STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
Honolulu, Hawaii

October 22, 2021

Board of Land and
Natural Resources
State of Hawaii
Honolulu, Hawaii

REGARDING:	Submittal and Recommendation to the Governor to Accept the Final Environmental Impact Statement (EIS) for the Kāʻanapali Beach Restoration and Berm Enhancement
APPLICANT	Department of Land and Natural Resources
LANDOWNER:	State of Hawaiʻi
AGENT:	Sea Engineering, Inc
LOCATION:	Hanakaoʻo, Lāhainā, Maui Makai of Tax Map Keys: (2) 4-4-008:001, 002, 003, 005, 019 & 022; (2) 4-4-013:001, 002, 006, 007, 008 & 013
AREA OF USE:	Restoration Site: Approximately 1 mile of coastline widened 41-78-feet Sand Recovery Site: 8.5-acres
SUBZONE:	Resource

The draft FINAL EIS for the Kāʻanapali Beach Restoration and Berm Enhancement can be reviewed at https://dlnr.hawaii.gov/occl/kaanapali/

Background
This matter was scheduled to come before the Board on August 13, 2021 but was deferred as a significant number of comments were generated from the Canoe Clubs of the Lāhainā District. Consultant Chris Conger of Sea Engineering along with project proponents, the Kāʻanapali Operations Association (KOA) virtually meet with representatives of the Canoe Clubs, West Maui Preservation Association, and interested private parties on August 18, 2021. Details of this meeting are discussed later in this recommendation under public outreach.

Staff would like to clarify that what is before the Board is the proposed final Environmental Impact Statement (EIS). At this time, we are not evaluating the project, we are evaluating the content of the EIS. The EIS is utilized to supplement

the application process for permits. During the application process, a public hearing shall be held, and the merits of the project may be evaluated.

Environmental Impact Statement (EIS)
An EIS is a disclosure document that discloses the environmental setting of a proposed action, analyzes the effects of the proposed action on the environment in terms of direct, indirect and cumulative impacts, discusses alternative methods, modes or designs of the proposed action, and formulates mitigation to eliminate, reduce, rectify adverse impacts of the proposed action. Public consultation must be sought and incorporated into the document. An EIS must provide sufficient information for decision makers in considering the environmental effects of a proposed action.

Final EIS ACCEPTABILITY EVALUATION
The rules that govern the EIS process require that the statement contain at least the following elements:

- A concise summary and table of contents
- A statement of purpose for the project
- A detailed project description including maps, technical data, economic and cultural effects and historical perspective
- An analysis of alternatives to the proposed project and an explanation why the alternatives were rejected
- A description of the environmental setting
- A statement of the relationship of the proposed action to land use plans, policies and controls for the affected area
- A description of the probable impacts of the project including the direct, indirect and cumulative impacts, as well as impacts on both the natural and human environments
- A description of the relationship between short-term uses of environmental resources and long-term productivity (sustainability analysis)
- A statement of the unavoidable environmental impacts caused by the project and a rationale for proceeding with the project in light of these impacts
- A consideration of all mitigation measures proposed to avoid, minimize, rectify or reduce the project's adverse impacts
- A summary of unresolved issues and a discussion of how such issues will be resolved
- A listing of all agencies, organizations and individuals consulted during the preparation of the document
- Reproduction of all substantive comments received during the study process and the responses to those comments

Pursuant to Hawaiʻi Administrative Rules (HAR) §11-200-23 Acceptability:

(a) Acceptability of a statement shall be evaluated on the basis of whether the statement, in its completed form, represents an informational instrument which fulfills the definition of an EIS and adequately discloses and describes

all identifiable environmental impacts and satisfactorily responds to review comments.

(b) A statement (i.e. Environmental Impact Statement) shall be deemed to be an acceptable document by the accepting authority or approving agency only if all of the following criteria are satisfied:

1) The procedures for assessment, consultation process, review, and the preparation and submission of the statement, have all been completed satisfactorily as specified in this chapter;

2) The content requirements described in this chapter have been satisfied; and

3) Comments submitted during the review process have received responses satisfactory to the accepting authority, or approving agency, and have been incorporated in the statement.

PROPOSED ACTION

Beach restoration is a specific type of environmental restoration focused on restoring coastal sandy habitat that extends across the terrestrial/marine boundary. In broad terms, environmental restoration is focused on the rejuvenation of a damaged resource, typically after the resource has been damaged due to human interactions. Modern sea level rise is a result of human-induced global atmospheric and ocean warming. Changes in storm severity have also been attributed to climate change. These phenomena have been identified as accelerating coastal erosion rates in Hawaiʻi and globally.

The Department of Land and Natural Resources has determined that the proposed beach restoration is an action subject to HRS, Chapter 343 and has further determined that an environmental impact statement should be prepared as the beach restoration project is proposed upon state land in the conservation district and partially funded with state funds. In 2012, the State Legislature enacted Act 172 allowing the Chapter 343 process to begin with preparation of an environmental impact statemen preparation notice (EISPN) rather than a draft environmental assessment in cases where the agency determines that an EIS is likely to be required.

Beach restoration is proposed for the section of beach between Hanakaʻōʻō Beach Park and Hanakaʻōʻō Point (“Hanakaʻōʻō Littoral Cell”), and beach berm enhancement is proposed for the section of beach between Hanakaʻōʻō Point and Puʻu Kekaʻa (“Kāʻanapali Littoral Cell”) **(Figure 1**). The proposed project is intended to mitigate the impacts of rising water levels and coastal erosion, which are increasing with global sea level rise.

EXISTING CONDITIONS

The Hanakaʻōʻō Littoral Cell (HLC) is suffering from a combination of chronic and episodic erosion, which has resulted in beach narrowing, shoreline recession,

reductions in beach access, and damage to backshore infrastructure including the Kāʻanapali Beachwalk. The beach in this littoral cell is less seasonally dynamic than the beach in the Kāʻanapali Littoral Cell to the north; however, the long-term changes in beach location and width are more persistent along this length of shoreline than in the Kāʻanapali Littoral Cell. The presently narrow beach, chronic erosion, and limited seasonal sand transport make this section of shoreline suitable for beach restoration.

The Kāʻanapali Littoral Cell (KLC), between Hanakaʻōʻō Point and Puʻu Kekaʻa, experiences significant seasonal erosion with alternating predominant wave directions in summer and winter.

The Sand Recovery Area The beach quality sand proposed for recovery from an 8.5-acre sand deposit is located approximately 150 feet to nearly 800 feet seaward of Kāʻanapali Beach. This sand area, in 28 to 56 feet water depth, is part of a much larger regional sand field fronting Kāʻanapali. The sand selected for this project is nearly an ideal match to the existing beach sand. The sand recovery site is nearby, which limits travel and sand transfer requirements. The offshore sand's similarity to the adjacent beach sand is likely a result of transport and loss from the active beach system.

Offshore reconnaissance of the sand deposit included side-scan sonar imaging, towed video transects, hand coring, compressed air probing, vibracoring, diver inspection, and sub bottom profiling. Laboratory tests on the vibracore samples included graded sieve analysis, fine content analysis, calcium carbonate analysis, and wet/dry color comparison. The sonar investigations revealed the Sand Recovery Area to be approximately 11-acres in area with a varying thickness between 7 and 26 feet with an estimated volume of 358,000 cubic yards of sand.

OBJECTIVES OF THE PROPOSED PROJECT

As an adaptation measure, the beach is proposed to be maintained through sand nourishment and berm enhancement as an interim measure for erosion mitigation. The project:

- Provides a nature-based solution as an interim step in sea level rise adaptation
- Ensures the viability of the sandy coastal resource
- Restores the recreational resources and natural habitat
- Mitigates the impacts of coastal erosion and rising water levels, which are increasing with global sea level rise and increased storm severity in the tropics
- Increase the resilience of the Kāʻanapali community to the effects of seasonal erosion and longer-term climate change
- Protects the backshore lands and improvements on an interim basis

PROJECT DESCRIPTION (Figures 2, 3, 4, 5 & 6)

A total of approximately 75,000 cubic yards of sand is needed for the proposed beach restoration and berm enhancement project, with 50,000 cubic yards and

25,000 cubic yards allocated to the Hanakaʻōʻō and Kāʻanapali littoral cells, respectively. The project would utilize approximately 21% of the overall sand volume in the Sand Recovery Area, leaving about 79% of the sand resource in place. The recovery effort would require a submarine excavation pit that would be about 6-feet deep.

The proposed sand recovery method consists of a moored crane barge equipped with an environmental clamshell bucket, two sand transport barges, several tugboats, and two landing areas at opposite ends of the project area. The crane barge would lift sand from the seafloor with the environmental clamshell bucket and place it onto two approximately 1,500 cubic yard capacity barges. Environmental clamshell buckets are designed to minimize water volume and maximize precision with each sand recovery scoop, which minimizes potential impacts to the surrounding environment. The sand transport barges would rotate between the sand recovery site and the off-loading sites. Once a sand transport barge is filled at the sand recovery site, it would be towed to the off-loading site by a tugboat, where the barge would be moored adjacent to an elevated trestle or floating bridge. The elevated trestle or floating bridge would extend from approximately 15 feet of water depth to shore. Sand would be transferred from the barge to shore along the bridge/trestle system using a methodology selected by the contractor. Land-based equipment would then transfer the sand from the shoreline, at the end of the elevated trestle or bridge, to the placement area. At the sand placement area, which would move each day as the project advances, bulldozers and crews would spread sand along the shore to meet the lines and grades of the design beach restoration plan and section and the berm enhancement plan and section. Sand would be placed over the existing beach and no excavation of the beach is planned with the proposed project.

During placement activities there would be heavy equipment operated on the beach at the sand transfer site and at the sand placement site. These areas would be treated as active construction sites and public access would be limited near the heavy machinery and sand loading and grading areas. The sand placement site would move progressively through the berm enhancement and beach restoration areas as sand is added to the beach. Sand would be mechanically hauled by dump trucks between the two transfer sites on the beach and the restoration areas on the berm and beach. During hauling operations, the transit corridor for the trucks would be cordoned off and assistants would be available along the full length of the haul route to facilitate public access to and from the shoreline. While sand transport barges are transiting from the sand recovery barge to the off-loading sites, marine traffic and public access along the navigation route would be restricted. There would be approximately four rotations of barges between the recovery site and off-loading sites each day. There would also be restricted public access around the sand recovery barge and the offloading sites, to protect the public from potentially dangerous contact with the equipment and support materials.

HLC- Beach restoration would include the addition of beach quality sand from the current beach face out to the former extent of the beach in the 1980s. This part of

the proposed project would use approximately 50,000 cubic yards of highly compatible marine carbonate sand to restore the beach to the approximate position shown in a 1988 aerial photograph **(Figure 7)**. This would widen the dry beach by between 41 and 78 feet.

KLC-Berm enhancement, or raising the elevation of the beach berm, would create a new reservoir of sand along the backshore (the upper, usually dry area of the beach) to augment the current sediment system with additional volume. This additional volume of highly compatible sand will help offset temporary beach loss during the natural seasonal erosion cycles. Sand placed at the north end of the beach would be seasonally eroded during the winter months, while sand placed at the south end of the littoral cell, at Hanakaʻōʻō Point, would be released during summer months. Both berm enhancement areas would provide a buffer during extreme erosion events by increasing total beach sand volume within the broader littoral cell. This part of the proposed project would use approximately 25,000 cubic yards of sand to raise the north and south beach berm elevation by 3.5 feet along most of the Kāʻanapali Littoral Cell (Figure 2). The berm enhancement area would extend from the vegetation in the backshore to the berm crest, at the mauka edge of the beach face.

Beach restoration is expected to last approximately two months, including sand recovery, transfer, and placement activities, which are expected to take place at least 12 hours per day, seven days per week. The goal is to complete the project in the most efficient manner possible, thereby limiting the inconvenience to the general public and construction related impacts to the environment. The work is projected to take place during October, November, and part of December, minimizing overlap, as much as possible, with southern summer swell and northern winter swell environments.

Table 1 summarizes beneficial and adverse impacts of the proposed beach restoration action and the mitigation measures proposed to avoid, minimize, rectify, or reduce the project's potential adverse impacts.

Table 2 summarizes unresolved issues of the proposed action and a discussion of how such issues will be resolved.

ALTERNATIVES

Alternatives were defined to satisfy the following beach management tasks:

- Recovering nearshore beach compatible sand that would be a good match for both littoral cells
- Restoration of the HLC through beach restoration with placement of additional beach sand to widen the beach
- Adding sand to the dry berm area in the KLC to provide capacity to recover from episodic events

Several alternatives were identified and dismissed and were not developed and assessed. These would include: Offshore breakwaters, submerged breakwaters,

T-head groins, profile groins, groins, reef balls, artificial reefs, mangrove forest installation, living shorelines, biorock, sand grabbers, and dune restoration.

Six alternatives in addition to the proposed action/preferred alternative-Beach Restoration were considered and assessed:

1) Alternative Sand Sources
2) Temporary Shore Protection
3) Permanent Shore Protection
4) Vertical Accommodation
5) Managed Retreat
6) No Action Alternative-Unmanaged Retreat

Alternative Sand Sources
A suitable compatible sand source was a significant factor in selecting the sand source. **Table 3** compares the different sand sources that includes the Sand Recovery area (preferred); the nearby Sand Wave Area; the Mala Ramp Sand Area that is ≈ 2.7 miles south of the project area; the Reef Runway on Oʻahu; and the Maui Inland Sand Dune.

Temporary Shore Protection
Temporary, non-emergency shore protection has been used to protect landscaping, boardwalks, and pool complexes while permanent solutions are planned and designed, or until the erosion condition passes. This would be stacks of large geotextile or natural fiber sandbags, geotextile fabric draped over an erosion scarp and sand-filled geotextile mattresses. Due to the temporary nature, the materials degrade rapidly, require a lot of maintenance and are a short to midterm option.

Permanent Shore Protection
Permanent shore protection uses hard, durable materials to fix the shoreline and includes revetments, seawalls, groins, and breakwaters usually made of stone, concrete, or sheet pile. Revetments and seawalls are durable long-term and low maintenance. Buried shore protection structures may not be noticeable as long as they remain buried. However, if beach restoration efforts are not kept up, this would lead to beach narrowing and loss.

Groins and breakwaters are made of rock or concrete and extend offshore or are disconnected from the shoreline. A relatively short groin at Hanakaʻōʻō Point could adequately separate the two cells and provide limited protection from southern swell for a portion of the point within the Kāʻanapali Littoral Cell. A groin would be effective at blocking the erosive waves that come across the point from the south when the sand volume at the point is diminished. Groins typically result in downdrift, or down current, erosion. The beach on the downdrift side of the groin will typically experience erosion during periods of high sediment transport, while the beach on the updrift side will accumulate sand.

Offshore breakwaters would not be effective within the Kāʻanapali Littoral Cell, due to the changing, oblique seasonal wave patterns. A breakwater may be partially

effective at the paleochannel in the middle of the Hanakaʻōʻō Littoral Cell. However, this location has a very shallow fringing reef that currently reduces wave energy.

Vertical Accommodation
This would involve preparing the shorefront for inundation and land loss by elevating existing uses and structures above the shoreline to allow the shoreline to naturally migrate landward beneath the uses and structures. In this location with an erosion rate of ≈ 2.0-ft/year, should the beachwalk be redesigned to be an elevated boardwalk, it would eventually detach from the backshore and be suspended above the beach. The beach near and beneath the structure would not be safe during wave events due to turbulent water currents in and amongst the piles.

Managed Retreat
Managed retreat is the planned relocation of development away from the shoreline and out of vulnerable areas that is intended to allow the shoreline to naturally move inland. Managed retreat in a heavily developed high-rise resort community like Kāʻanapali is a multi-decadal process, requiring extensive planning and coordination between government, community, and affected property owners.

The EIS document discusses managed retreat throughout the document. However, managed retreat would not come under the Departments purview as actions would take place outside of the Conservation District. Under HAR, §11-200-17(f) for agency actions, the discussion of alternatives shall include, where relevant, those alternatives not within the existing authority of the agency.

No Action-Unmanaged Retreat
The No-Action alternative provides a baseline for comparison of the environmental effects of the proposed project. The shoreline in the proposed project area is moving landward ≈ up to 2-feet/year in the HLC. Episodic events and sea level rise are expected to cause increasing coastal erosion.

Unmanaged retreat would entail removing existing infrastructure in an unplanned manner as it is imminently threatened or fails as the shoreline migrates landward. It is retreating in response to shoreline erosion that limits response options. With the expected sea level rise, the beach may disappear as the waterline moves more mauka. In addition to sand, dirt and fill material may be released into the nearshore waters increasing turbidity and impact ocean resources.

Table 4 summarizes anticipated short-term and long-term impacts associated with the presented alternatives. Short-term impacts are generally defined as impacts due to construction and conditions that will return to pre-construction condition within 6 months. Long-term impacts generally last longer than 6 months, are ongoing, or are permanent. Mid-term is used in several instances to call out impacts that can last between 6 months to several years but will not be ongoing or permanent in nature.

THE FINAL EIS

Further studies and analysis were conducted based on community and agency feedback. Discussion within the final EIS has been expanded to incorporate additional information and data sets. An addendum to the marine environmental report was produced that improves the characterization of the nearshore marine environment, with a more robust assessment of potential direct, secondary, and cumulative impacts to the marine environment. There is focused discussion of the environment in and around the sand placement areas and under the sand transfer areas at the water's edge. The addendum proposed a post-construction monitoring plan that will coordinate with and contribute to two reef ecosystem monitoring stations.

The Cultural Impact Assessment was expanded with information and insights provided through discussion with and comments from longtime residents and others who are interested and engaged in the cultural resources of the region. A deeper discussion and analysis of the local cultural resources and potential impacts are included along with a Ka Paʻakai Analysis.

Broader discussions within the final Statement include:

- Managed Retreat
- Project Sequence
- Public Lands and Public Funds
- Turbidity Modeling
- Marine Biology
- Coastal Flora and Fauna
- Public Health and Safety
- Cultural/Archaeological Resources
- Secondary and Cumulative Impacts
- Alternatives
- Mitigation and Monitoring
- Unresolved Issues/Action to Resolve or Reason to Leave Unresolved
- Marine Biology and Water Quality (Appendix C)

PUBLIC OUTREACH

Information regarding this project has been available on the Office of Conservation and Coastal Lands website: https://dlnr.hawaii.gov/occl/kaanapali/. Solicitation of comments occurred via publication of the Office of Environmental Quality Control's *Environmental Notice.* The Environmental Impact Statement Preparation Notice (EISPN) was published on July 23, 2018 with a 30-day comment period and the draft Environmental Impact Statement was published on August 23, 2020 with a 45-day comment period.

A September 15, 2020 press release announced an Information Meeting on September 24, 2020, at 2pm with a zoom link. Staff noted 73 individuals present at this question and answer format meeting.

On November 18, 2020, the proposed project was presented to the Maui Lanaʻi Island Burial Council who voted to oppose sand recovery offshore of Puʻu Kekaʻa.

On March 24, 2021, the proposed project was discussed virtually with the County of Maui via Zoom. Comments and concerns raised were lack of lifeguard services; complaints regarding derelict sandbags along this coastline; managed retreat; potential effects on the reef ecosystem; sand compatibility and how long the sand would remain on the beach after restoration actions. Maui Mayor Victorino shared how he worked as a Security Guard along the project area and that he supported the project and would like the project to get done.

On March 29, 2021, the proposed project was discussed virtually with the West Maui Preservation Association via Zoom. Comments and concerns raised included managed retreat; value of the beach resource; shoreline certification; how long sand would remain on the beach after restoration actions; secondary and cumulative impacts; beach, reef and water quality monitoring; public safety during construction; potential user conflicts and consulting proper parties in regards to the cultural impact assessment. Comments suggested that the project could be acceptable if a managed retreat plan was a condition of approval.

On March 31, 2021, the proposed project was discussed virtually with Maui Surfrider via Zoom. Comments and concerns raised included managed retreat; how long would the sand remain on the beach after restoration actions; monitoring of the beach, reef and water quality; potential effects on the surf break and recreational users; adjacent landowners not embracing or planning for managed retreat; and endangered species monitoring.

On August 18, 2021, a virtual discussion was hosted by Kaʻanapali Operations Association. Sea Engineering, Inc., gave an introductory presentation on the EIS process for the proposed project. Community members were concerned that the project team did not approach and engage the local Kanaka Maoli community. Comments and concerns raised was that the local community was not given an opportunity to discuss the project or provide detailed site-specific information to help shape the design; the process is being rushed and comments are not being taken into consideration; and managed retreat. It was believed that the project is seen as public funding for improvement of the hotels' beach, not as a public benefit. There was concern that the project only impacts the local community, while all the benefits will be received by the resorts.

Forty comments were received with the publication of the draft EIS and responded to by the OCCL in June and have been included and incorporated into the final EIS. Staff notes there has been a three-year timeline in developing and processing the EIS from July 23, 2018 with the publication of the EIS Preparation Notice to now.

CONCLUSION

Beach restoration is a short to mid-term solution, intended to restore coastal resources while long-term solutions are investigated and implemented. Beach restoration is not the answer to sea level rise adaption, but it allows us to manage and remedy erosion effects so that we can avoid coastal armoring; protect,

preserve and enhance our beaches; insure lateral access and recreational areas for the local community; maintain economic viability of visitor destinations; and buy needed time to figure out what managed retreat looks like for Kā'anapali and how to accomplish it. Resource restoration along our coastlines is an important goal that benefits all. Moreover, the proposed project fulfills the State's responsibility to manage, conserve, and protect coastal resources, including sand beaches that are public trust lands.

A Conservation District Use Permit is required and subject to the Board's review prior to project implementation. The Board shall review the merits of the project at that time.

Staff has reviewed the final EIS and has concluded the final EIS has been prepared in compliance with the state environmental review process prescribed under HRS Chapter 343 and HAR Chapter 11-200. Staff believes the Statement is consistent with Act 50(2000) regarding cultural practices of the community and state and Act 286 (2012) that amended the Hawai'i State Planning Act regarding climate change adaptation priority guidelines.

RECOMMENDATION

Based on the preceding analysis, staff recommends the Board of Land and Natural Resources approve the submitting of the Final Environmental Impact Statement for the Kā'anapali Beach Restoration and Berm Enhancement located at Hanakao'o, Lahaina, Maui, makai of tax map keys: (2) 4-4-008:001, 002, 003, 005, 019 & 022; (2) 4-4-013:001, 002, 006, 007, 008 & 013 to the State Office of Environmental Quality Control for publication of its availability in The Environmental Notice and transmit this final EIS to the Governor with a recommendation for Acceptance.

Respectfully submitted,

K. Tiger Mills, Staff Planner
Office of Conservation and Coastal Lands

Suzanne D. Case, Chairperson
Board of Land and Natural Resources

EXHIBITS

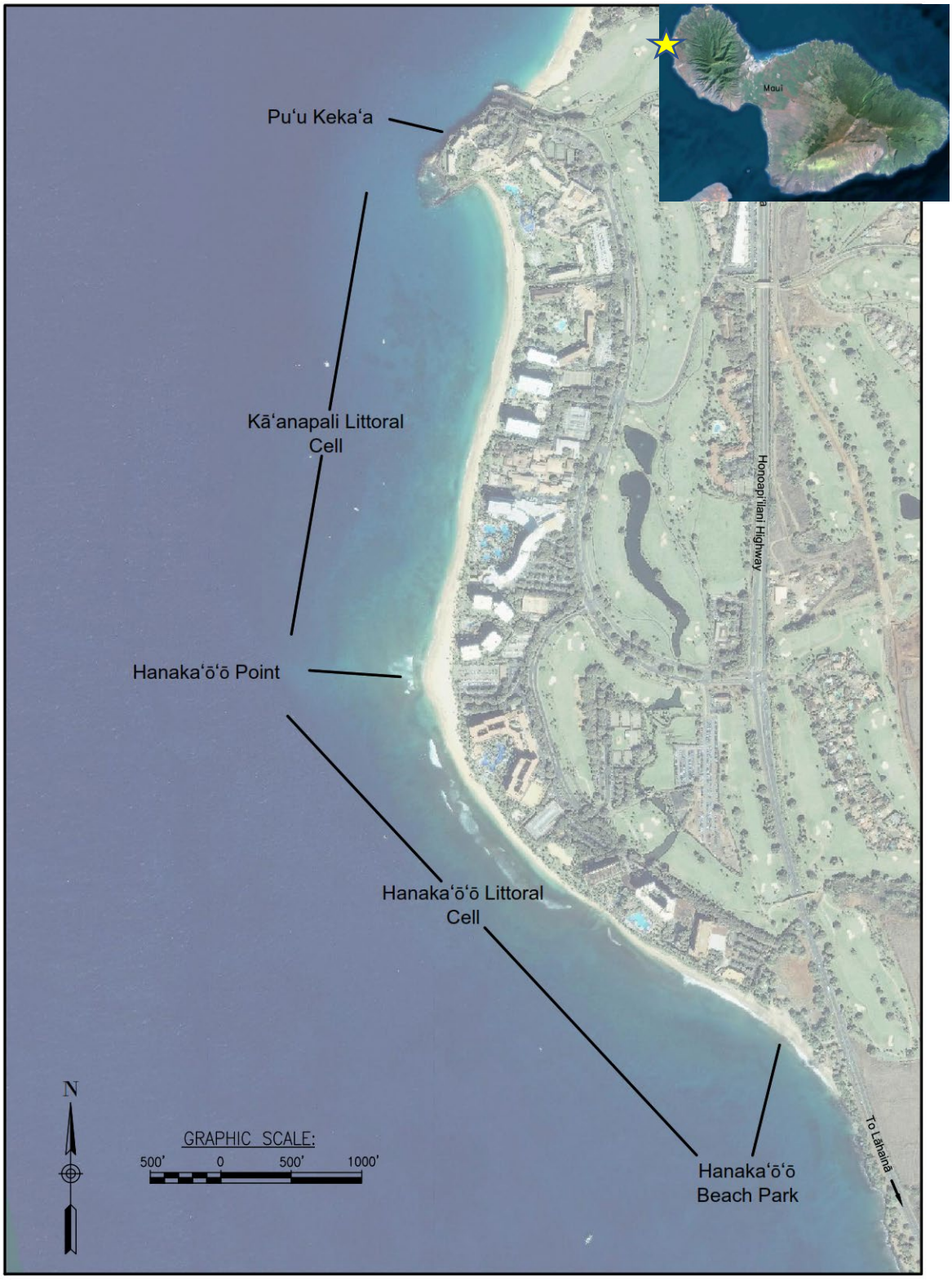

Figure 1. Project Area, Kāʻanapali Beach, Maui, Hawaiʻi

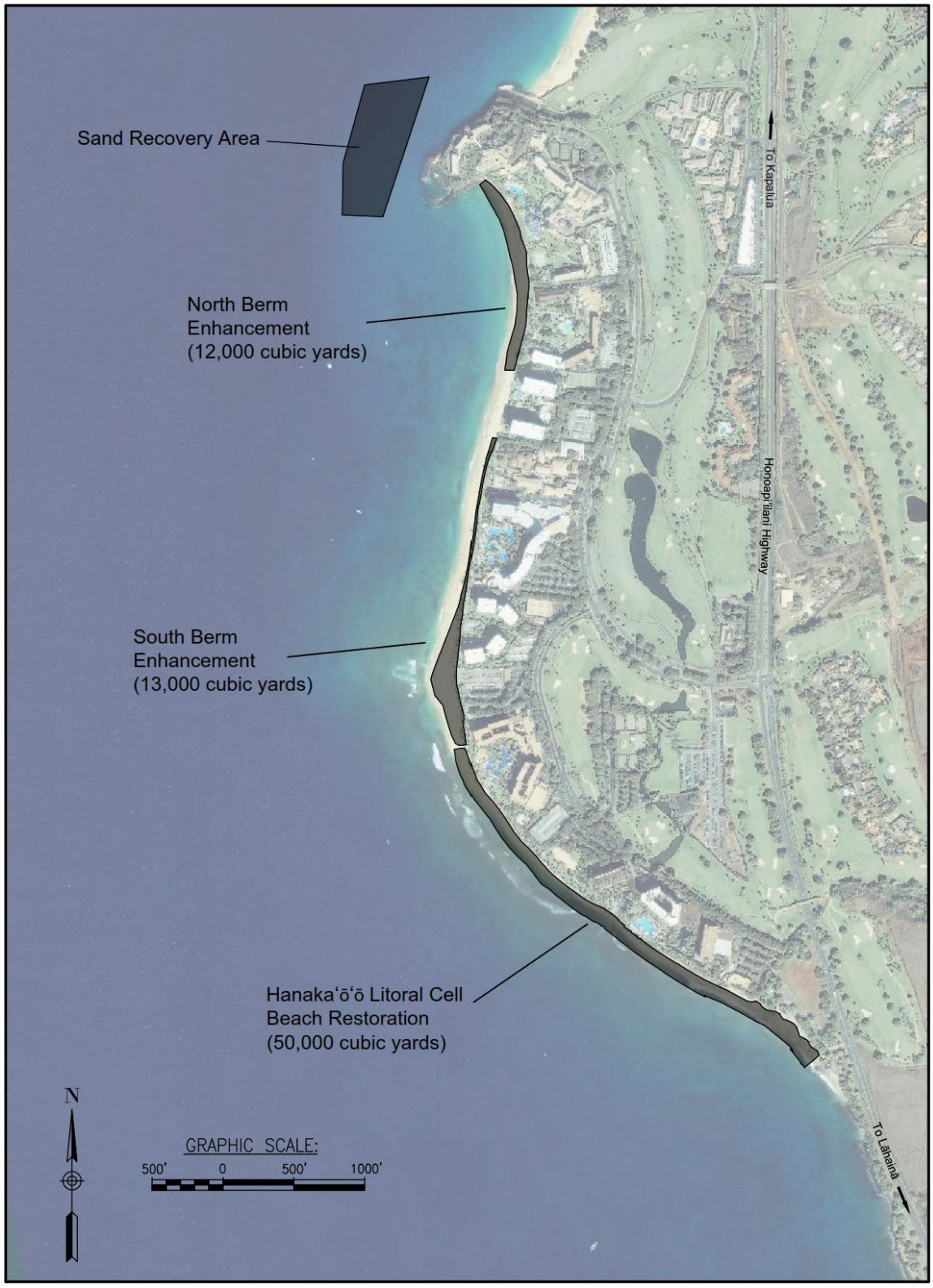

Figure 2. Proposed project elements, Kāʻanapali Beach, Maui, Hawaiʻi

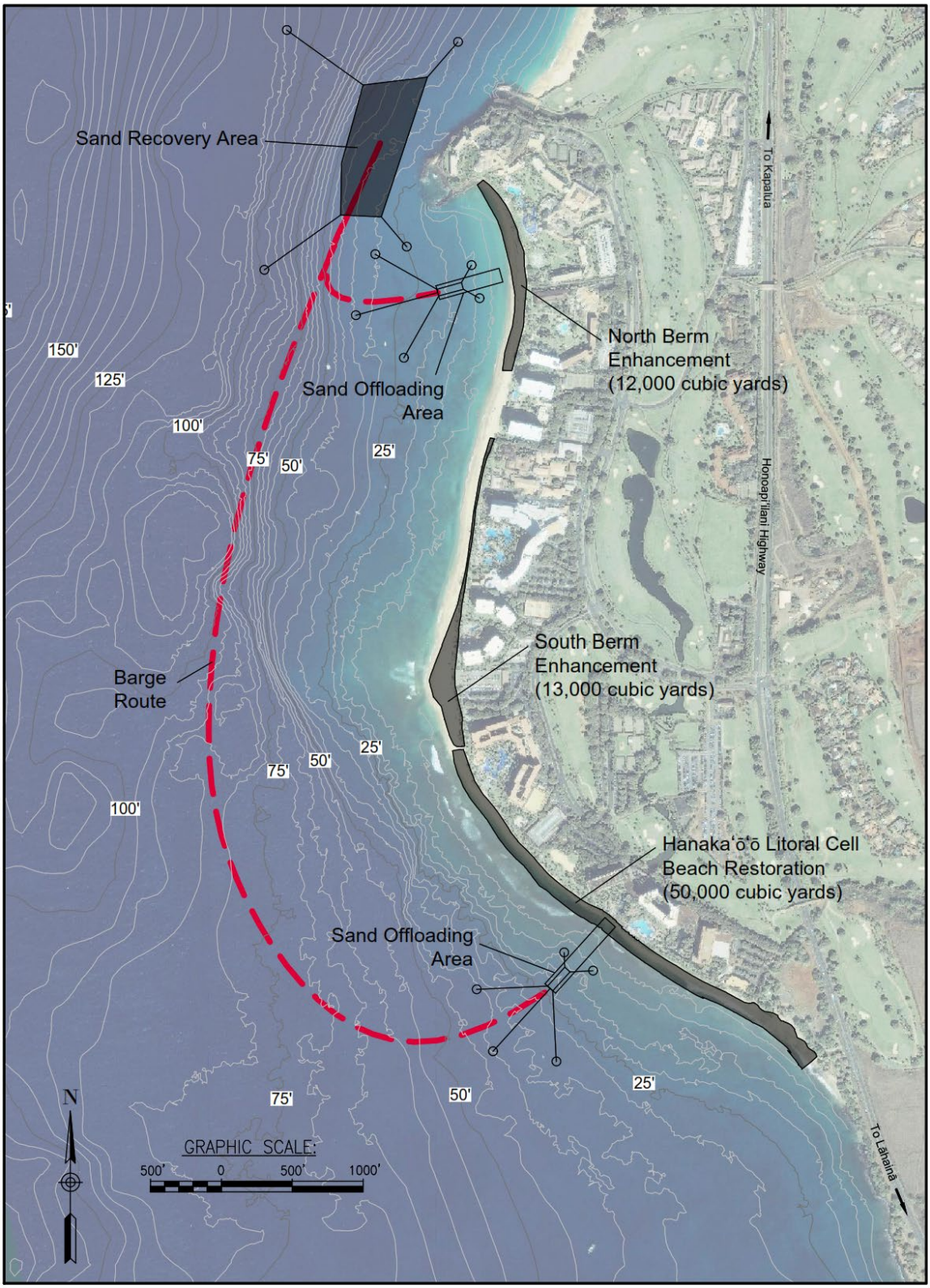

Figure 3. Proposed sand transportation routes and offloading areas, Kāʻanapali Beach, Maui, Hawaiʻi

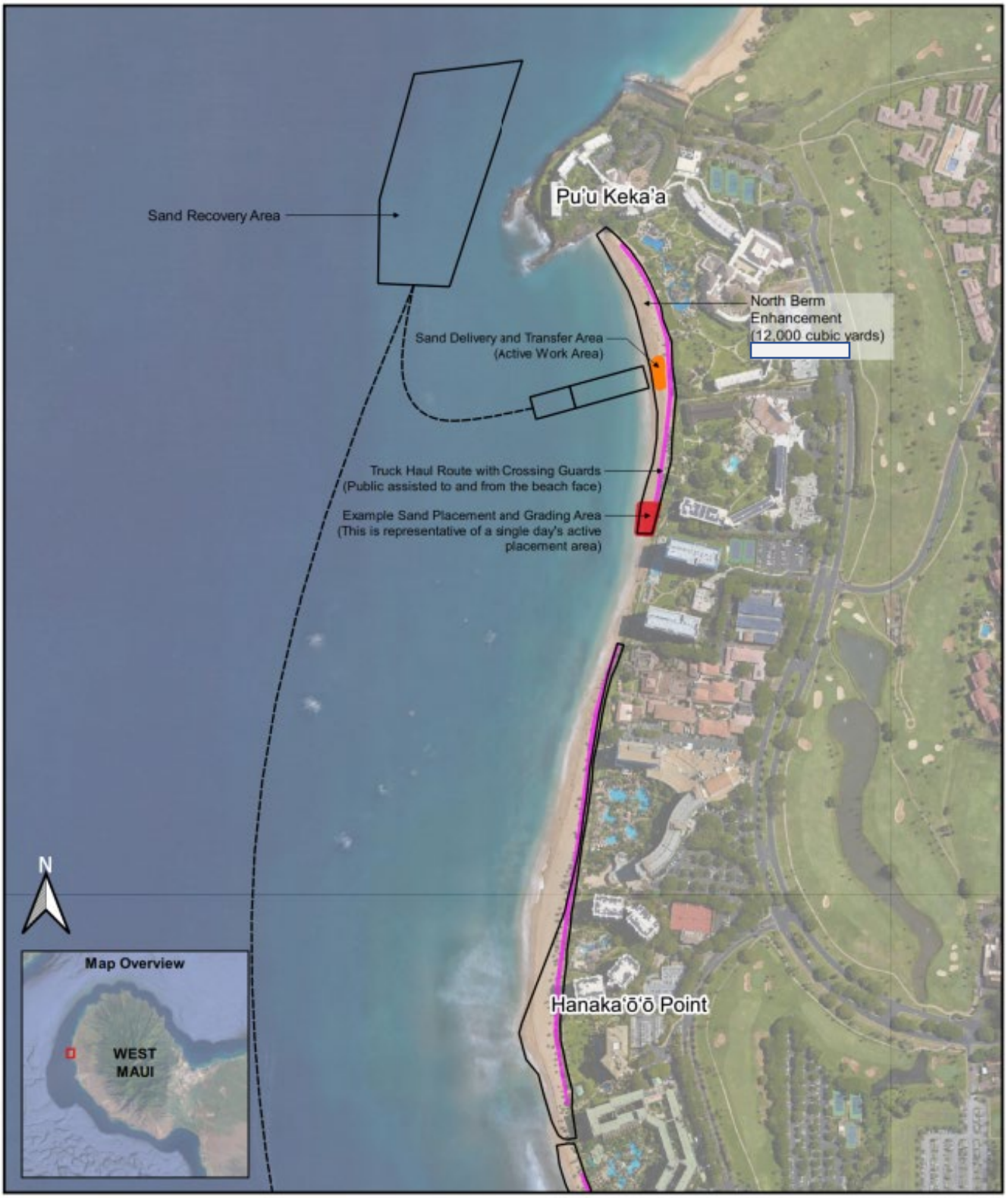

Figure 4. North Berm Enhancement sand transfer, truck haul route, and typical daily work area.

Figure 5. Hanakaʻōʻō Beach Restoration sand transfer, truck haul route, and typical daily work area.

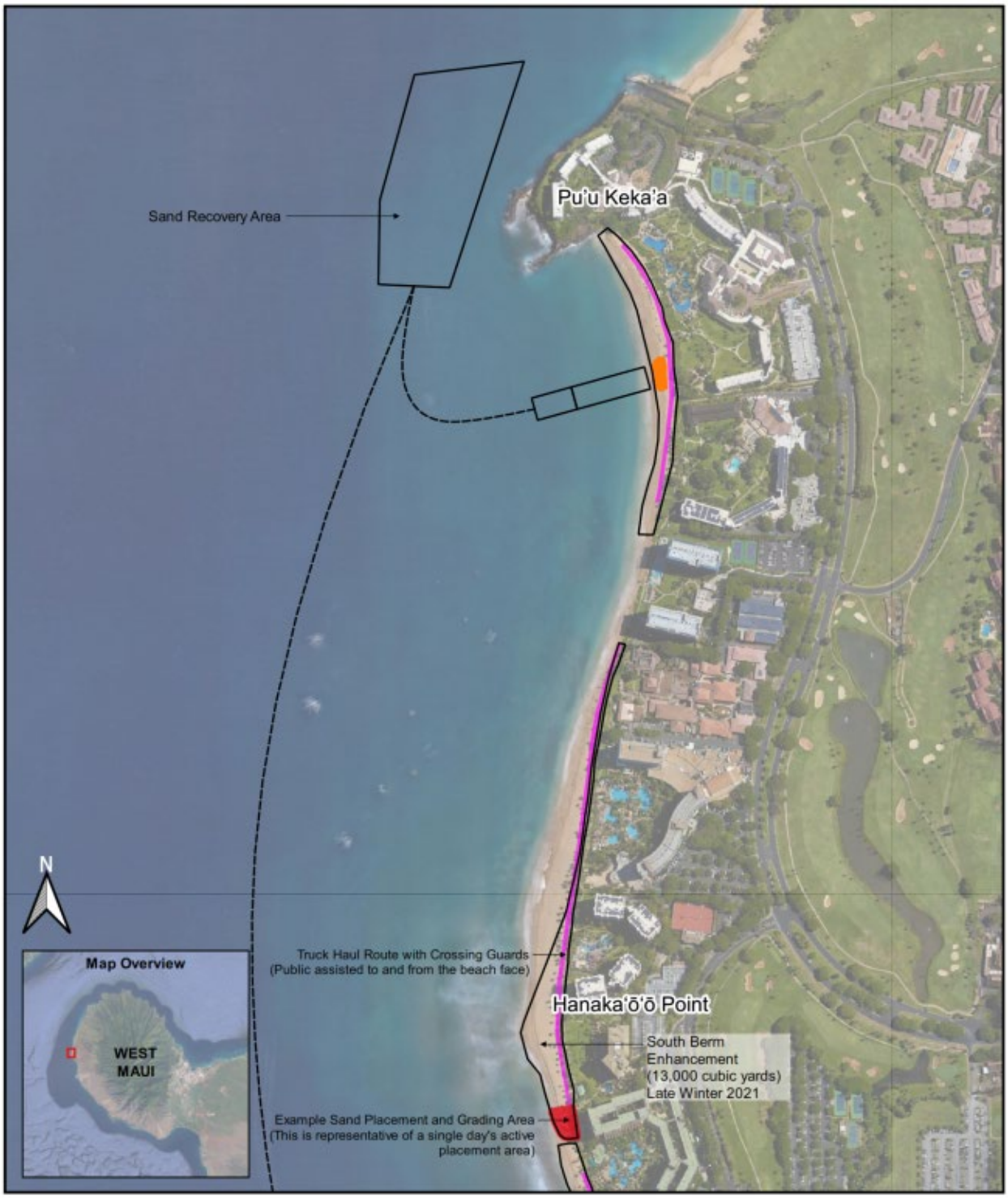

Figure 6. South Berm Enhancement sand transfer, truck haul route, and typical daily work area.

Figure 7. Kāʻanapali Beach Historical Shoreline a) 1988 aerial photograph (UH Coastal Geology Group) and b) 2020 aerial photograph (Google Earth)

Resource Area	Proposed Action Impacts – Beach Renourishment (Preferred Alternative)	Mitigation Measures
Sea-level rise	**Long-term beneficial impacts:** Mitigating impacts of increasing erosion and flooding with SLR while conserving and restoring the beach environment with a nature based adaptation solution. Restores natural habitat and recreational resources.	**Long-term mitigation:** N/A
Flood and Tsunami Hazard	**Long-term beneficial impacts:** Reduced susceptibility to flooding from large wave events.	**Long-term mitigation:** N/A
Offshore Bathymetry	**Short-term adverse impacts:** 6’ deep depression at the Sand Recovery Area.	**Short-term mitigation:** Design incorporates current scientific findings on optimal basin design, resulting in a shallow depression with a long-axis oriented parallel to prevailing current direction. Similar recovery basins have had minimal impact on their regional sand fields.
Nearshore Bathymetry and Coastal Processes	**Short-term adverse impacts:** Wave reflection at Hanakaʻōʻō Point during first season post-placement. Beach profile adjustments immediately after placement. **Mid-term impacts:** Increased beach berm height in the KLC. **Long-term beneficial impacts:** Beach width increases across both littoral cells.	**Short-term mitigation:** Ensure regular notification of beach users during adjustments and first season of summer swell. Recommend signage along the beach. **Mid-term mitigation:** Ensure regular notification of beach users during adjustments and first season of winter swell. Recommend signage along the beach. **Long-term mitigation:** N/A
Sand Characteristics	**Short-term adverse impacts:** Anoxic smell; change in beach color. **Long-term adverse impacts:** Potential compaction or lithification of placed sand; potential placement of some coral cobbles.	**Short-term mitigation:** Notification to beach users during first 3 months after placement. Recommend signage along the beach. **Long-term mitigation:** Tilling the delivery paths regularly during sand placement and at the end of the project are proven methods to mitigate lithification from construction activities. Monitoring during sand recovery and placement operations will be utilized to identify and minimize larger cobble placement in the beach profile.
Water Quality	**Short-term adverse impacts:** Increase in turbidity at the placement areas and at the Sand Recovery Area. **Long-term adverse impacts:** Intermittent increases in turbidity as fines in placed sand particles are released during seasonal high waves and erosion (~1 year).	**Short-term mitigation:** Water quality monitoring and silt containment devices. **Long-term mitigation:** Continued monitoring of water quality and beach dynamics.
Marine Biology	**Short-term adverse impacts:** Temporary loss of infaunal organisms at the dredge and placement areas. Potential impacts from vessel movement. Potential impacts from construction and sand placement related turbidity. Temporary displacement of organisms in the location of the anchor systems at the sand recovery site and the sand	**Short-term mitigation:** Monitoring during and after construction. Observers during construction operations to minimize or avoid contact. Diver or camera based investigation of the seafloor prior to placement of anchors and hardware. Diver or camera based investigation of the seafloor prior to installation of the sand transfer systems. **Long-term mitigation:** N/A **Long-term mitigation:** N/A

Table 1. Beneficial and Adverse Impacts, and Mitigation Measures

Resource Area	Proposed Action Impacts – Beach Renourishment (Preferred Alternative)	Mitigation Measures
	transfer sites. Temporary displacement of organisms for emplacement of the sand transfer systems. **Long-term beneficial impacts:** Conservation/restoration of sandy habitat for coastal species. **Long-term impacts:** Hard marine substrate within the 1988 beach footprint covered by sand.	
Protected Species	**Short-term adverse impacts:** Potential interaction with protected species during construction efforts. Interactions will be mitigated through application of BMPs. **Long-term beneficial impacts:** Conservation/restoration of sandy coastal habitat for protected species, especially in chronically eroded areas of the coastline.	**Short-term mitigation:** Interactions will be mitigated through application of BMPs provided by NOAA National Marine Fisheries Service in the PacSLOPES guidance. **Long-term mitigation:** N/A
Flora	**Short-term impacts:** Temporary displacement of cultivated vegetation at the mauka edge of the berm enhancement area. **Long-term impacts:** Conservation of vegetation at the mauka edge of project beach.	**Short-term mitigation:** N/A **Long-term mitigation:** Recommend replanting with native and endemic species, excluding the beach, restored beach, or berm enhancement area
Air Quality	**Short-term adverse impacts:** Local degradation of air quality due to construction related equipment exhaust.	**Short-term mitigation:** Use of machinery compliant with current State emissions standards.
Noise	**Short-term adverse impacts:** Increased noise from construction equipment.	**Short-term mitigation:** Use of equipment compliant with current State noise standards.
Streams	**Long-term impacts:** Alteration of the Hāhākea Gulch stream's path to the ocean by lengthening the intermittent stream channel across the restored beach berm. Similar to stream conditions prior to1988.	**Long-term mitigation:** None, because this is the prior condition of the stream when the beach was naturally wider, prior to 1988.
Scenic and Open Space Resources	**Short-term adverse impacts:** Turbidity, unsightly construction equipment, and minor sand color change. **Long-term beneficial impacts:** Improved views with increased beach width and removal of temporary erosion protection materials.	**Short-term mitigation:** Notification to beach users during first 3 months after placement. Recommend signage along the beach. **Long-term mitigation:** N/A
Surrounding Land Use	**Long-term beneficial impacts:** Protection of backshore land uses from erosion and coastal hazards, while conserving and restoring the natural beach environment.	**Long-term mitigation:** N/A
Community Character	**Long-term beneficial impacts:** Protection of community character from erosion and coastal hazards, while conserving and restoring the natural beach environment.	**Long-term mitigation:** N/A
Tourism	**Short-term adverse impacts:** Restricted access to portions of the beach that are undergoing nourishment efforts, and	**Short-term mitigation:** Notification to beach users during placement. Crossing guards to assist public with beach access. Notice to Mariners to inform ocean users. Recommend signage along the beach.

Table 1. Beneficial and Adverse Impacts, and Mitigation Measures

Resource Area	Proposed Action Impacts – Beach Renourishment (Preferred Alternative)	Mitigation Measures
	areas on the water that are being utilized for sand recovery, transport, and offloading operations. **Long-term beneficial impacts:** Improved beach resources provide long-term stability to coastal tourism.	**Long-term mitigation:** N/A
Beach Access	**Short-term adverse impacts:** Interruption during construction. **Long-term beneficial impacts:** Conservation, restoration of public beach access and protection of the Beachwalk.	**Short-term mitigation:** Notification to beach users during placement. Crossing guards to assist public with beach access. Recommend signage along the beach. **Long-term mitigation:** N/A
Coastal and Nearshore Recreation	**Short-term adverse impacts:** Closure of nearshore waters around dredge area and offloading locations; closure of portions of the beach during placement; brief disruption to canoe area at Hanakaʻōʻō Beach Park; possible undesirable wave reflection at Hanakaʻōʻō Point surf break during first season post-placement. **Long-term beneficial impacts:** Conservation and restoration of beach recreation though natural restoration of the beach resource.	**Short-term mitigation:** Notification to beach users during placement. Crossing guards to assist public with beach access. Notice to Mariners to inform ocean users. Recommend signage along the beach. Ensure regular notification of beach users during adjustments and first season of summer swell. **Long-term mitigation:** N/A
Public Health	**Mid-term adverse impacts:** Potential increase in return wave energy in the KLC due to higher berm elevation.	**Mid-term mitigation:** Ensure regular notification of beach users during adjustments and first season of winter swell. Recommend signage along the beach.
Cultural Resources	**Short-term adverse impacts:** Potential for conflict associated with interpretation of impacts in the area around Puʻu Kekaʻa as a leina a kaʻuhane, or a leaping place for departed souls. **Long-term beneficial impacts:** Conservation of both *in situ* and previously disturbed iwi kūpuna in the coastal plain through natural restoration of the beach resource, which provides erosion mitigation for the backshore.	**Short-term mitigation:** Ensure open communication during beach renourishment operations. Have an identified point of contact during placement. If cultural practices are taking place within the project area, but have not been previously observed, then all effort will be made to minimize and mitigate any project impacts. **Long-term mitigation:** N/A
Economy and Labor Force	**Short-term beneficial impacts:** Creation of construction and construction-related jobs. **Long-term beneficial impacts:** Stability in coastal and beach related jobs at the project site.	**Short-term mitigation:** N/A **Long-term mitigation:** N/A
Recreational Facilities	**Short-term adverse impacts:** Brief disruption to canoe area at Hanakaʻōʻō Beach Park during sand placement.	**Short-term mitigation:** Notification to beach users during placement. Crossing guards to assist public with beach access. Routine coordination with the canoe clubs to provide schedule updates. Recommend signage along the beach.
Roadways	**Short-term impacts:** Transportation of heavy machinery during mobilization and demobilization	**Short-term mitigation:** N/A

Table 1. Beneficial and Adverse Impacts, and Mitigation Measures

Resource Area	Proposed Action Impacts – Beach Renourishment (Preferred Alternative)	Mitigation Measures
Water System	**Long-term beneficial impacts:** Reduction in potential erosion threat to water systems through conservation and restoration of the sand beach through natural beach nourishment.	**Long-term mitigation:** N/A
Wastewater System	**Long-term beneficial impacts:** Reduction in potential erosion threat to wastewater systems through conservation and restoration of the sand beach through natural beach nourishment.	**Long-term mitigation:** N/A
Electrical, Telephone, and Cable Television Services	**Long-term beneficial impacts:** Reduction in potential erosion threat to communication and electrical systems through conservation and restoration of the sand beach through natural beach nourishment.	**Long-term mitigation:** N/A

Table 1. Beneficial and Adverse Impacts, and Mitigation Measures

Unresolved Issues	Discussion – Action to Resolve or Reason to Leave Unresolved
Anchor system placement locations	Prior to placement of anchors, as part of each location's anchoring system, the seafloor will be inspected by diver or camera to ensure that anchors and hardware to minimize impacts to benthic communities.
Sand transfer system seafloor contact	Prior to emplacement of the sand transfer system, at the proposed locations in the nearshore, the seafloor will be inspected by diver or camera to ensure that anchors and hardware to minimize impacts to benthic communities.
Potential Seabird nesting in the project area	Prior to commencing construction an ornithologist will investigate the project to ensure no seabird nesting sites will be impacted by the project. Should any active nesting sites be identified, the project team will coordinate with USFWS.
Potential Endangered Vegetation in the project area	Prior to commencing construction an arborist will investigate the project to ensure no endangered vegetation will be impacted by the project. Should any endangered vegetation be identified, the project team will coordinate with USFWS.
Potential Turtle Nests in the Beach and Dune	Consultation with the Services to obtain the latest information on sea turtle activity in the area will take place and additional BMPs shall be employed to avoid impact to sea turtle nests and hatchlings during this period, including constant monitoring of the beach and ocean during beach restoration activities.
Ocean recreation access issues	Require coordination between the contractor and the local community, via website or other digital format, to relay updated schedules for vessel movement as well as updated lists and locations that have limited or no access due to restoration activities. Ensure ocean access between the sand recovery area and Puʻu Kekaʻa, suitable for outrigger, or similar, vessel traffic for the duration of the project.
Short-term to less than one year economic impacts on subsistence fishers and gatherers	The sand recovery area may have fisheries utilized by subsistence fishers in the region. Require coordination between the contractor and the local subsistence fishing community, via website or other digital format, to relay updated schedules and projected locations for sand recovery, transport, and placement operations. Ensure the local subsistence fishing community has the maximum access allowable, given public safety concerns, to the sand recovery site and along the shoreline. Shoreline areas closed to the public will be limited to active construction areas utilized for sand offloading, sand transfer along the shoreline, and sand placement on the beach. Crossing guards will be available to assist beach users with safe transit across the transportation lanes, to and from the waterline.
Cultural Resources	Require coordination between the contractor and local cultural practitioners, via website or other digital format, to relay updated schedules for vessel movement as well as updated lists and locations that have limited or no access due to restoration activities. Ensure maximum feasible standoff between the sand recovery area and Puʻu Kekaʻa is maintained, within the practicable limits of the scope of the project.
Public Safety Concerns - Changes to seafloor bathymetry at the sand recovery area	Educational and warning signs should be placed along the shoreline during and after the project. These signs should include warnings for beach and ocean users to address public safety issues.

Table 2 Unresolved Issues

Unresolved Issues	Discussion – Action to Resolve or Reason to Leave Unresolved
Managed Retreat	Coastal management now and into the foreseeable future will rely on a range of design and adaptation options that are best suited to local needs, priorities, and capabilities. The suitability of the various design and adaptation options will continue to evolve based on the latest scientific projections for sea level rise, observed erosion and flooding impacts, and availability of government programs and policies to support implementation of managed retreat or other adaption measures.
Short-term impacts to Kona crab community in the sand recovery area	Previous studies indicate that Kona crab recolonize impacted regions within several months to years. Short-term impacts are anticipated to the Kona crab community at the sand recovery site; however, impacts are not anticipated in the regional sand field that represents the broader Kona crab habitat, outside of the sand recovery footprint.
Hawaiian Islands Humpback Whale National Sanctuary	Marine operations, including sand recovery in the nearshore, are scheduled to overlap with Humpback Whale season in the region. Additional coordination, through the permit process, will be completed before implementation of the project. BMPs for marine mammals are already included in Section 7.
User Conflicts – Beach and Offshore	Space on the beach and in the ocean will be restricted around the active work areas. To minimize potenential user conflicts, the contractor will need to have open lines of communication with the local community, via website or other digital format. Communication should relay updated schedules for vessel movement, beach restoration, offloading scheduling, truck hauling routes, as well as updated lists and locations that have limited or no access due to restoration activities. Ensure ocean access between the sand recovery area and Puʻu Kekaʻa, suitable for outrigger, or similar, vessel traffic for the duration of the project. Ensure regularly spaced crossing guards are available to assist with beach access. Minimize restricted work areas to active work zones and upcoming work zones.
Compaction of the beach and vertical scarping during erosion events	Tilling of the placed sand will be completed at the end of each restoration activity to mitigate compaction and scarping of the beach profile.
Archaeological Monitoring Plan	No excavation of the beach profile is proposed for the preferred alternative. Ongoing coordination with SHPD will determine the need for an archaeological monitoring plan. If a plan is required, it will be submitted to, reviewed, and approved by SHPD prior to completion of permits or cond
Access to the Hanakaʻōʻō grinding stones	Access to and from the site will be a design requirement during the project. The site is located to the south of the beach restoration effort with existing access from the upper Hanakaʻōʻō Beach Park parking lot.

Table 2 Unresolved Issues

Sand Source	Sand Recovery Area (preferred)	Sand Wave Area	Mala Ramp Sand Area	Reef Runway (Oʻahu)	Maui Inland Dune Sand
Distance from Site **(North Offloading, South Offloading)**	1,000 feet, 1.6 miles	2,000 feet, 1.6 miles	2.7 miles, 1.4 miles	85 miles	>20 miles
Recovery and Placement Rate	2,000 cubic yards per day	1,800 cubic yards per day	2,000 cubic yards per day	Up to 1,700 cubic yards per day	2,000 cubic yards per day
Unit Cost Estimate	$85 per cubic yard	$100 per cubic yard	$85 per cubic yard	$200 per cubic yard	N/A
Water Depth	28 to 56 feet	115 to 130 feet	60 to 70 feet	80 to 300 feet	N/A
Distance from Shore	150 feet	1,600 feet	2,600 feet	4,000 feet	N/A
Available Volume	358,000 cubic yards	629,000 cubic yards	97,000 cubic yards	> 1,000,000 cubic yards	N/A
Median Grain Size	0.21 mm to 0.37 mm	0.21 mm to 1.0 mm	0.19 mm to 0.23 mm	0.18 mm to 1.4 mm	0.23 mm
Percentage Fines	< 0.16%	Up to 1.2%	2%	Up to 8%	0% (screened)
Color Match with Native	Similar	Darker	Greyer	Greyer	Darker
Issues	Close proximity to shore would cause disruption to ocean recreation; unsightly dredge plant close to shore	High percentage rchaeoleda flakes; water depth makes recovery difficult; unsightly dredge plant close to shore; coral cobble layers	High percentage rchaeoleda flakes; tendency to lithify; unpleasant smell; poor color match	Wide range of median grain sizes; abundance of fines; poor color match; distance from project site drastically reduces production rate and increases cost	Moratorium on inland dune sand mining; would require screening to remove up to 40% fine material

Table 3 Sand Sources Comparison Chart

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
Climate						
Tides						
Sea-level rise	**Long-term impacts:** Mitigating impacts of increasing erosion and flooding with SLR while conserving and restoring the beach environment with a nature based adaptation solution. Restores natural habitat and recreational resources.	**Short to Mid-term impacts:** Reduced susceptibility of backshore development to increasing erosion and flooding from SLR and seasonal beach loss (while temporarily deployed). May impact beach processes.	**Long-term impacts:** Reduced susceptibility of backshore development to increasing erosion and flooding from SLR and seasonal to permanent beach loss. May impact beach processes and beach health on an erosional coast.	**Long-term impacts:** Reduced susceptibility of backshore development to increasing erosion and flooding from SLR if development is relocated and/or elevated, allowing the beach environment to migrate inland. Potential loss or reduction of existing backshore uses. No guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Short to Mid-term impacts:** Beach erosion events will continue to impact the coastal plain and backshore improvements. Terrigenous material in the backshore will be released into marine water. **Long-term impacts:** Allows the beach to migrate inshore; however, there is no guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR. Requires relocation or removal of infrastructure, habitable buildings, and other improvements in the coastal plain.	**Long-term impacts:** Increased susceptibility of backshore development to increasing erosion and flooding from SLR, in addition to impacts to water quality and the marine and coastal environment. Allows the beach to migrate inshore; however, there is no guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Currents						

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
Offshore Waves						
Flood and Tsunami Hazard	**Long-term impacts:** Reduced susceptibility to flooding from large wave events.	**Short to Mid-term impacts:** Reduced susceptibility to flooding from large wave events.	**Long-term impacts:** Reduced susceptibility to flooding and erosion from large wave events.	**Long-term impacts:** Reduced susceptibility to flooding and erosion from large wave events and tsunamis by elevating and moving mauka. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Mitigates susceptibility to flooding and erosion from large wave events and tsunamis but requires relocation or removal of infrastructure, habitable buildings, and other improvements in the coastal plain. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Increased susceptibility to flooding and erosion from large wave events and tsunamis. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Offshore Bathymetry	**Short-term impacts:** 6’ deep depression at the Sand Recovery Area.					
Nearshore Bathymetry and Coastal Processes	**Short-term impacts:** Wave reflection at Hanakaʻōʻō Point during first season post-placement. Beach profile adjustments immediately after placement. **Mid-term impacts:** Increased beach berm height in the KLC. **Long-term impacts:**	**Short to Mid-term impacts:** Wave reflection off structures during erosion events; localized end effects where structures terminate; beach narrowing; reduced beach access (during temporary deployment).	**Long-term impacts:** Beach narrowing during seasonal erosion events where the backstop is exposed for short periods of time; wave reflection off structures when exposed during erosion events; localized end effects where structures terminate**.** Long-term	**Long-term impacts:** Landward recession of the shoreline; wave interaction with pile supported structures and exposed structures during the relocation process. No guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents	**Long-term impacts:** Landward recession of the shoreline; wave interaction with exposed structures prior to removal. No guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents potential reach of backshore erosion	**Long-term impacts:** Landward recession of the shoreline; wave interaction with exposed structures prior to removal or while being destroyed. No guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents potential reach

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
	Beach width increases across both littoral cells.		beach narrowing and loss due to chronic erosion, if the beach migrates into the backstop.	potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Sand Characteristics	**Short-term impacts:** Anoxic smell; change in beach color. **Long-term impacts:** Potential compaction or lithification of placed sand; potential placement of some coral cobbles.			**Long-term impacts:** Release of terrestrial and/or fill sediments from developed areas to the beach and marine environment during events that erode the backshore substrate. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Release of terrestrial and/or fill sediments from developed areas to the beach and marine environment during events that erode the backshore substrate. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Release of terrestrial and/or fill sediments from developed areas to the beach and marine environment during events that erode the backshore substrate. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Water Quality	**Short-term impacts:** Increase in turbidity at the placement areas and at the Sand Recovery Area. **Long-term impacts:** Intermittent increases in turbidity as fines in placed sand are released during seasonal high waves and erosion (~1 year).			**Long-term impacts:** Increased turbidity due to release of terrestrial and/or fill sediments from developed areas to the beach and marine environment during events that erode the backshore substrate. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Increased turbidity due to release of terrestrial and/or fill sediments from developed areas to the beach and marine environment during events that erode the backshore substrate. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Increased turbidity due to release of terrestrial and/or fill sediments from developed areas to the beach and marine environment during events that erode the backshore substrate. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Marine Biology	**Short-term impacts:** Temporary loss of infaunal organisms at the dredge and placement areas.	**Short to Mid-term impacts:** Temporary-seasonal loss of coastal sandy habitat due to beach narrowing (while	**Long-term impacts:** Loss of coastal sandy habitat resulting from beach narrowing and	**Long-term impacts:** Conservation of sandy habitat, assuming beach is able to migrate inland and	**Long-term impacts:** Potential loss of coastal sandy habitat due to continued beach narrowing and loss in	**Long-term impacts:** Potential loss of coastal sandy habitat due to continued beach narrowing and loss in

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
	Potential impacts from vessel movement. Potential impacts from construction and sand placement related turbidity. Temporary displacement of organisms in the location of the anchor systems at the sand recovery site and the sand transfer sites. Temporary displacement of organisms for emplacement of the sand transfer systems. **Long-term impacts:** Conservation and restoration of sandy habitat for coastal species. Hard marine substrate covered by sand within the 1988 beach footprint.	temporary measures are deployed)	loss due to chronic erosion.	development is relocated inland. No guarantee that the beach will be stable or present at higher sea levels.	some areas if development is not relocated. No guarantee that the beach will be stable or present at higher sea levels.	some areas if development is not relocated. No guarantee that the beach will be stable or present at higher sea levels.
Protected Species	**Short-term impacts:** Potential interaction with protected species during construction efforts. Interactions will be mitigated through application of BMPs. **Long-term impacts:** Conservation/restoration of sandy coastal habitat for protected	**Short-term impacts:** Potential interaction with protected species during construction efforts. Interactions would be mitigated through application of BMPs. **Short to Mid-term impacts:** Temporary/seasonal habitat loss resulting	**Short-term impacts:** Potential interaction with protected species during construction efforts. Interactions would be mitigated through application of BMPs. **Long-term impacts:** Habitat loss resulting from beach narrowing	**Long-term impacts:** Conservation of sandy coastal habitat for protected species, assuming beach is able to migrate inland. Habitat loss may occur due to pile supported Beachwalk interactions with an eroding shoreline. No guarantee that the beach will be	**Long-term impacts:** Potential loss of coastal sandy substrate used by protected species when development encroaches into coastal habitat. No guarantee that the beach will be stable or present at higher sea levels.	**Long-term impacts:** Potential loss of coastal sandy substrate used by protected species when development encroaches into coastal habitat. No guarantee that the beach will be stable or present at higher sea levels.

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
	species, especially in chronically eroded areas of the coastline.	from beach narrowing and loss (while temporary measures are deployed).	and loss due to chronic erosion.	stable or present at higher sea levels.		
Flora	**Short-term impacts:** Temporary displacement of cultivated vegetation at the mauka edge of the berm enhancement area. **Long-term impacts:** Conservation of vegetation at the mauka edge of project beach.	**Short-term impacts:** Temporary displacement or loss of cultivated vegetation along the upper beach and makai edge of the coastal plain. **Short to Mid-term impacts:** Continued deployment of materials can result in long-term loss of cultivated vegetation at erosion site on the coastline.	**Short-term impacts:** Temporary displacement of flora in the structure's footprint during construction. **Long-term impacts:** Permanent loss of flora and fauna habitat area in eroded regions.	**Long-term impacts:** Conservation of vegetation assuming the beach environment is allowed to migrate landward.	**Long-term impacts:** Conservation of vegetation assuming the beach environment is allowed to migrate landward.	**Long-term impacts:** Permanent loss of flora and fauna habitat area in eroded regions when development encroaches into flora at the back of the eroding/migrating beach environment.
Air Quality	**Short-term impacts:** Local degradation of air quality due to construction related equipment exhaust.	**Short-term impacts:** Local degradation of air quality due to construction related equipment emissions.	**Short-term impacts:** Local degradation of air quality due to construction related equipment emissions.		**Long-term impacts:** Local degradation of air quality due to construction related equipment exhaust as the built environment is rebuilt in landward locations, then deconstructed near the shoreline.	
Noise	**Short-term impacts:** Increased noise from construction equipment.	**Short-term impacts:** Increased noise from construction equipment **Short to Mid-term impacts:** Increase noise from construction equipment during installation and	**Short-term impacts:** Increased noise from construction equipment.	**Long-term impacts:** Increased noise from construction equipment as backshore is reconfigured.	**Long-term impacts:** Increased noise from construction equipment as the built environment is rebuilt in landward locations, then deconstructed near the shoreline.	**Long-term impacts:** Increased noise from construction equipment as structures are removed or destroyed.

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
		maintenance/repairs activities.				
Streams	**Long-term impacts:** Alteration of the Hāhākea Gulch stream's path to the ocean by lengthening the intermittent stream channel across the restored beach berm. Similar to stream conditions prior to1988.					
Scenic and Open Space Resources	**Short-term impacts:** Turbidity, unsightly construction equipment, and minor sand color change. **Long-term impacts:** Improved views with increased beach width and removal of temporary erosion protection materials.	**Short to Mid-term impacts:** Unsightly construction equipment and temporary shore protection structures during erosion events.	**Short-term impacts:** Unsightly construction equipment **Long-term impacts:** Exposed boulders during seasonal erosion events and/or with permanent beach loss.	**Long-term impacts:** Unsightly construction equipment as backshore is reconfigured; increased turbidity during erosion events due to release of backshore terrigenous sediment and fill material. Conservation of scenic and open beach resources if development is relocated. No guarantee that the beach will be stable or present at higher sea levels.	**Long-term impacts:** Unsightly construction equipment as backshore is reconfigured; increased turbidity during erosion events due to release of backshore terrigenous sediment and fill material. Conservation of scenic and open beach resources as development is rebuilt in landward locations then deconstructed near the shoreline. No guarantee that the beach will be stable or present at higher sea levels.	**Short-term impacts:** Unsightly evidence of erosion (scarps, exposed root systems, exposed irrigation lines, etc.) **Long-term impacts:** Increased turbidity during erosion events due to the release of backshore terrigenous sediment and fill material. Encroachment of backshore development into the beach environment as the shoreline recedes. No guarantee that the beach will be stable or present at higher sea levels.
Surrounding Land Use	**Long-term impacts:** Protection of backshore land uses from erosion	**Short to Mid-term impacts:**	**Long-term impacts:**	**Long-term impacts:** Adjustments to land use as backshore is	**Long-term impacts:** Adjustments to land use as backshore is	**Long-term impacts:** Adjustments to land use as structures are

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
	and coastal hazards, while conserving and restoring the natural beach environment.	Protection of backshore land uses from erosion and coastal hazards.	Protection of backshore land uses from erosion and coastal hazards.	reconfigured. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	reconfigured through building replacement structures in landward positions, then deconstructing existing structures near the shoreline. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	removed or destroyed. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Community Character	**Long-term impacts:** Protection of community character from erosion and coastal hazards, while conserving and restoring the natural beach environment.	**Short to Mid-term impacts:** Protection of community character from erosion and coastal hazards.	**Long-term impacts:** Protection of community character from erosion and coastal hazards.	**Long-term impacts:** Reduction in community character with loss of community facilities, businesses, and landmark features. Possible improvement of aesthetic value of the coastline. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Reduction in community character as the entire coastline undergoes a regional relocation effort with construction of replacement structures in landward positions, then deconstruction of existing structures near the shoreline. Possible improvement of aesthetic value of the coastline. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Reduction in community character with loss of ADA compliant lateral beach access and loss of community facilities, businesses, and landmark features. Possible improvement of aesthetic value of the coastline. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Tourism	**Short-term impacts:** Restricted access to portions of the beach that are undergoing nourishment efforts, and areas on the water that are being utilized	**Short-term impacts:** Restricted access to construction areas and beach. **Short to Mid-term impacts:** Limited or restricted access to	**Short-term impacts:** Restricted access to construction areas. **Long-term impacts:** Limited or restricted access to beach when the structure is exposed	**Short-term impacts:** Restricted access to reconfiguration areas. **Long-term impacts:** Limited or restricted access within or below some reconfigured uses	**Short-term impacts:** Restricted access to reconfiguration areas, both the new structures in landward locations and the old structures near the shoreline.	**Short-term impacts:** Restricted access to during periods of removal or destruction of facilities and structures.

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
	for sand recovery, transport, and offloading operations. **Long-term impacts:** Improved beach resources provide long-term stability to coastal tourism.	beach. Protection of tourism related backshore development.	seasonally to permanently. Protection of tourism related backshore development.	on the shoreline. Relocation or loss of tourism related development. Possible improvement of aesthetic value of the coastline. No guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Limited or restricted access within or below some reconfigured uses on the shoreline. Relocation or loss of tourism related development. Possible improvement of aesthetic value of the coastline. No guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Loss of tourism related to backshore development. Possible improvement of aesthetic value of the coastline. No guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Beach Access	**Short-term impacts:** Interruption during construction. **Long-term impacts:** Conservation, restoration of public beach access and protection of the Beachwalk.	**Long-term impacts:** Interruptions from construction during erosion events and maintenance or repair efforts. **Short to Mid-term impacts:** Temporary loss of lateral beach access as structures are exposed by erosion (while temporarily deployed). Protection of the Beachwalk.	**Short-term impacts:** Interruption during construction. **Long-term impacts:** Temporary to permanent loss of lateral beach access as structures are exposed by erosion. Protection of the Beachwalk.	**Short-term impacts:** Interruption as public right-of-ways and Beachwalk are reconfigured. **Long-term impacts:** Conservation of public beach access assuming development is relocated inland. No guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Short-term impacts:** Interruption as public right-of-ways and Beachwalk are reconfigured. **Long-term impacts:** Potential loss of Beachwalk during the retreat process. Conservation of public beach access along the coastline as development is relocated inland. No guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents potential reach	**Long-term impacts:** Loss of lateral beach access as the Beachwalk is removed or destroyed and other development encroaches into the retreating beach. No guarantee that the beach will be stable or present at higher sea levels. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
					of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	
Coastal and Nearshore Recreation	**Short-term impacts:** Closure of nearshore waters around dredge area and offloading locations; closure of portions of the beach during placement; brief disruption to canoe area at Hanakaʻōʻō Beach Park; possible undesirable wave reflection at Hanakaʻōʻō Point surf break during first season post- placement. **Long-term impacts:** Conservation and restoration of beach recreation though natural restoration of the beach resource.	**Short-term impacts:** Closure of portions of the beach during construction and/or during beach erosion **Short to Mid-term impacts:** Temporary loss of beach and nearshore recreation as structures are exposed by erosion (while temporarily deployed)	**Short-term impacts:** Closure of portions of the beach during construction **Long-term impacts:** Temporary to permanent loss of beach and nearshore recreation as structures are exposed by erosion	**Short-term impacts:** Restricted access to reconfiguration areas. **Long-term impacts:** Conservation of beach and nearshore recreation, assuming shorefront development is relocated inland. Limited or restricted access within or below some reconfigured uses on the shoreline. Loss of tourism related infrastructure. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Short-term impacts:** Restricted access to the deconstruction areas for old structures near the shoreline. **Long-term impacts:** Conservation of beach and nearshore recreation, after shorefront development is relocated inland. Limited or restricted access within or below some reconfigured uses on the shoreline. Loss of tourism related infrastructure. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Short-term impacts:** Restricted access during periods of removal or destruction of facilities and structures. **Long-term impacts:** Loss of beach and nearshore recreation as development encroaches into the retreating beach. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Public Health	**Short-term impacts:** Potential increase in return wave energy in the KLC due to higher berm elevation.					
Cultural Resources	**Short-term impacts:** Potential for conflict associated with interpretation of impacts in the area around Puʻu Kekaʻa as a leina a kaʻuhane, or a					

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
	leaping place for departed souls.					
Archaeological Resources		**Short-term impacts:** Potential disruption of archaeological sites and iwi kūpuna if excavation in the coastal plain is required for temporary shore protection structures.	**Short-term impacts:** Potential disruption of archaeological sites and iwi kūpuna during excavation for shore protection structures.	**Short-term impacts:** Potential disruption of archaeological sites and iwi kūpuna during reconfiguration of existing infrastructure. **Long-term impacts:** Loss of potential backshore archaeological sites and iwi kūpuna as shoreline recedes. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Short-term impacts:** Potential disruption of archaeological sites and iwi kūpuna during reconfiguration of existing infrastructure. **Long-term impacts:** Loss of potential backshore archaeological sites and iwi kūpuna as shoreline recedes. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Loss of potential backshore archaeological sites and iwi kūpuna as shoreline recedes. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Economy and Labor Force	**Short-term impacts:** Creation of construction and construction-related jobs. **Long-term impacts:** Stability in coastal and beach related jobs at the project site.	**Short to Mid-term impacts:** Creation of construction and construction-related jobs during emplacement and maintenance actions.	**Short-term impacts:** Creation of construction and construction-related jobs. **Long-term impacts:** Loss of tourism-related jobs as the beach is ultimately narrowed and lost.	**Long-term impacts:** Creation of construction and construction-related jobs if development is relocated or reconstructed; loss of resort jobs if resort amenities are not relocated/reconstructed. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Creation of construction and construction-related jobs as development is relocated in landward locations then deconstructed near the shoreline; loss of resort jobs if resort structures and amenities are not relocated. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Temporary creation of construction and construction-related jobs as resort buildings are removed or destroyed; loss of resort jobs as resort buildings are removed or destroyed. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Population						**Long-term impacts:** Reduction of the transient population as

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
						resort buildings are removed or destroyed.
Housing						
Solid Waste Disposal						
Medical Facilities						
Police and Fire Protection						
Schools						
Recreational Facilities	**Short-term impacts:** Brief disruption to canoe area at Hanakaʻōʻō Beach Park during sand placement.			**Long-term impacts:** Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR. Recreational facilities near the shoreline will need to be relocated.	**Long-term impacts:** Loss of canoe facility, parking area, shower facilities, and picnic areas at Hanakaʻōʻō Beach Park. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Roadways	**Short-term impacts:** Transportation of heavy machinery during mobilization and demobilization	**Short-term impacts:** Transportation of heavy machinery during mobilization and demobilization	**Short-term impacts:** Transportation of heavy machinery during mobilization and demobilization	**Short-term impacts:** Transportation of heavy machinery during mobilization and demobilization	**Short-term impacts:** Transportation of heavy machinery during mobilization and demobilization	**Short-term impacts:** Transportation of heavy machinery during mobilization and demobilization for debris removal efforts. **Long-term impacts:** Disruption to traffic along Honoapiʻilani Highway behind Hanakaʻōʻō Beach Park during high water and wave events
Water System	**Long-term impacts:**	**Short to Mid-term impacts:**	**Long-term impacts:**	**Short-term impacts:**	**Short-term impacts:**	**Long-term impacts:**

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*

Resource Area	Proposed Action – Beach Restoration – Accommodation (Preferred Alternative)	Temporary Shore Protection (Alternative 1)	Permanent Shore Protection (Alternative 2)	Vertical Accommodation (Alternative 3)	Managed Retreat (Alternative 4)	No Action – Unmanaged Retreat (No Action Alternative)
	Reduction in potential erosion threat to water systems through conservation and restoration of the sand beach through natural beach nourishment.	Protection of the water systems from erosion threat.	Protection of the water systems from erosion threat.	Disruption during relocation or reconfiguration of existing supply lines. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	Disruption during relocation of existing supply lines. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	Eventual loss of water service to erosion area as infrastructure is removed or destroyed. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Wastewater System	**Long-term impacts:** Reduction in potential erosion threat to wastewater systems through conservation and restoration of the sand beach through natural beach nourishment.	**Short to Mid-term impacts:** Protection of the wastewater systems from erosion threat.	**Long-term impacts:** Protection of the wastewater systems from erosion threat.	**Short-term impacts:** Disruption during relocation or reconfiguration of existing infrastructure. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Short-term impacts:** Disruption during relocation of existing infrastructure. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Eventual loss of wastewater service to erosion area as sanitary sewer lines are removed or destroyed. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.
Drainage System						
Electrical, Telephone, and Cable Television Services	**Long-term impacts:** Reduction in potential erosion threat to communication and electrical systems through conservation and restoration of the sand beach through natural beach nourishment.	**Short to Mid-term impacts:** Protection of the communication and electrical systems from erosion threat.	**Long-term impacts:** Protection of the communication and electrical systems from erosion threat.	**Short-term impacts:** Disruption during relocation or reconfiguration of existing infrastructure. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Short-term impacts:** Disruption during relocation of existing infrastructure. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.	**Long-term impacts:** Eventual loss of electrical, telephone, and CATV service to erosion area as infrastructure is removed or destroyed. Figure 5-2 presents potential reach of backshore erosion under 0.5, 1.1, 2.0, and 3.2 feet of SLR.

*If entry is blank, no short-or long-term impacts are anticipated

Table 4 ALTERNATIVES Summary of Potential Impacts by Resource Area*