effects and potential beneficial effects, but they would not be cumulatively significant.

One reason for this is the amount of strategic planning for the parcel that has already occurred. A second reason is that project plans are not so rigid that adaptive management will be impossible. And, finally, the projects will be subject to many future reviews to ensure environmental compliance, which will allow agencies to suggest mitigation measures to minimize any potential adverse effects.

6.4.9 MARINE ENVIRONMENT

Coral Reef Research and Restoration Projects

Three other actions that impact the environment in Kāneʻohe Bay are focused on coral reef ecosystems, some of which have already been summarized above. Pertinent information to the cumulative impacts analysis is summarized in this subchapter. What the three projects have in common is that most effects are intended to be beneficial, but there could be some minor short-term impacts during construction phases or other phases of work that involve habitat manipulation. If a proposed Heʻeia NERR were designated, its additional contributions to cumulative impacts would be limited. Reserve designation and funding for reserve staff portions could allow new reserve staff to offer technical assistance and assistance with coordination related to coral reef projects. In addition, there could be reserve-related monitoring at the project sites. There is already oversight by state and federal agencies over these projects, as discussed below. In the future, if reserve funding were proposed for manipulation projects, OCM would evaluate the proposals to ensure any additional environmental compliance responsibilities required for federal actions were fulfilled. The types of impacts from each of the three projects are summarized below.

Invasive Algae Removal

First, as discussed previously, a project is being implemented by DLNR's Division of Aquatic Resources (DAR) and other partners to mechanically remove large quantities of invasive algae from the patch reefs of Kāneʻohe Bay. Divers remove the invasive algae by hand, feed it into the "Super Sucker" to be collected, and sea urchins are later released to help control the remaining algae. According to The Nature Conservancy, a project partner, the algae originally became established in the central portion of the bay, but natural barriers prevented the algae from spreading south. The "Super Sucker" has been in use in Kāneʻohe Bay for almost 10 years. One recent focus has been to prevent the invasive algae from spreading beyond the bay by using the "Super Sucker" and reintroduced urchins in areas infested with invasive algae near the northern end of the bay. In the local areas where restoration occurs, beneficial impacts include improved coral health and ecosystem services, such as habitat for fish, invertebrates, and other species. An environmental assessment prepared in connection with expanding the use of these restoration techniques to the northern portion of Kāneʻohe Bay concluded that "effects would be local and are not expected to significantly affect the human environment alone or in combination with other reef restoration projects around the Oʻahu coast."

In-situ Coral Nursery

Second, an in-situ pilot coral nursery is currently proposed for a small area off Moku o Lo'e and within the Hawai'i Marine Laboratory Refuge that could ultimately support coral reef restoration activities within the bay. This two-year "proof of concept" project would involve accepting coral fragments from a damaged site in Kāne'ohe Bay and placing them in a nursery area in the Hawai'i Marine Laboratory Refuge to grow. After two years, the fragments grown in the nursery would be returned to donor sites and monitored. The project would be funded in part by NOAA's Coral Reef Conservation Program and carried out through a partnership between DAR and HIMB. If successful, the project nursery could help researchers understand some of the parameters that affect coral nursery success. Future efforts could build on this foundation to help support nursery design for future DAR-led restorations of reefs damaged by ship groundings and other adverse impacts. The benthic environments at the nursery sites will change temporarily while the nurseries operate. The nurseries will not be installed where there are live coral reefs. Also, sea turtle resting areas will not be sources of donor fragments. In addition, the donor coral fragments will not leave Kāne'ohe Bay. Several BMPs were proposed for the project relating to minimizing the potential impacts to both listed species and EFH. NMFS also determined that the proposal would cause no or minimal adverse effect to EFH as long as certain BMPs were followed, such as only transporting coral fragments between sites that are free of disease and invasive species and avoiding placing any equipment and materials related to the nursery on substrate colonized by coral. NOAA's NMFS concurred with an OCM determination that the proposed project is not likely to adversely affect species listed under the ESA and monk seal critical habitat. Oversight by the many agency and institutional partners involved in the project would be expected to ensure that there are no significant impacts related to the pilot nursery site.

Coral Reef Mitigation Bank

Third, building on the Kāne'ohe Bay coral reef restoration project, DAR proposed a coral reef mitigation bank to continue these restoration efforts on four patch reefs within Kāne'ohe Bay and an additional three patch reefs as control reefs for the restoration reefs. One restoration and one control reef proposed as part of the bank are found within the proposed boundary of the reserve, under the preferred alternative (Figure 6.4). Patch reefs 9 (control) and 10 (restoration) have a combined area of 58,441 m². As part of the bank, DAR is also considering outplanting healthy coral from the proposed coral nursery to reef 10 to restore coral coverage (Hawai'i DLNR Aquatic Umbrella Mitigation Bank Prospectus, 2014). In the future, coral from the Moku o Lo'e pilot in-situ coral nursery could potentially be a source of restoration material.

The restoration efforts focused on the coral reefs of Kāne'ohe Bay and the proposed He'eia Reserve are anticipated to have overall minor to moderate beneficial effects (both in the short and long term) on marine habitats and associated species. The cumulative impacts of the three projects described above, any other restoration projects that might occur, and reserve designation could provide benefits to habitats, fisheries, other ecosystem services, and ecotourism. In addition, the restored patch reefs could become more resilient to other stressors, as important factors such as the ecosystem condition, biological diversity, connectivity and local environment improve (Marshall and Schuttenberg 2006). Some additional negligible beneficial effects may

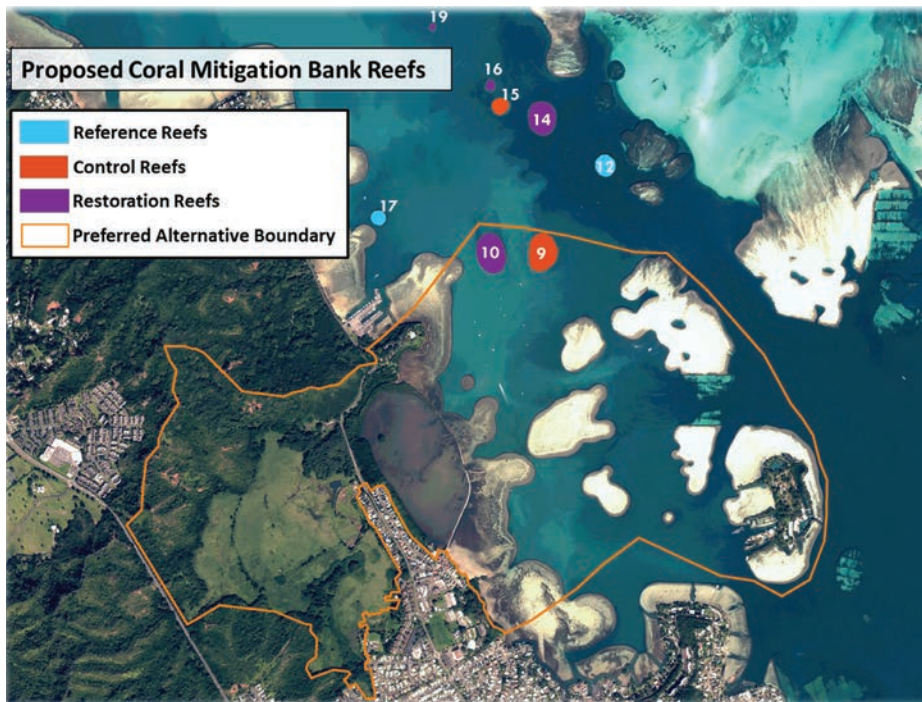


Figure 6.4. Proposed Mitigation Bank Reefs in Kāneʻohe Bay

occur as local coastal farmers replace some of their chemical fertilizer costs with the algae removed from the reefs. In the long term, minor benefits to the socioeconomic environment from reserve designation, combined with other projects, could include better visibility of the area as a destination for tourists, educators, and students (and other uses compatible with reserve goals). Cumulatively, these factors would not be expected to inhibit the potential for reef ecosystems to sustain themselves. Available information therefore suggests that reserve designation, implementation, and continued work on the projects in coral reef ecosystems identified to date would not have cumulatively significant effects in the foreseeable future.

HIMB Activities Affecting Marine Areas

A portion of the Coconut Island Infrastructure Rehabilitation and Replacement Project involved work on utilities on the island to prevent them from failing: replacing utility lines, rerouting sewer connections on the island, and replacement of pumps at the sewer pumping station. Also, horizontal directional drilling was to be used to install new utility lines from the mainland to Coconut Island (Moku o Lo'e) under the seabed, to prevent the release of sediment during installation and to install new lines where they will not impact marine habitats. These elements of the Coconut Island Infrastructure Rehabilitation and Replacement Project could have minor, short-term adverse effects on flora or fauna present during construction, as discussed in the associated environmental assessment, published in 2014 (Community Planning and Engineering, Inc. 2014). There could be direct impacts to the marine environment in a very-localized area, near the pier and near where the tunnel for the utility lines begins. However, the project would have long-term beneficial impacts to the marine environment by ensuring that the failing utilities and infrastructure will not adversely impact marine habitats and species in the future. Once installed, the upgraded utilities and wastewater lines were expected to support indirect long-term beneficial impacts to research, monitoring, and educational programming that could use those resources.

The Lighthouse Pier had been in such disrepair that it was a safety hazard and needed to be removed, and then replaced with a new pier with the same footprint. The project was undertaken beginning around 2015 in a fashion consistent with HIMB's commitment to protect and preserve marine resources. As part of implementing that project, the university planned not to do work on the pilings supporting the pier other than to reinforce them. According to the environmental assessment, there would be no in-water work on supports to which corals are attached, to prevent impacts to those corals, and no work on the west end of the pier, where corals are present in shallow water. On the other end of the pier (where corals are 6 feet under water at low tide), all in-water work was to be scheduled to avoid the spawning period for most coral species. A survey of species present in the vicinity of the pier was conducted to inform construction plans. Information about the marine environment collected during the survey is incorporated by reference from the environmental assessment. The environmental assessment also indicated that there were no known past or future projects that would compound impacts that would occur if the proposed work were to be carried out as planned. Its explanation of why work on the pier and utilities would not result in any significant impacts is incorporated by reference (Community Planning and Engineering, Inc. 2014). There could be indirect effects of the pier replacement project if boat traffic to the island increases, discussed below.

MCBH-Related Boating in Kāneʻohe Bay

There is a Naval Defense Sea Area that serves as a 500-yard buffer around the Mokāpu Peninsula, surrounding all of MCBH Kāneʻohe Bay. It is off-limits to most civilians (other than certain civilians associated with the Department of Defense). There are two shallow channels that cross barrier reefs into Kāneʻohe Bay. The Sampan Channel or Kāneʻohe Passage cuts diagonally through the bay, a little more than 500 yards from the northwestern tip of Mokāpu Peninsula and ending at Heʻeia Fishpond. It has a natural depth of 8 feet (2.4 m) and can be used by smaller boats. The other channel that crosses the reefs is called Mokoliʻi Passage (near Mokoliʻi Island, also known as Chinaman's Hat), in the northwestern portion of the bay. It was dredged by the Navy in the early 1940's to a depth of approximately 25 feet (7.6 m) (Bahr et al. 2015). A dredged ship channel (approximately 30 to 45 feet deep, according to the NOAA Nautical Chart 19359) extends the length of the bay, connecting MCBH with Mokoliʻi Channel and providing deep-draft ship access between the bay and open ocean. The ship canal ends near a pier inside the prohibited area that extends into Kāneʻohe Bay, not far from an on-base marina.

There is limited readily available information about the use of the pier at the base. It is reportedly used intermittently by large vessels, such as logistics support vessels, to refuel. Anecdotal reports from staff at the facility indicated that, at times, the pier might be used as infrequently as once per month by large vessels. The pier also offers a site for exercises or other maneuvers. Finally, it could allow equipment to be loaded onto or off of vessels (Unpublished data from MCBH – Kāneʻohe Bay Environmental Compliance and Protection Department, 2016). Larger military vessels would have the potential to have more significant adverse impacts to marine biota in the vicinity, including protected species (if present). The lack of detailed information available about large military vessels and how they might operate in Kāneʻohe Bay preclude a more detailed analysis herein. OCM did not find any information suggesting any large vessels are permanently stationed at the marine corps base. Many would be stationed at Naval Station Pearl Harbor,

according to the Commander, Navy Region Hawai'i, who also reports it has three dozen operational aircraft stationed at MCBH Kāne'ohe Bay (Commander Navy Installations Command 2016). Marine Corps Training Area Bellows (also part of MCBH) is located in Waimānalo, southeast of Kailua and the Mokāpu Peninsula. One source reports that Amphibious Assault Vehicles travel between the two Marine Corps bases so that personnel can practice beach landing maneuvers at Marine Corps Training Area Bellows (adjacent to Bellows Air Force Station) (Marine Corps Base Hawai'i 2006).

This Marine Corps recreational marina rents sailboats, kayaks, powerboats (including for fishing and waterskiing), and pontoon boats to military personnel. Some training on boat use is available on site, and a license from the marina is required to operate any of its boats. There is also a boat launch for boat owners. The powerboats available for rent are Boston Whalers that can accommodate six people. As of summer 2016, a comment on the marina's website noted: "The Marina is undergoing construction of a wave attenuator and new piers for approximately eight months. Full operations will continue, but there may be delays." (Marine Corps Community Services Hawai'i 2016). There is a reference to those upgrades in an environmental assessment (EA) published in 2014 associated with relocating an unmanned aerial vehicle squadron to the base. The EA mentions that projects planned at the marina included installing a floating wave attenuator, relocating moorings, and constructing new docks, a boat rinse area with improved drainage, a fuel pump, and a fuel dock. This information appears in a table of planned projects, without any other details about the projects. The lack of detailed information about most of the projects proposed in the vicinity of the marina precludes a detailed analysis of their impacts. A number of federal laws would apply to the projects, e.g., the MMPA and Clean Water Act, compliance with which could avoid or reduce potential adverse impacts. The USACE did issue a permit related to the demolition of an existing boat ramp and its replacement with a new boat ramp that addressed potential impacts to coral (USACE 2013).

Other Boating in Kāne'ohe Bay

OCM did not identify any thorough inventories or summaries of vessel use in Kāne'ohe Bay. However, by most accounts, boating activity in the bay is reportedly extensive. There is at least one private yacht club along the bay, called Kāne'ohe Yacht Club. In addition, Holokai Kayak and Snorkel Adventures offers activities such as stand-up paddling, kayaking, snorkeling, guided Hobie catamaran sailing, an interpretive tour of the fishpond by kayak, etc. (Holokai Kayak and Snorkel Adventures 2016). These trips depart from He'eia State Park. An article in Honolulu Magazine in 2007 reported that five companies operated commercial boats at He'eia Kea Harbor to take visitors out to the reefs. At that time, the two largest companies accounted for most of the tourist trade, and those two companies managed more than a dozen vessels and employed nearly 50 people (Hollier 2016). There are also operators who rent personal watercrafts to be used in the appropriate Ocean Recreation Management Area within the bay. A survey that compiled certain types of information about the boating industry throughout Hawai'i in 2003 did not have any information about other boating in Kāne'ohe Bay, although it did imply that boats that can be chartered for fishing make up some of the boating industry on O'ahu (Markrich 2004). Kāne'ohe Bay supports commercial, recreational and subsistence fishers, who primarily target yellowfin tuna and dolphinfish (Mahi mahi).

Potential Future Boating Associated with Reserve Designation

The amount of boat traffic to Coconut Island could increase as a result of the proposed He'eia NERR designation, particularly given that reserve offices are proposed to be on the island for the first few years it operates. HIMB reports that it hosts 4,000 school-aged visitors to the island each year. HIMB also operates a regular shuttle from Lilipuna Pier to the islands, owns more than half a dozen boats, and has active research and educational programs (involving both graduate and undergraduate students). Small numbers of additional staff commuting at times the boat shuttle runs and has adequate capacity could potentially travel back and forth on the Boston Whalers currently employed to shuttle people to and from the island. If groups of 13 or more people required transport, those trips would require a larger boat. Regardless of vessel used, boat operators at HIMB are required to hold a boating certification recognized by the US Coast Guard, and successfully complete an on-water skills checkout, which includes boat docking and handling skills. HIMB also offers formal boat training opportunities and has a Marine Safety Officer (HIMB 2016). HIMB would be expected to inform individuals who go through its on-water skills checkout of the BMPs that must be followed while operating, docking, or anchoring a boat. Even if there were additional round-trips on the HIMB Boston Whalers to transport reserve staff and visiting researchers, plus a few additional round-trips on the HIMB cargo vessel (or a new education vessel) for larger groups, the increase in activity would be comparatively small relative to particularly busy times at HIMB. Reserve-related boating would therefore be unlikely to materially increase total boating activity in Kāne'ōhe Bay and the waters around Coconut Island.

Boaters without a specific connection to Moku o Lo'e could use watercraft in the vicinity. Public access to the island is permitted in designated areas not situated near ongoing research activities. The main public access points are Maile Point, on the southwestern corner of the island, and the sandy beach on the eastern side of the island. Any members of the public visiting those parts of the island would also add to the total amount of boating that occurs in the vicinity. In addition, military personnel, private citizens, and tourists who own or rent motorboats could visit the area. Cumulative effects of the reserve designation and its implementation, and the replacement of Lighthouse Pier would not be expected to cause marine species or ecosystems to cross any ecological thresholds such that they would have difficulty sustaining themselves into the future, taking into account other stressors on the marine environment, such as invasive species.

6.4.10 NOISE

Underwater Sound

With respect to marine mammals, several MBCH-related documents reprint summary information about potential impacts of overflights to marine mammals originally included as an appendix produced by Wyle Laboratories for MCBH Kāne'ōhe Bay, in support of a 2008 Airfield Noise Study. The appendix, titled "Discussion of Noise and its Effect on the Environment," notes that there are differences in how different animals or groups of animals receive frequencies of sound. It also notes that marine mammals are sometimes startled by airborne noise, but some can become habituated to it over time. Rates of habituation vary by species, population, and demographics (primarily age and sex). In addition to airplanes, low-flying helicopters and loud boat noises could potentially disturb some marine mammals, not just airplanes.

Further, this analysis notes that the continued presence of a single noise source (or of multiple sources) could cause some marine mammals to leave a preferred habitat, but that does not always occur. In particular, a few studies exist where researchers did not observe marine mammals departing an area where overflights occurred regularly. Thus, the summary comments that “other anthropogenic noises in the marine environment from ships and pleasure craft may have more of an effect on marine mammals than aircraft noise.” (AECOM 2016). This may be in part because sound generated in the air travels through the water primarily in the narrow area right below the aircraft. The angle of incidence must be 13° or less from the vertical for the wave to continue propagating under the water’s surface. Further, both depth of water and bottom conditions affect sound propagation and levels of underwater noise audible from passing aircraft. Aircraft typically pass over a given area quickly, which reduces the duration of any sound that can be heard underwater (U.S. Navy 2013).

To illustrate how aircraft noise is transmitted to marine species, a model of underwater sound pressure level as a function of time at various depths (2 to 50 m) was run for an F/A-18 Hornet aircraft making subsonic (250 knots) overflights at various altitudes. For the most extreme modeled case, of an F/A-18 at the lowest altitude (300 m), the sound level at 2 m below the surface of the water peaked at 152 dB referenced to 1 micropascal, and the sound level at 50 m below the surface of the water peaked at 148 dB referenced to 1 micropascal. When an F/A-18 flight was modeled at 3,000 m altitude, peak sound level at 2 m depth dropped to 128 dB (referenced to 1 micropascal). The Navy’s study also addresses the effects of sonic booms on underwater sound (see Table 3.0-15). It further notes that sound from helicopters is transient and varies in intensity, just like sound from fixed-wing aircraft, but helicopters tend to produce lower-frequency sounds and vibration at a higher intensity than fixed-wing aircraft (Department of the Navy 2013).

Although acoustic signatures of naval vessels are considered classified information, a summary of the effects of naval vessel noise is also provided in the same chapter of the Navy’s report. Noise radiated from Navy ships is, in some cases, compared to the noise of a typical fishing vessel, approximately 158 dB referenced to 1 micropascal. After commenting on some of the types of watercraft that support naval operations in the Pacific and presenting general, qualitative differences between the watercraft, the EIS assesses, broadly, the relative contributions of Navy vessels versus other vessels to the overall ambient noise in the marine environment. It concludes that in the vicinity of inland waters near ports with naval activity, the contribution of Navy vessels to the overall noise in these environments is minimal because the areas in question typically have large amounts of commercial and recreational vessel traffic. Based on that assessment and the very limited documentation about military watercraft (particularly large vessels) that use Kāne’ohe Bay, it appears the focal areas for a cumulative impacts analysis of sound in Kāne’ohe Bay should be recreational and commercial vessel noise, discussed above. OCM did not identify adequate sources of data about boat traffic, the frequencies and intensities of the sounds, and spatial distribution of sources and receptors (e.g., the distance from boats to potentially affected marine mammals) to permit a quantitative analysis of the cumulative impacts from sound that on marine species in the bay. Boating activities associated with the proposed He’eia NERR would likely be minimal and conducted in vessels with relatively small acoustic signatures in the scheme of total boating activity in the bay. Further, reserve partners would be required to adhere to applicable BMPs if they identify marine

mammals or other threatened or endangered species in their immediate vicinity, e.g., requirements to reduce vessel speeds and maintain their distance from protected species until they leave the area of their volition.

Sound Transmitted Through Air

Noise from military overflights exceeds ambient noise levels only beneath approach and departure corridors, as well as certain on-base areas. According to the Department of Defense, as aircraft altitude increases, noise audible from the ground drops and soon becomes indistinguishable from other ambient noise. Coconut Island lies near approach pathways for MCBH-Kāneʻohe Bay. An *Air Installations Compatible Use Zones* (AICUZ) study is periodically updated for MCBH, most recently in June 2016. The study analyses parameters associated with aircraft operations, primarily related to noise and safety, and offers recommendations about compatible land uses. Pertinent information about noise in the area is incorporated by reference. One important change to AICUZs in 2016 pertains to Coconut Island. AICUZ noise levels projected on the island in the 2016 report increased by approximately 5 decibels (dB) compared to 2003 and 2012. (The 2012 analysis was part of a *Final EIS for the Basing of MV-22 and H-1 Aircraft in Support of III MEF Elements in Hawaiʻi* and contains more detailed information about noise generated by different types of aircraft at the base or that were proposed to be shifted to the base. That Final EIS also summarized baseline flight operations at the base under the scenarios evaluated in its Appendix D-1, which is incorporated by reference). (Department of the Navy 2012) Impacts occur at Coconut Island and in its vicinity even though aircraft departing from Runway 22 at the base are instructed to avoid Coconut Island and populated areas.

The 2016 AICUZ study depicts areas projected (based on modeling) to experience different sound levels; see figures throughout that report, e.g., Figure 4.4. The contours are intended to inform land use planning; they do not describe the level of sound a person might hear during a single event. The analysis published in 2016 finds that, by 2018, much of the land on Coconut Island and some nearby marine areas would be anticipated to fall within the contours representing 65-74 dB Day-Night Average Sound Level (DNL, a unit of measure that averages and weights noise over 24 hours). The Marine Corps considers this area moderately impacted and recommends the University of Hawaiʻi take the results of the updated AICUZ study into account as part of future land use planning. Also, some marine areas within the reserve would potentially experience a 60-64 dB DNL. Some areas along the shoreline proposed for inclusion in the reserve, including near Heʻeʻeia Fishpond, would potentially experience DNLs of 55-59 dB. Table A-1 in the study shows Department of Defense land use recommendations in different noise zones. It shows activities not recommended in the 65-74 dB DNL range, including residential uses, unless designed and built for noise reduction. Some other land uses are either not recommended in the zone experiencing 70-74 dB DNLs (e.g., including nature exhibits and places of public assembly) or would need noise level reduction techniques.

The AICUZ study also contains some information about maximum sound levels during aircraft overflights. See Table 4-2. The maximum sound level heard for a fraction of a second (L_{max}) at Heʻeʻeia State Park (Kealohi Point) could range from 73 to 105 dB, depending on the type of aircraft and its flight pattern. Other studies produced for MCBH indicate that noise from traffic on highways can also be heard in some areas. The potential impacts of different sound levels to humans and a number of different kinds of animals are discussed in

detail in the 2016 AICUZ study and are incorporated by reference. In brief, they include annoyance, interference with speech, interference with sleep, and non-auditory health effects (AECOM 2016).

An EA developed in connection with infrastructure upgrades at HIMB indicated that noise sources in the area include boat traffic, aircraft overflights, and occasional construction-related noise (generally limited by the Department of Health to 55 A-weighted decibels during the day). The study prepared for HIMB also notes that, generally, noise due to construction equipment can fall between 70 and 100 A-weighted decibels. Mufflers and noise barriers can be used to decrease these levels. HIMB follows state requirements for its construction projects and obtains noise permits when needed. With mitigation measures implemented, the assessment concluded that noise impacts would be reduced to less than significant, even when assessed in the context of other noise sources (such as overflights) (Community Planning and Engineering, Inc. 2014). On the basis of this assessment, OCM concludes that its proposed He'eia NERR designation and any associated increase in individuals visiting or working at the island, even the increase associated with short-term constructions projects, would not result in cumulatively significant impacts to noise heard on land. OCM recommends, however, that the results of the 2016 AUCIZ Study Update be taken into account as the reserve considers where to site future facilities. Anecdotal information suggests that aircraft overflights can sometimes be heard from shoreline areas, including He'eia Kea Harbor, so every portion of the reserve likely is subject to some intermittent noise from the marine corps base; and it might only be one factor of many to be considered as part of future planning efforts.

6.4.11 HUMAN ENVIRONMENT

Many different facets of the human environment were addressed individually in Chapter 6.3. Rather than revisiting those analyses at an equally granular scale, this subchapter groups some sectors together, where they are interrelated.

Ocean Economy, Fishing, Tourism, and Recreation

Major sectors boosting the ocean economy include tourism (and nearshore businesses, including restaurants), recreation, fishing, marine transportation services, and related businesses. Readily available information about tourism along (and within) Kāne'ohe Bay was summarized in Chapter 5, as well as in Chapter 6.4.9, under the header "Other Boating in Kāne'ohe Bay." Proposed He'eia NERR designation and operation could result in small increases to the numbers of recreational users and tourists who visit the region, but, were that to occur, no cumulatively significant adverse effects would be expected to occur given the fact that areas that draw tourists and recreational users appear to still have adequate capacity to cater to a larger number of visitors and residents.

The marine environments of Kāne'ohe Bay are a primary driver of the ocean economy in the study area. As noted earlier, there are a number of projects ongoing in the reefs of Kāne'ohe Bay that, if successful, could potentially result in minor improvements to habitat for fish. Such projects could lead to greater species abundance and diversity, which in turn, could make the area more appealing for fishing, tourism and recreational activities. Were a reserve designated, no new regulations or restrictions would be imposed on these ocean economy activities, however, new data about the status of fishery resources in the bay could be generated that could inform future management decisions. Over the medium- to long-term, these fisheries management decisions could either benefit or have adverse effects on commercial and

recreational fishers or other resource users depending on the resulting management decisions. However, given the strong fishery management requirements already in place, and the robust ongoing research in the study area, it is not expected that the effects associated with improved fishery management decisions derived from the work of the reserve would result in significant adverse cumulative effects on the ocean economy.

Employment, Military, and Traffic

Proposed He'eia NERR designation is not expected to have an appreciable impact on any of these sectors. As noted in Chapter 6.3, numerous factors affect employment and the economy in the study area. Major changes in employment trends are not reasonably foreseeable. MCBH is the largest employer in the region, and the population at the MCBH-Kāne'ohe Bay is on the order of 10,000 people. The military regularly reassesses which squadrons to "home base" at different installations, but changes resulting since 2000 from such decisions typically have not resulted in a net change in the population of more than about 10% at any given time. Other employers in the study area, including HIMB, are small by comparison and historically do not significantly impact the local employment rate. Military use of the coast is also a prominent feature of the economy. Reserve designation and operation would not be expected to result in changes to military operations, but could offer the same benefits to base residents as would be offered to other community members.

Also, regardless of whether and where new facilities are constructed, designation of a reserve could increase the amount of traffic traveling along Kamehameha Highway. The highway, however, has the capacity to handle anticipated added vehicle traffic, as noted in Section 1.5.1.4 of the FMP. Accordingly, the designation of research is not expected to result in significant cumulative effects to employment, the military, or traffic in the affected area.

Cultural, Historic, and Archaeological Resources

Hawai'i Revised Statutes, Chapter 6E, Historic Preservation, outlines the State's historic preservation program and recognizes the unique value accorded to historic and cultural heritage sites. With very limited exceptions, historic preservation program review applies to projects proposed by state and private entities that own historic properties, as well as to federal actions under the provisions of the NHPA, as amended. Within the study area, there are a number of historic properties, including areas traditionally important (because of their cultural or religious significance) to Native Hawaiian Organizations. These areas are more fully described in chapters 5 and 6 of this document.

Beyond the proposed action, NOAA is aware of a number of other activities being conducted in the area — primarily by the reserve's site partners — that have the potential to impact historic or archaeological resources. For example, there are archaeological resources on the HCDA parcel, managed by Kāko'o 'Ōiwi (see Figure 1.21 in the FMP) (USACE 2012c). As noted in the FMP, activities proposed in the area containing historic, cultural, and archaeological resources will need to undergo additional review to ensure that the resources are protected. As mentioned above, the Hawai'i State Historic Preservation Division (SHPD) was consulted before the USACE authorized the He'eia Fishpond restoration efforts to ensure the restoration would have no adverse impacts to the historical, structural or cultural integrity of the fishpond (which is listed on the National Register of Historic Places). As discussed in Chapter 6, the likelihood for significant impacts from activities outlined under the no

action alternative is thought to be relatively low due to the need for SHPD review to preserve and protect historic resources as a part of most permitting and planning processes, as well as due to site partners' awareness and sensitivity to the possible presence of historic and archaeological resources.

Any federal actions, including those that may be undertaken in connection with a proposed He'eia NERR, will be subject to the requirements of NHPA, including, when appropriate, consultation with the SHPD and interested Native Hawaiian Organizations. Accordingly, each OCM undertaking that has the potential to affect historic and traditionally important properties will be evaluated individually pursuant to NHPA, after the undertaking is proposed. Consultations, when needed, will help ensure that the historical significance of individual areas is accounted for when projects are planned. As a result of these safeguards, the identified external activities, when combined with the potential impacts from the proposed He'eia NERR and other identified federal actions in the vicinity, are not expected to result in significant cumulative effects to historic resources in the study area.

Cultural History, Maritime Heritage, Agriculture, and Aquaculture

The study area is home to a vibrant cultural history that is actively cultivated and maintained by local residents and organizations including a number of site partners for the proposed He'eia NERR. Subchapter 5.2.2.1 outlines a few major elements of the cultural history of the area. The HCDA parcel and the He'eia Fishpond (where traditional agriculture and aquaculture techniques are being applied) serve not only as sites of agricultural and aquacultural operations, but they also reflect a commitment to apply traditional management techniques to guide operations.

Traditional agricultural and aquacultural operations offer many benefits. In addition to providing local sources of food, they can increase community involvement, strengthen relationships among community members, offer educational opportunities, and help maintain cultural heritage and traditions. In this instance, the projects allow Native Hawaiian Organizations (including Paepae o He'eia and Kāko'o 'Ōiwi) to connect others to traditional culture and knowledge.

Organic relationship-building among community members offers its own benefits, as well. As community dialogue grows, additional community members will become aware of and potentially interested in cultural history of the region, which should increase the number of people in communities that understand and promote their heritage.

The maritime heritage of the area is also diverse: it spans from the use of fishponds and other traditional fishing practices to wrecks in Kāne'ohe Bay related to military operations. While the proposed action could indirectly promote fishpond agriculture, designation of a reserve is not anticipated to affect traditional (or modern) fishing practices. Wrecks in Kāne'ohe Bay are protected under the aforementioned federal and state laws and are similarly not anticipated to be affected by the proposed action.

Given the strong awareness of the area's cultural history and the numerous individuals and organizations working in the area to support this history and heritage, it is highly unlikely that research reserve activities conducted in coordination with site partners, would interfere with sustainability or push communities beyond tipping points, and thus no cumulatively significant adverse impacts are anticipated.

Education and Outreach

Information about outreach and education efforts ongoing at Moku o Lo'e, He'eia State Park, He'eia Fishpond, and a number of other formal and informal venues has already been presented, including in Table 5.22 and Subchapter 6.3.3.5. For example, various educational and community programs are offered by HIMB and other entities in the study area. The programs range from formal classroom instruction for students, to programs for school groups and community groups, to community engagement through "work days." In addition, numerous other entities also provide educational opportunities for children and adults to learn about many facets of local ecosystems. These contributions by non-governmental organizations, schools and universities, cultural and religious groups, government agencies, and others contribute to informing the public about the interrelationships between ecosystems, the potential effects of human behaviors, and best practices for resource conservation, among other topics.

If established, the proposed He'eia NERR's education goal for the site would be to increase the community's "understanding of the effects of human activities and natural events, to improve informed decision-making affecting the He'eia estuary, coastal ecosystems, and ultimately the entire ahupua'a." The reserve could also help its partners and others in the region collaborate on and integrate their educational programs. Finally, He'eia Reserve would carry out its own education and outreach programs for teachers, K–12 students, and interested members of the coastal management community (through the Coastal Training Program). Despite years of grappling with coastal management challenges, an array of complex coastal issues still challenge communities in the region. This suggests that there will continue to be a need for further community engagement about locally-relevant issues. Goals for the proposed He'eia NERR's educational and outreach activities might potentially extend beyond educating individuals towards bolstering community engagement and stewardship in the He'eia estuary.

Even with added capacity from the proposed He'eia NERR, given growing interest in sustainability and growing awareness of the need to better understand environmental stressors, there will continue to be an enduring need for more formal education, field trips, interactions between researchers and the public, and other types of community involvement opportunities. The activities of the reserve are expected to support expanded educational and outreach opportunities in the area, and thus, are not expected to result in cumulatively significant adverse impacts in the next 10 to 15 years.

Research and Monitoring

A number of institutions (academic, governmental, and non-governmental) have active research and monitoring programs in Kāne'ohe Bay and the He'eia estuary. The primary research topics studied at HIMB are summarized on its website. However, there are still many topics yet to be explored by researchers, information gaps with respect to areas being studied, and a large number of locations for which baseline data are not yet available.

If designated, the proposed He'eia NERR would collect baseline data about environmental conditions, including habitat and ecosystem service data, as well as baseline cultural and archaeologic information. The reserve's research program plans to compare and evaluate two different "ecosystem-based" management approaches – one which "embraces traditional Native Hawaiian management practices;" the other based on contemporary ecological restoration

techniques to increase native species biodiversity, ecological resilience, and ecosystem integrity. Through this, the reserve proposes to evaluate the various ecosystem services provided by each management approach.

Reserve research and monitoring is expected to contribute a great deal to efforts to increase the awareness of community members and decision-makers about natural and anthropogenic processes, restoration efforts and their impacts, and key ecosystem services. Specifically, the reserve could help broaden and deepen community knowledge about key ecosystem attributes and services, their impacts, and management options. Reserve staff could also serve to facilitate collaboration among outside researchers and practitioners. Because of the many outstanding research needs associated with the He'eia estuary as a whole, any cumulative adverse impacts related to research and monitoring in the study area would not be anticipated to be significant.

Stewardship

The FMP articulates several goals for the proposed He'eia NERR, including that the reserve could be a center for integrating sound estuarine science with traditional Hawaiian knowledge and cultural practices. Also, the reserve will seek to inform resource managers and local communities about ways to address key coastal issues. The proposed reserve could also put decision-makers who need to make resource management decisions in touch with the data and resources they need to effectively address key coastal issues like climate change, habitat restoration, and water quality. Ultimately, this could lead to more informed ecosystem-based management decisions that factor in many complex elements and interrelationships. Over time, the reserve would most likely serve as a clearinghouse for access to trusted sources for decision-makers facing resource management challenges, as well as for students and visitors to learn about Hawaiian uplands, estuaries, and marine areas and the challenges facing them. As important as ongoing activities in this vein and reserve contributions would be, in looking at the considerations applicable to determining whether impacts are cumulatively significant, OCM judges that even the cumulative impacts of anticipated education, research, monitoring, and stewardship activities would not be significant.

6.4.12 SUMMARY

In summary, this evaluation does not identify cumulatively significant adverse effects from designation and operation of the proposed He'eia NERR or from past, present, or reasonably foreseeable actions. For more detailed information, see preceding subchapters and the documents OCM considered as part of preparing this EIS. All available information indicates that natural resources and human communities would be expected to continue to be able to sustain themselves into the future, despite the cumulative effects of stressors, without crossing ecological thresholds. However, there are some unknown or poorly-understood factors that could intervene, for example, climate change. While other factors such as disease could potentially make it more difficult for some portions of ecosystems to maintain their current quality, designation of the proposed He'eia NERR and the availability of reserve staff to coordinate with researchers and resource managers about ecosystem functioning should support the development of management strategies to address and, to the extent practicable, mitigate the cumulative effects of natural and anthropogenic stressors.

6.5 RELATIONSHIP TO OTHER APPLICABLE STATE, REGIONAL, LOCAL AND NATIVE HAWAIIAN PLANS AND POLICIES

It is anticipated that the establishment of the proposed He'eia NERR would not conflict with the objectives of federal, state, regional or local land use plans, policies or controls for the areas within the designated boundaries. The FMP describes the activities that take place in and around the proposed reserve and the authorities that govern those uses (Appendix A). All the lands and waters comprising the proposed He'eia Research Reserve are currently under either public or private ownership by entities anticipated to become a party to a voluntary multi-partner Memorandum of Understanding or other agreement (hereafter "MOA") that will describe the roles and responsibilities of each party within the administrative boundary of the proposed He'eia NERR (Appendix A). If designated, reserve staff would coordinate with the landowning entities and their lessees at the programmatic and strategic partnership levels on an as needed basis to address any issues that may arise after the proposed reserve is designated. Any advice provided, or action taken, by the proposed reserve staff or signatory parties to the MOA is expected to be consistent with NERRS, local, state, or federal regulations and the roles and responsibilities detailed in the MOA. Proposed He'eia NERR staff would regularly meet with the future reserve advisory board, various strategic partners, and key community leaders to share ideas, promote efficiencies, and resolve conflicts. Using a collaborative process, the reserve staff and its partners will ensure the implementation of the reserve's Management Plan. The following paragraphs summarize some of the state, regional, and local plans that apply to the He'eia estuary and vicinity.

Portions of the proposed He'eia NERR fall into the Conservation District managed by the DLNR Office of Conservation and Coastal Lands, pursuant to Hawai'i Revised Statute (HRS) Chapter 183C and Hawai'i Administrative Rules Title 13, Chapter 5. The Conservation District includes areas "with important natural resources essential to the preservation of the State's fragile natural ecosystems, and the sustainability of the State's water supply." (HRS Chapter 183C-1). The Conservation District includes Coconut Island and surrounding waters, He'eia Fishpond, the upland forests within the HCDA parcel, and the He'eia Kea Small Boat Harbor. DLNR has established categories of allowable uses and activities in the Conservation District, some of which require a permit (e.g., construction of facilities and potentially permanent installation of research instruments). Because the proposed federal action does not involve any immediate changes to use or on-the-ground activities on the areas proposed for inclusion in the reserve, no CDUP would be needed at the time of reserve designation. However, to the extent that future activities trigger the requirement for a permit, reserve partners will be responsible for obtaining them, as discussed in the FMP. Thus, the proposed action is expected to be consistent with State requirements for the Conservation District.

Legislation passed by Hawai'i's legislature in 1990 created a task force charged with developing and implementing a master plan for Kāne'ohe Bay to support planning for the preservation and protection of the bay as a natural and cultural resource and resolving conflicts among recreational users, among other purposes. Issues identified in the plan included coastal development,

open space, public access, water quality, fishing, commercial recreation, and fishpond restoration. The Kāneʻohe Bay Regional Council was established by RS 200D to facilitate the implementation and periodic review of the Kāneʻohe Bay Master Plan. The Regional Council was also set up to coordinate public and private activities in Kāneʻohe Bay, educate and facilitate dialogue among bay users and the public, offer relevant recommendations regarding data and information needs relevant to the Bay, and advise the State and County on matters regarding the use of Kāneʻohe Bay. The Council is chaired by the administrator of DAR, and meets quarterly. For more information about the Council, see <http://dlnr.hawaii.gov/dar/kaneohe-bay-regional-council/>. Of particular note is that the Kāneʻohe Bay Master Plan mentions the possible designation of a NERR. As noted in the FMP, the proposed Heʻeia NERR would benefit from partnering with the Council to coordinate on reserve operation and receive feedback on how proposed programs and activities at the NERR would affect other users in the bay. The proposed action is consistent with the Kāneʻohe Bay Master Plan.

Another plan for the region is the Sustainable Communities Plan (SCP) for the Koʻolaupoko planning area, updated in April 2016. The planning area includes the entire study area, as Koʻolau Poko spans from Kualoa in the north to Makapuʻu Point in the south (a distance of about 20 miles). The SCP was prepared to implement objectives and policies set forth in the Oʻahu General Plan and to help guide public policy, investment, and decision-making through 2035. The SCP indicates that General Plan calls for the Koʻolau Poko area to “experience essentially no growth” and to maintain the characteristics typical of urban fringe and rural areas. The SCP’s vision for Koʻolau Poko’s future is focused on protection of natural, scenic, cultural, historic, and agricultural resources and addressing the region’s infrastructure needs. In particular, the vision references adapting the *ahupuaʻa* model for land use and natural resource management, as well as preserving and enhancing scenic, historic, recreational, agricultural, aquacultural (fishpond), and cultural features that define the region’s sense of place. The FMP for the proposed Heʻeia NERR mirrors these goals (City and County of Honolulu 2016).

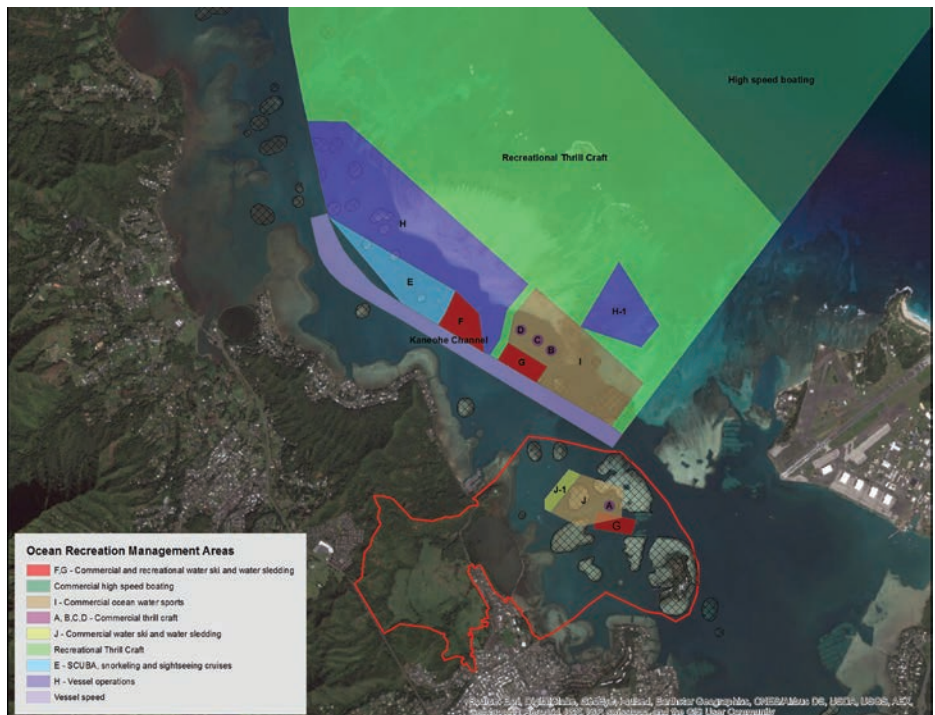
The policies identified in the Koʻolau Poko SCP are diverse. The policies most relevant to the proposed Heʻeia NERR include: “promote access to mountain and shoreline resources for recreational purposes and traditional hunting, fishing, gathering, religious, and cultural practices;” “seek to restore the natural filtering, flood control, recreational, biological and aesthetic values of streams, fishponds and wetlands;” “encourage continuation of small-scale agricultural uses in urban areas, provided that there are standards for compatibility between adjacent uses;” and “promote restoration of fish population in nearshore waters.” The FMP for the proposed Heʻeia NERR reiterates these goals. The SCP covers such topics as the desirability of protecting scenic views, providing for recreation, promoting access to shoreline and mountain areas, preserving significant historic features, protecting visual landmarks, and emphasizing physical references to the history of the area and its cultural roots. Many of these themes also are addressed in the FMP for the proposed Heʻeia NERR. Further, the SCP calls for providing public access to the shoreline, including spaces for passive and active recreation. Establishment of the proposed Heʻeia NERR could help promote recreational and educational

use of the study area. The SCP indicates that the vision for He'eia wetland is to produce taro once again, which is consistent with the goals of Kāko'o 'Ōiwi and the proposed He'eia NERR's FMP. Finally, the SCP recommends ensuring environmental compatibility in the design and construction of park facilities, something emphasized throughout the NERRS. A review by OCM of the SCP indicated no conflicts between it and the FMP. Thus, there are no apparent conflicts between designation and operation of the proposed He'eia NERR and the formally-adopted plan that lays out the vision for the larger community for the next 20 years. OCM also reviewed the Ko'olau Poko Watershed Management Plan and determined that establishment of a reserve would not be inconsistent with that plan (City and County of Honolulu 2016).

Hawai'i's Shoreline Protection Act established Special Management Areas (SMAs) along the coast of the State, extending from the shoreline inland, to protect coastal resources. Counties issue SMA permits for some uses, whereas other uses are exempt from SMA permitting requirements (e.g., agriculture). Coastal zone management objectives and supporting policies provide guidance to the counties in administering SMAs. SMA guidelines can be found in HRS 205A-26. The proposed He'eia NERR's FMP identifies the areas considered for inclusion within the reserve that are subject to SMA permitting requirements. When needed, the reserve and its partners will obtain the required permits prior to undertaking activities subject to permitting requirements. For a complete list of all the existing rules and regulations governing activities and uses within the study area (e.g., the Ocean Recreation Management Area), see Appendix L of the FMP. In addition, Figure 6.5 depicts the Ocean Recreation Management Areas.

In summary, based on its review of existing federal, state, regional, local and/or Native Hawaiian land use plans, policies or controls, OCM did not identify any conflicts between any of them and plans for the proposed He'eia NERR, as outlined in the FMP.

Figure 6.5. Ocean Recreation Management Areas in Kāne'ohe Bay, North of HIMB
(Note: Potential boundaries of the Reserve identified under the Preferred Alternative are outlined in red.)



6.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires an analysis of the extent to which the proposed action's direct and indirect effects would commit operational resources to uses that cannot be recovered or that future generations would be unable to reverse.

A resource commitment is considered irreversible when impacts from its use would limit future use options and the change cannot be reversed, reclaimed, or repaired. Irreversible commitments generally occur to nonrenewable resources such as minerals or cultural resources, and to those resources that are renewable only over long time spans, such as soil productivity.

A resource commitment is considered irretrievable when the use or consumption of the resource is neither renewable nor recoverable for use by future generations until reclamation is successfully applied. Irretrievable commitments generally apply to the loss of production, harvest, or natural resources and are not necessarily irreversible.

The designation of the proposed He'eia NERR and implementation of the FMP should result in few irreversible or irretrievable commitments of resources. The action alternatives would require minor commitments of both renewable and nonrenewable energy and material resources for the management, research, education and outreach activities associated with designation and operation of the proposed He'eia NERR. Designation of a reserve is also expected to result in the commitment of substantial resources, staff time, and funds associated with NERRS activities. Nonrenewable resources that would be used during these activities include fuel, water, power and other resources necessary to implement and operate a reserve. Ongoing operational funding is needed to plan, manage, and otherwise implement the proposed He'eia NERR. Once these operational funds are spent, they become irretrievable. Also, to the extent that any buildings or permanent infrastructure were to be installed in support of the proposed He'eia Reserve's operations, those efforts would also effectively irretrievably commit resources unless the infrastructure were removed or the reserve were de-designated.³¹

Under the no action alternative, the staff time invested in analyzing and planning for potential reserve designation and implementation would not result in an action that achieved the purpose and need for the proposed action. A team of individuals prepared the FMP for the reserve, staff at NOAA thoroughly evaluated the proposed designation, the preparers of the report listed below prepared this FEIS, and staff affiliated with a number of proposed partners have contributed time, effort and information in support of a potential reserve designation. However, partner actions in furtherance of habitat manipulations and restoration activities or associated education and outreach could continue, even under the no action scenario.

³¹ Upon de-designation, the State would be responsible for returning procurement acquisition and construction funding at the fair-market value at the time of de-designation.

In addition, limited environmental change is anticipated or permitted through the NERR program (other than minor disturbances associated with research). The proposed He'eia NERR would be operated and managed with advice of the land holding partners and/or their lessees. Each of these partners has a vested interest in the reserve due to land ownership, existing activities, and/or their interest in conserving natural resources. This partnership is voluntary, executed through a multi-party MOA that provides structure for the long-term support of the proposed He'eia NERR by local Native Hawaiian Organizations. However, any partner, could, if it chose, withdraw from the partnership. The multi-party MOA details the relationships between partners and each partner's commitment to the proposed He'eia NERR. It has been developed by signatories and will be available in the Final Management Plan.

Recreational and commercial fishing, traditional agricultural and aquaculture, and other traditional uses are expected to continue under current regulatory authorities, and these activities are not directly tied to the proposed He'eia NERR's implementation or management. Regardless of whether a reserve is designated, it is expected that the site partners, Paepae o He'eia and Kāko'o 'Ōiwi, would continue the implementation of planned habitat restoration and associated agricultural and aquacultural manipulation activities within the proposed buffer areas, albeit without the benefits associated with the coordination and resources afforded through the existence of a He'eia NERR. It is one of the goals of the proposed He'eia NERR to better understand the He'eia estuary, and coastal habitats of the He'eia ahupua'a, to provide decision-makers and the public with a balance of contemporary science and traditional knowledge to ensure that few irreversible or irretrievable commitments of resources occur beyond the staff time that would be associated with the designation of the site as a NERR. If a reserve is designated, the operational funding OCM awards to it each year could also lead to irreversible or irretrievable commitments of resources in the study area.

6.7 LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

NEPA requires consideration of the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. The short-term uses of the environment relating to the preferred alternative and the proposed alternatives A, B and C are expected to result, generally, in overall improvements to the health and quality of the affected natural and socioeconomic environments by: (1) improving the scientific understanding of the ecological functioning of the area; (2) expanding opportunities for public education and outreach related to the estuarine system; and (3) providing future He'eia NERR staff to assist site partners in the conduct of their ongoing and planned management of the reserve and to help advise on ways to mitigate any associated adverse environmental impacts stemming from these site partner activities. As noted previously, most of the adverse effects from the preferred alternative and alternatives A, B, and C would be short-term (e.g., during the restoration or construction process) and particular to just some of the species present (e.g., invasive species). These predominantly short-term, adverse effects are expected to co-occur with long-term benefits to ecosystem services and productivity.

The long-term productivity related to the preferred alternative and the proposed alternatives A, B and C is based on the goals of the proposed He'eia NERR and the FMP designed to achieve these goals. This includes use of ecosystem-based management strategies as a driving force for habitat manipulation and restoration activities within the proposed reserve so as to improve understanding of the environmental services provided. This management approach is expected to result in substantial improvements to natural resources management in the He'eia estuary in the long-term and to promote scientific investigations to improve informed decision-making, develop place-based education and training programs that inspire and educate the community, and create opportunities to practice and promote stewardship that sustains cultural, biological, and natural resources.

Under the no action alternative, it is expected the short-term improvements to the health and quality of the environment and the long-term productivity of the area as indicated by improved environmental services would be less pronounced. Although the planned site partner activities could be expected to provide some of these benefits without a research reserve designation, it is expected that, absent the coordinating function and resources provided by the NERRS, these benefits would not be as great as those provided under the action alternatives.

CHAPTER 7: COMPLIANCE WITH OTHER ENVIRONMENTAL AND ADMINISTRATIVE REVIEW REQUIREMENTS

7.1 CLEAN AIR ACT

The Clean Air Act (42 U.S.C. §§ 7401 *et seq.*) directs the U.S. Environmental Protection Agency (USEPA) to set limits on air emissions to ensure basic protection of health and the environment. The fundamental goal is the nationwide attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). Primary NAAQS are designed to protect human health. Secondary NAAQS are designed to protect the public welfare (for example, to prevent damage to soils, crops, vegetation, water, visibility, and property).

Compliance: Operation of a research reserve has the potential to bring additional visitors to the project area, which could result in additional car, bus, and/or boat traffic. However, all vehicles are required to be maintained and operated in accordance with all applicable requirements intended to improve air quality, including State of Hawai'i requirements. All vehicles and machinery that emit any air pollution are expected to be operated by reserve staff and others in compliance with all applicable federal, state, and local air quality rules and associated requirements. OCM will comply with CAA requirements as future funding decisions are made.

7.2 CLEAN WATER ACT

The Clean Water Act (33 U.S.C. §§ 1251 *et seq.*) is the principal federal law governing water quality. The act's objective is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The act regulates both the direct (sometimes called point source) and indirect (sometimes called nonpoint source) discharge of pollutants. Section 404 authorizes a permit program for the discharge of dredged or fill material into the waters of the United States. The United States Army Corps of Engineers (USACE) administers that program. Section 401 of the act requires applicants for federal licenses or permits to conduct activities that may result in a discharge of pollution into navigable waters to obtain certification of compliance with applicable state water quality standards and goals (or a waiver from the state). Other sections of the act govern point source and nonpoint source pollution.

Compliance: There are no compliance requirements under the Clean Water Act that must be followed in order to designate a National Estuarine Research Reserve (NERR), and there are no anticipated Clean Water Act requirements associated with implementing the proposed He'eia National Estuarine Research Reserve Final Management Plan (FMP). OCM will comply with CWA requirements as future funding decisions are made.

7.3 COASTAL ZONE MANAGEMENT ACT

The goal of the federal Coastal Zone Management Act (CZMA) (16 U.S.C. §§ 1451, *et seq.*) is to preserve, protect, develop, and, where possible, restore and enhance the nation's coastal resources. The portions of the act relating to the National Estuarine Research Reserve System (NERRS) are discussed in previous chapters. Under the act, NOAA's Office for Coastal Management (OCM) also supports implementation of federally-approved, state coastal zone management programs (CMP). NOAA approved the State of Hawai'i's CMP on September 18, 1978. Section 307 of the CZMA requires any federal action inside or outside of a state's coastal zone that affects any land or water use or natural resources of the coastal zone to be consistent, to the maximum extent practicable, with the enforceable policies of approved state management

programs. It provides that no federal license or permit may be granted without giving the state the opportunity to concur that the project is consistent with the state's coastal policies. Regulations outline the consistency procedures.

Compliance: Within the Hawai'i Office of Planning (OP), the Hawai'i CMP has the authority to review, pursuant to the federal consistency provisions of the CZMA, federal licenses, permits, financial assistance, and certain other activities that affect the coastal zone for consistency with the program's enforceable policies. These policies are found in Hawai'i Revised Statutes Chapter 205A. The Hawai'i CMP has been closely involved in the evolution of proposals for development of a NERR in Hawai'i. In addition, FMP proposes that the HI CMP be represented on the future reserve advisory board. Activities such as reserve designation, any future federally supported construction projects, and any future federally supported land acquisition carried out by reserve partners could be subject to OP review for consistency with applicable enforceable policies of the Hawai'i CMP. OCM completed a federal consistency determination for the proposed designation and approval of the management plan. The Hawai'i CMP provided written concurrence on October 26, 2016 (see Appendix E) and included a condition that any specific resource manipulation activities may require individual federal consistency reviews. OCM will consider the federal consistency review requirements as future funding decisions are made.

7.4 ENDANGERED SPECIES ACT

The federal Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. §§ 1531, *et seq.*), aims to protect animal and plant species from extinction and directs all federal agencies to conserve endangered and threatened species and the ecosystems upon which they depend.

Under the act, NOAA's National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) (collectively, the services) publish lists of endangered, threatened, candidate, and other species with special status under the act. The services also may designate critical habitat for endangered or threatened species. Section 7 of the ESA requires every federal agency to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species and that it will not result in the destruction or adverse modification of critical habitat for those species. When a federal agency action may affect a protected species or its critical habitat, that agency is required to consult with NMFS and/or the USFWS, depending upon the protected species potentially affected.

Compliance: NOAA's OCM requested lists of species and habitats with special status under the ESA from NMFS and USFWS. Chapter 5 lists the species and habitats that the services identified in 2016 as having the potential to occur within the proposed boundaries of the reserve (or sufficiently near the proposed boundaries of the reserve that potential activities within the reserve could affect such species).

OCM anticipates that the proposed He'eia NERR designation in and of itself will neither have any effect on species listed or proposed for listing as threatened or endangered, nor adversely affect critical habitat, candidate species, or of concern species (i.e., resources with special status under the ESA). However, operation of the reserve and implementation of its FMP could lead to activities on land or in the water that have the potential to affect these types of resources. For example, the FMP identifies a need for office space

on the mainland within the reserve and a space for educating large groups of people. After a needs assessment is carried out to better characterize requirements and potential locations for future facilities, construction of new facilities (such as a building) for the proposed He'eia NERR may be proposed. Federal funding support could be requested for acquisition or construction. In addition, some research methodologies require in-situ placement of instruments and equipment, while others involve researchers observing or manipulating species or environments.

After the locations of these and other activities have been proposed, OCM will carry out environmental compliance reviews, including an assessment of the potential for resources with special status under the ESA to be affected by the proposed funding request. As required under the ESA, prior to providing federal funds, OCM will consult the service(s) for their input on OCM's analysis of the potential for adverse effects, any additional data and information they might have, and any best management practices that should be followed to protect special-status resources.

7.5 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801 *et seq.*), as amended and reauthorized by the Sustainable Fisheries Act (Public Law 104-297), established a program to promote the protection of Essential Fish Habitat (EFH) for federally-managed species in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. After EFH has been described and identified in fishery management plans, federal agencies are obligated to consult with the National Marine Fisheries Service (NMFS) with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any EFH. An adverse effect is defined as any impact that reduces quality or quantity of EFH. Consultation is not required for actions that will not adversely affect EFH.

Compliance: Within Kāne'ohe Bay, the marine water column and seafloor in and surrounding the proposed He'eia NERR have been designated as EFH for Hawai'i Bottomfish, Hawai'i Coral Reef Ecosystems, Hawai'i Crustacean Fishery, and the Hawai'i Pelagic Group, as noted in Chapter 5. Kāne'ohe Bay also serves as the Habitat Area of Particular Concern (HAPC) for Coral Reef Ecosystems. In February 2016, Kāne'ohe Bay was also proposed as HAPC for Bottomfish, but a decision with respect to that proposal has not been issued. Reserve designation does not in and of itself have the potential to adversely affect EFH or HAPC. NMFS provided an email response (Appendix H) to OCM's consultation request, concurring with the determination that designation and approval of the management will have no effect on EFH or HAPCs.

Operating a NERR is expected to have long-term, minor beneficial impacts on EFH by contributing to habitat enhancement, improving scientific knowledge associated with EFH, and encouraging the protection of EFH. New research conducted under the auspices of the reserve might allow resource managers to understand and mitigate adverse effects to EFH from projects implemented in Kāne'ohe Bay. With respect to activities conducted in the water, analysis of alternative designs, options for installation, and appropriate best management practices by reserve partners can lessen or eliminate potential adverse effects on EFH. As projects are proposed and at other appropriate times, OCM

will consult with NMFS about the potential for funding other actions (e.g., deployment of new monitoring equipment for the reserve) to adversely affect EFH. At the present time, there is insufficient specific information available about future in-water activities to assess their potential to adversely affect EFH. EFH consultation with Habitat Conservation Division staff in NOAA Fisheries' Pacific Islands Regional Office will occur, as needed, to avoid, minimize, or offset any adverse impacts to EFH and HAPC, consistent with procedures outlined in the EFH federal consultation regulations at 50 C.F.R. § 600.920, and associated guidance.

7.6 MARINE MAMMAL PROTECTION ACT

The primary management objective of the Marine Mammal Protection Act (16 U.S.C. §§ 1361 *et seq.*), as amended, is to maintain the health and stability of the marine ecosystem, with a goal of obtaining an optimum sustainable population of marine mammals within the carrying capacity of the habitat. The Marine Mammal Protection Act (MMPA) prohibits the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas, as well as the importation of marine mammals and marine mammal products into the U.S. The act is intended to work in concert with the provisions of the ESA. There are some exceptions to the prohibitions on taking marine mammals, including a mechanism for requesting authorization from NMFS's Office of Protected Resources for "incidental," but not intentional, taking, of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing or directed research on marine mammals) within a specified geographic region. The MMPA and regulations adopted thereunder restrict harassment (meaning any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal in the wild by causing disruption of behavioral patterns, including breathing, breeding, feeding, migration, and sheltering).

Compliance: The research and education efforts described in the FMP for the proposed reserve would result in additional activity in and around Kāne'ohe Bay. The Hawaiian monk seal, also protected under the ESA, is known to use the habitat in the Bay. In addition, it is possible that other marine mammals, such as dolphins, could sometimes use the habitat within or near the boundaries of the proposed He'eia NERR. Humpback whales protected under the MMPA, have not been documented in Kāne'ohe Bay by NMFS (based on 2016 technical assistance provided by the NOAA Fisheries Cetacean Research Program, based at the Pacific Islands Fisheries Science Center), but they have been documented near Kāne'ohe Bay, according to data from the Hawaiian Islands Humpback Whale National Marine Sanctuary (NOAA 2004). Incorporation of the safeguards used to protect threatened or endangered species during implementation of projects by NERR staff would, in general, be expected to protect any marine mammals in the area. However, future actions will be evaluated individually for compliance with all applicable mandates, including the MMPA. Best management practices (summarized in Appendix I), such as monitoring for protected species before, during, and/or after project implementation, would be used to reduce the potential for there to be adverse impacts from NERR activities on marine mammals. Other mitigation measures will also be considered, if needed, such as time of year restrictions for projects or boating speed restrictions. If required for future projects, consultation with NMFS will be carried out. Therefore, designation of the proposed reserve and implementation of the associated federal actions described herein would comply with the MMPA.

7.7 MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act (16 U.S.C. §§ 715 *et seq.*) provides for the protection of migratory birds. The act makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird (or parts, nests, or eggs of such a bird) except under the terms of a valid permit issued pursuant to federal regulations. The act also regulates scientific collection and possession of migratory birds for educational purposes. The act does not specifically protect migratory bird habitat, but USFWS may suggest consideration of time of year restrictions for construction or remedial activities at sites where it is likely migratory birds may be nesting or project schedules that would avoid migratory bird nesting seasons.

Compliance: Designation of a proposed He'eia NERR would have no direct effects on migratory birds because it would not result in changes to ownership or management of land or water areas. Individuals and agencies within the reserve would need to comply with the act. OCM has contacted the USFWS in accordance with its obligation to consult the services under the ESA. The input OCM expects to receive from the USFWS in response to its planned informal consultation letter will also address migratory birds, pursuant to the Migratory Bird Treaty Act. If the USFWS has any recommendations regarding migratory birds, OCM will share the input with its partners so that they may take the recommendations into account in planning future activities at the proposed He'eia NERR.

7.8 NATIONAL HISTORIC PRESERVATION ACT

The National Historic Preservation Act (NHPA) (16 U.S.C. §§ 470 *et seq.*), as amended, is intended to provide for the preservation of historic sites, buildings, objects, and antiquities of national significance and promote preservation of historical and archaeological resources that might otherwise be lost or destroyed. Under the act and its implementing regulations, federal agencies undertaking an action that potentially affects any property with historic, architectural, archaeological or cultural value that is listed on or eligible for listing on the National Register of Historic Places (National Register) must comply with specific procedures for consultation with the appropriate State and/or Tribal Historic Preservation Officers and others. The act further requires that federal agencies consult with any Native Hawaiian organization that attaches religious and cultural significance to historic properties that may be affected by an undertaking. Amendments to the act clarified that properties of religious and cultural significance to Native Hawaiian Organizations may be eligible for listing in the National Register.

Compliance: Pursuant to NHPA, NOAA's OCM contacted more than 80 Native Hawaiian Organizations (see Appendix G) on June 18, 2015, to: (1) gain assistance with identifying properties within the area of potential effect that might be eligible for listing on the National Register of Historic Places; (2) request information related to the significance any such organizations attach to the areas potentially affected by the proposed action; (3) invite Native Hawaiian Organizations to advise NOAA if they would like to participate in the NHPA consultation process as a consulting party; and (4) identify any additional Native Hawaiian Organizations to involve in the process. OCM received two responses to its letter in July 2015, one from the State's Office of Hawaiian Affairs, and one from the Malu'ohai Residents Association. Neither respondent requested to be a consulting party, as provided for under the NHPA. In its response letter,

the Office of Hawaiian Affairs identified eight historic sites for consideration. The two response letters collectively identified a total of nine organizations to engage, all of which NOAA had already coordinated with in some fashion (including some entities that are expected to serve as reserve partners, such as Kāko'o 'Ōiwi, and others with which NOAA representatives met or otherwise conferred with during the reserve scoping process). As required by the NHPA, OCM consulted with the Hawai'i State Historic Preservation Officer, providing a no adverse effect to historic properties determination for designation of the Reserve and approval of the FMP (Appendix F). Prior to funding specific activities under the FMP, OCM will conduct targeted NHPA Section 106 consultations, providing the site-specific details necessary to fully analyze the effects to historic properties. OCM will presume concurrence if there is no response within 30 days of receipt of letter (§800.3(c)(4)).

7.9 NATIONAL MARINE SANCTUARIES ACT

Under the National Marine Sanctuaries Act (NMSA)(16 U.S.C. §§ 1431 *et seq.*), the Secretary of Commerce is authorized to designate and protect as national marine sanctuaries areas of the marine environment requires the protection and conservation of marine environments with special national or international significance due to their conservation, recreational, ecological, historical, scientific, cultural, archaeological, educational, or esthetic qualities. Pursuant to the act, federal agency actions likely to destroy, cause the loss of, or injure any sanctuary resource are subject to consultation with the National Marine Sanctuaries Program. Each federal agency proposing such an action must provide a written statement describing the action and its potential effects on sanctuary resources no later than 45 days before the final approval of the action. In addition, sanctuary permits may be required for certain actions that would otherwise be prohibited.

Compliance: The proposed project is not likely to destroy, cause the loss of, or injure any National Marine Sanctuary resources. The nearest National Marine Sanctuary is the Hawaiian Islands Humpback Whale National Marine Sanctuary, created in 1992 to protect humpback whales and their habitat in Hawai'i. The Sanctuary includes, among others, marine areas that wrap around Kahuku Point, in northern O'ahu, as well as marine areas off the southeastern corner of O'ahu, extending approximately as far north as Makapu'u Point. However, it does not include Kāne'ohe Bay or immediately adjacent waters, and the affected area is unlikely to be frequented by humpback whales. Accordingly, proposed He'eia NERR designation and implementation is not likely to affect the sanctuary resources of the Hawaiian Islands Humpback Whale National Marine Sanctuary.

7.10 ENVIRONMENTAL JUSTICE

Executive Order 12898 on Environmental Justice and Executive Order 12948 (Amendment to Executive Order 12898) require each federal agency to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The Department of Commerce (DOC) Environmental Justice Strategy also requires funding recipients to ensure projects have no disproportionately high and adverse human health or environmental effects on minority or low-income populations.

³² NOAA is in the process of updating its 2012 Guidance Manual and procedures for federally funded projects affected by Executive Order 13690. In the meantime, the existing Guidance is applicable, consistent with the October 8, 2015, “Guidelines for Implementing Executive Order 11988, Floodplain Management, and Executive Order 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input.”

Compliance: As noted in Chapter 5, the population in the immediate vicinity of the proposed reserve site is comprised predominantly of individuals from racial and ethnic minorities. However, the poverty rate across this population is lower than that of Hawai‘i as a whole. Consistent with Executive Orders 12898 and 12948, as well as the DOC’s Environmental Justice Strategy, the designation of a reserve in Hawai‘i would not be expected to have disproportionately adverse human health or environmental effects on minority or low-income populations. He‘eia NERR designation and operation would not be expected to cause significant adverse human health effects, and any adverse environmental effects caused by the proposed action are expected to be minor. Proposed He‘eia NERR designation also is expected to have numerous beneficial effects, as detailed herein. Many of the future program activities identified in the FMP, such as the education program to bring school children to the proposed He‘eia NERR, will benefit all populations, including minorities. According to the FMP, the proposed He‘eia NERR would endeavor to provide opportunities for classes from all interested schools to visit and participate in educational activities, which is one respect in which the proposed He‘eia NERR could provide positive effects to minority populations.

7.11 EXECUTIVE ORDER 11990 — PROTECTION OF WETLANDS; EXECUTIVE ORDER 11988 — FLOODPLAIN MANAGEMENT; AND EXECUTIVE ORDER 13690 — ESTABLISHING A FEDERAL FLOOD RISK MANAGEMENT STANDARD AND A PROCESS FOR FURTHER SOLICITING AND CONSIDERING STAKEHOLDER INPUT

Executive Order 11990 requires federal agencies to avoid the adverse impacts associated with the destruction or loss of wetlands, to avoid new construction in wetlands if alternatives exist, and to develop mitigation measures if adverse impacts are unavoidable. Executive Order 11988 requires federal agencies to avoid, to the extent possible, long and short-term adverse impacts associated with the occupancy and modification of floodplains. Executive Order 13690 updates Executive Order 11988 and establishes a new federal flood risk management standard intended to reduce risks and costs associated with future flood disasters by requiring all federal investments in and affecting floodplains to meet higher flood risk standards. It also requires all future federal investments in and affecting floodplains to be resilient to flooding, including as it is anticipated to be exacerbated by climate change.

Compliance: Portions of the He‘eia region, including many of its wetlands, are within the flood zone designated as AE by the Federal Emergency Management Agency (FEMA), and a large portion of the wetlands are also within the floodway, as noted in Chapter 5. The City and County of Honolulu participates in the National Flood Insurance Program. NOAA’s “Guidance Manual on Compliance with Implementing Executive Orders 11988 and 11990” (issued in 2012) outlines an eight-step evaluation process for most projects that extend into floodplains and wetlands, with a few exceptions.³² Under this guidance, the eight-step evaluation process does not apply to “site characterization, environmental monitoring, or environmental research activities in a floodplain or wetland, unless these activities would involve building any structure; involve draining, dredging, channelizing, filling, diking, impounding, or related activities or result in long-term change in the ecosystem.” Under the action alternatives, OCM proposes to designate a He‘eia NERR and approve its FMP. Reserve staff efforts would primarily revolve

around research, monitoring, coordination, technical assistance, and education. No actions proposed by OCM at this time will involve building any structure, carrying out activities that would result in long-term change in an ecosystem, or dredging, channelizing, impounding, or filling wetlands or water bodies. Thus, these executive orders would not apply to the proposed action. In the future, OCM will reevaluate the applicability of the three executive orders if federal funds are requested to support projects that both: (1) would be located in delineated wetlands or floodplains (or other areas to shown as the new federal flood risk management standard applies); and (2) would involve the construction of buildings, altering wetlands and waterbodies, and/or long-term ecosystem changes.

7.12 EXECUTIVE ORDER 13089 — CORAL REEF PROTECTION

Among other things, Executive Order 13089 directs federal agencies whose actions may affect U.S. coral reef ecosystems to identify their actions that may affect these ecosystems, utilize their programs and authorities to protect and enhance the conditions of these ecosystems, and ensure that any actions they authorize, fund, or carry out will not degrade the conditions of such ecosystems (to the extent permitted by law).

Compliance: Ongoing activities by prospective reserve partners, such as the Hawai'i Division of Aquatic Resources (DAR), are intended to enhance coral reef ecosystems in Kāne'ohe Bay.

The FMP for the proposed He'eia NERR includes a strategy supporting coral reef restoration. That strategy, identified as 10(h), is to “collaborate with partners on existing coral reef restoration and monitoring initiatives that are occurring within the marine boundaries of the reserve.” (The strategy supports Objective 10, which is to “support contemporary restoration of key areas in the reserve to improve habitat and increase ecosystem services.”) HIMB researchers and others are already conducting coral reef monitoring, and the proposed He'eia NERR is committed to, in coordination with partners, supporting development and implementation of a reef monitoring strategy. Plans for additional monitoring call for assessing the effects of coral reef restoration approaches compared to specific control areas left undisturbed. Implementation of a proposed He'eia NERR could also result in additional technical or planning assistance associated with coral reef research and restoration (including restoration projects on land that have the potential to reduce sedimentation, which can adversely affect coral reef ecosystems through sediment transport). In short, future reserve activities affecting reefs would likely be intended to study, slow, or reverse the effects of coral reef degradation. Since the reefs in Kāne'ohe Bay serve as Habitat Areas of Particular Concern (a type of Essential Fish Habitat) for coral reef ecosystems, the OCM will consult with NMFS if reserve-related activities proposed for funding have the potential to adversely affect coral reef ecosystems. OCM will also consider any conservation recommendations provided by NMFS to avoid, minimize, or offset potential adverse impacts. Thus, designation and implementation of a proposed He'eia NERR would be consistent with this Executive Order.

7.13 EXECUTIVE ORDER 13112 — INVASIVE SPECIES

The purpose of Executive Order 13112 is to prevent the introduction of invasive species; respond to and control invasions in a cost-effective and environmentally sound manner to minimize their economic, ecological, and human health implications; and to provide for restoration of native species and habitat conditions in ecosystems that have been invaded.

Compliance: Combatting invasive species has been identified as a priority coastal management issue facing the proposed He'eia NERR, according to the FMP. Reserve partners have been working to reduce populations of several invasive species, including California grass around He'eia Stream, mangroves near the mouth of He'eia Stream and around the edge of He'eia Fishpond, and invasive seaweed and weeds in and along He'eia Fishpond. According to the FMP, upland reforestation efforts by Kāko'o 'Ōiwi on the HCDA parcel will result in removal of some invasive plant species, but allow for selected non-native plants to remain (particularly species that provide key forest structural attributes or important ecosystem services). Neither OCM, nor anticipated He'eia NERR partners, are proposing introducing any invasive species within the reserve. (The urchins being added to Kāne'ohe Bay are a native species.) Reserve partners are already in the process of educating students and other visitors about invasive species, and these activities will continue whether or not a reserve is designated.

Reserve partners are very aware of risks associated with invasive species and how to combat their spread. One of the restoration objectives identified under the FMP, Objective 10(g), is to “provide technical assistance and support for the removal of invasive species and the establishment native plant communities within the He'eia stream buffer and stream channels.” Implementation of the proposed He'eia NERR's FMP could enhance efforts to remove invasive species and educate the community about their impacts. In addition, as part of providing technical assistance to NOAA under ESA, the USFWS provided a list of recommended invasive species minimization measures in June 2016. OCM will pass these recommendations along to its partners in Hawai'i. In addition, the State of Hawai'i has a number of regulations and policies related to combatting non-native species whose introduction causes (or is likely to cause) economic or environmental harm or harm to human health. See <http://dlnr.hawaii.gov/hisc/info/policy> for more information. State invasive species control mandates, along with Executive Order 13112, also direct agencies and others to do their best to avoid the introduction of invasive species through any Reserve-supported activities.

In short, the proposed action complies with this Executive Order.

7.14 EXECUTIVE ORDER 13158 — MARINE PROTECTED AREAS

Executive Order 13158 promotes strengthening the management, protection, and conservation of existing marine protected areas (MPAs), establishing new or expanded MPAs, and development of a national system of MPAs representing diverse marine ecosystems and their natural and cultural resources. The Executive Order defines MPAs to mean any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein. It directs the Department of Commerce and the Department of the Interior, in consultation with certain other federal departments, USEPA, and the National Science Foundation, to develop a

national system of MPAs. The Executive Order also requires that each federal agency whose authorities provide for the establishment or management of MPAs take appropriate actions to enhance or expand protection of existing MPAs and establish or recommend, as appropriate, new MPAs. It also requires federal agencies whose actions may affect the natural or cultural resources within MPAs to identify such actions and avoid harming those resources.

Compliance: If designated, the proposed He'eia NERR would meet the definition of an MPA. Establishment of a He'eia NERR would be consistent with this Executive Order because it would establish a new MPA and seek to avoid actions harming natural or cultural resources within reserve boundaries. Some of the other reserves that are part of the NERRS have joined the National Network of Marine Protected Areas; this would be an option that could be considered after designation. There would also be an MPA within the proposed reserve: the Hawai'i Marine Laboratory Refuge. The protections afforded to that refuge have been discussed above. Establishment of the proposed He'eia NERR could also strengthen the management of Hawai'i Marine Laboratory Refuge by providing additional partners interested in its protection.

7.15 EXECUTIVE ORDER 13175 — CONSULTATION AND COORDINATION WITH INDIAN TRIBAL GOVERNMENTS

Executive Order 13175 requires each federal agency to establish procedures for meaningful consultation and coordination with tribal officials in the development of federal policies that have implications for federally recognized tribes. The DOC subsequently issued a Tribal Consultation and Coordination Policy and a Departmental Administrative Order (DAO 218-8). Procedures outlined in the "NOAA Procedures for Government-to-Government Consultation with Federally Recognized Indian Tribes and Alaska Natives" (also known as the NOAA Tribal Consultation Handbook) provide guidance to NOAA to support a consistent, effective, and proactive approach to conducting tribal consultations.

Compliance: The proposed He'eia NERR would not be expected to have any tribal implications because there are no federally recognized tribes in Hawai'i (see 80 Fed. Reg. 1942). Thus, Executive Order 13175, the Department of Commerce Tribal Policy, and the NOAA Administrative Order on Tribal Consultation do not apply. NOAA is engaging Native Hawaiian Organizations under the framework of the NHPA, as discussed above.

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Appendix A. NERRS Regulations

SUBCHAPTER B—OCEAN AND COASTAL RESOURCE MANAGEMENT

PART 921—NATIONAL ESTUARINE RESEARCH RESERVE SYSTEM REG- ULATIONS

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APPENDIX I TO PART 921—BIOGEOGRAPHIC CLASSIFICATION SCHEME

APPENDIX II TO PART 921—TYPOLOGY OF NATIONAL ESTUARINE RESEARCH RESERVES

AUTHORITY: Section 315 of the Coastal Zone Management Act, as amended (16 U.S.C. 1461).

SOURCE: 58 FR 38215, July 15, 1993, unless otherwise noted.

Subpart A—General

- §921.1 Mission, goals and general provisions.

(a) The mission of the National Estuarine Research Reserve Program is the establishment and management, through Federal-state cooperation, of a national system (National Estuarine Research Reserve System or System) of estuarine research reserves (National Estuarine Research Reserves or Reserves) representative of the various regions and estuarine types in the United States. National Estuarine Research Reserves are established to provide opportunities for long-term research, education, and interpretation.

(b) The goals of the Program are to:

(1) Ensure a stable environment for research through long-term protection of National Estuarine Research Reserve resources;

(2) Address coastal management issues identified as significant through coordinated estuarine research within the System;

(3) Enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation;

(4) Promote Federal, state, public and private use of one or more Reserves within the System when such entities conduct estuarine research; and

(5) Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

(c) National Estuarine Research Reserves shall be open to the public to the extent permitted under state and Federal law. Multiple uses are allowed to the degree compatible with each Reserve's overall purpose as provided in the management plan (see §921.13) and consistent with paragraphs (a) and (b) of this section. Use levels are set by the state where the Reserve is located and analyzed in the management plan. The Reserve management plan shall describe the uses and establish priorities among these uses. The plan shall identify uses requiring a state permit, as well as areas where uses are encouraged or prohibited. Consistent with resource protection and research objectives, public access and use may be restricted to certain areas or components within a Reserve.

(d) Habitat manipulation for research purposes is allowed consistent with the following limitations. Manipulative research activities must be specified in the management plan, be consistent with the mission and goals of the program (see paragraphs (a) and (b) of this section) and the goals and objectives set forth in the Reserve's management plan, and be limited in nature and extent to the minimum manipulative activity necessary to accomplish the stated research objective. Manipulative research activities with a significant or long-term impact on Reserve resources require the prior approval of the state and the National Oceanic and Atmospheric Administration (NOAA). Manipulative research activities which can reasonably be expected to have a significant adverse impact on the estuarine resources and habitat of a Reserve, such that the activities themselves or their resulting short- and

long-term consequences compromise the representative character and integrity of a Reserve, are prohibited. Habitat manipulation for resource management purposes is prohibited except as specifically approved by NOAA as: (1) A restoration activity consistent with paragraph (e) of this section; or (2) an activity necessary for the protection of public health or the preservation of other sensitive resources which have been listed or are eligible for protection under relevant Federal or state authority (e.g., threatened/endangered species or significant historical or cultural resources) or if the manipulative activity is a long-term pre-existing use (i.e., has occurred prior to designation) occurring in a buffer area. If habitat manipulation is determined to be necessary for the protection of public health, the preservation of sensitive resources, or if the manipulation is a long-term pre-existing use in a buffer area, then these activities shall be specified in the Reserve management plan in accordance with §921.13(a)(10) and shall be limited to the reasonable alternative which has the least adverse and shortest term impact on the representative and ecological integrity of the Reserve.

(e) Under the Act an area may be designated as an estuarine Reserve only if the area is a representative estuarine ecosystem that is suitable for long-term research. Many estuarine areas have undergone some ecological change as a result of human activities (e.g., hydrological changes, intentional/unintentional species composition changes—introduced and exotic species). In those areas proposed or designated as National Estuarine Research Reserves, such changes may have diminished the representative character and integrity of the site. Although restoration of degraded areas is not a primary purpose of the System, such activities may be permitted to improve the representative character and integrity of a Reserve. Restoration activities must be carefully planned and approved by NOAA through the Reserve management plan. Historical research may be necessary to determine the “natural” representative state of an estuarine area (i.e., an estuarine ecosystem minimally affected by

human activity or influence). Frequently, restoration of a degraded estuarine area will provide an excellent opportunity for management oriented research.

(f) NOAA may provide financial assistance to coastal states, not to exceed, per Reserve, 50 percent of all actual costs or \$5 million whichever amount is less, to assist in the acquisition of land and waters, or interests therein. NOAA may provide financial assistance to coastal states not to exceed 70 percent of all actual costs for the management and operation of, the development and construction of facilities, and the conduct of educational or interpretive activities concerning Reserves (see subpart I). NOAA may provide financial assistance to any coastal state or public or private person, not to exceed 70 percent of all actual costs, to support research and monitoring within a Reserve. Notwithstanding any financial assistance limits established by this Part, when financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, such assistance may be used to pay 100 percent of all actual costs of activities carried out with this assistance, as long as such funds are available. Predesignation, acquisition and development awards are intended primarily for acquisition of interests in land, facility construction and to develop and/or upgrade research, monitoring and education programs. Operation and management awards provide funds to assist in implementing, operating and managing the administrative, and basic research, monitoring and education programs, outlined in the Reserve management plan. Special research and monitoring awards provide funds to conduct estuarine research and monitoring projects with the System. Special educational and interpretive awards provide funds to conduct estuarine educational and

interpretive projects within the System.

(g) Lands already in protected status managed by other Federal agencies, state or local governments, or private organizations may be included within National Estuarine Research Reserves only if the managing entity commits to long-term management consistent with paragraphs (d) and (e) of this section in the Reserve management plan. Federal lands already in protected status may not comprise a majority of the key land and water areas of a Reserve (see § 921.11(c)(3)).

(h) To assist the states in carrying out the Program's goals in an effective manner, NOAA will coordinate a research and education information exchange throughout the National Estuarine Research Reserve System. As part of this role, NOAA will ensure that information and ideas from one Reserve are made available to others in the System. The network will enable Reserves to exchange information and research data with each other, with universities engaged in estuarine research, and with Federal, state, and local agencies. NOAA's objective is a system-wide program of research and monitoring capable of addressing the management issues that affect long-term productivity of our Nation's estuaries.

[58 FR 38215, July 15, 1993, as amended at 62 FR 12540, Mar. 17, 1997; 63 FR 26717, May 14, 1998]

§ 921.2 Definitions.

(a) Act means the Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451 et seq.

(b) Assistant Administrator means the Assistant Administrator for Ocean Services and Coastal Zone Management or delegee.

(c) Coastal state means a state of the United States, in or bordering on, the Atlantic, Pacific, or Arctic Ocean, the Gulf of Mexico, Long Island Sound, or one or more of the Great Lakes. For the purposes of these regulations the term also includes Puerto Rico, the Virgin Islands, Guam, the Commonwealth of the Northern Mariana Islands, the Trust Territories of the Pacific Islands, and American Samoa (see 16 U.S.C. 1453(4)).

(d) State agency means an instrumentality of a coastal state to whom the coastal state has delegated the authority and responsibility for the creation and/or management/operation of a National Estuarine Research Reserve. Factors indicative of this authority may include the power to receive and expend funds on behalf of the Reserve, acquire and sell or convey real and personal property interests, adopt rules for the protection of the Reserve, enforce rules applicable to the Reserve, or develop and implement research and education programs for the reserve. For the purposes of these regulations, the terms “coastal state” and “State agency” shall be synonymous.

(e) Estuary means that part of a river or stream or other body of water having unimpaired connection with the open sea, where the sea water is measurably diluted with fresh water derived from land drainage. The term also includes estuary-type areas with measurable freshwater influence and having unimpaired connections with the open sea, and estuary-type areas of the Great Lakes and their connecting waters (see 16 U.S.C. 1453(7)).

(f) National Estuarine Research Reserve means an area that is a representative estuarine ecosystem suitable for long-term research, which may include all of the key land and water portion of an estuary, and adjacent transitional areas and uplands constituting to the extent feasible a natural unit, and which is set aside as a natural field laboratory to provide long-term opportunities for research, education, and interpretation on the ecological relationships within the area (see 16 U.S.C. 1453(8)) and meets the requirements of 16 U.S.C. 1461(b). This includes those areas designated as National Estuarine Sanctuaries or Reserves under section 315 of the Act prior to enactment of the Coastal Zone Act Reauthorization Amendments of 1990 and each area subsequently designated as a National Estuarine Research Reserve.

§921.3 National Estuarine Research Reserve System biogeographic classification scheme and estuarine typologies.

(a) National Estuarine Research Reserves are chosen to reflect regional

differences and to include a variety of ecosystem types. A biogeographic classification scheme based on regional variations in the nation’s coastal zone has been developed. The biogeographic classification scheme is used to ensure that the National Estuarine Research Reserve System includes at least one site from each region. The estuarine typology system is utilized to ensure that sites in the System reflect the wide range of estuarine types within the United States.

(b) The biogeographic classification scheme, presented in appendix I, contains 29 regions. Figure 1 graphically depicts the biogeographic regions of the United States.

(c) The typology system is presented in appendix II.

§921.4 Relationship to other provisions of the Coastal Zone Management Act, and to the Marine Protection, Research and Sanctuaries Act.

(a) The National Estuarine Research Reserve System is intended to provide information to state agencies and other entities involved in addressing coastal management issues. Any coastal state, including those that do not have approved coastal management programs under section 306 of the Act, is eligible for an award under the National Estuarine Research Reserve Program (see §921.2(c)).

(b) For purposes of consistency review by states with a federally approved coastal management program, the designation of a National Estuarine Research Reserve is deemed to be a Federal activity, which, if directly affecting the state’s coastal zone, must be undertaken in a manner consistent to the maximum extent practicable with the approved state coastal management program as provided by section 1456(c)(1) of the Act, and implementing regulations at 15 CFR part 930, subpart C. In accordance with section 1456(c)(1) of the Act and the applicable regulations NOAA will be responsible for certifying that designation of the Reserve is consistent with the state’s approved coastal management program. The state must concur with or object to the certification. It is recommended that the lead state agency for Reserve designation consult, at the

earliest practicable time, with the appropriate state officials concerning the consistency of a proposed National Estuarine Research Reserve.

(c) The National Estuarine Research Reserve Program will be administered in close coordination with the National Marine Sanctuary Program (Title III of the Marine Protection, Research and Sanctuaries Act, as amended, 16 U.S.C. 1431–1445), also administered by NOAA. Title III authorizes the Secretary of Commerce to designate discrete areas of the marine environment as National Marine Sanctuaries to protect or restore such areas for their conservation, recreational, ecological, historical, research, educational or esthetic values. National Marine Sanctuaries and Estuarine Research Reserves may not overlap, but may be adjacent.

Subpart B—Site Selection, Post Site Selection and Management Plan Development

§ 921.10 General.

(a) A coastal state may apply for Federal financial assistance for the purpose of site selection, preparation of documents specified in § 921.13 (draft management plan (DMP) and environmental impact statement (EIS)), and the conduct of limited basic characterization studies. The total Federal share of this assistance may not exceed \$100,000. Federal financial assistance for preacquisition activities under § 921.11 and § 921.12 is subject to the total \$5 million for which each Reserve is eligible for land acquisition. Notwithstanding the above, when financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, such assistance may be used to pay 100 percent of all actual costs of activities carried out with this assistance, as long as such funds are available. In the case of a biogeographic region (see appendix I) shared by two or more coastal states, each state is eligible for Federal financial assistance to establish a separate National Estuarine Research Reserve within their respective portion of the shared biogeographic region. Each separate National Estuarine Research Reserve is eligible for the full complement of

funding. Financial assistance application procedures are specified in subpart I.

(b) In developing a Reserve program, a state may choose to develop a multiple-site Reserve reflecting a diversity of habitats in a single biogeographic region. A multiple-site Reserve allows the state to develop complementary research and educational programs within the individual components of its multi-site Reserve. Multiple-site Reserves are treated as one Reserve in terms of financial assistance and development of an overall management framework and plan. Each individual site of a proposed multiple-site Reserve shall be evaluated both separately under § 921.11(c) and collectively as part of the site selection process. A coastal state may propose to establish a multiple-site Reserve at the time of the initial site selection, or at any point in the development or operation of the Reserve. If the state decides to develop a multiple-site National Estuarine Research Reserve after the initial acquisition and development award is made for a single site, the proposal is subject to the requirements set forth in § 921.33(b). However, a state may not propose to add one or more sites to an already designated Reserve if the operation and management of such Reserve has been found deficient and uncorrected or the research conducted is not consistent with the Estuarine Research Guidelines referenced in § 921.51. In addition, Federal funds for the acquisition of a multiple-site Reserve remain limited to \$5,000,000 (see § 921.20). The funding for operation of a multiple-site Reserve is limited to the maximum allowed for any one Reserve per year (see § 921.32(c)) and preacquisition funds are limited to \$100,000 per Reserve. Notwithstanding the above, when financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, such assistance may be used to pay 100 percent of all actual costs of activities carried out with this assistance, as long as such funds are available.

[58 FR 38215, July 15, 1993, as amended at 63 FR 26717, May 14, 1998]

§921.11 Site selection and feasibility.

(a) A coastal state may use Federal funds to establish and implement a site selection process which is approved by NOAA.

(b) In addition to the requirements set forth in subpart I, a request for Federal funds for site selection must contain the following programmatic information:

(1) A description of the proposed site selection process and how it will be implemented in conformance with the biogeographic classification scheme and typology (§921.3);

(2) An identification of the site selection agency and the potential management agency; and

(3) A description of how public participation will be incorporated into the process (see §921.11(d)).

(c) As part of the site selection process, the state and NOAA shall evaluate and select the final site(s). NOAA has final authority in approving such sites. Site selection shall be guided by the following principles:

(1) The site's contribution to the biogeographical and typological balance of the National Estuarine Research Reserve System. NOAA will give priority consideration to proposals to establish Reserves in biogeographic regions or subregions or incorporating types that are not represented in the system. (see the biogeographic classification scheme and typology set forth in §921.3 and appendices I and II);

(2) The site's ecological characteristics, including its biological productivity, diversity of flora and fauna, and capacity to attract a broad range of research and educational interests. The proposed site must be a representative estuarine ecosystem and should, to the maximum extent possible, be an estuarine ecosystem minimally affected by human activity or influence (see §921.1(e)).

(3) Assurance that the site's boundaries encompass an adequate portion of the key land and water areas of the natural system to approximate an ecological unit and to ensure effective conservation. Boundary size will vary greatly depending on the nature of the ecosystem. Reserve boundaries must encompass the area within which adequate control has or will be established

by the managing entity over human activities occurring within the Reserve. Generally, Reserve boundaries will encompass two areas: Key land and water areas (or "core area") and a buffer zone. Key land and water areas and a buffer zone will likely require significantly different levels of control (see §921.13(a)(7)). The term "key land and water areas" refers to that core area within the Reserve that is so vital to the functioning of the estuarine ecosystem that it must be under a level of control sufficient to ensure the long-term viability of the Reserve for research on natural processes. Key land and water areas, which comprise the core area, are those ecological units of a natural estuarine system which preserve, for research purposes, a full range of significant physical, chemical and biological factors contributing to the diversity of fauna, flora and natural processes occurring within the estuary. The determination of which land and water areas are "key" to a particular Reserve must be based on specific scientific knowledge of the area. A basic principle to follow when deciding upon key land and water areas is that they should encompass resources representative of the total ecosystem, and which if compromised could endanger the research objectives of the Reserve. The term buffer zone refers to an area adjacent to or surrounding key land and water areas and essential to their integrity. Buffer zones protect the core area and provide additional protection for estuarine-dependent species, including those that are rare or endangered. When determined appropriate by the state and approved by NOAA, the buffer zone may also include an area necessary for facilities required for research and interpretation. Additionally, buffer zones should be established sufficient to accommodate a shift of the core area as a result of biological, ecological or geomorphological change which reasonably could be expected to occur. National Estuarine Research Reserves may include existing Federal or state lands already in a protected status where mutual benefit can be enhanced. However, NOAA will not approve a site

for potential National Estuarine Research Reserve status that is dependent primarily upon the inclusion of currently protected Federal lands in order to meet the requirements for Reserve status (such as key land and water areas). Such lands generally will be included within a Reserve to serve as a buffer or for other ancillary purposes; and may be included, subject to NOAA approval, as a limited portion of the core area;

(4) The site's suitability for long-term estuarine research, including ecological factors and proximity to existing research facilities and educational institutions;

(5) The site's compatibility with existing and potential land and water uses in contiguous areas as well as approved coastal and estuarine management plans; and

(6) The site's importance to education and interpretive efforts, consistent with the need for continued protection of the natural system.

(d) Early in the site selection process the state must seek the views of affected landowners, local governments, other state and Federal agencies and other parties who are interested in the area(s) being considered for selection as a potential National Estuarine Research Reserve. After the local government(s) and affected landowner(s) have been contacted, at least one public meeting shall be held in the vicinity of the proposed site. Notice of such a meeting, including the time, place, and relevant subject matter, shall be announced by the state through the area's principal newspaper at least 15 days prior to the date of the meeting and by NOAA in the FEDERAL REGISTER.

(e) A state request for NOAA approval of a proposed site (or sites in the case of a multi-site Reserve) must contain a description of the proposed site(s) in relationship to each of the site selection principals (§921.11(c)) and the following information:

(1) An analysis of the proposed site(s) based on the biogeographical scheme/typology discussed in §921.3 and set forth in appendices I and II;

(2) A description of the proposed site(s) and its (their) major resources, including location, proposed bound-

aries, and adjacent land uses. Maps are required;

(3) A description of the public participation process used by the state to solicit the views of interested parties, a summary of comments, and, if interstate issues are involved, documentation that the Governor(s) of the other affected state(s) has been contacted. Copies of all correspondence, including contact letters to all affected landowners must be appended;

(4) A list of all sites considered and a brief statement of the reasons why a site was not preferred; and

(5) A nomination of the proposed site(s) for designation as a National Estuarine Research Reserve by the Governor of the coastal state in which the state is located.

(f) A state proposing to reactivate an inactive site, previously approved by NOAA for development as an Estuarine Sanctuary or Reserve, may apply for those funds remaining, if any, provided for site selection and feasibility (§921.11a)) to determine the feasibility of reactivation. This feasibility study must comply with the requirements set forth in §921.11 (c) through (e).

§921.12 Post site selection.

(a) At the time of the coastal state's request for NOAA approval of a proposed site, the state may submit a request for funds to develop the draft management plan and for preparation of the EIS. At this time, the state may also submit a request for the remainder of the predesignation funds to perform a limited basic characterization of the physical, chemical and biological characteristics of the site approved by NOAA necessary for providing EIS information to NOAA. The state's request for these post site selection funds must be accompanied by the information specified in subpart I and, for draft management plan development and EIS information collection, the following programmatic information:

(1) A draft management plan outline (see §921.13(a) below); and

(2) An outline of a draft memorandum of understanding (MOU) between the state and NOAA detailing the Federal-state role in Reserve management during the initial period of Federal funding and expressing the

state's long-term commitment to operate and manage the Reserve.

(b) The state is eligible to use the funds referenced in §921.12(a) after the proposed site is approved by NOAA under the terms of §921.11.

§921.13 Management plan and environmental impact statement development.

(a) After NOAA approves the state's proposed site and application for funds submitted pursuant to §921.12, the state may begin draft management plan development and the collection of information necessary for the preparation by NOAA of an EIS. The state shall develop a draft management plan, including an MOU. The plan shall set out in detail:

(1) Reserve goals and objectives, management issues, and strategies or actions for meeting the goals and objectives;

(2) An administrative plan including staff roles in administration, research, education/interpretation, and surveillance and enforcement;

(3) A research plan, including a monitoring design;

(4) An education/interpretive plan;

(5) A plan for public access to the Reserve;

(6) A construction plan, including a proposed construction schedule, general descriptions of proposed developments and general cost estimates. Information should be provided for proposed minor construction projects in sufficient detail to allow these projects to begin in the initial phase of acquisition and development. A categorical exclusion, environmental assessment, or EIS may be required prior to construction;

(7)(i) An acquisition plan identifying the ecologically key land and water areas of the Reserve, ranking these areas according to their relative importance, and including a strategy for establishing adequate long-term state control over these areas sufficient to provide protection for Reserve resources to ensure a stable environment for research. This plan must include an identification of ownership within the proposed Reserve boundaries, including land already in the public domain; the method(s) of acquisition which the

state proposes to use—acquisition (including less-than-fee simple options) to establish adequate long-term state control; an estimate of the fair market value of any property interest—which is proposed for acquisition; a schedule estimating the time required to complete the process of establishing adequate state control of the proposed research reserve; and a discussion of any anticipated problems. In selecting a preferred method(s) for establishing adequate state control over areas within the proposed boundaries of the Reserve, the state shall perform the following steps for each parcel determined to be part of the key land and water areas (control over which is necessary to protect the integrity of the Reserve for research purposes), and for those parcels required for research and interpretive support facilities or buffer purposes:

(A) Determine, with appropriate justification, the minimum level of control(s) required [e.g., management agreement, regulation, less-than-fee simple property interest (e.g., conservation easement), fee simple property acquisition, or a combination of these approaches]. This does not preclude the future necessity of increasing the level of state control;

(B) Identify the level of existing state control(s);

(C) Identify the level of additional state control(s), if any, necessary to meet the minimum requirements identified in paragraph (a)(7)(i)(A) of this section;

(D) Examine all reasonable alternatives for attaining the level of control identified in paragraph (a)(7)(i)(C) of this section, and perform a cost analysis of each; and

(E) Rank, in order of cost, the methods (including acquisition) identified in paragraph (a)(7)(i)(D) of this section.

(ii) An assessment of the relative cost-effectiveness of control alternatives shall include a reasonable estimate of both short-term costs (e.g., acquisition of property interests, regulatory program development including associated enforcement costs, negotiation, adjudication, etc.) and long-term costs (e.g., monitoring, enforcement,

adjudication, management and coordination). In selecting a preferred method(s) for establishing adequate state control over each parcel examined under the process described above, the state shall give priority consideration to the least costly method(s) of attaining the minimum level of long-term control required. Generally, with the possible exception of buffer areas required for support facilities, the level of control(s) required for buffer areas will be considerably less than that required for key land and water areas. This acquisition plan, after receiving the approval of NOAA, shall serve as a guide for negotiations with landowners. A final boundary for the reserve shall be delineated as a part of the final management plan;

(8) A resource protection plan detailing applicable authorities, including allowable uses, uses requiring a permit and permit requirements, any restrictions on use of the research reserve, and a strategy for research reserve surveillance and enforcement of such use restrictions, including appropriate government enforcement agencies;

(9) If applicable, a restoration plan describing those portions of the site that may require habitat modification to restore natural conditions;

(10) If applicable, a resource manipulation plan, describing those portions of the Reserve buffer in which long-term pre-existing (prior to designation) manipulation for reasons not related to research or restoration is occurring. The plan shall explain in detail the nature of such activities, shall justify why such manipulation should be permitted to continue within the reserve buffer; and shall describe possible effects of this manipulation on key land and water areas and their resources;

(11) A proposed memorandum of understanding (MOU) between the state and NOAA regarding the Federal-state relationship during the establishment and development of the National Estuarine Research Reserve, and expressing a long-term commitment by the state to maintain and manage the Reserve in accordance with section 315 of the Act, 16 U.S.C. 1461, and applicable regulations. In conjunction with the MOU, and where possible under state law, the state will consider taking appropriate

administrative or legislative action to ensure the long-term protection and operation of the National Estuarine Research Reserve. If other MOUs are necessary (such as with a Federal agency, another state agency or private organization), drafts of such MOUs must be included in the plan. All necessary MOU's shall be signed prior to Reserve designation; and

(12) If the state has a federally approved coastal management program, a certification that the National Estuarine Research Reserve is consistent to the maximum extent practicable with that program. See §§921.4(b) and 921.30(b).

(b) Regarding the preparation of an EIS under the National Environmental Policy Act on a National Estuarine Research Reserve proposal, the state and NOAA shall collect all necessary information concerning the socioeconomic and environmental impacts associated with implementing the draft management plan and feasible alternatives to the plan. Based on this information, the state will draft and provide NOAA with a preliminary EIS.

(c) Early in the development of the draft management plan and the draft EIS, the state and NOAA shall hold a scoping meeting (pursuant to NEPA) in the area or areas most affected to solicit public and government comments on the significant issues related to the proposed action. NOAA will publish a notice of the meeting in the FEDERAL REGISTER at least 15 days prior to the meeting. The state shall be responsible for publishing a similar notice in the local media.

(d) NOAA will publish a FEDERAL REGISTER notice of intent to prepare a draft EIS. After the draft EIS is prepared and filed with the Environmental Protection Agency (EPA), a Notice of Availability of the draft EIS will appear in the FEDERAL REGISTER. Not less than 30 days after publication of the notice, NOAA will hold at least one public hearing in the area or areas most affected by the proposed national estuarine research reserve. The hearing will be held no sooner than 15 days after appropriate notice of the meeting has been given in the principal news media by the state and in the FEDERAL REGISTER by NOAA. After a 45-day

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comment period, a final EIS will be prepared by the state and NOAA.

Subpart C—Acquisition, Development and Preparation of the Final Management Plan

§921.20 General.

The acquisition and development period is separated into two major phases. After NOAA approval of the site, draft management plan and draft MOU, and completion of the final EIS, a coastal state is eligible for an initial acquisition and development award(s). In this initial phase, the state should work to meet the criteria required for formal research reserve designation; e.g., establishing adequate state control over the key land and water areas as specified in the draft management plan and preparing the final management plan. These requirements are specified in §921.30. Minor construction in accordance with the draft management plan may also be conducted during this initial phase. The initial acquisition and development phase is expected to last no longer than three years. If necessary, a longer time period may be negotiated between the state and NOAA. After Reserve designation, a state is eligible for a supplemental acquisition and development award(s) in accordance with §921.31. In this post-designation acquisition and development phase, funds may be used in accordance with the final management plan to construct research and educational facilities, complete any remaining land acquisition, for program development, and for restorative activities identified in the final management plan. In any case, the amount of Federal financial assistance provided to a coastal state with respect to the acquisition of lands and waters, or interests therein, for any one National Estuarine Research Reserve may not exceed an amount equal to 50 percent of the costs of the lands, waters, and interests therein or \$5,000,000, whichever amount is less, except when the financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, in which case the assistance may be used to pay 100 percent of all actual costs of activities carried out

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with this assistance, as long as such funds are available.

[58 FR 38215, July 15, 1993, as amended at 62 FR 12540, Mar. 17, 1997; 63 FR 26717, May 14, 1998]

§921.21 Initial acquisition and development awards.

(a) Assistance is provided to aid the recipient prior to designation in:

(1) Acquiring a fee simple or less-than-fee simple real property interest in land and water areas to be included in the Reserve boundaries (see §921.13(a)(7); §921.30(d));

(2) Minor construction, as provided in paragraphs (b) and (c) of this section;

(3) Preparing the final management plan; and

(4) Initial management costs, e.g., for implementing the NOAA approved draft management plan, hiring a Reserve manager and other staff as necessary and for other management-related activities. Application procedures are specified in subpart I.

(b) The expenditure of Federal and state funds on major construction activities is not allowed during the initial acquisition and development phase. The preparation of architectural and engineering plans, including specifications, for any proposed construction, or for proposed restorative activities, is permitted. In addition, minor construction activities, consistent with paragraph (c) of this section also are allowed. The NOAA-approved draft management plan must, however, include a construction plan and a public access plan before any award funds can be spent on construction activities.

(c) Only minor construction activities that aid in implementing portions of the management plan (such as boat ramps and nature trails) are permitted during the initial acquisition and development phase. No more than five (5) percent of the initial acquisition and development award may be expended on such activities. NOAA must make a specific determination, based on the final EIS, that the construction activity will not be detrimental to the environment.

(d) Except as specifically provided in paragraphs (a) through (c) of this section, construction projects, to be funded in whole or in part under an acquisition and development award(s), may not be initiated until the Reserve receives formal designation (see §921.30). This requirement has been adopted to ensure that substantial progress in establishing adequate state control over key land and water areas has been made and that a final management plan is completed before major sums are spent on construction. Once substantial progress in establishing adequate state control/acquisition has been made, as defined by the state in the management plan, other activities guided by the final management plan may begin with NOAA's approval.

(e) For any real property acquired in whole or part with Federal funds for the Reserve, the state shall execute suitable title documents to include substantially the following provisions, or otherwise append the following provisions in a manner acceptable under applicable state law to the official land record(s):

(1) Title to the property conveyed by this deed shall vest in the [recipient of the award granted pursuant to section 315 of the Act, 16 U.S.C. 1461 or other NOAA approved state agency] subject to the condition that the designation of the [name of National Estuarine Reserve] is not withdrawn and the property remains part of the federally designated [name of National Estuarine Research Reserve]; and

(2) In the event that the property is no longer included as part of the Reserve, or if the designation of the Reserve of which it is part is withdrawn, then NOAA or its successor agency, after full and reasonable consultation with the State, may exercise the following rights regarding the disposition of the property:

(i) The recipient may retain title after paying the Federal Government an amount computed by applying the Federal percentage of participation in the cost of the original project to the current fair market value of the property;

(ii) If the recipient does not elect to retain title, the Federal Government may either direct the recipient to sell

the property and pay the Federal Government an amount computed by applying the Federal percentage of participation in the cost of the original project to the proceeds from the sale (after deducting actual and reasonable selling and repair or renovation expenses, if any, from the sale proceeds), or direct the recipient to transfer title to the Federal Government. If directed to transfer title to the Federal Government, the recipient shall be entitled to compensation computed by applying the recipient's percentage of participation in the cost of the original project to the current fair market value of the property; and

(iii) Fair market value of the property must be determined by an independent appraiser and certified by a responsible official of the state, as provided by Department of Commerce regulations at 15 CFR part 24, and Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally assisted programs at 15 CFR part 11.

(f) Upon instruction by NOAA, provisions analogous to those of §921.21(e) shall be included in the documentation underlying less-then-fee-simple interests acquired in whole or part with Federal funds.

(g) Federal funds or non-Federal matching share funds shall not be spent to acquire a real property interest in which the state will own the land concurrently with another entity unless the property interest has been identified as a part of an acquisition strategy pursuant to §921.13(7) which has been approved by NOAA prior to the effective date of these regulations.

(h) Prior to submitting the final management plan to NOAA for review and approval, the state shall hold a public meeting to receive comment on the plan in the area affected by the estuarine research reserve. NOAA will publish a notice of the meeting in the FEDERAL REGISTER at least 15 days prior to the public meeting. The state shall be responsible for having a similar notice published in the local newspaper(s).

Subpart D—Reserve Designation and Subsequent Operation

§ 921.30 Designation of National Estuarine Research Reserves.

(a) The Under Secretary may designate an area proposed for designation by the Governor of the state in which it is located, as a National Estuarine Research Reserve if the Under Secretary finds:

(1) The area is a representative estuarine ecosystem that is suitable for long-term research and contributes to the biogeographical and typological balance of the System;

(2) Key land and water areas of the proposed Reserve, as identified in the management plan, are under adequate state control sufficient to provide long-term protection for reserve resources to ensure a stable environment for research;

(3) Designation of the area as a Reserve will serve to enhance public awareness and understanding of estuarine areas, and provide suitable opportunities for public education and interpretation;

(4) A final management plan has been approved by NOAA;

(5) An MOU has been signed between the state and NOAA ensuring a long-term commitment by the state to the effective operation and implementation of the area as a National Estuarine Research Reserve;

(6) All MOU's necessary for reserve management (i.e., with relevant Federal, state, and local agencies and/or private organizations) have been signed; and

(7) The coastal state in which the area is located has complied with the requirements of subpart B.

(b) NOAA will determine whether the designation of a National Estuarine Research Reserve in a state with a federally approved coastal zone management program directly affects the coastal zone. If the designation is found to directly affect the coastal zone, NOAA will make a consistency determination pursuant to § 307(c)(1) of the Act, 16 U.S.C. 1456, and 15 CFR part 930, subpart C. See § 921.4(b). The results of this consistency determination will be published in the FEDERAL REG-

ISTER when the notice of designation is published. See § 921.30(c).

(c) NOAA will publish the notice of designation of a National Estuarine Research Reserve in the FEDERAL REGISTER. The state shall be responsible for having a similar notice published in the local media.

(d) The term state control in § 921.30(a)(3) does not necessarily require that key land and water areas be owned by the state in fee simple. Acquisition of less-than-fee simple interests e.g., conservation easements) and utilization of existing state regulatory measures are encouraged where the state can demonstrate that these interests and measures assure adequate long-term state control consistent with the purposes of the research reserve (see also §§ 921.13(a)(7); 921.21(g)). Should the state later elect to purchase an interest in such lands using NOAA funds, adequate justification as to the need for such acquisition must be provided to NOAA.

§ 921.31 Supplemental acquisition and development awards.

After National Estuarine Research Reserve designation, and as specified in the approved management plan, a coastal state may request a supplemental acquisition and/or development award(s) for acquiring additional property interests identified in the management plan as necessary to strengthen protection of key land and water areas and to enhance long-term protection of the area for research and education, for facility and exhibit construction, for restorative activities identified in the approved management plan, for administrative purposes related to acquisition and/or facility construction and to develop and/or upgrade research, monitoring and education/interpretive programs. Federal financial assistance provided to a National Estuarine Research Reserve for supplemental development costs directly associated with facility construction (i.e., major construction activities) may not exceed 70 percent of the total project cost, except when the financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, in which case the assistance may be used to pay 100

percent of the costs. NOAA must make a specific determination that the construction activity will not be detrimental to the environment. Acquisition awards for the acquisition of lands or waters, or interests therein, for any one reserve may not exceed an amount equal to 50 percent of the costs of the lands, waters, and interests therein of \$5,000,000, whichever amount is less, except when the financial assistance is provided from amounts recovered as result of damage to natural resources located in the coastal zone, in which case the assistance may be used to pay 100 percent of all actual costs of activities carried out with this assistance, as long as such funds are available. In the case of a biogeographic region (see appendix I) shared by two or more states, each state is eligible independently for Federal financial assistance to establish a separate National Estuarine Research Reserve within their respective portion of the shared biogeographic region. Application procedures are specified in subpart I. Land acquisition must follow the procedures specified in §§921.13(a)(7), 921.21(e) and (f) and 921.81.

[58 FR 38215, July 15, 1993, as amended at 62 FR 12540, Mar. 17, 1997; 63 FR 26717, May 14, 1998]

§921.32 Operation and management: Implementation of the management plan.

(a) After the Reserve is formally designated, a coastal state is eligible to receive Federal funds to assist the state in the operation and management of the Reserve including the management of research, monitoring, education, and interpretive programs. The purpose of this Federally funded operation and management phase is to implement the approved final management plan and to take the necessary steps to ensure the continued effective operation of the Reserve.

(b) State operation and management of the Reserves shall be consistent with the mission, and shall further the goals of the National Estuarine Research Reserve program (see §921.1).

(c) Federal funds are available for the operation and management of the Reserve. Federal funds provided pursuant to this section may not exceed 70 percent of the total cost of operating and

managing the Reserve for any one year, except when the financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, in which case the assistance may be used to pay 100 percent of the costs. In the case of a biogeographic region (see Appendix I) shared by two or more states, each state is eligible for Federal financial assistance to establish a separate Reserve within their respective portion of the shared biogeographic region (see §921.10).

(d) Operation and management funds are subject to the following limitations:

(1) Eligible coastal state agencies may apply for up to the maximum share available per Reserve for that fiscal year. Share amounts will be announced annually by letter from the Sanctuary and Reserves Division to all participating states. This letter will be provided as soon as practicable following approval of the Federal budget for that fiscal year.

(2) No more than ten percent of the total amount (state and Federal shares) of each operation and management award may be used for construction-type activities.

[58 FR 38215, July 15, 1993, as amended at 62 FR 12541, Mar. 17, 1997]

§921.33 Boundary changes, amendments to the management plan, and addition of multiple-site components.

(a) Changes in the boundary of a Reserve and major changes to the final management plan, including state laws or regulations promulgated specifically for the Reserve, may be made only after written approval by NOAA. NOAA may require public notice, including notice in the FEDERAL REGISTER and an opportunity for public comment before approving a boundary or management plan change. Changes in the boundary of a Reserve involving the acquisition of properties not listed in the management plan or final EIS require public notice and the opportunity for comment; in certain cases, a categorical exclusion, an environmental assessment and possibly an environmental impact statement may be required.

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NOAA will place a notice in the FEDERAL REGISTER of any proposed changes in Reserve boundaries or proposed major changes to the final management plan. The state shall be responsible for publishing an equivalent notice in the local media. See also requirements of §§921.4(b) and 921.13(a)(11).

(b) As discussed in §921.10(b), a state may choose to develop a multiple-site National Estuarine Research Reserve after the initial acquisition and development award for a single site has been made. NOAA will publish notice of the proposed new site including an invitation for comments from the public in the FEDERAL REGISTER. The state shall be responsible for publishing an equivalent notice in the local newspaper(s). An EIS, if required, shall be prepared in accordance with section §921.13 and shall include an administrative framework for the multiple-site Reserve and a description of the complementary research and educational programs within the Reserve. If NOAA determines, based on the scope of the project and the issues associated with the additional site(s), that an environmental assessment is sufficient to establish a multiple-site Reserve, then the state shall develop a revised management plan which, concerning the additional component, incorporates each of the elements described in §921.13(a). The revised management plan shall address goals and objectives for all components of the multi-site Reserve and the additional component's relationship to the original site(s).

(c) The state shall revise the management plan for a Reserve at least every five years, or more often if necessary. Management plan revisions are subject to (a) above.

(d) NOAA will approve boundary changes, amendments to management plans, or the addition of multiple-site components, by notice in the FEDERAL REGISTER. If necessary NOAA will revise the designation document (findings) for the site.

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Subpart E—Ongoing Oversight, Performance Evaluation and Withdrawal of Designation

§921.40 Ongoing oversight and evaluations of designated National Estuarine Research Reserves.

(a) The Sanctuaries and Reserve Division shall conduct, in accordance with section 312 of the Act and procedures set forth in 15 CFR part 928, ongoing oversight and evaluations of Reserves. Interim sanctions may be imposed in accordance with regulations promulgated under 15 CFR part 928.

(b) The Assistant Administrator may consider the following indicators of non-adherence in determining whether to invoke interim sanctions:

(1) Inadequate implementation of required staff roles in administration, research, education/interpretation, and surveillance and enforcement. Indicators of inadequate implementation could include: No Reserve Manager, or no staff or insufficient staff to carry out the required functions.

(2) Inadequate implementation of the required research plan, including the monitoring design. Indicators of inadequate implementation could include: Not carrying out research or monitoring that is required by the plan, or carrying out research or monitoring that is inconsistent with the plan.

(3) Inadequate implementation of the required education/interpretation plan. Indicators of inadequate implementation could include: Not carrying out education or interpretation that is required by the plan, or carrying out education/interpretation that is inconsistent with the plan.

(4) Inadequate implementation of public access to the Reserve. Indicators of inadequate implementation of public access could include: Not providing necessary access, giving full consideration to the need to keep some areas off limits to the public in order to protect fragile resources.

(5) Inadequate implementation of facility development plan. Indicators of inadequate implementation could include: Not taking action to propose and budget for necessary facilities, or not undertaking necessary construction in a timely manner when funds are available.

(6) Inadequate implementation of acquisition plan. Indicators of inadequate implementation could include: Not pursuing an aggressive acquisition program with all available funds for that purpose, not requesting promptly additional funds when necessary, and evidence that adequate long-term state control has not been established over some core or buffer areas, thus jeopardizing the ability to protect the Reserve site and resources from offsite impacts.

(7) Inadequate implementation of Reserve protection plan. Indicators of inadequate implementation could include: Evidence of non-compliance with Reserve restrictions, insufficient surveillance and enforcement to assure that restrictions on use of the Reserve are adhered to, or evidence that Reserve resources are being damaged or destroyed as a result of the above.

(8) Failure to carry out the terms of the signed Memorandum of Understanding (MOU) between the state and NOAA, which establishes a long-term state commitment to maintain and manage the Reserve in accordance with section 315 of the Act. Indicators of failure could include: State action to allow incompatible uses of state-controlled lands or waters in the Reserve, failure of the state to bear its fair share of costs associated with long-term operation and management of the Reserve, or failure to initiate timely updates of the MOU when necessary.

§ 921.41 Withdrawal of designation.

The Assistant Administrator may withdraw designation of an estuarine area as a National Estuarine Research Reserve pursuant to and in accordance with the procedures of section 312 and 315 of the Act and regulations promulgated thereunder.

Subpart F—Special Research Projects

§ 921.50 General.

(a) To stimulate high quality research within designated National Estuarine Research Reserves, NOAA may provide financial support for research projects which are consistent with the Estuarine Research Guidelines referenced in § 921.51. Research awards may be awarded under this subpart to

only those designated Reserves with approved final management plans. Although research may be conducted within the immediate watershed of the Reserve, the majority of research activities of any single research project funded under this subpart may be conducted within Reserve boundaries. Funds provided under this subpart are primarily used to support management-related research projects that will enhance scientific understanding of the Reserve ecosystem, provide information needed by Reserve management and coastal management decision-makers, and improve public awareness and understanding of estuarine ecosystems and estuarine management issues. Special research projects may be oriented to specific Reserves; however, research projects that would benefit more than one Reserve in the National Estuarine Reserve Research System are encouraged.

(b) Funds provided under this subpart are available on a competitive basis to any coastal state or qualified public or private person. A notice of available funds will be published in the FEDERAL REGISTER. Special research project funds are provided in addition to any other funds available to a coastal state under the Act. Federal funds provided under this subpart may not exceed 70 percent of the total cost of the project, consistent with § 921.81(e)(4) (“allowable costs”), except when the financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, in which case the assistance may be used to pay 100 percent of the costs.

[58 FR 38215, July 15, 1993, as amended at 62 FR 12541, Mar. 17, 1997]

§ 921.51 Estuarine research guidelines.

(a) Research within the National Estuarine Research Reserve System shall be conducted in a manner consistent with Estuarine Research Guidelines developed by NOAA.

(b) A summary of the Estuarine Research Guidelines is published in the FEDERAL REGISTER as a part of the notice of available funds discussed in § 921.50(c).

(c) The Estuarine Research Guidelines are reviewed annually by NOAA. This review will include an opportunity

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for comment by the estuarine research community.

§921.52 Promotion and coordination of estuarine research.

(a) NOAA will promote and coordinate the use of the National Estuarine Research Reserve System for research purposes.

(b) NOAA will, in conducting or supporting estuarine research other than that authorized under section 315 of the Act, give priority consideration to research that make use of the National Estuarine Research Reserve System.

(c) NOAA will consult with other Federal and state agencies to promote use of one or more research reserves within the National Estuarine Research Reserve System when such agencies conduct estuarine research.

Subpart G—Special Monitoring Projects

§921.60 General.

(a) To provide a systematic basis for developing a high quality estuarine resource and ecosystem information base for National Estuarine Research Reserves and, as a result, for the System, NOAA may provide financial support for basic monitoring programs as part of operations and management under §921.32. Monitoring funds are used to support three major phases of a monitoring program:

(1) Studies necessary to collect data for a comprehensive site description/characterization;

(2) Development of a site profile; and

(3) Formulation and implementation of a monitoring program.

(b) Additional monitoring funds may be available on a competitive basis to the state agency responsible for Reserve management or a qualified public or private person or entity. However, if the applicant is other than the managing entity of a Reserve that applicant must submit as a part of the application a letter from the Reserve manager indicating formal support of the application by the managing entity of the Reserve. Funds provided under this subpart for special monitoring projects are provided in addition to any other funds available to a coastal state under the Act. Federal funds provided

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under this subpart may not exceed 70 percent of the total cost of the project, consistent with §921.81(e)(4) (“allowable costs”), except when the financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, in which case the assistance may be used to pay 100 percent of the costs.

(c) Monitoring projects funded under this subpart must focus on the resources within the boundaries of the Reserve and must be consistent with the applicable sections of the Estuarine Research Guidelines referenced in §921.51. Portions of the project may occur within the immediate watershed of the Reserve beyond the site boundaries. However, the monitoring proposal must demonstrate why this is necessary for the success of the project.

[58 FR 38215, July 15, 1993, as amended at 62 FR 12541, Mar. 17, 1997]

Subpart H—Special Interpretation and Education Projects

§921.70 General.

(a) To stimulate the development of innovative or creative interpretive and educational projects and materials to enhance public awareness and understanding of estuarine areas, NOAA may fund special interpretive and educational projects in addition to those activities provided for in operations and management under §921.32. Special interpretive and educational awards may be awarded under this subpart to only those designated Reserves with approved final management plans.

(b) Funds provided under this subpart may be available on a competitive basis to any state agency. However, if the applicant is other than the managing entity of a Reserve, that applicant must submit as a part of the application a letter from the Reserve manager indicating formal support of the application by the managing entity of the Reserve. These funds are provided in addition to any other funds available to a coastal state under the Act. Federal funds provided under this subpart may not exceed 70 percent of the total cost of the project, consistent with §921.81(e)(4) (“allowable costs”),

except when the financial assistance is provided from amounts recovered as a result of damage to natural resources located in the coastal zone, in which case the assistance may be used to pay 100 percent of the costs.

(c) Applicants for education/interpretive projects that NOAA determines benefit the entire National Estuarine Research Reserve System may receive Federal assistance of up to 100% of project costs.

[58 FR 38215, July 15, 1993, as amended at 62 FR 12541, Mar. 17, 1997]

Subpart I—General Financial Assistance Provisions

§ 921.80 Application information.

(a) Only a coastal state may apply for Federal financial assistance awards for preacquisition, acquisition and development, operation and management, and special education and interpretation projects under subpart H. Any coastal state or public or private person may apply for Federal financial assistance awards for special estuarine research or monitoring projects under subpart G. The announcement of opportunities to conduct research in the System appears on an annual basis in the FEDERAL REGISTER. If a state is participating in the national Coastal Zone Management Program, the applicant for an award under section 315 of the Act shall notify the state coastal management agency regarding the application.

(b) An original and two copies of the formal application must be submitted at least 120 working days prior to the proposed beginning of the project to the following address: Sanctuaries and Reserves Division Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration, 1825 Connecticut Avenue, NW., suite 714, Washington, DC 20235. Application for Federal Assistance Standard Form 424 (Non-construction Program) constitutes the formal application for site selection, post-site selection, operation and management, research, and education and interpretive awards. The Application for Federal Financial Assistance Standard Form 424 (Construction Program) constitutes the formal

application for land acquisition and development awards. The application must be accompanied by the information required in subpart B (predesignation), subpart C and § 921.31 (acquisition and development), and § 921.32 (operation and management) as applicable. Applications for development awards for construction projects, or restorative activities involving construction, must include a preliminary engineering report, a detailed construction plan, a site plan, a budget and categorical exclusion check list or environmental assessment. All applications must contain back up data for budget estimates (Federal and non-Federal shares), and evidence that the application complies with the Executive Order 12372, "Intergovernmental Review of Federal Programs." In addition, applications for acquisition and development awards must contain:

- (1) State Historic Preservation Office comments;
- (2) Written approval from NOAA of the draft management plan for initial acquisition and development award(s); and
- (3) A preliminary engineering report for construction activities.

§ 921.81 Allowable costs.

(a) Allowable costs will be determined in accordance with applicable OMB Circulars and guidance for Federal financial assistance, the financial assistance agreement, these regulations, and other Department of Commerce and NOAA directives. The term "costs" applies to both the Federal and non-Federal shares.

(b) Costs claimed as charges to the award must be reasonable, beneficial and necessary for the proper and efficient administration of the financial assistance award and must be incurred during the award period.

(c) Costs must not be allocable to or included as a cost of any other Federally-financed program in either the current or a prior award period.

(d) General guidelines for the non-Federal share are contained in Department of Commerce Regulations at 15 CFR part 24 and OMB Circular A-110.

Copies of Circular A-110 can be obtained from the Sanctuaries and Reserves Division; 1825 Connecticut Avenue, NW., suite 714; Washington, DC 20235. The following may be used in satisfying the matching requirement:

(1) Site selection and post site selection awards. Cash and in-kind contributions (value of goods and services directly benefiting and specifically identifiable to this part of the project) are allowable. Land may not be used as match.

(2) Acquisition and development awards. Cash and in-kind contributions are allowable. In general, the fair market value of lands to be included within the Reserve boundaries and acquired pursuant to the Act, with other than Federal funds, may be used as match. However, the fair market value of real property allowable as match is limited to the fair market value of a real property interest equivalent to, or required to attain, the level of control over such land(s) identified by the state and approved by the Federal Government as that necessary for the protection and management of the National Estuarine Research Reserve. Appraisals must be performed according to Federal appraisal standards as detailed in Department of Commerce regulations at 15 CFR part 24 and the Uniform Relocation Assistance and Real Property Acquisition for Federal land Federally assisted programs in 15 CFR part 11. The fair market value of privately donated land, at the time of donation, as established by an independent appraiser and certified by a responsible official of the state, pursuant to 15 CFR part 11, may also be used as match. Land, including submerged lands already in the state's possession, may be used as match to establish a National Estuarine Research Reserve. The value of match for these state lands will be calculated by determining the value of the benefits foregone by the state, in the use of the land, as a result of new restrictions that may be imposed by Reserve designation. The appraisal of the benefits foregone must be made by an independent appraiser in accordance with Federal appraisal standards pursuant to 15 CFR part 24 and 15 CFR part 11. A state may initially use as match land valued at greater than the Federal share of the acquisition and develop-

ment award. The value in excess of the amount required as match for the initial award may be used to match subsequent supplemental acquisition and development awards for the National Estuarine Research Reserve (see also §921.20). Costs related to land acquisition, such as appraisals, legal fees and surveys, may also be used as match.

(3) Operation and management awards. Generally, cash and in-kind contributions (directly benefiting and specifically identifiable to operations and management), except land, are allowable.

(4) Research, monitoring, education and interpretive awards. Cash and in-kind contributions (directly benefiting and specifically identifiable to the scope of work), except land, are allowable.

§921.82 Amendments to financial assistance awards.

Actions requiring an amendment to the financial assistance award, such as a request for additional Federal funds, revisions of the approved project budget or original scope of work, or extension of the performance period must be submitted to NOAA on Standard Form 424 and approved in writing.

APPENDIX I TO PART 921— BIOGEOGRAPHIC CLASSIFICATION SCHEME

Acadian

1. Northern of Maine (Eastport to the Sheepscot River.)
2. Southern Gulf of Maine (Sheepscot River to Cape Cod.)

Virginian

3. Southern New England (Cape Cod to Sandy Hook.)
4. Middle Atlantic (Sandy Hook to Cape Hatteras.)
5. Chesapeake Bay.

Carolinian

6. North Carolinas (Cape Hatteras to Santee River.)
7. South Atlantic (Santee River to St. John's River.)
8. East Florida (St. John's River to Cape Canaveral.)

West Indian

9. Caribbean (Cape Canaveral to Ft. Jefferson and south.)
10. West Florida (Ft. Jefferson to Cedar Key.)

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Louisianian

- 11. Panhandle Coast (Cedar Key to Mobile Bay.)
- 12. Mississippi Delta (Mobile Bay to Galveston.)
- 13. Western Gulf (Galveston to Mexican border.)

Californian

- 14. Southern California (Mexican border to Point Conception.)
- 15. Central California (Point Conception to Cape Mendocino.)
- 16. San Francisco Bay.

Columbian

- 17. Middle Pacific (Cape Mendocino to the Columbia River.)
- 18. Washington Coast (Columbia River to Vancouver Island.)
- 19. Puget Sound.

Great Lakes

- 20. Lake Superior (including St. Mary's River.)

- 21. Lakes Michigan and Huron (including Straits of Mackinac, St. Clair River, and Lake St. Clair.)

- 22. Lake Erie (including Detroit River and Niagara Falls.)

- 23. Lake Ontario (including St. Lawrence River.)

Fjord

- 24. Southern Alaska (Prince of Wales Island to Cook Inlet.)

- 25. Aleutian Island (Cook Inlet Bristol Bay.)

Sub-Arctic

- 26. Northern Alaska (Bristol Bay to Damarcation Point.)

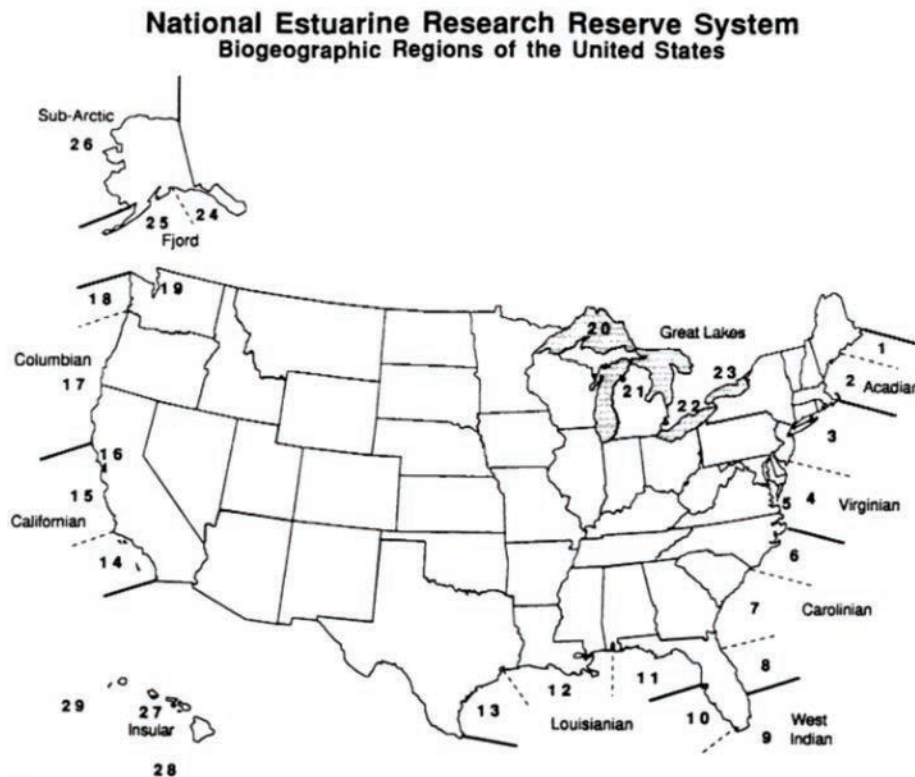
Insular

- 27. Hawaiian Islands.

- 28. Western Pacific Island.

- 29. Eastern Pacific Island.

FIGURE 1



APPENDIX II TO PART 921—TYPOLOGY OF NATIONAL ESTUARINE RESEARCH RESERVES

This typology system reflects significant differences in estuarine characteristics that are not necessarily related to regional location. The purpose of this type of classification is to maximize ecosystem variety in the selection of national estuarine reserves. Priority will be given to important ecosystem types as yet unrepresented in the reserve system. It should be noted that any one site may represent several ecosystem types or physical characteristics.

Class I—Ecosystem Types

Group I—Shorelands

A. Maritime Forest-Woodland. That have developed under the influence of salt spray. It can be found on coastal uplands or recent features such as barrier islands and beaches,

and may be divided into the following biomes:

1. Northern coniferous forest biome: This is an area of predominantly evergreens such as the sitka spruce (*Picea*), grand fir (*Abies*), and white cedar (*Thuja*), with poor development of the shrub and herb layer, but high annual productivity and pronounced seasonal periodicity.
2. Moist temperate (Mesothermal) coniferous forest biome: Found along the west coast of North America from California to Alaska, this area is dominated by conifers, has relatively small seasonal range, high humidity with rainfall ranging from 30 to 150 inches, and a well-developed understory of vegetation with an abundance of mosses and other moisture-tolerant plants.
3. Temperate deciduous forest biome: This biome is characterized by abundant, evenly distributed rainfall, moderate temperatures which exhibit a distinct seasonal pattern,

well-developed soil biota and herb and shrub layers, and numerous plants which produce pulpy fruits and nuts. A distinct subdivision of this biome is the pine edible forest of the southeastern coastal plain, in which only a small portion of the area is occupied by climax vegetation, although it has large areas covered by edaphic climax pines.

4. Broad-leaved evergreen subtropical forest biome: The main characteristic of this biome is high moisture with less pronounced differences between winter and summer. Examples are the hammocks of Florida and the live oak forests of the Gulf and South Atlantic coasts. Floral dominants include pines, magnolias, bays, hollies, wild tamarine, strangler fig, gumbo limbo, and palms.

B. Coast shrublands. This is a transitional area between the coastal grasslands and woodlands and is characterized by woody species with multiple stems and a few centimeters to several meters above the ground developing under the influence of salt spray and occasional sand burial. This includes thickets, scrub, scrub savanna, heathlands, and coastal chaparral. There is a great variety of shrubland vegetation exhibiting regional specificity:

1. Northern areas: Characterized by *Hudsonia*, various erinaceous species, and thickets of *Myrica*, *Prunus*, and *Rosa*.

2. Southeast areas: Floral dominants include *Myrica*, *Baccharis*, and *Ilex*.

3. Western areas: *Adenostoma*, *arcotophylos*, and eucalyptus are the dominant floral species.

C. Coastal grasslands. This area, which possesses sand dunes and coastal flats, has low rainfall (10 to 30 inches per year) and large amounts of humus in the soil. Ecological succession is slow, resulting in the presence of a number of seral stages of community development. Dominant vegetation includes mid-grasses (5 to 8 feet tall), such as *Spartina*, and trees such as willow (*Salix* sp.), cherry (*Prunus* sp.), and cottonwood (*Populus deltoides*.) This area is divided into four regions with the following typical strand vegetation:

1. Arctic/Boreal: *Elymus*;

2. Northeast/West: *Ammophila*;

3. Southeast Gulf: *Uniola*; and

4. Mid-Atlantic/Gulf: *Spartina patens*.

D. Coastal tundra. This ecosystem, which is found along the Arctic and Boreal coasts of North America, is characterized by low temperatures, a short growing season, and some permafrost, producing a low, treeless mat community made up of mosses, lichens, heath, shrubs, grasses, sedges, rushes, and herbaceous and dwarf woody plants. Common species include arctic/alpine plants such as *Empetrum nigrum* and *Betula nana*, the lichens *Cetraria* and *Cladonia*, and herbaceous plants such as *Potentilla tridentata* and *Rubus chamaemorus*. Common species

on the coastal beach ridges of the high arctic desert include *Bryas intergrifolia* and *Saxifraga oppositifolia*. This area can be divided into two main subdivisions:

1. Low tundra: Characterized by a thick, spongy mat of living and undecayed vegetation, often with water and dotted with ponds when not frozen; and

2. High Tundra: A bare area except for a scanty growth of lichens and grasses, with underlying ice wedges forming raised polygonal areas.

E. Coastal cliffs. This ecosystem is an important nesting site for many sea and shore birds. It consists of communities of herbaceous, graminoid, or low woody plants (shrubs, heath, etc.) on the top or along rocky faces exposed to salt spray. There is a diversity of plant species including mosses, lichens, liverworts, and "higher" plant representatives.

GROUP II—TRANSITION AREAS

A. Coastal marshes. These are wetland areas dominated by grasses (*Poacea*), sedges (*Cyperaceae*), rushes (*Juncaceae*), cattails (*Typhaceae*), and other graminoid species and is subject to periodic flooding by either salt or freshwater. This ecosystem may be subdivided into: (a) Tidal, which is periodically flooded by either salt or brackish water; (b) nontidal (freshwater); or (c) tidal freshwater. These are essential habitats for many important estuarine species of fish and invertebrates as well as shorebirds and waterfowl and serve important roles in shore stabilization, flood control, water purification, and nutrient transport and storage.

B. Coastal swamps. These are wet lowland areas that support mosses and shrubs together with large trees such as cypress or gum.

C. Coastal mangroves. This ecosystem experiences regular flooding on either a daily, monthly, or seasonal basis, has low wave action, and is dominated by a variety of salt-tolerant trees, such as the red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia Nitida*), and the white mangrove (*Laguncularia racemosa*.) It is also an important habitat for large populations of fish, invertebrates, and birds. This type of ecosystem can be found from central Florida to extreme south Texas to the islands of the Western Pacific.

D. Intertidal beaches. This ecosystem has a distinct biota of microscopic animals, bacteria, and unicellular algae along with macroscopic crustaceans, mollusks, and worms with a detritus-based nutrient cycle. This area also includes the driftline communities found at high tide levels on the beach. The dominant organisms in this ecosystem include crustaceans such as the mole crab (*Emerita*), amphipods (*Gammaridae*), ghost crabs (*Ocypode*), and bivalve mollusks such

as the coquina (*Donax*) and surf clams (*Spisula* and *Mactra*.)

E. Intertidal mud and sand flats. These areas are composed of unconsolidated, high organic content sediments that function as a short-term storage area for nutrients and organic carbons. Macrophytes are nearly absent in this ecosystem, although it may be heavily colonized by benthic diatoms, dinoflagellates, filamentous blue-green and green algae, and chaemosynthetic purple sulfur bacteria. This system may support a considerable population of gastropods, bivalves, and polychaetes, and may serve as a feeding area for a variety of fish and wading birds. In sand, the dominant fauna include the wedge shell *Donax*, the scallop *Pecten*, tellin shells *Tellina*, the heart urchin *Echinocardium*, the lug worm *Arenicola*, sand dollar *Dendraster*, and the sea pansy *Renilla*. In mud, faunal dominants adapted to low oxygen levels include the terebellid *Amphitrite*, the boring clam *Playdon*, the deep sea scallop *Placopecten*, the Quahog *Mercenaria*, the echiurid worm *Urechis*, the mud snail *Nassarius*, and the sea cucumber *Thyone*.

F. Intertidal algal beds. These are hard substrates along the marine edge that are dominated by macroscopic algae, usually thalloid, but also filamentous or unicellular in growth form. This also includes the rocky coast tidepools that fall within the intertidal zone. Dominant fauna of these areas are barnacles, mussels, periwinkles, anemones, and chitons. Three regions are apparent:

1. Northern latitude rocky shores: It is in this region that the community structure is best developed. The dominant algal species include *Chondrus* at the low tide level, *Fucus* and *Ascophyllum* at the mid-tidal level, and *Laminaria* and other kelp-like algae just beyond the intertidal, although they can be exposed at extremely low tides or found in very deep tidepools.

2. Southern latitudes: The communities in this region are reduced in comparison to those of the northern latitudes and possess algae consisting mostly of single-celled or filamentous green, blue-green, and red algae, and small thalloid brown algae.

3. Tropical and subtropical latitudes: The intertidal in this region is very reduced and contains numerous calcareous algae such as *Porolithon* and *Lithothamnion*, as well as green algae with calcareous particles such as *Halimeda*, and numerous other green, red, and brown algae.

GROUP III—SUBMERGED BOTTOMS

A. Subtidal hardbottoms. This system is characterized by a consolidated layer of solid rock or large pieces of rock (neither of biotic origin) and is found in association with geomorphological features such as submarine canyons and fjords and is usually covered with assemblages of sponges, sea fans, bivalves, hard corals, tunicates, and

other attached organisms. A significant feature of estuaries in many parts of the world is the oyster reef, a type of subtidal hardbottom. Composed of assemblages of organisms (usually bivalves), it is usually found near an estuary's mouth in a zone of moderate wave action, salt content, and turbidity. If light levels are sufficient, a covering of microscopic and attached macroscopic algae, such as kelp, may also be found.

B. Subtidal softbottoms. Major characteristics of this ecosystem are an unconsolidated layer of fine particles of silt, sand, clay, and gravel, high hydrogen sulfide levels, and anaerobic conditions often existing below the surface. Macrophytes are either sparse or absent, although a layer of benthic microalgae may be present if light levels are sufficient. The faunal community is dominated by a diverse population of deposit feeders including polychaetes, bivalves, and burrowing crustaceans.

C. Subtidal plants. This system is found in relatively shallow water (less than 8 to 10 meters) below mean low tide. It is an area of extremely high primary production that provides food and refuge for a diversity of faunal groups, especially juvenile and adult fish, and in some regions, manatees and sea turtles. Along the North Atlantic and Pacific coasts, the seagrass *Zostera marina* predominates. In the South Atlantic and Gulf coast areas, *Thalassia* and *Diplanthera* predominate. The grasses in both areas support a number of epiphytic organisms.

Class II—Physical Characteristics

GROUP I—GEOLOGIC

A. Basin type. Coastal water basins occur in a variety of shapes, sizes, depths, and appearances. The eight basic types discussed below will cover most of the cases:

1. Exposed coast: Solid rock formations or heavy sand deposits characterize exposed ocean shore fronts, which are subject to the full force of ocean storms. The sand beaches are very resilient, although the dunes lying just behind the beaches are fragile and easily damaged. The dunes serve as a sand storage area making them chief stabilizers of the ocean shoreline.

2. Sheltered coast: Sand or coral barriers, built up by natural forces, provide sheltered areas inside a bar or reef where the ecosystem takes on many characteristics of confined waters—abundant marine grasses, shellfish, and juvenile fish. Water movement is reduced, with the consequent effects pollution being more severe in this area than in exposed coastal areas.

3. Bay: Bays are larger confined bodies of water that are open to the sea and receive strong tidal flow. When stratification is pronounced the flushing action is augmented by

river discharge. Bays vary in size and in type of shorefront.

4. Embayment: A confined coastal water body with narrow, restricted inlets and with a significant freshwater inflow can be classified as an embayment. These areas have more restricted inlets than bays, are usually smaller and shallower, have low tidal action, and are subject to sedimentation.

5. Tidal river: The lower reach of a coastal river is referred to as a tidal river. The coastal water segment extends from the sea or estuary into which the river discharges to a point as far upstream as there is significant salt content in the water, forming a salt front. A combination of tidal action and freshwater outflow makes tidal rivers well-flushed. The tidal river basin may be a simple channel or a complex of tributaries, small associated embayments, marshfronts, tidal flats, and a variety of others.

6. Lagoon: Lagoons are confined coastal bodies of water with restricted inlets to the sea and without significant freshwater inflow. Water circulation is limited, resulting in a poorly flushed, relatively stagnant body of water. Sedimentation is rapid with a great potential for basin shoaling. Shores are often gently sloping and marshy.

7. Perched coastal wetlands: Unique to Pacific islands, this wetland type found above sea level in volcanic crater remnants forms as a result of poor drainage characteristics of the crater rather than from sedimentation. Floral assemblages exhibit distinct zonation while the faunal constituents may include freshwater, brackish, and/or marine species. EXAMPLE: Aunu's Island, American Samoa.

8. Anchialine systems: These small coastal exposures of brackish water form in lava depressions or elevated fossil reefs have only a subsurface connection in the ocean, but show tidal fluctuations. Differing from true estuaries in having no surface continuity with streams or ocean, this system is characterized by a distinct biotic community dominated by benthic algae such as Rhizoclonium, the mineral encrusting Schizothrix, and the vascular plant Ruppia maritima. Characteristic fauna which exhibit a high degree of endemicity, include the mollusks *Theosoxus neglectus* and *Teariosus*. Although found throughout the world, the high islands of the Pacific are the only areas within the U.S. where this system can be found.

B. Basin structure. Estuary basins may result from the drowning of a river valley (coastal plains estuary), the drowning of a glacial valley (fjord), the occurrence of an offshore barrier (bar-bounded estuary), some tectonic process (tectonic estuary), or volcanic activity (volcanic estuary).

1. Coastal plains estuary: Where a drowned valley consists mainly of a single channel, the form of the basin is fairly regular form-

ing a simple coastal plains estuary. When a channel is flooded with numerous tributaries an irregular estuary results. Many estuaries of the eastern United States are of this type.

2. Fjord: Estuaries that form in elongated steep headlands that alternate with deep U-shaped valleys resulting from glacial scouring are called fjords. They generally possess rocky floors or very thin veneers of sediment, with deposition generally being restricted to the head where the main river enters. Compared to total fjord volume river discharge is small. But many fjords have restricted tidal ranges at their mouths due to sills, or upreaching sections of the bottom which limit free movement of water, often making river flow large with respect to the tidal prism. The deepest portions are in the upstream reaches, where maximum depths can range from 800m to 1200m while sill depths usually range from 40m to 150m.

3. Bar-bounded estuary: These result from the development of an offshore barrier such as a beach strand, a line of barrier islands, reef formations a line of moraine debris, or the subsiding remnants of a deltaic lobe. The basin is often partially exposed at low tide and is enclosed by a chain of offshore bars of barrier islands broken at intervals by inlets. These bars may be either deposited offshore or may be coastal dunes that have become isolated by recent sea level rises.

4. Tectonic estuary: These are coastal indentures that have formed through tectonic processes such as slippage along a fault line (San Francisco Bay), folding or movement of the earth's bedrock often with a large inflow of freshwater.

5. Volcanic estuary: These coastal bodies of open water, a result of volcanic processes are depressions or craters that have direct and/or subsurface connections with the ocean and may or may not have surface continuity with streams. These formations are unique to island areas of volcanic origin.

C. Inlet type. Inlets in various forms are an integral part of the estuarine environment as they regulate to a certain extent, the velocity and magnitude of tidal exchange, the degree of mixing, and volume of discharge to the sea.

1. Unrestricted: An estuary with a wide unrestricted inlet typically has slow currents, no significant turbulence, and receives the full effect of ocean waves and local disturbances which serve to modify the shoreline. These estuaries are partially mixed, as the open mouth permits the incursion of marine waters to considerable distances upstream, depending on the tidal amplitude and stream gradient.

2. Restricted: Restrictions of estuaries can exist in many forms: Bars, barrier islands, spits, sills, and more. Restricted inlets result in decreased circulation, more pronounced longitudinal and vertical salinity gradients, and more rapid sedimentation. However, if

the estuary mouth is restricted by depositional features or land closures, the incoming tide may be held back until it suddenly breaks forth into the basin as a tidal wave, or bore. Such currents exert profound effects on the nature of the substrate, turbidity, and biota of the estuary.

3. Permanent: Permanent inlets are usually opposite the mouths of major rivers and permit river water to flow into the sea.

4. Temporary (Intermittent): Temporary inlets are formed by storms and frequently shift position, depending on tidal flow, the depth of the sea, and sound waters, the frequency of storms, and the amount of littoral transport.

D. Bottom composition. The bottom composition of estuaries attests to the vigorous, rapid, and complex sedimentation processes characteristic of most coastal regions with low relief. Sediments are derived through the hydrologic processes of erosion, transport, and deposition carried on by the sea and the stream.

1. Sand: Near estuary mouths, where the predominating forces of the sea build spits or other depositional features, the shore and substrates of the estuary are sandy. The bottom sediments in this area are usually coarse, with a graduation toward finer particles in the head region and other zones of reduced flow, fine silty sands are deposited. Sand deposition occurs only in wider or deeper regions where velocity is reduced.

2. Mud: At the base level of a stream near its mouth, the bottom is typically composed of loose muds, silts, and organic detritus as a result of erosion and transport from the upper stream reaches and organic decomposition. Just inside the estuary entrance, the bottom contains considerable quantities of sand and mud, which support a rich fauna. Mud flats, commonly built up in estuarine basins, are composed of loose, coarse, and fine mud and sand, often dividing the original channel.

3. Rock: Rocks usually occur in areas where the stream runs rapidly over a steep gradient with its coarse materials being derived from the higher elevations where the stream slope is greater. The larger fragments are usually found in shallow areas near the stream mouth.

4. Oyster shell: Throughout a major portion of the world, the oyster reef is one of the most significant features of estuaries, usually being found near the mouth of the estuary in a zone of moderate wave action, salt content, and turbidity. It is often a major factor in modifying estuarine current systems and sedimentation, and may occur as an elongated island or peninsula oriented across the main current, or may develop parallel to the direction of the current.

GROUP II—HYDROGRAPHIC

A. Circulation. Circulation patterns are the result of combined influences of freshwater inflow, tidal action, wind and oceanic forces, and serve many functions: Nutrient transport, plankton dispersal, ecosystem flushing, salinity control, water mixing, and more.

1. Stratified: This is typical of estuaries with a strong freshwater inflow and is commonly found in bays formed from “drowned” river valleys, fjords, and other deep basins. There is a net movement of freshwater outward at the top layer and saltwater at the bottom layer, resulting in a net outward transport of surface organisms and net inward transport of bottom organisms.

2. Non-stratified: Estuaries of this type are found where water movement is sluggish and flushing rate is low, although there may be sufficient circulation to provide the basis for a high carrying capacity. This is common to shallow embayments and bays lacking a good supply of freshwater from land drainage.

3. Lagoonal: An estuary of this type is characterized by low rates of water movement resulting from a lack of significant freshwater inflow and a lack of strong tidal exchange because of the typically narrow inlet connecting the lagoon to the sea. Circulation whose major driving force is wind, is the major limiting factor in biological productivity within lagoons.

B. Tides. This is the most important ecological factor in an estuary as it affects water exchange and its vertical range determines the extent of tidal flats which may be exposed and submerged with each tidal cycle. Tidal action against the volume of river water discharged into an estuary results in a complex system whose properties vary according to estuary structure as well as the magnitude of river flow and tidal range. Tides are usually described in terms of the cycle and their relative heights. In the United States, tide height is reckoned on the basis of average low tide, which is referred to as datum. The tides, although complex, fall into three main categories:

1. Diurnal: This refers to a daily change in water level that can be observed along the shoreline. There is one high tide and one low tide per day.

2. Semidiurnal: This refers to a twice daily rise and fall in water that can be observed along the shoreline.

3. Wind/Storm tides: This refers to fluctuations in water elevation to wind and storm events, where influence of lunar tides is less.

C. Freshwater. According to nearly all the definitions advanced, it is inherent that all estuaries need freshwater, which is drained from the land and measurably dilutes seawater to create a brackish condition. Freshwater enters an estuary as runoff from the

land either from a surface and/or subsurface source.

1. Surface water: This is water flowing over the ground in the form of streams. Local variation in runoff is dependent upon the nature of the soil (porosity and solubility), degree of surface slope, vegetational type and development, local climatic conditions, and volume and intensity of precipitation.

2. Subsurface water: This refers to the precipitation that has been absorbed by the soil and stored below the surface. The distribution of subsurface water depends on local climate, topography, and the porosity and permeability of the underlying soils and rocks. There are two main subtypes of surface water:

a. Vadose water: This is water in the soil above the water table. Its volume with respect to the soil is subject to considerable fluctuation.

b. Groundwater: This is water contained in the rocks below the water table, is usually of more uniform volume than vadose water, and generally follows the topographic relief of the land being high hills and sloping into valleys.

GROUP III—CHEMICAL

A. Salinity. This reflects a complex mixture of salts, the most abundant being sodium chloride, and is a very critical factor in the distribution and maintenance of many estuarine organisms. Based on salinity, there are two basic estuarine types and eight different salinity zones (expressed in parts per thousand-ppt.)

1. Positive estuary: This is an estuary in which the freshwater influx is sufficient to maintain mixing, resulting in a pattern of increasing salinity toward the estuary mouth. It is characterized by low oxygen concentration in the deeper waters and considerable organic content in bottom sediments.

2. Negative estuary: This is found in particularly arid regions, where estuary evaporation may exceed freshwater inflow, resulting in increased salinity in the upper part of the basin, especially if the estuary mouth is restricted so that tidal flow is inhibited. These are typically very salty (hyperhaline), moderately oxygenated at depth, and possess bottom sediments that are poor in organic content.

3. Salinity zones (expressed in ppt):

a. Hyperhaline—greater than 40 ppt.

b. Euhaline—40 ppt to 30 ppt.

c. Mixhaline—30 ppt to 0.5 ppt.

(1) Mixoeuhaline—greater than 30 ppt but less than the adjacent euhaline sea.

(2) Polyhaline—30 ppt to 18 ppt.

(3) Mesohaline—18 ppt to 5 ppt.

(4) Oligohaline—5 ppt to 0.5 ppt.

d. Limnetic: Less than 0.5 ppt.

B. pH Regime: This is indicative of the mineral richness of estuarine waters and falls into three main categories:

1. Acid: Waters with a pH of less than 5.5.

2. Circumneutral: A condition where the pH ranges from 5.5 to 7.4.

3. Alkaline: Waters with a pH greater than 7.4.

PART 922—NATIONAL MARINE SANCTUARY PROGRAM REGULATIONS

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Appendix B. Mo‘olelo of He‘eia: Oral Traditions from the He‘eia Estuary Area

Mo'olelo of He'eia: Oral Traditions from the He'eia Estuary Area

The places within the He'eia Estuary, as with other Hawaiian places, have had their history preserved since antiquity through oral traditions. Among the oral traditions found to document the history of the He'eia Estuary are mo'olelo, or traditional stories; 'ōlelo no'eau, or wise sayings; oli, or poetic chants that are not accompanied by dance; and mele, or poetic compositions which may be danced to including those modern compositions accompanied by musical instruments. Mo'olelo is a term “embracing many kinds of recounted knowledge, including history, legend, and myth. It included stories of every kind, whether factual or fabulous, lyrical or prosaic. Mo'olelo were repositories of cultural insight and a foundation for understanding history and origins, often presented as allegories to interpret or illuminate contemporary life... Certainly many such [oral] accounts were lost in the sweep of time, especially with the decline of the Hawaiian population and native language” (Nogelmeier 2006:429,430). Like Nogelmeier's description of mo'olelo, the 'ōlelo no'eau, oli, and mele all contribute to the cultural understanding of the He'eia Estuary. The oral traditions which pertain to the He'eia Estuary are shared in this appendix.

Mo'olelo

There are a number of mo'olelo connected to the lands within the He'eia Estuary project which have been passed down throughout the generations. The kūpuna still share these stories. Some of these accounts have been documented in the old Hawaiian language newspapers. Other accounts have been recorded in the relatively recent reports put together by archaeologists and anthropologists working in the area. Some of these stories attach significance to the naming of places such as He'eia, He'eia Kea, He'eia Uli, Ko'amanō, Moku o Lo'e, and Keahiakahoe. Other stories talk about the guardian spirits within He'eia, namely Meheanu and Lupekia'inui.

Naming of He'eia

1) Groza and Monahan (2012), crediting Pukui's *Place Names of Hawaii*, say He'eia is the foster son of Haumea; the grandson of 'Olopana; and the uncle of Kamapua'a. [However, I have not been able to find the aforementioned reference to Kamapua'a].

-Haumea names him He'eia because “they had been washed out to sea,” and eventually, the district “adjoining Kaneohe was named for him” (Sterling and Summers 1978:197).

-At Ko'olau, He'eia meets and falls in love with Ka'ohelo, the younger sister of Pele and Hi'iaka. According to Beckwith's Legend of Kaohelo, the handsome He'eia abandons Ka'ohelo for another woman. A sister of Ka'ohelo named Malulani grieves for Ka'ohelo's loss. In her grief, Malulani hangs herself, and Ka'ohelo forms the little hills of He'eia district out of her sister Malulani's body (Sterling and Summers 1978:201).

2) Pukui offers an additional explanation for the naming of He'eia:

“During a battle with people from Leeward O‘ahu, a tidal wave is said to have washed (he‘e ‘ia) the natives out to sea and back, after which they were victorious, thus fulfilling a prophecy” (Pukui et al 1974:44)

3) Yet another story may have contributed to the naming of He‘eia as originally told by Paki in 1972. According to this account, He‘eia figuratively means “The Envious Challenge.” There were two chiefly brothers, both skilled in surfing, who lived in the area. The older brother was envious of the other and challenged him to a surfing contest of which the loser of the contest would lose his life. Due to the older brother’s envy and ill-willed intent of the surfing contest, he was swept out to sea and perished. His cries of “He‘eia! He‘eia!” can still be heard today (Henry 1993).

Here is the story of the two chiefly brothers of He‘eia as it was published, quoting Paki, in *He‘eia Fishpond, Loko I‘a O He‘eia, An Interpretive Guide for the He‘eia State Park Visitor*:

HE‘EIA, THE ENVOIOUS CHALLENGE

The figurative interpretation of the name He‘eia is the Envious Challenge. The He‘eia coastline of O‘ahu is famous for He‘e, or Octopus-fish, which swarm in these waters at a certain time each year. When the Wili-wili tree crimsones with its claw-like blossoms, fishermen know the He‘e are running.

Once there were two brothers, both chiefs in this thriving community of He‘eia. Both men were champions in the art of He‘e-nalu, or wave-surfing, and both were handsome figures.

However, the older brother was shorter, and for this reason envied his younger relative. The neighbors contributed to the older one’s feeling of inferiority and jealousy, by forever comparing the two men and praising the younger one’s tall, erect figure, his mien of chiefly dignity. In those days, a chief should be able to look over and above the heads of others.

Finally, the envious brother challenged the younger favorite to a contest in surfing. As usual, the wager was large and included full title to all the family possessions and the loser’s very life.

Surfing at that particular time was very dangerous. Often the monster octopus of the deep ocean depths swarmed with their smaller cousins. The He‘e were running and the Wili-wili blossoms were clustered on the branches like jewels of blood. But the challenge made had to be accepted as was the custom of the times. Had the younger man refused to accept the duel, the people would have judged him to be cowardly. A chief’s Mana or Power, should protect him even from any huge, man-devouring He‘e of the depths.

The Kana-wai or Law, teaches that mortals should be content with their lot in life and make the best of it and feel truly thankful. Therefore, when the older brother broke this law he had to receive just punishment from the Akua, or Deity.

In punishment, the older brother was caught in the rip tide and taken down among the He'e-nui, the huge devils of the deep sea.

Today, at the swarming time of the He'e, each year, during the season of Fall-Into-Winter when the Wili-wili blossoms redly, you should listen carefully. You can hear, on the stillness of the night, the muffled voice of the older brother calling to his younger brother, his tones lamenting, "He'eia! He..ee..i..a!" in the later October to December and January when the surf rides high upon the shore of He'eia (Henry 1993:40).

The Division of He'eia Kea & He'eia Uli

Kupuna and Kumu Hula Al Makahinu Barcarse relates the significance of Ke'alohi Point as being the boundary between He'eia Kea to the north and He'eia Uli to the south. Auntie Rocky Kaluhiwa says that Ke'alohi Point is a leina 'uhane for the souls of the departed. The deceased were judged here and sent to either side depending on whether or not they were good or bad people. Kumu Barcarse explains:

“Kealohi Point was where the kahu [caretaker] would decide whether a dead person was black [uli] or white [kea]. The [south] side of Kealohi Point, where the He'eia Fishpond is, was named He'eia-uli. The [north] side of the Point was He'eia-kea. The body of a dead person who was judged black, or who was bad, was fed to the sharks and their body cast to He'eia-uli. Those who were good, or white, were buried and their spirit was cast to He'eia-kea” (Cruz and Hammatt 2012:62).

The Caretaker Makanui

Ma kai of He'eia Fishpond is a reef known as Ko'amanō, and its numerous caves housed a great number of sharks. According to McAllister, Makaanui was the caretaker of these sharks; he lived on land northwest of the fishpond (Summers 1978). Kumu Barcarse relates the story of Makaanui feeding the bodies of the recently deceased to his sharks unbeknownst to the people of He'eia. Eventually the people found out, and when they did, they fed Makaanui to the sharks in revenge (Cruz and Hammatt 2012).

Here is the story of Makaanui as it was published, quoting McAllister, in *Sites Of Oahu*:

Koamano Reef

Koamano reef [is a] short distance out from Heeia fishpond. The reef is oval in shape and not very large. All about the reef are caves where a great number of sharks dwell. If you listen from the reef today you can frequently hear them breathing heavily in sleep. Makanui, the keeper of these sharks, lived on the land on the northwest side of the Pond. He spent most of his time feeding the sharks, which was quite an undertaking. For a long time it had been noticed that the bodies of the dead had been disappearing. After the death of a person, someone would be chosen to watch over the body, but as frequently happened, the watcher would fall asleep, and upon awakening the corpse would be gone. This happened for some time, until it was discovered that in the night the sharks of Makanui would come from the sea and carry off the dead to the caves of Koamano. The people were so enraged that they took revenge upon Makanui and fed his body to the sharks (Sterling and Summers 178:198).

The Guardian Meheanu

Meheanu was the guardian or *kia'i* of He'eia who lived next to He'eia Fishpond at Luamo'o. Among her kinolau was a lizard, a frog, or her favorite, an eel (Henry 1993). Aunty Rocky Kaluhiwa notes that Meheanu is the 'aumakua of He'eia Fishpond, and Meheanu's presence has been manifested in the past by a multitude of intertwined eels within the fishpond walls. According to Kumu Barcarse, as told to him by Grandfather Kamaka, Meheanu made sure that the people of He'eia had fish during times of famine, and her presence was especially signified by the yellowing of the hau flowers (Cruz and Hammatt 2012).

The Guardian Lupekia'i-nui

Lupekia'inui, the great stingray, was another guardian of He'eia Fishpond. Lupekia'inui was from Kekepa Island near Mōkapu, but he moved to He'eia Fishpond after being solicited for help from the overseer of the fishpond. According to the *mo'olelo*, the overseer of the fishpond was distraught because his prized mullet were being eaten by barracudas and were also being stolen by thieves. So the overseer paddled to Kekepa Island to enlist the help of the great stingray Lupekia'inui. A pact was made between the two whereby Lupekia'inui would rid the fishpond of thieving people and trespassing barracudas if the overseer would promise to keep the fishpond there for eternity. The overseer agreed. In return, Lupekia'inui moved to He'eia Fishpond to dwell there; ensured the safety of the mullet from thieves and barracudas; and as a result the fishpond has survived throughout the generations until today (Henry 1993).

Here is the story of Lupekia'inui as it was published in *He'eia Fishpond, Loko I'a O He'eia, An Interpretive Guide for the He'eia State Park Visitor*:

LUPE-KIA'I-NUI

The konohiki (overseer) of He'eia Fishpond knew that he needed to solicit the help of a squadron of sting rays (hīhīmanu) that lived at Kekepa Island, near Mokapu, to watch over his pond. He paddled his canoe out to the island and prayed to the god of the hīhīmanu, "Oh, hīhīmanu akua, I need your guardian services. I need you to help save my crop of 'ama'ama. The kākū (barracuda) and 'aihue loko (pond robbers) are stealing me blind! I will do anything to get your help."

"Anything?" the voice from above bellowed as the konohiki bounced around in his little canoe.

"Yes, anything," he replied.

"I want you to promise me that your fishpond will always be a fishpond and will be a fishpond for your children and a fishpond for their children and their children to come forever," the voice resounded.

"Ae, 'ae," the konohiki answered. "Yes, yes, my fishpond will be another monument to the genius of my people forever and ever and ever!"

With that, the water started to churn and spin the canoe around as hundreds of hīhīmanu in the water rushed and glided in a circle around him. The canoe spun around and around as he was dizzily sucked in to the darkness of the wiliwai (whirlpool) that consumed him.

When he came out of the whirlpool, the konohiki as being pulled across the bay by a large hīhīmanu that was flying across the sky like a kite (which it resembled); the kite-string, made of olonā, was over a mile long. This special hīhīmanu was the legendary Lupe-kia'i-nui, the super-watching sting ray.

Because He'eia Fishpond was one of the largest ponds along the shore, it needed a special sting ray to dwell there. That is why Lupe-kia'i-nui, the super sting ray, was assigned to this Fishpond. At times, Lupe-kia'i-nui would visit his friends and family at Kekepa. He would wing his way between the reefs and coral heads. When returning, he would fly over the wall in to the fishpond.

Lupe-kia'i-nui made his home near the mākāhā-nui (large- water-control gate). From this advantageous spot, he could watch the fishpond walls and all that happened in the large body of the pond. He could swiftly fly to any spot when he sensed a predator or intruder. He would kill a predator and eat it; kākū were good eating too. Sometimes when there were many to be taken, he would call to his friends at Kekepa. At such times, the waters of the pond would sparkle and glow in the night as many hīhīmanu whipped and lashed out at the predators.

Lupe-kia'i-nui would slash human pond robbers to death with his whiplike tail and tow the human carcass to his manō (shark) friends that lived at Ko'amanō Reef, a short distance from the pond. After stripping the flesh from the bodies, the sharks would bury the bones of the 'aihue loko in shallow holes along the sandy shore near the mouth of He'eia Stream. Fishermen knew that this area was a good source of human bones to make fish hooks.

To this day, the word of the konohiki has been kept to the hihīmanu akua. He'eia Fishpond is still a fishpond. At times during the year, the water of the pond will sparkle and glow in the night as it is whipped and lashed by the legendary hihīmanu chasing the kākū. Sharks still live at Ko'amanō Reef. Bones of the 'aihue loko are still being found at the mouth of He'eia Stream (Henry 1993:39).

The Siblings Lo'e, Pahu, and Kahoe

According to Kumu Barcarse, there were three siblings named Lo'e, Pahu, and Kahoe. Lo'e lived on Moku o Lo'e; Pahu lived near He'eia Fishpond; and Kahoe lived in the mountains of the ahupua'a. The sibling named Pahu, who lived near the fishpond, was known to be greedy, and gave away the less desirable fish to others while keeping the best only for himself. In return, during times of famine when there were no fish, the sibling named Kahoe, who lived in the mountains, carefully cooked his upland crops in a cave in the hopes that the others would not see the smoke from his oven and know that he was cooking (Cruz and Hammatt 2012). This area of upland cliffs where Kahoe lived is now called Keahiakahoe, meaning 'The fire of Kahoe.'

The Supernatural Twins Hilu-ula & Hilu-uli

In Thrum's *Hawaiian Folk Tales*, the story is told about the brother and sister twins Hilu-ula and Hilu-uli. The sister Hilu-uli is credited with bringing the hilu fish, or wrasse, to the shores of He'eia and Kāne'ohē. Before that, it had not been known to those people of the Ko'olau. The story is recounted in *Sites Of Oahu*:

Hilu-ula and Hilu-uli were born twins, one a male and the other a female. They had human forms, but with power to assume that of the fish now known as hilu. The two children grew up together and in due time when Hilu-uli, the sister, was grown up, she left her brother and parents without saying a word and went in to the sea, and, assuming her fish form, set out on a journey she increased the numbers of the hilu so that they came close to Heeia there was so large a school that the sea was red with them. When the people of Heeia and Kaneohe saw this, they paddled out in their canoes to discover that it was a fish they had never seen nor heard of before. Returning to the shore for nets, they surrounded the school and drew in so many that they were not able to care for them in their canoes. The fishes multiplied so rapidly that when the first school was surrounded and dragged ashore, another one appeared, and so on, till the people were surfeited. Yet the fish stayed in the locality,

circling around. The people ate of them in all styles known to Hawaiians; raw, lawalued, salted, and broiled over a fire of coals.

While the Koolau people were thus fishing and feasting, Hilu-ula, the brother, arrive among them in his human form; and when he saw the hilu-uli broiling over the coal fire he recognized the fish form of his sister. This so angered him that he assumed the form of a whirlwind and entered every house where they had hilu and blew the fish all back into the sea. Since then the hilu-uli has dark scales, and is well known all over the islands (Sterling and Summers 1978:202).

The Supernatural Woman Kamehaikana

One more story is told about a supernatural being, this one named Kamehaikana. Kamehaikana was a woman from the uplands who went to Ke‘alohi and He‘eia Kea to get food from the sea. A piece of morning-glory vine, also known as pōhuehue, grew on the banks of the spring where she once washed her bounty from the sea. This story was published in the Hawaiian language newspaper, Ka Nupepa Kū‘oko‘a, in August of 1896; it was reprinted as follows in *Sites Of Oahu*:

Kamehaikana was a beautiful woman for this place, Iolekaa, in those days of old Hawaii. She was a supernatural woman. Her husband was Makea (Wakea). One day, she went to the sea at Kealohi to fish and came to Heeia-kea. She went down to the beach to catch crabs and gather sea weeds. Then she went up to Haakolea where there was a spring. There she washed the sea weeds and crabs. The crabs ran about and the sea weeds were found growing in the spring, said the ancients. The surplus piece of pohuehue vine which she wore about her was broken off and thrown down where she washed the sea weeds and crabs. The pohuehue vine grew at the edge of the spring (Sterling and Summers 1978:200).

‘Ōlelo No‘eau

Only one ‘ōlelo no‘eau pertaining to He‘eia was recorded in the documentation done by Pukui in her book *‘Ōlelo No‘eau: Hawaiian Proverbs & Poetical Sayings*:

(1561)

Ka ua kani ko‘o o He‘eia.

The rain of He‘eia that sounds like the tapping of walking canes.

Also said of the rain of Hilo (Pukui 1982:168).

This ‘ōlelo no‘eau paints a picture that reminds everyone of the generous amounts of rain which waters this windward district of O‘ahu.

OLI

Among the chants found which mention He‘eia are two published in the booklet *He‘eia Fishpond, Loko I‘a O He‘eia: An Interpretive Guide for the He‘eia State Park Visitor*, and another which has been passed down orally from Kumu Hula Al Makahinu Barcarse. The chant from Kumu Barcarse is a chant of welcome which first acknowledges the guardian Meheanu and then invites the listeners to a happy gathering in He‘eia:

Pala luhiehu ka hau o Luamoo

A noho o Meheanu i ka malie

E na malihini, na pua kahiki i hiki mai e

Welina, welina no

Mai na pali o Haiku a i ka lae o Kealohi

Heeia Kea, Heeia Uli kani lea lea e

Lea hauoli hoi Ahuimanu

A hui mai kakou e launa pu i ka poli uluwehi o Heeia

Eia makou na pua e mohala nei i ka ua kilihune

E inu i ka awa o Iolekaa

E ku paakai i ka amaama o Kalimuloo

O ko makou wahi opu weuweu la no oukou ia

Aloha no, aloha e

(Source: Kumu Hula Al Makahinu Barcarse)

Of the two chants found in the He‘eia interpretive guide, one is printed in English and is credited to Paki in 1972. And the other is printed in Hawaiian with an English translation, credited to Lanakila Henry who composed it in 1976. The first chant is entitled “He‘eia, A Chant”:

HE‘EIA, A CHANT

*There were, and are
Two place-names, He'eia.*

*One is He'eia-uli, The Dark He'eia;
The other, He'eia-kea, Fair He'eia.*

*There is all the difference
Between these two,
He'eia-uli and He'eia-kea,
As is the difference Of Night and Day.*

*Men died in Old Hawai'i...
The entered places
Where dead Men dwell.
But the difference here,
At He'eia,
The dead men entered
The Depths of the Seas.*

*Their lives were judged,
Their Fate decreed,
With some judged white
And some called black.*

The black souls leaped

*From the left-hand shore;
The white souls jumped
From the right-hand shore;
He'eia, here, the Dividing Line.*

*Now, if you will,
Look into the sea
Where sand-strip islands
Are close to shore.
Watch, for this is a mystery,
Now they appear;
Now they are gone.*

*You may judge it a trick
Of the Tide and the Sea,
But in reality,
It is the Shadows
Falling strangely
Upon the Sun-lit waves.*

*Neither the light,
Nor tide to be blamed,
For the Force that controls
Is the Will of the Gods,
A Decree that was made,*

In the time of Antiquity.

How it happened,

So the story gels,

There were, and are,

On He'eia's shore,

Various fishing grounds,

Each with its own,

Its protective Gods.

Gods, like men,

Often disagreed,

Thus, two of the Gods

Who controlled these grounds,

Quarreled on a matter of

Right and Wrong,

As who should be fishing

He'eia's Shores!

The Man-god of He'eia-kea

Was fishing in Koolau Bay,

The Man-god of He'eia-uli

Became justly enraged.

He sent a challenge

*To the poaching god,
Proposing a battle
For control of the shores.*

*They met and fought
'Til the righteous god won.
However, he proved himself to be
A god of kindly heart,
He made a pact with He'eia-kea,
White god of Koolau,
And, speaking gently, said,
From this time forth,
And forever more,
You White Gods of He'eia
Fish from Kualoa Shore;
And Dark Gods of He'eia-uli
Fish Kane'ohe shores;*

He'eia is the Dividing line.

*So it was settled and agreed,
The flat, sandy-strips
Be Deciding line.
Now, here is a warning
To men of today,*

When Sandstrip appears

Beneath the waves

It is time to turn

Your boats around

(Source: Paki, 1972)

And the second chant is entitled, “Loko I‘a O He‘eia (A Modern Chant)”:

LOKO I‘A O HE‘EIA (A MODERN CHANT)

I.

Kapapa ka piko o Kāne‘ohe

Kapapa lies in the center of Kāne‘ohe Bay;

Kaikuone ne‘ine‘i nani Ko‘olau

The bay that sits beneath the beautiful Ko‘olau

Pu‘u Keahiakahoe iluna

With its high peaks of Keahiakahoe and

A ho‘ou‘ou lani o ka pu‘u Eleao

Eleao jutting skyward.

II.

Mano wai Ha‘ikū a Ioleka‘ā

Fresh water from Ha‘ikū and Ioleka‘a Valleys

Hui kaha wai He‘eia papalalo

Flow as He‘eia Stream to where the land

Pili ma kai Lae O Ke ‘Alohi

And sea meet by Ke ‘alohi Point under a fine

Wahi ho‘okili hu‘e ānuenuē

Light rain that produces a rainbow

III.

Na pua kukuna-o-ka-lā

The flowers of the mangrove are like

Kohu hoku 'imo'imo

Twinkling stars.

Pāpōhaku ho'opuni ia kūlana

The stonewall that surrounds this place

Loko hea ola a kapu i'a

Where fish that are raised in ponds live and grow.

IV.

He'eia pu'uone loko i'a

He'eia (fishpond) of beautiful Kāne'ohe (Bay)

Nani Kāne'ohe kaiku'one

The fishpond near the shore;

Ho'oheno no ho'i 'ia oe

Cherish it in thought

Kia ho'omano na wā hala

As a monument to recall the past.

V.

Haina 'ia mai kapuana;

This is the end of my song-story.

Ho'olaulima kū nā kupuna

Let us work it in the manner of our ancestors;

Mālama no ka loko i'a

Let us preserve the fishpond

Ho'omau neia waiwai ho'oilina.

To continue this part of our heritage.

(Created by: Lanakila Henry, 1976)

(Henry 1993:42)

Mele

Finally, a few mele which mention He'eia are found archived in the Huapala database of Hawaiian chants and songs. The first of these songs is the Hawaiian standard, "Nani Ka'ala." This song, with traditional double meanings, takes the listener on a trip to specific places around O'ahu Island. In the middle of the song, the composer stops in He'eia and finds love there. The second song, "Kāne'ohe," is a song written by Abbie Kong and Johnnie Noble in the 1930s. Instead of journeying around the island, this song only mentions places within the district of Ko'olaupoko, specifically Kāne'ohe with its lights, Mōkapu with its sea spray, and He'eia with its naturally jagged ridges and modern telegraph wires. The third mele, "A Honolulu Au," is annotated to be a hula pa'i umauma, or a song which can be accompanied by a chest-slapping dance. This mele was written specifically for the students of the Kamehameha Schools Explorations Program. It commemorates the many field trips that the students took during their schooling, and for He'eia, it remembers their boat ride there. The lyrics to all three of these mele are presented below. (Lyrics and translation to these songs along with their accompanied descriptions are from the www.huapala.org database compiled by Kanoa-Martin):

Nani Ka'ala

He nani Ka'ala, lae, la lae lae

Kuahiwi nani 'oe, lae, la lae lae

I Nu'uaniu au, lae, la lae lae

Ka makani Ko'olau, lae, la lae lae

I Kailua au, lae, la lae lae

Huki mai ka ulua, lae, la lae lae

I Kane'ohe au, lae, la lae lae

I ka 'ohe kaulana, lae, la lae lae

I He'eia au, lae, la lae lae

Eia a'e ke aloha, lae, la lae lae

I Waiahole au, lae, la lae lae

He kanaka pihole, lae, la lae lae

I Waikane au, lae, la lae lae

He kane hana nui, lae, la lae lae

Ha'ina Ka'ala, lae, la lae lae

Kuahiwi nani 'oe, lae, la lae lae

Beautiful is Ka'ala

You are a beautiful mountain

I was at Nu'uano

The wind of the Ko'olau

I was at Kailua

Pulling in a jackfish

I was at Kane'ohe

Famous for the utility towers

I was at He'eia

Here is love

I was at Waiahole

A very flirtatious man

I was at Waikane

A hard working man

Tell of Ka'ala

You are a beautiful mountain

Source: Puke Mele by Kimo Alama – Ka'ala, the highest mountain on O'ahu is symbolic of a woman, possibly seeking a mate. She travels to the districts on O'ahu and relates her various encounters with different men. Lae la lae lae is tra la la la. Ulua in verse #3 is a lover

Kāne'ōhe

*`Ōlapa ka uila i Kāne'ōhe
Ka hui laulima o 'i Laniwai*

**(Ka hui lau lima Hi'ilaniwai)*

Hui:

*Me ka ua Apuakea
Ka la'i a'o Malūlani (Mololani)
Me ka anu o ke Ko'ōlau*

*Kaulana mai nei Ko'olaupoko
Ua 'ā ka uila a'i Kāne'ōhe*

*Hanohano Mōkapu i ka 'ehu kai
Te tua motumotu a'o He'eia*

*Ho'okahi meahou ma He'eia
Ka uwea kelekalepa leo nahenahe*

*Aia 'ike lihi o ka 'āina
Kahi a ke aloha i walea ai*

*Walea ana 'oe me ke onaona
Ku'u lei hulu mamo pili i ke anu*

*Ua ana ho'i au a i kō leo
Kō pane 'ana mai pehea au*

*Ha'ina 'ia mai ana ka puana
Ua 'ā ka uila a'i Kāne'ohe*

Light flashes at the Kaneohe

Co-operative Society of Laniwai

*alternate stanza

Chorus:

The Apuakea rain

The peace of Malulani

The coolness of the Ko'olau

Famous is Ko'olaupoko

The lights go on at Kaneohe

The glory of Mokapu is the sea spray

And the jagged ridge of Heeia

The news at He'eia

Sweet-voiced telegraph wire

Glimpses of the land

Where love finds delight

Delight with the sweet one

My mamō feather lei in the coolness

Delighted by your voice

You ask, How am I?

Tell the refrain

The light goes on at Kaneohe

Source: Nā Mele o Hawai'i Nei by Elbert & Mahoe - Written in the 1930's to commemorate the installation of electricity at Kaneohe, the mele also tells of a delightful love affair on the windward side of Oahu.

A Honolulu Au

A Honolulu au la

E maka'ika'i la

A Waikīkī au la

Hoe i ka wa'a la

A He'eia au la

Holo ma ka moku la

A Mōkapu au la

'Āina o nā ali'i la

A Pu'uloa au la

'O ke awa lau la

A Makapu'u au la

Ho'ohula no na nai'a la

A Hale'iwa au la

I ka lo'i kalo la

A Maunalua au la

Aloha i nā kupuna la

A Nu'uānu au la

'Ike i na ki'i la

Ha'ina mai ka puana la

No Honolulu la 'ea

I am at Honolulu

To see the sights

At Waikiki

Paddle the canoe

At He'eia

Ride the boat

At Mōkapu

Sacred land of chiefs

At Pu'uloa

The many channels

At Makapu'u

Porpoises dance the hula

At Hale'iwa

The taro patch

At Maunalua

Greet the elders

At Nu‘uanu

See the petroglyphs

This the refrain

About Honolulu

Source: This chant was composed for the Kamehameha Explorations program to commemorate the field trips experienced by the students. Verse 5, Pu‘uloa is the ancient name for Pearl Harbor. The channels refer to the locks. Verse 8, the elders are the residents of Lunalilo Home for aged Hawaiians.

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Appendix C. Public Engagement: Public Scoping Meetings

Dated: November 18, 2014.

Glenna Mickelson,

Management Analyst, Office of the Chief Information Officer.

[FR Doc. 2014-27647 Filed 11-21-14; 8:45 am]

BILLING CODE 3510-JE-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

Intent To Prepare a Draft Environmental Impact Statement for the Proposed He'eia National Estuarine Research Reserve in Kane'ohe Bay, Hawai'i

AGENCY: National Estuarine Research Reserve System, Office for Coastal Management, National Ocean Service, National Oceanic and Atmospheric Administration, Department of Commerce.

ACTION: Notice.

SUMMARY: In accordance with section 315 of the Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451-1466), the State of Hawai'i and the National Oceanic and Atmospheric Administration (NOAA) intend to conduct two public scoping meetings on December 17, 2014, in Kane'ohe, Hawai'i, and on December 19, 2014, in Honolulu, Hawai'i, as part of NOAA's draft environmental impact statement (DEIS) and draft management plan (DMP) process to solicit comments for the preparation of a DEIS and DMP on the Proposed He'eia National Estuarine Research Reserve in Kane'ohe Bay.

DATES: December 17, 2014, at 5:00-7:00 p.m. and December 19, 2014, at 5:00-7:00 p.m.

ADDRESSES: December 17 at the King Intermediate School, 46-155 Kamehameha Hwy., Kane'ohe, HI 96744 and December 19 at the NOAA Fisheries Honolulu Service Center, 1139 N. Nimitz Hwy., Ste 220, Honolulu, HI 96817.

FOR FURTHER INFORMATION CONTACT: Contact Rebecka Arbin, Hawai'i Office of Planning, P. O. Box 2359, Honolulu, HI 96804 at (808)587-2831 or rebecka.j.arbin@dbedt.hawaii.gov or Joelle Gore, Acting Chief, Stewardship Division, Office for Coastal Management, National Ocean Service, NOAA, 1305 East-West Highway, Silver Spring, Maryland 20910, at (301) 713-3155 ext. 177, or Hawaii.nerr.comments@noaa.gov.

SUPPLEMENTARY INFORMATION: The decision to be made by NOAA is whether to designate the proposed He'eia National Estuarine Research

Reserve. The State of Hawai'i, through its Office of Planning, site partners and NOAA are working to determine the boundaries of the reserve, how the reserve would be managed, and the policies of the proposed reserve. These decisions will be made through an analysis process and described in the reserve management plan.

Found within the largest sheltered bay in the Hawaiian Islands, the He'eia estuary constitutes a range of diverse habitats, including uplands, wetland, and fringing coral reefs, and is representative of the estuarine habitats in the Insular biogeographic region. In addition, the site hosts numerous traditional Hawaiian practices, including an ancient Hawaiian fish pond and taro cultivation. The combination of unique traditional Hawaiian land uses and natural habitats is expected to attract a broad range of research interests from multiple scientific disciplines. In July 2012, the Governor of Hawai'i sent NOAA a letter of interest in exploring the feasibility of designating a reserve within the Hawaiian Islands based on ongoing conversations with community groups and the University of Hawai'i. In February 2013, the State of Hawai'i undertook a site selection process to determine appropriate areas of the Hawaiian Islands that might be nominated for inclusion in the reserve System. Hawai'i, working with scientists, community organizations, and the public, gathered input and suggestions to inform the selection of a potential site for consideration as a national estuarine research reserve.

On May 21, 2014, the Governor of the State of Hawai'i nominated the He'eia estuary for consideration as a Hawai'i reserve. On October 27, 2014, NOAA accepted the site nomination document for the proposed He'eia reserve and initiated planning efforts with the Hawai'i Office of Planning HIMB.

The He'eia reserve is proposed to be administered by the State of Hawaii in cooperation with the Hawaii Office of Planning, the Hawai'i Department of Land and Natural Resources, the University of Hawai'i, Hawai'i Community Development Authority, and community organizations Kako'o 'O'iwi, Paepae o He'eia, Ko'olaupoko Hawaiian Civic Club, Kamaaina Kids, and The Nature Conservancy, with support from other state and county agencies and community members. The Hawai'i Office of Planning, in collaboration with those partners, is jointly developing an outline of a preliminary DMP. The outline is intended to identify specific needs and priorities related to research, education,

and stewardship. At the public meetings, the Hawai'i Office of Planning and NOAA will provide a synopsis of the process for developing a DEIS and DMP and will solicit comments on the scope and the significant issues to be analyzed in a DEIS.

Interested parties who wish to submit suggestions or comments about the scope or content of the proposed DEIS and DMP are invited to attend the above meetings or provide comments to the Hawai'i Office of Planning or NOAA's Office for Coastal Management. Comments can be submitted to Hawaii.nerr.comments@noaa.gov or U.S. mail at the addresses listed below.

Federal Domestic Assistance Catalog Number 11.420 (Coastal Zone Management) Research Reserves

Dated: November 18, 2014.

Donna Rivelli,

Deputy Chief Financial Officer, National Ocean Service, National Oceanic and Atmospheric Administration.

[FR Doc. 2014-27729 Filed 11-21-14; 8:45 am]

BILLING CODE 3510-08-P

COMMODITY FUTURES TRADING COMMISSION

Agricultural Advisory Committee Meeting

AGENCY: Commodity Futures Trading Commission.

ACTION: Notice of meeting.

SUMMARY: The Commodity Futures Trading Commission (CFTC or Commission) announces that on December 9, 2014, from 10:00 a.m. to 3:00 p.m., the Agricultural Advisory Committee (AAC) will hold a public meeting at the CFTC's Washington, DC, headquarters. The meeting will focus on, among other issues, topics related to the agricultural economy, as well as the deliverable supplies of agricultural commodities as they pertain to position limits.

DATES: The meeting will be held on Tuesday, December 9, 2014 from 10:00 a.m. to 3:00 p.m. Members of the public who wish to submit written statements in connection with the meeting should submit them by December 1, 2014.

ADDRESSES: The meeting will take place in the first floor Conference Center at the Commission's headquarters, Three Lafayette Centre, 1155 21st Street NW., Washington, DC 20581. Written statements should be submitted to: Agricultural Advisory Committee, c/o Cory Claussen, Commodity Futures Trading Commission, Three Lafayette Centre, 1155 21st Street NW.,



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Notice of Intent to Prepare Draft Environmental Impact Statement and the Management Plan for the Proposed Heeia National Estuarine Research Reserve System (NERRS) in Kaneohe Bay, Hawaii

Notice is hereby given that the National Estuarine Research Reserve System, Office for Coastal Management, National Ocean Service, National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce and the Hawaii Office of Planning, Hawaii Coastal Zone Management Program will hold two public scoping meetings to solicit comments on significant issues related to the preparation of a draft environmental impact statement (DEIS) and draft management plan (DMP) for the proposed Heeia National Estuarine Research Reserve in Kaneohe Bay, Hawaii. The DEIS and DMP will address the research, education, and stewardship needs of the proposed reserve.

DATE: December 17, 2014 at 5:00 - 7:00 pm at the King Intermediate School Dining Room, 46-155 Kamehameha Hwy, Kaneohe, HI 96744

December 19, 2014 at 5:00 - 7:00 pm at the NOAA Fisheries Honolulu Service Center, 1139 N. Nimitz Hwy., Ste. 220, Honolulu, HI 96817

Interested parties who wish to submit suggestions or comments about the scope or content of the proposed DEIS and DMP are invited to attend the above meetings or provide comments to the Hawaii Office of Planning or NOAA's Office for Coastal Management. Comments can be submitted to hawaii.nerr.comments@noaa.gov or U.S. mail at the addresses listed below.

FOR FURTHER INFORMATION CONTACT:

Rebecka Arbin, Hawaii Office of Planning, P.O. Box 2359, Honolulu, HI 96804, at (808) 587-2831 or rebecka.j.arbin@dbedt.hawaii.gov or Joelle Gore, Acting Chief, Stewardship Division, Office for Coastal Management, National Ocean Service, NOAA, 1305 East-West Highway, Silver Spring, MD 20910, at (301) 713-3155 ext. 177, or hawaii.nerr.comments@noaa.gov.

Persons with disabilities please contact Leo Asuncion at the Office of Planning, Coastal Zone Management Program by December 8, 2014 to make arrangements. Phone: (808) 587-2846

More information on the NERRS can be found at <http://planning.hawaii.gov/czm/initiatives/nerrs-site-proposal-process>.
(SA693047 11/26/14)

**JOINT PUBLIC MEETING ON
NOTICE OF INTENT TO PREPARE DEIS AND MP FOR
PROPOSED HE'EIA NATIONAL ESTUARINE RESEARCH RESERVE
SYSTEM (NERRS) IN KĀNE'OHE BAY, HAWAI'I**

AGENDA

**Wednesday, December 17, 2014 at 5:00 p.m. – 7:00 p.m. at
King Intermediate School
46-155 Kamehameha Hwy., Kāne'ohe, HI 96744**

**Friday, December 19, 2014 at 5:00 p.m. – 7:00 p.m. at
NOAA Fisheries Honolulu Service Center
1139 N. Nimitz Hwy., Ste. 220, Honolulu, HI 96817**

5:00 – 5:15 Welcoming Remarks

- 1. Mahalo for attending;**
- 2. Opening Pule;**
- 3. Introductions;**
- 4. Project Overview and Purpose of the Meeting;**
- 5. Logistics.**

5:15 – 5:45 Presentations

- 1. Introduction of Presenters;**
- 2. NOAA NEPA process;**
- 3. OP Management Plan process;**
- 4. Limited clarifying questions only.**

5:45 – 6:50 Public Comments

6:50 – 7:00 Closing Comments

He'eia NEER Public Scoping Meeting
December 17, 2014, 5:00 pm to 7:00 pm
King Intermediate School

Attendance Sheet

Name
Donna Camvel
Wali Camvel
Kelvin Ching
Michael Chung
Jim Cook
Mahealani Cypher
Dietrix Duhaylonsod
Peleke Flores
Donald E. Gentzler
Joanne Hiramatsu
Jerry Kaluhiwa
Rocky Kaluhiwa
Hi'ilei Kawelo
Jarrett Keohokalole
Judy Lemus
Luwella Leonardi
Rusty Lillico
Tiffany Patrick
Keahi Piiohia
Susan Tamura
Ernest Theodore
Rob Toonen
Ikaika Wise
Ricardo Zanre

He'eia NEER Public Scoping Meeting
December 19, 2014, 5:00 pm to 7:00 pm
NOAA Fisheries Honolulu Service Center

Attendance Sheet

<u>Name</u>
Jerry Kaluhiwa
Rocky Kaluhiwa
Kristina Kekuwa
Luwella Leonardi
JoAnn Leong
Sean Martin
Michael Migliori
Ben Reder
Rob Toonen
Wendy Wiltse

Written Comment Form
 Proposed He'eia National Estuarine Research Reserve in Kāne'ohe Bay, Hawai'i

Thank you for participating in the public scoping meeting to solicit comments on significant issues related to the preparation of a draft environmental impact statement (NEPA) document and draft management plan for the proposed He'eia National Estuarine Research Reserve System in Kāne'ohe, Hawai'i. We invite you to use this form to provide your comments. If you complete this form at today's meeting, you may leave it at the registration table as you exit. If you do not wish to complete your comments during this meeting, you may submit comments by any of the methods listed below.

1. E-mail: hawaii.nerr.comments@noaa.gov

2. U.S. mail:

Rebecka Arbin
 Hawai'i Office of Planning
 P.O. Box 2359
 Honolulu, HI 96804

Your input into this process is appreciated. If you wish to be notified of future developments, please check here [] and provide your name, mailing address and/or e-mail address below.

Name: <u>KELVIN CHING</u>	Date: <u>12/12/14</u>
Mailing Address:	E-Mail Address:

COMMENTS (Please continue on the back of this page as necessary)

ATTENTION ~~MASTE~~ COMMERCIAL TOURIST OPERATIONS
 AS INTENDED IN MASTER PLAN.

FOR FURTHER INFORMATION CONTACT:

Rebecka Arbin, Hawai'i Office of Planning, Phone (808) 587-2831, rebecka.arbin@dbedt.hawaii.gov or hawaii.nerr.comments@noaa.gov. Phone number listed is not a toll-free number. Please see <http://planning.hawaii.gov/czm/initiatives/nerrs-site-proposal-process/> or <http://www.nerrs.noaa.gov/> for more information.

Comment Slips 12.17.14

Written Comment Form
Proposed He'eia National Estuarine Research Reserve in Kāne'ohe Bay, Hawai'i

Thank you for participating in the public scoping meeting to solicit comments on significant issues related to the preparation of a draft environmental impact statement (NEPA) document and draft management plan for the proposed He'eia National Estuarine Research Reserve System in Kāne'ohe, Hawai'i. We invite you to use this form to provide your comments. If you complete this form at today's meeting, you may leave it at the registration table as you exit. If you do not wish to complete your comments during this meeting, you may submit comments by any of the methods listed below.

1. E-mail: hawaii.nerr.comments@noaa.gov
2. U.S. mail:

Rebecka Arbin
Hawai'i Office of Planning
P.O. Box 2359
Honolulu, HI 96804

Your input into this process is appreciated. If you wish to be notified of future developments, please check here [] and provide your name, mailing address and/or e-mail address below.

Name: FRED FLORES (AKA PELEKE)	Date: 12/17/14
Mailing Address:	E-Mail Address:

COMMENTS (Please continue on the back of this page as necessary)

EXTEND BOUNDRIES TO ORIGINAL BOUNDRIES, WE CAN
MĀLAMA, ALOHA 'ĀINA, SUSTANABILITY CULTURE
AND FOOD RESOURCE.

FOR FURTHER INFORMATION CONTACT:

Rebecka Arbin, Hawai'i Office of Planning, Phone (808) 587-2831, rebecka.j.arbin@dbedt.hawaii.gov or hawaii.nerr.comments@noaa.gov. Phone number listed is not a toll-free number. Please see <http://planning.hawaii.gov/czm/initiatives/nerrs-site-proposal-process/> or <http://www.nerrs.noaa.gov/> for more information.

Ernie Theodore	<p>My question is what made the Office of Planning determine the outline of the proposed boundary? I have a suggestion, all of the fisherman fish in this area here (points to the reefs throughout the proposed boundary), there's no fishing around Coconut island so, that would be a perfect place. Coral island is enforced by the military. They would come shooting off the zodiac in the estuary. See these boundary lines on the chart there, it was changed from the previous meeting, why is that? I see some of the boundary lines, doesn't it include conservation lands? Why? Also, the proposed boundary in the ocean, it includes certain reef patches. That's unnecessary. The previous chart included two patch reefs and stretched out to Coconut island for what? Research or whatever? We get two natural estuaries.</p>
Michael Chung	<p>I am a fisherman of Kāne'ohē Bay and the previous comment reflects my concern as well in regards to boundary lines being changed. I brought this up at the first meeting. It extended to the commercial operations here and nothing was going to change. Fisherman were going to be included in this area. If nothing is gonna change why did they exclude these commercial guys? You guys must've thought of excluding them would help right? Well, we're worried. Are fishermen going to be excluded? I mean I care about a lot of other stuff too. But, the issues the water. The water quality check is gonna be from present and you gotta include historical water quality info, but we no more. We don't have enough water because it's going to 'Ewa side. But if you give back the water to Kāne'ohē Bay a lot of the bait fish is gonna come back. There's only one aku boat out there and that boat is done. They're retiring. So you cannot blame them for less fish in the water. They used to have 20 aku boats. Now there's no water.</p>
Kelvin Ching	<p>I also grew up in the bay and have been involved in the bay issues when I was in college. I attended all the meetings especially with the Kāne'ohē Bay Master Plan and I am disappointed. This sounds like another go through the motions. This will probably be adopted because it has different motives. You want comments and input regarding your goals and aspirations. Ok, well first off if there are no new regulations, I'd like to be able to reference that when I tell my kids and grandkids about it. But, I know it's not gonna happen. This is the beginning of the end for us. Second, these partners in the management plan: who decides who the partners are? Can we be partners? By the time public comment is over everything is all said and done. I see you guys going back to the ahupua'a and that's not recognized today. It's not for one certain group, privatizing the ocean, that's not right. You're going back to old Hawaiian system. Would be good if everything was done the same way across the State. We can't live in the two worlds. You can't have State support and want to be sovereign. Also, where is the money</p>

	<p>coming from? It seems like we're doing the same thing and expecting different results. I'm sure there will be different results. What I wanna see is us to save time and money... let alone the money we don't have.</p>
<p>Donna Camvel</p>	<p>Aloha to everyone, I too am concerned about He'eia as it is a very special place. A lot of us have long time genealogy and various kuleana here. My question regarding the boundaries seems insignificant as so many of my other concerns have an effect on our current practitioners. I understand the reasoning too. Here, we are looking at new ways to manage resources that are severely impacted and will continue to be impacted especially now due to climate change. We cannot merely look towards next generation; it must start with us now. There are mo'o of this 'āina and we need to all work together. I'm aware of the concerns regarding trust with various agencies that have come here from across other lands and have done great harm. But we do live in a time that the ahupua'a framework is coming back. Here in He'eia we can say we have a real special place that still holds a lot of critical components regarding customary practices and science. There must be serious mitigation measures in terms of environmental impacts. As fishermen, I know there are changes in species and amount of fish. The abundance conditions are certainly observed for example at Ioleka'a. In terms of interests in the NERR project include that when we talk about ahupua'a we talk about a mauka to makai management system. For Kanaka Maoli and the local community this is a complex and interconnected system. While it may appear to be broken, components in each 'ili are alive. This includes the tangible and intangible. The way those things are managed must be place-specific kuleana. So when we look to fishermen for expertise, we have to pay attention to their concerns. When we look to farmers, their concerns also must be addressed. I would also like to see the inclusion of the 4 perennial streams: Haiku, Ioleka'a, He'eia, and Puolena. These streams run through the wetland and into bay. The muliwai must be productive in order for the reserve to work properly. We need to begin talking about managing resources in best way possible. However, we also can't leave mauka sections out of the reserve if we are going to do this properly. Waters that come from mauka are source waters that flow to the Bay. These streams go thru smaller ecosystems, and it is important on how they are managed and then the capacity they have to manage themselves. This is critical to this plan. I would also like to clarify that the idea of ahupua'a is not a watershed. A watershed says there's a bunch of water and it all drains in same place. Ahupua'a is so</p>

	<p>much more. Everything in it is relational. Everything is bound by reciprocity and that includes the people who live in it. Cultural perspectives must be included while putting together this plan. You certainly have lots of volunteers in this room that have been a part of many volunteer efforts. See how we would like to remain in the loop. You may include streams yet, not the whole 'ili or the whole stream. We would like to see the streams evaluated, tested for components such as flow, groundwater, and turbidity. We would like to see studies regarding the drainage in the wetland. In terms of science, these elements can help answer those questions and explore the directions we should take. Yes, it is pretty hard to go national when you are going sovereign, but there is space for 'āina. There must be a way for us to advocate for that right? I also have a few questions. Are these arbitrary boundaries? Can they change? Who said they could be changed? Answer these questions, and we will begin to establish trust. As long as our history remains, we will always be looking out for the best interest of the 'āina. I understand this can help reserve and preserve but it might happen to have long-term ramifications. However if it is written using a cultural lens, it might just work. Another suggestion. You see here where Haiku Stream in Haiku valley trace from the source, where the punawai starts, maybe go from the middle of the stream 5 feet on each side. That might also be a good boundary. Those waters flow thru wetland. Mahalo.</p>
<p>Ms. Luwella Leonardi</p>	<p>Aloha I am Luwella Leonardi and I live in Wai'anae. However I am the daughter of Edward Nī'auipi'o who was born in Maunawili. We are the mauka Nī'auipi'o. Under Sites of O'ahu, under Waimānalo you'll find Edward Nī'auipi'o there. He was insulted throughout the Ko'olaupoko region. I'm opposed to this project. I don't have any theory; I can't talk theory and thesis. I'm not educational. I teach in the schools and the colleges. I know how to teach the children about the ocean in the classroom. I look at children every day. My question is where are these kids gonna live. They're not gonna have the opportunity to live in Hawai'i. I'm here to see that opportunity exists. This plan sort of carves our future generation out of Hawai'i. It does not embed our children into the future that our parents woke up to. I can't guarantee them that. I grew up in Waimānalo, before Sea life Park. It is appalling that we're creating another Sea Life Park. It took so much from my dad. When Chad Pryor showed up, he said, "Oh, we're going to feed the world." All that I can remember him doing was putting a wholphin and – a dolphin and a whale together and coming up with a wholphin. I got pictures of the wholphin. I thought he was cute. But did</p>

	<p>that feed the world? Later as an instructor I took students to Sea Life Park. The wholphin, two species together, to me that's appalling. When Makai Pier came up, that raped our resources. I remember when my father and grandfather's brother, okay? He showed McAllister, the scientist, what our ko'a is about, but today we have Makai Pier on it. Sea Life park was a heiau too, a lot of 'iwi buried there. They swept across like a plague. By the way read the Stratton Report. The only copy they have is in Hilo, used to have in Hamilton Library. What I've got from DLNR is that we don't have any authority and that scientists on west coast they have authority backed up by junk science. So I'm sitting here telling you 'a'ole, 'a'ole, 'a'ole. That's what we say. We're still sovereign and we're occupied. So what we're looking at, if the game is going to court how much is this gonna cost us? And whose gonna carry the burden. It can end tonight on your comments.</p>
<p>Mahealani Cypher</p>	<p>I live in Kāne'ohē. Eō to some of the remarks made earlier especially by Donna Camvel in regards to finding the right balance for Kāne'ohē Bay. What I also heard, in moving forward is to include the voices of our fishermen. They need to be a part of this. It's not about a museum piece but the living pieces. We need to work together. We need to accept the help. What's the cause of problems, you know? I look forward to having the research done. I don't look to what's junk and I don't care where you come from. If you have the help than please help. I think it's rude to tell people to leave if they are offering help. Yes, we have been shifted out of balance for a hundred years. I don't see as many fish as there used to be over the last 10 years. There's a hope that through the years they are not meant to lock us out and hopefully ensure our future. The only way to do that is to stay engaged. Nobody should be outside the window. You guys are a part of this. And anyone who wants to be a part of the solution should be a part of the working group. Mahalo to everyone.</p>
<p>Jerry Kaluhiwa</p>	<p>Jerry Kaluhiwa. I'm from He'eia and born raised there. Before everyone talk about doing these areas I'd like know about the red line. I want to expand in the direction that won't be blocking no community. I'm talking about no community around so we don't have conflict with the community. It happens a lot. I've done research since the 60s with at-risk kids in the Key Project. That's how I got involved in high schools. We did a seaweed project with Ogo. On the Ogo part, I'm the only one that made seedlings. From that time on, I wanted to get deeper in my studies. I'm concerned about Kāne'ohē Bay. I caught it with my</p>

	<p>family. I know how to do it. Today, we don't show anyone that kind of fishing. Because not enough fish. I dive today; I go every day. These days the fish is too well educated, you gotta really think like one fish to catch one manini. We trying to find out why? Then I got into tropical fish. Tropical I see disappearing right from the earth. Some fish extinct. I ask fishermen, do you know what's happening? Today you don't see that kind of fish. I went to research on these tropical fish. It's coming back at least 1 or 2 I see. Makes my feelings good. We should look into it. Coral, now I went into corals trying to protect corals in front my place. I went to court and all that fighting is all in the air. Judge slapped those guys on the wrist, why? Because the judge don't know the rules. I try to protect Kāne'ohē Bay. I take tours out especially to see the tropical fish. When we go we feed fish, then there comes these crazy guys with net and they surround the whole place. When I go out again each time fish is getting less and less. Especially around Coconut Island. When I see people walking on the reef and saying they have rights. I know they were lying because I'm there and I know they not supposed to be doing that. It's the law. They should leave Coconut Island and use it as a restoration area. We did research there and it is excellent. Especially the Iimu Ogo. Now I have another project called Mauka Makai. We need to do a little more. We did Mauka Makai, had 6 members. Hi'ilei was one of them and several other people. Hi'ilei knows about it. We did that because I am also in the lo'i business. I helped build lo'i kalo in He'eia and I stayed doing that worked with Hi'ilei on the fishpond. In analyzing mauka, this boundary line needs to be moved more towards the blue mountain. We get rivers from Uncle Lono's place. We gotta research that. Next thing we looking at that to see how it affects the seaweed and the coral reefs.</p>
<p>Wali Camvel</p>	<p>I was born and raised in Kāne'ohē and have been here for 52 years. I swam at Ice Pond by Luluku side and have gone around Mōkapu. I've been from mauka to makai these hanabata places. Aunty you talk about Kanī'auipi'o. Kaupo where you from that's a good place too. I want to address where the Army Corps guys started dredging the bay. It changed the currents, and no more that wash that cleans it out. Maybe that part science can help clean out, circulate here. Here, these subdivisions, the mud goes right out into the bay. Now I hear people are afraid of doing stuff. If we don't do anything what are we going to do. If we just do nothing, what is our option? We can get together someplace else and actually do something. We have invasive species up mauka that goes into the stream, which goes into the bay. Several groups in Haiku are planting kalo and opening up streams Ioleka'a side, also the working being done at Paepae by the fishpond. Get involved, there are people actually doing something make this</p>

	<p>place better. He'eia is on the move, we not good yet but we doing something. What kind of future are we going to leave? My parents never do anything. If one hurricane came can you drink the water in the stream? I know we can. We stay up mauka. But, the H3 frees all that asbestos from all your tires go into the drains into the streams and into the bay. What can we do now? How can we control our community so that we can offer something later on? Neighbors spray Round Up that goes in the stream. They spray Round Up, goes on top the bees and kills the bees. What are we doing to better our community? We take care of the limu and we gonna get that fish. Sure, we cannot go back 100 years but if you think about 100 years, was not so long ago. We really mucked it up. I have memories when my sisters, they played in taro patches. For a long while He'eia wasn't producing any kalo. 1948 was the biggest production of kalo and after that slowly went downhill. Lo'i kalo allows for stream water to percolate and create water recharge. Board of Water calls em recharge units. The water, they go into the aquifer. If we do nothing now, then what are we going to do?</p>
<p>Rocky Kaluhiwa</p>	<p>Aloha kākou, I was born and raised He'eia all my life. I am a part of the Kāne'ohe Bay Regional Council. We have talked to the senators; we have 5 members. Kelvin, Maybe you should get back on that committee. What Wali and Donnie said is true; I used to drink that water, near their place. My 'ohana is from up that place. All my life we always maka'ala with He'eia because that is our ahupua'a. We have 11 'ili inside there. Rick Barboza them are back there. I also just like let you folks know that we are the partnerships that are actively sustaining these resources, it's all what we have. So, don't just come grumble. We invite you guys to come because we need your help. It is our kuleana and it is a kākou thing. You know we got little left. Look at our coral reefs and the depletion of fish. You're a fisherman, you can help on the board of fishermen. And you know what? Every time I hear He'eia I'm on top of it. Either you gonna help us or you gonna fight us, either way we invite you to help us.</p>
<p>Wali Camvel</p>	<p>For clarification, the ahupua'a of He'eia actually goes to the Marine Base. It's a good place to do studies because get plenty fish and not to mention the fishpond out there. There are several fishpond. Also get place for us to make salt.</p>

<p>Sean Martin</p>	<p>Hi, I live in Kaha'u, and I am affected somewhat frequently. My place is very close to some of these boundaries. Going back to Leo's comment, regarding community engagement. He said that community engagement would be primarily based on landowners and the community within these respective areas. I think it's shallow. Users of the bay are not only from the windward side. Community involvement should be encouraged at a higher level other than the public comment period. For example, there are other interested parties that aren't engaged as landowners or users. It would be good if they had the opportunity to provide input. Another concern I have is regarding the layer of bureaucracy. I've been hearing that the Feds are not going to develop regulations. So it's clear that the State will allot the activities that are encouraged or prohibited in the designated area. I am cautious about that. The more you have public engagement the less hostility</p>
<p>Wendy Wiltse</p>	<p>I work for the EPA and I support the nomination of the He'eia for NERRS program. I think it's a positive thing for Hawai'i, for Kāne'ōhe Bay and for Ko'olaupoko area. As far as the boundary, I recommend considering including more mauka land to have more of a complete ahupua'a system. The remainder of my comments relate to management. Some aspects of this area that I'd like to see considered in the EIS and the management plan include the following: first, the role of mangroves. I know that in general they're considered a nuisance but in my personal opinion they have important ecological function especially for filtering sediment. I think they're more effective than a native wetland. I'd recommend they evaluate the ecological function of mangroves. My second comment would be on the fishpond aquaculture and taro production. I think they're positive but they also could be negative. It depends on how they're operated and managed. For example, water quality studies we have done in Hanalei, the biggest taro producing region in the state, we have found that the lo'i export nutrients and sediments. Although we do not have the data, we suspect the lo'i also export pesticides. How the taro is managed needs to be considered as well. I wouldn't want to see a major nutrient export from these lo'i into the bay. In addition, fishponds and the way they are managed is also a concern. Well, like the lo'i it depends, will the fish be fed? What's the population density? Is there a potential for exporting nutrients from fertilizers and fish feed? We already have eutrophic conditions in the bay, especially with the algae blooms due to nutrient exports. Finally, the plan should consider herbivore fishery management. It's something that DAR is doing on Maui with some success. There's lots of scientific information that</p>

	<p>indicate that a high abundance of herbivorous fish serve an important ecosystem function.</p> <p>Aloha, just for your information, like I've said, we did research on these areas (points to coastal region of the proposed NERR site). I don't only do lo'i, fishponds or marine biology. It's all what I do. We started a program up mauka with 429 acres of kalo. We doing that today too. We doing our Mālama Mauka-Makai project. What we're doing is monitoring these areas (points to mauka areas of proposed NERR site and above the NERR mauka boundary line). I was born and raised Kāne'ohē all my life. Why we suggested doing this? It's because we're doing lots of projects. We're working on the river. Kāko'o 'Ōiwi Program started in here too. We're going through a fishpond protection and used one of the key projects out in Kahalu'u. We're already doing it. We were the only one out of every island doing these projects and we will continue to do this. This is my second round and it is getting much bigger. Now we're trying to work on the whole Kāne'ohē Bay and studying limu. I've made the babies with Dr. Abbot and Jack Fisher. Thank you for letting me do this project again. Just reminding you guys we working hard. We get the Ko'olaupoko Civic Club raising money for kids who are going through college. We are not kicking back, we moving.</p>
Luwella Leonardi	<p>This is a tough project. It's so glamorous—rich with Christmas tree lighting. Unbelievable. Our children deserve a future here in Hawai'i and that's where I'm coming from. Is there a future for our children in Hawai'i? I personally would like this project to go away. It's taking from our future and it's not going to contribute to our children. I've seen it before, the type of focus on this bay. I grew up in the area where sea life park is located. I've seen the damages to our people and to our places. I've seen the worldwide damage projects like these have done and that's what I'm comparing it to. I have been reading the Stratton Report. I've done huge meetings in the 70s and I speak to the fisherman every day. I attended the December 4th meeting and that was tough. That meeting was missing a group of non-commercial fishermen. I attended the meetings in Kahana and He'eia in the 70s and the 80s. I attended the meeting when the Tuna industry was going down. We're supposed to focus on K-12. I'm in the schools on the leeward side. From Pearl city to Makaha. This project's curriculum is inviting. We need that, it's plausible. You know I don't see our participation. I don't see the NOAA program including our children as a part of this plan. I see more out-transits doing the bulk of this project. I don't see the relationship.</p>

<p>Dawn Chang knows me really well. This is a huge comparison especially with the huge statewide meetings with the DOI. It was awful, it was nasty rotten, and I knew that it was going to be that way before it begun. It was tough and I'm still burnt out. I can't believe they're going through with this second wave of meetings. I attended all the CZM meetings in 2013. I attended the first for this project in January. And well, Dawn knows me. What I'm seeing here is that we need to take a look at the local community. Not a particular person, community or Hawaiian Civic Club. This is going to hurt us. We are a polytheistic people; we are not of a mono-god. I don't know how we're going to address the local community. I don't have the resources to keep the communication going back and forth. There needs to be more investment in money, rather than that 30% and 70% you folks talk about. I've been on that computer researching the NERS. And, I seen the Native Americans are pretty pissed about it. I'm not sitting at home I've been doing a lot of homework and asking questions. It's not going to be a good thing. We're going to have the same old problems with all the programs. I don't know the resolutions anymore.</p>	<p>Aloha. My name is Rocky Kaluhiwa, and I'm the vice president of the Ko'olaupoko Hawaiian Civic Club and I just wanted guys a brief background of He'eia. Our family fought against all of the developments since the early '70s. We fought against that. The He'eia meadowlands, which was going to be another Hawaii Kai. I actually saw a model of it. The 500-berth Marina was going to either be constructed over the fishpond or they were going to fill it in. Remember when He'eia State Park at Kalaeulaula at Kealohi Point was going to be a hotel? We fought against that. Part of the plan was even to raze the broken bridge and leave a drawbridge. We fought against that. When He'eia Kea was going to be a nuclear power plant; we were the first community to take that case all the way up to the Supreme Court. I'm also on the Kahalu'u Neighborhood Board. Here, we extend our hand for help. We are working on research to look at the coral and the limu. They are not here to harm us we need the resources from them. Also, this is not just one person, community, or civic club. The restoration efforts of Native Hawaiian plants and other species is ongoing. The Ko'olau Foundation and HIMB help us research. Kāko'o 'Ōiwi does the lo'i. I just want to make a note that no taro goes into the lo'i without coming to my house first. We inspect each one. We even incubate the kalo and make sure everything is pono, that there's no snails or other diseases. Also, I don't believe in insecticides or pesticides. My grandpa ran the last poi mills in this area. You guys welcome to come, we have Mālama</p>
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Notes from
Public Mtg. 12.19.14

days, come. We are inclusive, we want everyone to come. My grandfather was the last konohiki for the ahupua'a of He'eia. My family before that, we were maka'ala. We're trying and I will continue to fight for the rest of my life. Come join our club, or there are other clubs. Kāko'o 'Ōiwi and the Haiku Nursery is open to the public, so come in. Even HIMB is open to the public. Come and join us, I see nothing wrong with that. Mahalo.

Appendix D. Public Engagement: Focus Group Meeting—January 31, 2015

**PROPOSED HE‘EIA NATIONAL ESTUARINE RESEARCH RESERVE (NERR)
IN KĀNE‘OHE BAY, HAWAII**

**FOCUS GROUP #1
EDUCATION/TRAINING/INTERPRETATION**

**Saturday, January 31, 2015 14 at 1:30 – 4:30 p.m.
He‘eia Elementary School
Kāne‘ohe 96744**

AGENDA

I. Pule and Welcoming Remarks

- 1. Introductions**
- 2. Purpose of the Meeting**
- 3. Overview of the afternoon**

II. Discussion on Strategic Planning Process

- 1. Overview Presentation on He‘eia NERR**
- 2. Vision for He‘eia NERR**
- 3. Mission for He‘eia NERR**

**III. Discussion on specific goals and objectives for
Education/Training/Interpretation**

**IV. Discussion on the strategies and tasks to address the
Education/Training/Interpretation objectives**

**V. Discussion of additional Education/Training/Interpretation topics that may
be included in other sections of the Management Plan**

VI. Next Steps

Topic	Participant	Comment
Goal	SB	At the elementary level, during "Aloha 'Aina lessons, use the "ahupua'a" system poster, by Marilyn Kahalewai as a historical sample and then utilize a picture of He'eia as the current "ahupua'a" model.
	KR	Document the land use history of the He'eia ahupua'a, for better or for worst. Utilize historical photos and testimonials. Connect the landscape history lessons with lessons about ecosystem health. This is a teaching opportunity and goes beyond literacy. We would establish a fundamental baseline by allowing students to truly feel and observe something grow and change. Children will feel personally connected to the places in which they live. In turn, they could then appreciate science at that level as a way to document the health of the ecosystem. Throughout these lessons, there would be an emphasis on the mauka to makai connection. What you do up mauka will affect makai, and vice versa. Here, we would have an opportunity to synthesize traditional and Western knowledge.
	SB	We could achieve "Environmental intelligence".
	Ulukoa	These types of lessons are currently trending, especially in the upper levels of education. There is a greater appreciation and a deeper understanding that can be fostered when to looking at indigenous knowledge and Western science side by side. Though in my experience, it is not always easy. We must be maka'ala, we must be careful, as we have both scientists and kupuna in this room. We must keep in mind when we present these bodies of knowledge to visitors and kama'aina we show the importance and all the value of each set. It is not a matter of valuing one form over the other—it is a matter of juxtaposing them. It is about contextualizing 'ike or insights in order to holistically appreciate

He'eia.	(1) Family is big time; I've had instances where my students have learned things from their grandparents and I teach them something contrary. I mean we all know whom'd they choose right? Their grandparents. There is something to be said about traditional knowledge and the value it holds. I don't want to lose access to the family. When we train these kids, it is an opportunity to reach their parents, families, and the essentially the community. (2) This is also an opportunity to work closely with site partners. I hope we'll have more formal connections so that when we point towards each other when teaching the students, we'll know the history of each place and the current work going on in those areas. What I'd like to see in five years is an "overnight on Moku o Lo'e" where we'd coordinate with the other site partners to bring their program participants and check out what we're doing. It's unfortunate that we're all so busy. I mean Moku o Lo'e takes everything I have.
Dawn Chang	So I'm hearing, more site partner integration.
Mark Heckman	Yes, whoever ends up being education lead, maybe they could formally require us to meet every so often, maybe on a quarterly basis.
Noel Campbell	We all believe that our connection to one another is going to be only way to accomplish things however, it is difficult because we're busy and so focused on our areas. I'd like to see us launch initiatives that would allow us to come and work together. It is easy to talk about ahupua'a model, but the community aspect is difficult. We're still trying to figure that out.
Emily Montgomery	In my experience, our management advisory committee, the site partners, meet on a quarterly basis. Many of the ideas I am hearing, well you could adapt

	<p>many of the NERRS program frameworks to your specific goals and objectives. We have the Coastal Training Program that provides a multidisciplinary setting with reserve-based field activities and training initiatives. Second, the K-12 Estuarine Education Program that emphasizes the importance of coastal and estuarine concepts.</p>
Malia Rivera	How does public outreach fit in?
Emily Montgomery	The NERRS has an outreach program component that will do that with the exception of coastal training program component.
Matt Ramsey	He'eia is the perfect place because of its accessibility. For example, if I had a student who was in a wheel chair, even kupuna, these areas are able to house those kinds of facilities if need be.
Rocky Kaluhiwa	I second that comment.
Dawn Chang	I hear that "facilities" would be helpful. Would it be important for the site partners to have a "central" location?
Rocky Kaluhiwa	Yes, He'eiakea.
Emily Montgomery	This kind of central location would be a living and multi-purpose place that we would be able to conduct education programs, bring in administrators and legislators for meetings, maybe an interpretative hall, labs, auditorium and classrooms.
Kanekoa Schultz	I wouldn't have labs at this central location. That's why we have HIMB. Rather than one complex, I want a diversity of structures, especially for each designated site.

Dawn Chang	I see, so the site partners would be interested in a hybrid form infrastructure.
Emily Montgomery	Yes, of course. Some NERRS sites don't have any structures. It all depends on what the partners desire.
Jo-Ann Leong	I would like to look into this hybrid for of infrastructure for He'eia, what would that look like?
Dawn Chang	Yes, this hybrid could be in the form of a small facility with visuals centered on the ahupua'a as well as the mauka to makai connect.
Mark Heckman	Maybe we don't need a central place and designate funding accordingly to each site, especially since there are existing structures.
Emily Montgomery	Yes, interpretive centers do not need to be built in the reserve. You could also rent another building, maybe a facility in Kane'ohē where people are able to access it the center more readily.
Rocky Kaluhiwa	We could be open to that, I mean our Civic Club offices are in a building near Windward mall.
Dawn Chang	Yes, I also hear the need for more opportunities regarding the integration and coordination between site partners—furthermore, coordinating the accessibility to site partners' facilities.
Ulukoa	Accessibility is an interesting issue. I am from Wai'anae and I have been blessed with so many opportunities to travel as military, for school, and my career. Many of those I know from my hometown were not as fortunate. So, if we are able to provide public access for those outside of this community, maybe they won't feel as ostracized.
Noelle Campbell	Yes, access is an interesting one. Us folks at Paepae get a lot of visitors. One

	<p>thing that is difficult is that when we reach out for people to come visit, we don't always get a good response. Money is normally the issue. We struggle because we can't always do things for free. We need to figure out how to maintain this accessibility and not give away too much to where people will take advantage.</p>
Emily Montgomery	<p>One way to strategize, since He'eia is a big resource, you could set up workshops at the NERRS sight and provide justifications that the program is "regional". I've done so in the past as I lived in a county that was in proximity of a NERRS site. You can write many things with "regional", maybe Integrating science with outreach. The NERRS program is set up to do things like that.</p>
Kathleen Ruttenberg	<p>My goal for outreach would be to create programs where you could involve teachers with the sites. Like a "train the trainer" type theme. Maybe fund summer fellowships for specific K-12 curriculum development. Instructors would be made aware of activities and opportunities happening in these areas, which could be promoted as field trip sites.</p>
Malia Rivera	<p>With that, it's been pretty difficult for us at HIMB. We have so many constraints with the Department of Education ("DOE").</p>
Dawn Chang	<p>Ok so we must address ways that we are able to institutionalize this program with the DOE.</p>
John Mitchell	<p>Yes, I second the "train the trainer" idea as a possible program. NERRS is not classroom base and therefore, He'eia is the classroom. Our goal is to get the kids out into the field. We strategize a way to bring a DOE representative to the table. We need advocates in that department. We need to establish some form of trust with the DOE so we can get kids out into the field.</p>

	Dawn Chang	I understand the difficulties that come with excursions, especially with the DOE. However, Hokule'a is doing lots of interactive learning for those of us who are not able to be on the navigating canoe or visit when they are docked. Yes, the kids should have the opportunity to physically come to the site, but maybe we could develop an "interactive learning" curriculum.
	Emily Montgomery	Yes, some of the NERRS grant money can fund interactive learning.
	Kathleen Ruttenberg	I would also like to suggest telemeter data to classrooms (wireless; transmit info). Higher-level students could do projects on the information we garner from these sites.
	Mark Heckman	Well I can tell you, from a student perspective, its not exciting. However if we incorporate images, that could help. Although it is our strongest priority to get the kids in the field. We've done this telemeter type approaches, so what can we do different with this NERRS program?
	Dawn Chang	Overall, I'm hearing that we need to find a way to integrate our children's experience amongst the mauka to makai connection.
	Ulukoa	One strategy for incorporating kupuna knowledge is to have them physically or have their testimonials recorded at the "welcoming center" as a prelude to site visits. Upon each group's return, debrief with Kupuna.
	Emily Montgomery	What I'm hearing is the development of an adaptive strategic plan—one that incorporates outreach and the coastal training program. In order to test priority agendas, you'll have to do many market analysis and needs-based assessments.
Training and Outreach	Stephanie Bennett	How do you incorporate training or outreach to compatible use folks? I would

		like to see commercial entities play a role in the NERRS as ambassadors. Develop a series of K-12 career based program.
	Malia Rivera	
	Jo-Ann Leong	I would like to see us develop “synthesizers” or “bridgers”. This would mean training our next generation to be effective communicators—the ability to comfortably speak to those across the spectrum.
	Rocky Kaluhiwa	Develop Ahupua’a protocols and procedures document, could base on the Ahamoku System.
	Emily Montgomery	Yes, this could be an opportunity that is provided by the coastal training program. Speaking to the critical synthesis of modern science and cultural knowledge. How do we take our research and show it to legislators? We must continuously id stakeholders, policies, and avenues to achieve visions/missions.
Final Reflections	Ulukoa	I would suggest incorporating a lesson on He’eia’s connection to the moku of Ko’olaupoko on a broader scale.
	Emily Montgomery	NERRS is a great framework to all the work that’s currently being done.
	John Mitchell	He’eia is a prime example to examine anthropogenic dynamics in an estuarine system.
	Aarin Gross	This is a great vision of connections between man and earth.
	Jo-Ann Leong	I normally have a public distrust, but this meeting turned out great and quite productive.
	Malia Rivera	We need to properly “train our own” first and then we would be able to branch out to others in order for this process to be more productive.
	Jerry Kaluhiwa	Put the younger generation to work. This project is gonna be long-term but I look forward to it. Get plenty mana.

Focus Group Mtg. 01.31.2015
He'eia NERR Education/Training/Interpretation
Goals and Objectives

	Rocky Kaluhiwa	Protocols need to be incorporated.
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FOCUS GROUP MEETING PARTICIPANTS
HE'EIA ELEMENTARY SCHOOL
ATTENDANCE SHEET

1/31/15	
Education/Training/Interpretation	
Name	Affiliation
Noelle Campbell	Paepae O He'eia
Aarin Gross	Conservation International
Mark Heckman	HIMB
Jerry Kaluhiwa	Ko'olaupoko Hawaiian Civic Club
Rocky Kaluhiwa	Aha Moku Advisory Rep
Kristina Kekuewa	NOAA
Jo-Ann Leong	HIMB
John Mitchell	NOAA
Emily Montgomery	PCSU Planner
Matt Ramsey	NOAA
Malia Rivera	HIMB
Kathleen Ruttenberg	UHM
Kanekoa Kukea Shultz	Kako'o 'O'iwi

Appendix E. Public Engagement: Focus Group Meeting—February 7, 2015

**PROPOSED HE‘EIA NATIONAL ESTUARINE RESEARCH RESERVE (NERR)
IN KĀNE‘OHE BAY, HAWAI‘I**

**FOCUS GROUP #2
RESEARCH AND MONITORING**

**Saturday, February 7, 2015 14 at 1:30 – 4:30 p.m.
He‘eia Elementary School
Kāne‘ohe 96744**

AGENDA

- I. Pule and Welcoming Remarks**
 - 1. Introductions**
 - 2. Purpose of the Meeting**
 - 3. Overview of the afternoon**

- II. Discussion on Strategic Planning Process**
 - 1. Overview Presentation on He‘eia NERR**
 - 2. Vision for He‘eia NERR**
 - 3. Mission for He‘eia NERR**

- III Discussion on specific goals and objectives for Research and Monitoring**

- III. Discussion on the strategies and tasks to address the Research and Monitoring objectives**

- IV. Discussion of additional Research and Monitoring topics that may be included in other section of the Management Plan**

- V. Next Steps**

Meeting Notes
1st Series of Focus Group Mtg. 02.07.2015
He'eia NERR Research and Monitoring
Goals and Objectives

Topic	Participant	Comment
Goals	Scott Larned	Start to generate data for comparison across long term trends (fisheries, water ecology, etc.).
	Kathleen Ruttenberg	Establish baselines in order to understand the magnitude of change in the Bay, the impact of those changes on this ecosystem and its health. I'd also like to see more resources to monitor current research.
	Scott Larned	Yes, we need to generate data required to make accurate assessments. Develop reference conditions, something like developing physical conditions in the absence of people used for restoration goals
	Michael Parke	Archeological and historical research: terrestrial reconstruction of what has happened in He'eia.
	Dawn Chang	This was considered a very healthy system at one point. What were the changes at those times when there were changes in land use? Understand this and we might be able to better understand our current status.
	Rosie Alegado	We need to establish the parameters that we are interested in.
	Dawn Chang	I'm hearing that we need to incorporate our goals for establishing baseline information into our vision and mission. Maybe understanding a dynamic system, such as an estuary, to monitor health of the system.
	Paulo Maurin Rob Toonen	Will the goals we set be achievable? How specific do they have to be within the 5 year timeframe? To clarify with everyone, there are mandates for the NERRS to get funding. Since there's a lack of coordinated long term data, this would be an opportunity for us to establish a long term monitoring plan.
	Brian Glazer	I would suggest feasible goals such as point source v. non-Point source pollution goals.

Meeting Notes
1st Series of Focus Group Mtg. 02.07.2015
He'eia NERR Research and Monitoring
Goals and Objectives

Rosie Alegado	Research to inform the site partners and their current work; establish some kind of shared database.	
Hi'ilei Kawelo	“Scientific” - I want it to be understood that this term is inclusive of traditional and Western bodies of knowledge.	
Dawn Chang	Another item I am hearing is to reestablish connections and coordination of info sharing. That we need to find ways to communicate internally and externally.	
Rosie Alegado	Establish a central database infrastructure, a repository of information.	
Kiana Frank	We need a person to manage and interact with scientists; some kind of a bridger to communicate and facilitate that information.	
Kathleen Ruttenberg	I second that comment. This person must research all the current studies and incorporate that as well.	
Paulo Maurin	5 themes I've been hearing: <ol style="list-style-type: none"> 1. Need to have integrated efforts 2. Long term and historical repository, looking forward and back. 3. Programmatic elements; and mandates to look at. 4. Accessibility to stakeholders in the community; online database, coordinator and advisory board 5. Support connections to existing efforts (not only research but curriculum and outreach etc.) 	
Scott Larned	We need basic environmental monitoring for baseline understanding and the NERRS can do that for us. We should work with the DOH, NOAA and EPA monitoring databases, instead of reinventing the wheel	
Rosie Alegado	This might be difficult, especially if we have to rationalize and contextualize (a sense of what's important) the data in these data bases.	
Rocky Kaluhiwa	We also need to keep in mind that not all the surveys and scientific studies they've done are right. For example, all archaeological surveys are not accurate. We had to correct them.	

Meeting Notes
1st Series of Focus Group Mtg. 02.07.2015
He'eia NERR Research and Monitoring
Goals and Objectives

	<p>I say let's establish a monitoring system for current commercial businesses – we need to check their zoning and the activities going on there.</p>
Kathleen Ruttenberg	<p>It's easy for research groups to be insulated so, we need a structure to facilitate interactions between different interest groups and maximize the way that data sets from land and sea can be incorporated.</p>
Megan Donahue	<p>Coordinator needs to know the people. He or she will become the repository. This person would also facilitate presentations to these groups – a node in a personal network.</p>
Scott Larned	<p>I don't think "multidisciplinary" approaches have to be so legislative in terms of our studies and interactions. Let's put down restoration monitoring as a goal – study effects of large scale restoration efforts – look at effect on NERRS resource. Land restoration and its effect on the marine resources and communities.</p>
Hi'i'ilei Kawelo	<p>The goals to need to inform the direction of the 5 year plan. Generally, it seems that we are trying to understand our restoration efforts and their impacts on near shore waters / marine systems.</p>
Scott Larned	<p>We need to measure impacts of lo'i restoration.</p>
Dawn Chang	<p>Maybe that's where anecdotes and historical knowledge may come into play, I'm hearing that we need to coordinate efforts with the Department of Health.</p>
Rob Toonen	<p>Gather baseline data for sea level change in order to measure and understand its impacts on fishpond and lo'i restoration.</p>
Scott Larned	<p>Framework for floodwater and sediment movement through the watershed. This needs to be established to assess restoration activities. We need an integrated monitoring system and frameworks.</p>
Kathleen Ruttenberg	<p>Observe changes in receiving waters.</p>

Meeting Notes
1st Series of Focus Group Mtg. 02.07.2015
He'eia NERR Research and Monitoring
Goals and Objectives

	<p>Paepae o He'eia could serve as a mesocosm - "artificial" system. That could be the scientific hook as an "enclosed system to quantify numbers that could not be imagined elsewhere".</p>	
	<p>Adopting indigenous based models for land management as an alternative to Western practices. That seems to have broader national significance. It would lend validation to assess those land management models.</p>	<p>Rosie Alegado</p>

Meeting Notes
1st Series of Focus Group Mtg. 02.07.2015
He'eia NERR Research and Monitoring
Strategies and Tasks

Topic	Participant	Comment
Management Plan	Rob	“Cultural orientation”
Facilities	Kathleen Ruitenberg	Cable Observatory – biological primers to measure specific info
	Rob	Infrastructure funding
	Megan	Reasonable but hesitant to build a new building
	John	Another outreach facility would require extensive resources “collaborative” science projects; opportunity available from NERRS; hire on another staff member for this position; handles grants (part time)
	Rob	Funds are highly competitive – if you have collaborative with other sites as well.
Definition of <u>healthy</u> ecosystem	Rosie Alegado	“Habitats that are in less than pristine condition” . Base it on historical accounts: what color were the beaches, what kind of fish did they use to catch whether or not you can harvest certain kinds of limu etc.
	Paulo Maurin	I second this comment. Though it seems the term restoration runs counter to our visions and mission. Maybe something like “natural, tradition and coastal restoration needs to be inserted.
	Kathleen Ruitenberg	A place where native species will thrive. Removal of invasive species as they are outcompeting the native species.
	Scott Larned	We need to also think about how much monitoring is being done in and out of the Bay. What kinds of funding that will be allocated to those kinds of monitoring? Cultural health: expand lo`i and fishpond system to its current state of functioning. To optimize its production so it does not disturb its marine neighbors

Meeting Notes
1st Series of Focus Group Mtg. 02.07.2015
He'eia NERR Research and Monitoring
Strategies and Tasks

		downstream.
Kiana Frank		Layout systems within these boundaries in order to assess what is a “healthy” ecosystem. I see a healthy ecosystem as a system that is culturally functioning and has a sustainable fishpond.
Hi'ilei Kawelo		So for this management plan, I'd suggest the following outline: Historical overview Cultural overview (past and current land and resource uses) Vision Mission Conceptual framework You can write a lot of these things without using a data set--more at a high level of thinking. The optimal system will be based on your subsistence needs.
Dawn Chang		So I am hearing the following: <u>Short term:</u> Studies to be done on the coral reef impacts from lo'i and fishpond system. <u>Long term:</u> In order for us to have a healthy fishpond you need healthy coral reef system. Everyone is functioning at its optimum; but that's difficult to assess since the system is constantly changing—dynamic.

Meeting Notes
1st Series of Focus Group Mtg. 02.07.2015
He'eia NERR Research and Monitoring
Strategies and Tasks

		We need to also keep in mind that we may not necessarily reach that optimization.
	Scott Larned	<p>Our goal is to understand how each system works and the links between those systems.</p> <p>We need to develop or adopt an ecosystem model that links all of the systems and includes the feedbacks that makes the sets of changes in one system quantifiable versus in the other.</p> <p>We also need to map and calculate the export sediment in the NERRS.</p> <p>Our strategies and tasks need to reflect the “interoperable” system within the NERRS—similar to our integrated efforts/</p> <p>This is where kūpuna knowledge needs to be incorporated.</p> <p>Questions such as “what do we need to observe?” and “what were they observing before?”</p>
	Kathleen Ruttenberg	
	Rosie Alegado	Listening to the guidance from our elders speaks to Hawaiian values within this historical framework.

FOCUS GROUP MEETING PARTICIPANTS
HE'EIA ELEMENTARY SCHOOL
ATTENDANCE SHEET

2/7/15 Research and Monitoring	
Name	Affiliation
Rosie Alegado	UH
Michael Burke	DOH
Megan Donahue	HIMB
Dr. Kiana Frank	UHM
Dr. Brian Glazer	UHM
Doug Harper	NOAA
Darcey Iwashita	DOH
Hi'ilei Kawelo	Paepae O He'eia
Dr. Scott Larned	TNC
Paulo Maurin	NOAA
Michael Parke	NOAA
Kathleen Ruttenberg	UHM
Greg Takeshima	DOH
Rob Toonen	HIMB

Appendix F. Public Engagement: Focus Group Meeting—February 14, 2015

**PROPOSED HE‘EIA NATIONAL ESTUARINE RESEARCH RESERVE (NERR)
IN KĀNE‘OHE BAY, HAWAI‘I**

**FOCUS GROUP #3
PUBLIC OUTREACH & RESOURCE MANAGEMENT**

**Saturday, February 14, 2015 from 1:30 – 4:30 p.m.
He‘eia Elementary School
Kāne‘ohe, Hawai‘i 96744**

AGENDA

- I. Pule and Welcoming Remarks**
 - 1. Introductions**
 - 2. Purpose of the Meeting**
 - 3. Overview of the afternoon**

- II. Discussion on Strategic Planning Process**
 - 1. Overview Presentation on He‘eia NERR**
 - 2. Vision for He‘eia NERR**
 - 3. Mission for He‘eia NERR**

- III Discussion on specific goals and objectives for Public Outreach & Resource Management**

- III. Discussion on the strategies and tasks to address the Public Outreach & Resource Management objectives**

- IV. Discussion of additional Public Outreach & Resource Management topics that may be included in other sections of the Management Plan**

- V. Next Steps**

Meeting Notes
 1st Series of Focus Group Mtg. 02.14.2015
 He'eia NERR Public Outreach & Resource Management
 Strategic Plan Vision & Mission

Topic	Participant	Comment
He'eia Strategic Plan Vision (ref. PPT slide # 12):		
Ho'ola Hou – New Life, The He'eia Ahupua'a shall be a healthy resilient ecosystem from mauka to makai that sustains natural, cultural and human resources	Paulo Maurin	<p>Inquiry: As you say, there was plenty of conversation last week, I missed the first meeting. Don't know if the first meeting, not sure whether we we're aligning with the first meeting. From what I recall, we looked at the how the words are incorporated here. Is that the same wording as last time? Cultural, natural and community?</p> <p>Will the 3 focus groups be reconvened individually or altogether?</p> <p>Separately, according to your specific group.</p> <p>The boundaries are not final; using the word He'eia ahupua'a is not really the whole ahupua'a (as stated in the vision statement). That word is bigger than the boundaries.</p> <p>If we want to change, can you do that? You going see something coming in the future, can we adjust that? We talked about moving the boundary. KHCC wants expansion to include He'eia Kea Pier & C&C lands mauka of He'eia Pier.</p> <p>Last time we talked in relation to research that research is always going to be related to the NERR boundaries; programs are going to go elsewhere; clearly if we're interested in cleaning up the He'eia watershed, we are going to have to talk very nicely to people who own the private land; talk to their kids.</p> <p>While there are many research organizations, the vision should be consistent with the He'eia NERR.</p> <p>It can be reflected in the plan, the different alternatives reflected by the community & land acquisitions.</p> <p>The vision can be inspiration, we can aim a little bit higher even though we cannot</p>
Vision Statement		
	Dawn Chang	
	Peleke Flores	
	Uncle Jerry Kaluhiwa	
	John Kirkpatrick	
	Dawn Chang	
	Paulo Maurin	

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He‘eia NERR Public Outreach & Resource Management
Strategic Plan Vision & Mission

	see how we are going to be there but we can dream about it; mindful of the boundary later on.
Keli‘i Kotubetey	Time frame of the management plan is 5 years what happens after?
Dawn Chang	There will be an advisory board; 5 years evaluate.
Peleke Flores	Not unnecessarily vision should be 5 years, the vision can be beyond 5 years. Trying to see the picture; the vision we trying to bring back the system but just starting more the coastal then going up or plenty folks going all at the same time? How is it going to happen?
Uncle Jerry Kaluhiwa	We working on another one. Every time I go to meetings like this, this is always brought up in these meetings. That we are so unique in Kāne‘ohe, we have one of the best place in the whole Hawaiian chain; excellent research already done; need the documents of the research already done – to research steps from mauka to Makai; provides a unique opportunity to provide as a model for other restorations; fishpond – Lāna‘i is one of them, Maui is another one; Big Island is another one; I been to everyone; ours is unique; using He‘eia as a model
Dawn Chang	Uniqueness of He‘eia estuary; greater understanding and a desire for better internal coordination. How do individuals affect this estuary - from a vision standpoint? He‘eia should be a model for other estuaries.
Peleke Flores	Whatever where the He‘eia part, where the water stay; resilient ecosystem when it comes to restoring that stuff, it was basically built for the food; and everything else will come along with that – culture, natural resources; is this just about looking nice or looking good on paper or are we trying to feed the people; the river; basically made for in the beginning; I from Kaua‘i, bring back the taro patches to feed everybody. Today, the birds come back, everything comes back; but gotta start up mauka first. But if we start from the bottom up for our system, we trying to bring back what it was meant for in the beginning.
Dawn Chang	So we are looking for it to be functional.
Peleke Flores	Gotta start from mauka; if everyone doing stuff at the same time, the opala still

Meeting Notes
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Strategic Plan Vision & Mission

	coming down from mauka.
Aunty Rocky Kaluhiwa	Should we include cultural practitioners? Don't forget we have other partners aside from the 3 mentioned (Paepae o He'eia, Kāko'o 'Ōiwi, HIMB); there is the Ko'olau Foundation, Ko'olaupoko Hawaiian Civic Club, Aha Moku
Paulo Maurin	Integrating; we are trying to talk about natural, cultural and human; last week we were talking about community; natural resources, cultural practices and human community; should the word "practices" be added too?
John Kirkpatrick	Its values too.
Keli'i Kotubetey	Can work but cause some confusion; fixing something just to be a natural resource it could be competing depending on who's thinking about it
Strategic Plan Mission:	
Mālama to care for. To practice and promote responsible stewardship consistent with principles and values of the traditional ahupua'a utilizing innovative research, education and training	
Mission Statement	I am more comfortable with ahupua'a in the vision statement because it's more defined here: although in the previous statement too large a concept; whereas it's addressed here; it might be more appropriate.
Keli'i Kotubetey	The whole point of ahupua'a is human interaction with the land; I like it in the vision statement because then it incorporates; possibility of increasing the boundaries; if it's in the vision then maybe going forward, then, maybe it needs to be in the vision statement.
John Kirkpatrick	Defined what stewardship means to him – someone who is dusting off something.
	Stewardship is almost removed; it can sound only one way "taking care of the land."
Aunty Rocky Kaluhiwa	Mālama encompasses a broader meaning beyond stewardship; put the 2 words together; that is why they put up the ahupua'a markers; to educate, going have to learn our way too.

Meeting Notes

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He'eia NERR Public Outreach & Resource Management
Strategic Plan Vision & Mission

	Dawn Chang	Would you be more comfortable with kuleana?
	Peleke Flores	To mālama is being a good steward; use kuleana.
	Aunty Rocky Kaluhiwa	In ancient times, we may not have used the word sustainability; but we automatically planned for the next 7 generations.

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He‘eia NERR Public Outreach & Resource Management
Goals and Objectives

Topic	Participant	Comment
Goals	Kalei Kini	What is “place based?”
	Paul Conry	Site specific.
	Shahin Ansari	Typo – the goal for NERRS (national) should be “strategic plan – science protected places ” goal.
	Keli‘i Kotubetey	To me, I think this includes but it goes well beyond the 3 that you have been mentioning; Paulo mentioned earlier; the three organizations are only as strong as the individuals who do the work. It’s the public, its volunteers who are participating at those sites, students, the researchers driven by the organization. Then there’s the residents; the people who use the resources in the area; this goal is the one that should be the most inclusive of the three and more and beyond; meaning they may not be here in 20 years; this goal should be much broader.
	Rob Toonen	How about tying in the public? Better education about the natural and cultural resources of this place & engaged in the sustainability.
	John Mitchell	The philosophy is western, that doesn’t fit; resilience of the community as a whole; feed themselves.
	Paulo Maurin	Question: I think it’s fairly difficult to come up with a goal to outreach and resource management. It’s easier to link with education. Have a hard time coming up with a suggestion; that people who know the ahupua‘a what the place is like understanding of the place, having the public that live in the area become aware of those connections and the ahupua‘a concept.
	Dawn Chang	Take it apart & focus on goal for public outreach.
	Paulo Maurin	People should know the boundaries; understand the place & the connection; people in the area should be aware of the connection.
	Rob Toonen	Coordination; site manager; and outreach educator
	Dawn Chang	Our team’s job is to find out what are your goals? Let us try to figure out how to make it fit into the plan.
	John Mitchell	Know what is going on with all the moving parts and we also want the rest of the world to know. This is what we expect you to know about this area. International coordination amongst the site partners as well as external coordination.

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Goals and Objectives

		With the common goal; everybody working together for the common goal.
Kalei Kini		Hawaiian Civic Clubs do education & outreach.
Aunty Rocky Kaluhiwa		We go out and attend hearings. Trying to get matching funds. We testify. Some of the non-profit groups, we cannot do that. The ahupua'a markers took 5 years; federal city and state funds took 5 years; it was a task; federal didn't want to use the 'okina. Then we had to come up with a design. To the Ko'olaupoko Hawaiian Civic Club, it was worth doing. We went with the 1876 map, before the missionaries came and changed the wording. It was our kuleana to do it.
Peleke Flores		'Ili markers for us at the pond. We get plenty outreach, not talk about how we are affected. Get the app on the phone. It's like a public outreach to learn about the fishpond. Everybody does (their) parts like that in the ahupua'a.
		You can watch the t.v. in the food court.
Aunty Rocky Kaluhiwa		They had a trivia contest. They took it ran it with HECO and that went one for a couple months. Then we had something in midweek. It was good that we are all able to work together. Next year, we are going to be hitting the leg to get matching funds.
Kalei Kini		Even the schools, they use Kāne'ohē bay with the students. Do we kind of know, what current public outreach opportunities right now? Current educational opportunities?
Paulo Maurin		No central depository? There is people that know a good amount.
Kalei Kini		I'm sure that schools are doing their own thing. Whether in videos of Kāne'ohē bay, I'm sure they are doing that already.
Aunty Rocky Kaluhiwa		They do. But all the research projects, they do tremendous work with the schools. Right now have docents on tours; students from Castle High School; everybody does something. You're right, maybe under the NERRS project we can integrate all these projects together.
John Kirkpatrick		My wife works on the other side of the island. Often when a teacher burns out or moves, the program ends; need to keep a listing of what's been done, which would be helpful over the long haul.
Peleke Flores		Same problem we had just with our returning people. We are telling them the same basic

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		information. Second level, we'll go higher and higher with repeat people; redevelop the info instead of repeating the same info.
	John Mitchell	Set a picture of the ahupua'a as long as they all touch back to the water. The groups all know what's going on – it's the teachers that don't always know. Need to get an inventory; what's going on with the DOE
	John Kirkpatrick	Anytime you go in the water and you see resource management, it means who gets the most use. Who figures out how to manage, who gets how much fish one gets. Pretty clear how Paepae works, how Kako'o works. There's other people using it too – recreational. Resource management is trying to figure out what you are going to do to manage the ocean.
	Peleke Flores	Should the NERR's council be giving input to agencies on how to enforce the area even if we do have regulatory things in place? Good he brought that up. That's what we gotta figure out now because we are so separated. How do we enforce that?
	John Kirkpatrick	What happens if somebody has a commitment in the bay? They don't like how you're doing something in the Bay – it's affecting my kuleana/business/issues. Does NERRS MP have any input? Do we have anything to say about somebody being unhappy?
	Kalei Kini	I live in Kailua – come from Waimānalo, Kailua. Used to fish in the 1960s and 1970s in Kāne'ohē bay, as a Kailua person, I would defer to someone from Kāne'ohē Bay.
	Aunty Rocky Kaluhiwa	Had this discussion a few weeks ago. They incorporated for the first time in the history, that they had someone sitting at the table at forestry and wildlife. All on the same page to protect our resources; take care of your kuleana. There was a hearing where they wanted to close net fishing in Kāne'ohē bay. The biggest contention was from Kailua. We want our bay open because some of the people use it for food; Hawaiian traditional way is to incorporate native Hawaiian values – it'll work. We have to step forward to make sure they take care of their kuleana. Irresponsible fishermen are why we're in the situation we're in today.

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Peleke Flores	<p>Not going make everybody happy. But if we stay strong; tell 'um, no can do your stuff there. Concept of the kuleana gives you a strength to cut thru the b----- . Whether the NERR should participate in the management means making things work for everybody. I'm just assuming that use conflict will come up. Wondering how the NERR is involved in addressing those? If you have somebody who is doing something in the land area or in the sea area that isn't pono, then the advisory board should be able to at least express that concern to say DOBAR.</p>
John Kirkpatrick	
Rebecka Arbin	<p>So the NERR advisory board of the state agency, they will need to understand what is permitted and what isn't permitted and if there are changes that need to be made by the State, then it's up to them how to change it or recommend to DLNR. The advisory board has an opportunity to make an opinion. The state laws don't change as a NERR is designated. Maybe there is tool that all the NERR's partner can work with.</p>
John Kirkpatrick	<p>Get it expressed in one voice; this is what the NERR advisory board can help with.</p>
Auntie Rocky Kaluhiwa	<p>If I see something wrong, I'm going to speak up; it's our kuleana to mālama.</p>
Keli'i Kotubetey	<p>The most contentious part was the fishing. Are you going make new regulations? The ocean is where the biggest contention was. Make sure that it stays away from specific words so it doesn't make people pissed off with the NERR. Be sensitive that no new regulations will come out of this. Boils down to kuleana and the NERR will support proper management to those resources. Can come up with a resource management goal but it's sticky.</p>
Rebecka Arbin	<p>In terms of a goal of the resource, it's not the active manager but it could be a forum where you can learn about the other managing strategies; express their opinions to DLNR; so it's not like the NERR is a new entity; it's more like a platform.</p>
Peleke Flores	<p>Using the NERR to help enforce what we are trying to plan.</p>
Uncle Jerry Kaluhiwa	<p>When we first started this, the fisherman weren't sure what was going to happen. When the tour boats started, they have these walking under the sea. So they using their fishermen's place; when you cut their line out, they going make noise. Shorten on the outside and now they coming on the inside. We always respect the place. We feel it's good that they have all the research. They start moving their boats along the bay. They kind of damage the area. Over 1,000 a week walking the reef and it does affect the area. The</p>

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	fishermen getting tied up. We need to restore more in Kāne'ōhe. Get outlaws that hunt when the season is closed, have a time limit before DLNR come to work; by then, the fishermen are gone.
Aunty Rocky Kaluhiwa	We should mālama what's happening down in the Bay. Don't even go into making new rules and let the 'Aha Moku deal with that; the kapu system. Move forward with our own projects. NERR's should focus on their kuleana which his not making new rules. Need to engage with fishermen to get them on the same side.
Kalei Kini	Will facilities that expand other users increase the # of users of Kāne'ōhe Bay? Research and therefore conflicts and so on.
Paul Conry	The reality is NERR is not going to set-up regulations. Provided explanation of the NERRS & how it will connect all 3 resources.
Dawn Chang	It is having both the long-term fisherman; what it was like and what it is now; having the scientific information; it helps to manage that.
Keli'i Kotubetey	From the land side, what is the research monitoring and education? From the upper reaches, the land side, but if some research comes up from HIMB, that relates to fisherman don't know if it's coming from the fishpond, poi or whatever, the NERR is the outreach to get that information out. The public areas of the NERR, the ocean spaces, but then the private property of the NERR. But if some other information tells us we should be doing something different because it's having negative impacts, or doing something because it's having positive impacts we can have it changed? Seems like resource management is tied to research and the monitoring that's coming out of it; the western side is fundable by the NERR but what makes us unique is we use the kūpuna stories.
John Kirkpatrick	It's information and discourse of taking care of what we have here to sustain it for the future.
Aunty Rocky Kaluhiwa	HIMB for years had a bad reputation with the community – for us to use their information.
Dawn Chang	The traditional ahupua'a is the common thread at all these meetings.
Kalei Kini	In Kailua, Kawai Nui Marsh, then the tour buses are doing to come. Any facility, any kind of

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Goals and Objectives

	improvement and trails, then busloads of tourists are going to come. Busloads of Japanese tourists that might be holding us back doing something good for Kawai Nui Marsh trying to incorporate something like that.
Dawn Chang	When you do go, go with a level of sensitivity.
Keli'i Kotubetey	Other NERRs are they unpopulated? Populated? Heavily populated? Thinking about the uniqueness of He'eia. Just curious, how well used are other NERRs?
Kalei Kini	Other previous NERR was at Waimanu nothing was happening there.
Rob Toonen	The NERR across the country reaching from San Diego Marine Corps helicopter base – not really populated at all; they are all over the place, very few places likes Michigan and Alaska that are influencing both. Very few that have traditional cultural practitioners; He'eia is the only site where the community is involved from the start & the only one with a fish pond. This is the only site that I know of that has historic site.
Peleke Flores	What is the bays used for? Food?
Rob Toonen	Shipping lines; chunks cut off where ships can pass back and thru them. No other NERR where the intent is to feed people. The filter grounds were the river meets the sea.

FOCUS GROUP MEETING PARTICIPANTS
HE'EIA ELEMENTARY SCHOOL
ATTENDANCE SHEET

2/14/15	
Public Outreach & Resource Management	
Name	Affiliation
Peleke Flores	Paepae O He'eia
Jerry Kaluhiwa	Ko'olaupoko Hawaiian Civic Club
Rocky Kaluhiwa	Aha Moku Advisory Rep
Kalei Kini	Community
Keli'i Kotubetey	Paepae O He'eia
Paulo Maurin	NOAA
John Mitchell	NOAA
Bill Thomas	NOAA
Rob Toonen	HIMB

Appendix G. Public Engagement: Focus Group Meetings—March 10, 11, and 12 2015

**PROPOSED HE'EIA NATIONAL ESTUARINE RESEARCH RESERVE (NERR)
IN KĀNE'OHE BAY, HAWAI'I**

2nd SERIES OF FOCUS GROUP MEETINGS

King Intermediate School, Kāne'ōhe from 5:30 – 7:30 p.m.

Tuesday, March 10 – Education and Training

Wednesday, March 11 – Research and Monitoring

Thursday, March 12 – Public Outreach and Resource Management

AGENDA

I. Pule and Welcoming Remarks

II. Discussion on Draft Strategic Plan

III. Discussion on strategies to address specific goals and objectives for:

A. Education and Training (March 10)

B. Research and Monitoring (March 11)

C. Public Outreach and Resource Management (March 12)

IV. Discussion on Components of the Management Plan

V. Next Steps

minutes

Education and Training		
3.10.2015	5:30pm – 7:30pm	King Intermediate School
Meeting		
Type of	Focus Group	
Facilitator	Dawn Chang	
Note taker	Lu'ukia Nakanelua	
Attendees	Dawn Chang, Paul Conry, Shirlyn Ho'okano, Lu'ukia Nakanelua, Dietrix Duhaylonsod, Joshua Hekekoa, Bill Thomas, Jean Tanimoto, Bill Sager, Aarin Gross, Kauano Campbell, Josephine Patacsil, Mahealani Cypher, Rocky and Jerry Kaluhiwa and Tiffany Patrick	
Miscellaneous: NERRS Boundary		
<p>Mahealani Cypher expressed that in order for the ahupua'a model to function at full capacity, the Reserve boundary should encompass the entire ahupua'a of He'eia.</p> <p>Dawn Chang acknowledged the importance of "walking" the ahupua'a "talk" in regards to the Reserve boundary however, for the purposes of this five-year management plan, the proposed boundary was designated as a feasible area for the NERRS. If all goes well in accordance with the parameters set by this five-year plan, the site partners could potentially plan for the Reserve boundary expansion as apart of their long-term goals.</p> <p>Mahealani Cypher understood and suggested that their long-term goals for the boundary expansion be incorporated into this five-year management plan. Language such as "the boundary expansion will occur in incremental phases" and that this NERRS will "reorient community thinking" that would then prompt groups such as private property owners, to be a part of the ahupua'a model being executed by the NERRS.</p>		
Discussion: Draft Strategic Plan		
<p>Vision – Revisions "Ho'ōla – To restore ecosystem balance as <i>framed by Native Hawaiians practices that are reflected in the ahupua'a land management system</i>. The He'eia ahupua'a shall be a global example of a thriving and resilient ecosystem from mauka to makai <i>that feeds</i> and sustains our natural, cultural, and human communities."</p>		
<p>Mission "...traditional ahupua'a land management system supported by innovative research, traditional knowledge, education, and training that supports <i>lifelong learning</i> and a healthy and vibrant ecosystem that in turn nourishes the community."</p>		

minutes

Discussion: Strategies for Goals and Objectives

Goal

No further revisions.

Objectives

Kauanoë Campbell noted her concerns about keeping the current coordination and collaborative efforts between existing site partners.

Discussion: Strategies

Educational Initiatives

- Develop a booklet or a brochure to be incorporated in schools—especially on the Windward side.

Public Access Issues

- Focus Group expressed that they have no interest in creating public trails at this time.

Central Facility

- Kauanoë Campbell expressed that Paepae o He'eia would be interested in a central location to house their, research materials, publications, maps etc.
- Focus Group agreed that public accessibility is important.
- Paul Conry: Do site partners wish to maintain their individual sites?
- Site partners would like to maintain their individual sites and have a central meeting location.
- Bill Sager: Evaluate consequences and implications of the “tsunami flood zones” throughout the ahupua'a of He'eia. If site partners want the central facility to serve as a repository for physical records, these records should also be digitized.

NERRS Staff – Discussion of their roles and responsibilities.

- Site Manager
- Research Coordinator
- Education Coordinator: Dietrix emphasized the importance of this position. Coordinator would be an integral part of the coordination efforts between site partners, the community, government officials and commercial sector. Site partners were also encouraged to think about qualities and criteria for an ideal candidate.

minutes

Research and Monitoring		
3.11.2015	5:30pm – 7:30pm	King Intermediate School
Meeting		
Type of	Focus Group	
Facilitator	Dawn Chang	
Note taker	Lu'ukia Nakanelua	
Attendees	Paul Conry, Shanin Ansari, Jean Tanimoto, Dawn Chang, Joshua Hekekoa, Kanani Kealalio, Lu'ukia Nakanelua, Ricardo Zanre, Hi'ilei Kawelo, Doug Harper, Paulo Maurin, Bill Sager, Jo-Ann Leong, Josphine Patacsil, Donna Camvel, Mahealani Cypher, Rocky and Jerry Kaluhiwa	
Discussion: Draft Strategic Plan		
<p>Vision Ho'ōla – To restore ecosystem balance as envisioned by ahupua'a. The He'eia ahupua'a shall be a global example of a thriving and resilient ecosystem from mauka to makai that feeds and sustains our natural, cultural, and human communities.</p> <p>No further revisions.</p>		
<p>Mission</p> <p>Kuleana – Privilege and responsibility. To practice and promote responsible stewardship and outreach consistent with the principles and values of the traditional ahupua'a land management system supported by innovative research, traditional knowledge, education and training that supports a <i>resilient</i> ecosystem that in turn nourishes the community.</p> <p>Donna Camvel – We should make mention of “climate change” somewhere in this statement since it works hand in hand with resilience. Should those impacts become critical, we will have a place for that.</p> <p>Ricardo Zanre – Replace “healthy and vibrant” for “resilient”.</p>		
Discussion: Goals and Objectives		
<p>Goals</p> <ul style="list-style-type: none"> • Donna Camvel would like to remove the term “watershed” and replace with “ahupua'a” throughout the entire document. “Ahupua'a” is a complex holistic system that acknowledges the relationships between inanimate and animate beings. “Watershed” does not capture that fundamental component. • Jo-Ann suggests footnoting the term “ahupua'a”, while Dawn clarifies that we will make mention of this in the document’s “cultural orientation” section. • Ricardo points out that the goal seems focus more on ecological 		

minutes

components instead of the relationships and benefits shared between man and the environment.

- Paulo Maurin states that the statement “reads a little narrow”. He suggests replacing “research” and “sustainable food consumption. We need to link “research” back to the “guidance of environmental health”.
- Donnie Camvel states that we need to begin to look at ways in which this plan will benefit Kanaka Maoli and the people who work in the field by enriching the “cultural landscape”. She echoes Paulo’s point that the cultural component is lacking in the goal statement. Although this document isn’t legally binding, she reminds us that the document should speak to our community’s voice and worldview. She is also grateful for this opportunity to explore each other’s intentions for this project.

Objectives

- Hi’ilei Kawelo revised to insert the term “directed research”. As research will be directed by an informed professionals.
- Dawn Chang suggests “integrated research”.
- Mahealani Cypher delves further and presents the term “collaborative research”.
- Paul Conry adds the term “applied research”.
- Doug Harper states that (3) needs to be reworded.
- Ricardo Zanre asks: how will we execute the collaborative research?
- Jean Tanimoto reminds everyone that the nomination requires an “applied science” component. In turn, research would help to inform the State and other managers in the ahupua’a regarding best management practices.
- Donna Camvel states that the term “traditional ecological knowledge” has an antagonizing connotation. She suggests “traditional, customary and contemporary practices”, which would encompass a broader audience.
- Dawn Chang suggests that we incorporate the prior mentioned term as a part of the legal status. It is the Government’s affirmative obligation to protect those rights.
- Jo-Ann Leong suggests the term “traditional and local knowledge”.

Discussion: Strategies

- Hi’ilei Kawelo seeks a change in (2). Replace “impacts” with “effects”.

minutes

Potential Locations for Central Facility:

- Omega station
- He'eia State Park
- Focus group emphasized the importance of accessibility.

(5) How will we inform/relay information to community about research?

- Presentations at the central facility.
- Include scientists.
- Comprehensive baseline of information.
- Research coordinator will coordinate with scientists and serve as a "conduit for dissemination.
- Gap analysis within the research is required.
- Scientists advise site partners to inform management practices [options, consequences, etc.].

Dawn Chang reminds the focus group that there are other components of the management plan that address the points above.

- (8) Paulo Maurin states that this point seems prescriptive--especially if its not mandated
- Dawn Chang stated that (8) was meant to read that way in order to reinforce that it is a "responsibility" rather than "voluntary".
- Jean Tanimoto suggested having HIMB extend their database to the NERRS. Much of the information that has been and will be gathered is exceptional leverage with other NERRS.
- It was suggested that we incorporate a strategy about interactions between our site and other NERRS sites (what are the benefits? A lot of what we have occurring at our site could be instructive and informative).
- Add another component regarding the production of "bridgers".
- Hi'ilei Kawelo – What about research occurring outside of boundary? (i.e. fish) make mention of a research "buffer". We shouldn't feel limited by those lines. Part of the data gathering is going to entail research outside of the boundaries. Incorporate something about connectivity. She suggests the following statement be incorporated into the strategies: "create opportunities to conduct research that may at times exceeds the boundaries".
- Donna Camvel would like to see the development of "contemporary mo'olelo". They would reflect and track changes in the ahupua'a over time. This would obviously require expertise in the language and would confirm the "tenacity of the system to respond" in a poetic and digestible way.

As a side note, it was suggested that we utilize the management plan website for public comments regarding DRAFT management plan.

minutes

Public Outreach and Resource Management		
3.12.2015	5:30pm – 7:30pm	King Intermediate School
Meeting		
Type of	Focus Group	
Facilitator	Dawn Chang	
Note taker	Lu'ukia Nakanelua	
Attendees	Shirlyn Ho'okano, Dawn Chang, Jean Tanimoto, Joshua Hekekoa, Lu'ukia Nakanelua, Paul Conry, Shahin Ansari, Bill Sager, Judy Lemus, Kalei Kini, Mahealani Cypher, Peleke Flores, Bill Tam, Rocky and Jerry Kaluhiwa, Paulo Maurin, Doug Harper	
Discussion: Draft Strategic Plan		
<p>Vision</p> <ul style="list-style-type: none"> Judy Lemus likes the broader definition of “feeding” and “sustain”. It reads more holistic. 		
<p>Mission</p> <ul style="list-style-type: none"> No further revisions. 		
Discussion: Strategies for Goals and Objectives		
<p>Goals</p> <ul style="list-style-type: none"> Judy Lemus suggested replacing “community” with “<i>various communities</i>”. 		
<p>Objectives</p> <ol style="list-style-type: none"> Broaden the phrase “among residents and visitors”. Make mention of other interest groups such as commercial and military entities since they also have an impact. “local, <i>national</i>, and international...” 		
Discussion: Components of the Management Plan		
<p>Strategies</p> <ol style="list-style-type: none"> “sustainably managed” – perhaps the plan meant that management would be “adaptive” to sustain the resources. “Restore and <i>adaptively</i> manage <i>to sustain</i> the...” Broaden term “marine ecosystem”. In order to maintain connectivity replace with “<i>sustainable</i>” ecosystem. 		

minutes

3. “Central group” may generate sensitivities; organization will be the “coordinating” organization; “aggregating information” or “establishing networks”.
4. Statement seems prescriptive. “Rules and regulations” seems redundant. Last phrase is much more relevant. –source of info for internal and external use.
5. “Informed opinion”
 - Dawn Chang cautioned the group regarding the term “informed” as it would expose the Board to liability.
 - Rather than informed opinion, a more appropriate characterization would be “*will provide inquiry...*”
 - Paul Conry asked the group if they foresee the NERRS playing an advocacy role? The group expressed their concerns about attracting “advocates” or “lobbyists” to the project.
 - Combine strategies (4) and (5).
6. Remove the term “versus”.
7. Reword this statement so that resource management also guides “education and research” activities.
8. Insert “*Utilizing expertise of cultural experts...*”
9. Maintain ongoing communications so that even though they are not in NERRS boundary, they should have the same access.
 - Expanding outreach to incorporate other partners
 - Working towards the long-term goal of expanding the boundary to encompass all of mauka etc.

Conclusions

Group is extremely adamant about expanding the NERRS boundaries to include Ioleka‘a and Haiku stream and “checkered reef”. Their concerns with project managers and Office of Planning grow regarding this matter.

Expand goals, objectives, and strategies; how do we achieve the long-term vision of expanding the first proposed NERRS boundary?

FOCUS GROUP MEETING PARTICIPANTS
KING SAMUEL WILDER INTERMEDIATE SCHOOL

3/10/15	
Education/Training/Interpretation	
<u>Name</u>	<u>Affiliation</u>
Noelle Campbell	Paepae O He'eia
Mahealani Cypher	Ko'olau Foundation
Aarin Gross	Conservation International
Jerry Kaluhiwa	Ko'olaupoko Hawaiian Civic Club
Rocky Kaluhiwa	Aha Moku Advisory Rep
Josephine Patacsil	Mauka Landowner
Tiffany Patrick	USMC
Bill Sager	Kāne'ohē Neighborhood Board
Jean Tanimoto	NOAA
Bill Thomas	NOAA
3/11/15	
Research and Monitoring	
<u>Name</u>	<u>Affiliation</u>
Donna Camvel	UH
Mahealani Cypher	Ko'olau Foundation
Doug Harper	NOAA
Hi'ilei Kawelo	Paepae O He'eia
Jerry Kaluhiwa	Ko'olaupoko Hawaiian Civic Club
Rocky Kaluhiwa	Aha Moku Advisory Rep
Jo-Ann Leong	HIMB
Paulo Maurin	NOAA
Josephine Patacsil	Mauka Landowner
Ricardo Zanre	Conservation International
3/12/15	
Public Outreach & Resource Management	
<u>Name</u>	<u>Affiliation</u>
Mahealani Cypher	Ko'olau Foundation
Peleke Flores	Paepae O He'eia
Doug Harper	NOAA
Jerry Kaluhiwa	Ko'olaupoko Hawaiian Civic Club
Rocky Kaluhiwa	Aha Moku Advisory Rep
Kalei Kini	Community
Judy Lemus	UH
Paulo Maurin	NOAA
Bill Sager	Kāne'ohē Neighborhood Board

Appendix H. Public Engagement: Steering Committee Meeting — March 31, 2015

**PROPOSED HE'EIA NATIONAL ESTUARINE RESEARCH RESERVE
(NERR) IN KĀNE'OHE BAY, HAWAI'I**

STEERING COMMITTEE MEETING

**Tuesday, March 31, 2015 at 2:00 – 4:30 p.m.
Ko'olaupoko Hawaiian Civic Club Office
46-005 Kawa Street, #104
Kāne'ohe, Hawai'i 96744**

AGENDA

- I. Pule and Welcoming Remarks**
- II. Discussion on Draft Strategic Plan**
- III. Discussion on proposed content for:**
 - 1. Management Plan Table of Contents**
 - 2. Management Plan**
- IV. Next Steps**
- V. Closing Pule**

Appendix I. Frequently Asked Questions

Q: *What is an Estuary?*

A: Estuaries are coastal areas where salt water from the sea mixes with fresh water from rivers and streams. They are among the most productive ecosystems on Earth. Some familiar examples of estuary ecosystems include Kaneohe Bay, Oahu; Kealia Ponds, Maui; Waipio Bay, Hawai'i and Wainiha Bay, Kauai. Whether they're called a bay, harbor, inlet, or lagoon, estuaries are the transition area between the inland waters and the sea. The physical make-up of estuaries can vary widely, as illustrated by the photos below.

Examples of Estuarine Physical Characteristics



Exposed Coast



Sheltered Coast



Bay



Embayment



Tidal River



Lagoon



Perched Wetlands



Anchialine Ponds

In addition to physical composition, estuaries include different ecosystem types as shorelands transition to submerged lands. Photos of ecosystem types follow.

Examples of a variety of ecosystems that can be associated with estuaries:

Shorelands



Coastal Shrublands



Coastal Grasslands



Maritime Forest-Woodland

Transition Areas



Coastal Marshes



Intertidal Beaches



Intertidal Sandflats



Intertidal Rocky Areas



Intertidal Algal Beds

Submerged Bottoms



Subtidal Hard Bottoms



Subtidal Soft Bottoms

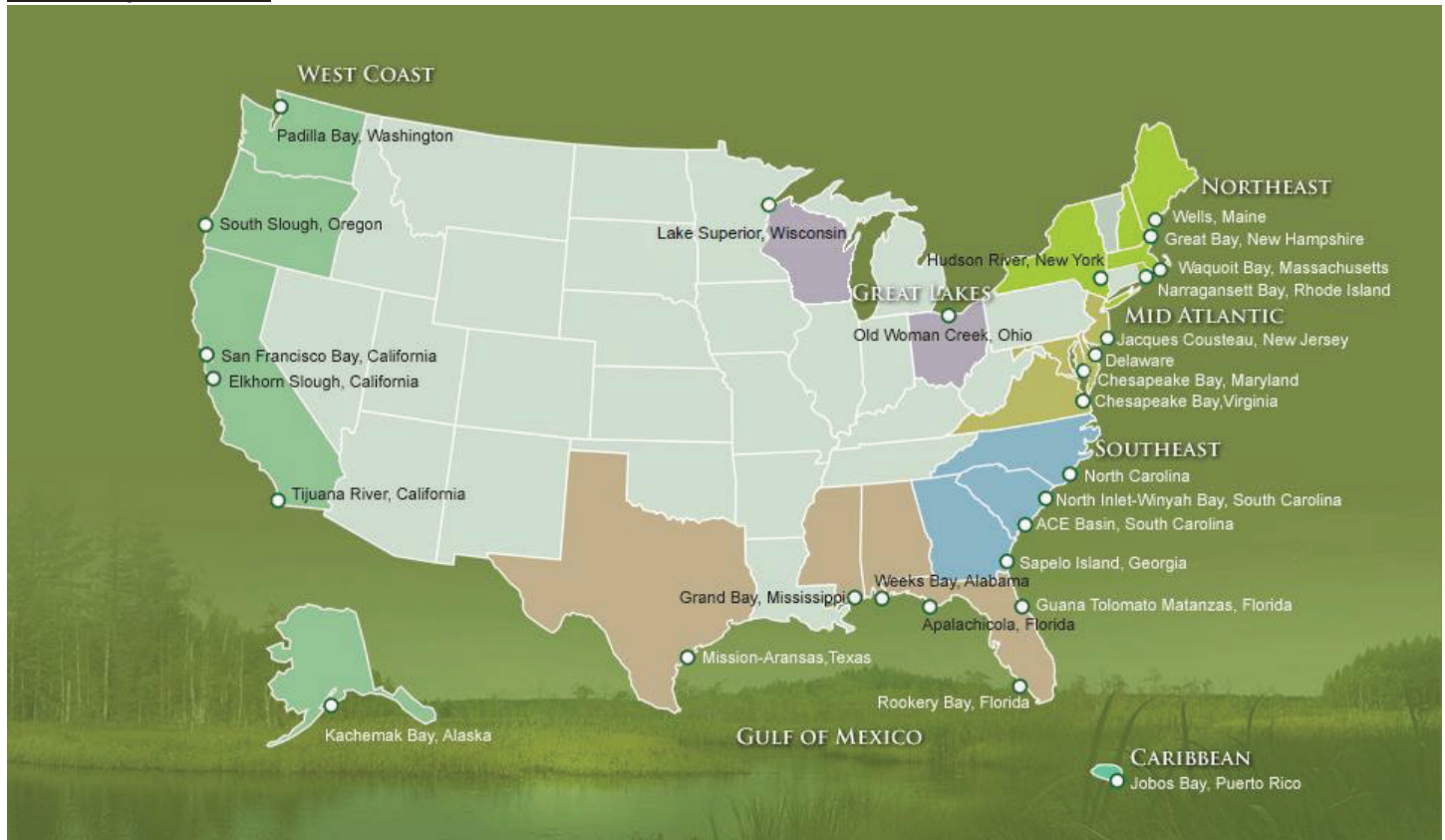


Subtidal Plants and Coral

Q. *What is NERRS?*

A. NERRS is an acronym for National Estuarine Research Reserve System. The National Estuarine Research Reserve System is a network of 28 estuaries, representing different biogeographic regions of the United States, that are protected for long-term research, water-quality monitoring, education and coastal stewardship. Established by the Coastal Zone Management Act (CZMA) of 1972, as amended, the NERRS network is a partnership program between the National Oceanic and Atmospheric Administration (NOAA) and the coastal states. NOAA provides funding, guidance and technical assistance to support research. Each reserve is managed on a daily basis by a lead state agency or university, with input from local partners. Hawaii does not have a NERRS reserve and the Pacific biogeographic region is unrepresented in the NERRS network. More information about the NERRS can be found at <http://www.nerrs.noaa.gov/>.

Reserve System Sites:



Q. *What is the legal authority that enables and regulates the NERR program?*

A. Several laws and executive orders form the statutory basis of the Reserve System, including the Coastal Zone Management Act (CZMA) of 1972, as amended. A link to the CZMA is here http://coastalmanagement.noaa.gov/about/media/CZMA_10_11_06.pdf. The regulations pertaining specifically to the Reserve System, including the nomination process, NERR characteristics and planning requirements are housed in the Code of Federal Regulations (CFR). A link to the applicable chapter and subpart of the CFR is here <http://www.nerrs.noaa.gov/BGDDefault.aspx?ID=64>.

Q. *If a NERR site is designated in Hawaii, will there be restrictions to the cultural, recreational or commercial activities that occur in the area?*

A. As part of the NERR designation process, the Code of Federal Regulations (15 CFR 921) that set the requirements for NERR sites requires development of a management plan. The management plan must consist of several elements, including a public access plan as well as a resource protection plan. These two plan elements guide allowable uses, describe uses that will require a permit and articulate how the public will interact with the site and its resources. The Code of Federal Regulations does not set forth specific restrictions on uses or activities in NERRS sites. States are allowed to develop their management plan in a manner that respects human as well as natural resource needs. For example, the San Francisco Bay NERRS Public Access Plan acknowledges “traditional uses” as follows: *“Recreational and commercial fishing, hiking, horseback riding, bicycling, camping, and boating are all traditional uses within the boundaries of the Reserve sites. Some of these activities are subject to state regulation and require licenses and/or permits. Traditional use access will continue according to local and state laws.”* This is just one approach that a NERR Management Plan can take. Development of a management plan for a Hawaii NERRS site will require the State to work with stakeholders to determine an approach that serves Hawaii’s resources and people best.

Q. *Does the NERRS designation mean that new Federal regulations are imposed?*

A. The NERRS designation does not add any new Federal regulations.

Q. *Why should Hawaii participate in the National Estuarine Research Reserve System?*

A. Currently, the NERRS does not include a representative Pacific island estuary. Designation of a NERRS site in Hawaii will facilitate research about our unique estuaries and support decision-making about our coastal resources. A site in Hawaii would also create new opportunities for educating residents and visitors about Hawaii's unique native plants, animals and environments that connect the land and the ocean. These “living laboratories” focus on important resources that are easily overlooked but are rich with life and critical to the health of a watershed.

Q. *What is the process for designating a NERRS site in Hawaii?*

A. The Office of Planning’s Coastal Zone Management Program is conducting a selection and evaluation process to select a site. Proposals for a Hawaii NERRS site will be accepted by the Coastal Zone Management Program until 4:00 PM, May 15, 2013. Proposal forms, checklists and resources pages are all available on the CZM Program’s website <http://planning.hawaii.gov/czm/initiatives/nerrs-site-proposal-process/>. Site selection criteria have been developed and are also available for review on the website. An objective Site Evaluation Committee will review the proposed sites against the selection criteria and develop a “short list” of potential NERRS sites that meet the selection criteria and recommend a preferred site and alternative sites. These recommendations will be reviewed by a neutral Site Selection Committee. This committee will recommend a site to the Governor for nomination to NOAA. The Governor will then submit to the NOAA Administrator a site selection document and a nomination letter identifying the proposed site by December 31, 2013. NOAA will review the site selection document and send a letter to the Governor accepting or rejecting the nomination. Once approved by NOAA, an Environmental Impact Statement and Management Plan must be developed. Upon approval of the EIS and Management Plan, the site is officially designated and added to the NERRS network.



HE'EIA NATIONAL ESTUARINE RESEARCH RESERVE

FREQUENTLY ASKED QUESTIONS

Below is a list of frequently asked questions (FAQs) and responses regarding the proposed designation of He'eia estuary in Kāne'ohe, Hawai'i as a National Estuarine Research Reserve (NERR). These FAQs are compiled from questions raised by the public at scoping and informational meetings during the site designation process.

Q. *If a NERR site is designated in Hawai'i, will there be restrictions to the cultural, recreational or commercial activities that occur in the area?*

A. No, the NERR designation does not add new regulations or restrictions on uses or activities within the NERR boundaries. The existing Federal, State, and County rules and regulations that apply to the area will continue to apply. As part of the NERR designation process, each NERR site is required to develop a management plan including a public access plan as well as a resource protection plan. The management plan will contain a summary of existing rules and regulations on uses and activities in the area that identify permissible and prohibited uses and activities. For example, the San Francisco Bay NERRS Public Access Plan acknowledges "traditional uses" as follows: *"Recreational and commercial fishing, hiking, horseback riding, bicycling, camping, and boating are all traditional uses within the boundaries of the Reserve sites. Some of these activities are subject to state regulation and require licenses and/or permits. Traditional use access will continue according to local and state laws."* A similar approach may be used for the He'eia NERR Management Plan.

Q. *Does the NERR designation mean that new Federal regulations are imposed?*

A. No, the NERR designation does not add any new Federal regulations.

Q. *How were the boundaries determined for the NERR proposal?*

A. The general location and boundaries for the He'eia NERR site were first proposed by the He'eia community partners and submitted to the Office of Planning for consideration as a new NERR during the site selection process in 2013. Input on the appropriateness of the site and proposal boundaries was solicited from the general public, the neighboring community, affected landowners, and local, state and federal agencies during public meetings in January and February, 2014. Based on feedback, the Office of Planning revised the boundaries taking into consideration landownership boundaries, site partner's conservation plans, and what would meet the national guidelines for selection as a new NERR site. Those boundaries were the ones included in the nomination document and submitted to NOAA by former Governor Abercrombie for consideration as a new site (Figure 1).

Figure 1. Proposed He'eia NERR site boundaries as included in the Hawai'i NERR Site Nomination Document, May 2014.



Q. Can the boundaries for the NERR be changed, and how?

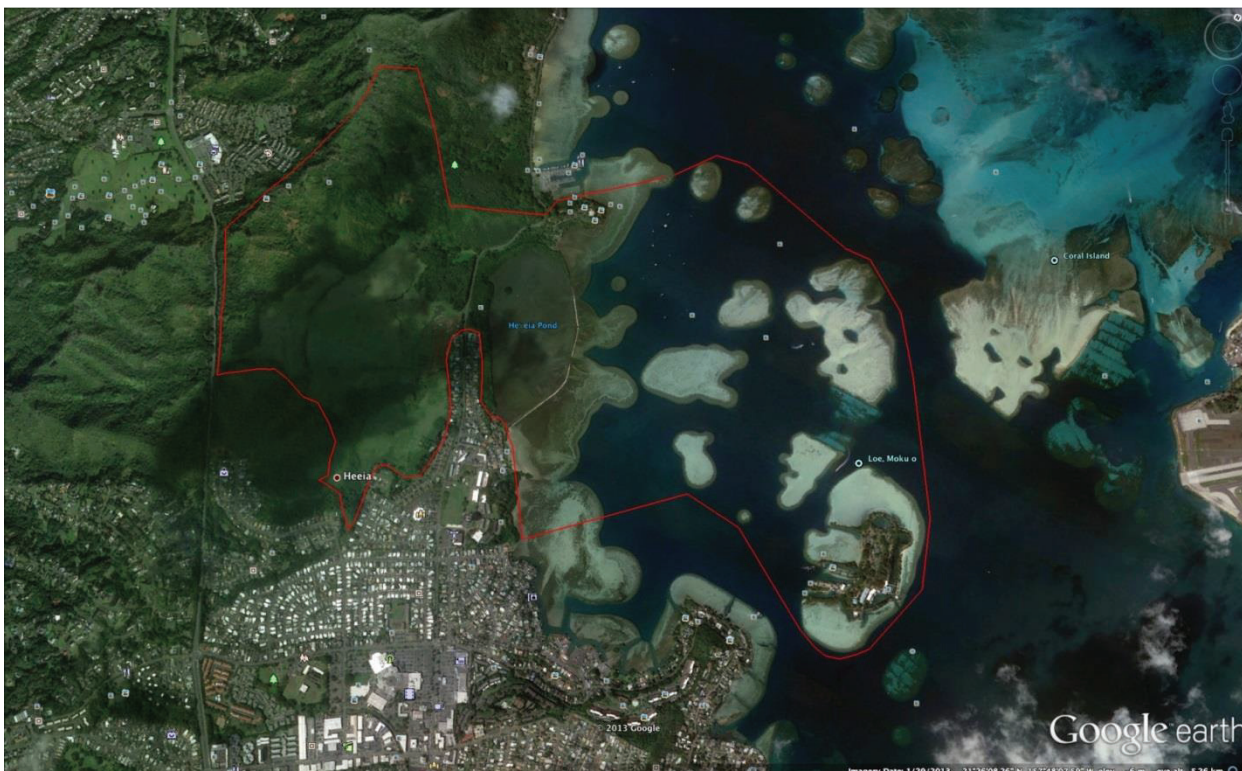
A. Yes, changes to the boundaries can be made during the NOAA designation process now underway, or in the future when the management plan for the NERR is updated. As part of the designation, NOAA will conduct a review of the nominated boundaries to evaluate their appropriateness for inclusion in the NERR, and also examine appropriate alternatives that have been suggested during the NEPA scoping and public information meetings on the proposed designation and content of the draft management plan. The draft management plan will include a description of the project site and the proposed boundaries. The public will be able to provide comments on suggested changes for consideration by OP and NOAA. The plan also includes a section on land acquisition that identified lands that may be appropriate for acquisition (or de-designation if no longer useful) in the future. Management plans are updated every five years and new boundary considerations can be proposed, evaluated, and included in the management plan and implemented as part of the site's ongoing management actions.

Q. Why has the proposed boundary for the NERR changed?

A. The boundary was first proposed by the He'eia community partners as part of their site proposal in April, 2013 (Figure 2). Based on input from private landowners to the south of the proposed boundary that the boundaries seemed to overlap with their property, the Office of Planning refined the boundaries. In refining the boundaries, some potentially appropriate areas in the wetland area and in Kāne'ōhe Bay were omitted from the area and the error was not caught by any of the reviewing parties. This was an oversight on the part of Office of Planning. The site partners have identified those areas, including the four fringing reefs in Kāne'ōhe Bay and upland portions of the Hawai'i Community Development Authority property for consideration in the current process. Suggestions on alternative

boundaries are being evaluated in the NOAA designation process and in the development of the management plan. Additionally, the management plan has a section on Land Acquisition that can identify and consider changes in the boundaries as part of future management actions. If you have a suggestion about areas to include or exclude in the NERR boundary, please submit it using the [Written Comment Form](#).

Figure 2. Original He'eia NERR site boundaries proposed by the He'eia site partners for the site selection process in April, 2013.



Q. *Why does the proposed NERR include coral reefs and a portion of Kane'ohe Bay?*

A. Any area designated as a NERR needs to be a representative estuarine ecosystem that includes the diversity of fauna, flora, and natural processes occurring within the estuary. To encompass the diversity of the He'eia estuary, representative areas of upland forested-watersheds, streams, wetlands, fish pond, marine and coral habitats have been included in the proposal. This range of habitats provides all the essential elements of the estuary necessary to research and understand how all function together productively and sustainably.

Q. *Are commercial fishing interests included in the planning process? Is the fishing community being included in the development of the management plan?*

A. The fishing community, both the commercial and recreational fishers are welcomed and encouraged to participate in the planning process and development of the management plan. The planning process is open and transparent. A total of 10 meetings are taking place during this phase of the designation process, and are open to fishermen and the fishing community to participate. These meetings include 2 scoping meetings on the Draft EIS and Draft management plan, 6 focus group meetings, and 2 public

hearings for soliciting comments on the draft management plan and draft EIS. The Office of Planning also maintains a website with additional background information, draft documents, summaries of public comments, responses to frequently asked questions, notices of meetings and ways to provide input. Visit the website at <http://planning.Hawai'i.gov/czm/initiatives/nerrs-site-proposal-process/>.

Q. *Who are the partners involved in the project, and can new partners be added?*

A. Five site partner organizations did much of the initial work developing the concept, proposal and documentation to propose He'eia as a NERR site in Hawai'i. The site partners are Ko'olaupoko Hawai'i an Civic Club, Kāko'o 'Ōiwi, Hawai'i Institute of Marine Biology, Paepae o He'eia , and Kama'āina Kids/He'eia State Park. Collectively, they are engaged in research, education, restoration and protection of the He'eia estuary. Other entities involved in developing and supporting this project include Papahana Kualoa, The Nature Conservancy, Conservation International, and state and federal agencies. Expanding and nurturing partnerships with community groups is a common goal of NERRS across the country and will likely be one of the new He'eia NERR.

Q. *Where is the money coming from to fund this project?*

A. The major source of funds for this project will come from the federal partner, NOAA and its National Estuary Research Reserve Program and the State of Hawai'i, through the state agency management partner to support the NERR. In recent years, approximately \$500,000 in federal funds has been available to each NERR site each year to carry out program activities. A 30% state match is required and could come from direct funding by state agencies, or staff salaries to coordinate the education, research and management activities of the NERR. NERR sites in other states have also leveraged private funding, which amplifies modest public investment. Additionally, approximately \$4 million per year of competitive funding is available through the NERRS Science Collaborative, for researchers at NERR sites across the country. This funding does not currently come to Hawai'i.

Q. *What State agency will be the management partner and implementing agency for the He'eia NERR?*

A. The He'eia NERR is expected to be managed by University of Hawai'i (UH), Hawai'i Institute of Marine Biology with oversight from NOAA. A draft Memorandum of Understanding (MOU) between UH and NOAA will be developed as part of the Management Plan as well as an MOU between UH and the additional landowners and managers involved in the area included in the NERR.

ADDITIONAL QUESTIONS AND ANSWERS REGARDING THE SITE SELECTION

CRITERIA USED IN EARLY 2013

Q: *What is Criterion #16 (potential to generate revenue in order to support NERR activities) trying to get at?*

A: The selected NERR site in Hawaii will have a number of educational and research activities taking place on-site. In order to ensure continuity of these activities, it is desirable to have some way that the site can support itself when established. Other NERRS sites across the country offer guided tours, have small gift shops for souvenirs or have lab facilities that can be rented by visiting scientists for research purposes. These and other potential sources of funds will be considered during the development of the management plan of the site. Revenue generating activity is secondary to NERRS science and stewardship programs.

Q: *Do all sites need to have the four components listed in Criterion #8?*

A: No. The sites will be evaluated according to scoring point A, which assigns higher points to a more diverse site. The components listed in criterion #8 are an example of a highly diverse site with all four of these components. Another site may also be considered very diverse if the site includes shrublands, intertidal sand flats, and subtidal plants. A list of possible ecosystem types and physical characteristics can be found in Appendix 2 of the NERRS Program Regulations (15 CFR Part 921).

Appendix J. Memorandum of Understanding between National Oceanic and Atmospheric Administration (NOAA) and University of Hawai‘i (UH), Hawai‘i Institute of Marine Biology (HIMB)—To be inserted in Final Management Plan

Appendix K. Multi-Party Governance Charter between Landowners and Managers in the He‘eia NERR—To be inserted in Final Management Plan

Appendix L. Existing Rules and Regulations Governing Activities and Uses in the Area of the Proposed He'eia NERR

State Agency statute, rules and regulations

The statutes, rules and regulations that apply to resource conservation and management at the He‘eia NERR are listed below by State regulatory agency and topic. Pertinent sections are described below or if voluminous, a link to the rule is provided.

Department of Land and Natural Resources

1. Kaneohe Bay Regional Council (Hawai‘i Revised Statutes [HRS] 200D)
http://www.capitol.hawaii.gov/hrscurrent/Vol03_Ch0121-0200D/HRS0200D/HRS_0200D-.htm
2. Aha Moku Advisory Committee (HRS 171-4.5)
http://www.capitol.hawaii.gov/hrscurrent/Vol03_Ch0121-0200D/HRS0171/HRS_0171-0004_0005.htm

Office of Conservation and Coastal Lands

1. Conservation District. HAR Title 13, Chapter 5.
<http://dlnr.hawaii.gov/occl/files/2013/07/183C.pdf>

Excerpts of Pertinent Information for He‘eia NERR

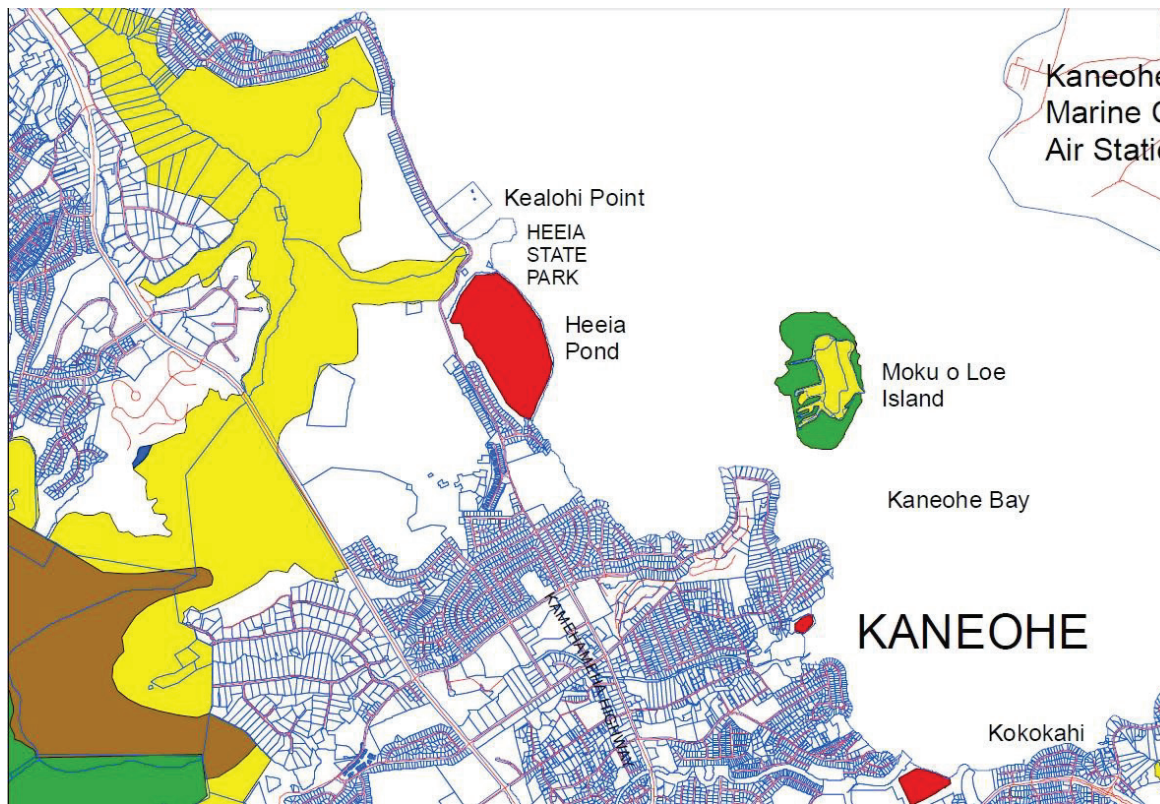
Division of Aquatic Resources

1. Hawai‘i State fishing regulations -General
 - Commercial Bait License (HRS 188-45)
 - Commercial Marine License (HRS 189-2.3)
 - Aquaculture License (HRS 187-3.5, HAR 13-74-43)
 - Aquaculture Facility License (HRS 187-3.5, HAR 13-74-43)
 - Special Activity Permit (HRS 187A-6)
 - Recreational Bottomfish Fishing Vessel Registration (HAR 13-94)
 - Commercial Fishing Vessel Registration (HAR 13-94)
2. Hawai‘i State fishing regulations Site-specific
 - He‘eia Kea Wharf (HAR 188-36)
 - Coconut Island (HAR 188-36)
3. Fisheries Resource Management
 - Lay nets (HAR §13-75.12.4)
 - Oahu Aquarium Life Management (HAR §13-77-1)
4. Protected Marine Fisheries Resources (HAR §13-83 to §13-95)
5. Protected Freshwater Fisheries Resources (HAR §13-100)
<http://dlnr.hawaii.gov/dar/administrative-rules/>

HAR Title 13, Chapter 5, Conservation District. Rules regulating land uses within the State Land Use Conservation District. <http://dlnr.Hawai'i.gov/occl/files/2013/08/13-5-2013.pdf>

CDUA permit (from DLNR OCCL) applying to conduct land uses within the State Land Use Conservation District (HRS Chapter 183C; HAR Title 13, Chapter 5)

- Light yellow: Conservation District
- Bright yellow: General Subzone (Coconut Island)
- Brown: Limited Subzone
- Green: Protected Subzone (waters around Coconut Island)
- Red: Resource Subzone (fish pond)
- Blue: Special Subzone



Conservation District Subzones

Excerpts of Pertinent Sections of Hawai'i State Fishing Regulations

General Regulations

Commercial Bait License (HRS 188-45)	Any commercial marine licensee to use a small mesh net to take certain fish for use as live bait. Required: Commercial Marine License, Bait report.
Commercial Marine License (HRS 189-2.3)	Any person to take marine life for commercial purposes. Required: Catch report.
Aquaculture Facility License (HRS 187-3.5, HAR 13-74-43)	Any fish pond owner or operator to take regulated marine life, including young mullet, from the ocean, or to acquire regulated marine life from non-ocean sources, to stock their pond or facility with the intention of raising the marine life for commercial purposes. Required: Initial site inspection, Letter of authorization, Take report.
Special Activity Permit (HRS 187A-6)	Any individual associated with any research, educational, or management institution to collect aquatic life, or use certain fishing gear or methods, that are prohibited or restricted by regulations. Required: Reports.
Recreational Bottomfish Fishing Vessel Registration (HAR 13-94)	Any vessel owner to take or possess any of the Deep 7 bottomfishes. Vessel identification required.

Site-specific Fishing Regulations

He'eia Kea Wharf (HAR 188-36)	Permitted: To take any legal size fish in season with one line, or one rod and line, with no more than two hooks. To take crabs with not more than 10 nets, provided the nets are not more than two feet in diameter. To take shrimp for bait with a hand net, provided that the net is not more than three feet in any dimension. Commercial Marine licensees with a Bait License may take nehu, iao, and other authorized baitfish for bait purposes. Licensed pond owners or operators may take young mullet (pua) or other small fish for stocking their fishpond. Prohibited: To fish in or take aquatic life, except as indicated in permitted activities above.
Coconut Island (HAR 188-36)	Permitted: Unlawful to take any aquatic life from within the boundaries of the refuge. Prohibited: This restriction does not apply to any officer, faculty member, employee or student of the University of Hawai'i, or licensee of the Board of Regents of the University of Hawai'i while employed in catching or taking of aquatic life for scientific purposes. All authorized taking of aquatic life must follow minimum size and closed seasons for certain species, gear restrictions, etc.

Division of Boating and Ocean Recreation

1. Small Boat Harbors
 - Offshore Mooring Rules and Areas (HAR §13-235)
2. Boating (§13-240 to §13-245)
3. Ocean Waters, Navigable Streams & Beaches
 - General Provisions (HAR §13-250)
 - Local Ocean Waters (HAR §13-254)
 - Ocean Recreation Management Rules (HAR §13-256)

<http://dlnr.hawaii.gov/dobor/rules/>

Excerpts of Pertinent Sections of Hawai'i Boating and Ocean Recreation Statutes, Rules and Regulations

Rules for state waters:

HRS 200-4	vessels, access to boat ramps, harbors, etc.
HRS 200-10	permits/fees for state small boat harbor moorings
HRS 200-39	<p>Kaneohe Bay activities, permits, restrictions</p> <p>(a) For the purposes of this section, "ocean use activities" means commercial operation of thrill craft, high speed boating, parasailing, water sledding, sailing and snorkeling tours, glassbottom boat tours, or any other similar commercial ocean recreation activity for hire.</p> <p>(b) Any other provision of this chapter to the contrary notwithstanding, no person shall operate thrill craft, parasailing, water sledding, or commercial high speed boating unless the person meets the requirements of section 200-37 and all rules adopted by the department that regulate or restrict these activities.</p> <p>(c) Permits issued by the department for the commercial operation of ocean use activities in Kaneohe Bay shall be limited to the number and locations, by permit type and vessel and passenger capacity, provided in the Kaneohe Bay master plan developed pursuant to Act 208, Session Laws of Hawai'i 1990, until applicable rules consistent with the master plan are adopted by the department; provided that the passenger capacity for snorkeling tours and glassbottom boat tours shall be set through rules adopted pursuant to chapter 91. No thrill craft permit may be transferred after June 21, 1998; provided that transfers of permits may be made at any time between family members.</p> <p>(d) On Sundays and federal holidays, all commercial ocean use activities shall be prohibited.</p> <p>(e) All rules adopted by the department with regard to Kaneohe Bay shall be drafted in consultation with the Kaneohe Bay regional council. For those provisions of the Kaneohe Bay master plan previously adopted by the legislature, the rules adopted by the department shall be in accordance with those provisions. Notwithstanding subsection (c) to the contrary, if the department determines for safety or environmental protection reasons that a permitted use should be relocated, the department may relocate the permitted use and the department shall have discretion to permit vessel</p>

substitution with a similar length vessel; provided that the increase is not greater than ten per cent of the current vessel length.

For those provisions of the Kaneohe Bay master plan developed pursuant to Act 208, Session Laws of Hawai‘i 1990, not previously adopted by the legislature, the master plan shall be used as the recommended guideline in the adoption and implementation of rules with regard to the regulation of all activities in Kaneohe Bay. [L 1993, c 317, §§3(1), 7; am L 1998, c 4, §§2, 3 and c 129, §2; am L 2000, c 110, §1]

Ocean Resource Management Rules

DLNR Ocean Recreation Management Rules and Area (HAR §13-256).

DLNR Offhore Mooring Rules and Areas

§13-235-35 Kaneohe Bay designated mooring areas “A”, “B”, “C” and “D”. (a) The Kaneohe Bay designated mooring areas “A”, “B”, “C” and “D” means the areas confined by the boundaries shown for said mooring areas on Exhibits “G” and “H”, dated, October 28, 1991, located at the end of this subchapter. The boundaries are as follows:

(2) Kaneohe Bay designated mooring area “B”.

Beginning at a point on the water measured by azimuth clockwise from True South, 267 degrees for a distance of one thousand five hundred feet from the northern tip of the He‘eia Kea Small Boat Harbor Pier; then 270 degrees for a distance of nine hundred feet; 360 degrees for a distance of one thousand five hundred seventy-five feet; 090 degrees for a distance of nine hundred feet; then on a straight line to the point of beginning.

(b) All vessels within Kaneohe Bay ocean waters shall be moored or anchored within a designated mooring area, except:

(1) Vessels moored in accordance with a permit approved by the board of land and natural resources and a U. S. Army Corps of Engineers permit as provided in section 13-235-9;

(2) Vessels moored in privately-dredged channels fronting private residences on February 3, 1992;

(3) Skiff and other small craft moored on fringing reefs or mud flats; and

(4) Vessels temporarily anchored for less than seventy-two hours in the immediate vicinity of Ahu o Laka Island (the “sand bar”).

(c) Compliance is required within sixty days of receipt of written notice to the owner of a vessel to relocate to a designated mooring area.

(d) No person shall navigate, moor or anchor a commercial vessel providing service on a fee basis in a designated mooring area unless the vessel has been registered and the owner has a valid commercial use permit issued by the department to operate from He‘eia Kea Small Boat Harbor, or is operating from a private boating facility or location for which an ingress or egress corridor has been established by the department. Unofficial Compilation

(e) No permanent mooring shall be installed within the designated mooring area except by permit issued by the department.

(f) No application for mooring for areas “C” and “D” shall be accepted unless the applicant can demonstrate acceptable public or private access to the shoreline, including adequate parking provisions. [Eff 2/24/94] (Auth: HRS §§200-1, 200-2, 200-3, 200-6) (Imp: HRS §§200-1, 200-2, 200-3, 200-6)

Division of State Parks

1. Hawai'i State Park System (HAR Title 13, Chapter 146)

http://dlnr.hawaii.gov/dsp/files/2015/04/hsp_13-146_har.pdf

Division of Forestry and Wildlife

1. Threatened and Endangered Plants (HAR Title 13, Chapter 107)
<http://files.hawaii.gov/dlnr/dofaw/rules/Chap107.pdf>
2. Indigenous Wildlife, Endangered & Threatened Wildlife, Injurious Wildlife, Introduced Wild Birds, and Introduced Wildlife (HAR Title 13, Chapter 124)
<http://dlnr.hawaii.gov/dofaw/files/2013/09/Chap124a.pdf>

State Historic Preservation Division

1. Rules Governing Requirements for Archaeological Site Preservation and Development (HAR Title 13, Chapter 277)
<http://files.hawaii.gov/dlnr/shpd/rules/277.pdf>
2. Rules Governing Procedures for Historic Preservation Review to Comment on Chapter 6E-42, HRS, Projects (HAR Title 13, Chapter 284)
<http://files.hawaii.gov/dlnr/shpd/rules/284a.pdf>
3. Rules of Practice and Procedure Relating to Burial Sites and Human Remains (HAR Title 13, Chapter 300)
<http://files.hawaii.gov/dlnr/shpd/rules/300.pdf>

Hawai'i Community Development Authority

4. Heeia Community Development District (HRS 206E – 201 to 205)
http://www.capitol.hawaii.gov/hrscurrent/Vol04_Ch0201-0257/HRS0206E/HRS_0206E-0201.htm

Federal Agency Regulations

Army Corps of Engineers

Regulate impacts to wetlands, navigable waterways, discharge of fill material into waterbodies and wetlands

- [Section 10 of the Rivers and Harbors Act of 1899](#) requires approval prior to the accomplishment of any work in, over, or under navigable waters of the United States, or which affects the course, location, condition or capacity of such waters.

<http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/materials/rhsec10.pdf>

- Navigable waters of the United States (33 CFR Part 329) are defined as waters that have been used in the past, are now used, or are susceptible to use as a means to transport interstate or foreign commerce up to the head of navigation. Section 10 and/or Section 404 permits are required for construction activities in these waters.

Typical activities requiring Section 10 permits include:

- Construction of piers, wharves, breakwaters, bulkheads, jetties, weirs, dolphins, marinas, ramps, floats, intake structures, and cable or pipeline crossings.
- Installation of overhead utilities across navigable waters or installation of underground utility lines beneath navigable waters.
- Work such as dredging or disposal of dredged material.
- Excavation, filling, or other modifications to navigable waters of the U.S.

<http://www.gpo.gov/fdsys/pkg/CFR-2011-title33-vol3/pdf/CFR-2011-title33-vol3-part329.pdf>

- Section 404 of the Clean Water Act requires approval prior to discharging dredged or fill material into the waters of the United States.

http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/materials/cwa_sec404doc.pdf

- Waters of the United States (33 CFR Part 328) include essentially all surface waters, including all navigable waters and their tributaries, all interstate waters and their tributaries, all impoundments of these waters, all wetlands adjacent to these waters, and certain isolated wetlands.

The term "wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include tundra, permafrost areas, swamps, marshes, bogs, and similar areas.

Typical activities requiring Section 404 permits include:

- Discharging fill or dredged material in waters of the U.S., including wetlands.
- Site development fill for residential, commercial, or recreational developments.
- Construction of revetments, groins, breakwaters, levees, dams, dikes, and weirs.
- Placement of riprap and road fills.

Discharges of fill may include grading or other earthwork into streams or wetlands, construction of temporary access ramps, equipment pads, or temporary containment berms.

Certain activities are exempt (33 CFR 323.4) from Section 404 permit requirements. Section 103 of the Marine Protection Research and Sanctuaries Act requires approval for the transportation of dredged material for the purpose of dumping it in ocean waters at disposal sites previously approved by the U.S. Environmental Protection Agency.

<http://www.gpo.gov/fdsys/pkg/CFR-2011-title33-vol3/pdf/CFR-2011-title33-vol3-part328.pdf>

National Ocean and Atmospheric Administration

1. Regulate take of threatened and endangered species (CFR Title 50, Chapter II, Subchapter C, Part 222 – General Endangered and Threatened Marine Species)
<http://www.ecfr.gov/cgi-bin/text-idx?SID=2916760137f149277cfb5acc440b6ac0&mc=true&node=pt50.10.222&rgn=div5>
2. Regulate take of marine mammals. (CFR Title 50, Chapter II, Subchapter C, Part 216 – Marine Mammals)
<http://www.ecfr.gov/cgi-bin/text-idx?SID=941fa8e1d0d4fe99b0e41f5efc46ce2b&mc=true&node=pt50.10.216&rgn=div5>

U.S. Fish and Wildlife Service

1. Regulate take of threatened and endangered species (CFR Title 50, Chapter I, Subpart B, Part 17 – Endangered and Threatened Wildlife and Plants)
http://www.ecfr.gov/cgi-bin/text-idx?SID=247d2168f4009d5bf34483957bba9896&mc=true&tpl=/ecfrbrowse/Title50/50cfr17_main_02.tpl
2. Regulate the take of migratory birds (CFR Title 50, Chapter I, Subpart B, Part 21 – Migratory Bird Permits)
<http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=247d2168f4009d5bf34483957bba9896&mc=true&n=pt50.9.21&r=PART&ty=HTML>

Appendix M. Reserve Strategic Plan, Strategies and Outcomes

Appendix M Strategic Plan with Strategies and Outcomes

GOAL 1: Increase our understanding of the effects of human activities and natural events to improve informed decision making affecting the He'eia estuary, coastal ecosystems, and ultimately the entire ahupua'a of He'eia.	STRATEGY	OUTCOME
1) Baseline environmental data informs researchers' understanding of the magnitude of changes in the various He'eia ecosystems.	<p>(a) Document cultural and archaeological information to establish historical and baseline conditions in the ahupua'a of He'eia, including the waters of Kāne'ohē Bay</p> <p>(b) Explore the development of a reserve-specific repository to house historical, cultural, and scientific information conducted in He'eia.</p> <p>(c) Reserve staff will identify the gap areas that need additional research.</p> <p>(d) Reserve staff and partners develop a site profile for the He'eia NERR by collecting relevant information.</p> <p>(e) Support research studies on how floodwaters, sediment, and nutrients move through the ahupua'a of He'eia.</p> <p>(f) Create opportunities to conduct research within the ahupua'a, potentially outside the NERR boundaries, that provides relevant information about impacts on the entire ahupua'a of He'eia, to inform the long-term vision of a healthy He'eia ahupua'a.</p> <p>(g) Conduct scientific research and monitoring that will provide information on climate change, water quality, estuary habitat change, and other topics of local and national interest and significance.</p> <p>(h) Establish 4 water quality SWMP stations and 1 weather station</p> <p>(i) Implement baseline biodiversity surveys with reserve site partners</p> <p>(j) Establish a site experimental design that supports ecosystem-based management research approach.</p> <p>(k) Recruit and maintain reserve research and monitoring staff.</p>	<p>Ethnographic interviews with kūpuna document what they considered an optimal and healthy state of Kāne'ohē Bay and the ahupua'a of He'eia. The ethnographic and historical data for the He'eia area inform research.</p> <p>He'eia historical, cultural, and scientific data and information are compiled and available digitally for internal and external users.</p> <p>Researchers at the He'eia NERR shall be informed of other research being conducted in the area and possible synergies and data gaps.</p> <p>By 2019, a completed site profile is provided to NOAA OCM and interested researchers. He'eia NERR shall have a complete and approved site profile.</p> <p>Researchers and coastal managers have an improved understanding of how water, sediment, and nutrients movement studies in the through the ahupua'a of He'eia are conducted.</p> <p>The long-term vision of the He'eia ahupua'a is informed by research conducted within the ahupua'a.</p> <p>Information on topics of local and national interest and significance shall be developed from research and monitoring conducted in the He'eia NERR.</p> <p>He'eia NERR SWMP data contributes to local understanding of changes in the He'eia ecosystem. By 2018, He'eia NERR SWMP program is integrated with the national monitoring program (i.e. NERRS, NOAA Sentinel Sites and IOOS).</p> <p>Comprehensive biological survey data informs reserve site profile and is available to use by researchers.</p> <p>Treatment and control areas are identified within each major ecosystem type for the reserve.</p> <p>Staff are supporting the development and implementation of reserve research programs.</p>

Appendix M Strategic Plan with Strategies and Outcomes

GOAL 1: Increase our understanding of the effects of human activities and natural events to improve informed decision making affecting the He'eia estuary, coastal ecosystems, and ultimately the entire ahupua'a of He'eia.	OBJECTIVE	STRATEGY	OUTCOME
2) Coordinate independent research and monitoring efforts in the ahupua'a.	(a) Develop a comprehensive long-term environmental monitoring program for He'eia NERR in upland, estuarine, and marine ecosystems. (b) Reserve staff coordinates implementation of the reserve monitoring program with site partners. (c) Facilitate the coordination, collaboration, and distribution of all scientific investigations conducted within the ahupua'a of He'eia (to the extent legally permissible) to minimize duplication of research and identify the gap areas that need additional research. (d) Recruit and maintain reserve research and monitoring staff. (e) Collaborate with new partners conducting relevant research and monitoring efforts	Researchers and partners improve their understanding of short and long-term changes within the He'eia ahupua'a. The He'eia NERR monitoring programs are linked to local monitoring efforts.	
3) Integrate traditional knowledge and research in the He'eia NERR that will better reflect and inform community decision making forward creating a sustainable ecosystem.	(a) Create opportunities for Native Hawaiian practitioners, scientists, (including those with expertise in traditional and customary practices) and others (including those with expertise in contemporary science) to collaborate and develop contemporary mo'olelo (stories) reflecting change that reflect and track changes in the He'eia ahupua'a over time. (b) Coordinate periodic community meetings to inform the community about upcoming scientific research opportunities, gather input to guide further research, and share ongoing research results. (c) Work with site partners to share ecosystem-based best management practices that support improved management of the He'eia ahupua'a.	Researchers at the He'eia NERR shall be informed of other research being conducted in the area and possible synergies and data gaps. Staff support reserve implementation of SWMP and other key terrestrial and marine monitoring efforts. New external partnerships are established.	
		Contemporary mo'olelo for He'eia ahupua'a inform the collective understanding of recent changes within the ahupua'a.	At least 2 local communities are knowledgeable of the ongoing and planned research within the He'eia NERR. Ecosystem-based best management practices are applied by communities to improve coastal ecosystems.

Appendix M Strategic Plan with Strategies and Outcomes

STRATEGY	OUTCOME
(d) Creates opportunities for the “synthesizers” or “bridgers” of traditional customary practices and contemporary science to collaborate and share their findings and recommendations. <i>**Synthesizers/bridgers are defined as individuals who applies different ways of knowing including traditional practices and contemporary science.</i>	Site partners and the community are knowledgeable of the synthesizers’ mana’o about the nexus of traditional practices and contemporary science.
(e) Recruit and maintain reserve educational and cultural staff.	Staff are supporting the integration of traditional knowledge and scientific research in the He’eia NERR.

GOAL 2: Develop a place-based education and training program for the He’eia NERR that inspires and educates the community about estuaries, coastal ecosystems, and traditional Hawaiian practices, such as lo’i and loko i’a, that mālama (nurture) these systems sustainably.

OBJECTIVE	STRATEGY	OUTCOME
4) Increase student, educator, and community understanding of estuaries in general and in particular Hawaiian estuaries, coastal habitats, and the ahupua’a land management system.	(a) NERR educational programs build on existing efforts and cultural resources (e.g. the poster by Marilyn Kahalewai of a traditional ahupua’a) and incorporate a traditional cultural perspective.	At least 50% of students and teachers participating in NERR educational programs demonstrate improved understanding of traditional Hawaiian culture.
	(b) Kūpuna make traditional Hawaiian cultural information available to the He’eia NERR and local communities.	Local communities and the NERRS network have improved access to educational and cultural resources based on the He’eia ahupua’a.
	(c) NERR will include kūpuna in He’eia site tours as part of a cultural orientation to the He’eia NERR site.	At least 50% of NERR visitors experience a cultural orientation to the He’eia NERR.
	(d) Kūpuna testimonials are included as part of a cultural orientation to the He’eia NERR site.	At least 50% of NERR visitors experience a cultural orientation to the He’eia NERR.
	(e) NERR staff develop programs that incorporate information about the entire ahupua’a of He’eia.	At least 50% of students and others participating in NERR programs have an improved understanding of the He’eia ahupua’a.
	(f) Provide site-specific educational experiences that facilitate hands-on exploration of the upland, estuarine, and marine environments in the He’eia estuary with site partners.	Annually, at least 2 education and training events at the He’eia NERR include hands-on activities coordinated with site partners.
(g) Translate reserve estuarine science and monitoring data to develop data visualizations for use in educational and training programs.	Increased understanding of estuarine science, monitoring data and the He’eia estuary.	

Appendix M Strategic Plan with Strategies and Outcomes

STRATEGY	OUTCOME
(h) Reserve staff will develop and establish the system-wide K-12 Estuarine Education Program (KEEP) at the He'eia NERR.	He'eia NERR has a NOAA approved KEEP program in place.
(i) Recruit and maintain reserve educational, stewardship and cultural resource staff.	Staff are supporting reserve educational, training and interpretation programs.
(j) Establish and maintain He'eia NERR website.	Increased understanding of estuarine science, monitoring data and the He'eia estuary.
<p>GOAL 2: Develop a place-based education and training program for the He'eia NERR that inspires and educates the community about estuaries, coastal ecosystems, and traditional Hawaiian practices, such as Iolo'i and Iolo'i'a, that mālama (nurture) these systems sustainably.</p>	
OBJECTIVE	OUTCOME
<p>5) Provide a comprehensive framework to integrate and enhance coordination and effectiveness of place-based education and training programs that have been initiated independently by the He'eia community.</p>	
<p>(a) Collaborate with the Hawai'i Department of Education (DOE) to explore ways to integrate state K-12 educational standards into He'eia NERR education program curricula.</p> <p>(b) 1. Develop cultural standards and operating protocols for reserve education, training, and interpretation programs at the He'eia estuary with the assistance of stakeholders such as the KHCC and other native Hawaiian cultural practitioners in the He'eia community.</p> <p>(b) 2. The Stewardship and Cultural Resources Coordinator shall implement a cultural workshop with partners to coordinate discussions on cultural standards and protocols.</p> <p>(c) Develop initiatives that allow the Reserve and site partners to coordinate and integrate aspects of their educational activities.</p>	<p>A pilot NERR education program addresses state educational standards and is aligned with the K-12 curriculum for one elementary and one secondary grade band.</p> <p>Place-based education programs at the He'eia NERR incorporate and follow cultural protocols.</p> <p>At least 2 site partners have integrated an educational program or aspects of their educational programs at the He'eia NERR.</p>

Appendix M Strategic Plan with Strategies and Outcomes

GOAL 3: The Heeia NERR will engage various communities to create opportunities for collaboration to practice and promote stewardship that sustains cultural, biological, and natural resources.		
OBJECTIVE	STRATEGY	OUTCOME
6) Integrate traditional knowledge and contemporary science to effectively address climate change, habitat restoration, and water quality.	(a) Utilize historical photos, testimonials, and other information to document the land use history of the ahupua'a of He'eia and incorporate into reserve education and interpretative programs.	Visitors to the He'eia NERR indicate increased awareness of the interconnectedness of activities in the mauka and makai areas, including the history of cultural activities in the area and the effect changing uses has had on the ecosystem.
	(b) Consult with the Ko'olaupoko Moku Kūpuna Council to develop methods for kūpuna to inform cultural and scientific education programs at the He'eia NERR.	Place-based cultural and scientific education programs at the He'eia NERR incorporate input from kūpuna.
	(c) Develop and establish the Coastal Training Program to support training opportunities for targeted coastal decision maker audiences.	The He'eia NERR has a fully developed and NOAA approved Coastal Training Program.
	(d) Provide technical assistance to site partners in support of ongoing traditional agricultural (taro lo'i) and aquaculture (He'eia fishpond) practices	Measured improvements of targeted ecosystem services provided by traditional land use practices
	(e) Collect and analyze ecosystem service data for each management approach implemented at the reserve.	Ecosystem service data inform strategies for adaptive management at He'eia estuary and other estuaries.
7) Engage and educate the community on the practices and values of the ahupua'a land management system; in other words, promote 'āina momona and enhanced stewardship efforts by all sectors of the community, to increase their understanding of how human activities and natural events affect the estuary.	(a) Provide a variety of hands-on stewardship experiences to the community groups and visitors.	The community groups and visitors of the He'eia NERR improve their understanding of 'āina momona.
	(b) Collaborate with partners to incorporate reserve science, traditional knowledge and information in the rehabilitation of historical, agricultural and aquacultural resources within the He'eia NERR.	The He'eia NERR agricultural and aquacultural resources are managed sustainably to provide food security and other ecosystem services for local communities.
8) Become a leading repository of information for cultural, biological, and natural resources in the He'eia estuary.	(a) Organize and incorporate cultural and natural resource information from the broader community into the reserve website and other accessible platforms.	Increased awareness of He'eia estuary resources and information.

GOAL 3: The He‘eia NERR will engage various communities to create opportunities for collaboration to practice and promote stewardship that sustains cultural, biological, and natural resources.	STRATEGY	OUTCOME
<p>OBJECTIVE</p> <p>9) Develop the tools, capacity and connections to increase public awareness across the community, island, state, nation, and the world of the ecological and cultural significance of the He‘eia estuary and ultimately the entire ahupua‘a of He‘eia.</p>	<p>(a) Engage with site partners and other organizations such as local civic clubs to implement public outreach activities in the He‘eia ahupua‘a.</p> <p>(b) Reserve staff utilize the expertise of cultural experts, such as the KHCC members, as haku (ambassadors) for the He‘eia NERR.</p> <p>(c) Implement an assessment of reserve facility needs.</p> <p>(d) Recruit and hire a reserve manager to coordinate and supervise NERR operations and management.</p> <p>(e) The reserve manager will form and engage a Reserve Advisory Board (RAB) to gather advisory guidance on reserve activities and planning.</p> <p>(f) Establish and maintain He‘eia NERR website.</p> <p>(g) Engaged in the NERR National System and at relevant state, regional, national, and international scales.</p> <p>(h) Plan for future He‘eia NERR facilities that integrate climate adaptation strategies and incorporate traditional Hawaiian values and customs.</p>	<p>Communities and individuals gain an understanding of the ecological and cultural significance of the He‘eia estuary.</p> <p>Expertise of haku (ambassadors) are integrated into He‘eia NERR outreach activities.</p> <p>He‘eia NERR has a plan that allows sufficient infrastructure and facilities to support research, education and stewardship programmatic activities.</p> <p>The He‘eia NERR management plan is implemented and core partnerships are established.</p> <p>Within the first year, the RAB is established and sets its meeting and committee structures.</p> <p>Increased understanding of ecological and cultural significance of the He‘eia estuary.</p> <p>Communities and individuals gain an understanding of the ecological and cultural significance of the He‘eia estuary.</p> <p>He‘eia NERR facilities are resilient to a changing climate and embody the unique relationship between the Hawaiian people and the land.</p>
<p>10) Support restoration of key areas in the reserve to improve habitat and increase ecosystem services.</p>	<p>(a) Demonstrate restoration best practices in the land and estuarine stewardship of He‘eia NERR natural resources that support climate change adaptation.</p> <p>(b) Revise land acquisition and habitat restoration projects, taking into account climate change impacts.</p> <p>(c) He‘eia NERR uses a multi-disciplinary and multi-sector approach in the implementation of restoration initiatives.</p>	<p>He‘eia NERR natural resource are more resilient to a changing climate.</p> <p>By 2018, land acquisition and habitat restoration plans are revised to incorporate climate vulnerabilities.</p> <p>He‘eia NERR is viewed as an example of multi-disciplinary and traditional approaches to ecosystem-based management.</p>

Appendix M Strategic Plan with Strategies and Outcomes

STRATEGY	OUTCOME
(d) Work with partners to develop and implement a hybrid ecosystem framework for upland reforestation.	Measured improvements of targeted ecosystem services provided by upland habitat.
(e) Provide technical and monitoring assistance to support the removal of mangrove habitat and replacement with native estuarine species.	Measured improvements of targeted ecosystem services provided by estuarine habitat.
(f) Develop a restoration and monitoring plan in collaboration with partners to guide the restoration of the He'eia stream and adjacent buffer.	Restoration and monitoring plan guides future stream restoration and monitoring.
(g) Provide technical assistance and support for the removal of invasive species and the establishment native plant communities within the He'eia stream buffer and stream channels.	Measured improvements of targeted ecosystem services provided by the He'eia stream and riparian habitats.
(h) Collaborate with partners on existing coral reef restoration and monitoring initiatives that are occurring within the marine boundaries of the reserve.	Measured improvements of targeted ecosystem services provided by marine habitat.
(i) Coordinate future restoration planning and monitoring activities within marine boundaries of the reserve.	Partners actively coordinate their marine restoration with reserve staff.

This Memorandum of Understanding (“MOU” or “Agreement”) is entered into by the Office for Coastal Management, National Oceanic and Atmospheric Administration, (“OCM”) and the University of Hawai‘i on behalf of its Hawai‘i Institute of Marine Biology (“HIMB”) an organized research unit within the School of Ocean and Earth Science and Technology, University of Hawai‘i at Manoa for the purpose establishing a cooperative framework for the management of the He‘eia National Estuarine Research Reserve (He‘eia NERR).

RECITALS

The Governor of the State of Hawai‘i determined that the waters and related coastal habitats of He‘eia estuary within Kāne‘ohe Bay, Island of O‘ahu, provide unique opportunities for the study of natural and human processes to contribute to the science of estuarine ecosystem processes, enhance environmental education opportunities, and provide scientific information for effective coastal zone management in the State of Hawai‘i.

The Governor determined that the citizens of Hawai‘i and the United States will benefit if the resources of the He‘eia estuary were managed as part of the National Estuarine Research Reserve System administered by OCM. Accordingly, by a letter dated May 21, 2014, former Governor Abercrombie nominated the He‘eia estuary and related lands for inclusion in the National Estuarine Research Reserve System.

The National Oceanic and Atmospheric Administration (“NOAA”) concurs with the Governor’s determination and recommendation, and pursuant to its authority under Section 315 of the Coastal Zone Management Act of 1972, as amended (CZMA, 16 U.S.C. § 1461), and in accordance with the implementing the regulations at 15 C.F.R. § 921.30, intends to designate the He‘eia estuary and related coastal habitats as the He‘eia NERR.

As part of the designation process, NOAA is conducting an environmental review and assessment pursuant to NEPA and will, in collaboration with the State of Hawai‘i, finalize an environmental impact statement (NOAA EIS) prior to designating the He‘eia NERR.

Former Governor Abercrombie also designated the Office of Planning as the lead agency for the site selection process. This also included coordinating the drafting of a “Management Plan” for the He‘eia NERR. This sets forth the goals, objectives, strategies, actions, administrative structure, and institutional arrangements for the He‘eia NERR. Per 15 C.F.R. § 921.30(a)(4), approval of the Management Plan by NOAA is a prerequisite to designation of the He‘eia NERR.

The University of Hawai‘i, through its HIMB, has been designated by the Governor to be the lead state agency to coordinate the management of He‘eia NERR in accordance with Section 315 of the Coastal Zone Management Act and the Management Plan. HIMB acknowledges the values of state and federal cooperation and agrees to promote the long-term management of the He‘eia NERR in a manner consistent with the purpose of its designation.

To set forth a framework for the long-term, cooperative management and administration of He‘eia NERR, including a specification of respective duties and responsibilities, the parties hereby agree as follows:

AGREEMENT

A. Roles and Responsibilities of the Hawai‘i Institute of Marine Biology for He‘eia NERR

1. In the conduct of its performance regarding the management of He‘eia NERR, HIMB shall comply will applicable federal laws and regulations.
2. HIMB shall promote the protection of the natural and cultural resources of He‘eia NERR, and shall assist and cooperate with other governmental agencies that have enforcement or regulatory powers over the He‘eia NERR.

3. HIMB shall work cooperatively with other governmental agencies, non-profit organizations and community groups to ensure adequate, long-term protection and management of lands and waters within the Hawai'i NERR boundaries.
4. HIMB shall request or apply for funds to support the administration and management of He'eia NERR, and shall expend such funds as made available to HIMB in accordance with the He'eia NERR Management Plan, the annual funding guidance from OCM, and the specific conditions and limitations of the funding. The budget request and expenditures shall be made in accordance with state budget and execution policies and procedures and in accordance with the University of Hawaii's internal fiscal and accounting procedures.
5. HIMB shall conduct and coordinate research and monitoring programs that encourage scientists from a variety of institutions to work together to understand the ecology of the reserve ecosystem to improve coastal management.
6. HIMB shall conduct and maintain programs that disseminate research results via materials, activities, workshops, and conferences to resource users, state and local agencies, school systems, general public, and other interested parties.
7. HIMB shall provide initial start-up staff and endeavor to secure state funding, or private funding if appropriate, to support the costs of more permanent administrative staff. The parties envision the He'eia NERR will have a more permanent staff consisting of at least a manager, an education coordinator, and a research coordinator. Upon written agreement, the parties may agree to an expanded staff for the He'eia NERR.
8. HIMB shall endeavor to obtain facilities and equipment to implement the Management Plan.
9. HIMB shall endeavor to obtain funding to support facilities operations and maintenance.
10. HIMB shall endeavor to obtain funds to support land acquisition and construction of facilities, consistent with the goals and objectives of the NERR system and the He'eia NERR Management Plan.
11. HIMB shall maintain effective liaison with local, regional, state, and federal policy makers, regulators, and the general public.
12. HIMB shall be the principal point of contact and coordinator for any proposed boundary changes to the He'eia NERR or amendments to the Management Plan.

13. HIMB shall coordinate state agency responses to NOAA's requests for information made pursuant to Section 312 of the CZMA, particularly cooperative agreement and grant progress reports and evaluation findings. Such state agency responses to NOAA requests for information shall include descriptions of any actions or recommendations deemed by the state agency to be necessary to address any progress report or evaluation finding deficiencies. Where possible and appropriate to the organizational and legal authority of HIMB, HIMB shall implement any necessary actions and recommendations.

14. HIMB acknowledges the requirements of 15 C.F.R. § 921, specifically section 921.21(e), which specify the legal documentation required for the use and disposition of real property acquired for He'eia NERR purposes with federal funds under Section 315 of the CZMA.

B. Roles and Responsibilities for Office for Coastal Management, NOAA

1. OCM shall administer the provisions of the Sections 312 and 315 of the CZMA to ensure that the reserve operates in accordance with goals of the reserve system and the He'eia NERR Management Plan.

2. OCM shall review and process applications for financial assistance from HIMB, consistent with 15 C.F.R. Part 921, for management and operation of the He'eia NERR, and, as appropriate, land acquisition and facility construction.

3. OCM shall advise the HIMB of existing and emerging national and regional issues that have bearing on the reserve and reserve system.

4. OCM shall maintain an information exchange network among reserves, including available research and monitoring data and educational materials developed within the reserve system.

5. OCM shall to the extent possible, facilitate the allocation of NOAA resources and capabilities in support of reserve goals and programs.

6. OCM shall schedule periodic evaluations of HIMB's performance in meeting the terms of this Agreement, financial assistance awards, and the reserve management plan. Where findings of deficiency occur, NOAA may initiate action in accordance with the designation withdrawal or interim sanctions procedures established by the CZMA and applicable regulations at 15 C.F.R. § 921.40-41.

C. General Provisions

1. Obligations Subject to Funding. All obligations and duties required of either party to this MOU shall be subject to and implemented only to the extent that funds have been properly appropriated or authorized thereto, and the funds have been released and allocated in accordance with state or federal budget execution policies. Nothing in this MOU or subsequent financial assistance awards shall obligate either party to perform its duties specified herein in the absence of funding support.
2. Financial Assistance Subject to Further Documentation. Any financial assistance awarded to University of Hawai'i to implement this He'eia NERR project shall be processed, documented, and administered in accordance with customary University of Hawai'i policies and procedures for receiving federal grants and contracts, or in accordance with policies and procedures to receive state funds or private financial support, as the case may be. Any financial assistance awarded by NOAA shall be processed, documented, and administered in accordance with and subject to customary NOAA policies and procedures for the award of financial assistance.
3. Free Exchange of Research Data. The parties are encouraged to freely exchange research and assessment data, as consistent with University of Hawai'i policies on academic research, instruction and publication, and with any applicable state or federal laws. NOAA understands that HIMB's primary mission is education and the advancement of knowledge and research. HIMB views its activities under this MOU as supporting that mission. HIMB may use, exchange, share and publish research information generated from this project as consistent with customary public university academic practices, including attribution and acknowledgement of funding sources, where necessary. HIMB and NOAA shall disclose government records concerning this MOU as required by applicable state and federal law.
4. Non-Impairment of Pre-Existing Legal Authority. Nothing in this Agreement diminishes the independent authority or responsibility of either party in administering its respective statutory obligations. Nothing in this Agreement is intended to conflict with current written directives or policies of either party. If the terms of this Agreement are inconsistent with existing written directives or policies of either party entering this Agreement, then those portions of this Agreement which are determined to be inconsistent with such written directives and policies shall be invalid; but the remaining terms not affected by the inconsistency shall remain in full force and effect. At the first opportunity for revision of this Agreement, all necessary changes shall be made by either an amendment to this Agreement or by terminating this Agreement and entering in a new superseding agreement, whichever is deemed expedient to the interested parties.

5. Dispute Resolution. Should disagreement arise on the interpretation of the provisions and/or amendments of this Agreement, such disagreement shall be resolved by negotiations at the operating level of each party. If such disagreement cannot be resolved, then the areas(s) of disagreement shall be stated in writing and presented to the other party for further consideration. If agreement is not reached within thirty (30) days of presentation, then the parties shall forward the written presentation of the disagreement to their respective higher official for appropriate resolution.

6. Effective Date. Upon the signature of both parties, this Agreement shall be deemed effective as of the date of NOAA's designation of the He'eia NERR.

7. Amendments. This Agreement will be reviewed periodically by both parties and may be amended by the mutual written consent of both parties.

8. Regulatory Authority. Nothing in this Agreement adds to the regulatory powers or enforcement authority of either party that may have existed prior to the effective date of this Agreement.

9. Early Termination Prior to Expiration. This Agreement may be terminated (a) by mutual consent of both parties, or (b) by NOAA if NOAA withdraws designation of the reserve within the reserve system, pursuant to applicable provisions of the CZMA and its implementing regulations as described under 15 C.F.R. Part 923, Subpart L, or if NOAA finds, in its sole discretion, that Hawai'i Institute of Marine Biology fails to comply with this MOU, or (c) by HIMB if HIMB determines, in its sole discretion, it is no longer capable of fulfilling its obligations under this Agreement or the Management Plan.

10. Disposition of Funds and Equipment upon Termination. Should this Agreement be terminated, reimbursement of unexpended funds from financial assistance awards shall be determined on a pro rata basis according to the amount of work done by the parties at the time of termination. Additionally, reimbursement for land purchased and facilities constructed with NOAA funds shall be consistent with terms and special award conditions of financial assistance awards.

Upon termination of this Agreement or any subsequent financial assistance awards to HIMB any equipment purchased for studies to further this Agreement will be disposed of in accordance with 15 C.F.R. § 24.32.

11. Severability If any clause, sentence or other portion of this MOU shall become illegal, null, or void for any reason, the remaining portions of this MOU shall remain in full force and effect.

12. Waiver Must be in Writing. No waiver of right by either party of any provision of this MOU shall be binding unless expressly confirmed in writing by the party giving the waiver.

13. No Third Party Rights. This MOU establishes benefits and obligations between the parties to this MOU. Nothing in this MOU shall be interpreted or construed to provide standing to any person or organization who is not a party to this MOU, acting either in their own capacity or on behalf of any party, to demand performance of any duty or responsibility set forth this MOU. Nor shall this MOU confer standing to any person or organization who is not a party to this MOU to claim benefits provided in this MOU in their own right or on behalf of a party to this MOU.

14. Equal Employment Opportunity Requirement. Each party will comply will all applicable laws, regulations, and executive orders relative to Equal Employment Opportunity (EEO). In the event HIMB utilizes financial assistance or support funds provided by NOAA to issue subawards or other financial assistance to a third party for performance of activities associated with management of the Reserve, HIMB shall condition receipt of such funds upon the third party recipient's acknowledgment and acceptance of applicable EEO requirements.

Executed by the Office for Coastal Management, National Ocean Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce

By _____
Jeffrey L. Payne, Ph.D., Director, Office for Coastal Management

Date _____

Executed by the University of Hawai‘i, on behalf of its Hawai‘i Institute of Marine Biology

By _____
Director, Hawai‘i Institute of Marine Biology

By _____
Dean, School of Ocean and Earth Sciences and Technology

By _____
Chancellor, University of Hawai‘i, Mānoa

Date _____

APPENDIX C.

MULTI-PARTY AGREEMENT BETWEEN HAWAI'I INSTITUTE OF MARINE BIOLOGY AND SITE PARTNERS

Under development and will be available for Final Environmental Impact Statement

APPENDIX D.

RESPONSE TO PUBLIC COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT AND DRAFT MANAGEMENT PLAN

The NOAA Office for Coastal Management (OCM) and the University of Hawai'i – Hawai'i Institute of Marine Biology (HIMB) have collaborated to provide a joint response to comments received on the Draft Environmental Impact Statement (DEIS) and the Draft He'eia National Estuarine Research Reserve Management Plan (MP).

During the public review and comment period, six written comments were submitted and twelve individuals commented at the public meeting held at He'eia State Park in Kāne'ohe Bay, Hawai'i. In large part, those commenting supported the proposed designation of the He'eia Estuarine Research Reserve (Reserve) and implementation of the Draft Management Plan. In some instances, commenters raised important questions, offered corrections, requested additional information, or expressed concerns related to the proposed action and draft documents. In some cases, comments have resulted in changes to the Final Environmental Impact Statement (FEIS) and the Final Management Plan (FMP) and readers of the final documents are encouraged to take note of these changes. Some of those changes reflect additional analysis of climate related impacts in Subchapter 6.2.1.1. Other changes specifically addressing comments around different Clean Water Act provisions were made in multiple FEIS sub-chapters including 6.2.1.2., 6.2.2.2., 6.2.2.3., 6.3.3.1., and 6.4.8. Additional changes based on these comments were also made in Section 1.3.3. of FMP. A more detailed response to individual written and oral comments is provided below.

GENERIC RESPONSE 1. STATEMENT OF SUPPORT FOR THE DESIGNATION OF THE HE'EIA NATIONAL ESTUARINE RESEARCH RESERVE.

The majority of comments received expressed support for designation of the He'eia Estuarine Research Reserve (Reserve) and implementation of the Draft Management Plan. OCM and HIMB acknowledge this support and appreciate the public views expressed.

GENERIC RESPONSE 2. STATEMENTS OF CONCERN REGARDING IMPACT OF THE HE'EIA NATIONAL ESTUARINE RESEARCH RESERVE ON FISHING BY LOCAL CITIZENS.

Several individuals expressed concern that designation of a Reserve would restrict or otherwise limit fishing activity or access to the marine fishery resources within the designated boundaries of a Reserve.

Designation of the Reserve will not alter the existing fishery management authorities in the area. The Hawai'i Department of Land and Natural Resources, Division of Aquatic Resources will continue to manage these resources and is not required to alter any existing fishing regulations as part of the Reserve designation process. Subchapter 6.3.3.3 of the DEIS analyzed the anticipated impact to fishing from the designation of a national estuarine research reserve. Over time, it is expected that a reserve, through its research, monitoring, education and outreach capabilities, would have beneficial indirect impacts to local fisheries.

Ultimately, it is anticipated that research and information generated by the Reserve will inform resource managers and lead to improved resource management decisions by responsible state entities and local communities.

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ORAL COMMENT #1 — KANEKOA KUKEA-SHULTZ

Aloha kakou. My name is Kanekoa Kukea-Shultz. I'm the executive director for Kāko'o 'Ōiwi. I am actually in support of the National Estuarine Research Reserve System. As we restore taro patches within He'eia, which is right above Kamehameha Highway, having the NERR will really help us actually join together as a group. It will help us bring the tools that we really need to counteract a lot of the issues that are coming in terms of climate change, in terms of food security, in terms of just the presence of invasive species. The NERR will help to provide funding, but also provide tools for people to manage these resources.

Our kupuna have laid great footsteps for us to walk, for us to follow, and the NERR will only help us bring those partnerships together. So for the people that are interested in malamaing this aina, to make this aina momona, every second Saturday, we have a community workday right above and there's a lot of activities with a lot of different nonprofits working to aina momona this space. So thank you for coming out tonight and I look forward to you guys coming. Mahalo

RESPONSE TO COMMENTS FROM KANEKOA KUKEA-SHULTZ:

Thank you for your comments. See Generic Response #1.

ORAL COMMENT #2 — LUWELLA LEONARDI

My name is Luwella Leonardi. Actually, I have a memory of 200 years here in Ko'olaupoko. Most of my tutus that I grew up with is pure Hawaiian. So I got to hear their voices and I still hear their voices. Tonight, I'm here because I'm opposed to this. I'm opposed to NERRS. I'm opposed to what it is that you're all doing. And the reason being is because, as I'm reading, I see the dwindling of locals, and I see the dwindling, as I'm reading, when I get to the system and the management of people from the continent. I see that we're being carved out, but that's not the only reason. When I look I have a BA in geography, and my specialty is cartography, remote sensing and GIS.

When I look at the mountain all the way out to the sea and the amount of the expanding acres and the language of leasehold that goes along with this, I am questioning the integrity of this expansion. I'm also questioning — Just to give you an example, I'm 50 percent plus blood quantum. I grew up on Hawaiian homestead. I'm a Hawaiian homesteader lessee today. I mean, take a look at Waimānalo, what's happening there at the beach park. 80 percent or more of the people that were evicted recently from the coastline are Hawaiians and are descendants of Hawaiian homesteaders. So I'm — really, I'm paralleling that to what is happening and what could happen in the future. In other words, we're expected to be giving tonight and I'm far from that. I'm not about to give this entire ahupua'a to the USA continent, and I also want to make sure that people understand I am not here for na'i aupuni (phonetic). I never have been for na'i aupuni, and out of all the 15 meetings that we've had statewide, I've attended all 10 (sic).

The other problem that we're encountering is BOEM, Bureau of Ocean Management. I've attended all six of their meetings. So this is all tying in into this proposal. And, you know, I'm at standstill right now. I see no room for locals in this proposal. It's written in there, but we're written in there as a third person into the semantics of it. We are not the third person. We are not present third person in the semantics of your proposal, but that's how we're written in there. Let me give you one of the good things that's in the 700-page

document in case any of you read some of it. The good thing that's in there that's positive, because I promised my students today that I was going to mention something that is positive, and that is it's place based. Children today in high school know what project based is as opposed to place based. So that's what they're excited about, that it's place based.

And one more thing. One more thing. I don't know who your participants are. I know you say the future generation in this because I'm a future too. I mean, I've studied under Jim Dator for 10 years of my life. I'm a futurist. I don't know what children you're talking about. I know one thing for sure, you're not talking — when you talk about children, you're not talking about my nine grandchildren and three great grandchildren in your plan. So I want to know what future, what children are you talking about? And if so, if they come to your project, your estuary, what do they come to you about? And do we — as parents and grandparents and great grandparents, is there a cost to this? It's important to get that is there a cost to us, and if so, do our college-bound grandchildren, at their internship, do they have the possibility of internship should they become science children, I mean, science majors in college? Is this who you're talking about in research? Because I'm reading that 700-page document — well, approximately 700 — and I don't see us in there. I see the fantasy of moana, but I don't see us in there — from 200 years ago. I don't see that history in there. I don't see that respect for my kupuna in there.

RESPONSE TO COMMENTS FROM LUWELLA LEONARDI:

Thank you for your comments. The designation of the proposed Reserve and implementation of its FMP establishes a collaborative partnership between the United States Department of Commerce and the State of Hawai'i. The federal government is expected to provide annual grants to implement approved strategies and actions from the MP supported by State matching funds, and the State (HIMB in particular) will administer the grants and program provisions. Future activities will have an influence on education, research, and stewardship activities that take place within the proposed Reserve. At the site level, these activities typically include input and support from the various stakeholders and partners a reserve.

As detailed in the Final Management Plan (FMP), the focus of the research question being addressed by the proposed Reserve is to evaluate the effectiveness of Native Hawaiian traditional practices as a solution to modern resource management issues. As part of this NERR designation effort, the Koolaupoku Hawaiian Civic club has been a partner to the process. The comments from Kanekoa Kukea-Shultz, Mehealani Cypher, Hi'ilei Kawelo, Rocky Kaluhiwa all indicate that Native Hawaiians have been (and are) included in this process and demonstrate that the NERRS management has respected, included and learned from kupuna of He'eia. Both NOAA and HIMB intend this important role for Native Hawaiians to continue following designation of the proposed Reserve.

The designation of the proposed Reserve and implementation of its FMP establishes a collaborative partnership between the United States Department of Commerce and the State of Hawai'i. The federal government is expected to provide annual grants to implement approved strategies and actions from the MP supported by State matching funds, and the State (HIMB in particular) will administer the grants and program provisions. Future activities will have an influence on education, research, and stewardship activities that take place within the proposed Reserve

ORAL COMMENT #3 — MAHEALANI CYPHER

Aloha mai kākou. My name is Mahealani Cypher. I'm born and raised in Kāne'ohe. I have nine grandchildren and five great grandchildren, and I really care about the future of this area and Kāne'ohe Bay. I support the NERRS project. I think the information that will be developed and the partnerships that will be developed are important for our community. I do agree with Luwella that we have to make sure that the people who work on this project are from the area as much as possible and are committed to this area, committed generationally. You need to be here because we're going to be here forever and ever. So we want to make sure the project reflects this community as much as possible. So I will help in whatever way. I'm with the Ko'olau Foundation and the Ko'olaupoko Hawaiian Civic Club. Thank you.

RESPONSE TO COMMENTS FROM MAHEALANI CYPHER:

Thank you for your comments. An explicit goal of the NERR system is to offer public involvement through site-based research, community involvement, and education. The various site partners (e.g., Kāko'o 'Ōiwi, Paepae O He'eia) currently offer extensive opportunities for public involvement in their activities, and more efficient coordination of those opportunities through the proposed Reserve will allow for increased public involvement and education without changing human pressures on the site. See Generic Response #1.

ORAL COMMENT #4 — BRIAN BOWEN

Hi, I'm Brian Bowen. As you can tell from the Red Sox shirt, I wasn't born here, but I do love my home here in Hawai'i — in Hawai'i. And I just wanted to share an experience about why I support this, and that is that before I was a fish scientist at HIMB, I grew up in New England and my dad would take the kids fishing every year for salmon and we loved salmon, but as the years went by, there were fewer and fewer salmon, and one day there was no salmon. We went fishing for a week and there was no salmon. And that experience probably got me to be a fish scientist, to learn enough about fish to make sure there's enough fish around for people like me that are fishermen.

So the reason I support this is because monitoring the bay is going to be the best way to detect problems early. When there's a problem like an invasive species in Kāne'ohe Bay, if you don't catch it early, you don't catch it at all. It spins out of control, and you get situations like we've seen in the last decades here in Kāne'ohe Bay. So I support this program because catching problems early is the only way in the ocean that you're going to have a chance to fix it.

Thank you for the opportunity to comment.

RESPONSE TO COMMENTS FROM BRIAN BOWEN:

Thank you for your comments. See Generic Response #1.

ORAL COMMENT #5 — BERTRAM WEEKS

Bertram Weeks, Nature Conservancy supports the designation of a He'eia National Estuarine Research Reserve as it will unite the various organizations within He'eia, allowing for an ahupua'a-based management that integrates traditional and contemporary stewardship practices. These organizations include Ko'olaupoko Hawaiian Civic Club, Ko'olau Foundation, Kāko'o Ōiwi, Paepae o He'eia, Hawai'i Institute for Marine Biology and He'eia State Park. He'eia is an ideal location for NERR to demonstrate and promote local management, education and research into the health and productivity of a Hawaiian estuarine system. He'eia contains a world-class research institution as well as multiple community organizations working together to develop and implement effective management strategies in the entire ahupua'a. Collaboration between these organizations is already recognized as necessary because of the interconnectedness relationship each ecosystem has to one another within the ahupua'a. Any effect of the mountains will work its way down to the wetlands and lo'i, flow down to the loko i'a and eventually into the bay and coral reefs. Ecologically, Kāne'ohe Bay is unique and the opportunity to highlight this special type of estuarine system is unparalleled in Hawai'i. From a research perspective, Kāne'ohe Bay has experienced a history of significant turbidness from wastewater effluent to invasive algae; yet, its variety of corals have been shown to be some of the most resilient and able to recover from recent bleaching events around the entire state, even compared to those in nearby areas of Kailua and Waimānalo, potentially providing insight into how to save other coral reefs around the state from future unfavorable ocean conditions. By designating He'eia as an NERR, it will create a platform for communities and organizations, researchers, educators and students to engage in learning opportunities together and be part of functioning ahupua'a system. Additionally, it can help leverage additional resources to support the current restoration and conservation effects of organizations, such as Paepae o He'eia and Kāko'o Ōiwi, and will bring stronger — and will build stronger partnerships with federal, state and local entities to provide effective place-based management strategies. By supporting these organizations, it will also create more opportunities for Hawaiians to be involved in education, conservation and research in the He'eia ahupua'a.

Overall, He'eia has the opportunity to be at the forefront in researching the benefits of a full functioning ahupua'a system, including the important estuarine researchers there learning ways to address the drastic changes that our Hawaiian archipelago is currently experiencing due to climate change, land development inclusion and invasive species. It will highlight the importance of local and traditional knowledge informing and working together with contemporary sciences as we collectively move forward towards a holistic, place-based approach in managing our local resources.

RESPONSE TO COMMENTS FROM BERTRAM WEEKS:

Thank you for your comments. See Generic Response #1.

ORAL COMMENT #6 — RAY SANBORN

Ray Sanborn, I wasn't ready for that. We just want to say that we're fully in support as Kama'aina Kids and He'eia State Park, and we're really glad for the opportunity to be part of this organization.

RESPONSE TO COMMENTS FROM RAY SANBORN:

Thank you for your comments. See Generic Response #1.

ORAL COMMENT #7 — LYNDON HIBBARD

My name is Lyndon Hibbard. I'm not totally against this proposition, but I'm opposed to part of it.

I've fished this area since I was two years old and I've fished talapia with my mom. We fished everywhere from Chinaman's Hat to Kailua. Now I'm a father and I have three half Hawaiian children of my own. I bring them out here to fish because this is the safest place that I know of for them. I teach them how to fish here. It's one of the best memories I've had as a child, and my children are seeing the same. Part of the proposition that I don't agree with is just this area out here, this area here and these flats is one of my favorite places to fish. I'm one of the few people that comes here during the day. The damage that I see to this area — because I dove out here as well, looked at the reef, the damage I see is not from the fishermen. I've seen it from the kayaks coming through, the commercial kayaks that go over the reef during lower tides and damage the reef. They get out of their kayaks and walk on the reef. That is more of the damage that I've seen.

When my kids grow up, I'd like them to remember this area as a place that they can go to; that when they have kids, that they can bring their kids here too and not only as a preserve. I mean, I agree with the upper part — that the upper part of this should be preserved and protected, but the lower part, I think it's — The fishermen here are very light. There are very few fishermen out here during the day, even during the night. Boat fishermen are very light in this area. I think protecting this area is good, but blocking it off from all fishermen, I don't agree with. That's all. Thank you.

RESPONSE TO COMMENTS FROM LYNDON HIBBARD:

Thank you for your comments. See Generic Response #2.

ORAL COMMENT #8 — MARK HECKMAN

Hi, I'm Mark Heckman. I'm from the Hawai'i Institute of Marine Biology at University of Hawai'i. I'm an education guy and couple of things. When the NERRS was coming up, I went and read about all the other NERRS's around because I was curious. The Chesapeake Bay one sponsors a fishing tournament. Kind of cool.

So what the NERRS becomes is really what all of you decide it becomes. And just bear with me. One of the things we're doing out at Coconut Island now is doing what I call pathways to science; right? Not everybody wants to be a scientist, but some of your kids are going to be scientists. They're going to come in. I'm going to retire. I'm going to get out (SIC) way and let them figure things out. And these are all local kids that we're running through our programs. A lot of them didn't think they can do science. I had one girl, she wanted to do — she was from Castle High School. She wanted to do her science fair project and, of course, she came out and wanted to work on dolphins. I was kind of like, "You know, come out to this beach. Just look at the beach for a second." So she was looking at this beach, and these people pulled up and they just started getting wild out on the sand and stuff, and she said, "Is there anything out there growing?" I said, "Yeah, there's this little, tiny native sea grass that's about that big, halapa."

She goes, "Aren't they kind of stomping it?" "Yeah, maybe." She goes, "Does that hurt?" I go, "I haven't got a clue. So maybe you got a project there." So she did a project. She won district. She won state. She went to the national competition. These are your kids. They're going to decide what this NERRS is, and we'll see if they do it. You guys are going to figure it out. I'm looking forward to seeing what you come up with because you got cool tools. We're going to get those tools to you and we're going to see where you're going to go. Thanks.

RESPONSE TO COMMENTS FROM MARK HECKMAN:

Thank you for your comments. See Generic Response #1.

ORAL COMMENT #9 — HI'ILEI KAWELO

Aloha mai kākou. I'm Hi'ilei Kawelo. I was born and raised over here. My family's from Kahalu'u. My ohana's from Ka'alaea. I have a little bit of history in this space. I grew up fishing in Kāne'ohe Bay. My dad is a full-time fisher even in his retirement. He fishes probably three to four days a week looking for he'e. Many members of our community here have been involved in the Kāne'ohe Bay Master Plan and helped to inform that. That's actually Uncle Skipper that just arrived. Hi, Uncle Skipper.

I think I just — I really just want to say that I'm the executive director of Paepae O He'eia. We take care of the fishpond which is adjacent to Kalai (phonetic) and Kealohi here, and our organization is in support of the NERR. I think it's also a really good opportunity to dispel some of the myths that surround the NERRS designation. A common misperception is that this designation is going to close a portion of the bay in He'eia and create a sanctuary, create a space where few people cannot fish. That is far from the truth. Really, what the designation is will be to — We've been here — we've been working at the fishpond for 15 years. Kāko'o 'Ōiwi's been there for 10 years. Papahana's been there for a while, but we've been doing the work for years. We're nonprofits with, you know, the resources that many nonprofits have to struggle for and to fight with, and, really, what this designation would be would be additional

resources towards the work that's already going on. It doesn't mean any closures. What it means is if I have a question, I have a science question, I have a question about sedimentation on the reef out here, I have a question about because every time it rains, the shit's going out into the bay. I want those questions answered.

I'm going to talk to Ron over there at Coconut Island and I'm going to say, "I would like your help in answering these questions," because it's important for me. It's important for my dad that fishes here. It's important for us that we're trying to restore a fishpond and want to make sure that those fish are safe for consumption. So you can come to me after. You can blame it on me if you'd like, but, you know, for many years, our community has been opposed to any kind of closures in Kāne'ohe Bay that would prevent fishing. I can tell you right now that this designation is not going to result in that. It's going to help us in the way of supporting research activities. It's going to help us in the way of supporting educational programs. All of the organizations within the ahupua'a all have educational arms. We get thousands of kids, local kids that come out to learn about why it's so important to take care of the ahupua'a, to mālama, to give back, and we need — we need additional support in our stewardship activities as well. I know many of you come here for family parties and look out that way or you can see the improvements along the He'eia Stream, but all of that's been done without the support of NERRS or federal government. That's been done with support of us writing grants and seeking private donations from different entities, and it's hard work and it's not fun. So wouldn't it be so wonderful to have additional support so that we can see more of the stream restored so that whenever there's a big rain and big flooding, we don't have to worry that, you know, our fishpond wall is going to break or this lo'i is going to get, you know, destroyed? It would be really nice to know that, hey, we got a bunch of people in the community that really want to see this place succeed. We really want to be able to mālama aina. We want to teach our kids that. We want to be able to grow food and want to share that with the community. And, okay, maybe going the federal route wasn't — maybe that's not for everyone, you know, but for us and the work we've been doing here for 15 years, to us, that's the best option at the moment.

And, you know, I think times are changing. We don't have all — we don't have all the answers, yeah? And there's too many people here. So I think we need all the help we can get in answering and addressing those very many questions and those very many issues that arise from too many people in our space. So mahalo. And just to reiterate, Paepae o He'eia supports the NERRS designation.

RESPONSE TO COMMENTS FROM HI'ILEI KAWELO:

Thank you for your comments. See Generic Response #1.

ORAL COMMENT #10 – ROCKY KALUHIWA

Aloha mai kākou. As a kupa`āina in He`eia ahupua`a, I also believe Luwella that we should have people from the community involved with this project.

Let me go back and give you a short history about the He`eia ahupua`a. You know, from the '60s to '70s to '80s, the He`eia ahupua`a was in great danger of this. To us, it's an unreasonable kind of development. We fought and I was with the lawyer that fought against the nuclear power plant. I fought against the hotel being built here at He`eia State Park. We fought to make this a state park. Fought against the fishpond, and I almost went to jail a couple of times because of the fishpond and the lo'i over there to save the fishpond from being a 500-berth marina. We fought to save the lo'i because they said no possible way it's going to be restored to farming again, but to make it another Hawaii Kai. We fought that. We fought for years to keep the right kind of development in He`eia ahupua`a, and to me, it's worth it. I went bankrupt personally three times in my lifetime. Would I do it again? Yes.

Fishing — we need to actually — we need to have some kapu system that's traditional to Hawaiians. We don't believe in any kind of full — Yeah, the turtle. Sorry, NOAA. All Hawaiians didn't believe in that, but we did believe in the kapu system, and turtles have been 40 years.

Maybe it's time to lift the ban. I am part of this NERRS. I am proud of being part of this NERRS because it's not closing anything. It's monitoring the bay. And so what? We need that. Think about it. We need to be together as a community, all of us, not only Hawaiians. My family has been here for over 200 years. My family is still here living on lands given to us by the king. In Ha'ikū, I have actually 89 first cousins because my father has 21 children. By He`eia State Park at the bottom is my grandfather's property. I'm proud to say thank you for taking care of the park and I always feel part of it, and I'm asking the community to be involved in it because it's for the betterment of our ahupua`a. We can't let it go to waste. We together can save it. Mahalo.

RESPONSE TO COMMENTS FROM ROCKY KALUHIWA:

Thank you for your comments. An explicit goal of the NERR system is to offer public involvement through site-based research, community involvement, and education. The various site partners (e.g., Kāko'o 'Ōiwi, Paepae O He`eia) currently offer extensive opportunities for public involvement in their activities, and more efficient coordination of those opportunities through the proposed Reserve will allow for increased public involvement and education without changing human pressures on the site. Additionally, as part of this effort, the Ko'olaupoku Hawaiian Civic club has been a partner and comments from Kanekoa Kukea-Shultz, Mehealani Cypher, Hi'ilei Kawelo all indicate that Native Hawaiians have been (and are) included in this process and that the NERRS management will respect, include and learn from kupuna of He`eia. See Generic Response #1.

ORAL COMMENT #11 — JAY DASIGO

Hi, how are you? I'm Jay Dasigo. Basically, what it is, I'm a fisherman. I'm just speaking for some of the fishermen. As you can see, there's a bunch of us out here and maybe 10 here, we go down to the pier of Kāne'ohe Bay. It's like a little community that we go out there and go fish. So for us to get involved here in the fishing community, we try our best to go out here and just to come and go fish, take out exactly what I want to take out, catch what we wanted to catch just so we can kaukau. I understand you guys are doing the best for our community and I thank you guys for that. Thank you very much. One thing that I just wanted to say, though, like this sister right here mentioned, there's, like, 700 pages. I mean, when do we finally kind of sit there? I mean, I know it's for our future. 700 pages? Can you kind of explain to us?

Like, for us fishermen, we're already thinking how much more spots do you guys need to take away from us? Just the other day, me and my son, Dustin, we love to go fishing. I'm a business owner. I'm busy. I keep myself busy, and when we find time to go out there and go fishing, where can we go no more? We can't. There's nowhere for us to go. After 10:00 o'clock, anywhere on the south side closes. They won't give none of us fishermen anywhere to go to go fishing. So now we're thinking now they're closing it off here. You know, I know you guys are making a sanctuary or whatever it may be for our future. Yes, thank you very much, but for us right now, we're already running out of places to go.

I hear that we still can fish, but what's going to happen in the future? "Oh, you know what, I'm sorry to say it's really bad. So sorry. No fishing." So does this lead to that direction? Can you fill us fishermen in on what's going on? At least we know if there's something we can do, we're here to help. Not here to get you guys upset in any way, but we're here to help just to let you know. Thanks for letting me speak.

RESPONSE TO COMMENTS FROM JAY DASIGO:

Thank you for your comments. See Generic Response #2.

ORAL COMMENT #12 — JUSTIN MIGUEL

Hello, I'm Justin Miguel, one of the guys that fish at He'eia Pier, I guess. I don't know what I should be saying, but I guess He'eia is one of those places you could take your kids and feel is a safe area. Sorry. Kind of nervous.

But, yeah, kind of not really understanding what's going on and just wanted to put my comments on how it kind of affects the youth, I think, in a way. By taking this place away, it ruins one of those places that's actually safe, and, you know, I just really don't feel like having this kind of sanctuary and so on. Taking He'eia Pier, taking that away for future generations and kids that could fish during the day, especially at night when it's, I said, safe, it's just — yeah, sorry. That's it. Thank you.

RESPONSE TO COMMENTS FROM JUSTIN MIGUEL:

Thank you for your comments. See Generic Response #2

Additionally, the He'eia Small Boat Harbor and Pier are specifically excluded from the preferred alternative boundaries. The harbor and pier were evaluated for inclusion within the reserve as part of an alternatives analysis and were found to be a major source of commercial, subsistence and recreational fishing among a variety of activities. Although, these uses are not necessarily inconsistent with reserve designation, at this time, the harbor and pier are not included within the preferred alternative boundary. As noted in the FMP, the He'eia Small Boat Harbor and Pier may be considered for possible inclusion within a future reserve expansion area. Any expansion of the reserve, however, would require additional environmental review and public input.

**WRITTEN COMMENT #1 — WESLEY K. MACHIDA,
STATE OF HAWAI‘I, DEPARTMENT OF BUDGET
& FINANCE**

DAVID Y. IGE
GOVERNOR



WESLEY K. MACHIDA
DIRECTOR

RODERICK K. BECKER
DEPUTY DIRECTOR

EMPLOYEES' RETIREMENT SYSTEM
HAWAII EMPLOYER-UNION HEALTH BENEFITS TRUST FUND
OFFICE OF THE PUBLIC DEFENDER

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
P.O. BOX 150
HONOLULU, HAWAII 96810-0150

ADMINISTRATIVE AND RESEARCH OFFICE
BUDGET, PROGRAM PLANNING AND
MANAGEMENT DIVISION
FINANCIAL ADMINISTRATION DIVISION
OFFICE OF FEDERAL AWARDS MANAGEMENT (OFAM)

October 4, 2016

Mr. Matthew Chasse
Coastal Management Specialist
National Oceanic and Atmospheric Administration
Office for Coastal Management
1305 East-West Highway
Silver Spring, Maryland 20910
matt.chasse@noaa.gov

Dear Mr. Chasse:

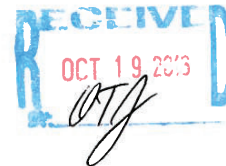
This is to acknowledge receipt of your email request dated September 1, 2016, soliciting comments on the draft environmental impact statement and draft management plan for the designation of the proposed He'eia National Estuarine Research Reserve.

We have no comments at this time.

Sincerely,

A handwritten signature in blue ink that reads "Wesley K. Machida".

WESLEY K. MACHIDA
Director of Finance



No. 1 Capitol District Building, 250 S. Hotel Street, Honolulu, Hawaii 96813

**RESPONSE TO COMMENT FROM WESLEY K. MACHIDA,
STATE OF HAWAI‘I, DEPARTMENT OF BUDGET & FINANCE:**

Thank you for your comments. No other response necessary.

**WRITTEN COMMENT #2 – CONNELL DUNNING,
U.S. ENVIRONMENTAL PROTECTION AGENCY**



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

October 27, 2016

Joelle Gore
Chief Stewardship Division
Office for Coastal Management
National Ocean Service, NOAA
1305 East West Highway, N/ORM2, Room 10622
Silver Spring, Maryland 20910

Subject: Draft Environmental Impact Statement for the He'eia National Estuarine Research Reserve
Draft EIS Project, Oahu, Hawai'i (CEQ# 20160197)

Dear Ms. Gore:

The U.S. Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the He'eia National Estuarine Research Reserve Project, Oahu, Hawai'i, pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and Section 309 of the Clean Air Act. These comments were also prepared under the authority of, and in accordance with, the provisions of the Federal Guidelines promulgated at 40 CFR 230 under Section 404(b)(1) of the Clean Water Act (CWA).

Based on our review, we have rated the Preferred Alternative as "Environmental Concerns – Insufficient Information" (EC-2) (see enclosed "Summary of Rating Definitions"). This rating is based primarily upon questions regarding impacts to aquatic resources and the need to more clearly describe how proposed management actions related to implementation of the National Estuarine Research Reserve (NERR) Management Plan will be integrated with other plans already being implemented in the watershed. These concerns are further described below and in the attached detailed comments.

EPA is concerned that the proposed actions, including the conversion of over 176 acres of wetlands into a working agricultural landscape (conversion to taro lo'i), may require a Clean Water Act Section 404 permit. EPA encourages NOAA to further coordinate with the U.S. Army Corps of Engineers to determine if the proposed project requires a Section 404 permit under the CWA. EPA is also concerned the Management Plan may not be aligned with water quality and habitat restoration goals of other plans already being implemented in the watershed. EPA recommends further inter-agency coordination to avoid potential overlap of regulatory actions and federal funding. Specifically, EPA recommends that NOAA more clearly identify how the proposed actions are consistent with the goals and objectives of the Hawai'i Department of Health Polluted Runoff Control Program and the Hawai'i Nonpoint Source Management Plan. EPA also recommends additional clarity in the Final Environmental Impact Statement (FEIS) regarding how certain proposed actions outlined in the DEIS, such as specific species restoration projects and water quality sampling, would be implemented.

EPA also encourages NOAA to include in the FEIS further discussion that analyzes climate change impacts, particularly how climate change would impact current wetlands in the project area vs. the proposed working agricultural taro landscape. For example, analyze the ability of both landscapes species/habitats to adapt to projected temperature, precipitation, and sea level changes.

EPA encourages NOAA to highlight how the NERR Draft Management Plan and EIS provide an opportunity to ensure continuity between NOAA, and the Hawai'i Department of Health Polluted Runoff Control Program. This would help ensure state and federal resources are leveraged for maximum improvement rather than potentially duplicative efforts. Thank you for the opportunity to review this DEIS. We appreciate NOAA's coordination with EPA during our review. When the FEIS is released, please send one hard copy and two CDs to the address above (mail code: ENF-4-2). If you have any questions, please contact me at (415) 947-4161, or have your staff contact James Munson, the lead reviewer for this project. James can be reached at (415) 972-3852 or Munson.James@epa.gov.

Sincerely,



Connell Dunning, Acting Manager
Environmental Review Section

Enclosures: Summary of EPA Rating Definitions
EPA's Detailed Comments

Cc:

Stephen Cayetano, Chief, United States Army Corps of Engineers

Alec Wong, State of Hawai'i Department of Health

Mike Burke, Hawai'i Pollutant Runoff Control Program

Christopher G. Chung, Hawai'i Coastal Zone Management Program, Office of Planning

SUMMARY OF EPA RATING DEFINITIONS*

This rating system was developed as a means to summarize the U.S. Environmental Protection Agency's (EPA) level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the Environmental Impact Statement (EIS).

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

ADEQUACY OF THE IMPACT STATEMENT

"Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, Policy and Procedures for the Review of Federal Actions Impacting the Environment.

EPA DETAILED COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE HE'EIA NATIONAL ESTUARINE RESEARCH RESERVE PROJECT, OAHU, HAWAII, OCTOBER 27, 2016

Clean Water Act, Section 404

The Draft Management Plan (Appendix A) for the National Estuarine Research Reserve Project describes activities proposed in 176 acres of wetlands, including conversion to working agricultural landscape or taro lo'i. This conversion may require a Clean Water Act (CWA) Section 404 permit. Page 197 of the Draft Environmental Impact Statement (DEIS) states the "US Army Corps of Engineers (USACE) has determined that a Section 404 permit was not necessary" for the proposed wetlands conversion; however, EPA notes that the DEIS references the USACE "Paepae o He'eia" Public Notice (PN), which is for repair of "80 feet" of the fishpond wall, not specifically for taro wetlands as the DEIS identifies. While there is a stipulation in the PN that the project would include some restoration of historic taro wetlands, no size reference or approval of conversion is identified.

Recommendations: We recommend NOAA work with the USACE to determine if a CWA Section 404 permit is needed for the activities described in DEIS, specifically, but not limited to, the conversion of wetlands to taro agriculture. In the Final Environmental Impact Statement (FEIS), update the CWA Section 404 section to reflect the outcome of this discussion and identify any additional mitigation that would be warranted.

In the event that the project is not covered by previous regulatory approvals, we recommend NOAA obtain all necessary permits prior to starting construction. Include in the FEIS a clear description of the required permits along with an anticipated schedule of when required permits and approvals will be completed.

In the event that a CWA Section 404 individual permit is required by the USACE, the Least Environmentally Damaging Practicable Alternative (LEDPA) must be identified and an alternatives analysis will need to be completed in order to comply with CWA Section 404(b)(1) Guidelines. The alternatives analysis would need to include a reasonable range of practicable alternatives, including an expanded alternatives analysis that would contain offsite alternatives. Specifically, the location of other agriculture taro cultivation opportunities that don't require conversion of 176 acres of wetlands and all viable offsite alternatives would need to be considered within the range of practicable alternatives. EPA recommends that these considerations and required analysis for CWA Section 404 permitting occur prior to release of the FEIS.

Clean Water Act, Section 303(d)

The DEIS accurately identifies that Hawai'i Department of Health (HDOH) has determined the He'eia stream water quality is impaired by sediment, total suspended solids (TSS), and nutrients pursuant to Section 303(d) of the Clean Water Act. However, the DEIS does not provide sufficient information to determine if the projects in the Draft Management Plan would control or contribute to these pollutants of concern. For example, depending on the type of agricultural practices followed, there could be an increase in nutrients and or sediment. While the USACE PN states that "nutrient-rich fresh water" created by this taro wetland reintegration is beneficial, it is possible such actions would exacerbate the nutrient loads of the stream.

Recommendations: We recommend the FEIS describe the anticipated impacts to water quality pollutants of concern anticipated from the management plan actions and associated activities in the National Estuarine Research Reserve (NERR). EPA recommends referencing the listed

pollutants identified on the CWA Section 303(d) list, which can be found on the following website: <http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/integrated-report-and-total-maximum-daily-loads/>. Consider water quality impacts of the proposed project in relationship to other efforts in the watershed, including nutrient and sediment reduction efforts to meet water quality standards. Discuss if nutrient loads in streams would be exacerbated by taro reintroduction and commit to specific mitigation actions to reduce such impacts.

Clean Water Act, Section 319

EPA provides approximately \$1.2 million per year of Clean Water Act Section 319 (Nonpoint Source Program) to the HDOH Polluted Runoff Control (PRC) Program to implement the Hawai'i Nonpoint Source Management Plan. There is a potential for duplication of federal funding investments from the project as proposed in the DEIS. The PRC Program includes statewide programs such as development and implementation of the Coastal Nonpoint Pollution Control Program pursuant to the Coastal Zone Act Reauthorization Amendments (CZARA), Section 6217, in partnership with the Coastal Zone Management Program (Office of Planning). The PRC Program also invests implementation of watershed plans to restore water quality to impaired watersheds. Specifically, the Hawai'i Nonpoint Source Management Plan 2015- 2020, approved by EPA in September 2015, identifies He'eia as a priority watershed. The plan establishes a goal for the state to eliminate the sediment and nutrient water quality impairments in the He'eia stream by 2020.

As a priority watershed, in addition to supporting several on-the-ground restoration projects, the HDOH PRC program has also committed to monitoring He'eia stream to demonstrate water quality trends over time. The monitoring proposed in the He'eia NERR Draft Management Plan is likely duplicative to the current monitoring efforts being undertaken by HDOH. EPA is concerned that implementation of uncoordinated management plans may result in projects and investments (e.g. monitoring) with cross purposes and/or duplication of efforts.

HDOH PRC has previously funded, and is currently funding, on-the-ground restoration projects in the watershed (under CWA section 319) including stream bank restoration and invasive species removal (including mangroves near the stream mouth / fish pond). HDOH also conducts regular water quality sampling at several long term sites in the He'eia stream, including the mouth of the stream at the fishpond.

Recommendations: We recommend NOAA identify the Hawai'i Department of Health Polluted Runoff Control Program as a key stakeholder and partner in the NERR Draft Management Plan to ensure federal and state investments are not duplicative or in conflict.

We also encourage coordination between all watershed health stakeholders moving forward and recommend that this coordination be identified as a goal in the FEIS. This will ensure the NERR leverages existing efforts rather than duplicates efforts already supported by federal funding.

Climate Change

The DEIS does not contain estimates of the greenhouse gas emissions (GHG) that would be caused by the alternatives considered. Consistent with Council on Environmental Quality's (CEQ) Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews (CEQ Guidance), the EPA recommends that the FEIS estimate the direct and indirect GHG emissions that would be caused by the

proposal and its alternatives.^[1] Examples of tools for estimating and quantifying GHG emissions can be found on CEQ's website.^[2] Estimated GHG emissions levels can serve as a basis of comparison for climate change impacts among alternatives and appropriate mitigation measures.

The DEIS does not estimate GHG emissions that would be caused by the proposed land management actions and changes in vegetative community type, such as impacts on carbon sequestration from conversion of wetlands. As recommended by the CEQ Guidance, "agencies should include a comparison of estimated net GHG emissions and carbon stock changes that are projected to occur."^[3] EPA recommends quantifying the GHG emissions caused by these changes.

Also, consistent with the CEQ guidance, we recommend that the FEIS include future climate scenarios, such as those provided by the U.S. Global Change Research Program's National Climate Assessment^[4], and how they may impact the proposal and its potential impacts. Including future climate scenarios provides valuable information to determine whether the proposal includes appropriate resilience and preparedness measures for the impacts of climate change. The EPA recommends that the He'eia National Estuarine Research Reserve management plan incorporate measures to improve resiliency to climate change, where appropriate.

Specifically, the FEIS would benefit from an analysis of the effects that climate change may have on the adaptability of specific species to thrive. For example, consider the increased vulnerability of specific species under a reasonably anticipated climate change scenario. EPA recommends NOAA include a diversity strategy in any wetland restoration/conversion plans to increase the chances of species adaptation to climate change and survival of a healthy watershed.

Recommendations: In the FEIS, include a climate analysis that is consistent with the CEQ guidance. In the climate analysis consider how climate change would potentially affect the project area, specifically within sensitive species areas, and assess how the projected impacts of the project could be exacerbated by climate change.

Additionally, we recommend the climate change analysis include how climate change could affect taro cultivation and determine which wetland, (current or proposed), is better able to adapt to the effects of climate change. When considering adaptation to climate change, we recommend that the FEIS discuss measures that would improve both adaptability and overall wetland health in the project area, such as diversifying the land cover with the selection of certain adaptive species for replanting in addition to taro.

^[1] White House Council on Environmental Quality, *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*, p.11, p. 16.

^[2] https://ceq.doe.gov/current_developments/GHG-accounting-tools.html

^[3] CEQ Guidance, p. 26.

^[4] <http://nca2014.globalchange.gov/>

WRITTEN COMMENT #3 — LAURA MCINTYRE,
STATE OF HAWAII, DEPARTMENT OF HEALTH

DAVID Y. IGE
GOVERNOR OF HAWAII



VIRGINIA PRESSLER, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

EPO 16-305

September 29, 2016

Ms. Joelle Gore
Stewardship Division Chief
Office for Coastal Management
National Ocean Service, NOAA
1305 East West Highway, N/ORM2, Room 10622
Silver Spring, Maryland 20910

Dear Ms. Gore:

SUBJECT: Draft Environmental Impact Statement (DEIS) for Hee'ia National Estuarine Research Reserve Kaneohe, Oahu

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your DEIS to our office via the NOAA link:

<https://coast.noaa.gov/data/docs/nerrs/hawaii-reserve-draft-eis.pdf>

We understand from the NOAA publication that the purpose of the action is to designate a National Estuarine Research Reserve (hereafter "research reserve") in Hawaii as the 29th reserve in the National Estuarine Research Reserve System (hereafter "reserve system") within portions of the He'eia estuary and adjacent Kane'ohe Bay waters. As required by 15 C.F.R. § 921.20, the proposed action will also include the National Oceanic and Atmospheric Administration's (NOAA) approval of a management plan developed by the state, provided the plan meets the required elements described in the applicable reserve system regulations. If all requirements of the process are met and there is a designation of the proposed He'eia NERR, the state and NOAA will partner in the operation and management of the reserve in accordance with 15 C.F.R. § 921.32. Therefore, the purpose of the proposed action includes both the designation of the proposed reserve, including NOAA approval of the He'eia National Estuarine Research Reserve Draft Management Plan (DMP), and the subsequent implementation of plan management elements resulting from a NERR designation.

In the development and implementation of all projects, EPO strongly recommends regular review of State and Federal environmental health land use guidance. State standard comments and available strategies to support sustainable and healthy design are provided at: <http://health.hawaii.gov/epo/landuse>. Projects are required to adhere to all applicable standard comments. EPO has recently updated the environmental Geographic Information System (GIS) website page. It now compiles various maps and viewers from our environmental health programs. The eGIS website page is continually updated so please visit it regularly at: <http://health.hawaii.gov/epo/egis>. EPO also encourages you to examine and utilize the Hawaii Environmental Health Portal at: <https://eha-cloud.doh.hawaii.gov>. This site provides links to our e-Permitting Portal, Environmental Health Warehouse, Groundwater Contamination Viewer, Hawaii Emergency Response Exchange, Hawaii State and Local Emission Inventory System, Water Pollution Control Viewer, Water Quality Data, Warnings, Advisories and Postings.

We suggest you review the requirements of the Clean Water Branch (HAR, Section 11-54-1.1, -3, 4-8) and/or the National Pollutant Discharge Elimination System (NPDES) permit (HAR, Chapter 11-55) at: <http://health.hawaii.gov/cwb>. If you have any questions, please contact the Clean Water Branch, Engineering

Ms. Joelle Gore
Page 2
September 29, 2016

Section at (808) 586-4309 or cleanwaterbranch@doh.hawaii.gov. If your project involves waters of the U.S., it is highly recommended that you contact the Army Corps of Engineers, Regulatory Branch at: (808) 835-4303.

EPO recommends you review the need and/or requirements for a Clean Air Branch permit. The Clean Air Branch can be consulted via e-mail at: Cab.General@doh.hawaii.gov or via phone: (808) 586-4200.

You may also wish to review the draft Office of Environmental Quality Control (OEQC) viewer at: <http://eha-web.doh.hawaii.gov/oeqc-viewer>. This viewer geographically shows where some previous Hawaii Environmental Policy Act (HEPA) {Hawaii Revised Statutes, Chapter 343} documents have been prepared.

In order to better protect public health and the environment, the U.S. Environmental Protection Agency (EPA) has developed a new environmental justice (EJ) mapping and screening tool called EJSCREEN. It is based on nationally consistent data and combines environmental and demographic indicators in maps and reports. EPO encourages you to explore, launch and utilize this powerful tool in planning your project. The EPA EJSCREEN tool is available at: <http://www.epa.gov/ejscreen>.

We request that you utilize all of this information on your proposed project to increase sustainable, innovative, inspirational, transparent and healthy design. Thank you for the opportunity to comment.

Mahalo nui loa,



Laura Leialoha Phillips McIntyre, AICP
Program Manager, Environmental Planning Office

LM:nn

Attachment 1: Environmental Health Management Web App Snipit of Project Area: <http://health.hawaii.gov/epo/egis>

Attachment 2: Clean Water Branch: Water Quality Standards Map

Attachment 3: Wastewater Branch: Act 120 Cesspool Tax Credit Web App Snipit of Project Area

Attachment 4: Wastewater Branch: Recycled Water Use Map of Project Area

Attachment 5: OEQC Viewer Map of Project Area

Attachment 6: U.S. EPA EJSCREEN Report for Project Area

c: DOH: CWB, CAB, EPA, HEER (via email only)

**RESPONSE TO COMMENT FROM LAURA MCINTYRE,
STATE OF HAWAII, DEPARTMENT OF HEALTH:**

Thank you for your comments. Section 1.3.3. of draft management plan has been revised to describe how HDOH has been historically engaged within the He'eia watershed and how the proposed Reserve will actively engage with the HDOH during the development and implementation of the NERR monitoring program.

WRITTEN COMMENT #4 — SHELBY PROFFER, TYLER THOMS, NICK CHAPLIN, ANDREA HENDRICK, GRAND VALLEY STATE UNIVERSITY

In totality, this EIS covered a large area of topics. They not only accounted for current environmental issues of the area but also accounted for or at least considered the effect that climate change will have on the system. A baseline of the air and water quality as well as the hydrology, geology, and groundwater along with analysis of the various habitats have been established. There is a full list of identified species of both fauna and flora and special consideration of endangered or threatened species. With a plan to implement control on predators such as feral cats to help native bird populations. This allows a clear definition and distinction between now and the future. This will lead to clearly separating your results from the previous levels and to represent your improvement or failure. As the report continues, they go on to identify cultural importance of various locations, historical use of the land through agriculture, aquaculture and the like. The local culture is highlighted and details on some of the key locations is emphasized. The economic situation on the island seems to be much more focused on the food industry with some revenue through tours and recreational activities. Much of this would be largely unaffected by the establishment of a reserve.

Biophysical Impacts:

The most notable biophysical impacts are those involving water quality and hydrology, terrestrial, estuarine, riparian/freshwater, and marine habitats, flora and fauna, threatened and endangered species, candidate species and species proposed for listing, concerned species, other marine species, fish, and migratory birds. All of these impacts were extensively thought through and the impacts were clearly listed and explained. The agency looked at all of the alternatives including the “business as usual” alternative.

Social and Cultural Impacts:

The agency took into large consideration the cultural history and land use, cultural resources and maritime heritage when looking at the “business as usual” alternative and all the preferred alternatives. All alternatives including business as usual will bring restoration to the He’eia Fishpond, no action bring long term restoration to historic agriculture and the preferred will bring minor long-term benefit of improved baseline information on archaeological, historic, and cultural resources.

Economic Impacts:

Populations impacts, employment impacts and ocean economy were all taken into high consideration by the agency. They looked at all the impacts from a “business as usual” approach and the preferred alternative and A, B and C alternatives. The most notable impact was that of employment where there were minor beneficial impacts in creating jobs with the preferred alternatives.

Conclusion:

This EIS was very helpful and exhaustive. From the very beginning, the document explained the physical geography of the area under consideration, as well as providing a very detailed providing a strong argument for social and economic improvement.

There is also strong scientific and policy support for such a project. As the document stated, it is very important for research and further development, that

we increase the biogeographic representation of research areas throughout the United States. This research reserve, does, indeed fill a biogeographic gap in with a currently unrepresented habitat. It also does a much needed service by generating information and idea for further development in sustainable food systems and ecosystem services. Overall, the He'eia National Estuarine Research Reserve seems to have positive biophysical, social, and Economics that will have positive impacts for generations.

**RESPONSE TO COMMENTS FROM SHELBY PROFFER, TYLER THOMS,
NICK CHAPLIN, ANDREA HENDRICK, GRAND VALLEY
STATE UNIVERSITY:**

Thank you for your comments. No other response necessary

**WRITTEN COMMENT #5 — PATRICIA SANDERSON PORT,
OFFICE OF ENVIRONMENTAL COMPLIANCE AND
POLICY, U.S. DEPARTMENT OF INTERIOR**



United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Pacific Southwest Region
333 Bush Street, Suite 515
San Francisco, CA 94104

IN REPLY REFER TO:
(ER 16/0494)

Filed Electronically

14 October 2016

Joelle Gore
Stewardship Division
Office for Coastal Management
National Ocean Service, NOAA
1305 East West Highway
Silver Spring, MD

Subject: Notice of Availability of Draft Environmental Impact Statement and Draft Management Plan by the National Oceanic and Atmospheric Administration (NOAA) for the Proposed Designation of the He'eia National Estuarine Research Reserve - Hawai'i

Dear Ms. Gore,

The Department of the Interior has received and reviewed the subject document and has no comments to offer.

Thank you for the opportunity to review this project.

Sincerely,

Patricia Sanderson Port
Regional Environmental Officer

cc: OEPC - Staff Contact: Carol Braegelmann, (202) 208-6661;

**RESPONSE TO COMMENT FROM PATRICIA SANDERSON PORT,
OFFICE OF ENVIRONMENTAL COMPLIANCE AND POLICY,
U.S. DEPARTMENT OF INTERIOR:**

Thank you for your comments. No other response necessary.

WRITTEN COMMENT #6 – MALIA CHOW, HAWAIIAN ISLANDS HUMPBACK WHALE NATIONAL MARINE SANCTUARY

HAWAIIAN ISLANDS HUMPBACK WHALE NATIONAL MARINE SANCTUARY

Joelle Gore
Stewardship Division, Office for Coastal Management
National Ocean Service, NOAA
1305 East West Highway, N/ORM2, Room 10622
Silver Spring, MD 20910

Oct. 30, 2016

Aloha Joelle,

We could not be more enthusiastic about the proposal to establish a National Estuarine Research Reserve (NERR) in Kaneohe Bay. As one of the only NOAA place-based conservation programs in the Southeastern Hawaiian Islands, we look forward to working collaboratively with a future He'eia National Estuarine Research Reserve on education and outreach community programs to promote ocean literacy and awareness of the importance of marine conservation stewardship in the Hawaiian Islands.

We have reviewed the DEIS and agree with the findings that humpback whales within Kāne'ohe Bay have not been documented to date. However, the data referenced in the draft DEIS (NOAA, 2004) is a compilation of survey results from 1993-2003. Since then, the humpback whale population in the Hawaiian Islands has increased and is likely expanding into areas beyond the areas mapped since 2003. It is interesting to note that our Sanctuary Ocean Count program has recorded sightings this past winter (March 2016) of up to 8 adult humpback whales and up to three mom/calf pairs within several 15 minute intervals at Pyramid Rock on the Mokapu Peninsula, which is just outside of Kāne'ohe Bay.

Humpback Whales are not only protected under the Marine Mammal Protection Act (as stated in Sec. 7.6 of the DEIS) but are also protected within sanctuary waters under the National Marine Sanctuary Act (15 CFR § 922.184 Prohibited activities). Sanctuary waters wrap around Kahauku Point of the Northshore of Oahu and extend to Kahana Bay just north of Kāne'ohe Bay on the windward side of Oahu.

As appropriate, we would work closely with our NOAA and State partners to teach ocean etiquette and responsible behavior around humpback whales through the sanctuary's Ocean Awareness Training to minimize any impacts to humpback whales in the event one is found sighted within the vicinity of the proposed NERR of Kāne'ohe Bay. And we would welcome the opportunity explore citizen-science training opportunities modeled after our Sanctuary Ocean Count that would promote the community active engagement in marine conservation stewardship and management of the NERR site.

There are many opportunities for collaboration and we look forward to partnering with our NOS colleagues to support our collective NOS mission of place-based conservation.

Sincerely,



Malia Chow, Ph.D.
Superintendent
Hawaiian Islands Humpback Whale National Marine Sanctuary



Visitor Center & Maui Office

726 South Kihei Road
Kihei, HI 96753
Toll Free: 1-800-831-4888
(808) 879-2818

O'ahu Office

NOAA/DKIRC
NOS/HIHWNMS
1845 Wasp Blvd, Bldg 176
Honolulu, HI 96818

Kaua'i Office

4370 Kukui Grove Street
Suite 206
Lihue, HI 96766
(808) 246-2860

State of Hawai'i Department of Land and Natural Resources

1151 Punchbowl Street
#330
Honolulu, HI 96813
(808) 587-0437

NOAA and the State of Hawai'i - a Partnership for
Protection
E-mail: hihumpbackwhale@noaa.gov Web site: hawaiiumpbackwhale.noaa.gov

NOAA RESPONSE TO COMMENT FROM MALIA CHOW, HAWAIIAN ISLANDS HUMPBACK WHALE NATIONAL MARINE SANCTUARY, NOAA:

Thank you for your comments. No other response necessary.

WRITTEN COMMENT #7 — AEDWARD LOS BANOS,
HAWAI'I COMMUNITY DEVELOPMENT AUTHORITY



HAWAII COMMUNITY
DEVELOPMENT AUTHORITY



David Y. Ige
Governor

John Whalen
Chairperson

Aedward Los Banos
Interim Executive Director

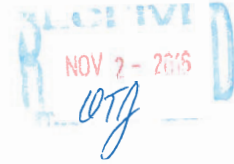
547 Queen Street
Honolulu, Hawaii
96813

Telephone
(808) 594-0300

Facsimile
(808) 587-0299

E-Mail
contact@hcda.web.org

Website
www.hcda.hawaii.gov



Ref. No.: PL HEEIA 17.5.2

October 25, 2016

Ms. Joelle Gore, Stewardship Division Chief
Office for Coastal Management
National Ocean Service, NOAA
1305 East West Highway, N/ORM2, Room 10622
Silver Spring, Maryland 20910

Dear Ms. Gore:

Re: Draft Environmental Impact Statement (DEIS)
He'eia National Estuarine Research Reserve (NERR)

Thank you for the opportunity to provide comments on the subject DEIS. We support the preferred alternative, which includes the entire He'eia Community Development District. We believe that the He'eia NERR (preferred alternative) will support and assist with the on-going restoration efforts within the NERR area, as well as provide much-needed technical assistance, monitoring, and resources beyond what is currently available to the landowners, the lessees and the community.

We offer the following comments on the subject DEIS.

- Proposed activities and uses within the property owned by the Hawaii Community Development Authority (HCDA) includes lo'i kalo (taro patch) cultivation, organic agriculture, aquaponics, ecological restoration, educational and cultural facilities. Some of the discussions indicate lo'i kalo cultivation only. Organic agriculture/farming is also an integral part of the restoration effort and should be included in the discussion.
- The HCDA-owned parcel is leased to and managed by Kāko'o 'Ōiwi, a local non-profit. A 38-year ground lease between the HCDA and Kāko'o 'Ōiwi was executed on January 1, 2010.
- The DEIS states that approximately 1 acre of the wetlands within the HCDA parcel have been converted to lo'i kalo. In total, approximately 12 acres of wetlands have been converted

Ms. Joelle Gore, Stewardship Division Chief
Page Two
October 25, 2016

to lo'i kalo, organic farming and appurtenant uses including roads and kuauna (taro patch walls).

- –To clarify (page 173), Kāko'o 'Ōiwi did not receive a Section 404 permit from the USACE; rather, the USACE determined that a Section 404 permit was not necessary for removal of invasive vegetation, tilling the soil, excavating soil and otherwise restoring historic taro patch walls and historic agricultural roads.

In addition, a Conservation District Use Permit (page 173) is not required for the wetland portion of the HCDA parcel as the site is zoned 'Urban', not 'Conservation under the State Land Use District boundary map.

Thank you again for the opportunity to comment on the DEIS. Should have any questions regarding this matter, please contact Susan Tamura of our Planning Office at (808) 594-0330.

Sincerely,

Edward Los Banos
Interim Executive Director

ALB/DN/ST:ak

c: Mr. Leo Asuncion, Office of Planning

**RESPONSE TO COMMENT FROM AEDWARD LOS BANOS,
HAWAI'I COMMUNITY DEVELOPMENT AUTHORITY:**

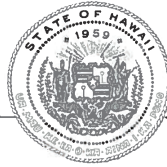
Thank you for your comments. See Generic Response 1. In addition, NOAA has included information in the FEIS to address HCDA's comments on the DEIS. These additions address Clean Water Act Section 404 permitting for the 160-acre taro lo'i restoration, organic agriculture and Conservation District Use permitting.

HCDA recommended that the information provided in the DEIS regarding CWA Section 404 permitting compliance for the activities described in the DEIS be revised to note that USACE's determination that a Section 404 permit was not necessary for several of the activities related to restoration of the historic taro lo'i. These comments were addressed in response to a previous set of comment from U.S. EPA on page 263 of Appendix D. In response, NOAA has added additional information to multiple sub-chapters of the FEIS to detail the Section 404 compliance of Kāko'o 'Ōiwi. Specifically, the FEIS now describes that Kāko'o 'Ōiwi submitted an application to USACE in 2011 for coverage under Nationwide Permit #27 (Aquatic Habitat Restoration). Kāko'o 'Ōiwi had sought permit coverage for its activities associated with the proposed 160-acre taro lo'i restoration. The USACE determined that the work described (e.g., removal of invasive vegetation, excavation and redistribution of existing soils inconnect with taro lo'i restoration) would not result in the discharge of more than "incidental fallback" into the jurisdictional waters of the U.S. The USACE further found that, based on the BMPs proposed by Kāko'o 'Ōiwi, the proposed activities would neither degrade nor have of the effect of degrading the jurisdictional waters in the area. As a result, the USACE determined that a section 404 permit was not required.

HCDA also recommended that organic agriculture should be added to the list of proposed activities described for the HCDA property in the FEIS. Subchapter 6.3.3 of the FEIS does identify organic agriculture as part of the current activities on the HCDA portion of the preferred alternative boundaries. Although part of the overall proposed activities by Kāko'o 'Ōiwi, the area impacted from organic agriculture is small in comparison to the taro lo'i. The primary agricultural impacts identified are connected to Kāko'o 'Ōiwi efforts to restore the taro lo'i and are expected to be direct, long-term, major, and beneficial for the proposed reserve.

HCDA also noted that a Conservation District Use Permit (CDUP) was not required for the wetland portion of the HCDA parcel. As a result, NOAA has a revised Subchapter 6.3.3.1 to remove reference to the CDUP from the discussion of agriculture.

Finally, HCDA noted that 12 acres of wetlands have been converted to taro lo'i by Kāko'o 'Ōiwi at this time rather than the one acre listed in the DEIS. The total areage number has been updated in the FEIS to reflect the 12 acre number provided in Table 8.1 of the FMP.



**OFFICE OF PLANNING
STATE OF HAWAII**

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: <http://planning.hawaii.gov/>

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
DIRECTOR
OFFICE OF PLANNING

Ref. No. P-15350

October 26, 2016

Mr. Matt Chasse
Coastal Management Specialist
National Oceanic and Atmospheric Administration
NOS, Office for Coastal Management
1305 East West Highway, SSMC4/10th Floor
Silver Spring, Maryland 20910

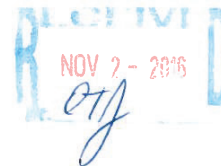
Dear Mr. Chasse:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency Review for Proposed Designation and Management Plan Approval for the Heeia National Estuarine Research Reserve (NERR), Kaneohe Bay, Oahu

The Hawaii CZM Program has completed the federal consistency review of the Office for Coastal Management (OCM) consistency determination for the proposed designation and Management Plan approval for the Heeia NERR, Kaneohe Bay, Oahu. We concur with the OCM determination that the proposed federal agency activity is consistent to the maximum extent practicable with the enforceable policies of the Hawaii CZM Program based on the following condition.

This CZM federal consistency concurrence does not cover the current and proposed resource manipulation activities by site partners that are identified in the Heeia NERR Draft Management Plan, Section 10.2 Specific Resource Manipulation Activities at Heeia NERR, as well as future activities that have not been identified. Resource manipulation activities may require individual federal consistency review if they involve either a federal agency activity, a federal license or permit, or federal assistance that is listed by the Hawaii CZM Program as requiring review. This condition is necessary to ensure that the proposed action is implemented as reviewed for consistency with the enforceable policies of the Hawaii CZM Program. Hawaii Revised Statutes (HRS) Chapter 205A Coastal Zone Management, is the federally approved enforceable policy of the Hawaii CZM Program that is applicable to this condition.

If the requirements for conditional concurrences specified in 15 CFR § 930.4(a), (1) through (3), are not met, then all parties shall treat this conditional concurrence letter as an objection pursuant to 15 CFR Part 930, subpart C.



Mr. Matt Chasse
Coastal Management Specialist
National Oceanic and Atmospheric Administration
NOS, Office for Coastal Management
October 26, 2016
Page 2

This CZM consistency conditional concurrence does not convey approval with any other regulations administered by any state or county agency. Thank you for your cooperation in complying with the Hawaii CZM Program. If you have any questions, please call John Nakagawa of our CZM Program at (808) 587-2878.

Sincerely,



Leo R. Asuncion
Director

c: Joelle Gore, Chief, Stewardship Division, OCM, NOAA
Ruth Gates, The Hawaii Institute of Marine Biology
Suzanne Case, Chairperson, DLNR
Aedward Los Banos, Interim Executive Director, HCDA



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office for Coastal Management
Silver Spring Metro Center, Building 4
1305 East-West Highway
Silver Spring, Maryland 20910

September 14, 2016

Mr. Leo R. Asuncion
Director
State of Hawaii Office of Planning
P.O. Box 2359
Honolulu, Hawaii 96804

**Re: Coastal Zone Management Act Consistency Determination
Proposed Designation of He'eia National Estuarine Research Reserve**

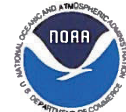
Dear Mr. Asuncion:

Pursuant to section 307(c)(1) of the Coastal Zone Management Act, 16 U.S.C. § 1457(c)(1), and the implementing regulations promulgated at 15 C.F.R. § 921.4(b), NOAA Office for Coastal Management (OCM) Stewardship Division is submitting this Consistency Determination to the Hawai'i Coastal Zone Management Program (HCZMP), for the designation of the proposed He'eia National Estuarine Research Reserve (the reserve) in Kane'ohe Bay, Hawai'i and the approval of the State developed management plan. The information in this Consistency Determination is provided pursuant to 15 C.F.R. § 930.39 and is being submitted in compliance with 15 C.F.R. part 930, subpart C.

Designation of the He'eia site as the 29th reserve in the national system will provide a more coordinated approach to managing the estuarine system that fosters collaboration in reaching common goals for research, education and resource/cultural stewardship. Designation does not alter existing state or federal regulations and authorities of the resource agencies, land owners, and lessees of the lands and waters contained within the proposed boundaries. Additionally, the proposed reserve will be operated by the University of Hawai'i Institute of Marine Biology in partnership with NOAA and multiple state and local entities and be eligible for annual operational funding from NOAA.

The proposed reserve is located in Kaneohe Bay, on the northeastern or windward shore of the island of Oahu. The proposed site includes a state park (18.5 acres) on its northern coast, one of the largest fishponds in the Hawaiian Archipelago (88 acres) at its estuarine border, a wetland restoration project at its upland (mauka) end (405 acres), and a University research institute, HIMB (28 acres) on Moku o Lo'e (Coconut Island). The 530-acre marine portion of the site includes patch and fringing reefs. Just outside the site boundary is the only barrier reef in U.S. waters.

The state developed management plan for the 1,385 acre site lays out three foundational programs for research and monitoring, education and stewardship tied to specific reserve goals and objectives.



Physical impacts at the site will be limited to ongoing and planned activities by the key site partners related to the rehabilitation of traditional agricultural and aquaculture practices or the restoration of targeted native habitats within the site boundaries. The impacts of planned or anticipated future facilities in support of reserve programs would also be limited and subject to additional environmental review.

The NOAA Office for Coastal Management believes that the proposed reserve would support the goals and policies within the Hawai'i Coastal Zone Management Program by improving coordination between existing federal, state, regional and local programs, and increasing public awareness of coastal resources. Specifically, the reserve will support the protection and restoration of significant historic and cultural Hawaiian resources and valuable coastal ecosystems; promote the protection, use, and development of marine and coastal resources to assure their sustainability; and stimulate public awareness, education, and participation in coastal management.

Using the HCZMP assessment form (see attachment), the information contained in this Consistency Determination is derived largely from the He'eia National Estuarine Research Reserve Draft Environmental Impact Statement and Draft Management Plan found at coast.noaa.gov/czm/compliance. Based on a review of the enforceable policies found in the HCZMP Federal Consistency Assessment Form, OCM, through its Stewardship Division, has determined that the designation and the management plan of the proposed He'eia National Estuarine Research Reserve will be consistent to the maximum extent practicable with the enforceable policies of the Hawai'i CZM Program.

Pursuant to 15 C.F.R. § 930.41, the Hawai'i Coastal Zone Management Program has 60 days from receipt of this letter in which to concur or object to this consistency determination, or to request an extension of time to review this matter. The State's concurrence will be presumed if the NOAA Office for Coastal Management does not receive the State's response on the 60th day from receipt of this determination. The State's response should be sent to:

Matt Chasse
Coastal Management Specialist
National Oceanic & Atmospheric Administration
NOS, Office for Coastal Management
1305 East West Highway, SSMC4/10th Floor
Silver Spring, MD 20910

Please let me know if you have any questions or concerns. I can be reached at (240) 533-0808 or matt.chasse@noaa.gov.

Sincerely,



Matt Chasse



Coastal Management Specialist

Attachment

cc: Kerry Kehoe, NOAA Office for Coastal Management
Dr. Rob Toonen, Hawai'i Institute of Marine Biology





U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office for Coastal Management
Silver Spring Metro Center, Building 4
1305 East-West Highway
Silver Spring, Maryland 20910

28 November 2016

Alan Downer
Administrator & Deputy State Historic Preservation Officer
State Historic Preservation Division
Kakuhihewa Building
601 Kamokila Blvd., Suite 555
Kapolei, HI 96707

Dear Mr. Downer:

The State of Hawai'i nominated the He'eia estuary within the He'eia Ahupua'a and the Kāne'ohe Bay watershed to be established as a National Estuarine Research Reserve (NERR). The NERR System is a federal-state partnership administered by the National Oceanic and Atmospheric Administration (NOAA) and established by the Coastal Zone Management Act of 1972, as amended. NERR sites are managed in order to facilitate long-term research and monitoring, education and training, and stewardship of coastal resources. The proposed reserve would be managed by the Hawai'i Institute of Marine Biology, in collaboration with local partners, and with oversight by NOAA. NOAA also provides states with technical assistance, guidance, and funding. Funding supports such program purposes as research, monitoring, facility construction and operation, teacher training, education, restoration, and stewardship activities.

NOAA's Office for Coastal Management Stewardship Division is proposing to approve the designation of the He'eia NERR and approve the draft management plan. Pursuant to § 106 of the National Historic Preservation Act of 1996 (NHPA), as amended, NOAA has determined that this designation and approval of the draft management plan is an "undertaking" and is therefore initiating consultation.

NOAA prepared a Draft Environmental Impact Statement (EIS) which describes the proposed action and the affected environment and analyzes alternatives related to the proposed designation, along with potential environmental impacts. The draft management plan addresses research, monitoring, education, stewardship, and cultural resource needs for the proposed reserve. Both of these documents can be found at <https://coast.noaa.gov/czm/compliance/>. NOAA is currently finalizing the final EIS.

Project Location:

The He'eia estuary is located within the Kāne'ohe Bay region on the windward side of O'ahu and is the largest sheltered body of water within the main Hawaiian Islands. Unique within the

reserve system, the proposed He'eia reserve would represent the only reserve within the Hawaiian Islands and the insular biogeographic region.

The proposed site encompasses 1,385 acres of coastal habitats including uplands (i.e., grasslands and shrublands), wetlands (i.e., streams, ponds, and freshwater and estuarine wetlands), and marine habitats (i.e., patch reefs, sandy bottoms, and seagrass beds). The four main components are profiled below.

- Upland areas (438 acres) fall within the Hawai'i Community Development Authority parcel in He'eia, as well as He'eia State Park. The development authority parcel lands are a mix of wetlands and forested land. Proposed activities within this parcel would include stream restoration, demonstration lo'i kalo (taro patches) cultivation and aquaponics. He'eia State Park protects historic and cultural sites and provides public access and recreational opportunities.
- Marine areas (822 acres), the largest component of the proposed reserve, are managed by the State of Hawai'i, Department of Land and Natural Resources, and are comprised primarily of patch and fringing coral reefs and sand flats.
- He'eia Fishpond (88 acres) is owned by the Kamehameha Schools and is a pre-existing use in the area being restored to promote food security through traditional aquaculture.
- Moku o Lo'e (Coconut Island - 28 acres) is owned by the University of Hawai'i Foundation and operated by the University of Hawai'i as a research lab under the Hawai'i Institute of Marine Biology. The Hawai'i Marine Laboratory Refuge surrounds the island and is the most protected habitat within the proposed reserve.

Historic Properties:

Section 5.2.2 of the Draft EIS provides a detailed description of the affected environment for the cultural and historic setting of the proposed action and Section 6.3.2 provides the analysis of the potential impacts to the cultural and historic setting of the proposed action.

Native Hawaiian Organizations have been involved throughout the entire reserve development and designation process, including scoping and management plan development. These entities would continue to be engaged through the implementation of the management plan. These entities would be among the community members that benefit from reserve designation and reserve programs.

Findings:

Based on the available information, including the specific information presented in the DEIS, NOAA has determined that the designation of the He'eia estuary as a National Estuarine Research Reserve and approval of the state's management plan will have no adverse effect on historic properties. In addition, prior to NOAA providing subsequent funding for specific activities under an approved reserve management plan, NOAA will conduct a targeted NHPA Section 106 consultation, providing the site-specific details necessary to fully analyze the affects

to historic properties. In accordance with 36 C.F.R. § 800.3(c)(4) of the NHPA, NOAA will assume concurrence if no comments are received within 30 days of receipt of this letter.

Should you require any additional information, please contact me at (240)533-0725 or patmarie.nedelka@noaa.gov.

Sincerely,

Patmarie S. Nedelka

Patmarie S. Nedelka
NEPA & Environmental Compliance
Coordinator

cc: R. McWilliams, R.A., NOAA Federal Preservation Officer
J. Gore, Office for Coastal Management

LIST OF NATIVE HAWAIIAN ORGANIZATIONS CONTACTED DURING DEIS DEVELOPMENT

For contact information for each organization, visit <https://www.doi.gov/hawaiian/NHOL>. Please note, this list is updated on a regular basis, and some organizations may have changed.

‘Aha Kāne

‘Ahahui Siwila Hawai‘i O Kapōlei

Aha Kukaniloko Koa Mana mea ola kanaka maui Aha Moku O Kahikinui

Aha Moku o Maui Inc. Aha Wahine Ahupua‘a o Moloka‘i Aloha First

Association of Hawaiian Civic Clubs Association of Hawaiians for
Homestead Lands Au Puni O Hawaii

Brian Kaniela Nae‘ole Naauao Charles Pelenui Mahi Ohana

Council for Native Hawaiian Advancement Friends of ‘Iolani Palace

Friends of Moku‘ula, Inc. George K. Cypher ‘Ohana God’s Country Waimanalo

Hau‘ouiwi Homestead Association on Lāna‘i Hawaiian Civic Club of Hilo

Hawaiian Civic Club of Wahiawa Hawaiian Community Assets, Inc. Ho Ohana

Ho‘okano Family Land Trust Hui Ho‘oniho

Hui Huliau

Hui Kaleleiki Ohana

Hui Mālama I Nā Kūpuna O Hawai‘i Nei Hui Mālama Ola Nā ‘Ōiwi

Kaha I Ka Panoa Kaleponi Hawaiian Civic Club Kāko‘o ‘Ōiwi

Kalaeloa Heritage and Legacy Foundation Kalama‘ula Mauka
Homestead Association Kalihi Palama Hawaiian Civic Club Kamealoha

Kamehameha Schools — Community Relations and Communications Group,
Government Relations

Kamiloloa One Ali‘i Homestead Association Kanu o ka ‘Āina Learning ‘Ohana

Kapolei Community Development Corporation Kawaihapai Ohana

Kingdom of Hawai‘i Ko‘olau Foundation

Ko‘olaupoko Hawaiian Civic Club Koa Ike

La‘i ‘Ōpua 2020 Lahui Kaka‘ikahi

Ma‘a ‘Ohana c/o Lani Ma‘a Lapilio Machado-Akana-Aona-Namakaeha Ohana
Mahu Ohana

Mainland Council Association of Hawaiian Civic Clubs Makaha Hawaiian
Civic Club

Maku‘u Farmers Association Malu‘ōhai Residents Association Marae Ha‘a Koa

Meleana Kawaiaea, LLC Menehune Foundation Moku o Kaupo

Na Aikane O Maui

Na Ku‘auhau ‘o Kahiwakaneikopolei Nā Kuleana o Kānaka ‘Ōiwi

Na Ohana o Puaoi a me Hanawahine Nanakuli Housing Corporation
Native Hawaiian Church
Native Hawaiian Economic Alliance Native Hawaiian Education Council
Nekaifes Ohana
Office of Hawaiian Affairs Order of Kamehameha I
Pacific Agricultural Land Management Systems Pacific Justice and
Reconciliation Center
Papa Ola Lokahi
Papakōlea Community Development Corporation Partners in
Development Foundation
Paukukalo Hawaiian Homes Community Association Peahi Ohana
Piipihonua Hawaiian Homestead Community Association Royal Hawaiian
Academy of Traditional Arts
The Friends of Hokuleʻa and Hawaiʻiloa
The I Mua Group
Waiʻanae Hawaiian Civic Club Waiehu Kou Phase 3 Association
Waimānalo Hawaiian Homes Association

**SAMPLE LETTER DISTRIBUTED TO U.S. DEPARTMENT
OF INTERIOR'S NATIVE HAWAIIAN ORGANIZATION
LIST JUNE 18, 2015**



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office for Coastal Management
Silver Spring Metro Center, Building 4
1305 East-West Highway
Silver Spring, Maryland 20910

28 November 2016

Alan Downer
Administrator & Deputy State Historic Preservation Officer
State Historic Preservation Division
Kakuhihewa Building
601 Kamokila Blvd., Suite 555
Kapolei, HI 96707

Dear Mr. Downer:

The State of Hawai'i nominated the He'eia estuary within the He'eia Ahupua'a and the Kāne'ohe Bay watershed to be established as a National Estuarine Research Reserve (NERR). The NERR System is a federal-state partnership administered by the National Oceanic and Atmospheric Administration (NOAA) and established by the Coastal Zone Management Act of 1972, as amended. NERR sites are managed in order to facilitate long-term research and monitoring, education and training, and stewardship of coastal resources. The proposed reserve would be managed by the Hawai'i Institute of Marine Biology, in collaboration with local partners, and with oversight by NOAA. NOAA also provides states with technical assistance, guidance, and funding. Funding supports such program purposes as research, monitoring, facility construction and operation, teacher training, education, restoration, and stewardship activities.

NOAA's Office for Coastal Management Stewardship Division is proposing to approve the designation of the He'eia NERR and approve the draft management plan. Pursuant to § 106 of the National Historic Preservation Act of 1996 (NHPA), as amended, NOAA has determined that this designation and approval of the draft management plan is an "undertaking" and is therefore initiating consultation.

NOAA prepared a Draft Environmental Impact Statement (EIS) which describes the proposed action and the affected environment and analyzes alternatives related to the proposed designation, along with potential environmental impacts. The draft management plan addresses research, monitoring, education, stewardship, and cultural resource needs for the proposed reserve. Both of these documents can be found at <https://coast.noaa.gov/czm/compliance/>. NOAA is currently finalizing the final EIS.

Project Location:

The He'eia estuary is located within the Kāne'ohe Bay region on the windward side of O'ahu and is the largest sheltered body of water within the main Hawaiian Islands. Unique within the

reserve system, the proposed Heʻeia reserve would represent the only reserve within the Hawaiian Islands and the insular biogeographic region.

The proposed site encompasses 1,385 acres of coastal habitats including uplands (i.e., grasslands and shrublands), wetlands (i.e., streams, ponds, and freshwater and estuarine wetlands), and marine habitats (i.e., patch reefs, sandy bottoms, and seagrass beds). The four main components are profiled below.

- Upland areas (438 acres) fall within the Hawaiʻi Community Development Authority parcel in Heʻeia, as well as Heʻeia State Park. The development authority parcel lands are a mix of wetlands and forested land. Proposed activities within this parcel would include stream restoration, demonstration loʻi kalo (taro patches) cultivation and aquaponics. Heʻeia State Park protects historic and cultural sites and provides public access and recreational opportunities.
- Marine areas (822 acres), the largest component of the proposed reserve, are managed by the State of Hawaiʻi, Department of Land and Natural Resources, and are comprised primarily of patch and fringing coral reefs and sand flats.
- Heʻeia Fishpond (88 acres) is owned by the Kamehameha Schools and is a pre-existing use in the area being restored to promote food security through traditional aquaculture.
- Moku o Loʻe (Coconut Island - 28 acres) is owned by the University of Hawaiʻi Foundation and operated by the University of Hawaiʻi as a research lab under the Hawaiʻi Institute of Marine Biology. The Hawaiʻi Marine Laboratory Refuge surrounds the island and is the most protected habitat within the proposed reserve.

Historic Properties:

Section 5.2.2 of the Draft EIS provides a detailed description of the affected environment for the cultural and historic setting of the proposed action and Section 6.3.2 provides the analysis of the potential impacts to the cultural and historic setting of the proposed action.

Native Hawaiian Organizations have been involved throughout the entire reserve development and designation process, including scoping and management plan development. These entities would continue to be engaged through the implementation of the management plan. These entities would be among the community members that benefit from reserve designation and reserve programs.

Findings:

Based on the available information, including the specific information presented in the DEIS, NOAA has determined that the designation of the Heʻeia estuary as a National Estuarine Research Reserve and approval of the state's management plan will have no adverse effect on historic properties. In addition, prior to NOAA providing subsequent funding for specific activities under an approved reserve management plan, NOAA will conduct a targeted NHPA Section 106 consultation, providing the site-specific details necessary to fully analyze the affects

to historic properties. In accordance with 36 C.F.R. § 800.3(c)(4) of the NHPA, NOAA will assume concurrence if no comments are received within 30 days of receipt of this letter.

Should you require any additional information, please contact me at (240)533-0725 or patmarie.nedelka@noaa.gov.

Sincerely,

Patmarie S. Nedelka

Patmarie S. Nedelka
NEPA & Environmental Compliance
Coordinator

cc: R. McWilliams, R.A., NOAA Federal Preservation Officer
J. Gore, Office for Coastal Management

RESPONSES RECEIVED FROM NATIVE HAWAIIAN ORGANIZATIONS

Malu'ohai Residents Association
P.O. Box 700911
Kapolei, HI 96709

July 3, 2015

Patmarie S. Nedelka
NEPA and Environmental Compliance Coordinator
Office for Coastal Management
1305 East-West Highway
Silver Spring, MD 20910

Aloha Ms. Nedelka:

Malahlo for inviting Malu'ohai Residents Association to submit comment on the State of Hawaii's nomination of He'eia estuary to be established as a National Estuarine Research Reserve (NERR) in Kāne'ohe Bay.

Specifically, your letter seeks our assistance in identifying properties within the area of potential effects that may be eligible for the National Register listing, and providing you with any information we may have relating to the religious or cultural significance that our organization attaches to the property that might be affected by designation of the NERR in Hawai'i.

In addition, you also asked for assistance in identifying any additional Native Hawaiian Organizations that may be of interest in commenting on this action.

When a site for review is located in another ahupua'a (district) of our island in which we have little connection or familiarity; it is our organizations' practice to defer comments to those with closer ties, historical knowledge and/or cultural practitioners with familiarity of the review site.

Your letter did not list any Native Hawaiian Organizations (NHO's) serving the ahupua'a of Ko'olaupoko which I found disturbing. Disturbing because I am aware there are several NHO's who for countless years have been and continue to be very involved with restoration projects both ma'uka and ma'kai.

I ask that you kindly include and consult with Paepae O He'eia -- P.O. Box 6355, Kāne'ohe, 96744 and Ko'olaupoko Hawaiian Civic Club -- P.O. Box 664, Kaneohe, HI 96744. Both of these organizations can educate and provide a wealth of information on the past religious and cultural practices of our ancestors; and their present efforts to restore these places and practices to ensure our future generations will have a place to continue living our culture.

We are supportive of establishing He'eia estuary as a National Estuarine Research Reserve (NERR) in Kāne'ohe Bay.

Respectfully,



Homelani Schaedel
President

PHONE (808) 594-1888

FAX (808) 594-1938



STATE OF HAWAII
OFFICE OF HAWAIIAN AFFAIRS
560 N. NIMITZ HWY., SUITE 200
HONOLULU, HAWAII 96817

HRD15/7521

July 7, 2015

Patmarie S. Nedelka
National Oceanic and Atmospheric Administration
1305 East-West Highway
11th Floor N/OCM-1
Silver Spring, MD 20910

Re: Request for Consultation Under NHPA Section 106 for the State of Hawai'i Nomination of the He'eia Estuary to be Established as a National Estuarine Research Reserve He'eia Ahupua'a, Ko'olaupoko Moku, O'ahu Mokupuni

Aloha Ms. Nedelka:

The Office of Hawaiian Affairs (OHA) is in receipt of your June 18, 2015 letter requesting consultation under the National Historic Preservation Act Section 106 for the State of Hawai'i nomination of He'eia estuary as a National Estuarine Research Reserve (NERR).

OHA is the constitutionally established body responsible for protecting and promoting the rights of Native Hawaiians. Hawai'i law mandates OHA to "[s]erve as the principal public agency in the State of Hawai'i responsible for the performance, development, and coordination of programs and activities relating to native Hawaiians and Hawaiians; . . . and [t]o assess the policies and practices of other agencies impacting on native Hawaiians and Hawaiians, and conducting advocacy efforts for native Hawaiians and Hawaiians." Hawai'i Rev. Stat. § 10-3.

The NERR is administered by the National Oceanic and Atmospheric Administration (NOAA) facilitating long-term research and monitoring, education and training, and stewardship of coastal resources. The estuary will be managed by the Hawai'i Institute of Marine Biology in collaboration with local partners, and oversight from NOAA.

Patmarie S. Nedelka
July 7, 2015
Page 2

OHA is aware of the following historic sites within the He'eia Ahupua'a¹:

- Loko I'a O He'eia: He'eia Fishpond
 - State Inventory of Historic Places (SIHP) 50-80-10-00327
- He'eia Kea Terrace
 - SIHP 50-80-10-04135
- He'ia Kea Slope Cut
 - SIHP 50-80-10-04136
- He'eia Kea Platform
 - SIHP 50-80-10-04137
- He'eia Kea Retaining Walls
 - SIHP 50-80-10-04138
- He'eia Kea Mound/Platform
 - SIHP 50-80-10-04139
- He'eia Kea Retaining Walls
 - SIHP 50-80-10-04140
- He'eia Kea Shrine
 - SIHP 50-80-10-04144

OHA would like to suggest that the following entities and individuals be contacted:

- Kāko'o 'Ōiwi
- Hawai'i Institute of Marine Biology
- Ko'olaupoko Hawaiian Civic Club
- Kama'āina Kids
- Paepae o He'eia
- The Nature Conservancy of Hawai'i
- Papahana Kuaola
- Hawai'i Community Development Authority, and
- Conservation International, Hawai'i

Mahalo for the opportunity to consult. Should you have any questions, please contact Jeannin Jeremiah at 594-1790 or by email at jeanninj@oha.org.

'O wau iho nō me ka 'oia 'i'o,



Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer

KC:jj

¹ These historic sites are listed on OHA's geographical information system (GIS) Kipuka Database www.kipukadatabase.com

LIST OF NATIVE HAWAIIAN ORGANIZATIONS CONTACTED DURING DEIS/DMP PUBLIC COMMENT

For contact information for each organization, visit <https://www.doi.gov/hawaiian/NHOL>. Please note, this list is updated on a regular basis, and some organizations may have changed.

‘Aha Kāne

‘Ahahui Siwila Hawai‘i O Kapōlei

Aha Kukaniloko Koa Mana mea ola kanaka maui Aha Moku O Kahikinui

Aha Moku o Maui Inc. Aha Wahine Ahupua‘a o Moloka‘i Aloha First

Association of Hawaiian Civic Clubs Association of Hawaiians for Homestead
Lands Au Puni O Hawaii

Brian Kaniela Nae‘ole Naauao Charles Pelenui Mahi Ohana

Council for Native Hawaiian Advancement Friends of ‘Iolani Palace

Friends of Moku‘ula, Inc. George K. Cypher ‘Ohana God’s Country Waimanalo

Hau‘ouiwi Homestead Association on Lāna‘i Hawaiian Civic Club of Hilo

Hawaiian Civic Club of Wahiawa Hawaiian Community Assets, Inc. Ho Ohana

Ho‘okano Family Land Trust

Hui Huliau Inc.

Hui Kaleleiki Ohana

Hui Mālama Ola Nā ‘Ōiwi

Imua Hawaii

Kaha I Ka Panoa Kaleponi Hawaiian Civic Club Kāko‘o ‘Ōiwi

Kalaeloa Heritage and Legacy Foundation Kalama‘ula Homesteaders
Association Kalihi Palama Hawaiian Civic Club Kamealoha

Kamehameha Schools — Community Relations and Communications Group,
Government Relations

Kamiloloa One Ali‘i Homestead Association Kanu o ka ‘Āina Learning ‘Ohana

Kapolei Community Development Corporation

Kauwahi ‘Anaina Hawai‘i Hawaiian Civic Club

Kawaihapai ‘Ohana

Ke One O Kakuhihewa

Kingdom of Hawai‘i Ko‘olau Foundation

Ko‘olaupoko Hawaiian Civic Club Koa Ike

Kuloloi‘a Lineage – I ke Kai ‘o Kuloloi‘a

La‘i ‘Ōpua 2020 Lahui Kaka‘ikahi

Ma‘a ‘Ohana c/o Lani Ma‘a Lapilio Machado-Akana-Aona-Namakaeha Ohana
Mahu Ohana

Mainland Council Association of Hawaiian Civic Clubs Makaha Hawaiian
Civic Club

Maku‘u Farmers Association Malu‘ōhai Residents Association Marae Ha‘a Koa

Meleana Kawaiāea, LLC Menehune Foundation Moku o Kaupo
Na Aikane O Maui
Na Koa Ikaika Ka Lahui Hawaii
Na Ku'auhau 'o Kahiwakaneikopolei Nā Kuleana o Kānaka 'Ōiwi
Na Ohana o Puaoi a me Hanawahine Nanakuli Housing Corporation
Native Hawaiian Chamber of Commerce
Native Hawaiian Church
Native Hawaiian Economic Alliance Native Hawaiian Education Council
Native Hawaiian Hospitality Association
Nekaifes Ohana
Office of Hawaiian Affairs Order of Kamehameha I
Pacific Agricultural Land Management Systems Pacific Justice and
Reconciliation Center
Papa Ola Lokahi
Papakōlea Community Development Corporation Partners in
Development Foundation
Paukukalo Hawaiian Homes Community Association
Peahi Ohana
Piihonua Hawaiian Homestead Community Association Royal Hawaiian
Academy of Traditional Arts
Sovereign Councils of the Hawaiian Homelands Assembly
The Friends of Hokule'a and Hawai'iloa
The I Mua Group
Wai'anae Hawaiian Civic Club
Waiehu Kou Phase 3 Association
Waimānalo Hawaiian Homes Association

**SAMPLE LETTER DISTRIBUTED TO U.S. DEPARTMENT
OF INTERIOR'S NATIVE HAWAIIAN ORGANIZATION
LIST AUGUST 25, 2016**



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office for Coastal Management
Silver Spring Metro Center, Building 4
1305 East-West Highway
Silver Spring, Maryland 20910

25 August 2016

G. Umi Kai
'Aha Kāne
P.O. Box 31303
Honolulu, HI 96820-1303

Dear Mr. Kai:

The State of Hawai'i nominated the He'eia estuary within the He'eia Ahupua'a and the Kāne'ohe Bay watershed to be established as a National Estuarine Research Reserve (NERR). The NERR System is a federal-state partnership administered by the National Oceanic and Atmospheric Administration (NOAA) and established by the Coastal Zone Management Act of 1972, as amended. NERR sites are managed in order to facilitate long-term research and monitoring, education and training, and stewardship of coastal resources. The proposed reserve would be managed by the Hawai'i Institute of Marine Biology, in collaboration with local partners, and with oversight by NOAA. NOAA also provides states with technical assistance, guidance, and funding. Funding supports such program purposes as research, monitoring, facility construction and operation, teacher training, education, restoration, and stewardship activities.

NOAA announces the availability of the Draft Environmental Impact Statement for the designation of the proposed He'eia National Estuarine Research Reserve. This document and the draft management plan for the proposed NERR are available for review at coast.noaa.gov/czm/compliance, or may be obtained by email request at coastal.info@noaa.gov. This Draft Environmental Impact Statement, prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, describes the proposed action and the affected environment and analyzes alternatives related to the proposed designation, along with potential environmental impacts. The draft management plan addresses research, monitoring, education, stewardship, and cultural resource needs for the proposed reserve.

Section 106 of the National Historic Preservation Act (NHPA) requires that federal agencies consult with Native Hawaiian organizations when federal undertakings may have an effect on historic properties and to seek to avoid unnecessary harm to historic properties from such undertakings¹. Pursuant to NHPA, NOAA's Office for Coastal Management contacted more than 80 Native Hawaiian organizations (see Appendix 3 of Draft Environmental Impact Statement) on June 18, 2015, to: (1) gain assistance with identifying properties within the area of potential effect that might be eligible for listing on the National Register of Historic Places; (2) request information related to the significance any such organizations attach to the areas potentially affected by the proposed action; (3) invite Native Hawaiian organizations to advise NOAA if they would like to participate in the NHPA consultation process as a consulting party; and (4) identify any additional Native Hawaiian organizations to involve in the process. OCM received two responses to this letter in July 2015, one from the State's Office of Hawaiian Affairs, and one from the Malu'ohai Residents Association. Neither respondent requested to be a consulting party, as provided for under NHPA. In its response letter, the Office of Hawaiian Affairs identified eight historic sites for considerations. The two response letters collectively identified a total of nine organizations to engage, all of which NOAA had already coordinated with in some fashion.

¹ See Section 5.2.2 of Draft Environmental Impact Statement for a detailed description of the affected environment for the cultural and historic setting of the proposed action and Section 6.3.2 for an analysis of the impacts to the cultural and historic setting of the proposed action.

NOAA welcomes your input. The Draft Environmental Impact Statement (DEIS) and Draft Management Plan (DMP) will be available for a forty-five day public comment period beginning September 2, 2016. See Figure 4.1 in the Draft Environmental Impact Statement for a map of the areas being considered for inclusion within the He'eia NERR. If you have information you wish to share with us relating to religious or cultural significance that you attach to these areas or other information you wish to communicate with us about the site, please let me know by the close of the public comment period on October 17, 2016. If you would like to be a consulting party pursuant to NHPA, please submit your request in writing to me at the address below by October 17, 2016. NOAA intends to make a formal determination pursuant to Section 106 of the NHPA about the potential effects to historic properties later this year or early in 2017.

One public hearing on the DEIS/DMP will be held at the following time and location:

6:00 p.m. to 7:00 p.m.
Thursday, October 6, 2016
He'eia State Park
46-465 Kamehameha Highway
Kāne'ohe, HI 96744

Written comments on the DEIS/DMP will be accepted until October 17, 2016 (but cannot be submitted before September 2, 2016). Comments may be submitted using the following methods:

- Electronic Submissions: Submit all electronic public comments through the Federal e-Rulemaking Portal. Go to regulations.gov/#/docketDetail;D=NOAA-NOS-2016-0114, click the "Comment Now!" icon, complete the required fields, and enter or attach your comments.
- Mail: Comments should be directed to the program official identified below.

Responsible Official:

Russell Callender, Ph.D.
Assistant Administrator for Ocean Services and Coastal Zone
Management

Program Official:

Joelle Gore, Stewardship Division Chief
Office for Coastal Management
National Ocean Service, NOAA
1305 East West Highway, N/OCM2, Room 10622
Silver Spring, MD 20910.

Please do not hesitate to contact me if you have any questions on the DEIS/DMP or consultation under NHPA. I can be reached via telephone (240) 533-0725, via email at patmarie.nedelka@noaa.gov, or via mail addressed to my attention and sent to: NOAA Office for Coastal Management, N/OCM1, 1305 East West Highway, Silver Spring, Maryland 20910.

Sincerely,

Kimberly Jexum for Patmarie Nedelka

Patmarie S. Nedelka
NEPA and Environmental Compliance Coordinator

Re: Heeia NERR Designation EFH consultation letter



Ian Lundgren - NOAA Affiliate
to me, Samantha, Jean, Kristina

Aloha Matt,

On September 17, 2015 received a request from NOAA OCM to review the He'eia NERR DEIS. On September 23, 2016 PIRO responded to OCM's designation will not adversely effect Essential Fish Habitat (see attached for your records). Revisions were made to the EIS and a formal consultation on October 24, 2016. PIRO continues to concur with OCM's determination. PIRO looks forward to discussing specific projects that occur at the He'eia effects to EFH, or to discuss implementation of a programmatic consultation for this NERR.

Lastly, while PIRO will continue to be engaged as much as OCM would like, especially early in planning processes, PIRO is not obligated to respond determination when there will be no adverse effect to EFH. Neither the EFH consultation provisions of the Magnuson-Stevens Fishery Conservation & EFH guidelines have any provisions regarding such a concurrence. The OCM, as the lead Federal action agency, must make the initial determination and then proceed with consultation if, in the OCM's view, the project may adversely affect EFH. If the OCM determines that the action would not adv obligation to consult pursuant to the MSA EFH consultation requirements.

Ian Lundgren
Essential Fish Habitat Coordinator (LynkerTech)
NOAA Fisheries, Pacific Islands Regional Office
Habitat Conservation Division
Inouye Regional Center, Honolulu
Office: (808) 725-5088
Mobile: (202) 642-3691

HAWAIIAN HOARY BAT

- The endangered Hawaiian hoary bat may be present within the proposed project area. The Hawaiian hoary bat roosts in both exotic and native woody vegetation and will leave young unattended in “nursery” trees and shrubs when they forage. If trees or shrubs suitable for bat roosting are cleared during the breeding season, there is a risk that young bats could inadvertently be harmed or killed.
- To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 through September 15).
- Additionally, Hawaiian hoary bats forage for insects from as low as three feet to higher than 500 feet above the ground. When barbed wire is used in fencing, Hawaiian hoary bats can become entangled. It is recommended that barbed wire not be used for fencing or only within 2 inches of the ground surface.

HAWAIIAN GOOSE

- If Hawaiian goose (nēnē) appears within 100 feet (30.5 meters) of ongoing work, all activity will be temporarily suspended until the animal leaves the area of its own accord.
- Moreover, if any number of nēnē are observed loafing or foraging within the project area during the nēnē breeding season (October through March), a biologist familiar with the nesting behavior of nēnē will survey in and around the project area prior to the resumption of any work, or after any subsequent delay of work of three or more days (during which the birds may attempt to nest).
- If a nest is discovered within a radius of 150 feet of proposed work, or a previously undiscovered nest is found within said radius after work begins, all work will cease immediately and the U.S. Fish and Wildlife Service will be contacted for further guidance.

SEA TURTLE

- Sandy beaches in Hawai‘i and the Pacific Islands may be used by nesting sea turtles.
- Optimal nesting habitat is a dark beach free of barriers that restrict their movement.
- Nesting turtles may be deterred from approaching or laying successful nests on lighted or disturbed beaches. If they do come ashore, they may become disoriented by artificial lighting.
- If they do come ashore, they may become disoriented by artificial lighting, leading to exhaustion and placement of a nest in an inappropriate location (such as at or below the high tide line where nests are unlikely to be successful). Hatchlings that emerge from unprotected nests may be disoriented by artificial lighting.
- Sea turtles come ashore to nest on beaches from May through September, peaking in June and July.

- Construction on or in the vicinity of sea turtle nesting beaches can result in sand compaction, beach erosion, and increase in direct and ambient light pollution.
- The rate of habitat loss because of erosion and escarpment may be increased when humans attempt to stabilize the shoreline, either through re-nourishment or through placement of hard structures, such as sea walls or pilings.
- Off-road vehicle traffic also contributes to habitat loss through erosion, especially during high tides or on narrow beaches where driving is often concentrated on the high beach and fore dune.
- To avoid crushing sea turtle nests or increased erosion, driving should be restricted to existing roads.
- No hard structures such as seawalls should be constructed and dune vegetation should not be cleared.

BEST MANAGEMENT PRACTICES (BMP) FOR GENERAL IN-WATER WORK INCLUDING BOAT AND DIVER OPERATIONS

January 2015

National Marine Fisheries Service Protected Resources Division recommends implementation of the following best management practices (BMPs) to reduce potential adverse effects on protected marine species. These BMPs are not intended to supplant measures required by any other agency, and compliance with these BMP shall always be considered secondary to safety concerns.

All workers associated with this project, irrespective of their employment arrangement or affiliation (e.g. employee, contractor, etc.) should be fully briefed on required BMP and the requirement to adhere to them for the duration of their involvement in this project.

- A)** Constant vigilance shall be kept for the presence of ESA-listed marine species during all aspects of the proposed action, particularly in-water activities such as boat operations, diving, and deployment of anchors and mooring lines.
 - 1.** The project manager shall designate an appropriate number of competent observers to survey the areas adjacent to the proposed action for ESA-listed marine species.
 - 2.** Surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour. Periodic additional surveys throughout the work day are strongly recommended.
 - 3.** All work shall be postponed or halted when ESA-listed marine species are within 50 yards of the proposed work, and shall only begin/resume after the animals have voluntarily departed the area. If ESA-listed marine species are noticed within 50 yards after work has already begun, that work may continue only if, in the best judgment of the project supervisor, that there is no way for the activity to adversely affect the animal(s). For example; divers performing surveys or underwater work would likely be permissible, whereas operation of heavy equipment is likely not.

4. Before entering the water, all divers shall be made aware of ESA-listed corals, and the requirement to avoid contact with those organisms while performing their duties. This shall include taking measures to avoid kicking the reef with fins and to secure dive and survey equipment in a manner that will prevent that material from being dragged across the substrate.
 5. Special attention will be given to verify that no ESA-listed marine animals are in the area where equipment or material is expected to contact the substrate before that equipment/material may enter the water. This includes the requirement to limit anchoring to sandy areas well away from coral.
 6. All objects will be lowered to the bottom (or installed) in a controlled manner. This can include the use of buoyancy controls such as lift bags, or the use of cranes, winches, or other equipment that affect positive control over the rate of descent.
 7. In-water tethers, as well as mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary, and shall remain deployed only as long as needed to properly accomplish the required task.
 8. When piloting vessels, vessel operators shall alter course to remain at least 100 yards from whales, and at least 50 yards from other marine mammals and sea turtles.
 9. Reduce vessel speed to 10 knots or less when piloting vessels at or within the ranges described above from marine mammals and sea turtles. Operators shall be particularly vigilant to watch for turtles at or near the surface in areas of known or suspected turtle activity, and if practicable, reduce vessel speed to 5 knots or less.
 10. If despite efforts to maintain the distances and speeds described above, a marine mammal or turtle approaches the vessel, put the engine in neutral until the animal is at least 50 feet away, and then slowly move away to the prescribed distance.
 11. Marine mammals and sea turtles shall not be encircled or trapped between multiple vessels or between vessels and the shore.
 12. Do not attempt to feed, touch, ride, or otherwise intentionally interact with any ESA-listed marine species.
- B) No contamination of the marine environment shall result from project-related activities.**
13. A contingency plan to control toxic materials is required.
 14. Appropriate materials to contain and clean potential spills shall be stored at the work site, and be readily available.
 15. All project-related materials and equipment placed in the water shall be free of pollutants.
 16. The project manager and heavy equipment operators shall perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations shall be postponed or halted should a leak be detected, and shall not proceed until the leak is repaired and equipment cleaned.

- 17.** Fueling of land-based vehicles and equipment shall take place at least 50 feet away from the water, preferably over an impervious surface. Fueling of vessels shall be done at approved fueling facilities.
- 18.** Turbidity and siltation from project-related work shall be minimized and contained through the appropriate use of erosion control practices, effective silt containment devices, and the curtailment of work during adverse weather and tidal/flow conditions.
- 19.** A plan shall be developed to prevent debris and other wastes from entering or remaining in the marine environment during the project.

APPENDIX J.

GLOSSARY OF HAWAIIAN WORDS*

*Glossary adapted from the proposed He'eia National Estuarine Research Reserve final management plan (2016)

The Hawaiian translations are from Pukui and Elbert (1986). For some of the words, a more contemporary meaning may be used by Hawaiians today; for these words they are placed before the Pukui and Elbert (1986) translations and marked with “(common).”

The ‘okina and the kahakō are diacritical markings that are part of the Hawaiian alphabet and used in the Hawaiian words. The ‘okina, or glottal stop, is found only between two vowels or at the beginning of a word that starts with a vowel. A break in speech is created between the sounds of the two vowels. The pronunciation of the ‘okina in the word Kāko’o is similar to saying “ka-koh-oh.” The kahakō is found only above a vowel. It stresses or elongates a vowel sound from one beat to two beats. The kahakō is written as a line above a vowel. There are differing pronunciations of some words depending on the area or island.

HAWAIIAN WORD	ENGLISH TRANSLATION
‘Aha moku	A system of best practices based on indigenous resource management practices within specific moku (district) boundaries to sustain resources and the community of that moku A series of district councils that would manage land and natural resources for tenants and the community through the implementation of site specific cultural conservation coupled by utilitarian practices.
Ahupua‘a	Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (ahu) of stones surmounted by an image of a pig (pua‘a), or because a pig or other tribute was laid on the altar as tax to the chief.
Akua ki‘i	Image representing a god.
‘Āina	Land.
Ali‘i	Chief, chiefess, officer, ruler, monarch, peer, headman, noble, aristocrat, king, queen, commander.
‘Ama‘ama	Mullet (<i>Mugil cephalus</i>), a very choice indigenous fish.
‘Aumakua	Family of personal gods, deified ancestors who might assume the shape of sharks, owls, hawks [etc.]. A symbiotic relationship existed; mortals did not harm or eat ‘aumakua, and ‘aumakua warned and reprimanded mortals in dreams, visions, and calls. Aumākua — plural of ‘aumakua.
‘Auwai	Ditch, canal, water conveyance channels
Awa	Milkfish (<i>Chanos chanos</i>).
Hala	Pandanus or screw pine (<i>Pandanus odoratissimus</i>).
Hālau	Meeting house.
Hau	Lowland tree (<i>Hibiscus tiliaceus</i>), found in many warm countries, some spreading horizontally over the ground forming impenetrable thickets, and some trained on trellises.

Heiau	Pre-Christian place of worship, shrine; some heiau were elaborately constructed stone platforms, others simple earth terraces. Many are preserved today.
Kalo	Taro (<i>Colocasia esculenta</i>), a kind of aroid cultivated since ancient times for food, spreading widely from the tropics of the Old World. In Hawai'i, taro has been the staple from earliest times to the present, and here its culture developed greatly, including more than 300 forms.
Konohiki	Overseer, headman of an ahupua'a land division under the chief; land or fishing rights under control of the konohiki.
Kuapā	Wall of a fish pond.
Kuāuna	Taro patch walls (common). Bank or border of a taro patch; stream bank.
Kuleana	Native Hawaiian land rights (common). Right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province.
Kupuna, kūpuna	Elders (common). Grandparent, ancestor, relative or close friend of the grandparent's generation, grandaunt, granduncle. Kūpuna — plural of kupuna.
Limu	Seaweed, algae (common)
Lo'i	Irrigated terrace, especially for taro, but also for rice; paddy.
Lo'i kalo	Irrigated taro patch.
Loko i'a	Fishpond (common).
Loko i'a kalo	Combined fishpond and taro patch.
Mākāhā	Sluice gate, as of a fishpond; entrance to or egress from an enclosure.
Makai	Toward the sea.
Mauka	Toward the mountain.
Moku	District, island, islet, section.
Mo'olelo	Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. (From mo'o 'ōlelo, succession of talk; all stories were oral, not written.)
Poi	The Hawaiian staff of life, made from cooked taro corms, or rarely breadfruit, pounded and thinned with water.
'Uala	Sweet potato (<i>Ipomoea batatas</i>).
Uhi	Yam (<i>Dioscorea alata</i>).
Wahi pana	Celebrated, noted, or legendary place.
Wai	Fresh water (common).
Waiwai	Wealth, abundance, prosperity.

COMMON AND SCIENTIFIC NAMES FOR PLANTS AND ANIMALS

COMMON NAMES		POSSIBLE SCIENTIFIC NAMES		SOURCE
HAWAIIAN	OTHER	GENUS	SPECIES	
'A'ama	Crab	<i>Grapsus</i>	<i>grapsus</i>	Pukui and Elbert 1986
Āholehole	Juvenile āhole (Hawaiian flagtail)	<i>Kuhlia</i>	<i>xenura</i>	Hoover 1993
'Anae	Striped mullet (full-sized)	<i>Mugil</i>	<i>cephalus</i>	Hoover 1993
'Ama'ama	Striped mullet	<i>Mugil</i>	<i>cephalus</i>	Hoover 1993
Awa	Milkfish	<i>Chanos</i>	<i>chanos</i>	Hoover 1993
Haole (kūhonu)	White crab	<i>Portunus</i>	<i>sanguinolentus</i>	Pukui and Elbert 1986
Hau	Beach hibiscus	<i>Hibiscus</i>	<i>tiliaceus</i>	Wagner et al. 1999
Kalo	Taro	<i>Colocasia</i>	<i>esculenta</i>	Wagner et al. 1999
Kūhonu	Crab	<i>Portunus</i>	<i>sanguinolentus</i>	Pukui and Elbert 1986
Limu 'ele'ele	Seaweed, algae	<i>Enteromorpha</i>	<i>prolifera</i>	Abbott and Williamson 1974
Limu huluhuluwaena	Seaweed, algae	<i>Grateloupia</i>	<i>filicina</i>	Abbott and Williamson 1974
Limu kohu	Seaweed, algae	<i>Asparagopsis</i>	<i>taxiformis</i>	Abbott and Williamson 1974
Limu manauea	Seaweed, algae, ogo	<i>Gracilaria</i>	<i>coronopifolia</i>	Abbott and Williamson 1974
Māmaki	An endemic nettle	<i>Pipturus</i>	<i>spp.*</i>	Wagner et al. 1999
Manini	Convict tang	<i>Acanthurus</i>	<i>triestegus</i>	Hoover 1993
'Ō'io	Bonefish	<i>Albula</i>	<i>spp.*</i>	Hoover 1993
'Ōlena	Turmeric	<i>Curcuma</i>	<i>domestica</i>	Pukui and Elbert 1986
'Ōpae lōlō	Brackish-water shrimp or prawn	<i>Penaeus</i>	<i>marginatus</i>	Pukui and Elbert 1986
Weke	Goatfish	<i>Mulloidichthys</i>	<i>spp.*</i>	Hoover 1993

* spp. = multiple species



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Executive Summary

The National Estuarine Research Reserve System (NERRS) is a network of 28 estuaries representing different biogeographic regions of the United States. NERRS is administered by the National Oceanic Atmospheric Administration (NOAA) and is a partnership between NOAA and the coastal states. Each National Estuarine Research Reserve (NERR) serves as a place-based living laboratory and classroom where research methods and management approaches can be piloted and applied to issues of local, regional, and national importance. NERRS, however, currently does not include a representative estuary from the insular (NERRS biogeographic region) Hawaiian Islands (NERRS insular biogeographic subregion).

In May 2014, the State of Hawai‘i (State) nominated He‘eia estuary in He‘eia, Kāne‘ohe, on the island of O‘ahu, to be part of NERRS. The total acreage of the nominated area is about 838 acres and includes He‘eia State Park (18.5 acres), He‘eia Fishpond (88 acres), He‘eia wetlands (about 200 acres), University of Hawai‘i Institute of Marine Biology property (28 acres) on Moku o Lo‘e (Coconut Island), and a large (503 acres) expanse of ocean with patch and fringing reefs.

The nomination was approved by NOAA, but prior to designating He‘eia estuary as a NERR, NOAA is required to comply with the National Environmental Policy Act (NEPA) and, in collaboration with the State, to draft an environmental impact statement (EIS). To conduct a comprehensive environmental analysis, NOAA needs information about the natural, cultural, and socioeconomic resources in the proposed action area, that is, the area in He‘eia that is officially nominated to be a NERR site. Lack of information can impede the NEPA process.

The purpose of this report (referred to herein as a *gap analysis*) is to determine whether currently available information is sufficient to analyze, at a program level, the environmental and social impacts of establishing a NERR at He‘eia in Hawai‘i, and to identify any information that is lacking.

For the gap analysis, two additional alternatives were analyzed in addition to the proposed action. Alternative 1 includes the proposed action area plus about 200 acres of upland area contiguous with the He‘eia wetlands. Alternative 2 includes the proposed action area plus additional outer reefs, contiguous and to the north of the marine portion of the proposed action area.

The gap analysis exercise involved three steps. First, data types were identified that would be needed to programmatically analyze, under NEPA, the natural, cultural, and socioeconomic aspects of the He‘eia NERR designation. Next, the required information was compiled, primarily from documented literature but also from members of the community and representatives of State and County agencies. Last, using subject matter expertise and applying knowledge of the topics typically analyzed under NEPA, the types of potential effects (e.g., direct or indirect take of listed species) that could occur through implementation of

the proposed action and the alternatives were identified. The information needed to support sound conclusions regarding the significance of potential effects was also identified; this included the criteria set forth in NOAA Administrative Order (NAO) 216-6 §6.01. If any of the data or information needed for the programmatic analysis was found missing, it was identified as a gap. The table at the end of this executive summary lists the topics analyzed and the potential effects of relevance to the NERR designation.

No information gaps were identified for natural or cultural resources: the existing and available data, inventories, interviews, research results, conservation guidance, and management measures are sufficient to analyze effects of the NERR designation at a program level. One socioeconomic gap was identified: resolution of community concerns about the potential for the NERR to increase environmental regulation and oversight and thus raise costs for local operations, or impose restrictions on community activities. These concerns would be assuaged by data or research from other NERRS sites. Data demonstrating that NERR designation does not impose new regulatory oversight or constraints, or increase costs for local operations, would be valuable to the programmatic NEPA analysis.

Gap Analysis Topics, and Potential Effect Types and Significance Criteria Identified

Topic	Potential Effect Type	Sufficient Information Available?
Habitat types: uplands, wetlands, freshwater stream, estuarine, coastal, and marine	<ul style="list-style-type: none"> • Effect on upland habitats—these could be significant if there was destruction of remnant native plant species in uplands or conversion of forest to grassland habitats in uplands. • Effects on wetlands—these could be significant if there were a net loss of wetland habitat due to conversion of wetland to upland, or degradation of wetland quality by invasive species. • Effects on freshwater, estuarine, and marine habitats—significant effects would include long-term reductions of species populations or their habitats, increased freshwater discharge rates, worsened water quality, spread of invasive species, and exacerbation of coral bleaching. 	Yes
Threatened and endangered species	<ul style="list-style-type: none"> • Effects on listed plants, birds, marine mammals, marine reptiles, and terrestrial mammals—these could be significant if direct or indirect take of individuals or their habitats occurred or if invasive species caused cumulative effects in the action area. 	Yes
Other flora and fauna	<ul style="list-style-type: none"> • Effects on native flora and fauna—these could be significant if population-level impacts or substantial habitat modifications occurred. 	Yes
Watershed and hydrology	<ul style="list-style-type: none"> • Effects on watershed or hydrology—these could be significant if substantial changes occurred in the frequency or magnitude of peak flows in He‘eia Stream or in the impervious surface area in the He‘eia watershed. 	Yes
Water quality	<ul style="list-style-type: none"> • Effects on water quality—these could be significant if the characteristics measured by Hawai‘i State water quality standards were substantially altered over baseline conditions. 	Yes
Geological characteristics	<ul style="list-style-type: none"> • Erosion—effects could be significant if total suspended solids in receiving water bodies exceeded levels set by the State’s water quality standards. 	Yes
Climate change	<ul style="list-style-type: none"> • Interactions between the proposed action and climate-related effects—significant effects could occur if the action caused a change in ecosystem resilience to climate change, or if climate change adversely affected project activities, such as with sea level rise and ocean acidification. 	Yes
Cultural resources	<ul style="list-style-type: none"> • Effects on remains of documented archaeological sites, such as postcontact features—these could be significant if the sites were removed or modified. • Effects on as-yet undiscovered cultural resources—these would occur only if standard procedures for identifying and protecting discoveries were not followed. 	Yes
Socioeconomics	<ul style="list-style-type: none"> • Effects on the local community—these could be significant if substantial changes to health, income, access to resources, or other indicators 	No

occurred; see discussion above for a description of the information gap identified.

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Acronyms and Other Abbreviations

Abbreviation	Meaning
BMPs	best management practices
CFR	Code of Federal Regulations
chl-a	chlorophyll- <i>a</i>
CO ₂	carbon dioxide
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DAR	Division of Aquatic Resources, DLNR
DBEDT	Hawai‘i State Department of Business, Economic Development and Tourism
DLNR	Hawai‘i State Department of Land and Natural Resources
DO	dissolved oxygen
DOBOR	Division of Boating and Ocean Recreation, DLNR
DOC	dissolved organic carbon
DOCARE	Division of Conservation and Resource Enforcement, DLNR
DOFAW	Division of Forestry and Wildlife, DLNR
DPS	distinct population segment
EA	environmental assessment
EIS	environmental impact statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FWS	U.S. Fish and Wildlife Service
HAR	Hawai‘i Administrative Rules
HCDA	Hawai‘i Community Development Authority
HEPA	Hawai‘i Environmental Policy Act
HIDOH	Hawai‘i Department of Health
HIMB	Hawai‘i Institute of Marine Biology
HRS	Hawai‘i Revised Statutes
NEPA	National Environmental Policy Act
NERR	National Estuarine Research Reserve
NERRS	National Estuarine Research Reserve System
NH ₃	ammonia-nitrogen
NMFS	National Marine Fisheries Service
NO ₃ +NO ₂	nitrate+nitrite-nitrogen

NOAA	National Oceanic and Atmospheric Administration
NWI	National Wetland Inventory
OP	Office of Planning, State of Hawai'i
PCBs	polychlorinated biphenols
SEC	Site Evaluation Committee
SSC	Site Selection Committee
TMDLs	total maximum daily loads
TMK	Tax Map Key (number to identify real property unit)
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
ZCTA	Zip Code Tabulation Unit (U.S. Census equivalent of Zip Code area)

Glossary of Hawaiian Words

The Hawaiian translations are from Pukui and Elbert (1986). For some of the words a more contemporary meaning may be used by Hawaiians today; for these words they are placed before the Pukui and Elbert (1986) translations and marked with “(common).”

The *‘okina* and the *kahakō* are diacritical markings that are part of the Hawaiian alphabet and used in the Hawaiian words. The *‘okina*, or glottal stop, is found only between two vowels or at the beginning of a word that starts with a vowel. A break in speech is created between the sounds of the two vowels. The pronunciation of the *‘okina* is similar to saying “oh-oh.” The *‘okina* is written as a backward apostrophe. The *kahakō* is found only above a vowel. It stresses or elongates a vowel sound from one beat to two beats. The *kahakō* is written as a line above a vowel.

Hawaiian Word	English Translation
ahupua‘a	Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (ahu) of stones surmounted by an image of a pig (pua‘a), or because a pig or other tribute was laid on the altar as tax to the chief.
‘auwai	Ditch, canal, water conveyance channels
hau	Lowland tree (<i>Hibiscus tiliaceus</i>), found in many warm countries, some spreading horizontally over the ground forming impenetrable thickets, and some trained on trellises.
kalo	Taro (<i>Colocasia esculenta</i>), a kind of aroid cultivated since ancient times for food, spreading widely from the tropics of the Old World. In Hawai‘i, taro has been the staple from earliest times to the present, and here its culture developed greatly, including more than 300 forms.
leina ‘uhane	a place where the souls of the dead leaped into the nether world
lo‘i	Irrigated terrace, especially for taro, but also for rice; paddy.
loko i‘a	Fishpond (common).
mele	chants
mo‘olelo	Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting. (From mo‘o ‘ōlelo, succession of talk; all stories were oral, not written.)

Section 1. Purpose of This Gap Analysis

In May 2014, after a site selection process lasting one and a half years, the State of Hawai‘i (State) nominated He‘eia estuary in He‘eia, Kāne‘ohe, on the island of O‘ahu, to be part of the National Estuarine Research Reserve System (NERRS). NERRS is administered by the National Oceanic and Atmospheric Administration (NOAA) in partnership with the State. The mission of National Estuarine Research Reserve (NERR) Program is the establishment and management, through federal–state cooperation, of a national system of estuarine research reserves representative of the various regions and estuarine types in the United States. NERRs are established to provide opportunity for long-term research, education, and interpretation (Title 15, Code of Federal Regulations [CFR], Part 921.1[A]).

Upon approval of the site nomination, NOAA (through its Office for Coastal Management) is required to complete a series of actions before the site is designated. The action of designating a NERR site requires that NOAA comply with the National Environmental Policy Act (NEPA), and that a site-specific management plan be prepared by the collaborating state. For NEPA, an environmental impact statement (EIS) is being prepared to document the environmental impacts of designating the He‘eia NERR site. The EIS is being prepared by NOAA in collaboration with State of Hawai‘i Department of Business, Economic Development, and Tourism (DBEDT) Office of Planning (OP) (henceforth referred to as the State or OP) (PBR Hawai‘i 2014).

An EIS is a detailed document that assesses the environmental impacts of the proposed action. In this case, the action is designation of the He‘eia estuary as a NERR. The EIS for this action will include a description of significant environmental impacts that cannot be avoided if the action is implemented, alternatives to the proposed action, and mitigation measures considered and selected to minimize negative environmental effects.

For NOAA to conduct thorough environmental analyses of the effects of the proposed action and alternatives, sufficient information is needed regarding the natural, cultural, and socioeconomic resources in the proposed action area. If needed information is lacking, the NEPA process might be impeded (NOAA 2009). Therefore, the purpose of this report (referred to herein as a *gap analysis*) is to determine whether currently available information is sufficient to analyze, at a program level, the environmental and social impacts of establishing a NERR at He‘eia in Hawai‘i, and to identify any information that is lacking.

Section 2. Background on the Proposed National Estuarine Research Reserve at He‘eia

2.1 Project Background and History

The NERRS is a network of 28 estuaries representing different biogeographic regions of the United States that are protected for long-term research, water quality monitoring, education, and coastal stewardship. Established by the Coastal Zone Management Act (CZMA) of 1972, as amended, the NERRS is a partnership between NOAA and the coastal states. NOAA provides funding, national guidance, and technical assistance to support research. Each NERR is managed on a daily basis by a lead state agency or university, with input from local partners.

The NERRS mission is to practice and promote the stewardship of coasts and estuaries through innovative research, education, and training using a place-based system of protected areas. As a representative system, each reserve serves as a place-based living laboratory and classroom where research methods and management approaches can be piloted and applied to issues of local, regional, and national importance. Some examples of research being done at NERRs include the effects of pollutants on estuarine species, water quality studies, and fish migration studies.

Currently, the insular biogeographic region in the United States is not represented in the NERRS. This region comprises three subregions: the Hawaiian Islands, the Western Pacific Islands, and the Eastern Pacific Islands. With the designation of a NERR in Hawai‘i, the system would have a tenth region (of 11 total regions) and a twenty-second subregion (of 29 total subregions) represented.

In 1978, a NERR was designated in Hawai‘i, in the Waimanu Valley on the windward coast of the Big Island of Hawai‘i. The reserve was administered by the State Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW). Waimanu is a remote drowned river valley, accessible only by boat, helicopter, or a strenuous hike on a 9-mile switchback trail. The site’s inaccessibility was one of the reasons the Governor of Hawai‘i requested withdrawal of designation of this site in 1993 (PBR Hawai‘i 2014).

Governor Neil Abercrombie submitted a letter of interest in July 2012 to propose an expansion of the NERRS to include the unrepresented insular paleotropical region. He designated OP as the lead agency for the site selection process. The State Coastal Zone Management (CZM) Program, within OP, began the NERR site selection process for Hawai‘i in February 2013, per the process definition in 15 CFR 921. NOAA ultimately designates new NERRS sites, but coastal states are allowed to tailor the site selection process to suit regional sensibilities and the needs of the individual states’ CZM programs.

Phase I of the site selection process involved developing site selection criteria, forming a Site Selection Committee (SSC) to approve the criteria, forming a Site Evaluation Committee (SEC) to perform a technical review of proposed NERR sites, and soliciting proposals from the public. Proposals were received for two sites: Hilo Bay on the Big Island of Hawai‘i and He‘eia in Kāne‘ohe Bay on O‘ahu (PBR Hawai‘i 2014).

In Phase II, the SSC reviewed these two site proposals and was given all available information to consider. The committee selected He‘eia as the preferred site. The site selection document, including comments received from the public, was forwarded to the Governor in the first quarter of 2014. In May 2014, former Governor Abercrombie submitted a site nomination to NOAA. This nomination was approved by NOAA on October 27, 2014.

Phase III of the process involves drafting the EIS and developing a management plan for the He‘eia site.

2.2 Hawai‘i NERR Proposed Site Description

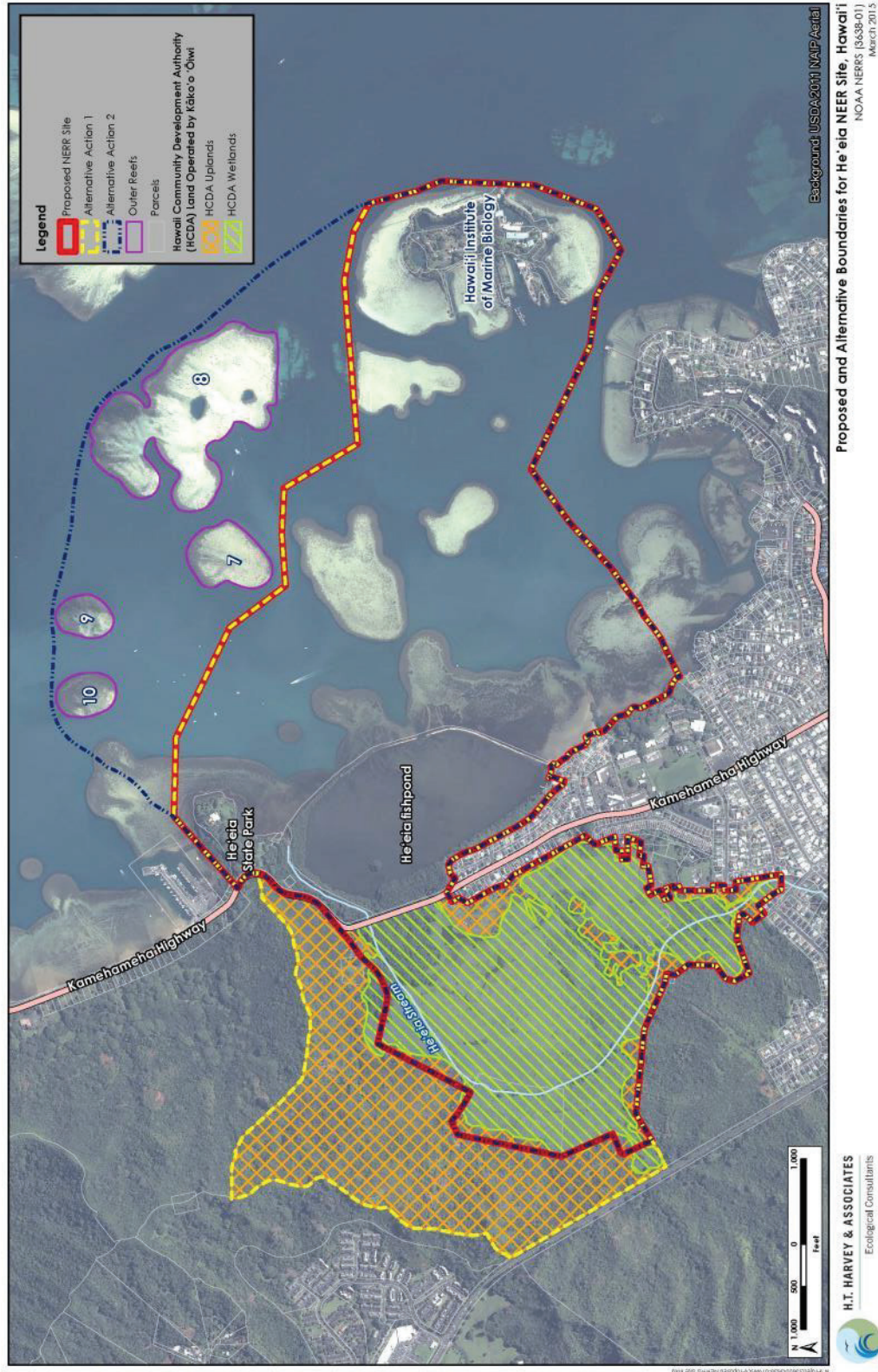
The He‘eia estuary is located in Kāne‘ohe Bay on the northeastern, or windward, shore of the island of O‘ahu. Kāne‘ohe Bay is the largest sheltered body of water in the Hawaiian Islands. The estuary is influenced by runoff from the surrounding watershed as well as by exchange of seawater from the ocean. Also, the semienclosed nature of the bay makes this estuary more vulnerable than an open coastline to damage by factors associated with urbanization and agricultural development (Jokiel 1991).

In the nomination document to NOAA, the area proposed as the He‘eia NERR was described as including the estuary, open ocean, and upland areas. The total acreage of the proposed site is about 838 acres and includes He‘eia State Park (18.5 acres) to the north, He‘eia Fishpond (88 acres) in the center, wetlands (about 200 acres) to the west and south, the University of Hawai‘i Institute of Marine Biology (HIMB) property (28 acres) on Moku o Lo‘e (Coconut Island) to the east, and the large (503 acres) expanse of ocean with patch and fringing reefs (Figure 2-1). For the purposes of the EIS, this area (proposed in the nomination document) will be designated and further analyzed as the location of the proposed action.

In December 2014, during the public scoping meetings for the NEPA process, NOAA received several comments requesting that the boundary of the proposed NERR include more upland areas as well as marine areas. As such, NOAA and the OP are considering additional alternatives for the NEPA analysis. The following two alternatives were identified by OP to include in this gap analysis report.

Alternative 1 includes the proposed action area plus about 200 acres of upland area contiguous with and north of the wetlands (Figure 2-1). Therefore, Alternative 1 would increase the reserve area by about 200 acres and would include within the NERR the entire parcel owned by the Hawai‘i Community Development Authority (HCDA).

Figure 2-1-1. He'eia NERR Proposed and Alternative Action Areas Considered in the Gap Analysis for the Programmatic EIS



Proposed and Alternative Boundaries for He'eia NERR Site, Hawaii
 NOAA NERRS (S638-01)
 March 2015

H.T. HARVEY & ASSOCIATES
 Ecological Consultants

Alternative 2 is the proposed action area plus the outer reefs, numbered 7, 8, 9, and 10, to the north of the marine portion of the proposed action area (Figure 2-1). These reefs are located in State-owned waters. The addition of these reefs and surrounding waters would increase the NERR site by approximately 302 acres.

The *no-action alternative* was not considered in this gap analysis because no additional information would be needed to analyze the no-action alternative beyond what is collected for analyzing the three action alternatives. It is known that several government and nongovernmental organizations in He‘eia (discussed in Section 2.3, “He‘eia Site Partners”) are actively conducting environmental research and cultural and natural resource projects in the region, such as restoration of the fishpond, removal of invasive plants, and restoration of traditional Hawaiian agricultural practices to the once productive upland and wetland habitats of He‘eia. These organizations have obtained the necessary permits to implement their strategic and management plans in the near future, irrespective of designation of He‘eia as a NERR. For the foreseeable future, conditions in the proposed He‘eia NERR site are not expected to evolve differently from that which would occur under the proposed action or alternatives. For example, if the site were designated a NERR, the currently planned projects would not be inhibited or precluded. And, if the site were not designated a NERR, it is unlikely that the area would be developed or habitat degraded, owing to the ongoing independent restoration projects.

This gap analysis for the He‘eia NERR is being conducted as part of Phase III of the site selection process described above. As discussed in Section 1, the purpose of this gap analysis is to determine whether currently available information is sufficient to identify, at a program level, the environmental, cultural, and socioeconomic impacts of establishing a NERR at He‘eia. The analyses to identify information gaps in this report were conducted for all three action alternatives described above.

2.3 He‘eia NERR Site Partners

The nomination of He‘eia estuary as a NERR site is supported by many organizations such as Kāko‘o ‘Ōiwi, Paepae o He‘eia, HIMB, He‘eia State Park, Ko‘olau Foundation, and the Ko‘olaupoko Hawaiian Civic Club, whose collective commitment is the conservation and restoration of Kāne‘ohe Bay. As detailed below, these groups bring expertise and commitment to provide solutions for restoring and protecting the bay.

- Kāko‘o ‘Ōiwi is a 501(c)3 nonprofit organization that has entered into a 38-year lease with landowner HCDA (Figure 2-1). The HCDA lands encompassed by the proposed action and Alternative 1 were once very productive lands in Kāne‘ohe, with hundreds of acres of taro lo‘i (taro fields) along He‘eia Stream. Kāko‘o ‘Ōiwi plans to restore the cultural, environmental, and agricultural significance of this place. Its proposed project, Māhuahua ‘Ai o Hoi (“to restore the fruit of Hoi”), will establish a land management program to restore the wetlands of He‘eia, also known as “Hoi,” to productive agricultural use. The purpose of this project is to feed the community and sustain its culture and economy, and to improve the health of wetlands and coastal areas.

- Paepae o He‘eia is a private nonprofit organization dedicated to caring for He‘eia Fishpond, an ancient Hawaiian fishpond located in the center of the proposed action area. Paepae o He‘eia has a lease from the owner, Kamehameha Schools, to manage and maintain He‘eia Fishpond for the community.
- HIMB is located on Moku o Lo‘e in He‘eia, which is owned and operated by the University of Hawai‘i. HIMB conducts multidisciplinary research and education in all aspects of marine biology.
- He‘eia State Park is owned by the State of Hawai‘i and is currently managed by Kama‘aina Kids, an organization that conducts various waterfront and environmental education programs in Kāne‘ohe.
- The Ko‘olau Foundation is a cultural heritage preservation program with a mission to promote Hawaiian cultural and environmental practices, preservation, and education.
- The Ko‘olaupoko Civic Club, established in 1937, is part of the State Association of Hawaiian civic clubs and perhaps one of the oldest organizations in the state. This civic club continues its effort to support the culture and heritage of native Hawaiians through its educational and service programs, community outreach, and participation in the Association of Hawaiian Civic Clubs.

Section 3. Gap Analysis Approach

3.1 Overview of Approach

The gap analysis process was started by compiling information on the natural, cultural, and socioeconomic aspects of Heʻeia watershed. Whenever necessary, project stakeholders, including representatives of State and County of Honolulu agencies and members of the community, were consulted and interviewed to collect additional information. By considering NEPA requirements and using subject matter expertise, the types of potential effects that could occur through implementation of the proposed action or alternatives were identified. Compiled information was then analyzed to identify if there were any gaps in the information necessary to analyze the direct, indirect, and cumulative effects, at a program level, of the proposed and alternative actions. This overall approach is further described below. As noted in Section 2.2, no information gaps are expected to affect analysis of the no-action alternative, so this alternative is not discussed to the same extent as the proposed action and other alternatives.

3.2 Step 1: Collection of Data and Information

The following types of data were gathered to assess the completeness of current information regarding environmental, cultural, and socioeconomic conditions in the action area:

- Natural resources
 - Habitat types and descriptions (aquatic and terrestrial)
 - Endangered and threatened species (federally and State-listed) and records of occurrence
 - Distribution and abundance of flora and fauna
 - Watershed and hydrology
 - Water quality
 - Geology
 - Climate
- Cultural resources
 - Archaeological feature types and descriptions
 - Cultural sites and descriptions
 - Archival historical documentation
 - Oral history interviews
 - Moʻolelo and oli Moʻolelo (Hawaiian-based historical accounts) and mele (chants)
- Socioeconomics
 - Current demographic and economic characteristics of the population living in the vicinity of the proposed action area, and in the surrounding community
 - Demographic and economic trends in the surrounding community
 - Recent traffic levels on major roadways

- Projected population and economic trends in the surrounding community
- Likely trends in recreation, commercial activity, and traffic in the surrounding community
- Property development and values in the surrounding community
- Investment of human capital and funds for research, education, subsistence, and recreation activities in the proposed action area, and future projections (independent of the NERR designation)

3.3 Step 2: Compilation of Data and Information

3.3.1 Natural Resources

A thorough review was conducted of previous studies in He‘eia and Kāne‘ohe Bay that addressed the natural resource topics identified above. Information on natural resources was compiled primarily from a review of literature, including books, journal articles, technical reports, government documents, and other scientific literature regarding flora, fauna, habitat types, water quality, hydrology, watershed, geology, and climate in Kāne‘ohe Bay and, where possible, within the He‘eia watershed. Online spatial databases such as the National Wetland Inventory (NWI) and the U.S. Fish and Wildlife Service’s (USFWS’s) Critical Habitat Mapper were used in conjunction with the printed resources. When necessary, agencies such as the Hawai‘i Department of Health (HIDOH) were contacted to gather unpublished information.

3.3.2 Cultural Resources

Information on cultural resources was compiled from existing literature. Research was done at the library that holds archaeological reports at the Hawai‘i State Historic Preservation Division. Additional archaeological reports were received from the community and private organizations. These reports document all previous work done in the He‘eia watershed and surrounding areas and list known archaeological and cultural sites, including historical architectural features.

3.3.3 Socioeconomic Characteristics

Socioeconomic characteristics were studied using U.S. Bureau of the Census data, Hawai‘i data collected for the State or County on fishing and agricultural production, State of Hawai‘i and City and County of Honolulu data on the use of roadways, and State and County projections of population and economic change in areas within Hawai‘i. Interviews with local experts, including major stakeholders in preservation projects in the proposed action area, helped to establish current levels of activity, likely future activities with or without NERR designation, and anticipated impacts on the surrounding community.

3.4 Step 3: Gap Analysis and Recommendations

Section 4 describes and analyzes the available information on natural, cultural, and socioeconomic aspects of He‘eia. To some extent, the summaries discuss not just current but various future activities planned by the organizations in He‘eia, supporting the conclusion that available information on the no-action alternative is sufficient.

To identify gaps in the compiled information that would impede a programmatic analysis of direct, indirect, and cumulative effects, the types of potential effects were first identified (see the example in Table 3-1, first column). These types of potential effects were identified based on the known natural and cultural resources, environmental conditions, and socioeconomic conditions in He‘eia, and by applying knowledge of the topics typically analyzed under NEPA and any additional impact topics deemed to have relevance to the action. The thresholds at which each effect would be considered significant and adverse also were considered, in order to pinpoint the scale and type of data or information needed to determine significance (see Section 3.4.1 below).

Subject matter experts then identified the information that would be needed (Table 3-1, second column) to support sound conclusions regarding the significance of potential effects. The geographic extent of effects was determined separately for each topic or resource, to adequately account for how the NERR designation may have consequences outside the boundaries of the action area. Lastly, this list of required information was compared to the compiled inventory of currently available information (Table 3-1, third column) to identify what is still needed for the programmatic NEPA analysis. The gaps are listed separately for the proposed action and Alternatives 1 and 2 (Table 3-1, fourth, fifth, and sixth columns).

Table 3-1. Gap Analysis Sample Table

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Direct or indirect take of listed marine reptiles or their habitat	Distribution and status of green sea turtles in Kāne‘ohe Bay	Balazs et al. 1998, Francke et al. 2013: These sources state that the National Marine Fisheries Service continues to assess the health and stability of green turtles in Kāne‘ohe Bay, with an emphasis on assessing quality foraging resources, disease occurrence and prevalence, and outreach efforts designed to minimize risk and avoid take.	Yes	Yes	Yes

3.4.1 Determining Significance

The following list from NOAA Administrative Order (NAO) 216-6 §6.01 described factors that should be considered when determining significance for all NOAA actions:

- A. Impacts may be both beneficial and adverse; a significant impact may exist even if the federal agency believes that on balance the impact will be beneficial.

- B. Degree to which public health or safety is affected.
- C. Unique characteristics of the geographic area.
- D. Degree to which impacts on the human environment are likely to be highly controversial.
- E. Degree to which impacts are highly uncertain or involve unique or unknown risks.
- F. Degree to which the action establishes a precedent for future actions with significant impact or represents a decision in principle about a future consideration.
- G. Individually insignificant but cumulatively significant impacts.
- H. Degree to which the action adversely affects entities listed in or eligible for listing in the National Register of Historic Places, or may cause loss or destruction of significant scientific, cultural, or historic resources.
- I. Degree to which endangered or threatened species, or their critical habitat as defined under the Endangered Species Act of 1973, are adversely affected.
- J. Whether a violation of federal, state, or local law for environmental protection is threatened.
- K. Whether a federal action may result in the introduction or spread of a non-indigenous species.

For each of the resource topics discussed in Section 4, impact types and significance thresholds were identified in accordance with the broad criteria listed above. For example, if an alternative's impacts were considered likely to meet Criterion B (effects on public health or safety), Criterion E (impacts that are highly uncertain or involve unique or unknown risks), or Criterion I (impacts that affect threatened or endangered species, or their critical habitat), those issues were noted as impact types for which measurable thresholds will be applied in the NEPA analysis of effects.

Section 5 identifies the information gaps that need to be addressed in order to develop the programmatic EIS. In summary, only one information gap, relating to baseline socioeconomic data, was identified. Section 5 makes recommendations regarding research necessary to address this information gap prior to completion of the EIS. Also, the section provides recommendations for research or studies on future site-specific projects, to support their future compliance with NEPA or the Hawai'i Environmental Policy Act (HEPA).

Section 4. Summary of Available Information

4.1 Habitats

4.1.1 Upland Habitats

Upland areas in the proposed action area boundary comprise (1) forested areas at Heʻeia State Park (19 acres), (2) undeveloped and landscaped areas between the Heʻeia Fishpond and the residential neighborhood (about 9 acres), (3) emergent lands on Moku o Loʻe (28 acres), and (4) natural uplands and fill areas in wetlands on the HCDA property (approximately 15 to 20 acres west of Kamehameha Highway) (Figure 4-1). Compared to the proposed action, Alternative 1 would add about 200 acres of uplands contiguous with and north of the HCDA wetlands (Figure 4-1). Under Alternative 2, there would be no change in the area of uplands that would be part of the NERR.

The upland habitats in Heʻeia State Park, around the residential units, and on Moku o Loʻe are modified, and reported to support a few native plants and animals, but no rare, threatened, or endangered species (Weissich 1993). The northern part of Heʻeia State Park comprises landscaped habitats, manicured lawns, and a wide variety of introduced and exotic tree and shrub species (PBR Hawaiʻi 1993) (Figure 4-2).

The upland areas around the residences (between the residential community and the Heʻeia Fishpond) are dominated by a mosaic of landscaped and weedy habitats. The landscaped areas consist of mowed lawns and ornamental plant species, either being actively cared for or in various stages of disrepair (LeGrande 2006). A patch of dense indigenous hau (*Hibiscus tileaceous*) forest grows in this part of the action area (Brooks 1991, LeGrande 2006). The fallen leaves and other vegetative matter in the hau forest are rarely dry, because of the thick canopy cover of the hau trees. The moist ground cover is believed to create habitat for mosquitoes and other insects, which in turn may serve as food for juvenile fish in the adjacent mangrove habitats (Brooks 1991). Upland habitats on Moku o Loʻe also are highly modified, by past and ongoing land uses. These habitats contain a mosaic of open scrub vegetation with scattered trees, which are predominantly nonnative (Char & Associates 1994, 1995; SWCA 2013).

Some upland areas are located in the southern half of the HCDA lands, which are otherwise predominantly wetlands. These upland areas occur in the southwestern part of the proposed action area, near the residential neighborhoods, along Kamehameha Highway, and on Kealohi Road, an unpaved road that runs along the foothill bordering the wetlands (Figure 4-1). There is a demonstration taro loʻi in the southwestern part of the wetlands, and Kākoʻo ʻŌiwi plans to construct supporting agricultural and community facilities in the remaining upland areas, including a poi mill, composting facility, community center, health center, Hawaiian hale (house), and baseyards (Townscape 2011a, 2011b). Photographs of the upland areas reveal a grassland habitat interspersed with shrubs and trees (Townscape 2011a). The vast majority of plants and

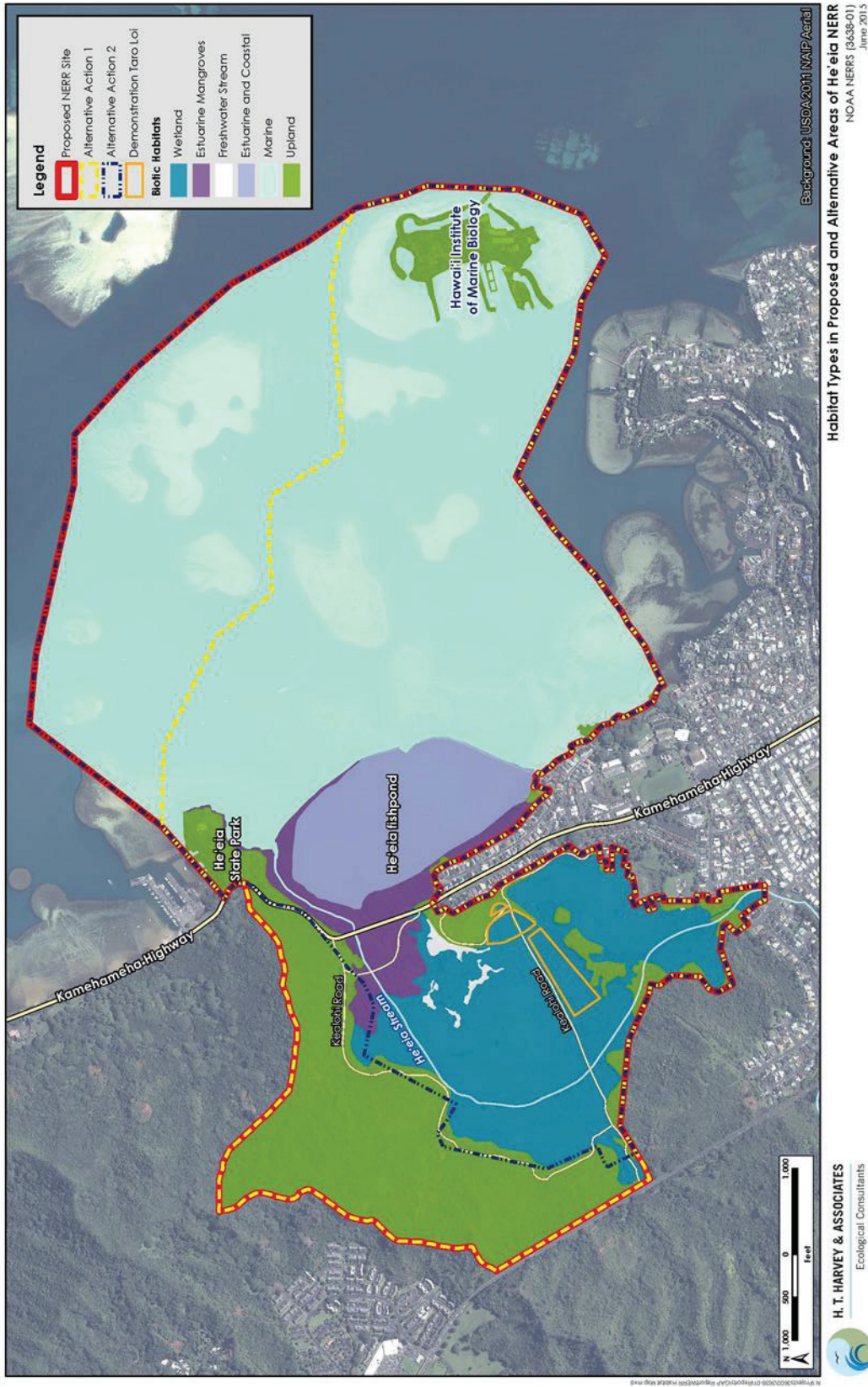


Figure 4-1. Habitat Types in He'eia Proposed and Alternative Action Areas



Figure 4-2. Landscaped Upland Habitat at He'eia State Park with Monkey Pod (*Samanea saman*) and Coconut (*Cocos nucifera*) Trees (December 16, 2014)

animals identified in a recent biological survey (Townscape 2011a) of these upland habitats were nonnative invasive species, indicating the disturbed and degraded nature of these habitats. Prior biological surveys (Krauss 1976, Lamoureux 1983, Calvin and Kim 1990) in and around the upland areas also found these habitats to be dominated by cultivated and nonnative escaped ornamental shrubs and trees and weedy herbaceous plants, indicating a long history of disturbance (Figure 4-3).



Figure 4-3. Upland Habitats Bordering the He'eia Wetlands, Dominated by Ornamental and Cultivated Species Like Ulu (*Artocarpus altilis*), Banana (*Musa sp.*) and Coconut (*Cocos nucifera*) (December 16, 2014)

Alternative 1 would add about 200 acres of forested land at the foothills of the Ko‘olau Mountains. Past deforestation and land clearing for agriculture and urban development has resulted in significant erosion of these upland habitats. In the steeper areas, the land has slopes of 25 to 40%, and the soils on these hillsides are considered highly erodible, with bare landslide areas visible in many places (see Section 4.6, “Geology”). These upland areas currently are used illegally by hunters and dirt bike riders, whose activities continue to exacerbate the soil erosion problem (Townscape 2011a); control of these actions is at the discretion of the landowner. The upland forests support mostly invasive trees such as Java plum (*Syzygium cumini*), strawberry guava (waiawā, *Psidium guajava*), ironwood (paina, *Casuarina equisetifolia*), octopus tree (*Schefflera actinophylla*), and koa haole (*Leucaena leucocephala*) (Krauss 1976, Lamoureux 1983, PBR Hawai‘i 1993, Townscape 2011a). *Albizia* trees in the uplands are a safety concern because of their propensity to drop branches and fall over. Through its Māhuahua ‘Ai o Hoi Project, Kāko‘o ‘Ōiwi plans to conduct forest restoration and cultivate dryland crops, medicinal and ornamental plants, and orchards with fruit trees like banana (maia, *Musa x paradisiaca*) and breadfruit (ulu, *Artocarpus altilis*) (Townscape 2011a, 2011b).

Effect Types and Significance Criteria

Because most of the upland areas are zoned for conservation, and because some upland areas, such as those around the fishpond, have historical significance (Helber Hastert & Fee 2007), the loss or degradation of upland habitat due to urban development is considered unlikely, regardless of whether the area is designated as a NERR. No activities in the upland habitats are planned under the proposed action or under Alternative 1. However, potential effects on upland habitats could be considered significant if ongoing activities such as agriculture, aquaculture, restoration, or construction of low-impact facilities being planned and developed by Kāko‘o ‘Ōiwi led to the direct or indirect loss of the remaining native plant species or caused the conversion of upland forest-type habitat to grasslands or bare earth. Also, the chance of fire spreading into the upland habitats would be higher with even low-impact construction activities. Furthermore, the chances of inadvertently causing the introduction and spread of invasive species that can change upland vegetation communities are greater under any scenario that involves the movement of dirt, building material, plants, or plant propagules for habitat restoration.

Conversion of diverse forested uplands to monotypic grasslands would be considered adverse because of decreased watershed services, the higher propensity of grasslands to carry fire, and changes in the biogeochemistry of the upland habitats (D’Antonio and Vitousek 1992, Asner and Beatty 1996). Furthermore, because the terrestrial uplands within the uplands boundary expansion area (Alternative 1) have highly erodible soils (Townscape 2011b), actions that occur in this area in particular could result in loss of vegetative cover and increased bare ground.

Table 4-1. Information Available for Analysis of Upland Habitat Effects

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Destruction of remnant native plant species in the uplands	<ul style="list-style-type: none"> Distribution and composition of upland habitats Details on existing and planned land management activities 	<ul style="list-style-type: none"> Krauss 1976, Lamoureux 1983, Calvin and Kim 1990 Brooks 1991, PBR Hawai‘i 1993, LeGrande 2006, Townscape 2011a and b, SWCA 2013: These sources have described the distribution and the composition of the upland habitats, including the distribution of the remnant native plant species. Townscape (2011a and b) have discussed the activities planned by Kāko‘o ‘Ōiwi in the upland habitats that involve enhancing the population of remnant native plant species. 	Yes	Yes	Yes
Conversion of upland forests to grasslands or bare earth	<ul style="list-style-type: none"> Distribution and composition of upland habitats Details on existing and planned land management activities 	<ul style="list-style-type: none"> Krauss 1976, Lamoureux 1983, Calvin and Kim 1990 Brooks 1991, PBR Hawai‘i 1993, LeGrande 2006, Townscape 2011a and b, SWCA 2013: These sources describe the distribution and composition of upland forest habitats. Townscape (2011a and b) discuss how Kāko‘o ‘Ōiwi plans to convert limited upland habitats (at the foothills and not in steeper parts) gradually and in phases to orchard, avoiding erosion and the establishment of invasive weeds. 	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawai‘i Community Development Authority.

Yes = Existing sources are sufficient for analysis.

4.1.2 Wetlands

The wetlands of He‘eia are fed by the waters of Haiku Stream and Iolekaa Stream, which converge upstream of the wetlands to form the He‘eia Stream. According to the NWI, five types of wetlands occur within the proposed action and alternative NERR boundaries: (1) estuarine and marine deepwater, (2) freshwater emergent, (3) estuarine and marine wetland, (4) freshwater forested/shrub, and (5) freshwater pond (USFWS 2015a) (Figure 4-4). Except for estuarine and marine deepwater wetlands, these different types

of wetlands occur on (1) HCDA lands to the west of Kamehameha Highway, (2) along the banks of the He‘eia Stream in He‘eia State Park, and (3) along the northwestern, western, and southwestern walls of the fishpond (Figure 4-4) (USFWS 2015a). The wetland types and locations are further described below, except for estuarine and marine deepwater wetlands, which are discussed under Section 4.1.5, “Coastal and Marine Habitats.”

The HCDA lands contain four out of the five wetland types identified by NWI: estuarine and marine wetland, freshwater emergent, freshwater forested/shrub, and freshwater pond (Figure 4-4). These wetlands encompass about 200 acres and are leased to Kāko‘o ‘Ōiwi, which plans to restore the wetlands’ cultural, environmental, and agricultural significance and health through its Māhuhua ‘Ai o Hoi project. All three action alternatives include the wetlands on HCDA lands, with the western part of the proposed action boundary almost running parallel to He‘eia Stream (Figure 4-4).

Estuarine and marine wetlands occur in the northern part of the HCDA wetland area, and largely comprise thick mangrove swamp (Calvin Kim and Associates 1990, Brooks 1991, PBR Hawai‘i 1993, U.S. Department of Agriculture [USDA] 2011). Red mangrove (*Rhizophora mangle*), introduced to the area around 1910, is the dominant species, followed by the *Bruguiera* species *B. sexangula* and *B. gymnorhiza*. The expansion of mangroves and deposition of sediments over time has reduced the estuarine environment and altered water flow pattern with respect to both the stream channel locations and the extent of tidal water incursions. Although the mangroves are not native, they are known to harbor a variety of marine and estuarine organisms that are sought for bait and food. The habitat provided by the mangrove prop roots and associated fouling assemblages (e.g., algae, invertebrates) provide habitat for juvenile fish which, as adults, populate freshwater or marine environments (Calvin Kim and Associates 1990, Brooks 1991).

The expansion of mangroves also has substantially reduced the area of marshland habitat once used by native waterbirds (Calvin Kim and Associates 1990, Brooks 1991, Helbert Hastert & Fee 2007). Kāko‘o ‘Ōiwi, through its Māhuhua ‘Ai o Hoi Project, plans to remove approximately 20 acres of the mangroves that are choking the stream channel, and to replace them with native sedges that will serve as habitat for birds and as a nursery for juvenile fish (Townscape 2011a, 2011b). As discussed in Section 4.2, the endangered Hawaiian hoary bat (‘ope‘ape‘a, *Lasiurus cinereus semotus*) likely roosts in the mangroves (Helber Hastert & Fee 2007, SWCA 2013), so removal of the mangroves will be conducted outside of the bat’s breeding season to avoid impacts on the species. The project also includes a predator control program for rats, mongooses, cats, and dogs, and a monitoring program for the early identification and response to sightings of avian botulism (Townscape 2011a, 2011b).

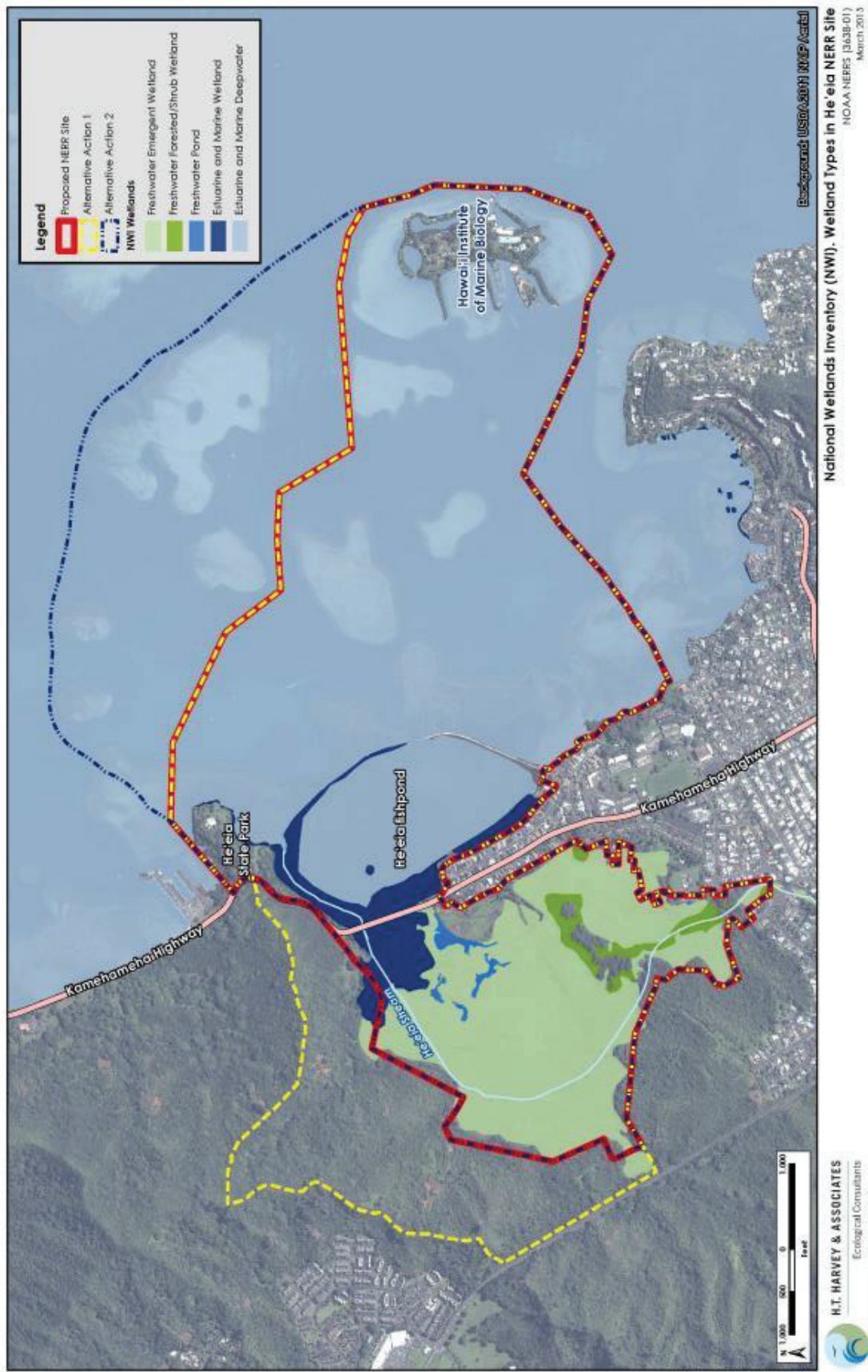


Figure 4-4. Wetland Types in the He'eia Proposed and Alternative Action Areas

The vast majority (about 170 acres) of HCDA lands above the mangrove swamp is freshwater emergent wetland (Figure 4-4) and comprises He‘eia Stream, marsh, and seasonally wet grasslands (Calvin Kim and Associates 1990, Townscape 2011a). He‘eia Stream, along the southwestern boundary of the proposed action area, is lined with a dense forest of hau trees. Almost throughout its course in the wetlands, the stream is choked by California grass (*Urochloa mutica*) and other invasive species that impede its flow and water quality (Townscape 2011a, HDOH 2014). The stream currently provides poor habitat for waterbirds and does not allow fish passage. After studying the stream’s hydrology and hydraulics, Kāko‘o ‘Ōiwi plans to restore the stream channels to create habitat for native aquatic fish, shrimp, and other organisms now absent from the stream. Whether dredging of the stream will be needed has not been determined (Townscape 2011a). Kāko‘o ‘Ōiwi also plans to create detention ponds toward the southern end, where the stream enters the HCDA property. The detention ponds are planned to be approximately 10 to 15 acres, and will help slow down or detain the stormflows that enter the wetland, thereby reducing impacts on the wetland.

The marsh habitat consists mostly of the floodplain of the He‘eia Stream west of the mangrove swamp. It is extensively overgrown with California grass, which occludes open-water areas (Calvin Kim and Associates 1990, Townscape 2011a, USDA 2011). The marsh habitat is known to occasionally provide feeding and loafing habitat for the Hawaiian gallinule (‘alae ‘ula, *Gallinula chloropus sandvicensis*), Hawaiian duck (koloa maoli, *Anas wyvilliana*), Hawaiian coot (‘alae kea, *Fulica alai*), and Hawaiian stilt (ae‘o, *Himantopus mexicanus knudseni*). The dense growth of California grass in the He‘eia marsh (Figure 4-5) is believed to have a greater negative impact on native waterbird habitat than the mangrove swamp (Calvin Kim and Associates 1990, Townscape 2011b).



Figure 4-5. Dense Growth of California Grass (*Urochloa mutica*) in He‘eia Marsh Habitat (December 16, 2014)

Seasonally wet grasslands form the floodplain east of the He'eia stream. They flood and become marshy in the rainy season, when they are covered by up to 1 foot of water (Calvin Kim and Associates 1990). Dominated by California grass, these seasonally wet grasslands also support a variety of nonnative facultative and obligate wetland plant species.

The freshwater forested/shrub type wetland occurs within a narrow belt around the upland habitat located in the southern part of the HCDA wetlands (Figure 4-4). The forested/shrub wetlands comprise trees like java plum (*Syzygium cumini*) and shrub species such as cat's claw (puakelekino, *Caesalpinia decapetala*), Cuba jute (*Sida rhombifolia*), koa haole, and guava (*Psidium guajava*). At the southern boundary of the proposed action area, where Heeia Stream enters the HCDA wetlands, this wetland type comprises thick hau forest (Townscape 2011a, 2011b).

Freshwater pond wetlands are represented by natural open-water ponds located inland from the mangrove forests (Figure 4-4). These ponds have mixed native and nonnative vegetation; native plants present include makaloa (*Cyperus laevigatus*) and neke (*Cyclosorus interruptus*) ferns (Townscape 2011a).

In cooperation with the Natural Resources Conservation Service, Kāko'o 'Ōiwi has developed a detailed conservation plan, the implementation of which is in progress. This includes restoring 12 acres of wetland to taro lo'i in the southern part of the HCDA wetlands (Townscape 2011b) (Figure 4-6). The conservation plan comprehensively addresses concerns regarding the soil, water, animals, plants, and air resources involved in the 12-acre restoration of wetland to taro lo'i.



Figure 4-6. Taro Lo'i in He'eia Wetlands (December 16, 2014)

In addition to taro lo'i, Kāko'o 'Ōiwi's long-term plan includes restoration of approximately 10 acres of loko i'a kalo in the northern, wetter part of the marsh, immediately adjacent to the mangrove swamp. Loko

i‘a kalo is the Hawaiian traditional agricultural practice of combining taro fields and fishponds in brackish areas. As well as producing fish and taro, the loko i‘a kalo is expected to enhance native waterbird habitat and act as a sediment trap during rain events (Townscape 2011a). Just north of the loko i‘a kalo, Kāko‘o ‘Ōiwi plans to establish an aquaculture or aquaponics facility on about 1 acre.

The wetlands on the east side of Kamehameha Highway are mostly of the estuarine and marine type, and occur along the banks of the He‘eia Stream in He‘eia State Park and along the north, west, and south walls of the fishpond (Figure 4-4). Similar to the estuarine and marine wetlands on the HCDA lands, this area largely comprises a dense mangrove swamp (Calvin Kim and Associates 1990, Brooks 1991, PBR Hawai‘i 1993). Right before entering the ocean, He‘eia Stream flows through the southern part of He‘eia State Park. The banks of the stream are crowded by the invasive red mangrove and *Bruguiera* species (*B. sexangula* and *B. gymnorhiza*) (Figure 4-7). This mangrove habitat functions as a trap for nutrients and sediments from He‘eia Stream and confines saltwater intrusion to the east side of Kamehameha Highway. As discussed above, the mangrove habitats have considerably reduced the estuarine environment by altering the streamflow and the extent of tidal water incursions (Calvin Kim and Associates 1990, Townscape 2011a). The expansion of mangroves also had substantially altered the fishpond by encroaching on the fishpond walls. As part of recent restoration efforts by Paepae o He‘eia, mangroves were removed from the fishpond and the fishpond wall; however, mangrove stands still grow along Kamehameha Highway (PBR Hawai‘i 2007).



Figure 4-7. He‘eia Stream Bank in He‘eia State Park, Dominated by Invasive Mangroves (December 16, 2014)

Effect Types and Significance Criteria

Potential effects on wetlands would be considered significant if any net loss of wetland habitat occurred, or if modifications to wetland habitat adversely affected a wetland's hydrology and ability to support native flora and fauna. Hawai'i has lost nearly a third of its coastal wetlands to agricultural and urban development (Dahl 1990, Kosaka 1990). Further loss of coastal wetlands in He'eia would not only affect the local watershed but would reduce the ecological services provided by wetlands to humans and native flora and fauna on the island (Ducks Unlimited 2000, Rauzon and Drigot 2002). However, neither the proposed action nor the alternatives include modifications to wetlands.

The potential effect types in Table 4-2 below reflect the criteria described above for each of the four wetland types discussed in this section. The introduction and spread of invasive species also could contribute to the cumulative impacts on wetlands. Habitat-level effects of invasive species on wetlands would be considered significant if they further degraded the function of wetlands, for example, if greater incursions by mangroves caused additional impacts on wetland hydrology and chemistry.

4.1.3 Freshwater Stream Habitats

The main tributary in the proposed action area, He'eia Stream, is listed in the Hawai'i Stream Assessment (Parham et al. 2008) as a small perennial stream containing moderate aquatic resources. In ranking streams according to a suite of ecological diversity and resilience factors, Parham et al. (2008) assign streams a standardized score from 1 to 10, with 1 being the poorest and 10 being the best. He'eia Stream received a Stream Biological Rating of 4, and is noted to contain moderately important biological resources that include diverse native and introduced macrofauna (Townscape 2010). The stream goby (o'opu nakea, *Awaous guamensis*) was identified as occurring in the stream, as well as seven other native aquatic (fish) species and five introduced species (Townscape 2011a). Largest of the Hawaiian gobies, *A. guamensis* is the only one of the five species of o'opu that is not endemic to the Hawaiian Islands. This species is also found in Guam, New Caledonia, Vanuatu, and Fiji, and is considered indigenous in Hawai'i.

Table 4-2. Information Available for Analysis of Wetland Habitat Effects

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Net loss of wetland habitat due to conversion of wetland to upland and/or degradation of wetland quality due to cumulative effect of invasive species	Determination and delineation of wetland habitats	<ul style="list-style-type: none"> USFWS 2015a: Source identifies the NWI wetland types. USDA 2011: Source documents a systematic survey to identify and delineate wetlands in He'eia. 	Yes	Yes	Yes
	Details of ongoing and planned agricultural activities in wetlands	<ul style="list-style-type: none"> Townscape 2011a and b: These sources do not discuss reclaiming wetland areas to convert to upland habitats among the various restoration activities that currently occur or are planned for the wetlands. Brooks 1991: Source states that fishpond restoration does not entail conversion from wetland to upland habitat. 	Yes	Yes	Yes
	Current distribution and abundance of invasive species	<ul style="list-style-type: none"> Calvin Kim and Associates 1990, Townscape 2011a and b, PBR Hawai'i 2007: These sources describe in detail the distribution of invasive plants and also discuss their impacts on the functioning of wetlands. 	Yes	Yes	Yes
Effects on He'eia Stream (freshwater emergent) habitat	Distribution and status of the wetland stream habitat	<ul style="list-style-type: none"> Calvin Kim and Associates 1990, Townscape 2011a and b: These sources describe species composition in He'eia Stream, distribution of native plants, and the extent of encroachment of invasive plants that impede streamflow. These sources also discuss stream restoration activities and conservation BMPs to prevent impacts on stream habitat and water quality. 	Yes	Yes	Yes

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Effects on mangrove swamp (estuarine and marine) habitats	Distribution and status of the mangrove swamp habitat	<ul style="list-style-type: none"> Brooks 1991, PBR Hawai'i 1993, Townscape 2011a and 2011b: These sources describe distribution of mangrove swamp and impacts of mangroves on the biological, chemical, and physical characteristics of estuarine habitat in He'eia; they prescribe restoration of mangroves to marsh habitat with native sedges and implementation of BMPs to avoid impacts on hoary bats inhabiting mangroves. 	Yes	Yes	Yes
Effects on marsh and seasonally wet grassland (freshwater emergent) habitats	Distribution and status of the marsh habitats (floodplains of the He'eia Stream)	<ul style="list-style-type: none"> Calvin Kim and Associates, Townscape 2011b: These sources document distribution and composition of species found in the marsh and seasonally wet meadows. PBR Hawai'i 1993, Townscape 2011a and b: These sources describe invasion and degradation of marsh habitat by California grass and unsuitability for native waterbirds; they also prescribe restoration of marsh and seasonally wet grasslands to taro lo'i and loko i'a kalo, plus predator control program for rats, mongooses, cats, and dogs. 	Yes	Yes	Yes
Effect on freshwater forested/shrub wetland	Distribution and status of freshwater forested/shrub wetland	<ul style="list-style-type: none"> Townscape 2011a and b: These sources describe the distribution and composition of this wetland type. 	Yes	Yes	Yes
Effect on freshwater pond wetland	Distribution and status of freshwater pond wetland	<ul style="list-style-type: none"> Townscape 2011a and b: These sources describe the distribution and composition of freshwater ponds in He'eia. 	Yes	Yes	Yes

Notes: Alt = Alternative; BMPs = best management practices; HCDA = Hawai'i Community Development Authority; NWI = National Wetlands Inventory; USDA = U.S. Department of Agriculture; USFWS = U.S. Fish and Wildlife Service. Yes = Existing sources are sufficient for analysis.

In 2001–2003, the Hawai‘i Biological Survey examined the lower reaches and nearshore estuarine waters of He‘eia Stream and documented a total of six fish species: the endemic flagtail (āholehole, *Kuhlia xenura*) and flathead gray mullet (‘ama‘ama, *Mugil cephalus*); the indigenous great barracuda (ono, *Sphyraena barracuda*); and the introduced western mosquitofish (*Gambusia affinis*), shortfin molly (*Poecilia mexicana*), and tilapia (*Tilapia melanothera*) (Englund et al. 2003). Only two species of insects were documented by Englund et al. (2003), one of these being the indigenous dragonfly (*Pantala flavescens*). Parham et al. (2008) reported 15 fish species and the endangered blackline Hawaiian damselfly (*Megalagrion nigrohamatum nigrolineatum*) as occurring in He‘eia Stream, based on eight surveys conducted in the lower and middle sections of the stream between 1975 and 2003. Low aquatic insect diversity may be attributed to the high-salinity environment of lower He‘eia Stream.

Key threats to native and indigenous freshwater and estuarine fish and invertebrate species and their habitats include degradation resulting from the introduction of nonnative species (which prey on and displace native aquatic species and alter habitat), water diversion, stream channelization, pollution and sedimentation, and nonpoint sources of water pollution (Bishop Museum 2010, Townscape 2010).

Effect Types and Significance Criteria

Potential effects on freshwater stream habitats could result from construction activities or other disturbances, which may directly affect stream habitat by changing streamflow or stream gradient, or by altering other physical characteristics and thereby indirectly displacing fish, invertebrates, or aquatic insects. Land uses that cause substantial sedimentation or that alter natural stream channels could reduce the amount of habitat available for native species. Similarly, if invasive aquatic species are introduced via human activities, they could displace and greatly reduce the abundance of native species, especially those with specific and limited habitat requirements.

Potential effects on freshwater stream habitats would be considered significant if changes in the quantity or quality of stream habitats resulted in permanent or substantive declines in the number of native aquatic species or if He‘eia Stream receives a reduced Stream Biological Rating as a result of activities associated with the proposed action or Alternative 1.

Table 4-3. Information Available for Analysis of Freshwater Stream Habitat Effects

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Adverse effects on freshwater stream habitats and on native and endemic freshwater species	<ul style="list-style-type: none"> • Characterization of aquatic communities • Physical stream habitat variables • Early detection and management actions necessary to minimize and avoid invasive species introductions 	Englund et al. 2003, Parham et al. 2008, and Townscape 2010: These sources document the types of habitat and biological communities that are present, and identify threats.	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawai'i Community Development Authority.
 Yes = Existing sources are sufficient for analysis.

4.1.4 Estuarine Habitats

The upper intertidal parts of the proposed action area, including the seaward portion of He'eia Fishpond and lower reaches of He'eia Stream, are dominated by red mangrove and estuarine mudflats, and are inundated by fresh water from He'eia Stream and by seawater when the tide is high (Figure 4-1). Large fluctuations in water quality in the estuary cause abrupt changes in dissolved oxygen, pH, salinity, and temperature (Jokieli 1991). The mangroves capture sediment and organic material that are transported downstream and deposited in the estuary, creating a silty mud bottom along the coast. These areas function as breeding and nursery habitat for marine life and attract many resident coastal species that are tolerant of changes in salinity. Currently, the estuarine ecosystem of He'eia is vulnerable to effects resulting from polluted runoff, changes in land use patterns, accelerated or changed rates of freshwater discharge, fishpond modifications, wetland management, and construction associated with urbanization.

Following curtailment of sewage discharges in 1978–1979, researchers noted shifts and an apparent decline in the abundance and distribution in southern Kāne'ohe Bay of the rare inarticulated brachiopod, *Lingula reevii*, a federal Species of Concern (Woo 2000, Hunter et al. 2008). These changes suggested that, after the diversion of sewage, *L. reevii* may have been affected by changes in sediment deposition rates and factors such as lower particulate organic food supply (Hunter et al. 2008). Adverse effects may have been exacerbated further by habitat alteration and displacement caused by the spread of the mat-forming invasive red algae, *Kappaphycus striatum* (Woo 2000, Hunter et al. 2008). Planned horizontal directional drilling during the implementation of the HIMB Infrastructure Rehabilitation and Replacement Project at Moku o Lo'e has the potential to further alter the estuarine environment in this portion of the proposed action area, but impacts are expected to be short term (Community Planning and Engineering, Inc. 2014).

Effect Types and Significance Criteria

Although estuarine habitats and resources are vulnerable to a wide range of adverse effects resulting from human activities and natural events, they are not expected to be affected directly by the proposed action or alternatives. Effects that may be considered in the programmatic NEPA analysis may include potential increases in stormwater discharge, pollution, or construction runoff. These could threaten fish, invertebrates, or other organisms in the estuary. Also, if human activities contributed to the invasion of species such as marine algae, these could degrade estuarine habitats and displace native flora and fauna.

Effects on estuarine habitats and resources would be considered significant if activities associated with the proposed action caused the direct loss of habitat or mortality of fish and benthic communities, through sedimentation, reduction in water quality (as measured by total suspended solids [TSS], dissolved oxygen, and nutrient levels), polluted discharge, or invasive species. Prolonged exposure to these types of stressors would be significant if effects resulted in long-term or permanent declines in populations of key indicator species.

Table 4-4. Information Available for Analysis of Estuarine Habitat Effects

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Proposed Action	Is Sufficient Information Available?	
				Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Effects on estuarine habitats and resources	<ul style="list-style-type: none"> Current estuarine processes and threats 	Woo 2000, Englund et al. 2003, Hunter et al. 2008, and Townscape 2010: These sources document estuarine processes, biological responses to sedimentation, pollution, urbanization, and invasive species.	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawai‘i Community Development Authority.

Yes = Existing sources are sufficient for analysis.

4.1.5 Coastal and Marine Habitats

The coastal waters of Kāne‘ohe Bay are influenced by a combination of estuarine and marine processes, and support a dynamic ecological structure composed of diverse assemblages of marine invertebrates, coral, and fish. The proposed action area is located between the southeastern and central sections of Kāne‘ohe Bay; the waters in this area are characterized by relatively high rates of freshwater input and slower overall rates of circulation.

Three distinct physiographic zones that define the marine environment of Kāne‘ohe Bay were described by Jokiel (1991)—inshore, inner bay, and outer bay. Most of the inshore area is fronted by shallow fringing reef <3.3 feet deep that extends 1640–2460 feet offshore. Seaward of this fringing reef and the intertidal

zone lie the inner bay and lagoon, which include patch reefs containing rich coral colonization, algal communities, and sand and sea grass beds. The inner bay waters support abundant planktonic organisms (Smith et al. 1981, Taguchi and Laws 1987, Ringuet and Mackenzie 2005) and a diverse assembly of reef-associated and pelagic fish species (Jokiel 1991, Hunter and Evans 1995). The inner bay receives considerably more oceanic enrichment than do the inshore waters because of its physiography relative to the open ocean. The outer bay is fronted by a barrier reef complex that slopes gently seaward and receives considerable marine nourishment, owing to wind-driven mixing of surface waters and transport of deeper oceanic waters into the bay.

In total, about 25% of the more than 6500 currently described species of Hawaiian coral reef organisms are endemic (Fautin et al. 2010), and many of these are found among the diverse habitats of Kāneʻohe Bay. Kāneʻohe Bay is considered an outstanding world-class scientific and field research setting because of the complex patch reef structure, fringing reef that extends the landward margin, well-flushed lagoon, and diversity of habitats and organisms present (Bahr et al. in prep.).

During storm events, coastal waters can receive a considerable influx of fresh water and particulate organic material, resulting in amplified sedimentation and reductions in salinity that acutely affect the health and stability of coral reef communities on short times scales. Discharges of polluted waters into Kāneʻohe Bay have occurred in the vicinity of the proposed action area; these can result in chronic mortality of coral and other organisms, which may take years to recover (Jokiel et al. 1993). Since the 1980s, coral bleaching events have been documented with increased frequency on a global scale, sometimes resulting in severe mortality of affected corals. The first large-scale coral bleaching event in Hawaiʻi occurred during the late summer of 1996 and was monitored closely in Kāneʻohe Bay (Jokiel and Brown 2004). A second major bleaching event occurred in the Northwestern Hawaiian Islands during summer 2002 (Brainard 2002, Aeby et al. 2003). Because bleaching events are occurring with greater frequency in response to ocean and atmospheric forces, resource management agencies and HIMB are closely monitoring the onset of these events and the recovery of corals in Kāneʻohe Bay (Jokiel and Brown 2004, Buddemeier et al. 2008).

Lastly, diseases that adversely affect the health and survival of corals have been documented in Kāneʻohe Bay. *Montipora* white syndrome (aMWS), a tissue-loss disease found on corals throughout the Hawaiian Archipelago, affects only *Montipora capitata* (rice coral), a common and widespread species in Kāneʻohe Bay. Research on the causes of the disease has identified the bacteria *Vibrio owensii* as a potential bacterial coral pathogen that affects Hawaiʻi's reefs (Ushijima et al. 2012). These types of stressors could contribute to cumulative effects on the ecological resilience of marine habitats in the proposed action area and the Alternative 2 outer reef boundary expansion area.

Effect Types and Significance Criteria

Because the proposed action and alternatives would mostly involve activities in the terrestrial environment, any potential effects of the NERR designation on coastal and marine habitats likely would stem from

fishpond management, wetland management, stream habitat modifications, and any activity that might contribute to changes in the rate and constituent properties of freshwater discharge. Specifically, potential adverse effects could be caused not only by unusually high rates of freshwater discharge, but by related introductions of nonnative invasive species and inputs of polluted runoff. Habitat effects could contribute to, or be exacerbated by, an increased incidence or severity of coral bleaching events or of diseases that affect corals and other organisms (Hunter and Evans 1995, Jokiel et al. 2004).

Effects on coastal and marine habitats and resources would be considered significant if they resulted in loss of available habitat for reef corals, other benthic organisms, or fish, through the introduction and proliferation of invasive marine algae or increased incidence of diseases that could adversely affect the resilience of the coastal and marine ecosystem in the proposed action and Alternative 2 areas. These significant effects would be predicted to occur if water quality were considered likely to worsen as a result of the action or alternatives, as measured by the standards set by the State (see Section 4.5, “Water Quality”).

Table 4-5. Information Available for Analysis of Coastal and Marine Habitat Effects

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Effects on coastal and marine habitats and resources	<ul style="list-style-type: none"> • Distribution, health, and relative abundance of coral species • Occurrence, severity, and distribution of invasive species and diseases • Bleaching events and severity • Resource uses and sustainability 	Jokiel et al. 1993, Hunter and Evans 1995, Woo 2000, Brainard 2002, Friedlander and DeMartini 2002, Aeby et al. 2003, Jokiel and Brown 2004, Ringuet and Mackenzie 2005, Fautin et al. 2010, Baker et al. 2011, Ushijima et al. 2012, Guidry et al. 2013, and Bahr et al. in prep.: These sources characterize the ecology of Kāneʻohe Bay and adjacent coastal marine systems, identify programs that detect invasive species and pathogens, and identify the existing resource management framework.	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawai‘i Community Development Authority.

Yes = Existing sources are sufficient for analysis.

4.2 Endangered and Threatened Species

4.2.1 Rare, Endangered, and Threatened Plants

More than 343 plant species are listed as threatened or endangered in the State of Hawai‘i. Critical habitat has been designated for a limited number of listed plant species or plant species clusters; however, the proposed action area does not overlap with any such critical habitat (USFWS 2015b). Given the long history of land disturbance in the action area, it is not surprising that the area’s wetlands and uplands do not apparently harbor any rare, threatened, or endangered plants.

Krauss (1976) reported that the native plants pili (*Heteropogon contortus*), ‘ākia (*Wikstroemia* sp.), mountain nuapaka (*Scaevola gaudichaudii*), and ‘ōhi‘a lehua (*Metrosideros collina*) grow in the vicinity of the proposed action area, just east of Kahekili Highway and about 0.5 mile north of Haiku Road. Indigenous hala (*Pandanus tectorius*) and hau trees were observed in a residential neighborhood near the action area, just east of the He‘eia small boat harbor (Lamoureux 1986). Native plants reported in He‘eia State Park are hala, hau, loulu (*Pritchardia* sp.), and naupaka (*Scaevola sericea*) (Weissich 1993).

Although these surveys, conducted since the 1970s in and around the action area, reported some native plants, none except LeGrande (2006) reported the presence of threatened or endangered plant species (Krauss 1976, Lamoureux 1983, Calvin Kim and Associates 1990, Brooks 1991, Weissich 1993). *Achyranthes* (*A. splendens* var. *rotunda*) was the only endangered, endemic plant reported (LeGrande 2006); it is cultivated in the residential neighborhood near the fishpond. Although this variety of the species is both State- and federally listed as endangered (USFWS 2013), because the individuals found on the property had been planted and their provenance could not be determined, the plants do not have the same protection status that is given to wild plants (HAR Section 13-107-7).

Effect Types and Significance Criteria

Potential effects of the proposed action or alternatives on threatened and endangered plants would be considered significant if these plant species’ populations or their habitats were adversely affected. An adverse effect on a population would entail a direct or indirect effect that caused the destruction of a rare, threatened, or endangered plant or its population. An adverse effect on the habitat of a rare, threatened, or endangered plant would entail alteration of the habitat such that it could no longer support the recruitment and establishment of these plants. No such effects are anticipated to occur, because these plants are apparently absent from the action and alternative areas.

Table 4-6. Information Available for Analysis of Effects on Rare, Endangered, and Threatened Plants

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Effects on threatened or endangered plant populations or habitats	Distribution of rare, threatened, or endangered plants in the action area	<ul style="list-style-type: none"> Krauss 1976, Lamoureux 1983, PBR Hawai'i 1993, LeGrande 2006, Townscape 2011a and b, USFWS 2013: These sources document that no threatened or endangered plants have been found around upland areas, in residential areas along Kamehameha Highway (except as noted), in He'eia State Park, or in wetlands; the sources also discuss that the upland areas in particular are highly degraded by urbanization and unlikely to support rare, threatened, or endangered plants. USFWS 2015b: This source documents that the action area is not designated or proposed as critical habitat for listed plants. 	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawai'i Community Development Authority; USFWS = U.S. Fish and Wildlife Service. Yes = Existing sources are sufficient for analysis.

4.2.2 Endangered and Threatened Terrestrial Wildlife

Like all areas in Hawai'i that still have vegetative cover, the terrestrial habitats in the proposed action and alternative areas could support rare, candidate, threatened, or endangered species. In recent coordination letters regarding projects in the vicinity of He'eia, USFWS listed the Hawaiian stilt (ae'o, *Himantopus mexicanus knudseni*), Hawaiian moorhen, Hawaiian coot ('alae kea, *Fulica alai*), Hawaiian duck (koloa maoli, *Anas wyvilliana*), and the Hawaiian hoary bat ('ope'ape'a, *Lasiurus cinereus semotus*) as federally listed species that may occur in the He'eia area (Townscape 2011b, Community Planning and Engineering, Inc. 2014). USFWS based this advice on data compiled by the Hawai'i Biodiversity and Mapping Program and the Hawai'i GAP Program, and on information from USFWS files.

Of the vegetated habitats in the proposed action area, the wetlands offer the greatest potential to support or attract special-status species. Biannual waterbird counts conducted at He'eia marsh confirm that the site is used by all four endangered waterbirds listed above, albeit in low numbers (DOFAW unpublished data,

USFWS 2011). Recent biological surveys of wetlands in the proposed action area found only sporadic occurrences of listed avian species. A 2011 biological survey of the Kāko‘o ‘Ōiwi wetlands recorded only a mallard-koloa hybrid (*Anas* sp.) in lo‘i and open-water ponds (Townscape 2011a). In addition, workers at Kāko‘o ‘Ōiwi observed a pair of stilts visiting and nesting in the wetland during the past 2 years (Shultz pers. comm. 2014).

Recent environmental assessments and conservation planning conducted for sites in the He‘eia area include correspondence from USFWS that advises of the potential presence of the Hawaiian hoary bat, another terrestrial listed species (Townscape 2011b, Community Planning and Engineering, Inc. 2014). Field surveys for these projects focused on birds and incidental observations of introduced mammals; no surveys were conducted specifically for Hawaiian hoary bats, although their potential presence was acknowledged (Helber Hastert & Fee 2007, Community Planning and Engineering, Inc. 2014). Helber Hastert & Fee (2007) noted that the Hawaiian hoary bat is known to forage over ponds and bays and roost in dense forests similar to the hau and mangrove vegetation in the proposed action area.

Townscape (2011a) further identified the Hawaiian owl (pueo, *Asio flammeus sandwichensis*) and O‘ahu creeper (‘aluahio, *Paroreomyza maculata*) as listed species with potential to occur in the proposed action area, but this information was likely based on historical or regional records. These species were not included in USFWS coordination letters for projects in the vicinity, have not been recorded during recent surveys, and are not mentioned in other environmental assessments from the area. The last well-documented observation of O‘ahu creeper was of two birds seen on Poamoho Trail (west of the ahupua‘a of He‘eia—on the west facing slopes of the Koolau Range) in 1985 (USFWS 2006).

None of the terrestrial habitats that occur in the action or alternative areas are identified as proposed or listed critical habitat for any endangered species (Helber Hastert & Fee 2007, Townscape 2011a, Community Planning and Engineering, Inc. 2014, USFWS 2015b). Critical habitat has not been designated for any of the listed waterbird species, and the He‘eia marsh was not identified as one of the “core” wetlands in the most recent recovery plan for endangered Hawaiian waterbirds (USFWS 2011). However, He‘eia marsh was identified as a “supporting” wetland. The USFWS recovery plan describes He‘eia as a site that historically had value as a complex of tidal marshes and open-water areas, but which has been substantially modified and presently consists of nonnative mangroves, remnants of ponds, and wet pasture. The recovery plan recommends that He‘eia be restored and managed by the State to provide enhanced habitat for endangered waterbirds (USFWS 2011).

Conservation management actions recommended for the He‘eia wetlands in the USFWS endangered waterbird recovery plan include actions to combat the impacts of invasive species, such as managing vegetation, controlling undesirable plant species, preventing introduction of invasive nonnative plants, eliminating predators, controlling avian disease, and removing the threat of mallard-koloa hybridization (USFWS 2011). Invasive species are recognized as a major problem in the He‘eia wetlands by the

conservation plans developed by Kāko‘o ‘Ōiwi for its wetland conservation project (Townscape 2011a, 2011b). The proposed action and alternatives are consistent with the recovery plan recommendations.

Effect Types and Significance Criteria

Effects on listed waterbirds would be considered significant if *take*¹ occurred, or if occupied habitat were significantly degraded or made unsuitable. One circumstance in which such effects could occur is if current or future management of wetlands attracted listed waterbirds, and then the wetlands were left unmanaged or were poorly managed. Such a change could result in failed nesting attempts and adult mortality, and consequent declines of waterbird populations. Management of occupied wetlands must minimize losses by predators (rats, mongooses, cats, and dogs), losses to avian disease (botulism), and hunting by humans (USFWS coordination letter in Townscape 2011b). The introduction and spread of nonnative invasive species also has been identified as contributing to cumulative impacts on threatened and endangered species and other trust resources in the He‘eia area; population-level effects of invasive species on listed waterbirds and their habitat may be considered significant if the invasive species caused mortality (e.g., via the introduction of a pathogen or predator) of listed species or degraded their habitat (e.g., via a weed invasion) to such a degree as to cause a population decline.

Effects on the Hawaiian hoary bat would be considered significant if young bats were at risk of being harmed or killed when left unattended in woody vegetation (USFWS coordination letter, in Townscape 2011b). Also, as described for waterbirds, the introduction and spread of nonnative invasive species could be considered a significant effect on the hoary bat if the invasive species caused mortality (e.g., via the introduction of a pathogen or predator) of bats or degraded their habitat (e.g., via a tangling weed invasion) to such a degree as to cause a population decline.

4.2.3 Endangered and Threatened Marine Species

The ecosystem in Kāne‘ohe Bay contains a diverse array of marine and freshwater habitats that may support several State- or federally listed threatened, endangered, and special-status species. Coral reefs are recognized as Essential Fish Habitat (EFH) under the provisions of the Magnuson-Stevens Fishery Conservation and Management Act (50 CFR 600) and are managed by the National Marine Fisheries Service (NMFS) to ensure the conservation and enhancement of EFH. In October 2009, the Center for Biological Diversity petitioned NMFS to list 83 reef-building corals as threatened or endangered under the Endangered Species Act (ESA) and to designate critical habitat. Seventy-five of the petitioned species occur widely in the Indo-Pacific region. NMFS conducted an extensive review and determined that 40 of the Indo-Pacific species in the proposal did not warrant listing, including several coral species that had already been listed as threatened and which occur in Hawai‘i (NOAA 2014). As a consequence of the

¹ The term *take* means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (Title 16, United States Code [USC], Section 1532).

Table 4-7. Information Available for Analysis of Effects on Endangered and Threatened Terrestrial Wildlife

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Direct or indirect take of listed birds or their habitat	<ul style="list-style-type: none"> Current rare bird distribution and abundance 	PBR Hawai‘i 1993, Helber Hastert & Fee 2007, Townscape 2011a and b, USFWS 2011, Community Planning and Engineering, Inc. 2014: All sources except USFWS 2011 and Townscape 2011a document that no listed species or habitat are found in the action area; USFWS 2011 and Townscape 2011a note presence of small numbers of listed endangered waterbirds in the Kāko‘o ‘Ōiwi wetland habitat: koloa, mallard-koloa hybrid, and Hawaiian stilt, coot, and moorhen.	Yes	Yes	Yes
Effects of invasive species on listed birds or their habitat	<ul style="list-style-type: none"> Current distribution and abundance of invasive species 	USFWS 2011 and Townscape 2011a: These sources document the presence of and problems with invasive species in the Kāko‘o ‘Ōiwi wetland habitat. They also identify conservation measures to control invasive species.	Yes	Yes	Yes
Direct or indirect take of listed mammals or their habitat	<ul style="list-style-type: none"> Current distribution and abundance of Hawaiian hoary bat in the action and alternatives areas 	Townscape 2011a and b, Community Planning and Engineering, Inc. 2014: These sources acknowledge the potential presence of Hawaiian hoary bats and identify measures to avoid take.	Yes	Yes	Yes
Effects of invasive species on listed mammals or their habitat	<ul style="list-style-type: none"> Current distribution and abundance of invasive species 	Townscape 2011a and b, Community Planning and Engineering, Inc. 2014: These sources document the presence of and problems with invasive species, and identified measures to avoid take. Also see Table 4.1 for information needed regarding invasive species.	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawai‘i Community Development Authority; USFWS = U.S. Fish and Wildlife.

Yes= Existing sources are sufficient for analysis.

NMFS ruling, there are presently no federally listed species of coral in the Hawaiian Islands. Effects on sensitive coral species are not discussed further in this section, but coral bleaching, coral resilience, and acidification of the ocean are discussed in Section 4.1.5, “Coastal and Marine Habitats,” Section 4.3.4, “Marine Fauna,” and Section 4.7, “Climate.”

Two federally listed marine vertebrates are known to occur near the proposed action and Alternative 2 areas: the threatened green sea turtle (honu, *Chelonia mydas*) and the endangered Hawaiian monk seal (*Monachus schauinslandi*).

The green sea turtle forages and rests in Kāneʻohe Bay. As elsewhere in the main Hawaiian Islands, green turtles in Kāneʻohe Bay were legally hunted until 1978, when full protection was provided under the ESA. The species has exhibited a consistent increase in the number of nesting females over the past 4 decades, suggesting that the population may be increasing at a steady rate (Hamburg and Balazs 2014). In March 2014, NMFS and USFWS published a proposed rule that would classify the Hawaiian green turtle population as a Distinct Population Segment (referred to in the proposed rule as the Central North Pacific DPS), and that delisting this DPS currently is not warranted (USFWS and NOAA 2015).

Balazs et al. (1998) reported that, between 1989 and 1998, of 581 turtles captured, examined, and tagged in Kāneʻohe Bay, 43.9% exhibited manifestations of the tumor-forming disease fibropapillomatosis (FP). The causes of FP are not clear, but research is being conducted to gain insight into whether habitat or related environmental factors might affect the distribution and prevalence of FP. Kāneʻohe Bay and adjacent coastal waters constitute important, long-term, in-water research sites that have been established in the main Hawaiian Islands to monitor FP prevalence and obtain baseline data on the biology, ecology, behavior, and life history of green turtles (Balazs et al. 1998, Francke et al. 2013).

The Hawaiian monk seal also may occur in the marine habitat of the proposed action and Alternative 2 areas. Although the seal has experienced a significant population decline in the last few decades and most of the current population resides in the Northwestern Hawaiian Islands, an increasing number of sightings and births have recently occurred in the main Hawaiian Islands. The 2011 best minimum abundance estimate for the main Hawaiian Islands is more than 150 seals, and it appears that the population is continuing to expand. Monk seals in the main islands forage, travel, and rest in nearshore waters, increasingly close to human population centers, including popular beaches, marinas, streams, coastal lagoons, and estuaries. In these areas, the seals may be exposed to agricultural activity, livestock, feral and domestic animals, and sources of polluted runoff and sewage, which may increase disease transmission (Littnan et al. 2006, Aguirre et al. 2007).

Effect Types and Significance Criteria

Effects on marine mammals and reptiles would be considered significant if they involved direct or indirect take of individuals or degradation of the species' habitat such that the habitat became unsuitable for use by the animals. Construction and disturbance activities may temporarily displace Hawaiian monk seals and green turtles, but because of the habits of these species, they are not expected to be affected by activities associated with the proposed action or alternatives.

Table 4-8. Information Available for Analysis of Effects on Endangered and Threatened Marine Animals

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Direct or indirect take of listed marine mammals or their habitat	Distribution and status of Hawaiian monk seals in Kāneʻohe Bay	Goodman-Lowe 1998, Parrish 2004, Littnan et al. 2006, Aguirre et al. 2007, and Baker et al. 2011: The sources document ongoing efforts to evaluate the population structure of Hawaiian monk seals in the main Hawaiian Islands and evaluate environmental constraints, risks, and interaction with human activities.	Yes	Yes	Yes
Direct or indirect take of listed marine reptiles or their habitat	Distribution and status of green sea turtles in Kāneʻohe Bay	Balazs et al. 1998, Francke et al. 2013: These sources state that NMFS continues to assess the health and stability of green turtles in Kāneʻohe Bay, with an emphasis on assessing quality foraging resources, disease occurrence and prevalence, and outreach efforts designed to minimize risk and avoid take.	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawaiʻi Community Development Authority; NMFS = National Marine Fisheries Service.
 Yes = Existing sources are sufficient for analysis.

4.3 Other Flora and Fauna

4.3.1 Other Flora

A few native plant species, including some endemics, were recorded in past or recent surveys in the proposed action and Alternative 1 areas. This section describes the vegetation that occurs in each portion of the proposed action and Alternative 1 areas.

The vegetation in the northern half of the HCDA upland areas primarily comprises nonnative species. Introduced trees such as Christmas berry (*Schinus terebenthifolius*), Java plum (*Syzygium cumini*), silver oak (*Grevillea robusta*), strawberry guava (waiawā, *Psidium guajava*), and ironwood (paina, *Casuarina equisetifolia*) dominate the upland areas. Native shrubs akia and mountain naupaka, and the native pili grass, were reported to dominate the understory in the 1970s (Krauss 1976), but later surveys (Lamoureux 1983, Townscape 2011a) in and around these areas did not report an abundance of these species.

The vegetation in the southern half of the HCDA upland areas (which are scattered in and around the wetlands) may be intermittently flooded, but these areas largely do not support obligate wetland plants. One

endemic species, akia, and two indigenous species, hala and hau, were reported to occur along Kealohi Road (Townscape 2011a). Widespread introduced species reported include Java plum, maile pilau (*Paederia foetida*), basket grass (*Oplismenus hirtellus*), and wedelia (*Sphagneticola trilobata*).

The upland areas directly around the residential neighborhood support escaped ornamental plants such as yellow ginger (‘awapuhi melemele, *Hedychium flavescens*), impatiens (*Impatiens sultani*), heliconia (*Heliconia* sp.), primrose willow (kāmole, *Ludwigia octovalvis*), and mango (*Mangifera indica*). It is likely that the ground there remains moist year-round because obligate plant species such as taro (kalo, *Colocasia esculenta*), Chinese taro (*Alocasia cucullata*), and honohono (*Commelina diffusa*) also are reported to occur in this area (Calvin Kim and Associates 1990).

Herbaceous plants reported to be growing along He‘eia Stream include basket grass, wedelia, and sword fern (laua‘e haole, *Microsorium scolopendria*). Trees overhanging the stream include hau, rose apple (*Eugenia jambosa*), guava, macranga (*Macaranga grandifolia*), and octopus trees (Calvin Kim and Associates 1990). The understory vegetation lining the streambank includes species like Job’s tears (kūkaekōlea, *Coix lachrymal-jobi*), wedelia, basket grass, dumb cane (*Dieffenbachia* sp.), ‘ape (*Xanthosoma robustum*), banana, and umbrella sedge (‘ahu‘awa haole, *Cyperus alternifolius*).

Common facultative wetland plant species in the grasslands include California grass, honohono, sensitive plant (pua hilahila, *Mimosa pudica*), sedge (*Frimbristylis littoralis*), and Job’s tears. Some parts of the seasonally wet grasslands have more natural marsh characteristics where the flow from He‘eia Stream is diverted into channels and low-lying areas. Such areas support wetland obligate plant species such as arrowhead (*Sagittaria sagittaeifolia*) and kāmole. Indigenous wetland plant species identified included ‘aka‘akai (*Schoenoplectus tabernaemontani*) and neke fern.

The vegetation along Kamehameha Highway, around the houses, mostly comprises cultivated plants such as mango, bananas, papaya (*Carica papaya*), ginger, crotons (*Croton* spp.), ti (ki, *Cordyline* spp.), and heliconias (*Heliconia* spp.). Avenue tree species such as monkey pod (*Samanea saman*) and false kamani (*Terminalia catappa*) are common. In some mauka (inland) gulches, guava, Christmas berry, Java plum, and ironwood form small patches of closed forest. The grasslands are dominated by introduced grasses such as broomsedge (*Andropogon virginicus*), California grass, molasses grass (*Melinis minutiflora*), guinea grass (*Megathyrsus maximus*), and dallis grass (*Paspalum dilatatum*), along with other introduced herbaceous plants such as vervain (*Stachytarpheta cayennensis*), partridge pea (laukī, *Chamaecrista nictitans*), and Spanish clover (ka‘imi, *Desmodium incanum*) (Lamoureux 1983).

A flora survey of He‘eia State Park found a wide variety of ornamental and cultivated plant species, such as star fruit (*Averrhoa carambola*), bauhinia (*Bauhinia purpurea*), mango, and allspice (*Pimenta dioica*). Some indigenous plant species such as loulou, hala, milo (*Thespesia populnea*), and kukui (*Aleurites moluccana*) were also recorded to occur in the park.

The flora in and around the residential area to the east of the fishpond comprises ornamental plants, hau, and mangrove species of *Bruguiera sexangula*, *B. gymorhiza*, and red mangrove (Brooks 1991, LeGrande 2006). Several native plants have been recorded to be intentionally planted and cared for in this area. These include kalo (*Colocasia esculenta*), ‘ahu‘awa (*Cyperus javanicus*), naupaka, naio (*Myoporum sandwicense*), ‘a‘ali‘i (*Dodonaea viscosa*), and pōhinahina (*Vitex rotundifolia*). As discussed in Section 4.2, the endangered *Achyranthes splendens* var. *rotunda* was found cultivated in the residential neighborhood. This variety is both State- and federally listed as endangered, but because the individuals found on the property were planted and their provenance could not be determined, the plants are not given the same protection status that wild plants receive.

The vegetation in the upland areas of Moku o Lo‘e is highly disturbed by previous and ongoing land uses. The flora on the island predominantly comprises nonnative plants and only three indigenous plant species—naupaka, hau, and milo—were reported to occur on the island (Char & Associates 1994, 1995; SWCA 2013). Red mangrove and pickleweed (*Batis maritima*) are common along the shoreline. Coconut (*Cocos nucifera*), phoenix palms (*Phoenix* sp.), ironwood, milo, and red powderpuff (*Calliandra haematocephala*) are some of the commonly seen trees on the island. Ornamental and cultivated plants growing on the island include Bermuda grass (*Cynodon dactylon*), red ginger (*Alpinia purpurata*), plumeria (*Plumaria pudica*), papaya, and ixora (*Ixora* sp.). Other common nonnative and weedy plants recorded on the island included Christmas berry, octopus tree, koa haole, pitted beardgrass (*Bothriochloa pertusa*), Hilo grass (*Paspalum conjugatum*), Chinese violet (*Asystasia gangetica*), Indian fleabane (*Pluchea indica*), and spurges (*Euphorbia* spp.) (SWCA 2013).

Effect Types and Significance Criteria

Effects on the native plant species in the proposed action and alternative areas would be considered significant if they resulted in an overall reduction in population size or involved impacts on large numbers of individuals. Effects on native plants also would be considered significant if modification to their existing habitat prevented their recruitment and establishment. Impacts on habitats commonly result from land clearing or construction activities associated with development; however, no such activities are planned as part of the proposed action or alternatives. Rather, habitat modification through ongoing restoration projects is likely to have a positive effect on native plants.

Table 4-9. Information Available for Analysis of Effects on Other Flora

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Population-level effects on native flora or significant modification of habitat	Native species distribution and abundance, and evidence of modification of habitats	Krauss 1976, Lamoureux 1983, Calvin Kim and Associates 1990, Brooks 1991, PBR Hawai‘i 1993, LeGrande 2006, Townscape 2011a and b, and SWCA 2013: The sources provide a sufficient inventory of botanical resources, including the distribution and abundance of native plants. These sources also discuss ongoing and future habitat modifications, such as restoration projects.	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawai‘i Community Development Authority.

Yes = Existing sources are sufficient for analysis.

4.3.2 Other Terrestrial Fauna

A variety of biological surveys and assessments have been done for projects in the He‘eia area in recent years (Helber Hastert & Fee 2007, Townscape 2011a, Community Planning and Engineering, Inc. 2014). The fauna found in the proposed action and Alternative 1 areas includes the common coastal, rural, and urban-introduced birds and mammals typically found in beachside, garden, parkland, and agricultural areas on O‘ahu, plus a few of the common wetland and coastal native and migratory species. This section describes the fauna that occurs in each portion of the proposed action and Alternative 1 areas.

Fauna identified in the wetland habitats includes cane toad (*Bufo marinus*); globe skimmer dragonfly (*Pantala flavescens*), scarlet skimmer (*Crocothemis servilia*), and three other dragonfly species (red, blue-green, and purple *Ischnura* spp.) near shallow stagnant water; a *Heteropoda* sp. cane spider (*Heteropoda venatoria*); cyclid fish, mosquitofish, and crayfish in the demonstration lo‘i and ponds; and mallard-koloa hybrid, Shama thrush (*Copsychus malabaricus*), and Pacific golden plover (kolea, *Pluvialis fulva*) (Townscape 2011a). Domestic ducks, black-crowned night herons (‘auku‘u, *Nycticorax nycticorax*), and cattle egrets (*Bubulcus ibis*) also have been recorded in waterbird surveys at the site (DOFAW unpublished data). Biannual waterbird counts conducted at He‘eia marsh confirm that the site is used by all four endangered waterbirds, albeit in low numbers (see Section 4.2.2, “Endangered and Threatened Terrestrial Wildlife”). Bullfrogs (*Rana catesbiana*) have been observed in small ponds in the seasonally wet grasslands (Calvin Kim and Associates 1990).

A survey for avifauna and feral mammals near the fishpond identified common native and nonnative birds and introduced mammals typically found in this region and throughout O‘ahu, including nine alien species of birds and one feral cat (*Felis catus*) (Helber Hastert & Fee 2007). Other mammals common to suburban areas, such as rats (*Rattus* sp.) and the house mouse (*Mus musculus*), are also likely to occur in the area. Native waterbirds such as black-crowned night herons and Hawaiian stilts have been reported along the edges of the fishpond. Although no native seabirds were recorded during the 2007 field survey, the black noddy (*Anous minutus*) and great frigatebird (‘iwa, *Fregata minor*) are expected to occur in this region. The Pacific golden plover was reported using the limited lawn habitat at the site (Helber Hastert & Fee 2007).

A recent survey at Moku o Lo‘e (Community Planning and Engineering, Inc. 2014) documented the common myna (piakelo, *Acridotheres tristis*), mallard-koloa hybrid, northern cardinal (*Cardinalis cardinalis*), common waxbill (*Estrilda astrild*), great frigatebird, zebra dove (*Geopelia striata*), red-crested cardinal (*Paroaria coronata*), Pacific golden plover, red-vented bulbul (*Pycnonotus cafer*), spotted dove (ekaho, *Streptopelia chinensis*), wandering tattler (‘ulili, *Tringa incana*), and Japanese white-eye (*Zosterops japonicas*). Approximately 30 individual native great frigatebirds were observed soaring above the island. Additionally, several individual ducks, likely to be mallard-koloa hybrids, were observed swimming in nearshore waters. Although not observed, black noddies are known to forage in Kāne‘ohe Bay, and could occasionally forage in the nearshore waters of Moku o Lo‘e. Mammals that are expected on the island include rats and mice. Lastly, the introduced monarch butterfly (*Danaus plexippus*) and the introduced honeybee (*Apis mellifera*) have been documented on the island (Community Planning and Engineering, Inc. 2014).

Migratory shorebirds are found in the proposed action area and will use the coastal habitats, estuaries, marshes, wetlands, and grasslands in the area. The *Pacific Islands Shorebird Conservation Plan* (Engilis and Naughton 2004) identifies Kāne‘ohe Bay as an important tidal flat used by flocks of shorebirds that forage at low tides. The plan also identifies tidal flats, where mangroves have been effectively removed, as providing positive benefits to shorebirds. Most of the freshwater, ephemeral, and managed wetlands on the windward and north shores of O‘ahu, including He‘eia marsh, are protected but exist in a degraded state. Lastly, the limited lawn habitat in the proposed action area could be used by the Pacific golden plover (Helber Hastert & Fee 2007).

Effect Types and Significance Criteria

Any effects on terrestrial fauna would be considered significant if large numbers of individuals or large portions of habitat were affected, such that the population of a species suffered a permanent decline. However, few effects on other terrestrial fauna are expected to result from the proposed action or alternatives. Any construction and other disturbance activities may temporarily displace species such as wandering tattler and Pacific golden plover if the activities are conducted during the migratory season, but these birds likely would return when construction is complete, and no long-term impacts are expected. Similarly, black noddies may be temporarily displaced during the rehabilitation of the Lighthouse Pier on

Moku o Lo‘e, but the displacement is expected to be temporary. Great frigatebirds typically fly at high altitudes and are not expected to be affected by the proposed action or alternatives (Community Planning and Engineering, Inc. 2014).

Table 4-10. Information Available for Analysis of Effects on Other Terrestrial Fauna

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Population-level effects on other terrestrial fauna, or significant modification of habitat	Inventories of fauna in the action and alternatives areas	Helber Hastert & Fee 2007, Townscape 2011a, Community Planning and Engineering, Inc. 2014: These sources provide inventories of common native and introduced birds and mammals, as well as mitigation measures.	Yes	Yes	n/a

Notes: Alt = Alternative; HCDA = Hawai‘i Community Development Authority.
 Yes = Existing sources are sufficient for analysis.

4.3.3 Other Freshwater and Estuarine Fauna

He‘eia Fishpond is the largest inland body of water in the proposed action area. This 88-acre seashore pond is located on the shoreline of Kāne‘ohe Bay and is completely surrounded by a rock wall. The waters of the pond receive freshwater input from the He‘eia Stream, which drains the He‘eia watershed and empties into the northwestern corner of the fishpond. The fishpond retains a brackish character owing to a tidal influx of seawater from the adjacent Kāne‘ohe Bay. Water flux into and out of the fishpond is regulated by a series of eight sluices. The pond has been used primarily as a site to promote aquaculture using traditional cultural practices of resource management (Helber Hastert & Fee 2007).

Fish species that live in the He‘eia Fishpond and adjacent fresh and estuarine waters include Hawaiian ladyfish (‘ama‘ama, *Elops hawaiiensis*), milkfish (awa, *Chanos chanos*), Dussumier’s surgeonfish (palani, *Acanthurus dussumieri*), flagtail (āholehole, *Kuhlia* spp.), threadfin (moi, *Polydactylus sexfilis*), porcupinefish (kokala, *Diodontidae*), barracuda (kākū, *Barracuda barracuda*), and juvenile trevally (papiro, *Carangidae*). The waters of the fishpond also contain various species of brackish water shrimp (‘ōpae, *Atyidae*), moray eel (puhi, *Gymnothorax* spp.), and mollusks (Townscape 2010, Paepae o He‘eia 2013).

Effect Types and Significance Criteria

The proposed action and alternatives are not expected to have direct or indirect effects on freshwater or estuarine fauna. Direct effects would be considered significant if they caused mortality of native freshwater organisms or long-term alteration of habitat necessary to support endemic species. Indirect effects would

be considered significant if they resulted in the inability of native freshwater species to reproduce normally or become established in unoccupied and otherwise suitable habitat. The introduction and spread of invasive species also would be considered to pose a significant threat to freshwater species and their habitats.

Table 4-11. Information Available for Analysis of Effects on Other Freshwater and Estuarine Fauna

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Effects on other freshwater and estuarine species	Species composition and habitat use	Helber Hastert & Fee 2007, Englund et al. 2003, Paepae o He'eia 2013: As part of the Final EA for He'eia Aquaculture Support Facilities, freshwater resources were identified in the action area. The sources also characterize threats and identify important species. Community-based conservation organizations have started to gather data on freshwater fish and invertebrates, as part of fishpond restoration.	Yes	Yes	Yes

Notes: Alt = Alternative; EA = environmental assessment; HCDA = Hawai'i Community Development Authority.
 Yes = Existing sources are sufficient for analysis.

4.3.4 Other Marine Fauna

Most of the 40 known species of corals that are documented in Hawai'i occur in Kāne'ōhe Bay, although only a few are abundant (Jokiel 1991). Hawai'i's corals are adapted to a wide range of wave energy conditions, which enables certain species to become widespread. The most abundant coral in Kāne'ōhe Bay is the finger coral, *Porites compressa*, representing more than 75% of the total coral population in Kāne'ōhe Bay (Maragos 1977, Jokiel 1991). Other common and fairly widespread species of coral found in Kāne'ōhe Bay are *Montipora verrucosa*, *Pocillopora damicornis*, *Cyphastrea ocellina*, *Pavona varians*, and *Fungia scutaria*.

Besides corals, a wide range of other invertebrates occupy the soft- and hard-bottomed demersal habitats of Kāne'ōhe Bay, such as various species of lobsters, crabs, octopus, pearl oysters, cowrie, cone shells, tunicates, sponges, shrimp, and feather duster worms (Jokiel 1991).

Kāne'ōhe Bay is a recognized pupping ground for the scalloped hammerhead shark (manō kihikihi, *Sphyrna lewini*), which is considered the most abundant carnivore in the bay. Several other species of elasmobranch fishes reside in the waters of Kāne'ōhe Bay, including the whitetip reef shark (*Trianodon obesus*), tiger shark (niuhi, *Galeocerdo cuvieri*), and a variety of rays (*Myliobatidae*, *Dasyatiidae*) (Jokiel 1991).

The marine waters of Kāneʻohe Bay in the proposed action and Alternative 2 areas support active recreational and subsistence fishing, and to a lesser extent, commercial fisheries. The fishery uses are broken down in general terms into those using active gear (hooks and lines, spears, trolls, crab nets, and throw nets) and those using passive gear (gill nets, surround nets, and traps). The main species taken using active gear are octopus, trevally and jacks (Carangidae), crabs (mainly *Portunus sanguinolentus*), goatfish (*Mullidae*), sharks (mainly scalloped hammerheads), akule (*Selar crumenophthalmus*), ʻawaʻawa (ladyfish, *Elops* spp.), uhu (*Scaridae*), taʻape (*Lutjanus kasmira*), and awa (milkfish, *Chanos chanos*). Octopus have consistently represented more than 50% of the total harvest of marine organisms taken for recreational and commercial uses, by all gear types and methods combined (Everson 1994, Everson and Friedlander unpublished data).

Over the years, considerable environmental and socioeconomic changes have affected the use of marine resources in Kāneʻohe Bay. Many of these changes have resulted in the introduction of regulatory measures that limit the catch and restrict the harvest season so as to support the replenishment and sustainability of resources. These regulatory measures are expected to continue, and may be adapted as new information becomes available and as threats and responses to various stressors are identified.

Effect Types and Significance Criteria

Threats to marine resources include overfishing, alteration of habitat, and displacement of fauna by the introduction and spread of invasive species, pollution, and disease. Any additional effects on other marine fauna would be considered significant if they resulted in the loss or significant decline of fish populations or coral species diversity, or in poor recovery of species. However, adverse effects on marine resources are currently minimized through public education, regulations, and enforcement, and further significant effects are not anticipated to result from the proposed action or alternatives.

Table 4-12. Information Available for Analysis of Effects on Other Marine Fauna

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Effects on other marine species	<ul style="list-style-type: none"> Distribution and abundance of key species Annual fishery data, including catch rates and statistics for recreation, subsistence use, and commercial fishing activity 	Williams et al. 2008, Gombos et al. 2010: These sources provide data on recreational fishing effort and catch rates in the main Hawaiian Islands, and on biological/ecological resilience factors by region.	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawaiʻi Community Development Authority.

Yes = Existing sources are sufficient for analysis.

4.4 Watershed and Hydrology

The action area is located in the 3.6-square-mile He'eia drainage basin, which extends 3.2 miles from the ocean to the 2826-foot summit of the Ko'olau Mountains (Townscape 2011a). In the basin, Ha'ikū Stream and 'Ioleka'a Stream merge to form the perennial He'eia Stream, which runs through the proposed action area. The terrestrial portion of the action area also includes approximately 405 acres of low-lying wetlands, most of which are within a floodway and within the Federal Emergency Management Agency's AE (high-risk) flood zone (Townscape 2011a). Another major water feature of the area is the He'eia Fishpond, an 88-acre brackish-water pond that extends from the shoreline out into Kāne'ohe Bay, enclosed by a 3500-foot-long wall built from volcanic rock and coral. A large storm damaged a 1000-foot portion of the wall in 1965, and the wall is slated for repairs in 2015 (U.S. Army Corps of Engineers 2012, Paepae o He'eia 2013). Lastly, the watershed is characterized by Kāne'ohe Bay. The bay is semienclosed by a barrier reef and therefore is heavily influenced by freshwater inputs. He'eia Stream is a relatively minor source of these inputs, given that it is only one of 11 streams that supply the bay with fresh water (Bahr et al. in prep.). Kāne'ohe Stream, just south of the proposed action area, is the largest freshwater source, accounting for more than 75% of the discharge into the southern section of the bay (Drupp et al. 2011).

Groundwater resources in the proposed action area were described in Kāko'o 'Ōiwi (2011):

The aquifer beneath the proposed site is within the Ko'olau Poko Aquifer System of the Windward Aquifer Sector. This aquifer mainly consists of high level dike-impounded groundwater. There are many groundwater seeps and springs in the wetlands of He'eia. The property area is located on the ocean side of the DOH Underground Injection Control (UIC) Line. There are no groundwater wells located onsite or in the vicinity of the property. The nearest groundwater wells are located in Upper Ha'ikū Valley, on the mountainside end of He'eia watershed. These wells are not listed as having contaminants.

He'eia watershed quality is considered "impacted" owing to the amount of impervious surfaces (18.41%), and most of the impervious surfaces (in the form of high-intensity development) are located just upstream of the proposed action area (Kailua Bay Advisory Council 2007) (Figure 4-8). Discharge records from He'eia Stream at Ha'ikū Valley, approximately 0.5 mile upstream of the proposed action area, indicate that high flows occur regularly in the watershed (U.S. Geological Survey [USGS] 2015) (Figure 4-9), and associated erosion and sedimentation are a concern for both the watershed and health of Kāne'ohe Bay. Coral health in the bay in particular has been negatively affected by nutrients and sediment-rich freshwater inputs (Guidry et al. 2013).

Actions that are part of the Māhuhua 'Ai o Hoi Project, independent of the proposed action, are likely to benefit the watershed and hydrology of the area. Invasive plants, such as California grass and other

nonnative plants that are constricting flows in the He'eia Stream channel, are being removed, along with invasive mangrove trees in the upper intertidal area and fishpond, which are acting as a sediment trap, filling the fishpond and contributing to destabilization of the fishpond walls (Townscape 2011a). Also, detention ponds are being constructed in the southern portion of the proposed action area, to help detain sediments and debris during storm events and thus reduce impacts on wetlands and agricultural areas (Townscape 2011a).

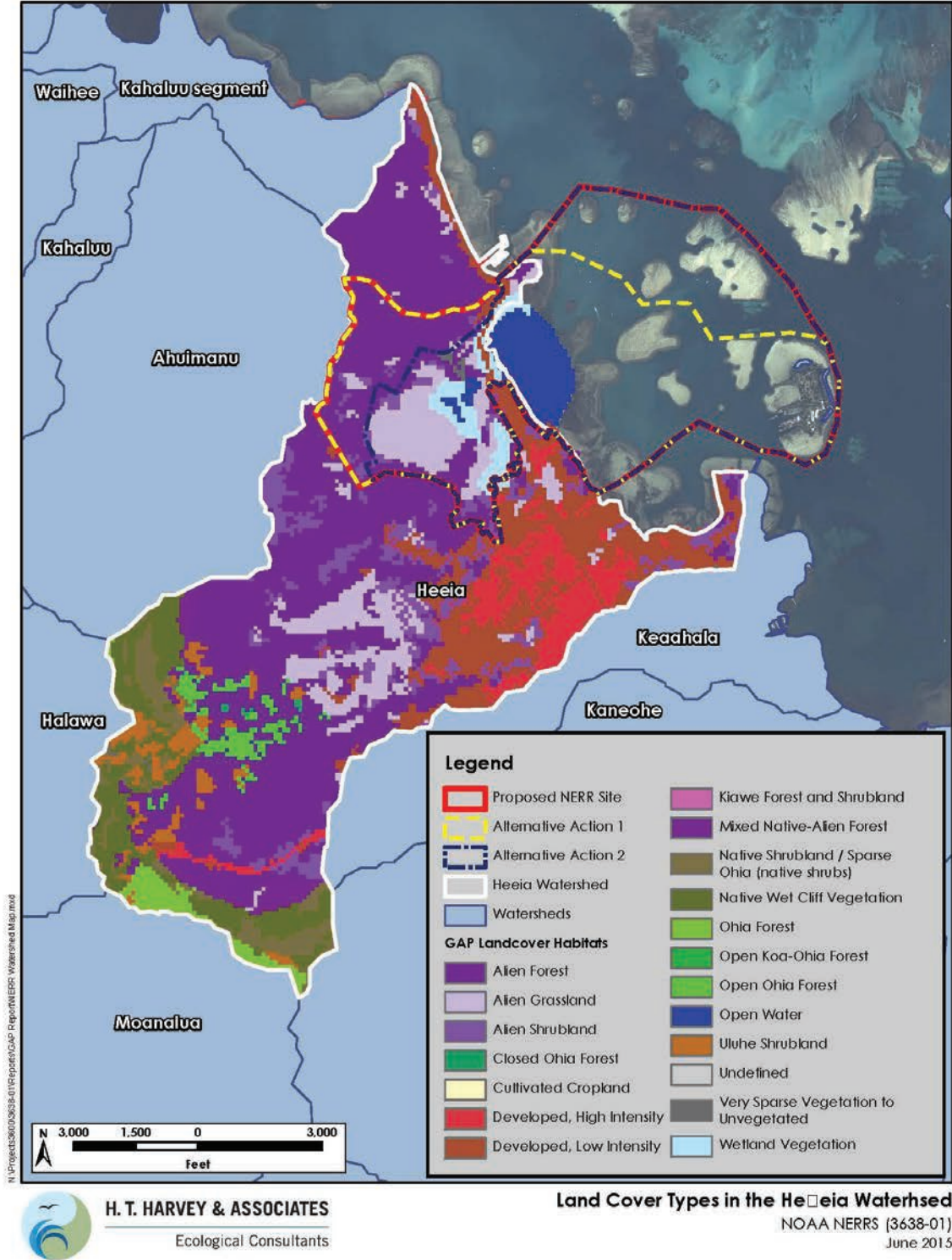


Figure 4-8. Land Cover Types in the He'eia Watershed (Kailua Bay Advisory Council 2007)

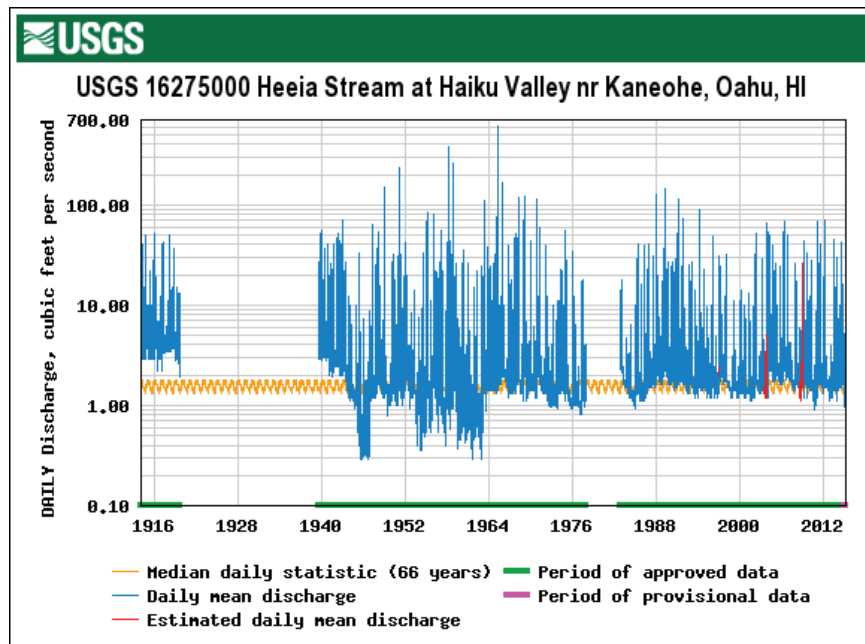


Figure 4-9. Daily Discharge of Fresh Water from He‘eia Stream (in Cubic Feet per Second) near Kāne‘ohe Valley, 1914–2014 (U.S. Geological Survey 2015)

Effect Types and Significance Criteria

Impervious-surface area is one of the most important indicators of watershed health, so additions of impervious surfaces would be considered to adversely affect the watershed (e.g., Arnold and Gibbons 1996; Booth et al. 2002, 2004). The proposed action is not likely to have any effect on impervious-surface area; however, high-density development just upstream of the proposed action area creates an already impacted condition that should be considered. Additionally, changes in the frequency or magnitude of peak flows could adversely affect the health of the watershed and water quality in Kāne‘ohe Bay.

Effects on hydrological and watershed characteristics would be considered significant if they involved substantial changes in the frequency and magnitude of peak flows in He‘eia Stream, or increases in the impervious-surface area in the He‘eia watershed.

Table 4-13. Information Available for Analysis of Watershed and Hydrological Effects

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Proposed Action	Is Sufficient Information Available?	
				Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Effects on watershed and hydrology	<ul style="list-style-type: none"> • Frequency and magnitude of peak flows • Impervious-surface area 	<ul style="list-style-type: none"> • USGS 2015: Source provides current and historical discharge data. • Kailua Bay Advisory Council 2007: Source provides impervious-surface area. 	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawai'i Community Development Authority; USGS = U.S. Geological Survey.

Yes = Existing sources are sufficient for analysis.

4.5 Water Quality

The water bodies in the proposed action and Alternative 2 areas consist of the perennial He'eia Stream, the estuary, He'eia Fishpond, and the semienclosed Kāne'ohe Bay (Figure 2-1). Water quality in these water bodies is important, because it affects the health of fish and coral populations in the bay, the quality of drinking water, and the resilience of natural water systems in the face of climate change.

Observed water quality impairment in the area likely originates in the uplands. Runoff from uplands may contain sediments naturally eroding from forestlands; nitrates from fertilizer runoff, septic tanks, sewage, or erosion of natural deposits; and pollutants from urban development and road construction (Sumiye 2002). Nutrient and sediment-rich fresh water runs off into Kāne'ohe Bay, especially during storm events, which induces phytoplankton blooms and threatens the health of the coral reefs in the bay (DeCarlo et al. 2007, Drupp et al. 2011, Guidry et al. 2013).

HIDOH is required by Clean Water Act Section 303(d) to report on the state's water quality on a 2-year cycle, and to submit a list of waters that do not meet state water quality standards, plus a priority ranking of listed waters exceeding total maximum daily load (TMDL) standards, based on the severity of pollution and the uses of the waters (HIDOH 2014). Both He'eia Stream and Kāne'ohe Bay are on the list for nonattainment of one or more of the water quality standards, so their status is reported on a 2-year cycle (HIDOH 2014). As of 2014, He'eia Stream had violated the standards for nitrate+nitrite-nitrogen (NO₃+NO₂) and total phosphorus (TP) during both the wet and dry seasons, but had attained the standard for turbidity, TSS, and total nitrogen (TN) (HIDOH 2014). Kāne'ohe Bay (Central Region, in the proposed action area) had violated the standards for TN, NO₃+NO₂, ammonia-nitrogen (NH₃), and turbidity, but there was insufficient data to evaluate bacteria, TP, and chlorophyll-*a* (chl-*a*) (HIDOH 2014). Records of the water quality data used for this assessment were unavailable.

Effect Types and Significance Criteria

The Hawai‘i water quality standards are intended to establish the level of water quality necessary to protect existing uses (propagation of fish, shellfish, and wildlife, and recreation) (HIDOH 2014). These standards define the types of water quality effects that will be considered in the analysis of the proposed action and alternatives, because the standards identify water pollutants and characteristics that, if substantially altered, can cause adverse effects on humans and the environment. The standards set thresholds of acceptability for nutrients, turbidity, TSS, bacteria, heavy metals, pesticides, herbicides, and other potentially harmful substances. The thresholds will be used to determine the significance of any potential impacts.

Data on current water quality conditions are sufficient to establish baseline water quality levels and determine the significance of potential impacts. Although there is a lack of continuous-measurement data on water quality in Hawai‘i (DeCarlo et al. 2007), including in the proposed action area, the current status of water quality in He‘eia Stream and Kāne‘ohe Bay is known (HIDOH 2014), and several short-term water quality monitoring projects were identified for the He‘eia Stream, the He‘eia wetlands, He‘eia Fishpond, and Kāne‘ohe Bay that may be useful for evaluating the effects of the proposed action on water quality.

4.6 Geology

The proposed action and alternatives areas are located on the windward side of the Ko‘olau Mountains. The windward side of O‘ahu is characterized by steep cliffs and short ridges less than 4 miles long, topography that contributes to rapid runoff and low infiltration (Ko‘olau Mountains Watershed Partnership 2002). The soils in the proposed NERR, at the base of these mountains, are described below.

The soils in much of the He‘eia wetlands comprise mostly Hanalei silty clay (HnA) and Marsh soils (MZ) (Townscape 2011a) (Figure 4-10). In a typical profile, Hanalei silty clay is composed of poorly drained silty clay and silty clay loam from 0 to 36 inches in depth. This clay is frequently flooded and occasionally ponded, and has a moderate available water capacity. Marsh soil is composed of mucky peat from 0 to 60 inches in depth. It is very poorly drained, frequently flooded and ponded, and has a very high available water capacity.

The uplands to the north of the wetlands and in the Alternative 1 area are characterized as Waikane silty clay, with slopes of 25 to 40% (WpE) and Alaeloa silty clay, with 15 to 70% slopes (AeE and ALF). The hillside soils are silty and well drained, although they have less water capacity than the soils in the wetlands and are classified as highly erodible. Landslide areas are visible on the hillsides, and sheet/rill and road erosion are a concern (Townscape 2011a).

Table 4-14. Information Available for Analysis of Water Quality Effects

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Effects on water quality in He'eia Stream	Wet- and dry-season data for Sites 1 and 2 ^a on N compounds (N, NO ₃ , NO ₂ , NH ₃), TP, silica, DO, salinity, temperature, pH, and TSS, in support of State water quality standards and TMDLs	<ul style="list-style-type: none"> • HIDOH 2014: Source contains 2011–2013 data on N compounds, TP, and TSS. • Windward Community College 2005: Source contains 2002–2005 data on N compounds and TP. • EPA 2004: Source contains 2000–2004 data on N compounds, turbidity, DO, salinity, temperature, pH. • Hoover and Mackenzie 2009: Source contains 1999–2000 data on N compounds, TP, silica, and suspended particulate matter. • USGS 2015: Source contains 1983–1998 data on suspended sediment. 	Yes	Yes	Yes
Effects on water quality in He'eia wetlands	Wet- and dry-season data for Site 3 ^a on N compounds, TP, silica, DO, salinity, temperature, pH, and TSS, in support of State water quality standards and TMDLs	<ul style="list-style-type: none"> • Kobayashi 2001: Source contains 2000 data on N compounds, TP, and PCBs. 	Yes	Yes	Yes
Effects on water quality in He'eia Fishpond	Wet- and dry-season data for Sites 4 and 5 ^a on N compounds, TP, silica, DO, salinity, temperature, pH, TSS, and chl- <i>a</i> , in support of State water quality standards and TMDLs	<ul style="list-style-type: none"> • Young 2011: Source contains 2007 data on N compounds, TP, phosphate, DOC, TSS, alkalinity, and chl-<i>a</i>. 	Yes	Yes	Yes
Effects on water quality in Kāne'ohe Bay	Wet- and dry-season data for Sites 6–8 ^a on N compounds, TP, silica, DO, salinity, temperature, pH, TSS, and chl- <i>a</i> , in support of State water quality standards and TMDLs	<ul style="list-style-type: none"> • HIDOH 2014: Source contains 2011–2013 data on N compounds and turbidity. • Drupp et al. 2011, Solomon 2008: Sources contain 2005–2008 data on N compounds, phosphate, silica, chl-<i>a</i>, and CO₂ at CRIMP CO₂ buoy in Kāne'ohe Bay. • DeCarlo et al. 2007: Source contains 2003–2004 data on N compounds, TP, phosphate, 	Yes	Yes	Yes

chl-*a*, TSS, DO, salinity, and temperature at CRIMP CO₂ buoy in Kāneʻohe Bay.

- Fagan and Mackenzie 2007: Source contains 2003–2004 data on DOC and alkalinity at several sites in bay.
- Windward Community College 2005: Source contains 2002–2005 data on N compounds and TP.
- Ringuet and Mackenzie 2005: Source contains 2001–2003 data on N compounds, TP, phosphate, silica, chl-*a*, and TSS near Moku o Loʻe.
- Cox and University of Hawaiʻi at Mānoa 2010: Source contains 1998–2001 data on N compounds, phosphate, silica, TSS, temperature, salinity, and chl-*a*.

Notes: Alt = Alternative; chl-*a* = chlorophyll-*a*; CO₂ = carbon dioxide; DO = dissolved oxygen; DOC = dissolved organic carbon; EPA = Environmental Protection Agency; HCDA = Hawaiʻi Community Development Authority; HDOH = Hawaiʻi Department of Health; N = nitrogen; PCBs = polychlorinated biphenols; TMDLs = total maximum daily loads; TP = total phosphorus; TSS = total suspended solids; USGS = U.S. Geological Survey, CRIMP CO₂ buoy = Coral Reef Instrumented Measurement and CO₂ Monitoring Platform buoy

Yes = Existing sources are sufficient for analysis.

^a = Monitoring sites shown in Windward Community College 2005.

The shoreline of Kāneʻohe Bay is ringed by shallow fringing reefs, and the bay has numerous patch reefs that occur less than 3.3 feet from the surface and are partially exposed during extreme spring tides (Jokiel 1991). Several of these patch reefs are found in the proposed action and Alternative 2 areas. The bottom of Kāneʻohe Bay consists of coral rubble, gray coral muds, and fine coral sands, with fine brown silts and clays nearshore, especially near stream mouths (Jokiel 1991). Four major islands and islets are located in Kāneʻohe Bay: Kapapa, Mokoliʻi (Chinaman’s Hat), Kekepa (Turtleback Rock), and Moku o Loʻe. The 28-acre Moku o Loʻe is the only one of the four that is situated in the proposed action area; this island is a basaltic outcrop formed by the old Koʻolau volcano and is surrounded by fringing reefs (Jokiel 1991).

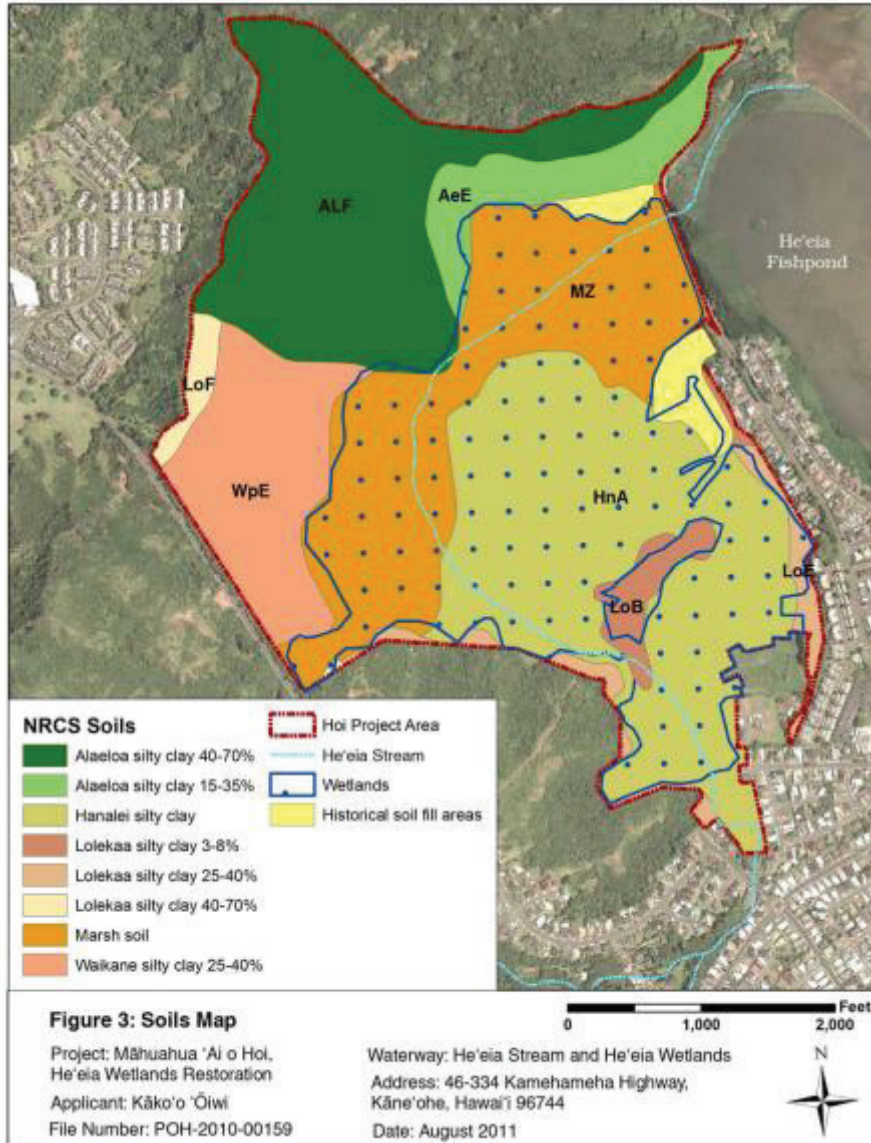


Figure 4-10. Soil Map for the Proposed Action and Alternative 1 Areas (Townscape 2011a)

Effect Types and Significance Criteria

The proposed action or alternatives could result in increased erosion, subsidence, or landslides. The removal of mangroves or other invasive vegetation in the proposed action area could cause increased sedimentation downstream. Because the terrestrial uplands in the Alternative 1 area have highly erodible soils, Kāko'o 'Ōiwi's planned activities, which involve removal of invasive plant cover to cultivate dryland crops and orchards, could increase erosion and thereby affect downstream areas. Erosional effects would be considered significant if they resulted in a violation of the State standards for TSS in receiving water

bodies—He‘eia Stream TSS levels would be most indicative of adverse effects. Current data on He‘eia Stream TSS levels are sufficient to determine the significance of any potential impacts.

Table 4-15. Information Available for Analysis of Geological Effects

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Effects of erosion on He‘eia Stream	Wet- and dry-season data for Sites 1 and 2 ^a on TSS in support of State water quality standards and TMDLs.	<ul style="list-style-type: none"> • HIDOH 2014: Source provides 2011–2013 data on TSS. • Hoover and Mackenzie 2009: Source provides 1999–2000 data on suspended particulate matter. • USGS 2015: Source provides 1983–1998 data on suspended sediment. 	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawai‘i Community Development Authority; HIDOH = Hawai‘i Department of Health; TMDLs = total maximum daily loads; TSS = total suspended solids; USGS = U.S. Geological Survey.

Yes= Existing sources are sufficient for analysis.

^a = Monitoring sites shown in Windward Community College 2005.

4.7 Climate

The windward side of O‘ahu, where the action area is located, experiences cooler temperatures and higher rainfall than the leeward side of the island. Trade winds from the northeast bring warm moist air to land. The moisture is deflected up along the Ko‘olau Mountains where the warm air cools, forms clouds, and releases rain. The mountains above the action area receive frequent rainfall, whereas the coastal areas receive moderate to frequent rainfall (Giambelluca et al. 2013) (Figure 4-11), most of which occurs from October through May, with occasional heavy storms. The average annual air temperature ranges from 71 to 85°F, averaging 78°F (U.S. Climate Data 2015).

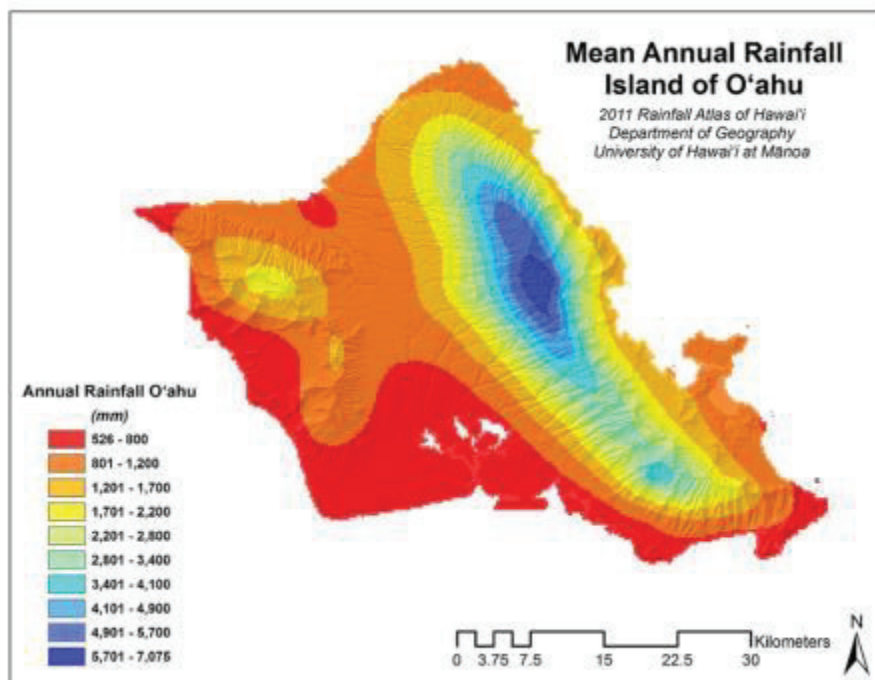


Figure 4-11. Mean Annual Rainfall on the Island of O’ahu, 1978–2007 (Giambelluca et al. 2013)

Climate change in the Hawaiian Islands has been observed and is predicted to continue in the form of rising sea surface and air temperatures, sea level rise, ocean acidification, and declining rainfall and streamflows, with more of the rainfall occurring in intense downpours (Codiga and Wager 2011, Nurse et al. 2014). Ocean acidification, caused by rising atmospheric carbon dioxide concentrations and subsequent increases in dissolved inorganic carbon and carbon dioxide in ocean waters, may reduce the recruitment rate and growth of corals in Kāne’ohe Bay (Jokiel et al. 2008, Kuffner et al. 2008). Sea level rise, which is predicted to be approximately 1 foot by 2050 and 3 feet by 2100 (Codiga and Wager 2011), could result in saltwater intrusion into the He’eia wetlands and taro ponds, and may overtop the fishpond walls. Changes in rainfall patterns to more intense downpours could affect hydrology and decrease water quality in He’eia Stream and Kāne’ohe Bay.

Methane emissions from the He’eia wetlands could exacerbate climate change impacts—wetlands are a natural source of methane, which is a greenhouse gas (Mitsch et al. 2013). However, tropical wetlands are predicted to function as a net carbon and radiative sink within the next 300 years and balance out the methane emissions (Mitsch et al. 2013). The He’eia wetlands may also provide a natural flood buffer that accommodates sea-level rise without the need for additional hard armoring or other measures to protect upstream urban development (Codiga and Wager 2011). Therefore, the He’eia wetlands may increase the overall resilience of the ecosystem to climate change.

Effect Types and Significance Criteria

Potential climate-related effects include both the effects of the proposed action on climate change and the effects of climate change on the proposed action. The former could occur through exacerbation of existing climate change impacts, or via a change (increase or decrease) in the resilience of the ecosystem to climate change. However, the proposed action and alternatives are not anticipated to have negative effects on climate change. Any such effects would be considered significant if the potential for He'eia wetlands to sequester carbon were not expected to balance out methane emissions, but this is not predicted to occur for tropical wetlands in general. Other types of potentially significant negative effects on climate change, such as an increase in greenhouse gas emissions (e.g., due to an increase in vehicular traffic), are not expected to occur as a result of the proposed action.

There are several ways in which climate change could negatively affect the proposed action: changes in rainfall patterns could affect water quality and hydrology, sea-level rise could overtop or affect the stability of the fishpond walls, and ocean acidification could affect coral recruitment and survival in Kāne'ohe Bay. These potential negative effects could occur, and should be considered during the planning and implementation of all project activities.

4.8 Cultural Resources

The proposed action and alternatives areas have been subject to numerous archaeological and cultural resource studies (McAllister 1933, Yent and Griffin 1977, Kawachi 1990, Nagata 1992, Henry 1993, Freeman and Hammatt 2004, Carson 2006, Altizer 2011, Groza and Monahan 2012, Cruz and Hammatt 2012, Soltz et al. 2014). McAllister (1933) was the first to document the major sites around O'ahu; with regard to the action area, he documented three cultural sites: He'eia Fishpond, Kaulauki Heiau, and the dwelling place of Meheanu at Luamo'o. Surface and subsurface archaeological surveys of He'eia-Matson Point State Park in 1977 (Yent and Griffin 1977) did not report any significant findings. However, relevant to the area, a 1982 report documented iwi (ancestral remains) at He'eia State Park, a discovery that was confirmed by a 1992 (Nagata 1992) archaeological survey of the same parcel. An archaeological and cultural impact study conducted for the Kamehameha waterline project did not identify any historic properties or traditional cultural practices, but, Ke'alohi Point was noted as leina 'uhane (a place where the souls of the dead leaped into the nether world) (Freeman and Hammatt 2004).

Table 4-16. Information Available for Analysis of Climate-related Effects

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Exacerbation of existing climate-related effects	<ul style="list-style-type: none"> Methane emissions from He‘eia wetlands 	Mitsch et al. 2013: Source describes potential climate change impacts of methane emissions in tropical wetlands.	Yes	Yes	Yes
Change in ecosystem resilience to climate effects	<ul style="list-style-type: none"> Carbon sequestration provided by He‘eia wetlands Natural flood buffer provided by He‘eia wetlands 	Codiga and Wager 2011, Mitsch et al. 2013: Sources describe potential for tropical wetlands to sequester carbon and act as flood buffers.	Yes	Yes	Yes
Potential effects of climate change on project activities	<ul style="list-style-type: none"> Predicted climate effects on water quality and hydrology of He‘eia Stream and Kāne‘ohe Bay Predicted sea level rise and resultant effects on fishpond and He‘eia wetlands Predicted ocean acidification and resultant effects on corals in Kāne‘ohe Bay 	Jokiel et al. 2008, Kuffner et al. 2008, Codiga and Wager 2011: Sources provide predictions as noted.	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawai‘i Community Development Authority.

Yes = Existing sources are sufficient for analysis.

An archaeological assessment of the replacement of the caretaker’s house at He‘eia Fishpond also did not identify any surface or subsurface cultural resources (Carson 2006). Work conducted within the boundaries of the He‘eia Fishpond identified no specific cultural resources other than the fishpond itself (Cruz and Hammatt 2012). A literature review and field inspection for the He‘eia Fishpond wall repair project determined that no adverse effects on cultural resources would result, and recommended no further archaeological work (Grozo and Monahan 2012). A separate cultural impact assessment (CIA) done for the He‘eia Fishpond involved community consultation and formal interviews (Cruz and Hammatt 2012). This CIA discussed the important relationship between the He‘eia Fishpond and inland lo‘i kalo, which mitigated the effects of flooding on the fishpond. The CIA also discussed that the fishpond may include Traditional Cultural Properties [TCPs] of ongoing cultural significance that may be included in the Hawai‘i Register of Historic Places. However, the CIA concluded that the fishpond wall repairs would not adversely affect cultural practices or resources.

Literature and field review for portions of the Māhuhua ‘Ai o Hoi project site documented a precontact basalt quarry, the foundation of an ‘okole hao distillery, two ranching enclosures, fences and roads (possibly related to agriculture), and possible subsurface lo‘i berms (Altizer 2011). Additional work conducted at the Kako‘o ‘Ōiwi property identified the following 17 sites (Soltz et al. 2014):

- Site 7521, plantation-era road
- Site 7522, basalt quarry with traditional debitage
- Site 7523, concrete foundation, possibly for ‘okole hao distillery
- Site 7524, ranching-era enclosure
- Site 7525, ranching-era enclosure
- Site 7526, glass and ceramic fragment scatter
- Site 7527, glass and ceramic fragment scatter and three depression features
- Site 7528, four plantation-era depressions with glass and ceramic fragments
- Site 7529, stone and mortar L-alignment
- Site 7530, complex of five terraces and two mounds
- Site 7531, World War II–era earthen terrace and foxhole depressions
- Site 7532, plantation-era road, possibly to/from rice mill
- Site 7533, plantation-era bridge
- Site 7534, plantation-era ‘auwai (ditch, canal)
- Site 7535, two concrete platforms/foundations, possibly for rice mill
- Site 7536, ranching-era wooden and metal cattle run
- Site 7537, subsurface lo‘i and rice berms

Four of these sites could be affected by the proposed action or alternatives: the basalt quarry (Site 7522) and an agricultural complex (Site 7530), both of which predate the first arrival of European sailors in 1778, and the postcontact (i.e., postdating 1778) remains of a rice mill (Site 7535) and of an ‘okole hao distillery (Site 7523) (Figure 4-12).

Effect Types and Significance Criteria

Few adverse effects on cultural resources are expected to result from the proposed action or alternatives. The He‘eia Fishpond is not expected to be affected. Likewise, the proposed action would not affect subsurface cultural resources inland. No archaeological resources have been identified in the Alternative 2 outer reefs, and any as-yet undiscovered resources that are encountered during implementation of the proposed action (for example, resources discovered in the bay) would be addressed appropriately through standard protocols.

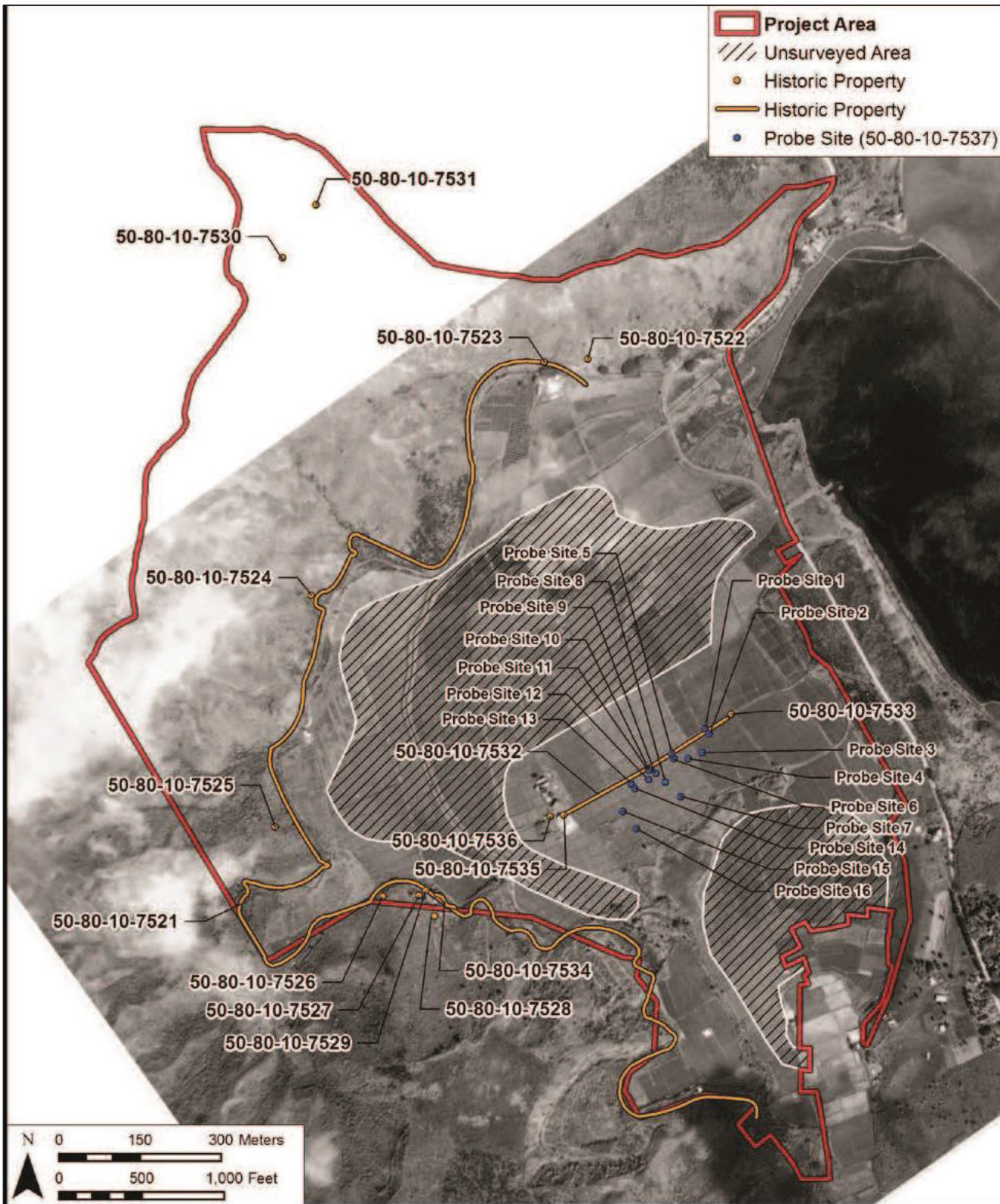


Figure 4-12. Location of Archaeological Features Found in Kako'o 'Ōiwi-Managed Lands at the He'eia NERR Site (Reproduced from: Soltz et al. 2014)

The only cultural resources that may be affected by the proposed action or alternatives would be the basalt quarry, an agricultural complex, and postcontact ‘okolehao distillery and rice mill remains. Effects on these sites would be considered significant if their removal or modification were required.

Table 4-17. Information Available for Analysis of Cultural Resources Effects

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Potential effect on the remains of documented archaeological sites such as the postcontact ‘okolehao distillery and rice mill	Inventory of surface cultural resource sites	McAllister 1933, Yent and Griffin 1977, Kawachi 1990, Nagata 1992, Henry 1993, Freeman and Hammatt 2004, Carson 2006, Altizer 2011, Groza and Monahan 2012, Cruz and Hammatt 2012, Soltz et al. 2014: Sources consist of cultural resource inventories and studies in the action area. Also, community consultation has been conducted for properties in the proposed action area. These oral histories provide valuable traditional knowledge and history of the area.	Yes	Yes	Yes
Effects on as-yet undiscovered cultural resources	None	None; e.g., no marine archaeological surveys have been completed in the action area.	Yes	Yes	Yes

Notes: Alt = Alternative; HCDA = Hawai‘i Community Development Authority.

Yes = Existing sources are sufficient for analysis.

4.9 Socioeconomic Characteristics

The immediate area of potential socioeconomic effect for the proposed action is the He‘eia NERR site itself; changes within the NERR could affect residents and organizations in the surrounding area. That surrounding area is defined as the 96744 Zip Code Tabulation Area (ZCTA), covering the various civilian communities located on and around Kāne‘ohe Bay. Also, economic impacts of the designation could have indirect and induced impacts on a wider scale, for which the State of Hawai‘i is the potentially affected area.

Kāneʻohe Bay is a recreation resource used by residents of nearby communities and appreciated by both residents and visitors to Oʻahu. The bay is a major resource for research on tropical marine environments, thanks to continuing research programs based at HIMB (HIMB 2010). As described earlier, the bay and the Heʻeia estuary have been affected by urbanization of the surrounding area and lack of long-term coordinated stewardship of resources (OP 1992); in response, the parties collaborating in the NERR planning effort have been working to restore the bay, estuary, and the Heʻeia ahupuaʻa (i.e., the cultural division of land) (PBR Hawaiʻi 2014).

The Kāneʻohe Bay region combines suburban and rural areas. The population is nearly 54,000.² The median age is 41.5 years old. The median household income (\$85,608) is 127% of the state median. Major highways run through the Koʻolau Mountains to the leeward side of the island and parallel to the coast. The stretch of Kamehameha Highway in the action area is a two-lane roadway; farther inland, Kahekili Highway is the major route for travel to the North Shore.

Effect Types and Significance Criteria

Executive Orders (EOs) 12898 and 13045 address the potential socioeconomic impacts of federal actions. These EOs are concerned with disproportionately adverse human health or environmental effects on minority or low-income populations, and with impacts on the health of children. Associated significance criteria have been set out by federal agencies and clarified in the course of reviews of EISs by agencies (such as the U.S. Environmental Protection Agency) and through judicial reviews.

Additional types of socioeconomic impacts can be identified by the level of contention that occurs over an issue, or by predicting that an action will result in changes in human use of resources. Below are three broad categories of socioeconomic effects that could result from the proposed action or alternatives, and their associated significance criteria:

- **Reduced Access to Fishing Resources.** In Hawaiʻi, the distinctions between recreational, subsistence, and commercial fishing can be blurred. It is generally agreed that fish stocks throughout the islands have declined. Kāneʻohe Bay fishers report a decline in stocks throughout the twentieth century. NERR activities could increase community support and interest in reef and fisheries conservation, and thus could change public sentiment to seek greater fishing restrictions in the NERR. Likewise, an increase in publicity about NERR resources could attract more fishers to the area and thereby affect both the availability of fish and current local fishers' access to the fisheries. However, NERR conservation and restoration activities could improve habitat and increase fish stocks, making more fish available to local fishers. In general, the potential negative effects on fisheries are clearly contentious, and the available resource is limited, so any further decline or restriction of access would be considered significant. The Division of Aquatic Resources

² U.S. Bureau of the Census, American Community Survey, 5-year data for 2009–2013 for the Kāneʻohe ZCTA (96744), which includes lands fronting the bay from Kāneʻohe to Kualoa.

(DAR) currently collects recreational fishing data statewide under the Hawai‘i Marine Recreational Fishing Survey project, and Kāne‘ohe Bay is included as a data collection site (DAR unpublished data). Although they are not routinely published in a form summarized by site, the existing data are available to track changes in future fishing participation and success.

- **Changes in Population, Jobs, Public Facilities, or Infrastructure.** The proposed action area is small and lightly populated, relative to both the Kāne‘ohe Bay region and the state as a whole. The NERR’s effects on local jobs might be large in comparison to the current modest employment opportunities provided by preservation and research efforts in the action area, but modest relative to employment in the surrounding community and state. Increased activity associated with the NERR is expected to bring a few more people to the region, and hence increase traffic on Kamehameha Highway, but otherwise will have minimal impacts on public facilities and infrastructure. As a rule of thumb, estimated changes that represent less than 5% of current or estimated levels of usage are considered unlikely to be significant.
- **Increased Costs for Local Operations Owing to Regulation and Oversight.** Implementation of the NERR management plan will support restoration and research efforts at the site. The increased attention of local, State, and federal agencies and the community to improving the area could result in increased public and agency support and advocacy for protection and preservation of resources. In fact, questions voiced by members of the He‘eia community reflect considerable concern that the NERR designation will result in higher levels of environmental review or restrictions on community activities, such as the cultural, recreational, or commercial activities now occurring, including beneficial restoration activities. NOAA and OP have informed the public that a NERR designation does not add new regulations on uses or activities within the NERR boundaries, but many community members have asked for some form of assurance. NOAA cites its authorizing regulations to underscore its intent (NOAA 2003), but because this is a new NERR site, and no local data are available on how other agencies and community members will react to the development of the NERR, concerns have persisted. Designation and management of the NERR could result in general positive community involvement and processes for resolution of user conflicts. However, a designation also could result in new environmental oversight of the site partners’ operations and restoration activities, increasing the time and costs involved in implementing beneficial projects, or creating restrictions on commercial and recreational activities in the NERR.

Table 4-18. Information Available for Analysis of Socioeconomic Effects

Potential Effect	Type and Scale of Information Needed to Support Significance Determination	Existing Sources	Is Sufficient Information Available?		
			Proposed Action	Alt. 1: Boundary Expansion (Uplands, Entire HCDA Parcel)	Alt. 2: Boundary Expansion (Outer Reefs)
Disproportionately adverse effects on minority or low-income populations; effects on children’s health	Demographic and socioeconomic data	<ul style="list-style-type: none"> • U.S. Bureau of the Census, 2010 Census and 2009–2013 American Community Survey • U.S. Census, Zip Code Business Patterns (annual, 1998–2012) 	Yes	Yes	Yes
Change in access to and availability of fish for local fishers	Catch data for fishing in Kāne’ohe Bay	<ul style="list-style-type: none"> • Interviews with local fishers (anecdotal) • Recreational fishing surveys (DAR unpublished data) 	Yes	Yes	Yes
Change in marine recreational activity	Estimated intensity of current usage	<ul style="list-style-type: none"> • Interviews with local experts • Clark 2005: Beach inventory 	Yes	Yes	Yes
Changes in traffic on nearby roadways	Recent traffic counts	<ul style="list-style-type: none"> • Department of Transportation–Highways and County Department of Transportation Services traffic count data 	Yes	Yes	Yes
Change in research funding or oversight for HIMB	<ul style="list-style-type: none"> • Trend data from HIMB • Comparative data for other NERR sites 	<ul style="list-style-type: none"> • HIMB records, interviews 	Yes	Yes	Yes
Increased yield from wetland and fishpond	Current yields	<ul style="list-style-type: none"> • Interviews with operators 	Yes	Yes	Yes
Impact on property development or values, nearby residential areas	<ul style="list-style-type: none"> • Inventory of nearby residential parcels • Local historical data on resale trends 	<ul style="list-style-type: none"> • Honolulu Real Property TMK database • Resale trend data compiled by realtors 	Yes	Yes	Yes
Effects related to job creation	Input-output model of the regional economy	<ul style="list-style-type: none"> • 2007 Inter-County input output model 	Yes	Yes	Yes
Increased costs for local operations owing to regulation and oversight	Comparative data for other NERR sites	None	No	No	No

Notes: Alt = Alternative; DAR = Division of Aquatic Resources; HCDA = Hawai‘i Community Development Authority; HIMB = Hawai‘i Institute of Marine Biology; NERR = National Estuarine Research Reserve; TMK = Tax Map Key.

No = Further information needed.

Yes = Existing sources are sufficient for analysis.

Section 5. Findings and Recommendations

5.1 Findings

This gap analysis finds that sufficient information is available regarding natural, cultural, and socioeconomic resources to support programmatic analysis of project effects under NEPA, with one exception, relating to socioeconomic effects.

Questions voiced by members of the He'eia community reflect considerable concern that the NERR designation will result in higher levels of environmental review or restrictions on community activities, including new environmental oversight of the site partners' operations and restoration activities, increasing the time and costs involved in implementing beneficial projects. Therefore, the programmatic NEPA analysis of socioeconomic effects would benefit greatly from any available data or research from other NERR sites that demonstrate that the NERR designation will not result in regulatory restrictions or increased reviews, consistent with NOAA's stated intent for the He'eia site. Resolving this question is a high priority.

5.2 Recommendations for Research or Studies

The research described in Section 5.2.1 is recommended to address the identified socioeconomic information gap for the current NEPA analysis. Section 5.2.2 lists studies recommended to support future environmental analysis of site-specific projects that may occur under the framework of the NERR.

5.2.1 Conduct a Survey of NERR Reserve Managers

Implementation of the NERR management plan will support restoration and research efforts at the site. Local, State, and federal agency and community attention to improving the area is likely to follow. The best sources for assessing the extent and impact of new agency and community involvement are the reserve managers of existing NERRs in other states and their local community stakeholders, such as a reserve's "Friends Group" or local fishing clubs. A two-phase electronic survey of reserve managers and stakeholders is recommended. The first phase would involve sending a survey to the managers, and the second phase would reach out to local stakeholders identified by the managers. The surveys could address short-term and midterm impacts related to the following topics:

- The extent of community involvement in the NERR
- Whether the NERR's programs and organization work to resolve community differences regarding natural resource management in the NERR.

- Whether the NERR’s community outreach committees and advisory bodies work to mitigate or limit user conflicts
- The type and extent of economic impacts on the immediately surrounding community
- The extent of impacts on local roadways and traffic volumes
- Changes in recreational activities enjoyed by NERR neighbors and by people coming from outside the immediate area
- Changes in fishing regulations in the NERR
- Whether the community is satisfied with the NERR designation
- Whether the NERR designation limits or changes environmental oversight of activities in the NERR, and whether that impact is burdensome

5.2.2 Conduct Recommended Studies for Future Site-specific Projects

- (1) **Establish Baseline Data on Water Quality.** There is a lack of consistent long-term monitoring data to document whether project sites meet State water quality standards and TMDLs. As of 2014, He‘eia Stream and Kāne‘ohe Bay were on the HDOH list for nonattainment of one or more water quality standards. Information on water quality baselines and potential effects of NERR project activities will be needed to conduct NEPA and HEPA analyses for future NERR projects. Water quality monitoring should be conducted for He‘eia Stream (upstream of and within the proposed NERR site), the He‘eia wetlands, He‘eia Fishpond, and Kāne‘ohe Bay to establish baseline conditions for any site-specific projects that will require NEPA or HEPA review. In addition, stream quality could be measured for He‘eia Stream using the invertebrate community index developed for O‘ahu (Wolff 2012). Lastly, the He‘eia NERR management plan should include long-term water quality monitoring as a core program function and as part of the NERRS nationwide water quality monitoring program.
- (2) **Conduct Baseline Surveys for Threatened and Endangered Species.** Listed waterbirds occasionally occur in the Kāko‘o ‘Ōiwi wetland areas, and there is potential for populations to increase. Existing studies are adequate to identify the current sporadic presence of waterbirds in wetland areas. However, baseline information on endangered waterbird presence and status, habitat use, and causes of mortality will be needed to conduct NEPA and HEPA analyses for future NERR site-specific projects. It is recommended that a baseline survey for endangered waterbirds and other listed threatened or endangered species be conducted for any future project that will require NEPA or HEPA analysis, as part of that project’s planning process. It is also recommended that an endangered waterbird monitoring program be developed and implemented as part of the resource protection activities prescribed by the NERR management plan. The NERR research coordinator or reserve manager should ensure that the He‘eia wetland complex continues to be included in future biannual statewide waterbird surveys conducted by DOFAW, and that those survey results are included in the NERR research database.

- (3) **Conduct Quantitative Surveys for Native Flora and Fauna.** Although several floristics inventories have been conducted in the action area, none of these surveys has provided quantitative measures of the abundance of native plants or invasive plant species. Likewise, brief surveys of terrestrial fauna have been done, but these are not current or site specific. Existing studies are adequate to identify the rare occurrence and limited range of native plants and the occurrence of nonnative plants and common terrestrial fauna in the action area. However, quantitative baseline data on the distribution and status of native and nonnative flora and fauna will be useful in NEPA and HEPA analyses for future NERR site-specific projects. It is recommended that a quantitative baseline survey for native plants, invasive species, and common terrestrial fauna be conducted for any future project that will require NEPA or HEPA analysis, as part of that project's planning process.
- (4) **Conduct Baseline Archaeological Surveys.** Few adverse effects on cultural resources are expected to result from the proposed designation of He'eia as a NERR. The He'eia Fishpond and subsurface cultural resources inland are not expected to be affected. The cultural resources that may be affected by the proposed action or alternatives would be the postcontact would be the basalt quarry, an agricultural complex, and postcontact 'okolehao distillery and rice mill remains. For any future NERR project that will require NEPA or HEPA review and that occurs in the vicinity of the 'okolehao distillery or rice mill sites, baseline information on the location and status of aboveground and subsurface cultural resources will be needed.

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Executive Summary

The purpose of this document is to provide an analysis of the natural, cultural, and socioeconomic impacts of the National Oceanic and Atmospheric Administration's (NOAA's) action of designating a National Estuarine Research Reserve (NERR) at He'eia and implementing the management plan for this reserve in Kāne'ohe Bay, Hawai'i.

In general, designating the He'eia NERR and implementing the reserve's management plan in years to come would be environmentally beneficial and would result in positive cultural and socioeconomic impacts. This overall beneficial effect would result because a major focus of the NERR is to support, and to provide research and monitoring to better understand, land management and restoration programs, as well as to improve habitat conditions and ecosystem processes throughout the ahupua'a (i.e., the traditional land management unit).

Three types of impacts were analyzed in this document: direct impacts, cumulative impacts, and the impact of not taking the action of designating the He'eia NERR. As analyzed, direct impacts on the natural environment include the effects of designating the He'eia NERR on habitats, flora and fauna, and the physical environment. The research and monitoring program of the He'eia NERR is expected to benefit the upland, wetland, freshwater stream, estuarine, and marine habitats of He'eia by improving our understanding of the functioning and interconnectedness of these habitats and providing data to support coastal management decisions. Increased research to understand native species distribution and abundance, as well as ecological threats and stressors (e.g., invasive species), would inform management efforts to preserve native flora and fauna. More enhanced and coordinated research on physical conditions, such as water quality, will increase knowledge of the nature and sources of water pollutants, provide baseline data, and guide management actions to improve water quality in the He'eia estuary. The education programs developed under the He'eia NERR are expected to increase participation by students, teachers, and other community members in education and training about coastal habitats, inculcate in them a greater appreciation and understanding of coastal ecosystems, and inform land management decisions. The He'eia NERR coastal training and outreach program would broaden and enhance community stewardship of resources, reduce anthropogenic effects on the environment, restore degraded habitats, and support actions by the community to improve coastal environmental conditions.

Direct impacts on the human environment include the cultural and socioeconomic effects of designating the He'eia NERR. The research and monitoring program at the He'eia NERR would result in better documentation and comprehension of archaeological and cultural resources and little to no change in the socioeconomic conditions like traffic, property values, demand for public facilities, or taxes. The educational programs of the He'eia NERR likely would improve the community's access to science resources and help to integrate traditional cultural knowledge with contemporary science to better inform

coastal management. Stewardship projects of the NERR coastal training and outreach program are expected to strengthen the community's relationship with its cultural landscape and increase community engagement in coastal resource management, and increase support and interest for conservation of fish stock and other resources. It is possible that increased conservation awareness might lead to increased public support for fishing restrictions in the area and result in additional State regulations on local fishing activity in He'eia. However, the education and outreach programs of the NERR could support a well-informed, involved community and decision makers, who are expected to take a balanced approach toward fishing and conservation and avoid unwarranted regulations on fishing. Given these considerations, the effect of the proposed NERR designation is uncertain but could have a neutral effect on fishing access and resources.

Several ongoing and planned projects, such as Kāko'o 'Ōiwi's wetland and upland agriculture and stream restoration project, the He'eia fishpond reconstruction and aquaculture farming, and the Kāne'ohe Bay coral reef restoration, were considered in the analysis of the cumulative impacts of the NERR designation on the natural, cultural, and socioeconomic environment. None of the independently ongoing or planned projects analyzed had moderate or considerable adverse effects. The specific effects of these ongoing or planned projects on natural, cultural, and socioeconomic resources were ranked as *no effect*, *low adverse effect*, or *overall beneficial effect*, and the potential cumulative impact of the designation of the He'eia NERR, when considered with these projects, was found to be beneficial overall. These organizations have already worked to obtain State environmental reviews of their programs and plans. Whether the NERR designation would bring an additional level of review, increasing the burden of restoration work for small non-profits, has not been decisively resolved.

The no-action alternative, that is, the action of not designating the He'eia NERR, would result in the continuation of the current status and trends in environmental, cultural, and socioeconomic conditions in He'eia. Not designating the He'eia NERR is expected to result in minimal coordination and long-term cooperation in the management of lands and waters in He'eia; also, research, monitoring, education, public outreach, and resource management would not be conducted or be eligible for NERR funding by NOAA. Without this funding and support, the He'eia coastal community in the proposed He'eia NERR area would not receive a variety of the potential long-term benefits of NERR designation, such as improved water quality, enhanced educational programs, habitat protection, and improved coastal stewardship projects.

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Acronyms and Other Abbreviations

Abbreviation	Meaning
BMPs	best management practices
EIS	environmental impact statement
HEPA	Hawai‘i Environmental Policy Act
HDD	Horizontal directional drilling
HIMB	Hawai‘i Institute of Marine Biology
NEPA	National Environmental Policy Act
NERR	National Estuarine Research Reserve
NERRS	National Estuarine Research Reserve System
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
RAB	Reserve Advisory Board
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers

Section 1. General Impacts

Overall, designating the proposed He‘eia National Estuarine Research Reserve (NERR) and implementing the reserve’s management plan in the years to come would be environmentally beneficial and would result in positive cultural and socioeconomic impacts. From a national perspective, the establishment of the 29th NERR in Kāne‘ohe Bay will add to the NERR System’s (NERRS’s) geographic reach, creating a more complete network of estuaries that is representative of the ecological diversity found in the United States and its territories.

The He‘eia NERR designation would create research and educational opportunities and synergies to improve our understanding and appreciation of the role and health of the uplands and estuaries in the Ko‘olaupoko region of the island of O‘ahu. Working to achieve goals set forth in the Coastal Zone Management Act: namely, to provide a stable environment for research and to enhance public awareness and understanding of estuarine areas, reserve staff will develop programs to conduct applied research and monitoring of the He‘eia uplands and estuary; educate students, decision makers, and the public about these estuaries to address coastal management issues; and protect and enhance the ecological health of the reserve and coastal habitats (Attachment A). Federal funds, along with matching funds provided by the State partner, would support enhanced efforts, coordinated with reserve partners, to achieve these goals.

No physical alteration of the present habitats or environmental conditions in the proposed reserve’s boundaries would occur as a result of this action, as described in the reserve management plan (Attachment A). However, site partners such as Paepae o He‘eia and Kāko‘o ‘Ōiwi would continue to conduct restoration activities with support from the He‘eia NERR. Additionally, the He‘eia NERR would support scientific research and monitoring, to be conducted by or with partners (i.e., ongoing research would be conducted by the Hawai‘i Institute of Marine Biology [HIMB] and the University of Hawai‘i Oceanography Department). Some of this research may require local experiments that modify a portion of specific habitat or include the installation of environmental monitoring or sampling equipment. Each of these future activities may be assessed for potential impacts according to NERRS regulation and other authorities, such as the Endangered Species Act and Section 106 of the National Historic Preservation Act (NHPA). Under NERRS regulations, Section 921.13, modifications to habitats are allowed only within the reserve buffer area and are subject to NOAA review and approval through the submission of a restoration or resource manipulation plan as part of the reserve’s overall management plan. In addition, annual NOAA funding awards to the reserve may specify projects that include these types of activities; as such, these projects are subject to review under the National Environmental Policy Act (NEPA) and the Hawai‘i Environmental Policy Act (HEPA) as applicable.

The expected impacts of the education, stewardship, and research programs would be positive (see Tables 2-1 and 3-1 for summaries of these impacts). Designation of the proposed reserve would create extensive

opportunities for researchers to gather scientific and socioeconomic information about the He‘eia estuary and thus enhance our knowledge and understanding of Hawaiian estuaries and the ahupua‘a land management system. This information would provide decision makers and resource managers with the tools and information necessary to address critical coastal management issues (food web processes, invasive species, toxins and contaminants, land use changes, and climate change). Monitoring short- and long-term ecological changes in the He‘eia NERR would support stewardship activities that protect and enhance the ecology of the area and similar estuarine systems in Hawai‘i. Research and stewardship also would support increased public awareness of the ecological and cultural significance of the estuary through educational programming directed toward students, educators, and other citizens.

Also included among the positive impacts is the use of reserve-generated research to support coastal management decisions regarding the estuary and Kāne‘ohe Bay. Within the NERRS, research results are often transferred to managers and decision makers to support informed management decisions that affect coastal resources. These activities could lead to improvements in resource management and land use policy decisions by local communities.

Public uses of the lands in the He‘eia NERR, such as boating, recreational and commercial fishing, diving, swimming, other recreation, and transportation, would continue to be administered by the appropriate regulatory resource agencies. To coordinate these uses, avoid conflict with long-term research and educational activities, and ensure that designated core research areas are sufficiently protected to create a stable environment for research, the reserve management plan would provide administrative support in the form of reserve staff and an advisory board and committees. Public access to the area may be enhanced through the addition of a central He‘eia interpretive center in support of reserve educational activities (Attachment A).

Minimal impacts may be caused by the use of facilities and the future acquisition of land needed to support He‘eia NERR goals and objectives (as described in the management plan). He‘eia NERR activities would be based in existing facilities provided by HIMB on Moku o Lo‘e (Coconut Island) and in He‘eia State Park until an analysis of long-term future facilities needs is completed. Any facilities constructed to support the reserve would be located in the proposed reserve buffer areas (i.e., outside the core area) and would be designed to result in minimal environmental disturbance. Also, additional lands may be considered and investigated for future inclusion in the NERR. All construction and land acquisition projects that are planned after the NERR designation will be reviewed and assessed for their potential impacts according to NEPA and NHPA procedures, NERRS regulations, and within the context and scope of the National and Hawai‘i-specific environmental impact statement (EIS) process.

Establishment of a Reserve Advisory Board (RAB) upon NERR designation would have beneficial effects because it would provide a mechanism to coordinate uses within the proposed reserve boundaries, guide the implementation of reserve programs based on the management plan, and result in positive benefits for

the natural and cultural resources in the He'eia NERR. The RAB also would help the reserve develop and maintain partnerships with other local, state, and federal agencies, as well as other research and educational institutions and the community, potentially reducing use conflicts. All decisions by the RAB are required to be consistent with the management plan, NERRS policies, and existing state and federal regulations.

Section 2. Natural Environment Impacts

Table 2-1. Impacts of the He‘eia NERR Designation on the Natural Environment

Topic	He‘eia NERR Program Areas		
	Research and Monitoring	Education	Coastal Training: Outreach and Resource Management
Habitats	Increased knowledge and data on the interconnectedness and functioning of habitats, and data to support coastal management decisions	Increased understanding of and involvement with coastal habitats by students, teachers, and other community members, resulting in improved land management decisions	Improved coastal management decisions and coordination, enhanced stewardship and reduction of anthropogenic effects on habitats, restoration of degraded habitats and management of other habitats, and increased participation by the community in habitat improvement projects
Flora and Fauna	Increased data allowing understanding of species distribution, abundance, and threats and stressors (e.g., invasive species); improved data for guiding preservation of rare, threatened, and endangered species; and increased coordination and adaptive management to effectively inform future management actions	Increased knowledge among students, teachers, and other community members, resulting in better protection of native species and reduction of invasive species, more support and improved resource management decisions, and increased participation in protection and conservation activities like “Makai Watch” and community workdays	Improved coastal management decisions and coordination, increased community participation in species protection programs, and increased participation in community restoration and stewardship activities to improve habitat for native species
Physical Environment	Increased knowledge of, and baseline data on, estuarine and stream water quality	Increased public awareness of how physical attributes like water quality affect ecosystems, and improved coastal management decisions	Enhanced stewardship and training, leading to improved coastal management decisions and coordination

2.1 Habitats

2.1.1 Uplands

The action of designating the He'eia NERR is expected to benefit upland forests and their watershed services by developing and expanding research and monitoring, education and training, and stewardship programs that protect biodiversity and vegetative cover and alleviate the impacts of habitat-modifying invasive plants and animals. The presence of the NERR staff and the fostering of a community committed to the protection of resources likely would encourage increased community policing and enforcement by the State of habitat-damaging activities like off-road driving, wildland fires, and illegal dumping. The increased community involvement and site partner collaboration that would occur as part of He'eia NERR management would facilitate implementation of major restoration efforts in the estuary that are likely to improve upland habitat quality for native flora and fauna. Furthermore, the increased research and monitoring that would occur with NERR designation would reduce the likelihood of the inadvertent introduction and spread of invasive species that can damage upland habitats.

2.1.2 Wetlands

Effects on wetlands would be considered significant if they caused a net loss of wetland habitat or adversely affected wetland hydrology and the wetland's ability to support native flora and fauna. However, the action of designating the He'eia NERR is expected to benefit the wetlands in He'eia. The wetlands are overgrown and dominated by California grass (*Urochloa mutica*) and other weedy species, and provide very poor habitat for native waterbirds and aquatic species. The research and monitoring program of the He'eia NERR is expected to enhance understanding of coastal wetland ecology and help identify threats and stressors that degrade wetlands. The educational programs that would accompany designation are likely to result in increased participation by students, teachers, and other community members in wetland projects, improving their understanding of the value and functions of wetlands and the need for sustained stewardship. Stewardship activities guided by the coastal training program are likely to raise awareness and engage coastal decision makers in the sustainable management of the He'eia wetlands. The combination of education, resource protection, and stewardship activities would result in benefits to wetland resources.

2.1.3 Freshwater Streams

The action of designating the He'eia NERR would not have any adverse effects on freshwater streams (or on native freshwater species), and in fact would benefit these resources. Currently, He'eia Stream, part of which runs through the He'eia NERR, is badly degraded, has poor water quality, and provides poor habitat for native species. Under the NERR, increased research and monitoring is expected to provide the data needed to inform management of the He'eia Stream and guide future research projects. Stewardship activities would likely include support for, and projects that involve, removing, managing, and discouraging further ingress of invasive species and implementing actions to avoid and reduce inputs of pollutants and sediments to the stream. The educational and training programs that accompany a NERR designation also

would provide benefits by increasing community understanding, protection, and stewardship of the values and benefits provided by healthy freshwater streams and native species.

There are no specific plans yet for constructing new facilities in support of the He'eia NERR or for implementing other NOAA-funded projects. However, any buildings or other facilities would be designed and constructed to minimize potential environmental impacts such as runoff and erosion into He'eia Stream. Proposed projects would be reviewed and assessed for their potential impacts according to NEPA procedures and NERRS regulations and HEPA procedures as applicable. Any He'eia NERR activities to restore and appropriately manage He'eia Stream are expected to result in positive benefits to stream habitats that support native aquatic species. Should future plans expand the NERR boundaries in the ahupua'a, additional stream habitat would be included in the NERR programs and would benefit from its research, monitoring, and stewardship activities.

2.1.4 Estuarine Habitats

Although estuarine habitats and resources are vulnerable to a wide range of adverse effects resulting from human activities and natural events, they are not expected to be affected directly by the designation of the He'eia NERR, and would in fact benefit from the action. Implementing research and monitoring, education, coastal training, and restoration would in fact help avoid adverse impacts on estuarine habitats and facilitate monitoring and improvement of resource conditions. An increase in community involvement is expected to accompany the NERR designation and its public education and outreach activities; enhanced community policing and oversight could prevent harmful human activities such as the introduction of invasive species of marine algae, invertebrates, and fish that could degrade estuarine habitats and displace native flora and fauna. Lastly, the educational opportunities presented by the NERR designation are likely to result in greater understanding of estuarine vulnerability and functions and the need for sustained stewardship by the community. The combination of education, research, resource protection, and management activities and oversight are thus expected to yield benefits to estuarine resources.

2.1.5 Coastal and Marine Habitats

The effects of the NERR designation on coastal and marine habitats are expected to be beneficial, and would stem from program facilitation of improved fishpond management, wetland management, and stream habitat management. Also, the increase in research and monitoring that would accompany the NERR designation would help detect and respond to adverse effects that are occurring now, such as introductions of nonnative invasive species, inputs of polluted runoff, and more frequent or severe coral bleaching events or diseases, all of which affect corals and other organisms and reduce the resilience of the coastal and marine ecosystem. Together, the increased opportunities for research, public outreach and education, and community stewardship and oversight that would come with NERR designation would yield positive benefits to coastal and marine habitats and resources.

2.2 Flora and Fauna

2.2.1 Rare, Threatened, and Endangered Flora and Fauna

No effects on rare, endangered, or threatened plants are anticipated to occur as a result of the designation of the He‘eia NERR, because neither these plants nor their critical habitat occurs within the proposed He‘eia NERR boundary.

The action of designating the He‘eia NERR is expected to benefit endangered and threatened wildlife. A major focus of the NERR is to support and provide research and monitoring to better understand the status of species and how land management and restoration activities affect them. Endangered and threatened waterbirds are found in very low densities in the He‘eia area; their low abundance is attributable mainly to the degraded habitat conditions of the wetlands and to uncontrolled predation, both of which would likely be improved through NERR programs. Endangered Hawaiian monk seals (*Monachus schauinslandi*) are rarely observed in the vicinity of the proposed NERR, and threatened green sea turtles (*Chelonia mydas*) are present year-round in Kāne‘ohe Bay. The designation of the NERR would lead to increased education and awareness about these rare and threatened resources, and could result in greater community support for their conservation and protection. Also, increased research and monitoring in the ahupua‘a would better inform managers of factors that might affect these species, such as the introduction or spread of invasive species, diseases, predators, or changing habitat conditions caused by climate change. Lastly, the NERR would provide an opportunity to eventually expand the NERR boundaries up into the ahupua‘a and to implement projects that further support habitat restoration and conservation.

The NERR designation would provide similar benefits for the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), which could be present in the area. The increase in research and monitoring would improve our knowledge of this species’ status, distribution, and habitat needs, and would better inform managers of how to avoid impacts. The NERR educational and outreach programs would help distribute that information to help the broader community avoid impacts and preserve and improve habitat. A possible expansion of the NERR boundary into the upper watershed areas of the ahupua‘a, and associated restoration and protection of forested watershed, would also improve habitat for bats.

2.2.2 Other Flora and Fauna

Effects on native plants would be considered significant if modification of their habitat resulted in a reduction of population size or prevented their recruitment and establishment. Impacts on plant habitats commonly result from land clearing or construction activities associated with development; however, no such activities are planned as part of the NERR designation. No significant reductions in native plant populations, impacts on large numbers of native plants, or adverse modifications of native plant habitats would occur.

Minor beneficial effects on other terrestrial flora and fauna are expected to result from the designation of the He‘eia NERR. The general increase in interest and support for conservation of threatened and

endangered species would also benefit other native flora and fauna. Habitat modification by ongoing restoration projects is likely to have a positive effect. For example, projects that control invasive species and restore native habitat would benefit native flora and fauna.

The designation of the NERR is not expected to have direct adverse effects on freshwater, estuarine, or marine fauna, and in fact could have beneficial effects. Current threats to aquatic resources in the He'eia area include overfishing, alteration of habitat, and displacement of fauna by the introduction and spread of invasive species, pollution, and disease. Adverse effects on these resources are currently addressed through public education, regulations, and enforcement. By adding to these mechanisms the increased opportunities for research, public outreach and education, and community stewardship, the He'eia NERR designation would result in beneficial effects on aquatic resources.

As discussed previously, buildings and other facilities that may be needed in the future would be designed and constructed to minimize environmental impacts, including impacts on native flora and fauna. Proposed projects would be reviewed and assessed for potential impacts according to NEPA procedures and NERRS regulations and HEPA procedures as applicable, and are not expected to adversely affect flora or fauna.

2.3 Physical Environment

2.3.1 Watershed and Hydrology

The proposed NERR designation would not adversely affect the watershed or its hydrology, and in fact is expected to have beneficial effects. Adverse effects on hydrological and watershed characteristics would be considered significant if they involved substantial changes in the frequency and magnitude of peak flows in He'eia Stream, or in the impervious-surface area in the He'eia watershed. Neither of these effects would occur as a result of the He'eia NERR designation. Rather, a major focus of the NERR would be to support research and monitoring to better understand land management and restoration programs and to improve habitat conditions and ecosystem processes throughout the ahupua'a. The increase in research and monitoring is expected to help land managers and community stakeholders learn about watershed conditions and make beneficial changes. Therefore, the NERR is expected to result in beneficial effects on watershed and hydrological conditions.

2.3.2 Water Quality

The proposed NERR designation would not have any adverse effects on water quality, and in fact would have beneficial effects. Adverse effects on water quality would be considered significant if the proposed action resulted in erosion of sediments into He'eia Stream that violate the State's standards for total suspended solids (TSS). This effect would not occur as a result of the He'eia NERR designation. Rather, a major focus of the NERR would be to support research and monitoring to better understand land management and restoration and to thereby improve water quality throughout the ahupua'a. Water quality monitoring will be conducted for the He'eia Stream (upstream of and within the proposed NERR site), the

Heʻeia wetlands, Heʻeia Fishpond, and Kāneʻohe Bay. Expected increased research and monitoring in the ahupuaʻa because of the NERR will help to inform land managers and community stakeholders of water quality conditions so that they can make changes to improve conditions. Therefore, the NERR is expected to result in beneficial effects on water quality.

As discussed previously, buildings and other facilities that may be needed in the future would be designed and constructed to minimize environmental impacts, including impacts on water quality. Proposed projects would be reviewed and assessed according to NEPA procedures and NERRS regulations and HEPA procedures as applicable.

2.3.3 Geology

The proposed action would not result in increased erosion, subsidence, or landslides, and may in fact result in beneficial effects on the geological characteristics of the area. Adverse effects would be considered significant if they resulted in a violation of the State standards for TSS in receiving water bodies—Heʻeia Stream’s TSS levels would be most indicative of adverse effects. Because the terrestrial uplands have highly erodible soils, actions that occur in the uplands in particular could increase erosion and thereby affect downstream areas. However, no such adverse effects are expected to result from the NERR designation.

After NERR designation, the increase in research and monitoring in the ahupuaʻa is expected to help inform land managers and community stakeholders of conditions so that they can make changes to improve conditions. Also, the NERR could provide an opportunity in the future to expand its boundaries up into the ahupuaʻa, where NERR programs to support habitat restoration and conservation could help improve habitat conditions and reduce erosion. Therefore, the NERR is expected to result in beneficial effects on geology.

As discussed previously, buildings and other facilities that may be needed in the future would be designed and constructed to minimize environmental impacts, including erosion-related impacts. Proposed projects would be reviewed and assessed according to NEPA procedures and NERRS regulations and HEPA procedures as applicable.

2.3.4 Climate

Potential climate-related effects include both the effects of the proposed NERR designation on climate change and the effects of climate change on the proposed designation. The former could occur through exacerbation of existing climate change impacts, or via a change (increase or decrease) in the resilience of the ecosystem to climate change. However, the proposed designation is not anticipated to have any adverse effects on climate change. The potential for the Heʻeia wetlands to sequester carbon is expected to balance out the wetlands’ methane emissions. Other types of potentially significant negative effects on climate change, such as an increase in greenhouse gas emissions (e.g., due to an increase in vehicular traffic), are not expected to occur as a result of the proposed action.

There are several ways in which climate change could adversely affect the lands within the He‘eia NERR: changes in rainfall patterns could affect water quality and hydrology, sea-level rise could overtop or affect the stability of the He‘eia Fishpond walls, and ocean acidification could affect coral recruitment and survival in Kāne‘ohe Bay. These potential negative effects should be considered during the planning and implementation of management decisions, outreach, and other project activities. Increased research and monitoring in the ahupua‘a because of the NERR will better inform all land managers and community stakeholders of changing habitat conditions and ecosystem processes due to climate change, so that they can better address or prepare for these changes.

Section 3. Human Environment Impacts

Table 3-1. Impacts of He'eia NERR Designation on the Human Environment

Topic	He'eia NERR Program Foundations		
	Research and Monitoring	Education	Coastal Training: Outreach and Resource Management
Cultural	Better documentation and understanding of archaeological and cultural resources	Synthesis of the different ways of knowing (via initiation of western academic educational programs and cultivation of indigenous approaches to knowledge), resulting in more complete understanding of cultural/archaeological resources of He'eia	Strengthened relationships between the people of He'eia and their cultural landscape, and enhanced support for sound coastal management decisions
Socioeconomic	Minimal change; increased data to guide resource management	Minimal change; improved access to science resources for local schools; enhanced education for general public about a balanced approach toward conservation of resources	No effect on population, employment, and demand of public facilities; likely increase in property values; community support for conservation of fish stock and environmental regulation; potential pressure for limits on fishing
-Traffic	Little or no change	Minimal change	Minimal change
-Fiscal (Taxation)	New funding for research; minimal increase in local tax collections	None	None

3.1 Cultural Resources

By initiating western academic educational programs and cultivating indigenous approaches to knowledge, the NERR will facilitate a valuable synthesis of the different ways of knowing, which will result in a more complete understanding and a more informed stewardship of the cultural and archaeological resources of He'eia.

Several significant archaeological and cultural resources are located within the boundaries of the proposed He‘eia NERR. Note that not all cultural resources are archaeological resources, because cultural resources are not necessarily created by human activity. For example, the reef of Ko‘amanō, where the sharks of Makanui live, and the place called Luamo‘o, where Meheanu lives, are not archaeological resources; however, they are culturally significant according to Hawaiian traditions, and therefore are counted among the cultural resources of the area. Such resources may or may not be included in the NERR education and stewardship programs. Other resources in the proposed He‘eia NERR are the result of human actions; for example, the precontact (i.e., before European contact) He‘eia Fishpond is both an archaeological and a cultural resource. Other archaeological resources in the area include a precontact agricultural complex and a precontact basalt quarry. There are also two archaeological sites from the postcontact era listed within the He‘eia NERR boundaries: the remains of a rice mill and an ‘ōkolehao distillery. Like the cultural resources mentioned earlier, these archaeological resources may or may not be addressed by education, stewardship, or monitoring efforts associated with the NERR. However, if they are included in NERR education and research programs, it could lead to better documentation and comprehension of the archaeological and cultural features, leading to a fuller appreciation for these individual resources and for their collective contribution to the history of He‘eia.

The cultural and archaeological resources of He‘eia would also gain from monitoring and stewardship programs. Monitoring efforts would ensure that the conditions of these resources remain optimal. For subsurface archaeological features, monitoring would minimize potential adverse impacts if these resources become exposed or otherwise affected by NERR-related activities. Stewardship efforts would help to maintain and protect all of He‘eia’s cultural/archaeological resources. Enhanced stewardship under the NERR would provide the additional, invaluable benefit of strengthening the pilina, or intimate relationship, between the people of He‘eia and their cultural landscape.

The impacts of the He‘eia NERR programs on the cultural and archaeological resources of the area are not expected to be adverse; rather, the NERR designation is predicted to help in preservation efforts. The people of He‘eia will also be impacted favorably as they learn about, reconnect with, and care for these irreplaceable resources.

3.2 Socioeconomic Impacts

The socioeconomic impacts of the proposed NERR designation vary by topic. A range of impacts were analyzed, as summarized below:

- **Population:** Few or no population impacts are anticipated because the NERR would not employ more than a few staff members and would not involve substantial construction of new facilities or demand for services.

- **Employment:** Increased research and educational activities in the NERR could support a few new jobs and research fellowships; this effect is considered minor.
- **Demand for public facilities:** Because the NERR designation would not result in a population increase, no change in demand for public facilities is anticipated. Rather, educational activities in the NERR could benefit local schools.
- **Adjacent residential areas:** NERR designation could, over several years, raise some property values. No impact on oceanfront residential areas is likely: these already have an important amenity that contributes to value. For the residential areas near the He'eia wetlands, restoration projects plus the area's status as a reserve could make residences more attractive to nearby buyers, and hence add to residential property values. The impact is likely to arise over time and to be smaller than the amenity value accruing to oceanfront properties.
- **Fishing:** NERR designation could affect fishing resources in the NERR. In Hawai'i, the distinctions between recreational, subsistence, and commercial fishing can be blurred. It is generally agreed that fish stocks throughout the islands have declined. Kāne'ohe Bay fishers have reported a decline in stocks throughout the twentieth century. Increased community support and interest in reef and fisheries conservation as a result of NERR activities could result in public sentiment leaning toward additional fishing regulations in the NERR. Also, an increase in publicity about the NERR resources could attract more fishers to the reserve and thereby affect current local fishers' access to the fisheries and the abundance of fish. On the other hand, NERR conservation and restoration activities also could result in improvements to the habitat and an increase in fish stocks, supporting an increase in the abundance of fish for local fishers.

Negative effects on fisheries are clearly contentious, and the available resource is limited, so any further decline or regulation of access would be considered significant. However, the research and monitoring program of the NERR would provide the data needed to guide effective management of fish stocks. Stewardship projects such as restoration of the reef could improve habitat for fish. Lastly, the education and outreach programs of the NERR could support a well-informed, involved community and decision makers, who are expected to take a balanced approach toward fishing and conservation and avoid unwarranted regulations on fishing. The risk remains that increased community scrutiny would lead to additional regulations on fishing that fishers would find unwarranted. Given these considerations, the proposed NERR designation is considered to have a neutral effect on fishing access and resources.

- **Organizations currently working on restoration of resources in the NERR:** NERR designation would bring increased funding for restoration and increased attention from the State and community. Although these effects would be welcomed by local nonprofit groups, it is also possible

that NERR designation would lead to increased regulation and environmental scrutiny to enhance protection of resources, thereby adding to the cost and time needed to accomplish restoration work. These organizations have already worked to obtain State environmental reviews of their programs and plans. Whether the NERR designation would bring an additional level of review, increasing the burden of restoration work for small non-profits, has not been decisively resolved. However, the education and outreach programs of the NERR would support a well-informed, involved community and decision makers, who are expected to take a balanced approach toward conservation and management and to avoid imposing unwarranted regulations. Given these considerations, the effect of the proposed NERR designation is uncertain but could have a slightly positive effect on the organizations working to restore resources in the NERR area.

- **Minority and low-income communities (Executive Order 12898):** The NERR designation would not involve disproportionate impacts on minority or low-income communities; there would be no effect.
- **Health of children (Executive Order 13045):** The NERR site is unpopulated; restoration and research activities are not expected to result in health impacts, either on site or off site. There would be no effect.
- **Traffic:** Although the section of the Kamehameha Highway crossing through the estuary area is narrow, traffic is light there in comparison with other major roadways in Kāneʻohe, and is not expected to be adversely affected by the proposed designation. Activities in the NERR could increase traffic to the State Park and other sites, but not enough to result in traffic congestion. This effect is considered minor.
- **Fiscal:** NERR designation is expected to attract federal funds while committing the State of Hawaiʻi to provide matching funds. The State also would gain tax revenues from the income and spending of new workers. These cash flows are small; thus, the action would have only a negligible effect.

Section 4. Cumulative Impacts

The designation of the He‘eia NERR does not involve or allow for any action that would significantly disrupt the landscape. There would be no change in land ownership, and current uses of the public and private lands and waters within the proposed NERR boundary would continue to be managed by present regulatory authorities. Reserve designation is largely an administrative action. An analysis of the proposed designation’s effects, considered together with the effects of other federal and nonfederal actions (Table 4-1), determined that the proposed action’s contributions to cumulative environmental and human impacts are either minimally adverse or beneficial.

No other federal actions affecting the He‘eia area were identified for the analysis of cumulative effects. However, five nonfederal actions were identified and considered (Table 4-1). The first nonfederal action is being conducted by Kāko‘o ‘Ōiwi, a reserve site partner. This action is the conversion of the He‘eia wetlands and uplands into a working agricultural landscape, with organic taro lo‘i in the wetlands and organic dryland agricultural crops and orchards in the uplands of the property (Townscape 2011a and b). Project elements include work towards:

- restoring He‘eia wetlands to active production of organic taro on approximately 150 acres;
- conducting organic agriculture on 3 acres and aquaponics on 1 acre of relatively level fill areas of the site;
- planting approximately 50 orchard trees along Kealohi Road;
- maintaining agricultural and safety roads that will provide access to the agricultural areas;
- restoring approximately 10 acres of loko i‘a kalo, or traditional combined taro fields and fishponds, in the Makai (seaward) brackish areas of the wetlands;
- constructing detention ponds in the mauka (upland) part of the property to detain sediments and debris during storm events and thus reduce impacts on agricultural areas;
- cultivating dryland crops and orchards in upland areas and on hillsides that are currently overgrown with nonnative invasive species;
- constructing supporting agricultural and community facilities in upland areas, including a poi mill, composting facility, community center, health center, Hawaiian hale and base yards; and
- establishing educational programs in partnership with other local groups.

Although wetland and upland agricultural conversion, construction of detention ponds, and construction of facilities could have short-term impacts within the proposed He‘eia NERR boundary, implementation of best management practices (BMPs) as part of the permits acquired from the U.S. Army Corps of Engineers (USACE) for activities in waters of the United States would avoid or minimize impacts on water quality and hydrology. Also, this project is expected to result in beneficial effects on He‘eia uplands and wetlands, as well as on the cultural, socioeconomic, and educational resources of the area.

Table 4-1. Summary of Potential Cumulative Impacts, Including the Contribution of the He'eia NERR Designation

Topic	Proposed Action	Kāko'o 'Ōiwi Wetland and Upland Agriculture	Kāko'o 'Ōiwi Wetland and Stream Restoration	He'eia Fishpond Reconstruction and Aquaculture Farming	Moku o Lo'e Infrastructure Rehab/Replacement	Kāne'ohē Bay Coral Reef Restoration	Cumulative Impact
Habitats							
Uplands	+	+	N	N	N	N	+
Wetlands	+	+	+	+	N	N	+
Freshwater streams	+	*	+	N	N	N	+
Estuarine habitats	+	*	+	+	N	N	+
Coastal and marine habitats	+	*	N	*	N	+	+
Flora and Fauna							
Rare, endangered, and threatened plants	N	N	N	N	N	N	N
Endangered and threatened wildlife	+	+	*	+	N	+	+
Other flora	+	+	+	+	N	N	+
Other fauna	+	+	+	+	N	+	+
Physical Environment							
Watershed and hydrology	+	*	+	N	N	N	+
Water quality	+	*	+	*	N	N	+
Geology	+	*	+	N	N	N	N
Climate	+	N	N	N	N	+	+
Human Environment							
Socioeconomic	+ or *	+ or *	N	+ or *	N	N	+ or *
Traffic	N	N	N	N	N	N	N
Cultural	+	+	N	+	N	N	+

Key: N = No effect; * = Low adverse effect; ** = Moderate adverse effect; *** = Substantial adverse effect; + = Overall beneficial effect. Socio-economic impacts uncertain because the impacts of federal and community supervision could outweigh the benefits of support.

The second nonfederal project, also being conducted by Kāko‘o ‘Ōiwi, is restoration of the He‘eia wetlands by removal of invasive mangroves (*Rhizophora* and *Bruguiera* spp.), and restoration of the He‘eia Stream channel by removal of California grass and other nonnative invasive plants that are choking water flows (Townscape 2011a and b). To minimize potential impacts on the endangered Hawaiian hoary bat, removal of the mangrove trees will not be conducted during the bat’s breeding season, which extends from June 15 through September 15. A predator control program also will be implemented to control rats, mongooses, cats, and dogs in the wetlands area. Although plant removal and restoration activities could have short-term impacts on water quality and hydrology within the proposed He‘eia NERR boundary, implementation of BMPs as part of the permits acquired from USACE for activities in waters of the U.S. would avoid or minimize these impacts. Overall, this project is expected to enhance water quality and hydrology of the watershed and estuary, and have beneficial effects on He‘eia Stream, the wetlands, the estuary, and the native flora and fauna that occur in these areas, and a neutral effect on the cultural and socioeconomic resources of the area.

The third nonfederal project, conducted by the community-based group and reserve site partner Paepae o He‘eia, is to repair, reconstruct, and rehabilitate the He‘eia Fishpond’s unique 7000-foot-long wall that completely encircles the pond, and to manage the fishpond to preserve the integrity of the pond and support a unique cultural, educational, and aquacultural program (Helber Hastert & Fee. 2007, Paepae o He‘eia 2015). Removal of introduced and invasive mangrove (which threatens the wall’s structural integrity) has been ongoing since the late 1990s. Once mangrove removal is completed, the damaged portions of the wall will be reconstructed, and invasive seaweed will be removed. Currently, the project produces various aquacultural products as part of its economic development efforts. Project activities may have short-term impacts on water quality, but implementation of BMPs as part of the permits acquired from USACE for activities in waters of the U.S. would avoid or minimize these impacts. Overall, this project is expected to have beneficial effects on the He‘eia estuary and wetlands and associated flora and fauna, as well as on the cultural, educational, and socioeconomic resources of the area.

The fourth nonfederal project, the Coconut Island Infrastructure Rehabilitation and Replacement Project, will be conducted by the University of Hawai‘i (Community Planning and Engineering, Inc. 2014). The project will involve utility line replacement, rerouting of an existing gravity sewer line, sewage pump replacement, and wet well repairs. The new utility lines will be installed under the sea floor, from Coconut Island to the mainland, using horizontal directional drilling (HDD). A 350-foot-long trench will be dug to reroute the sewer line and tie it into an existing main sewer line. None of the activities specified in the work plan will affect the He‘eia NERR resources; a Finding of No Significant Impact was issued for this project.

The fifth nonfederal project, the Kāne‘ohe Bay Coral Reef Restoration project, is being implemented by the Hawai‘i State Department of Land and Natural Resources, Division of Aquatic Resources (Division of Aquatic Resources 2013, USACE 2014). This project involves mechanically removing thousands of pounds of invasive algae from Kāne‘ohe Bay coral reefs and releasing sea urchins to graze on any remaining algae.

The removed algae is given to local farmers and used as compost and fertilizer. A coral reef mitigation bank, where invasive algae may be removed as part of mitigation bank management, may be established within the proposed He‘eia NERR. This outcome could result in significant habitat restoration benefits for affected coral reef, coastal, and marine habitats and the species that inhabit these systems.

The proposed federal (NOAA) action of designating the He‘eia NERR would yield a net beneficial effect on the human and natural environment. The NERR designation would increase attention to research and educational uses of the proposed reserve. There are already several educational and outreach programs occurring in the area as part of nonfederal projects, such as the Paepae o He‘eia Fishpond Reconstruction and Aquaculture Farming project and the agriculture and restoration projects being conducted by Kāko‘o ‘Ōiwi. The proposed reserve would build on and support these education and public programs, which is expected to foster environmental stewardship and resource conservation. Another major focus of the proposed He‘eia NERR research program would be to monitor the biological, ecological, and physical variables of the He‘eia uplands and estuary and Kāne‘ohe Bay. Monitoring would provide the long-term baseline data against which reserve managers and researchers may assess environmental changes over time. Enhancing our understanding of the spatial and temporal processes of the system would support informed management practices and improve stewardship of coastal natural resources in the future.

The overall cumulative impact of the NERR designation and the nonfederal projects on social and economic conditions and cultural resources is expected to be beneficial. The NERR designation and the nonfederal actions described above would increase awareness of the cultural and archaeological resources of the He‘eia NERR and result in increased public support for protecting them. Traffic is expected to increase, but not to the extent of causing traffic jams. Public schools and the community are expected to have greater access to science and cultural educational resources. The NERR and the nonfederal actions also would generate a modest increase in jobs and federal funding.

Regionally, the He‘eia NERR would be a center for estuarine research and education. Thus, the proposed reserve would serve resource users, coastal decision makers, educators, and visitors and would have positive effects on the entire region. Nationally, the proposed He‘eia NERR designation would further NOAA’s mission of establishing a system of reserves in all biogeographic subregions and estuarine types in the United States.

Section 5. Impacts of the No-Action Alternative (Trends)

5.1 Natural Environment

The no-action alternative (i.e., the choice to not designate the He'eia NERR and not implement associated programs for research and monitoring, education, and coastal training) would not result in any changes to the current status of the natural environment or the current management or ownership of the lands and waters in the proposed He'eia NERR area. The current conditions of environmental resources in the area would persist, and current trends would continue. However, taking no action would result in a lack of coordination and long-term cooperation in the management of the lands and waters in the proposed NERR. Research, monitoring, education, public outreach, and resource management would not be conducted or be eligible for NERR funding by NOAA. Without this funding and support by NOAA, the natural environment in the proposed NERR area may not receive potential long-term benefits such as improved water quality, habitat protection, and land stewardship.

5.2 Human Environment

The no-action alternative would not result in any changes to the current status of the human environment or the current management or ownership of the lands and waters in the proposed NERR area. The current conditions of human resources would persist, and current trends would continue. However, taking no action would result in a lack of coordination and long-term cooperation in the management of the lands and waters, and programs would not be conducted or be eligible for NERR funding by NOAA. Without this funding and support by NOAA, the human environment in the proposed NERR area would not receive potential long-term benefits such as an improvement of educational and outdoor recreational opportunities, increased access to science education resources, and perpetuation of cultural knowledge and practices.

Section 6. References

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Attachment A. Reserve Management Plan
