



A CONCEPTUAL SITE PLAN FOR KURE ATOLL

NOAA'S OFFICE OF NATIONAL MARINE SANCTUARIES



FACILITY PROGRAMMING AND CONSULTING
FINAL - DECEMBER 16, 2011

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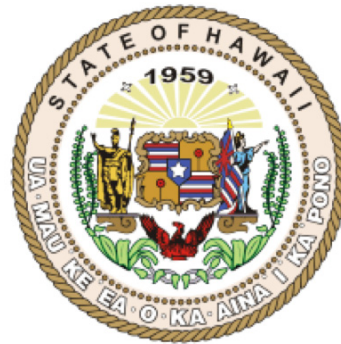


FOREWORD

Papahānaumokuākea Marine National Monument (Monument) in the Northwestern Hawaiian Islands comprises one of the largest protected areas in the world. The Monument, a vast, remote, and largely uninhabited marine region, encompasses an area of approximately 139,793 square miles (362,061 square kilometers) of Pacific Ocean in the northwestern extent of the Hawaiian Archipelago. Covering a distance of 1,200 miles, the 100-mile wide Monument is dotted with small islands, islets, and atolls and a complex array of marine and terrestrial ecosystems. This region and its natural and historic resources hold great cultural and religious significance to Native Hawaiians. It is also home to a variety of post-Western-contact historic resources, such as those associated with the Battle of Midway. As such, the Monument has been identified as a national priority for permanent protection as a Monument for its unique and significant confluence of conservation, ecological, historical, scientific, educational, and Native Hawaiian cultural qualities. The importance of protecting these unique values was further recognized through the inscription of the Monument as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site.

The three agencies that manage the Monument look to protect and preserve the delicate ecosystem through science, management, and conservation activities. NOAA's Office of National Marine Sanctuaries has engaged Facility Programming and Consulting to prepare a Conceptual Site Plan for Kure Atoll, one of several field camps within the Monument. The strategy serves as a guide for future facility plans on Kure Atoll to support research and restoration operations on the island. Kure Atoll is under the jurisdiction of the State of Hawai'i's Department of Land and Natural Resources (DLNR).

FOREWORD



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Architectural Programming
Laboratory Planning
Healthcare Planning
Strategic Facilities Planning
Needs Assessment
Space Utilization Analysis

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The contents of this document are not for regulatory approval, permitting, or construction. Final published December 2011.

TABLE OF CONTENTS

Introduction.....	1
About the Monument and Kure Atoll	1.1
Stakeholders	1.3
Purpose of this Document.....	1.5
Project Process	1.6
Executive Summary.....	2
Project Goals.....	2.1
Current Conditions	3
Site Overview.....	3.3
Scope of Activities.....	3.11
Challenges and Constraints.....	3.13
Conceptual Site Plan	4
Planning Guidelines	4.1
Summary of Future Requirements	4.2
Requirements Matrix	4.3
Facility Requirements	4.7
Other Requirements	4.15
Implementation Approach.....	5
Project Priorities on Kure Atoll	5.1
Priority Phasing.....	5.2
Cost Influences.....	5.3
Conclusion	5.4

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Terms and Abbreviations

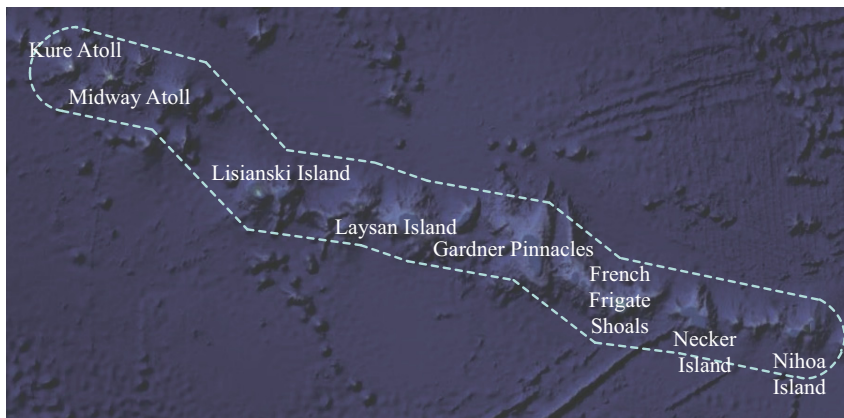
Many terms used in this document have been abbreviated. Following is a list of the common abbreviated terms used throughout.

ASF	Assignable Square Feet
DAR	Division of Aquatic Resources
DLNR	Department of Land and Natural Resources
DOFAW	Division of Forestry and Wildlife
FPC	Facility Programming and Consulting
HVAC	Heating, Ventilation, and Air Conditioning
NMFS	National Marine Fisheries Service
PIR	Pacific Islands Region
PMNM	Papahānaumokuākea Marine National Monument
SF	Square Feet/Foot
LEED	Leadership in Energy and Environmental Design
NOAA	National Oceanic and Atmospheric Administration
NWHI	Northwestern Hawaiian Islands
ONMS	Office of National Marine Sanctuaries
PIFSC	Pacific Islands Fisheries Science Center
PV	Photovoltaic (solar power)
SSB	Single Sideband
USCG	United States Coast Guard
FWS	Fish and Wildlife Service
VHF	Very High Frequency

NOAA/ONMS has commissioned this report to determine a strategy for facilities in support of restoration, research and science operations on Kure Atoll, a small island within Papahānaumokuākea Marine National Monument (PMNM). This Monument is jointly managed by three Co-Trustees – the Department of Commerce (through NOAA), Department of the Interior (through the Fish and Wildlife Service), and the State of Hawai‘i (through the Department of Land and Natural Resources) – and represents a cooperative conservation approach to protecting the entire ecosystem. The strategy and conceptual site plan represent the shared vision for facilities in support of the three individual programmatic missions on Kure Atoll.

Current facilities on the island include a new bunkhouse constructed in 2011 and an abandoned U.S. Coast Guard (USCG) station. These buildings are used for bunking, storage, and restoration activities. Because of their age and condition, a plan is needed to identify the next steps to maintain the facilities that support the many activities on the island. This document will determine much needed improvements that are respectful of the environment and leave minimal physical impact.

About Papahānaumokuākea Marine National Monument and Kure Atoll



Papahānaumokuākea Marine National Monument

Papahānaumokuākea Marine National Monument, created by Presidential Proclamation in 2006, is the single largest conservation area under the U.S. flag, and one of the largest marine conservation areas in the world. It encompasses 139,797 square miles of the Pacific Ocean (105,564 square nautical miles) - an area larger than all the country's

national parks combined. The extensive coral reefs found in

Papahānaumokuākea - truly the rainforests of the sea - are home to over 7,000 marine species, one quarter of which are found only in the Hawaiian Archipelago. Many of the islands and shallow water environments are important habitats for rare species such as the threatened green sea turtle and the endangered Hawaiian monk seal.

INTRODUCTION

The Monument includes two National Wildlife Refuges, the Midway Atoll National Wildlife Refuge and the Hawaiian Islands National Wildlife Refuge, the Battle of Midway National Memorial, the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, the Hawai'i State Seabird Sanctuary at Kure Atoll, and the Northwestern Hawaiian Islands Marine Refuge. Additionally, the Monument has been inscribed as a mixed (natural and cultural) World Heritage Site by the delegates to the United Nations Educational, Scientific and Cultural Organization's (UNESCO) 34th World Heritage Convention in 2010.

Kure Atoll

Kure Atoll is the northernmost coral atoll in the world. The atoll is nearly circular, with a reef six miles (9.6 kilometers) in diameter enclosing a lagoon with two islets comprising over 200 acres (0.81 square kilometers) of emergent land, flanked by almost 80,000 acres (324 square kilometers) of coral reef habitat. The associated marine habitats support 155 species of reef fishes and 27 species of coral found at the atoll. The outer reef forms a nearly complete circular barrier around the lagoon, with the exception of passages to the southwest. The only land of significant size is called Green Island, which rises to 20 feet above sea level and is located near the fringing reef in the southeastern quadrant of the lagoon, is habitat for hundreds of thousands of seabirds. The atoll is an important breeding site for black-footed and Laysan albatrosses, Christmas shearwaters, and 14 other breeding seabirds. A resident population of spinner dolphins inhabits the lagoon during the day.



Kure Atoll

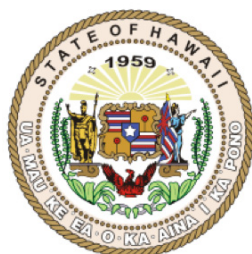
The USCG established a LORAN station at Kure in 1960 and occupied it until 1993. This land use had far-reaching effects on all the plants and animals at Kure Atoll, resulting in elevated invasive species problems and contaminants left behind when the base closed. A short, unused and unmaintained runway and a portion of the station's buildings are still located on the island and are used as a base of operations for restoration activities on the island. The structures of the old USCG station include two masonry buildings, a cistern, a pier, and an abandoned airfield that were originally constructed in the 1960s. The remaining infrastructure on Kure is now maintained and operated by DNLN. As part of PMNM, the Co-Trustees restrict public access to Kure Atoll. Most visits to the atoll are by biologists who conduct wildlife surveys, restore habitat, and remove marine debris. A permit is required to visit Kure as part of the Monument permit program, designed to ensure long-term protection of the NWHI by providing the Co-Trustees with a management tool to regulate, monitor, and understand the impacts of permitted activities on the ecosystem. The permit program authorizes only activities that are consistent

with Presidential Proclamation 8031 that minimize and prevent negative human impacts.

Stakeholders

Each of the three Co-Trustee agencies of the Monument has several subordinate agencies. Each office is charged with performing separate missions within the Monument. Because these agencies are organizationally distinct from one another, they tend to operate independently, although in many cases, they perform complimentary functions.

Department of Land and Natural Resources Background and Mission



The DLNR is the State of Hawai'i department responsible for management and protection of Hawai'i's natural resources. Divisions of DLNR responsible for the management and operations of the NWHI and/or activities on Kure include:

- Division of Aquatic Resources (DAR): Manages the State's marine and freshwater resources through programs in commercial fisheries and aquaculture; aquatic resources protection, enhancement and education; and recreational fisheries.
- Division of Forestry and Wildlife (DOFAW): Responsible for the management of State-owned forests, natural areas, public hunting areas, and plant and wildlife sanctuaries. Kure Atoll is owned by/under the jurisdiction of DOFAW.

The DLNR has ownership/jurisdiction of Kure Atoll. The main management objective on Kure Atoll is to eradicate or control invasive species, monitor and report of biological resources, and to reduce or eliminate all human impacts that negatively effect the resources. The mission of the DLNR is to:

"Enhance, protect, conserve and manage Hawai'i's unique and limited natural, cultural and historic resources held in public trust for current and future generations of visitors and the people of Hawai'i nei in partnership with others from the public and private sectors."

NOAA Background and Mission

NOAA, under the U.S. Department of Commerce, has primary management responsibilities for the marine areas of the PMNM in consultation with the Fish and Wildlife Service.

NOAA's Office of National Marine Sanctuaries consists of 13 sanctuaries and the Monument (PMNM). The sanctuaries are grouped into four regions, including the Pacific Islands Region.

INTRODUCTION

The Pacific Islands Region is comprised of three special areas that protect ocean denizens and ecosystems, as well as unique island cultural and maritime heritage. The Pacific Islands Region includes the following:

- Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS)
- Papahānaumokuākea Marine National Monument (PMNM)
- Fagatele Bay National Marine Sanctuary (FBNMS)

The mission of NOAA's Office of National Marine Sanctuaries (ONMS) is to serve as the trustee for the nation's system of marine protected areas, to conserve, protect, and enhance their biodiversity, ecological integrity and cultural legacy. ONMS operates under the National Marine Sanctuaries Act Mandate:

"...To identify and designate as national marine sanctuaries areas of the marine environment which are of special national significance and to manage these areas as the National Marine Sanctuary System..."¹

NOAA divisions with activities or interests within the Monument include the following:

- National Ocean Service (NOS)
 - Office of National Marine Sanctuaries (ONMS)
- National Marine Fisheries Service (NMFS)
 - Pacific Islands Fisheries Science Center (PIFSC)
 - 1. Protected Species Division (PSD)
 - 2. Coral Reef Ecosystem Division (CRED)
 - Pacific Islands Regional Office (PIRO)

NOAA's NMFS is responsible for the stewardship of the nation's living marine resources and their habitat. NMFS is responsible for the management, conservation and protection of living marine resources, and may have an increased presence in the future Kure Atoll due to their monk seal recovery program.

Fish and Wildlife Service Background and Mission

The mission of FWS, as part of the Department of the Interior, is to work in partnership with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.



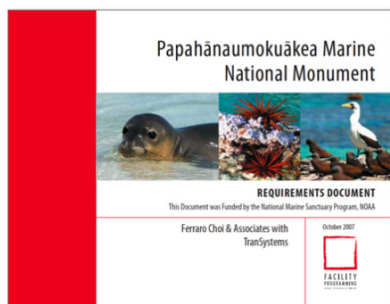
¹ *National Marine Sanctuaries Act (sec. 301)*



Under the management of the FWS, the National Wildlife Refuge System is a designation of public lands and waters set aside to conserve America's fish, wildlife and plants. The System includes more than 150 million acres, 555 national wildlife refuges and other units of the Refuge System, plus 37 wetland management districts. The Monument falls under the jurisdiction of the National Wildlife Refuge System. The FWS is proud to manage, in cooperation with partners, four marine national Monuments in the Pacific Ocean. In total, they include nearly 214,777,000 acres composed of small islands, atolls, coral reefs, submerged lands, and deep blue waters.

The mission of the National Wildlife Refuge System is:

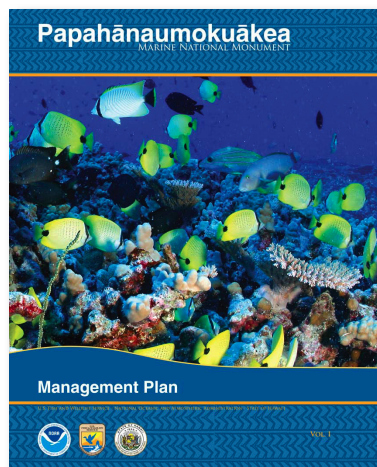
“To manage a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife and plant resources and their habitat. The Refuge System maintains the biological integrity, diversity and environmental health of these natural resources for the benefit of present and future generations of Americans.”



The 2007 Papahānaumokuākea Marine National Monument Requirements Document laid out future programmatic facility requirements within the Monument.

Purpose of this Document

In October 2007, the Co-Trustees of the Monument produced the PMNM Requirements Document that describes existing conditions and future needs at the various locations within the Monument, including Kure Atoll, projected to the year 2022. The Requirements Document includes a detailed site and operational plan for each location in the Monument by providing a general outline of people, programs, assets, and operations. The requirements document was the first step in outlining future facility requirements at Kure Atoll and served as the basis for some of the information in this document (the Conceptual Site Plan). Additionally, the joint 2008 PMNM Management Plan identified the need for individual conceptual site plans to be developed for the Hawaiian Islands National Wildlife Refuge and the State Seabird Sanctuary at Kure Atoll to identify long-term infrastructure alternatives and priorities. Appropriate facilities are critical to carry out field operations in a safe and effective manner. Coordinating these assets among Co-Trustees is central to achieving the goals of the Monument.



The 2008 Management Plan guides the work of the Monument Management Board and its individual agencies over the next 15 years.

The Conceptual Site Plan seeks to further refine and develop requirements for facilities at Kure Atoll. While there are several masonry buildings on Kure, they are old and in disrepair. The staff lives in tents and uses the buildings for storage and offices. A strategy is needed to improve facilities on Kure to support year-round operations. This document will inform continued site planning and needs analysis to ensure that field operations at Kure align with the purpose and mission of the Monument.

INTRODUCTION

It should be noted that at present, there is no funding for construction projects or building improvements on Kure Atoll. This document simply sets the stage for immediate action once funding becomes available.

Project Process

The process for the conceptual site plan is outlined below:

Initial Data Gathering. This process allowed Facility Programming and Consulting, along with participants from DLNR, NOAA, and FWS to gather information about Kure and to get all participants “on the same page” regarding the goals and outcomes of the project. This phase also set up goals and talking points for the planning charrette.

Planning Charrette. Field requirements at Kure were identified through an inclusive facilitated workshop that provided a venue for in-depth site planning and needs analysis through a multi-agency collaborative session. The workshop assessed opportunities for improvement research, habitat restoration, and management programs in Kure. Facilities were compared against the requirements, which determined a plan of action to best improve facilities on Kure.

The planning charrette served as an open forum where all three agencies were able to determine current shortcomings and possible future requirements that would affect facility requirements on Kure.

Conceptual Site Plan. After identifying field requirements, the conceptual site plan documents the needs and recommendations for facilities on the island. This plan will describe methods to maintain, improve, or replace buildings and other field camp support in a manner that does not enlarge the existing environmental footprint.

The intent of this document is to develop a “road map” and a menu of alternatives that will support the development of the site on Kure to support current as well as future operations. The plan defines supporting goals, mission and vision, and operational needs and requirements for growth.



*Monk seal on the beach at Kure Atoll.
(Source: DOFAW)*

Executive Summary

2



Kure Atoll is a nesting area for many sea birds and a habitat to many fish and marine mammals. Human activities pose many threats to the ecosystems of the atoll.

This report determines a strategy for facilities in support of research, restoration, and conservation activities on Kure Atoll. Existing facilities on Kure Atoll are small, aging, and only marginally functional. A plan is needed to determine future steps that ensure that these structures, and other potential improvements, are able to support field camps now and in the future.

Current research and restoration activities on Kure Atoll include:

- Habitat restoration to remove invasive species, such as *Verbesina* (*Verbesina encelioides*), and restore Native Hawaiian plants
- Marine debris removal
- Seabird banding and monitoring
- Spinner dolphin surveys and monk seal monitoring

The goal of the combined agency operations on Kure is to remove alien species and marine debris, and manage the resources there, including marine mammals, birds, coral reefs, fish, and plant life, resulting in a place that is virtually free of human impact. Any facility planning done on Kure Atoll must address the goal of enhancing research and restoration capabilities with consideration to a functional, yet environmentally sustainable design approach. The recommended strategy will take a “low impact” approach that will allow humans to leave the island in its natural state when the work there is completed.

The recent construction of a bunkhouse on Kure was the first priority for facilities on the island. This will provide increased capacity and the ability to extend field camps year-round. The addition of this building will free up other existing space, allowing improvements to be made to other structures, such as additional storage and a wet lab.

Project Goals and Objectives

The objectives of the Kure Atoll Conceptual Site Plan are:

- Ensure the most appropriate, compatible and efficient utilization of Monument management resources, in support of its mission;
- Identify field requirements and develop a plan that will guide proposals for capital investments for new construction, remodel, and repair of Kure Atoll buildings and infrastructure that are “green” to the fullest extent possible;
- Reflect both the special needs and constraints of the site and the impact of Kure-based Monument activities (research,

EXECUTIVE SUMMARY

education, Native Hawaiian practices, special ocean use, conservation and management);

- Identify opportunities for resource sharing, avoiding duplication;
- Establish and recommend a space utilization policy for near and long-term space requirements at Kure.

The goals of the Conceptual Site Plan, as determined by the planning team during the planning charrette, include the following:

1. Determine a plan that leaves a minimal footprint and has little environmental impact. Any preferred actions on the island should consider and protect animal and plant life on Kure.
2. Improve conditions and research capabilities during winter months to allow for year-round operation and restoration activities.
3. The plan should support each of the three managing agencies (DLNR, NOAA, and FWS) to sustain both individual and overlapping missions on Kure.
4. The plan should be flexible to address varying amounts of activity on the island. It should be possible to implement the conceptual plan in phases based on the available funding.

Planning and analyses are needed to ensure that current and future facilities on Kure Atoll support field operations and align with the purpose and mission of the Monument, as well as the purposes of the Midway Atoll and Hawaiian Islands National Wildlife Refuges, NWHI Coral Reef Ecosystem Reserve, the State of Hawai'i NWHI Marine Refuge, and the Seabird Sanctuary at Kure Atoll. These facilities will help meet the shared responsibilities for management, emergency response, enforcement, education, and research in the Monument.

Well-established, permanent biological monitoring and restoration programs at Kure Atoll are dependent on existing housing and facilities on Green Island at Kure Atoll. Given the harsh environmental conditions that exist, there is need to maintain, improve, or replace communications equipment, solar power and water production units, sewage treatment infrastructure, buildings, and equipment.

Planning has begun with the development of this strategy document. Field requirements have evolved through an inclusive, facilitated workshop process that included assessing the opportunities for education, research, habitat restoration, and management programs.



*The main threat on Kure Atoll is *Verbesina encelioides* (golden crownbeard), which covers a majority of Green Island and upsets the habitat of Laysan and Blackfoot albatross, making it difficult for them to nest and take off for flights. (Source: DOFAW)*

Current Conditions

3

The first step in determining the conceptual site plan is to identify current assets on the island along with current and future activities. Current facilities on Kure cannot support the operational needs of the multi-agency framework in the long-term due to age and condition, nor can they provide for the growth and maturity of operations on Kure. Current and future needs have been assessed for each of the three agencies and a conceptual site plan has been developed that aligns facilities with both current and future activities on Kure, and has the flexibility to adapt to the changing and developing requirements on the island. The plan takes into account personnel, programs, and operations on Kure for each agency and resource sharing opportunities and develops a preferred strategy for facilities in support of mission objectives.

The following chapter reviews current conditions at Kure Atoll and provides an analysis of current site conditions including existing buildings and current agency activities.

Kure Atoll Background

Kure Atoll is located more than 1,400 miles northwest of Honolulu. Northernmost of the Northwestern Hawaiian Islands, Kure is the final link in the chain of islands and atolls that make up PMNM. Kure's islands, reefs and protected lagoon offer a rare resource – a sanctuary where seabirds, monk seals, spinner dolphins, turtles, and fish forage, breed and rest.



An aerial view of the USCG LORAN station when it was operational. (Source: DOFAW)

Before the mid-19th century, Kure Atoll was visited by several ships and was renamed several times. In the beginning, the island's name was spelled Cure, which is named for a Russian navigator who landed at the atoll. It was officially named Kure Island in 1924 and then Kure Atoll in 1987. Through the years, many crews were stranded on Kure Atoll after being shipwrecked on the surrounding reefs and had to survive on the local seals, turtles, and birds. Many of these shipwrecks remain on the reef today, including the *USS Saginaw*. These underwater maritime heritage assets remain under the protection of the Monument.

During World War II, Kure was routinely monitored by visiting U.S. Navy patrols from nearby Midway Atoll to ensure the Japanese were not using the island to refuel submarines or prepare for attacks elsewhere in the Hawaiian Island chain. During the Battle of Midway, a Japanese bomber crash-landed near Kure after being damaged by U.S. fighters. In 1998 the *F/V Paradise Queen II* ran aground on the eastern edge of Green Island while fishing for Hawaiian lobsters.

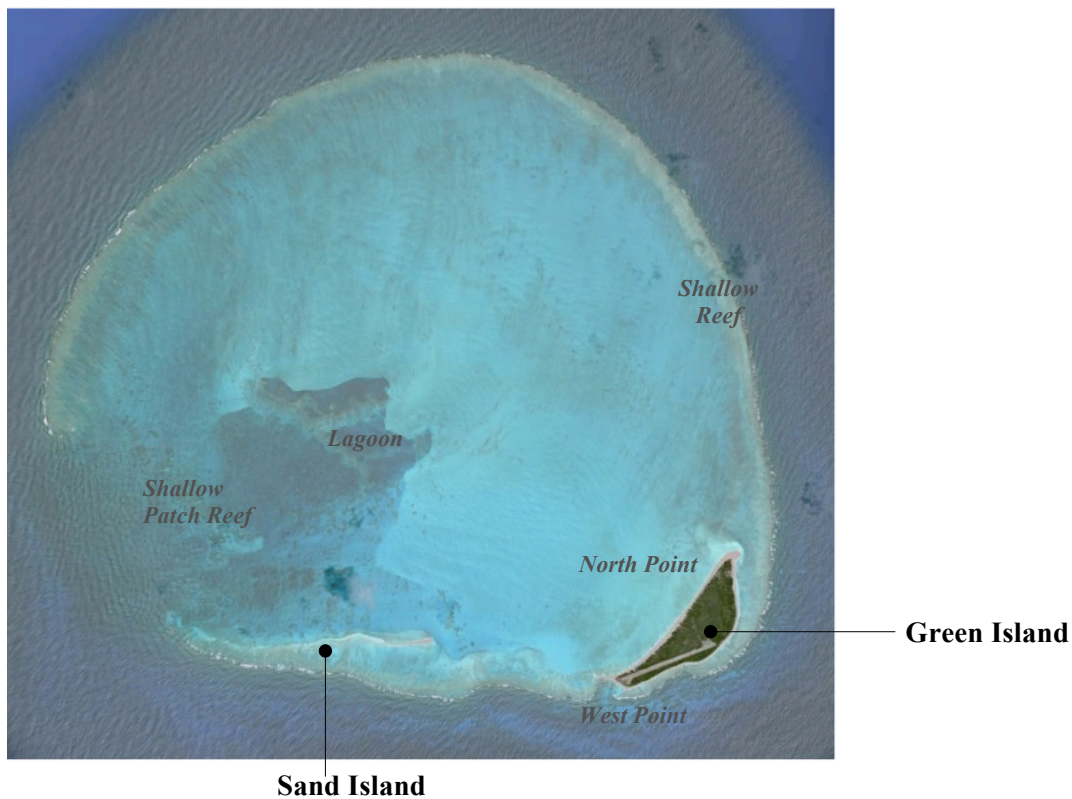
Kure Atoll formerly served as a LORAN (Long Range Aid to Navigation) Station for the USCG from 1961-1992. The station

CURRENT CONDITIONS

measured time differences in radio signals to determine position and aid in navigation. The station consisted of several buildings, a runway and other structures common to a functioning LORAN Station, including a radio tower.

Use by the USCG had far-reaching effects on all the plants and animals at Kure Atoll, resulting in elevated invasive species and contaminants left behind when the base closed. When the USCG ceased operations in 1992, a majority of the structures were removed; the four remaining structures make up the current field camp. Hawai'i's DLNR resumed control of operations in 1993 and restoration activities on Kure were increased.

Current activities on Green Island include continued restoration of native habitat and species through the removal of invasive plants, enhancement of bird habitats, reintroduction of native species, research programs on native species including coral reefs, birds, monk seals, and spinner dolphins, and removal of anthropogenic sources of pollution including marine debris and monitoring the old USCG dump on the Northwestern point on the island.



Site Overview

Kure Atoll is the northern-most coral atoll in PMNM and is located approximately 55 miles from Midway. Kure Atoll consists of a circular barrier reef, surrounding a shallow lagoon, and two landmasses, Green Island, approximately 180 acres, and Sand Island, approximately 35 acres. Green Island is the only permanent island, as Sand Island is subject to tides.

Four structures remain on Green Island along with the remnants of a coral runway. All structures on Green Island are maintained by the State of Hawai'i.



Four primary physical structures remain on Green Island.



Green Island is surrounded by sandy beaches on its perimeter and has 75 acres of low vegetation including *Verbesina* spread over most of the island. On average, three to five individuals, including biologists and volunteers, occupy Green Island three to five months of the year. The first winter camp was implemented in 2011 marking the beginning of year-round operations on Kure. Other ship-based research is conducted around Kure at various times of the year. The island is only accessible by small boats and cannot be accessed by helicopter or airplane due to bird populations that reside on Kure. The island is completely “off the grid” with no permanent electricity or running water.

CURRENT CONDITIONS

Existing Structures

Currently the field camp facilities on Kure consist of four structures preserved from the old LORAN station along with the new bunkhouse:

- A main camp building that is 35' x 50';
- A cement pier with a hoist and small concrete block structure;
- A storage shed that is approximately 20' x 30';
- A 25' x 20' concrete cistern (with a capacity of approximately 15,000 gallons); and
- The newly completed 19' x 32' bunkhouse, constructed on an existing concrete slab.



Main building exterior

Other smaller temporary structures have been constructed in recent years including an outhouse and small nursery.

The Main Building



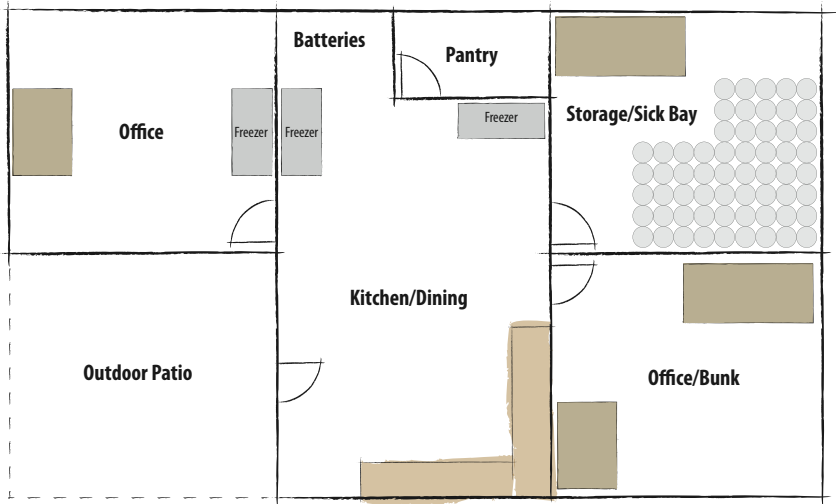
Various angles of the main camp building. (Source: DOFAW)

The main building is approximately 1,750 SF. The building contains one administrative office, a bunkroom, a storage/sick bay, a general-purpose common and kitchen dining area, and storage for batteries and food. The main building generally only sleeps one person, the camp manager.

There is an exterior dishwashing area outside of the main building with a water catchment and reverse osmosis system (this water is used for dishwashing and watering plants). Freezers, stoves, power tools and hand tools, watercraft, and outboard engines are stored on site. This is the main building used during field camps. The building is in severe disrepair with deteriorating concrete and exposed rebar.

Main Building Floor Plan

This floor plan shows the approximate layout of the existing one-story main building. This diagram is not to scale and has been included for informational purposes only.



The Pier

The pier is generally used to store marine debris. There is a small concrete structure on the pier and a hoist. A physical condition assessment is needed for the pier to determine if structural improvements are required to maintain the pier for the future of the island.

Marine debris, once collected, is placed on top of the pier for storage and covered with tarps until it can be hauled off. The hoist is used to haul debris and sometimes supplies. The structure at the end of the pier is currently not used.



The hoist on the pier is most often used for hauling marine debris from the water. (Source: DOFAW)

Marine debris is kept on the pier (Source: DOFAW)

CURRENT CONDITIONS

The Storage Shed and Cistern

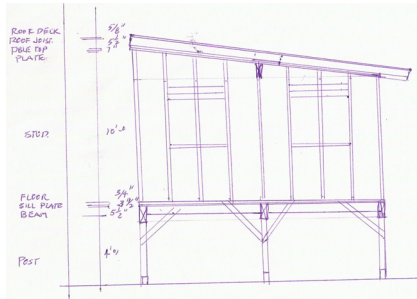


The storage shed and cistern are two separate masonry buildings adjacent to each other. The storage shed is approximately 600 SF. The cistern is approximately 500 SF and holds 15,000 gallons of water that is collected from the roof. This water is generally used for washing and watering purposes. Drinking water is brought on the island to ensure safety. The field camp showering area is in between the cistern and the storage building. Many tools and other field camp items are stored inside and around these structures.

The storage and cistern building are also in severe disrepair. The storage shed leaks in inclement weather and the structural reliability of the buildings is unknown.

*Various angles of the storage and cistern building.
(Source: DOFAW)*

The New Bunkhouse



Elevation of the new bunkhouse building. (Source: Tower Engineering Hawai'i, LTD)

The new bunkhouse was substantially completed in October 2011. Located on the existing leftover slab, the one story structure is constructed out of treated lumber, siding, and aluminum windows. The bunkhouse was constructed on piers to minimize impact on birds and to ensure safety in the event of tsunami/flooding on the island. The new building is 19'4" x 32' and 16' high, with approximately 600 SF of useable space. The building contains four bedrooms and an open common area for gathering, dining, and work. The building was constructed to hurricane specs for safety during winter storms. The addition of the new building will allow space in the main building to be used for other purposes.

While finishing touches still need to be completed on the building, it was used for the first DLNR winter camp in 2011. The new bunkhouse should serve as a "model" for other new or replacement facilities on Kure if they are deemed necessary to support operations.



A side view of the new bunkhouse. (Source: Kure Atoll Seabird Sanctuary)



A view of the front of the new bunkhouse under construction. (Source: Kure Atoll Seabird Sanctuary)

CURRENT CONDITIONS

Temporary Structures

In addition to the permanent concrete structures on Kure, there are two temporary structures on site including an outhouse and a nursery, along with canvas tents when needed for bunking.

These Alaska-type canvas tents are used to house and support the field personnel as personal quarters when needed. These tents are lightweight and durable, with metal frames to withstand most weather conditions. They have the ability to be broken down and stored on site, and moved around at the camp to provide privacy. An outhouse facility was constructed in 2009, and a small nursery helps to grow native species that help populate the island as invasive species are removed. The reverse osmosis system provides non-potable water for dishwashing and watering.

Other “facilities” on the island include the water catchments, solar power systems, and communications hardware that are set up to support camp life.



Nursery



Canvas Tent



Outhouse



Reverse Osmosis Water System

Site Utilities

Kure Atoll is completely off the grid, meaning it is remotely located and operates in a completely autonomous fashion.

Electrical Power Systems

Because there are no utilities on the island, a solar electrical system was installed in 2003 in the main facility to supply AC and DC electricity for the following equipment:

- 5.8 cubic foot DC freezer
- 20-watt florescent lights
- Battery chargers
- Five computers
- Satellite phone
- SSB radio and VHF radios
- Appliances such as a blender and a coffee grinder

Eight 150-watt, 24-volt nominal photovoltaic panels are secured to the roof of the main building using screws and adhesive. The panels are wired in parallel to create a 32-volt system that is changed to 12-volt with a peak power-tracking controller in the safety/control box located inside the main building. Cable from the panels is run through a hole in the roof into the distribution box inside the building. Two cigarette lighter-type DC plugs, a marine plug (for the SSB radio), and a unique DC plug (for the freezer) are wired into the distribution box. On a wooden shelf next to the distribution box, a bank of twelve, 6-volt deep cell batteries are wired in parallel pairs to create a 12-volt nominal battery bank. A control box is attached above the distribution box to regulate and optimize battery charging. Finally, an inverter is installed to create AC current for up to 1,000 watts. Two power strips with four outlets each are plugged into the inverter.

In 2009, a second 12-volt solar electrical system was installed with four 80-watt solar panels and ten batteries. The reverse osmosis/UV/carbon water purification system has a separate battery, controller box and 50-watt panel. There is also a small solar charger for the boat VHF radio and battery box, and a very small portable solar charger for an iridium phone. Existing and future projects will be evaluated to determine electrical power needs on Kure.

Water

Drinking water is brought on the island for safety purposes. On-site non-potable water sources include a reverse osmosis water filtration system and a cistern that gathers rainwater. The non-

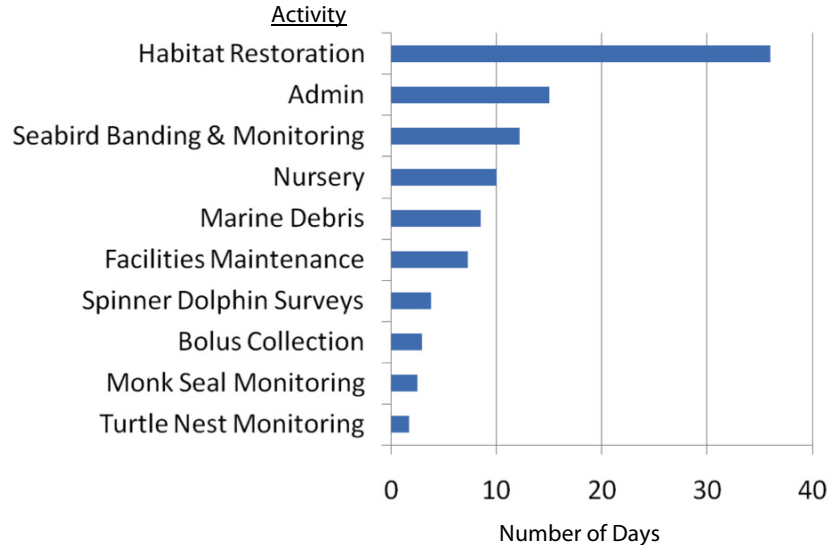
CURRENT CONDITIONS

potable water is utilized for dishwashing and in the nursery for plants. Wastewater is disposed of on site, and the outhouse uses an in-ground pit.

Scope of Activities

All three agencies conduct various programs at Kure Atoll, with DLNR personnel being the primary physical occupants on the island for year-round field camps (currently NOAA work in the area is primarily ship-based).

A summary of current activities on Kure is as follows:



State of Hawai'i DLNR

The State of Hawai'i is the primary occupant of Kure Atoll and maintains the facilities on Green Island. DLNR currently operates permanent year-round camps on Kure. Activities include seabird monitoring, vegetation eradication, marine debris collection and removal, and spinner dolphin research. Typical summer field camps are held for five months of the year (May through September) and consist of approximately three to five people; previously the field season was held only during the summer due to ideal weather conditions and increased activities by all agencies. In 2011 the first DLNR winter camp on Kure was implemented after the new bunkhouse was completed. In order to achieve one of the main objectives, eradication of *Verbesina*, the camp season had to be extended beyond summer primarily due to the *Verbesina*'s complex reproductive schedule and established seed bank. The eradication of *Verbesina* is made much more difficult because of the high density of nesting seabirds, which precludes many mechanized forms of control.

The effect of winter camp activities on *Verbesina* will dictate the level of eradication efforts necessary to have a permanent effect on the reduction of *Verbesina* at Kure. If winter eradication efforts

CURRENT CONDITIONS

are successful (it may take several seasons to evaluate the effectiveness of *Verbesina* eradication efforts), it will be necessary to take a serious look at improving facilities on Kure. Increased rains and winds during the winter season have also triggered a need for adequate, weather resistant housing for crews during winter storms, as all personnel and equipment must be brought inside. In order to allow winter field camps to continue, permanent lodging facilities are required which will ensure the safety and security of personnel and supplies.

NOAA

Most of NOAA's activities at Kure Atoll are ship-based and focus on protected species, coral reef monitoring, buoy maintenance, mapping activities, marine debris removal, and maritime heritage monitoring activities.

In the future, NOAA's overall presence may compliment operations on Kure Atoll in conjunction with the NOAA/NMFS implementation of an expanded monk seal captive care program. This program cares for monk seal pups and mothers to improve survival rates. In addition, NOAA has considered increasing dive operations in alignment with the PMNM Management Plan for research on fish populations and coral reefs within the Monument. As part of this initiative, NOAA may also considered utilizing facilities on Kure Atoll as a location for shore-based diving operations related to the aforementioned conservation, management, and research activities within Kure.

FWS

FWS is responsible for biological monitoring, endangered species recovery projects, habitat restoration, and controlling invasive species within the Hawaiian Islands National Wildlife Refuge and the Midway Atoll National Wildlife Refuge. Primary activities are focused on other islands, including Midway Atoll. Specific activities on Kure include occasional field camps for monitoring and assessment. As part of the PMNM Management Plan, occasional site "exchange" visits will be conducted between the State and FWS staff at Midway and Kure Atolls. These visits would ensure that habitat restoration and management activities and wildlife monitoring activities are coordinated between FWS and the State of Hawai'i.

Challenges and Constraints

Kure Atoll is a remote location with a delicate ecosystem that presents challenges and issues that must be considered in all planning, design, and construction efforts. During the planning charrette, some of these issues were identified to aid planning efforts for the conceptual site plan:

- Kure Atoll is completely “off the grid”, with no electrical service or running water. Electrical power is obtained from solar systems or generator. Drinking water is brought to the island, and non-potable water for washing is obtained from the cistern and a reverse osmosis system previously discussed.
- The unique ecosystem of Kure Atoll, including plants, birds, fish, marine mammals, and other wildlife must be considered during planning. Any construction effort must be planned with minimal disturbance to birds and monk seals and their natural activities and habitats on the island. Native Hawaiian plant species should not be disturbed.
- The existing structures on Kure are debilitated and should be further examined to determine their structural condition and the steps needed to restore them to ensure the safety of the Kure Atoll crew.
- The maximum number of people on the island should be restricted to approximately 13 for management, safety, and storage purposes. If there are too many people, it becomes a problem for the manager, food and water storage, bunking capability, and emergency rescue.
- There is limited staff on the island that could oversee or manage a construction project.
- Any construction or activity on the island must be kept low to the ground so as not to disturb seabird populations. Construction should not be more than one story in height.
- Any materials brought on the island must go through a strict quarantine and a 48-hour freezing process to prevent the spread of invasive species including non-indigenous plants, insects, and animals.
- The remote location of Kure Atoll presents logistical problems for the transportation of equipment, materials, food, and water. Generally, all items brought to the island originally from Honolulu are shipped via large vessel from Midway Atoll (approximately five hour trip) then brought to Green Island on smaller boats. All equipment and supplies are then carried by manpower to the camp (very labor intensive process that takes days). The logistical constraints of transporting people, building materials, and supplies must be considered.

CURRENT CONDITIONS

- Disposal and removal of trash, surplus items and building materials must be considered. It is costly and logistically challenging to remove trash from the island. Trash must be removed in the same way that supplies are brought to the island.
- Safety concerns are present with regard to wind and ocean activity, as well as rescue operations. It is impossible to access the island by air and small vessels sometimes are restricted by waves. Emergency situations are hard to address because of the limited access to the island. Access to the island is restricted to small vessels and air access would disturb birds on the island. With the exception of a few small boats at Midway Atoll, French Frigate Shoals, and Kure Atoll, no vessels have homeports in the NWHI.
- Due to the remoteness of Kure, construction costs are high. Construction techniques that can be used on the island are limited (i.e., mixing concrete and pouring for a new slab would be costly and difficult).
- Modification of existing facilities requires strict compliance with refuge laws and regulations, applicable historic regulations, and National Environmental Policy Act requirements. These may include compliance with the policies set forth in the 187A-6, Hawai'i Revised Statutes (HRS) Chapter 13-60.5; Hawai'i Administrative Rules (HAR); FWS Service Manual, National Wildlife Refuge System Administration Act, as amended; NOAA Administrative Orders Chapter 217-104 for Facility Capital Planning and Project Management, and Chapter 343 HRS – Hawai'i Environmental Policy Act.

Conceptual Site Plan

4

This chapter reviews the conceptual site plan and requirements for facilities at Kure Atoll. The intent is to align current and potential activities with the field camp facilities on the island and ensure there is a plan to meet requirements that are easily attainable and have little environmental impact. Facilities on Kure should support both the range of activities that are currently underway and those that are planned in the future. Having the wrong support facilities will constrain the potential activities that need to occur at the site.

For the conceptual site plan, a tiered approach was taken to determine needs by way of a low, mid, and high range of activity level on the island. This will allow the requirements to be adjusted to the varying requirements of each organization and flex as the programs change and develop their activities on Kure. Because the future level of activity is hard to predict, a flexible solution allows the plan to adjust where needed.

Planning Guidelines

Three guidelines will be considered throughout the planning on Kure to guide the process:

1. Sustainability and Minimal Environmental Impact:

One goal of the conceptual site plan is to promote a sustainable agenda. Any planning on Kure Atoll should look to protect, preserve, and maintain the natural environment by using low-impact green sustainable solutions. Any recommendation on Kure should be respectful of the island's natural residents, including plants and wildlife. Human presence on Kure is considered temporary.

2. Flexibility and Shared Resources:

Kure Atoll, like the entire PMNM, is a multi-agency operation. Any solution on Kure should take this into account and promote the overlapping agendas of each agency. Recommendations should be flexible to accommodate varying levels of activity (low, mid, and high) and current as well as possible future programs by all agencies.

3. Cost Effective and Attainable Solutions:

Due to the logistical constraints of Kure, it is understood that any suggested solutions must work within the challenges that Kure Atoll presents, including being an "off the grid", remote location that is only accessible by small boat. Existing structures should be adapted and reused whenever possible. All proposed solutions should have the ability to be phased with available funding.

Summary of Future Requirements

Along with the continuation of current programs and research on Kure Atoll, several new requirements may emerge based on long-term goals for DLNR, NOAA, and FWS.

Year-Round Field Camps

With the initial pilot winter camp in 2011, DOFAW plans to continue winter camps in the future (in addition to summer camps) to better combat *Verbesina* and propagate native species throughout Kure. Year-round camps would make it more productive to assess the feasibility of *Verbesina* eradication and fight the spread when it is seeding making the goal of total *Verbesina* eradication at Kure Atoll more attainable.

As the new year-round camp operation matures, the agency will have a better idea of the success and subsequent requirements of the program, but what is known at this time is the need for more reliable facilities for both storage and bunking:

- **People:** The maximum number of people for a camp is proposed to be three to five people. Each person in the camp would require dining space and indoor bunking.
- **Equipment:** A normal level of equipment is needed including food and water, along with existing freezers.
- **Facilities:** The main requirement for winter camps is reliable housing (indoors in the case of a winter storm) to withstand rain and high winds, and storage (a large majority of stored items would need to be stored indoors due to weather). The storage requirement for winter camps increases the need for reliable and secured storage for equipment. To meet the requirement for reliable housing, a new bunkhouse was added at Kure in the fall of 2011.

Captive Care

Monk seal scientists at the NOAA PIFSC and several partner agencies and organizations (including the FWS) are trying to improve pup survival, and thereby increase the population growth rate, through captive care and release. A captive care program has been tested at Midway to carefully identify and evaluate care and husbandry issues that need to be resolved to enable launch of a much larger captive care effort. If exported to Kure Atoll in the future, this program would require:

- **People:** Teams would consist of two to four people with a three-week stay. Dining and bunking space would be needed for each member of the captive care team. Monk seal captive care would be seasonal as time of year is important for monk seals.



A Hawaiian Monk Seal pup in captive care at Midway Atoll in the PMNM. (Source: NOAA)

- **Equipment:** Equipment needs would include three to four propane freezers for seal food. The freezers would need to be stored indoors with adequate space for propane supply. Food prep space would be required to prepare fish.
- **Facilities:** A pen, or holding tank, would be needed that has access to both shade and seawater (pen requires both wet and dry areas). The pen would need to be large enough to hold several seals with the potential to isolate individual seals.

Animal care personnel and seal biologists would need access to bunking and a wet lab, as well as storage for freezers/seal food, a dedicated food preparation area, and an area for other equipment.

Dive Operations

The PMNM Management Plan identifies the need for a safe and comprehensive dive operations program within the Monument. Coordinated dive operations are critical to effectively and safely carry out marine research, monitoring, emergency response, and management activities. Currently, dive operations are ship-based and personnel on Kure are transient. Implementing the dive program envisioned in the Management Plan would require land-based infrastructure and equipment investments.

An interagency dive program may conduct diving projects in the Kure area in the future; four-person dive teams would make up to 14 trips per year from Midway to neighboring atolls including Kure. In support of this, the following requirements are needed on the island:

- **People:** Dive operations would include four people with three dives per day. Stays would range from one to two weeks.
- **Equipment:** A compressor, 12 SCUBA tanks, and associated dive gear would be required, along with the appropriate storage (discussed below). A power source would be needed for the compressors to fill tanks. (Note: compressors are loud and may disturb animals and it would need to be contained somehow to mask the noise)
- **Vessels:** Small boats or small research vessels may be needed to provide transportation in and around Kure.
- **Facilities:** Storage for both wet and dry gear, including wet suits, buoyancy compensators, and regulators. These spaces would need to be close to the vessel for easy access (possibly on the pier; the structure on pier could be used for storage and/or the compressor). Storage should not only be easily accessed but also have adequate airflow for drying. Requirements should be modular and able to flex up or down based on programs on Kure.

CONCEPTUAL SITE PLAN

Additional new programs on Kure Atoll may be developed in coming years based on the research and restoration needs within the Monument. Any proposed facility solutions must be flexible to adjust to the changing and potential needs outlined in this document.

Requirements Matrix

The personnel and facility requirements for Kure were developed through a multi-agency planning process beginning with the planning charrette. To further understand and document the requirements on Kure Atoll, a requirements matrix was developed in partnership with each agency with operations on or near Kure that lists requirements in range of activity and capacity. The following requirements matrix has been provided for each of the three agencies that conduct activities on Kure and provides a framework for requirements at a low, mid, and high level of operations on Kure.

These requirements will be regularly re-evaluated by each of the Co-Trustees and can be modified in the case of developing agency requirements to ensure that each agency's goals continue to be achieved and mandates are satisfied.

Please note that the following examples are not complete and have been included as an illustration only.

State of Hawai'i DLNR

State of Hawai'i - DLNR

REQUIREMENTS	Range of Activity		
	LOWER	MID	HIGH
People			
Permanent	1	1	1
Seasonal	3-5	5-7	6-8
Facilities			
Storage	Yes	Yes	Yes
Items Stored	Plastic Buckets, Tools, two small vessels	TBD	TBD
Dining	Yes - Up to five	Yes - Up to seven	Yes - Up to eight
Bunking	Yes	Yes	Yes
Wet Lab	Yes	Yes	Yes
Nursery	Yes	Yes	Yes - Expanded
Special Equipment			
Freezers	Yes	Yes	Yes
Vessels	Yes	Yes	Yes

CONCEPTUAL SITE PLAN

FWS

U.S. Fish and Wildlife Service, Hawaiian and Pacific Islands National Wildlife Refuge Complex

REQUIREMENTS	Range of Activity		
	LOWER	MID	HIGH
People			
Permanent	0	0	1
Seasonal	3-5	5-8	8-10
Facilities			
Storage	Yes	Yes	Yes
Items Stored	TBD	TBD	TBD
Dining	Yes - Up to five	Yes - Up to eight	Yes - Up to ten
Bunking	Yes	Yes	Yes
Wet Lab	Yes	Yes	Yes
Special Equipment			
Freezers	N/A	Yes	Yes
Vessels	No	Yes - Small Boat	Yes - Small Boat

CONCEPTUAL SITE PLAN

NOAA

NOAA

REQUIREMENTS	Range of Activity		
	LOWER	MID	HIGH
People			
Permanent	0	0	1
Seasonal	0	2-4	3-6
Facilities			
Storage	No	Yes	Yes-Dive Storage
Items Stored	Nothing	Possible Monk Seal Food	Dive gear, tanks (12), compressor, Monk Seal food
Dining	No	Maybe	Yes
Bunking	No	Maybe	Yes
Wet Lab	No	Yes	Yes
Captive Care Pen	No	No	Yes
Special Equipment			
Freezers	No	Maybe	Yes, 3-4 propane
Compressor	No	Maybe	Yes

Facility Requirements



The existing slab on the site was repurposed for use as a bunkhouse. (Source: DOFAW)

To increase capability and capacity on Kure, additional permanent structures are required. In the fall of 2011, a new bunkhouse was constructed to provide reliable housing and storage for year-round camps. To achieve this with minimal impact and cost, the new construction utilized the existing 16' x 30' concrete slab as the base to construct a new permanent bunking structure on the island. Reuse of the existing pad avoids new development that will degrade the environment or interrupt wildlife, it will meet the needs of the agencies on Kure, and is the most cost effective and attainable solution (compared to new construction on a new site).

Starting with this existing pad, the new bunkhouse has added approximately 600 SF for shared use by all agencies that work on Kure. The functional goal for the new building is to provide flexible, permanent bunking quarters that are adaptive to varying field camp capacities in the case of winter storms or increased activity on Kure. The addition of the new four-bedroom bunkhouse building will provide durable indoor sleeping quarters for approximately eight people (if rooms are double occupancy plus a manager) or four people (if rooms are single occupancy). This option allows for the flexibility in the low, mid, and high range of activity previously discussed that may take place on Kure. The addition of a new housing structure will free up other spaces in the main multipurpose building for new uses, including a possible wet lab for sampling and necropsy as well as additional storage capacity.

Depending on future requirements, a monk seal pen and a dive locker may be added on/around the pier.

Site Plan

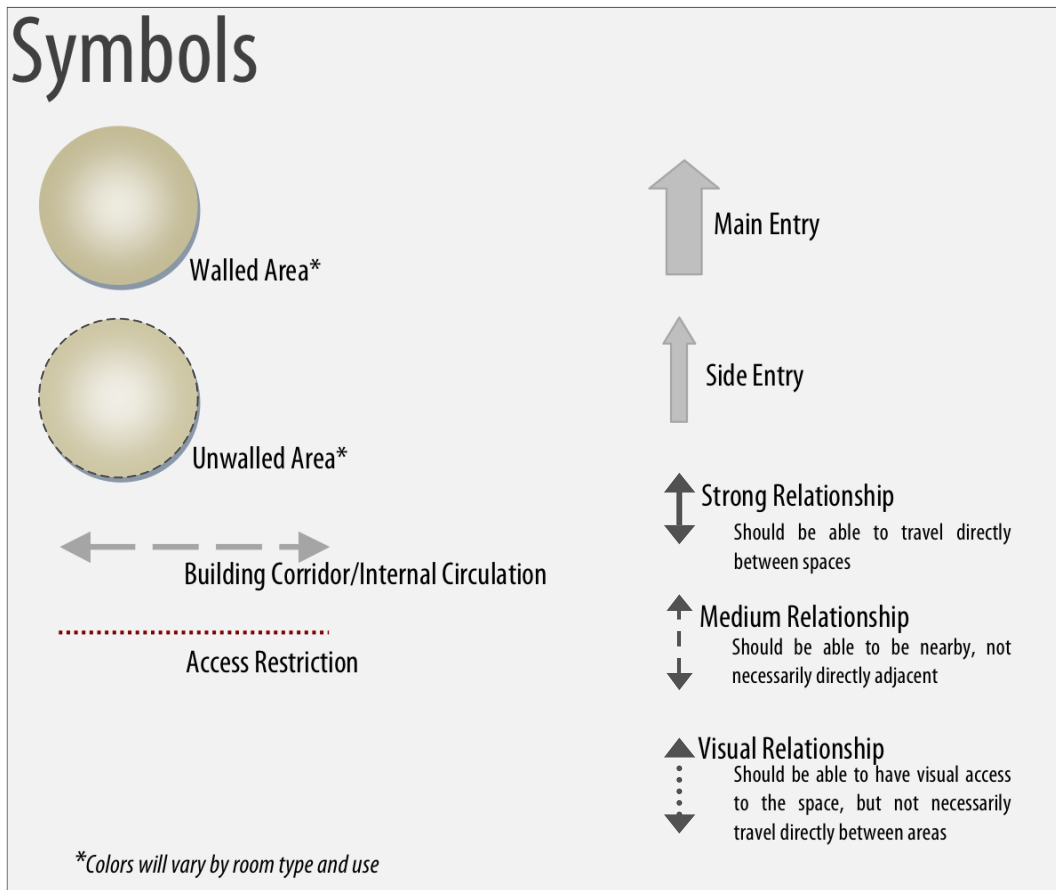


Space and Adjacency Requirements

This section reviews space requirements and functional relationships within the field camp in Kure, including the new bunkhouse. This section will serve as a checklist for the architects as they design and lay out the interior portions of the project.

Symbols

The following symbols are used to illustrate key concepts in this section:



The New Bunkhouse

The new bunkhouse structure at Kure Atoll was the priority project for new low impact facilities on the island. The bunkhouse provides sound permanent housing for visiting scientists and volunteers, along with a new manager’s room (with bunking and desk space). The addition of the bunkhouse increases capacity and provides safe personnel quarters for year-round field camps. The new one-story bunkhouse was constructed using the existing unused slab remaining on Green Island from the USCG station to reduce impact and cost.

Along with four bunkrooms, an open shared area in the building could be used for added storage, meals, or gathering. The common area is flexible and accommodates social and work activities.

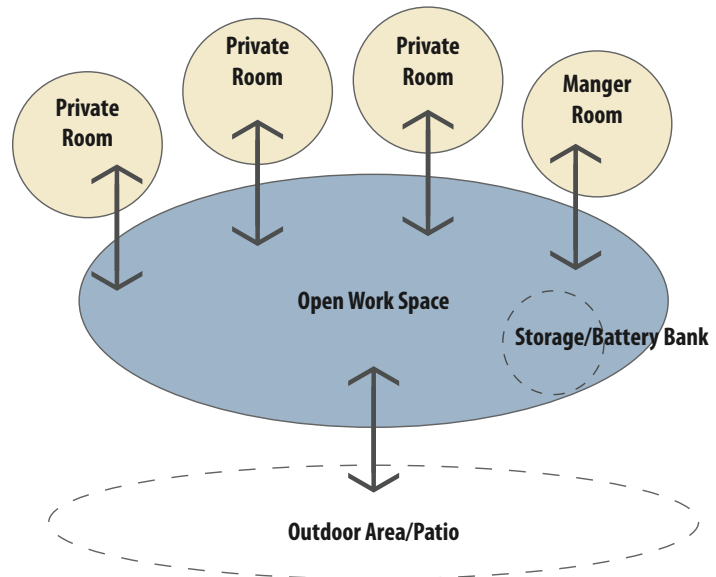
Bunkhouse Space List (approximate)

Space	Quantity	Size	Total SF
Manager Private Room	1	@ 100sf	100
Private Room	3	@ 85sf	255
Battery Bank	1	@ 25sf	25
Common Gathering/Open Work Space	1	@ 220sf	220
Subtotal			600

If the private rooms are changed to double occupancy, the capacity increases from four to eight.

Bunkhouse Adjacencies

This diagram illustrates the functional relationships within the bunkhouse.



Room-By-Room Requirements

Bunkhouse

Manager Private Room (100 SF)

The manager room provides sleeping and work quarters for one person. A window has been provided in the manager's room for ventilation. The manager's room is directly adjacent to the private rooms and the open workspace.

Test Fit:



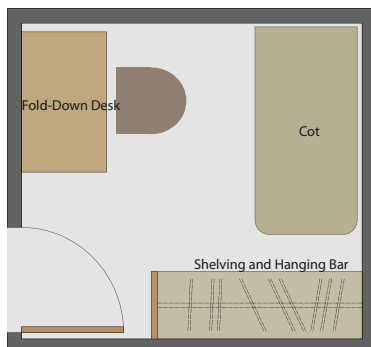
Furniture and Equipment:

- Cot or Bunk Bed
- Fold-down Desk with Chair
- Hanging Bar for Clothing
- Shelving for Personal Items
- Laptop

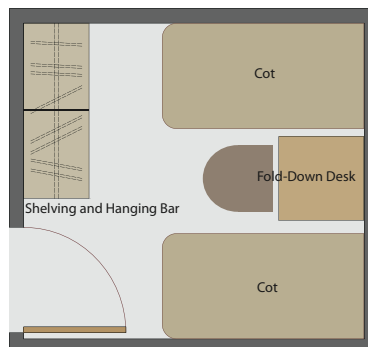
Private Room (85 SF)

The private room will provide sleeping quarters for one or two people depending on the size of the field camp. A window has been provided in each room for ventilation. The private rooms shall be directly adjacent to the open workspace. Three private rooms have been included in this phase of planning.

Test Fit:



Single Occupancy



Double Occupancy

Furniture and Equipment:

- Cot or Bunk Bed (one or two)
- Desk or Fold-down Desk with Chair
- Hanging Bar for Clothing
- Shelving for Personal Items

Battery Bank (25 SF)

The battery bank is an open space reserved for the solar batteries that powers the bunkhouse. The batteries should ideally be stored off the floor and should be protected from moisture and bugs.

Generally, solar panels are wired to a controller/regulator, which regulates the amount of power that feeds into the battery bank. The battery bank is the storage system for the entire power source and can be made up of an array of various types and brands of batteries, depending on location and use. An AC/DC inverter then transfers the power supply into the building. Currently the batteries are six-volt, deep cycle, lead acid batteries, although alternate arrangements are possible. The controller should be located near the battery bank. If possible, a backup generator should be provided in the future to allow for a redundant power source in the case of cloudy days or other failure of the system.

Equipment:

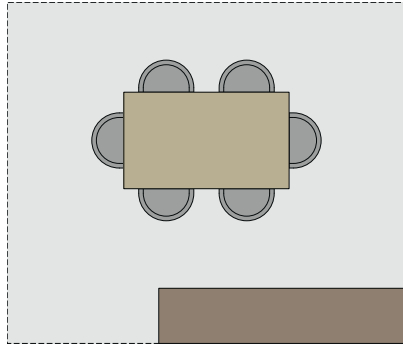
- Batteries
- Inverter
- Backup Generator

CONCEPTUAL SITE PLAN

Open Workspace (220 SF)

The open workspace is a shared gathering and workspace within the bunkhouse. This space is open with windows on the perimeter for ventilation. The open workspace should have the capacity for additional freezers (if needed) and at least five laptop computers.

Test Fit:



Furniture and Equipment:

- Freezer
- Table (1)
- Chairs (6)
- Laptop Computer (5)

The Main Building

The main multipurpose building provides approximately 1,600 SF currently used as office and dining area at the camp. With the addition of the new bunkhouse, space within the main building has been made available as the manager's room moves to the new bunkhouse. This additional space could be converted into a wet lab for sampling and necropsy or additional storage. This building should be examined by a qualified structural engineer to determine what improvements are needed to maintain the building as safe and usable.

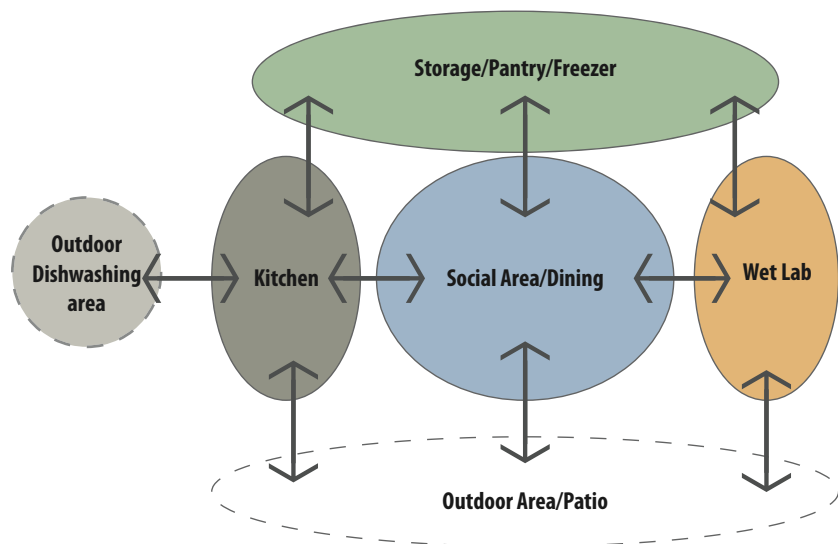
The following space list provides an example of how the main building may be used in the future with the addition of the bunkhouse.

Main Building Space List

Space	Quantity	Size	Total SF
Open Social Area/Dining	1	@ 500sf	500
Kitchen/Food Prep	1	@ 200sf	200
Pantry	1	@ 100sf	100
Battery Bank	1	@ 150sf	150
Wet Lab	1	@ 150sf	150
Storage/Sick Bay	2	@ 200sf	400
Subtotal			1,500

Main Building Adjacencies

This diagram illustrates the functional relationships within the main building.



Main Building New Spaces

Much of the main building spaces will remain the same. The relocation of the manager's room to the new bunkhouse allows the current space to be repurposed for a wet lab.

Wet Lab

The wet lab will be utilized for water sampling, refrigeration, and possible animal necropsy. The wet lab is a new space within the main field camp building. The wet lab will not be a typical wet lab because it will not have sinks or running water, but the lab will serve as dedicated space for research or biological purposes. In the future, the wet lab could also serve as food preparation space for the monk seal captive care program.

Test Fit:



Equipment:

- Refrigerator/Freezer
- Counter space with storage above and below

Other Requirements



An aerial view of Kure Atoll. (Source: DOFAW)

The following section reviews other issues affecting the implementation of a project on Kure.

Planning Strategies

The following issues and constraints affect the planning, design, and implementation of a new structure on Kure Atoll:

- A structural analysis of the condition of the existing structures on Kure is needed. This will give a better idea of what is needed to stabilize and rehabilitate the main building, cistern, pier, and storage building to ensure their safety and longevity.
- The remoteness of Kure causes safety concerns with natural disasters (such as storms and tsunamis) and because evacuation is not always an option, structures should be designed with sheltering in-place options.
- Although LEED certification is not anticipated at this time, any new construction or renovation will incorporate as many "green" products and technologies as budget and construction methods will allow.
- Planners should consider the effects of salt aerosols during design. All finishes should be corrosion-resistant and be able to withstand strong winds and storms.
- Any construction project should look to reduce impact to wildlife and vegetation.
- There will likely be a limited scheduling window for construction and/or repairs to the existing buildings. It will also be necessary for construction to be tightly contained with limited areas for staging (because of bird habitat). Pre-manufactured, component, or modular construction should be considered.
- Any new construction should be considered temporary and able to be easily dismantled or demolished, leaving the landscape as virtually untouched.
- Consider maintenance costs associated with any specialized systems proposed for the project, such as solar panels. All systems on Kure must be easily maintainable by the research staff that is stationed there, using basic tools and only "layman" expertise.
- Redundant power systems should be considered in the case that there are problems with the first system. As more people and equipment are added on Kure, the capacity of the backup systems must be increased too.
- Additional personnel would require more water for drinking, cooking and bathing. A new reverse osmosis system should be provided with the new bunkhouse.

CONCEPTUAL SITE PLAN

- ENERGY STAR appliances should be utilized in all new spaces at the field camp.
- The amount of people on Kure Atoll is directly proportional to the amount of resources required to support them including storage space, food and water, management/operations, sleeping quarters, power, etc.)

Sustainable Design Guidelines and Principles

Due to the remoteness of the ecosystem on Kure, sustainability and self-sufficiency is critical to the success of Kure's field camp and the continued health of the surrounding environment. Future designs and renovations need to meet the requirements to Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management. To accomplish this, measures should be taken to ensure that material selections, building positioning and power generation do not have a negative impact on the environment. The selected design team can utilize the latest version of either the USGBC (United States Green Building Council) LEED (Leadership in Environmental and Energy Design) or Green Globes as a guide to the integration of environmental performance in the project delivery.

<http://www.usgbc.org/DisplayPage.aspx?CategoryID=19>

<http://www.greenglobes.com/design/homeca.asp>

The decision of which guide and pursuing certification from either organization will be decided by the client at the onset of the project.

Sustainability Goals and Guidelines

At the beginning of the design process (for both the new bunkhouse and repair of existing buildings), the integrated design team including the end users will develop sustainability goals for the project. These goals will be referenced throughout the design and construction process to ensure steps are being taken to minimize the impact on the environment and to meet the Executive Order requirements. Guiding principles for sustainable new construction and major renovations are:

- Integrated Design Principles
- Optimize Energy Performance
- Protect and Conserve Water
- Enhance Indoor Environmental Quality
- Reduce Environmental Impact of Materials

Integrated Design Principles

The design team will use a collaborative, integrated planning and design process that initiates and maintains an integrated project team in all stages of the project's planning and delivery. Commissioning should also be conducted to ensure all building components are performing to expectations and design requirements are met.

Optimize Energy Performance

Optimizing energy performance will be beneficial to establishing the design parameters of the solar array. Solar is the preferred system for existing and future facilities due to its simplicity and reliability. While not having Heating, Ventilation, and Air Conditioning (HVAC) reduces the energy demand substantially, reducing other energy needs through integrated design will help minimize storage requirements of batteries and solar array size. During design, electricity draws will need to be quantified with future growth and a percentage of surplus capacity for peak demand.

The following equipment should be considered when planning for solar panels on both the existing main building and the proposed new bunkhouse:

- Freezers (must stay on all the time)
- Computers (five in the new bunkhouse and five in the main building)
- Satellite phone
- Battery charging
- Reverse osmosis system (both the existing system and a possible new or expanded system to accommodate added capacity)

Each facility with occupancy functions will have independent solar arrays with battery storage so redundancy is built into the complex. The solar arrays and battery storage will be sized based on the expected energy needs of each building.

In the event of complete failure of the solar systems, critical functions such as freezers and communication need to be on a generator back up system. The generator will run on gasoline used for the small boats as is currently done. The generator will need to be sized to meet the demand from the critical functions.

Protect and Conserve Water

With the Kure facility not being close to a potable water source, potable water is transported to the facility and stored. Non-potable water (rainwater) is also collected and put through a reverse osmosis system to supplement the water needs. Kitchen

CONCEPTUAL SITE PLAN

and shower functions, both interior and exterior will need to be consolidated to minimize water loss and simplify the water distribution system needed for multiple functions fed from a single storage point.

Enhance Indoor Environmental Quality

Enhancing indoor environmental quality can be done with natural ventilation, daylighting and the proper selection of materials. During the design phase implement the following strategies to improve the indoor environment for the end users:

- Encourage positive natural ventilation through all areas of the building
- Utilize proper overhangs and ventilation to minimize moisture build up
- Enhance daylighting to all interior spaces
- Select low-emitting materials
- Protect indoor air quality during construction
- Implement a no smoking policy

Reduce Environmental Impact of Materials

Material selection during design should take into account not only the environment in which they will be used, but also strive to choose materials with high recycled content or rapidly renewable materials to reduce the reliance on the environment for materials. The facilities should be designed using components that have been manufactured off-site and shipped to the site for easy assembly, thus minimizing material storage and waste generated on Kure. Consideration of the following strategies for sustainable products:

- Specify products with a high percentage of recycled content
- Specify products with the highest bio-based content
- Use products that have a lesser or reduced effect on human health and the environment
- Minimize construction generated waste through appropriate design and pre-manufacturing
- Eliminate the use of ozone depleting compounds during and after construction

This report provides guidance for long-term decision making in regard to current and future operations on Kure Atoll. The conceptual site plan prioritizes the needs for field camp facilities on the island to support field activities including scientific research of the important wildlife habitats and historic and cultural resources. The three agency partners will work together to determine roles and responsibilities in implementing the plan, along with potential funding sources. Currently, there is no funding or budget associated with any recommended projects on Kure Atoll and this plan does not constitute commitment of funding on the part of any agency involved.

Project Priorities on Kure Atoll

The following projects are recommended on Kure to provide the appropriate facilities to support the field camp:

1. Construction of new bunkhouse building (completed)

The priority construction project proposed on Kure was the new bunkhouse building constructed on the existing concrete slab retained from the LORAN station. The new bunkhouse will accommodate some functions from the multipurpose building while also increasing indoor sleeping and storage space within the field camp. This project was completed in the fall of 2011.

2. Structural assessment of existing buildings

The second step in the plan is to assess the condition of existing buildings on Green Island. This assessment will provide an accurate assessment of required structural improvements, and buildings that need to be completely replaced. The existing structures are vital to field camp operations; it is imperative to assess their current condition before steps are taken to plan improvements that are necessary to extend the life of the respective buildings.

This phase will require the coordination of the field camp manager and a structural engineer. Due to the cost of travel for a structural engineer to visit the site, the engineer may direct the manager to “self-assess” the buildings.

3. Make necessary improvements to existing structures

Based on the findings in step one, structural and other improvements may be needed on the existing multipurpose building, the cistern, and storage shed. These improvements could be made after the construction of the bunkhouse, allowing the bunkhouse to serve as the temporary staging space for multipurpose building functions. Improvements at this phase may include roof replacement, sealing, structural reinforcements, window replacement, etc.

IMPLEMENTATION APPROACH

At this time spaces within the main building can also be repurposed for new uses, such as the wet lab. In addition, if the pier is structurally sound, it may be considered for dive locker space.

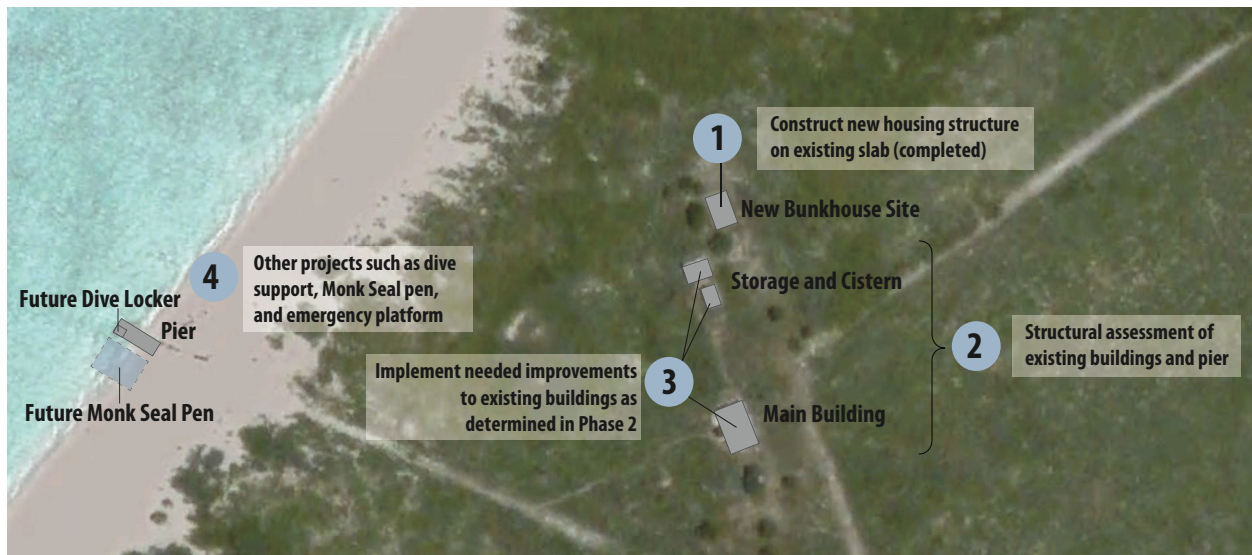
4. Other Projects

Several other projects may be required to support field camps at Kure. These may include needed improvements to the electrical, plumbing, and communications infrastructure. In addition, a potential structure for emergency situations (e.g. a post and pier platform) should be constructed to ensure the safety of the crew on Kure.

In addition, other projects have been suggested on Kure, including Hawaiian monk seal captive care and dive operations. A separate study should re-assess the feasibility of these projects and make additional planning arrangements for them, including an assessment of similar projects on other islands, namely Midway Atoll.

Priority Phasing Diagram

The diagram below suggests the proposed project phasing on Kure Atoll.



Location of bunkhouse is approximate, located at 28.394°, -178.294°

Cost Influences

The cost of any project on Kure Atoll will be greatly influenced by the challenges presented by a remote site.

- **Materials:** Green or specialized materials are desired, and may be required for this project. Major fluctuations in demand on a global basis can impact the availability and cost of materials. After materials are obtained, they must then go through the required 48-hour freezing and quarantining process, which will add additional cost.
- **Shipping:** There will be added cost to ship the building materials from the main Hawaiian Islands and/or the main land. Materials required for the project will likely be shipped to Midway Atoll first (by air or vessel) then transported by vessel to Kure.
- **Labor:** Labor costs will include not only those constructing the building or making improvements, but also costs for transportation, food, water, and living quarters for construction personnel for the duration of the project.

It is difficult to predict the construction costs for a project on Kure due to the lack of benchmark projects. The costs associated with Kure could be compared to recent or proposed projects on Midway Atoll.

IMPLEMENTATION APPROACH

Conclusion

The conceptual site plan determines several priority projects that have been identified to support and improve field operations on Kure Atoll. The need for a Kure Atoll conceptual site plan was first identified in the Monument management plan. The management plan outlines priorities and strategies that guide the direction of the Monument. The strategies contained in the management plan are used to guide decision-making and future project planning within the interagency framework that is responsible for managing PMNM. To this end, the conceptual site plan takes the goals and missions identified in the management plan and relates them to site-specific recommendations on Kure Atoll.

With the first strategic priority on Kure completed, it is time to move onto other needed improvements to the field camp. The new bunkhouse provides a reliable permanent housing building to increase overall capacity and to facilitate the extension of year-round field camps. This allows for more aggressive action in many of the primary field operations on Kure, including the eradication of invasive species and cleanup of marine debris. The addition of the bunkhouse will allow some space within the existing multipurpose building to be re-purposed for new uses, including a wet lab for scientific sampling and necropsy native species. The conceptual site plan has been designed with sustainability and minimal impact that is in alignment with the mission of the operations on Kure Atoll. The next step is to further assess existing masonry buildings to determine structural improvements are needed in order to ensure their longevity. Long-term plans on the island may include monk seal captive care, dive operations, and needed emergency and safety structures. Any improvements made on Kure will have the natural ecosystem of the island in mind including the birds, seals, and plants that are native to the atoll.

There is currently no funding for a project on Kure. This strategy is not a budget document and is intended for program planning purposes. Execution of the strategy will be contingent on available resources. This document will help to frame the need for funding related to Kure that will improve operations and conservation activities.



Marine debris collected on Kure Atoll rests on the pier structure (Source: DOFAW)



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