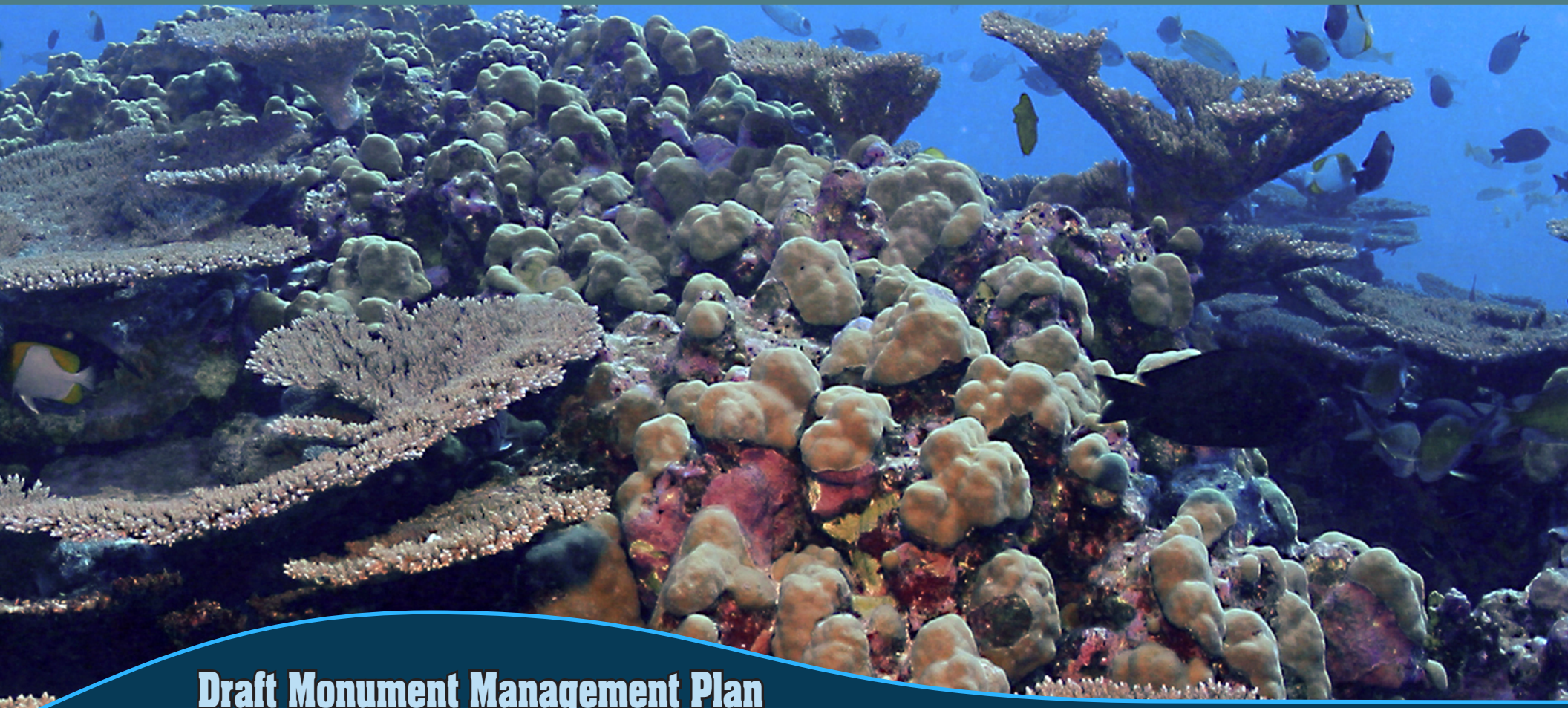
Papahānaumokuākea
Marine National Monument



Draft Monument Management Plan
Midway Atoll NWR Conceptual Site Plan

U.S. Fish & Wildlife Service * National Oceanic and Atmospheric Administration * State of Hawai'i

Volume IV

Midway Atoll National Wildlife Refuge Draft Conceptual Site Plan

Volume IV
Papahānaumokuākea Marine National Monument Draft Monument Management Plan

produced by

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Seattle, Washington

for the U.S. Fish & Wildlife Service

April 2008

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Midway Atoll Vision

1

1. Midway Atoll Vision

Vision Statements

Papahānaumokuākea Marine National Monument Vision:
That the health, diversity, and resources of the vast Northwestern Hawaiian Island ecosystems and the wildlife they support—unique in the world—be protected forever.

Laysan albatross chick with parent

Midway Atoll National Wildlife Refuge Vision:
As part of the Papahānaumokuākea Marine National Monument, Midway Atoll is a unique and peaceful treasury of wildlife and history in the midst of the Pacific where nature rules, and the health of people, wildlife, and ocean are intrinsically connected. Native habitats and species dominate the Midway landscape, while remnants of the historic Battle of Midway are protected along with rehabilitated historic structures that support a cooperative interagency field station. Coordinated management promotes ecological restoration, research, service-based tourism, and education to preserve and enhance this fragile island and coral reef system. Midway Atoll is the "window" to the Monument that offers people a rare opportunity to immerse themselves in the rich history and ecology of the Northwestern Hawaiian Islands, a remote ecosystem of international significance. As a living classroom, Midway provides restoration and sustainability lessons for current and future generations worldwide to apply to their home communities.

Significance of Midway

The purposes of Midway Atoll NWR are to maintain and restore its natural biological diversity; to provide for the conservation and management of fish and wildlife and their habitats within refuge boundaries; to fulfill the international treaty obligations of the United States with respect to fish and wildlife; to provide opportunities for scientific research, environmental education, and compatible wildlife-dependent recreational activities; and to recognize and maintain the historical significance of Midway Atoll (Executive Order 13022, October 31, 1996). All activities considered in this Conceptual Site Plan will be consistent with the Refuge purposes.

Midway Atoll's significance is also recognized by two other protective designations: Papahānaumokuākea Marine National Monument and National Memorial to the Battle of Midway. Midway Atoll plays a key role as a staging ground for field operations throughout the Monument and is critical to the operations of Kure Atoll Wildlife Sanctuary.

Midway Atoll National Wildlife Refuge is within the Pacific Region of the U.S. Department of the Interior, Fish and Wildlife Service (FWS). It is administered as part of the Hawaiian and Pacific Islands National Wildlife Refuge Complex that provides oversight for 19 refuges. The FWS began operating an "overlay refuge" on Midway Naval Air Station in 1988. Administration of Midway Atoll was transferred to the FWS in 1996.

As one of the Northwestern Hawaiian Islands, Midway Atoll is representative of a remarkably unique and important marine ecosystem. Located near the north end of the highest-latitude coral reef ecosystem in the world, it is bathed in relatively cold water for coral reefs, making it a vital case study in the global incidence of heat-induced coral bleaching. Part of a volcanically created island

Laysan albatross nesting

chain, Midway is an example of atoll formation, a poorly understood geological process. Because of its unique position in the middle North Pacific, it is also an important node in the global network of ongoing biogeographical and oceanographic research.

beach at Rusty Bucket

Due its geographic isolation, Hawai'i in general has a very high percentage of endemism, or occurrence of species that are found nowhere else in the world. Many of these species are threatened or endangered, often as a result of human activity; the isolation of the Monument provides them with a huge refuge habitat. Finally, the Northwestern Hawaiian Islands are the last intact, predator-dominated marine ecosystem in the United States and among the last in the world, making it invaluable to scientists' understanding of marine ecology. The access to this remote ecosystem provided by the infrastructure at Midway enables unparalleled opportunity for studying an isolated marine ecosystem.

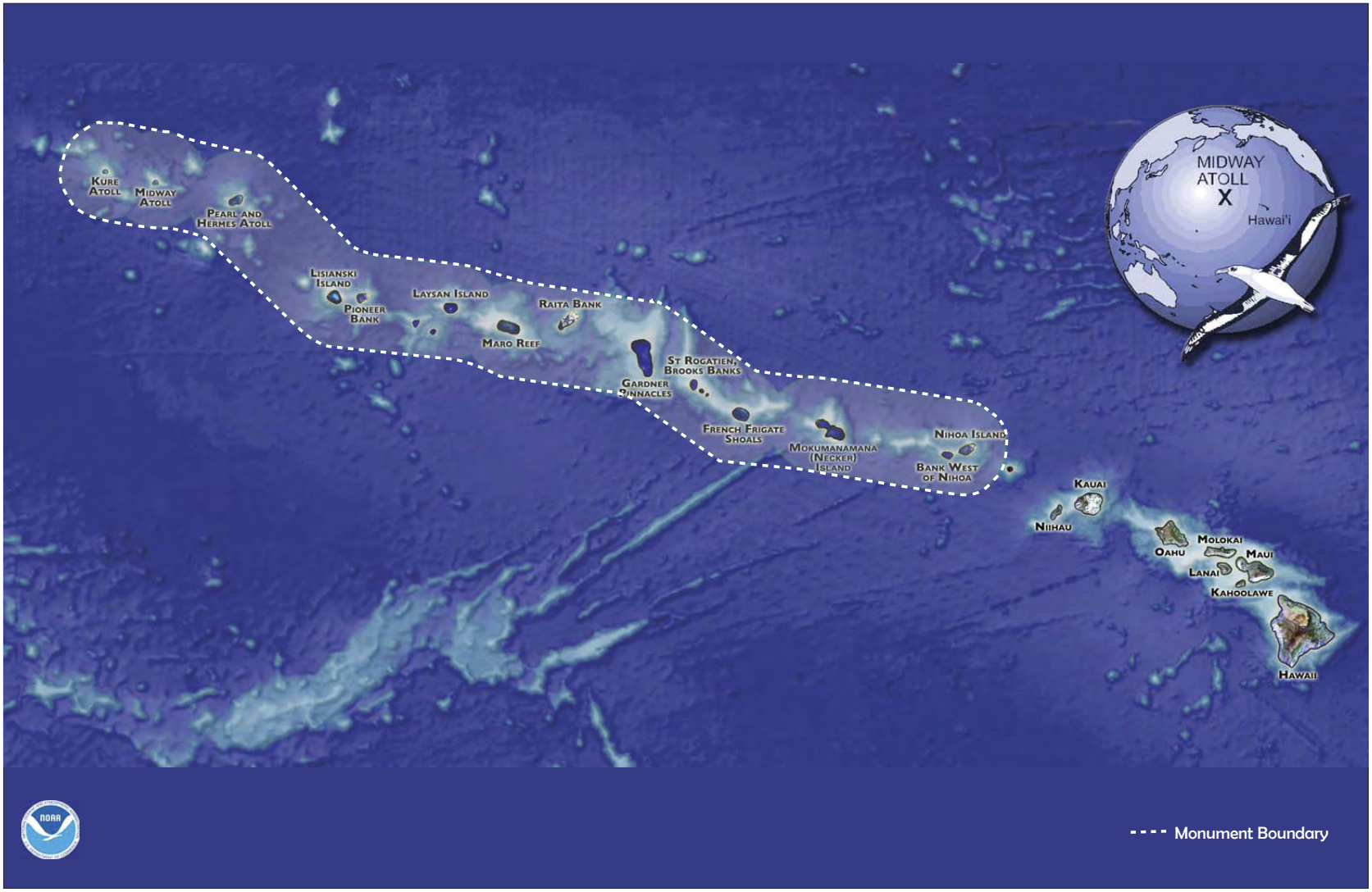
In addition to its rich assemblage of marine life, Midway Atoll contains numerous heritage resources that collectively tell the story of commerce, military, transpacific communication, and human modification of the atoll environment. Despite its small size and remote location, Midway's strategic location in the middle of the Pacific Ocean drew great attention over 100 years ago. Notably, Midway's pivotal role in World War II, commonly known as the "Battle of Midway," and the sacrifices of military personnel who fought at Midway, are memorialized in history. Today, Midway contains 63 existing historic properties eligible for the National Register of Historic Places; these include defensive structures, military architecture, both industrial and residential, and architecture from the Commercial Pacific Cable Company period (1903) and World War II period.

The recent designation of Midway as a special management area of the Monument elevates the atoll's significance regionally and globally. Midway will be a hub of Monument-wide management and operations, and the only atoll where visitors can experience the Northwestern Hawaiian Islands. Bringing people to the place in a way that does not diminish but rather enhances the integrity of Midway Atoll is beneficial to the Monument. Equally important is bringing the place to people who cannot visit, so that the valuable lessons and experiences of Midway reach across the world to local communities.

A key question is: how do we tell the amazing story of Midway and support Monument operations while preserving the atoll's character and integrity? The Midway Atoll Conceptual Site Plan offers the opportunity to re-envision the island as a powerful case study in how humans and a delicate ecosystem in a small locality can and must live in balance with itself and one another over a long timeframe. This precept is a vital one where the atoll's remoteness and terrestrial isolation make a model of sustainability essential. In addition, Midway Atoll has a delicate ecosystem and is of a scale where our actions, both positive and negative, quickly have an enormous impact. Midway Atoll can provide a vital biosphere experiment in a natural setting, which if we learn to manage successfully, could become a model of how to take better care of the planet at large, and a great source of environmental public awareness.

Midway House

Albatrosses and WWII gun battery on Eastern Island



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Pāpahanaumōkuakea Marine National Monument

Midway Atoll Conceptual Site Planning

50 100 200 300 400 KM

Satellite Imagery from Landsat 7 ETM+
Bathymetry from NOAA/NGDC ETOPO1 dataset

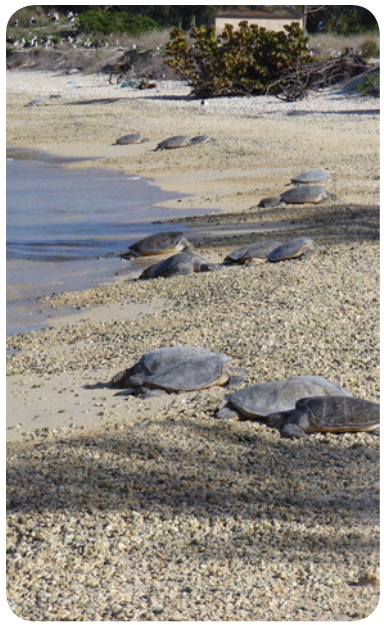
Project Mission / Purpose and Process

2

2. Project Mission / Purpose and Process

Monument Planning Context and Midway Atoll Conceptual Site Planning

In June 2006, Presidential Proclamation 8031 designated the 139,793 square miles of federal lands and waters in and around the Northwestern Hawaiian Islands (NWHI) as the Papahānaumokuākea Marine National Monument, thereby creating the largest fully protected marine conservation area in the world. The establishment of the Monument builds on the collective efforts of State and Federal agencies, research and nonprofit organizations, stakeholders, and the public to ensure the long-term protection of the marine and terrestrial ecosystems of the NWHI and the preservation of cultural and historic resources. Management of the Monument is the responsibility of three Co-Trustees: the State of Hawai'i; the U.S. Department of the Interior, through the U.S. Fish and Wildlife Service (FWS); and the Department of Commerce, through the National Oceanic and Atmospheric Administration (NOAA).



Sea turtles resting on beach

Midway Atoll National Wildlife Refuge is one of the five designated protected areas within Papahānaumokuākea Marine National Monument (Midway Atoll NWR, Hawaiian Islands NWR, NWHI Coral Reef Ecosystem Reserve, the State of Hawai'i Northwestern Hawaiian Islands Marine Refuge, and the State of Hawai'i Kure Atoll Wildlife Sanctuary.

Management Planning

The Monument Management Board is currently developing a Draft Monument Management Plan for the new Monument. To aid in development of the Central Operations and Coordinated Field Operations portions of the Monument Management Plan, the Co-Trustee agencies initiated two successive detailed planning processes. The first endeavor was to identify the agencies' existing assets and future requirements Monument-wide through a Papahānaumokuākea Marine National Monument requirements planning process. The Midway Atoll Conceptual Site Plan contained in these pages is the result of the second endeavor. With the full range of agency goals, requirements, and constraints articulated for Midway in the Papahānaumokuākea Marine National Monument requirements planning process, the Midway Atoll Conceptual Site Plan focuses with increased specificity on the required infrastructural and operational changes, offering a range of redevelopment solutions.

white tern

Papahānaumokuākea Marine National Monument Requirements

FWS Planning Team members on Sand Island

An important first step in effective site planning is the identification of existing assets alongside current and future field operational requirements. The requirements planning process provided a general outline of people, programs, assets, and operations associated with the Monument. It summarized the functions and numbers of personnel along with the types of supporting facilities required at each location within the Monument. Those requirements were then combined to define a "Monument level" requirement at each location.

Recommendations from the planning process guided development of this Midway Conceptual Site Plan. Specifically, the process identified the need for two consolidated operational plans to be developed: one for Midway and one for the remaining locations within the Monument. The operational plans will identify the needs of each agency, identify resource-sharing opportunities, and include mutually agreeable cost-sharing guidelines. Agencies are working to develop cooperative agreements that meet these needs.

One goal of the operational plans is to promote a sustainable agenda. The Monument Management Board is working to adopt an aggressive, measurable goal to reduce conventional fuel consumption through a combination of conservation, green architecture, and renewable energy.

Scope of Midway Atoll Conceptual Site Plan

As a NWHI hub of Monument operations and visitor experience, Midway Atoll requires conceptual site development to ensure that its use and management over the next 15 years and beyond is aligned with the purpose and mission of the Monument, the purposes of the National Wildlife Refuge, and the mission of the National Wildlife Refuge System. It is important that the conceptual site planning begin at Midway. The lessons drawn from the development of this plan will guide site planning Monument-wide.

The Midway Atoll Conceptual Site Plan builds on the results of the Monument requirements planning process and the extensive infrastructural repair work that has taken place at Midway over the past 10 years. Since 2003, the Fish and Wildlife Service has implemented recommendations proposed by the Infrastructure Condition Assessment and Modification Report for Midway Atoll National Wildlife Refuge, commonly referred to as the "right-sizing" plan. When the Monument was established in 2006, it was necessary to revisit previous decisions and consider new interests and needs for managing the Northwestern Hawaiian Islands. With the recent designation, Midway Atoll and the Monument are elevated to a status of national and global significance and public recognition. The Monument Management Board's goal is to protect and enhance the natural and historic resources of Midway, while providing opportunities for the public to experience its lessons and become stewards of this remote Pacific ecosystem.

2. Project Mission / Purpose and Process

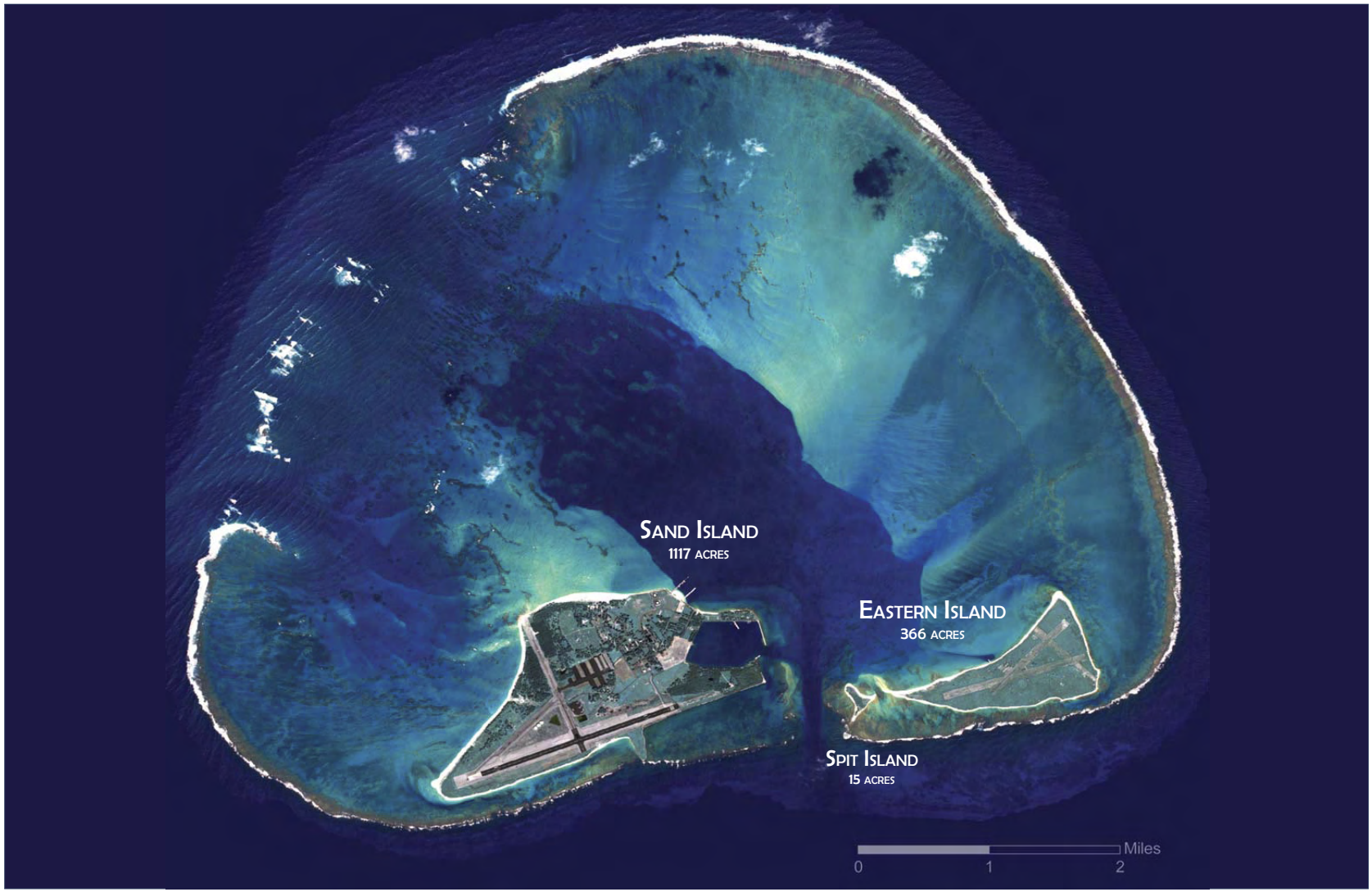
Description of Midway Conceptual Site Planning Process

The Planning Team began the Midway Atoll Conceptual Site Planning process in Spring 2007. U.S. Fish and Wildlife Service developed the Midway planning effort as a streamlined process occurring in tandem with the Marine National Monument Management Planning effort.

FWS staff and consultants conducted site analysis, document review, workshops, and mapping to identify primary issues and goals specific to Midway design and planning. Key design guidelines and preliminary building programs based upon biological constraints and historic preservation objectives were developed. The team facilitated a workshop in July 2007 in collaboration with FWS, NOAA, State of Hawai'i, and partners to present preliminary concepts and receive stakeholder input.

Based on the workshop findings, the Planning Team refined the Midway Atoll alternatives and the preferred site concept alternative. The draft Midway Atoll Conceptual Site Plan Report was produced and reviewed in three cycles by FWS and the Monument Management Board. This Midway draft report is attached as a supplement to the Draft Monument Management Plan for public review.

Midway Atoll supports the largest colonies of Laysan and Black-footed albatrosses in the world



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Midway Atoll

Midway Atoll Conceptual Site Planning

Site Overview

3

3. Site Overview

Site Analysis

Located on the far northern end of the Papahānaumokuākea Marine National Monument, Midway Atoll is located approximately 1,250 miles northwest of Honolulu, Hawai'i. One the oldest atoll systems in the NWHI, Midway originated as a volcano approximately 27 million years ago. Midway Atoll comprises an elliptical outer reef nearly 5 miles in diameter, and 580,392 acres of submerged reef and ocean and three flat coral islands totaling approximately 1,549 acres. Sand Island (1,117 acres) and Eastern Island (366 acres) are the two most prominent coral islands of the Atoll, while Spit Island is only about 15 acres in size. Sand Island contains the highest number of historical resources as well as all visitor facilities.

Midway Atoll is an unincorporated territory of the United States and is the only atoll/island in the Hawaiian archipelago that is not part of the State of Hawai'i. Midway Atoll National Wildlife Refuge is owned and administered by the U.S. Fish and Wildlife Service (FWS) on behalf of the American people and has international significance for both its historic and natural resources.

Key Midway Atoll site issues are described on the following pages.

Biological

Midway Atoll's plant and animal species are protected under several Federal laws, including the Endangered Species Act, the Marine Mammal Protection Act, and the Migratory Bird Treaty Act. Twenty-three species of plants and animals listed under the Endangered Species Act are known to occur in the NWHI. These include the Hawaiian monk seal, several turtle species such as the green and loggerhead turtle, whale species, Laysan duck, short-tailed albatross, and a half-dozen native plant species. Midway is also home to several endemic species, found only in Hawai'i, that merit special protection and management efforts.

Midway Atoll consists of vast expanses of coral reef, sediment beds, and algal substrate that support both a wide array of species unique to Hawai'i and one of the most intact coral reef ecosystems in the world. The three small, low-lying islands are protected by encircling barrier reefs, and are marine environments: constantly under the influence of ocean weather conditions, susceptible to periodic inundation, and constructed from oceanic materials. The islands support birds and terrestrial wildlife that prey on marine species and contribute to nutrient runoff into the shallows. The interdependence between the land and nearshore waters intrinsically connects the welfare of all Monument wildlife to the health of both terrestrial and marine ecosystems. This simple and profound reality is the underpinning of the integrated approach taken by the Co-Trustees to managing the Monument.

endangered Laysan ducks

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Sand Island Existing Conditions

Midway Atoll Conceptual Site Planning

Aerial Image from FWS June 2007

3. Site Overview

Site Analysis

1940s Officers' Quarters designed by Albert Kahn

Midway is a predator-dominated marine ecosystem, an anomaly among marine ecosystems, but typical of the Northwestern Hawaiian Islands (DeMartini and Friedlander 2006). Abundant populations of sharks, jacks, grouper, monk seals, dolphins, and other "top predators" live at Midway Atoll, out of proportion of top predator populations seen on other coral reefs around the world. This unusual ecological structure challenges commonly held biological assumptions, and scientists now speculate that all coral reef ecosystems were once predator-dominated before human impacts.

Spinner Dolphins

Male frigatebird

Approximately 200 Hawaiian spinner dolphins rest within Midway's lagoon and forage outside its reef. Bottlenosed, striped, spotted, and rough-toothed dolphins may occasionally be seen in the open ocean, as well as beaked, pilot, and endangered humpback whales.

Almost 2 million breeding seabirds of 19 species make Midway one of the most important breeding areas of seabird conservation in the Pacific. Midway supports the largest nesting colonies of both Laysan and black-footed albatrosses in the world. Midway's breeding populations of white terns, black noddies, and red-tailed tropicbirds constitute the largest colonies in the Hawaiian archipelago.

Historical/Cultural

The first visitors to Midway Atoll may have been Polynesians/Hawaiians exploring the Pacific Ocean in voyaging canoes. No physical evidence of their visits remains, but oral histories and chants refer to distant low-lying islands with abundant birds and turtles. Native Hawaiians named the atoll "Pihemanu," which means "the loud din of birds." Today, Native Hawaiian history and current cultural practices are a vital part of the NWHI management.

Midway Atoll contains the most historic resources within the Monument. Numerous federal laws, regulations, and policies mandate the protection and management of historic resources, including the National Historic Preservation Act of 1966, the Archaeological Resources Protection Act of 1979, and the Preserve America Executive Order of 2003 (Executive Order 13287). Historic resources at Midway Atoll include several sites, structures, artifacts, and places representative of the historic periods associated with early 20th Century transpacific communications and military operations. At Midway, there are four types of National Register eligible historic resources including: 1. National Historic Landmarks, 2. Cable Station, 3. Albert Kahn residential and industrial architecture, and 4. other historic elements such as Battle of Midway remnants.

Cable Station Building

Concrete pillbox on Sand Island

Site Analysis

Sand Island Land Cover

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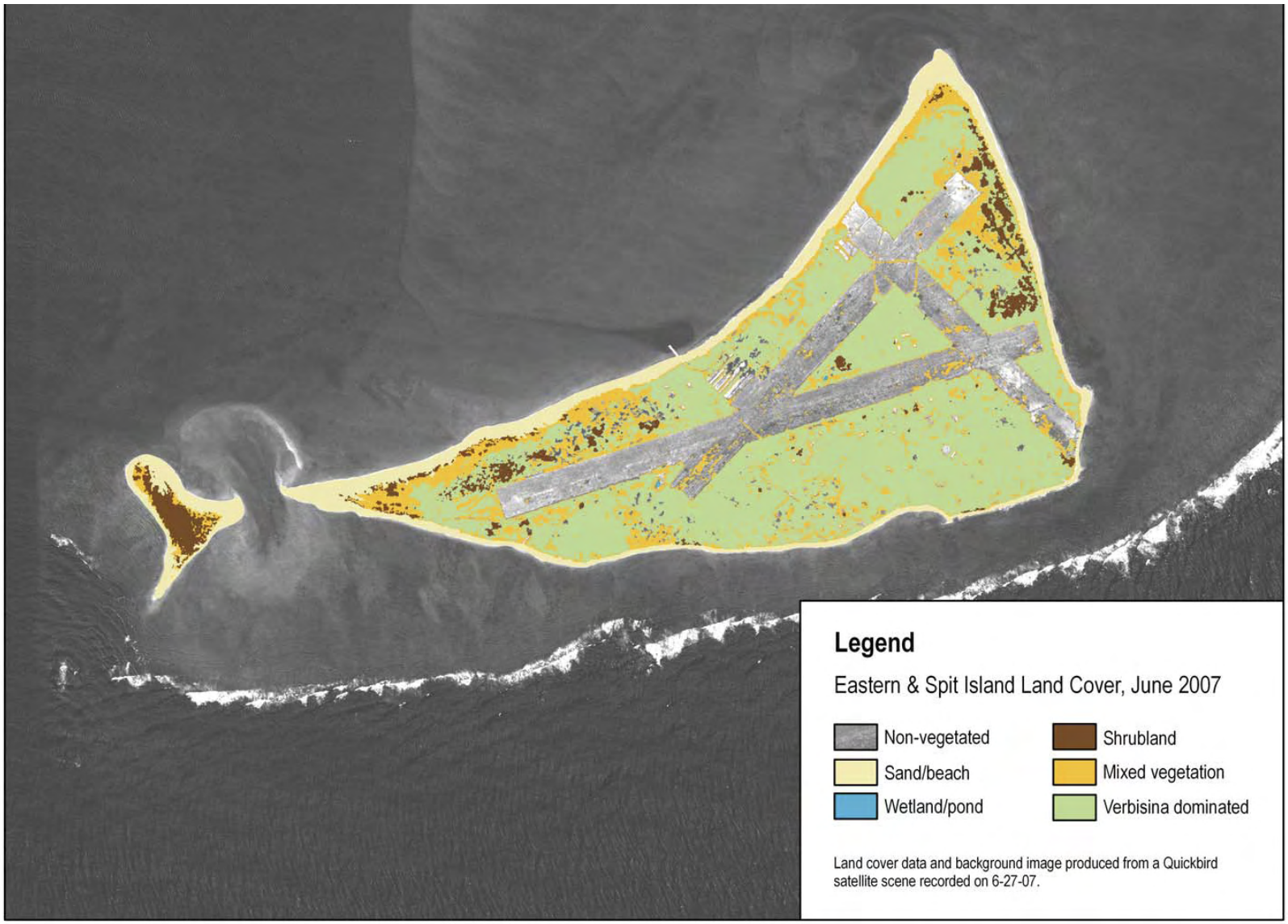

Eastern and Spit Island Land Cover

Midway Atoll Conceptual Site Planning

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3. Site Overview

Site Analysis

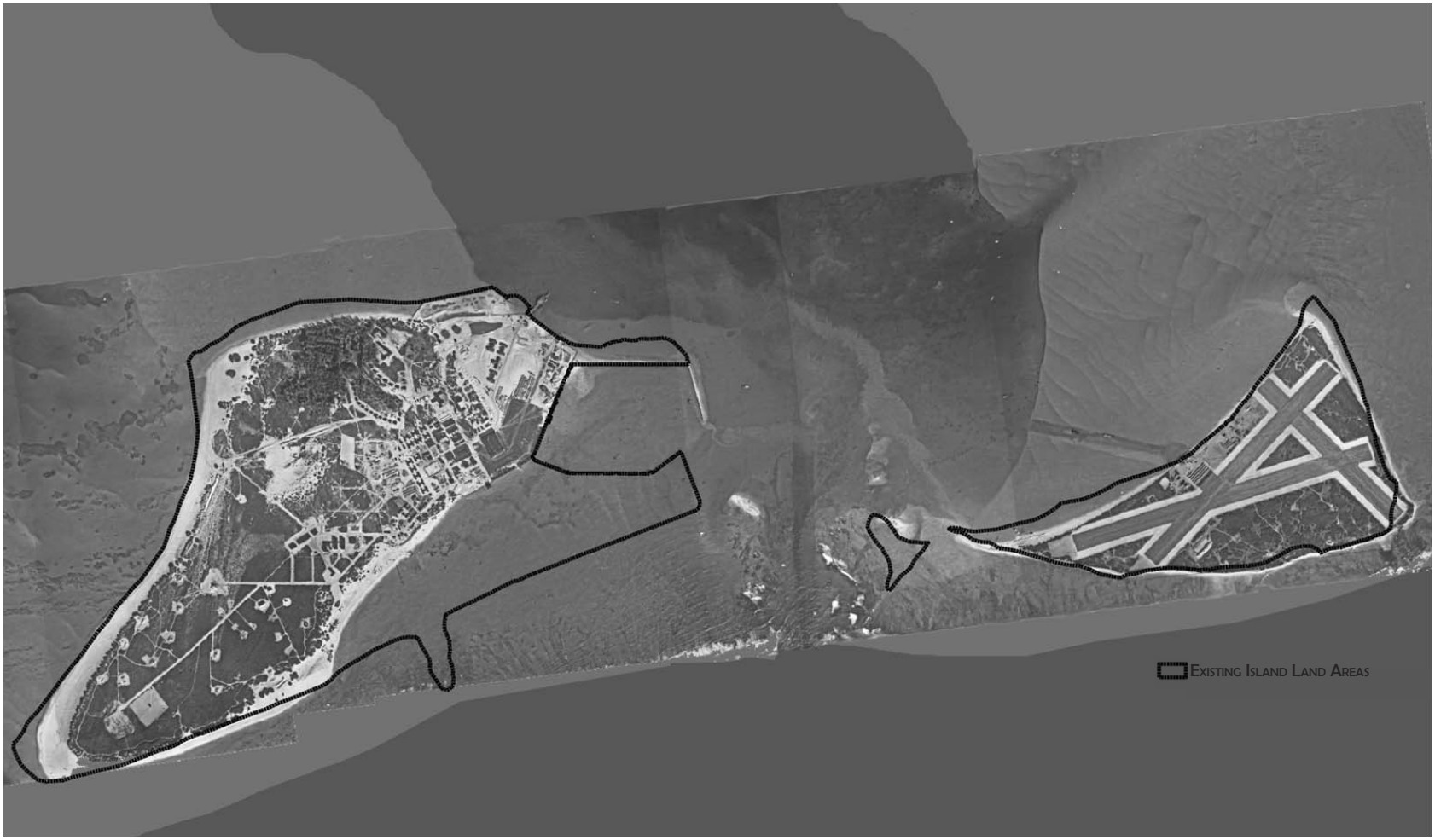
FWS currently manages the historic properties at Midway Atoll according to a Programmatic Agreement (1996) and Historic Preservation Plan (1999), which will be updated to address preservation issues at Midway within the context of the recent Monument designation. The Midway Atoll Historic Preservation Plan focuses on long-term management and treatment for each of the 63 historic properties. It also identifies procedures for treating new discoveries and caring for museum collections, and includes recommendations for interpretation, education, and public outreach.

The Programmatic Agreement and Historic Preservation Plan prescribe one of six different treatment categories to the historic properties. The treatment categories are (1) reuse, (2) secure, (3) leave as-is, (4) fill in, (5) demolish, or (6) relocate. Many factors were used to determine the treatment category to which a historic property was assigned, including historic importance, interpretive value, overall setting, association with key historic themes, and structural integrity. Preservation treatment primarily focuses on adaptive reuse of the historic buildings; reconstruction is generally not viewed as an appropriate treatment.

In 2007, the Cultural Resources Team of the FWS Pacific Region conducted further evaluations and provided treatment recommendation for specific buildings. Several buildings are severely deteriorated (e.g., Cable Station) or require significant repair (e.g., Seaplane Hangar). The Cultural Resource Team's recommendations were incorporated into the Midway Conceptual Site Planning process and are reflected in the Building Program and the Preferred Site Plan. Reuse of historic structures is a primary strategy that meets several goals: 1. Repair and preserve historic structures, 2. Avoid new development that would degrade historic landscape quality or wildlife habitat value, 3. Meet agency operations and visitor needs, 4. Be cost-effective compared to new construction costs.

The historic properties require continual repair and maintenance according to the terms of the Historic Preservation Plan and the Secretary of the Interior's Standards for the Treatment of Historic Properties. The effects of weathering and erosion by saltwater, salt spray, salty soils, precipitation, plant growth, solar radiation, and wind continue to threaten the integrity of the historic properties at Midway Atoll. Additionally, lead-based paint must be removed from structures to eliminate a hazardous material that is extremely toxic to the albatross populations.

Submerged historic resources around Midway will require additional understanding and warrant further consideration in their management. A careful study of the wrecks in the lagoon and nearshore rim of the atoll will be conducted. The submerged items need to be accurately identified in order to establish their historical association and eligibility to the National Register. Two Midway maritime heritage sites associated with World War II, the USS Macaw and a World War II-era Corsair, have been preliminarily documented.



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Sand, Spit & Eastern Islands Historic Conditions

Midway Atoll Conceptual Site Planning

0 0.045 0.09 0.18 0.27 0.36 Miles

November 1941 Aerial Image from FWS

3. Site Overview

Site Analysis

Utilities and Operations

Midway Atoll is so remote that it must operate independently as a small town. It provides its own power system, water treatment and distribution, facilities maintenance, sewage treatment, waste management systems, communications systems, and all the other operational necessities found in a small municipality.

Caterpillar electric generator

Drinking Water System

A new drinking water treatment system and distribution main were placed into service in October 2005. The old system is no longer treated to drinking water standards and was left in place to provide firefighting water. This took care of the major public-health-related concerns but sections of the water delivery system need to be modified to complete the full system upgrade. The new treatment system is sized for a short-term maximum population of 200 persons at a per capita daily use rate of 100-gallons per day, totaling 20,000 gallons per day. However, the actual efficient operating capacity is much lower. A regular on-island population above 120 people will require added capacity.

Rainwater is collected in a pond, then pumped to storage tanks at the R-1 area. The new electrical grid was not extended to provide power for the rain water pumps. The pumps are grossly oversized for current needs and should be replaced with smaller units. Electrical power can be furnished by extending new electrical grid, by installing a small generator, or by installing renewable energy systems. These pumps are operated infrequently, following significant rainfall events; thus a small portable generator may be an economical way to provide power.

Stored rainwater is conveyed to the treatment plant via gravity flow through an existing pipeline. Gravity flow allows use of only about half the total stored volume of water. The total storage volume, approximately 12 million gallons, is greatly in excess of current use. Using a daily use rate of 20,000-gal, the system has about 300 days of water accessible via gravity flow. However, this same rainwater storage feeds the "old" water system. The old system leaks approximately 10,000-gpd, so that reduces the storage volume to approximately 200 days.

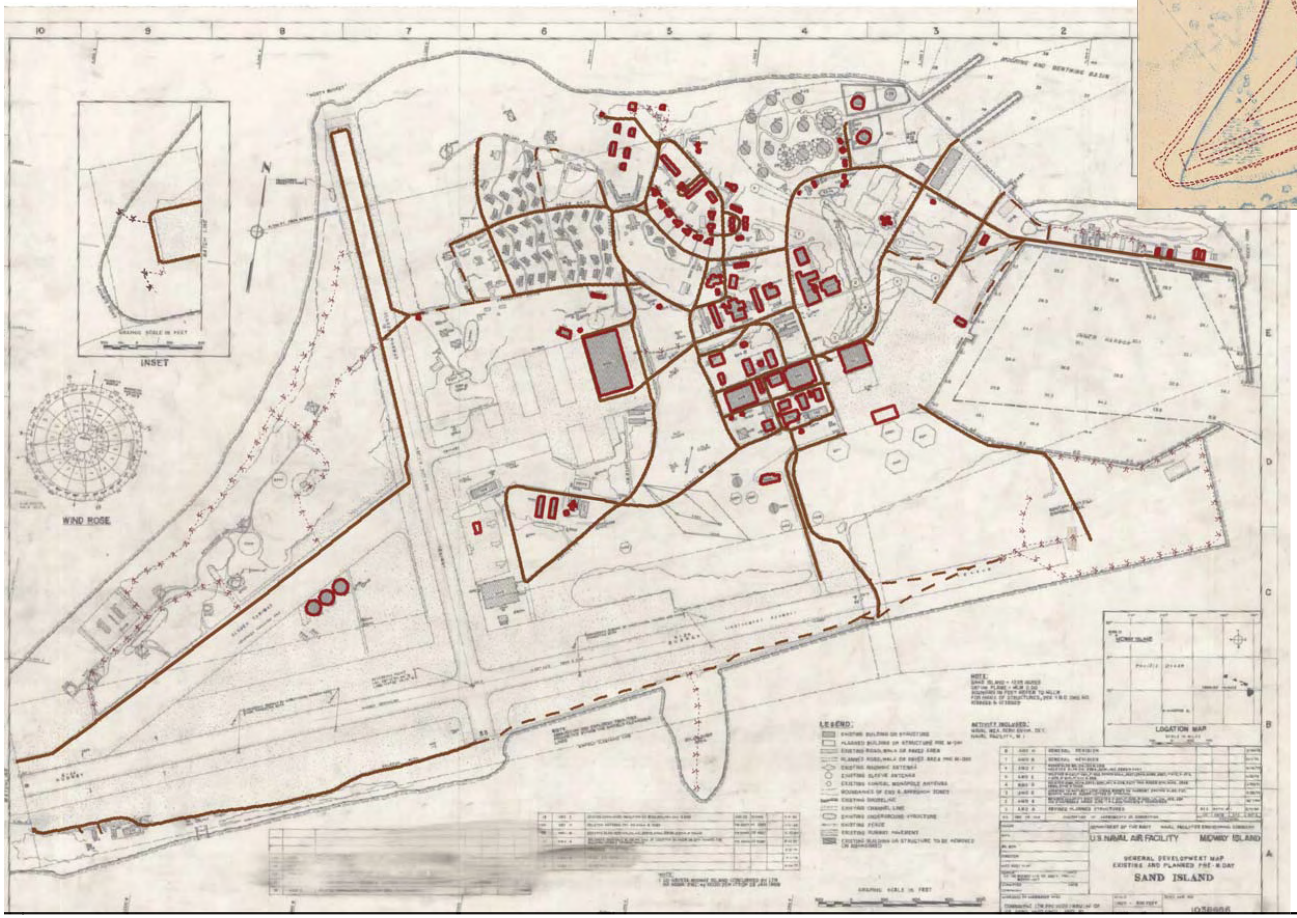
The existing pipeline that conveys untreated water to the plant is asbestos cement. This pipeline should be replaced. In addition, a small pump should be installed at R-1 to pump stored water to the treatment plant, thus making the entire storage capacity available.

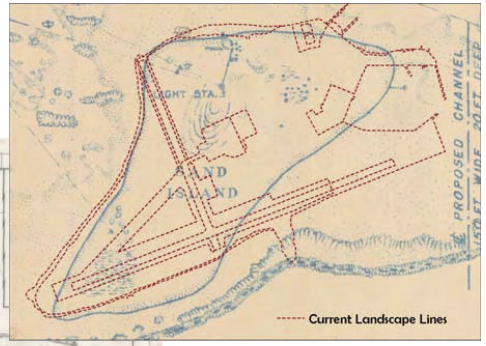
The new water distribution pipeline was connected to existing lateral service pipes at certain buildings through the core area of town (basically, from the FWS Office northward to the Clipper House restaurant). The distribution system would need to be extended to serve any newly constructed or remodeled facilities located outside the vicinity of the new water main. The Inner Harbor area does not currently have drinking water service. Water that is available comes from the old system and is no longer potable. The same situation exists at the Cargo Pier area near the old fuel tank farm. An evaluation will be conducted to determine whether these areas would be best served by new water pipes, new catchment systems, or left dry.

Water collection tanks

Water treatment facility

Map of Sand Island c. 1964





Map of Sand Island 1935

Legend

- Current Building Structures
- Current Circulation
  - Foot Traffic
  - Foot and Bike Traffic
  - Foot, Bike and Cart Traffic

Sand Island Historic Development

Midway Atoll Conceptual Site Planning

February 2008

Site Analysis

Electrical Generation and Distribution

Electrical switch gear

New electrical generator sets were installed and were placed into service approximately October 2005. These new generators were downsized from existing systems to better match generator capacity to connected load. Two generators were installed and they operate in an automatic duplex mode. For the most part, only one generator is needed to satisfy island electrical demand. When load exceeds the capacity of one generator, the second one automatically comes on-line. It then automatically shuts off when electrical demand reduces.

Maintenance activities can be accomplished on the "down" generator during that time. When the primary generator is due for service, the roles are switched and maintenance is then performed on the second generator. This style of engine-driven generator cannot be run continuously and must be periodically shut down for maintenance. Every few years, depending on operating hours, they must undergo a major engine overhaul. At that time, or whenever both smaller Caterpillar 3456 units are down, the system is run using the older, larger, but fully functional Caterpillar 3516 unit.

Current capacity for electrical generation is sufficient for existing population demand but nears maximum capacity during times of heavy load (summer). If island population increases or electrical demand grows to require that two generators must run continuously, additional electrical generation would be necessary. Increased demand for energy may be met with sustainable energy alternatives and conservation measures or operating other existing generators. Midway is currently powered by burning fossil fuels in diesel generators. Current and future projects will be evaluated with a goal to increase energy efficiency and transition to sustainable energy systems.

A new electrical distribution grid was constructed and placed into service approximately November 2006. The extent of this new grid was downsized in comparison to the existing old grid. The new grid was designed to supply electricity to only those facilities identified for future use, based on what was foreseeable in early January 2006. Facilities connected to the old grid are currently provided power through a backfeed to the old grid. The materials and equipment of the old grid are old, in disrepair, and some are obsolete. As long as there are no failures in the old grid, all island facilities will continue to have electricity. When a failure occurs, it most likely will not be able to be repaired and all facilities connected to that portion of the old grid will go "dark." The new grid does not extend services to the peninusla with the tug pier and finger piers, the old Fuel Farm area, or the large hangar. Either the new grid would have to be extended to serve any new developments or the facilities would be designed to generate their own energy. The same applies for any remodeled facilities that are currently connected to the old grid.

Wastewater System

The current wastewater treatment and disposal system (central septic tanks with drainfield) is overloaded by storm water intrusion and suspected groundwater infiltration. A new sewer system and treatment and disposal system have been designed to meet a goal of efficiency and water conservation. The design serves only certain facilities located in the core area of town. Some work is being accomplished to eliminate storm water intrusion. Dispersed septic design as opposed to centralized septic is preferable for fitting smaller wastewater treatment clusters around sensitive habitat areas and avoiding bird nesting sites. Estimated construction cost of new wastewater system is approximately $2 million. Implementation of a graywater utilization system and composting toilets will be considered with a goal of reducing demand on a wastewater system in new construction.

Solid Waste Disposal

New fuel tanks lead industry in spill protection

General waste is collected and burned in an incinerator when adequate waste fuel is available, or in an open air pit when fuel is not available. Ashes are buried in the existing small landfill/dump. Aluminum cans are collected, compacted, and periodically sent (via barge) to a recycling facility in Hawai'i. Glass is collected, crushed, and buried in the landfill/dump. There is no adequate system in place to deal with hazardous waste (asbestos and lead specifically). This issue will be addressed before any planned reuse, renovation, remodeling, or removal of existing structures takes place.

Solid waste disposal practices at the Midway Atoll presently consist of:

1. Temporary waste storage in open plastic containers
2. Periodic collection via stake bed truck
3. Waste burning in oil fired incinerator
4. Mounded burning in an unlined pit.

An incinerator or gasification system that could burn the waste as fuel to generate power is the type of technology needed on Midway to handle the island's waste long-term. It could also be modified to burn marine debris collected throughout the Monument. Several such machines are under development in the U.S. at this time but none are currently commercially available. Development of such incinerators should be tracked as plans for Midway develop, since burning waste for power would be a powerful cost and carbon-emissions savings.

Fueling Facilities

A new fuel tank system became operational in October 2007. A new tank for gasoline and a new fuels lab are scheduled for completion in approximately May 2008. Storage capacity for fuel is 450,000 gal. That amount is anticipated to satisfy FWS and Coast Guard fuel needs for approximately one year. More fuel storage capacity will be installed to meet NOAA and the State's needs for gasoline and biodiesel or other sustainable fuel types.

Telecommunications

A new fiber optic distribution system was constructed during 2006/2007. The satellite antenna was relocated and partially refurbished in October 2007. Satellite service is in the process of being upgraded. These upgrades will only moderately improve telecommunications for the existing island population, and are not designed to allow expansion of the system to additional customers. Any new offices/programs on Midway will have to invest in additional upgrades/additions to the system in order to meet their telecommunication needs.

Due to its isolation in the North Pacific, Midway is an important location for many types of data collection. In order to realize its scientific, enforcement, and educational potential, Midway would require additional data transmission capabilities.

Satellite telecommunications

Site Analysis

Aviation and Marine Transportation

Midway Atoll is accessible by two transportation modes: aviation and marine vessel. Currently there is no visitor welcome area at either Henderson Airfield or the Inner Harbor.

Most visitors arrive by plane to Midway Atoll

Midway is used as a required emergency landing site for extended twin-engine operations (ETOPS) flights across the Pacific Ocean. Under current regulations, twin-engine aircraft must be within a maximum of 180 minutes from a Part 139 certified airfield in case of an emergency. Midway's 7,900-foot runway is capable of handling almost any type of aircraft.

Cruise ships occasionally visit Midway Atoll NWR

Relatively few flights are conducted in the Monument, and most of them are to and from Midway Atoll. Henderson Airfield on Sand Island handled a total of 86 aircraft during 2007. Most of these, 51 flights, were by Gulfstream aircraft operated by Maritime Air, the charter company used by FWS/FAA. The next largest user is the U.S. Coast Guard, which had 18 flights to Midway in 2007. The remaining flights were a mix of military and civilian aircraft, most associated with special events held during the year. A new airport operations center was constructed southwest of the current hangar in 2007.

Marine traffic in the waters around Midway Atoll primarily consists of research ships, merchant ships, and occasionally Coast Guard vessels, recreational boats, and cruise ships. Midway Atoll receives day-trip visitors mainly via a small number of cruise ships. Three cruise ships visited Midway Atoll in 2004. In 2005, 2006, and 2007, one cruise ship visited the atoll each year (Maxfield 2007 pers. com.). No cruise ships are scheduled to visit in 2008. Due to port security requirements at Midway, cruise ships offload passengers 3 to 4 miles outside the lagoon and transport them ashore in small boats.

Pollutants and Toxic Materials

Building Materials

Several historic buildings on Sand Island contain hazardous materials such as lead-based paint or asbestos. These toxic materials pose health and safety concerns for humans and wildlife. Lead paint flakes are ingested by albatross chicks, causing growth deformities and mortality. Lead-based paint abatement is a high priority action for Sand Island structures.

No Dig/Landfill Areas

"No Dig" areas, found on both Sand and Eastern Islands, are Land Use Controls remaining from the closure of the Navy base. Areas identified for land use restrictions are former landfills or areas where contamination or solid waste was left in place at or below 4 feet from the surface. Restrictions were placed on these sites to avoid future exposure of humans or wildlife to potentially contaminated soil or groundwater. Human activities that expose potentially contaminated soil or groundwater within the site footprints would transfer the responsibility for the site from the Navy to FWS. Although the contaminants are expected to degrade through time, the amount and rate of degradation are unknown. Therefore, these land use restrictions will remain in place in perpetuity to protect humans and wildlife.

Old fuel tanks located in "no-dig" area

One area on Sand Island that needs continued monitoring and potentially further remediation is known as the Old Bulky Waste Landfill. This site is an uncharacterized landfill that was created by the disposal of scrap metal, used equipment, and unconsolidated waste off the south shore of Sand Island to create a peninsula approximately 1,200 feet long by 450 feet (average) wide by 9 feet high (Navy 1995). It is surrounded on the three seaward sides by an approximately 10-foot-thick band of concrete and stone rip-rap. Wastes known to have been deposited in the landfill are metals (lead, cadmium, chromium, and nickel), gasoline, battery acid, batteries, mercury, lead-based paint, solvents, waste oil, PCBs, dioxins, furans, transmission and brake fluids, vehicles, equipment, tires, and miscellaneous debris (BRAC SI 1996 vol. 1). The landfill was covered in approximately 2 to 2.5 feet of soil in an attempt to contain the waste. Currently the Old Bulky Waste Landfill is eroding, and the soil placed on top is sifting into the debris, causing large holes to open up around the edge and in the center of the landfill. Additionally, burrowing birds are bringing up buried soil and nesting below the cover. Over 500 bird burrows have been counted in the landfill.

Marine Debris

Marine debris accumulation on the reefs and beaches of NWHI is a staggering problem, and an estimated 57 tons of new debris enters NWHI on an annual basis (Dameron et al. 2007). Marine debris, especially derelict fishing nets and gear, plastics, and hazardous materials, is a severe chronic threat to shallow ecosystems such as Midway Atoll, and adversely impacts the critically endangered Hawaiian monk seal, threatened and endangered sea turtles, albatrosses, and other wildlife species who become entangled in or ingest these materials. Large masses of fishing nets degrade coral reef health by shading, abrading, or dislodging fragile corals or by preventing reef regeneration.

Over 15 agencies and partner groups have worked since 1996 to remove large accumulations of marine debris. The total debris removed from 1996 to 2006 in NWHI was 563 tons. Midway staff periodically clean the beaches to remove entanglement hazards and collect the ongoing accumulation of plastics, glass, and metal for eventual disposal.

Terrestrial Alien Species

Human occupation and development at Midway Atoll has transformed the atoll since the Commercial Pacific Cable Company established its operation on Sand Island in 1903. The cable company attempted to make the "sand spit" as self-sufficient as possible through the cultivation of gardens and small livestock. Due to the lack of organic soil on the islands, barge loads of soil were brought from O'ahu and Guam, and contained not only the organic matter that made gardening possible, but also all the associated soil organisms such as ants, centipedes, fungi, and other nonnative species.

Additionally, trees and ornamentals were planted on Sand Island, such as ironwoods, eucalyptus, and acacia. So successful were these introductions that, by 1922, an estimated two-thirds of Sand Island was covered with imported vegetation. The black rat (*Rattus rattus*) was successfully exterminated on Midway in 1997; however, mice (*Mus musculus*), along with various species of ants, termites, wasps, ticks, and mosquitoes, continue to infest the island. Mosquitoes are of special concern as they are potential vectors for diseases such as West Nile virus, avian malaria, and avian pox. Termites have compromised most of the historic wooden buildings on Midway.

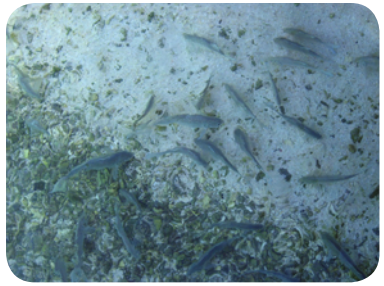
The number of alien land plants in the NWHI varies from only 3 introduced at Nihoa to 249 introduced at Midway Atoll. The level of threat from introduced plants also varies between species. For example, the invasive plant golden crownbeard (*Verbesina encelioides*) displaces all native vegetation in nesting areas, causing entanglement and heat prostration and killing hundreds of albatrosses each year (J. Klavitter, pers. com.).

Tons of marine debris pollute Pacific Ocean and islands

Site Analysis

Marine Alien Species

Several alien species also threaten Midway's waters and reefs. Although the ecological implications are unclear so far, one alien fish species and four alien invertebrate species are known to exist at Midway. At a minimum, these species compete for resources with native species. Two of the invertebrate species have the potential to change the character of coral reefs where they become established. One additional alien invertebrate species was found on a ship's hull at Midway and is thought not to be established at Midway.



Fish school in Eastern Island shallows

Golden crown-beard is a major invasive plant

Several other species have been identified as potential threats to Monument waters including Midway, having been documented in the main Hawaiian Islands or isolated locations in the Northwestern Hawaiian Islands. These include two fish species, one octocoral species, two algae species, and two invertebrate species. In particular the octocoral and algal species have the potential to alter the character of coral reefs where they become established.

Although marine alien species have been found at Midway, they are not believed to currently impact its infrastructure.

Climate Change and Sea Level Rise

Sea level rise is expected to have significant effects on the islands within Papahānaumokuākea Marine National Monument (Baker et al. 2006). Projected terrestrial habitat loss by 2100 among French Frigate Shoals, Pearl and Hermes Atoll, and Lisianski is expected to be 3 to 65% under a median scenario (48 cm rise), and 5 to 75% under the maximum scenario (88 cm rise). Spring tides would probably periodically inundate all land below 89 cm (median scenario) and 129 cm (maximum scenario) in elevation. Although Midway Atoll was not included in this study, Sand and Eastern Islands are more similar to Lisianski Island, which is expected to lose about 5% of its land area by 2100 (Baker et al. 2006). The environmental consequences of island inundation would likely be greater for Midway, with its buried toxic materials.

Changes in sea surface temperatures have been demonstrated to cause coral bleaching. Mass coral bleaching in the NWHI occurred in 2002, and was most severe in the three northernmost atolls, including Kure, Pearl and Hermes, and Midway. The occurrence of coral bleaching in the cool waters of the Northwestern Hawaiian Islands has been interpreted by some as indicative of climate change.

Shoreline accesss is restricted to protect wildlife

The measured increase of carbon dioxide in the atmosphere has been linked to ocean acidification, which slows the growth of coral reefs, and in some cases is predicted to dissolve them (Fine and Tchernov 2007). This is of great concern for the Monument.

C5 plane amid gooney birds

Challenges at Midway Atoll

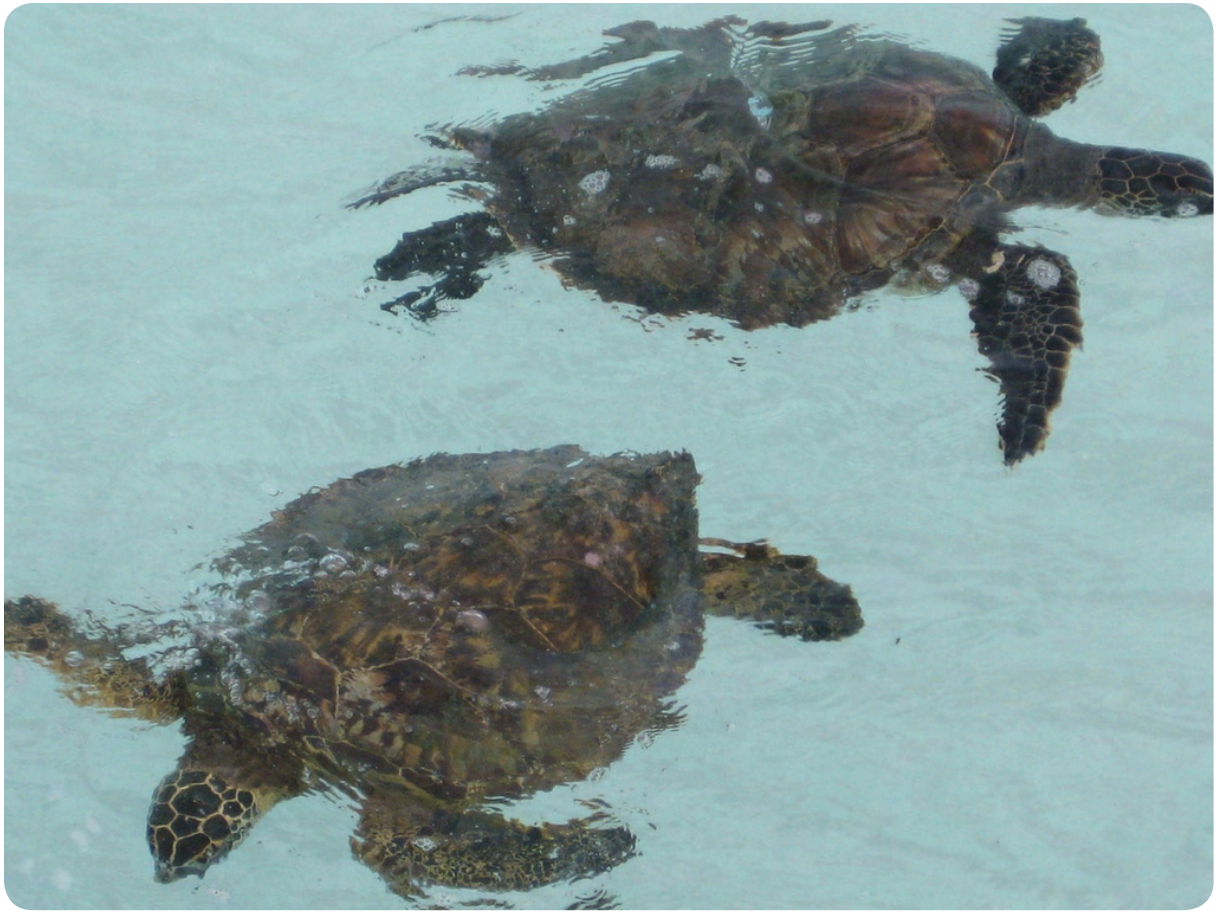
Midway Atoll is a highly unique setting that presents tremendous challenges and issues that must be considered in all planning and design efforts. This Conceptual Site Plan, along with ongoing work by FWS, NOAA, and other agencies, begins to suggest some creative solutions to address these compelling problems. Some of the key challenges specific to Midway include the following points:

- Sand Island and Eastern Islands are highly disturbed landscapes greatly impacted by human use since the early 1900s. Dredging and filling of the land and water environments, non-indigenous plant species introduction, and disruption of native species habitats are some indicators of the tremendous manipulation of the atoll.
- Global impacts adversely affect Midway Atoll's biological health. These adverse effects include marine debris (several tons of plastic washed up to shore annually), sea level rise, climate change, and oceanic conditions, among others.
- Midway Atoll contains both historically and biologically unique features. Preservation and enhancement of the historic and ecological systems must be carefully evaluated from the lens of both perspectives.
- Carrying capacity is very limited on Midway Atoll due its small land mass, sensitive biological and historic resources, and limited infrastructure. This capacity may be slightly increased, but human activities such as research, education, recreation, etc., must fit within this overarching constraint. Creative education and interpretation opportunities such as remote learning offsite, or sustainable tourism onsite, must be developed that help elevate public awareness while not creating impacts.
- Toxicity and hazardous materials clean-up at Midway Atoll is a major priority for ecological health, historic preservation, and public safety.
- Remote location of Midway Atoll creates impediments to transporting goods, materials, and people on- and off-island. Modes of travel to Midway and related logistical supply issues are pivotal issues. Disposal and removal of surpluses or damaged items or materials is also problematic as the expense involved in proper disposal is prohibitive.
- High construction costs due to logistics
- Limited construction techniques
- Harsh climate conditions for materials
- Severely deteriorating buildings and infrastructure
- Limited staff and funding
- Development restrictions based on contaminants, historic conditions, and wildlife

Plastics ingested by albatross

Peeling lead-based paint

Deteriorated bulkhead on Inner Harbor



Midway Atoll Alternatives Development

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4. Midway Atoll Alternatives Development

Goals

Design and planning goals developed for Midway Atoll are aligned with the Papahānaumokuākea Marine National Monument Management Plan goals.

GOAL 1—Protect, maintain, and, where appropriate, restore natural biological communities and their associated biodiversity, habitats, populations, native species, and ecological processes.

GOAL 2—Support, promote, and coordinate research, ecosystem characterization, and monitoring that increase understanding of the Papahānaumokuākea Marine National Monument and improve management decision-making.

GOAL 3—Manage human activities to maintain ecosystem integrity and prevent or minimize negative impacts.

GOAL 4—Provide for cooperative conservation including community involvement that achieves effective Midway Atoll operations and ecosystem-based management.

GOAL 5—Enhance public understanding, appreciation, and support for protection of the natural, cultural, and historic resources.

GOAL 6—Support Native Hawaiian practices consistent with long-term conservation and protection.

GOAL 7—Identify, interpret, and protect Midway Atoll historic resources.

GOAL 8—Offer visitor opportunities at Midway Atoll to discover and appreciate the wildlife and beauty of the Papahānaumokuākea Marine National Monument, enhance conservation, and honor its unique history. Promote sustainable tourism, interpretation, and education from site scale to global scale.

Design Guidelines and Principles

The Planning Team developed Design Guidelines and Principles that will inform appropriate design and planning efforts at Midway Atoll. These guidelines reinforce the key concept that Midway will become a "Model of Sustainability." They provide the framework for preserving and enhancing Midway's ecological and historic values in the course of implementing the Monument Management Plan at the Midway site-scale.

Many principles achieve multiple goals. For example, removing lead-based paint from historic structures removes a toxic substance that directly impairs wildlife and human health and helps preserve the historic integrity of these buildings. Adaptively reusing existing historic structures prolongs their life cycle and historic value while also meeting lodging, operations, research, and visitor services needs and reducing the need for new construction that would adversely impact native species and habitat. Generating electricity with alternative energy sources to reduce carbon emissions and increase energy efficiency may save the cost of wiring the structure to the existing utility grids. Building new structures on existing concrete pads within the historic core/redevelopment zone helps to meet the "no net habitat loss" principle while also staying in character of Midway's historic development patterns. For other examples, see **Design Guidelines and Principles** on the facing page.

Albatrosses and people

BEQ Barracks: replace with "green-designed" multi-plex units

Protect Historic Structures & Landscapes

- ✓ Protect, maintain, and interpret historic resources.
- ✓ Follow Secretary of the Interior Standards to protect and maintain buildings that maintain integrity and/or identified as historically significant and eligible for or listed on the National Historic Register.
- ✓ Follow Secretary of the Interior Standards to protect historic landscape features and characteristics
- ✓ Follow National Historic Preservation Act (36 CFR Part 800) to document historic buildings and structures that do not exhibit integrity and will be secured in place (building envelope is sealed) or demolished. Salvage materials and leave footprints or ruins for interpretation that are safe and compatible with wildlife.
- ✓ Explore adaptive re-use of historic buildings

Protect Habitat & Biological Resources

- ✓ Adhere to Narional Wildlife Refuge system principle "Wildlife comes first"
- ✓ Protect, maintain, enhance habitat and biological resources
- ✓ No net loss of habitat
- ✓ Construct new structures in footprints, building foundations, or pads of non-historic footprints
- ✓ Remove invasive species
- ✓ Protect nest sites
- ✓ Reduce high structures to minimize bird strikes
- ✓ New construction will not interfere with wildlife
- ✓ Remove pollutants (lead based paint, shore debris, toxic substances)
- ✓ Protect shallow water systems and reef sites
- ✓ Restore native habitat where feasible

Alternative Energy Systems & Waste Reduction

- ✓ Reduce consumption
- ✓ Use energy efficient strategies and alternative energy systems
- ✓ Consolidate power generators and power sources
- ✓ Construct new structures that are energy efficient or generate own energy
- ✓ Recycle materials for construction or enhancement projects
- ✓ Evaluate the use of alternative fuels for transportation and equipment

Operations and Maintenance

- ✓ Address current and future maintenance needs
- ✓ Communicate management plan to staff, e.g., training in historic resource protection, biological resource protection
- ✓ Consolidate development (utilities, infrastructure, buildings)
- ✓ Appropriate infrastructure matched to current/new development and operations

Sustainable Architecture & Landscape Architecture

- ✓ Re-use existing structures that still have integrity
- ✓ Sustainable design (materials, energy, etc.)
- ✓ Recycle materials, e.g., scrap metal, glass, ropes, etc.)
- ✓ Construct pre-fabricated components off-site
- ✓ Apply Performance Standards for new construction
- ✓ Apply sustainable design standards such as LEED
- ✓ Use termite-resistant building materials

Design Aesthetics

- ✓ Maintain historic character
- ✓ Build new structures in the aesthetic of tropical vernacular
- ✓ Reduce noise pollution
- ✓ Reduce light pollution

Visitor Use & Experience

- ✓ Limit human presence to appropriate visitation levels
- ✓ Zones of use (direct visitor uses while protecting wildlife and habitat)
- ✓ Regenerative design, e.g, hydroponic gardens
- ✓ Develop facilities to accommodate visitors
- ✓ Eco-tourism focus: wildlife/historic landscape immersion experience; interpretation/education
- ✓ Service and volunteer work opportunities offered to visitors
- ✓ Midway Site will be a demonstration model for sustainability
- ✓ Develop opportunities for people who cannot visit to learn about Midway Atoll (e.g., website, cam, online environmental data)

Build Partnerships and Management-Driven Research

- ✓ Collaborative management and development (FWS/NOAA/State of Hawai'i)
- ✓ Develop new partnerships and alliances
- ✓ Corporate sponsorships
- ✓ Research opportunities

Management Zones and Site Zones

Sand Island Management Zones

The Planning Team delineated Management Zones for Midway Atoll, including Sand Island, Eastern Island, and Spit Island. These zones show the physical areas where specific management, planning, and development activities occur. The zones are as follows:

Marine Protection Zone

Protected shoreline and marine habitat that supports bird, wildlife, and fish species, and their critical life activities such as resting, feeding, nesting, fledging, migrating, etc. No public access is allowed.

Revegetation/Habitat Zone

Midway Atoll is a highly disturbed system that hosts pervasive invasive plant species, toxic materials, and human development remnants that, taken together, have created significant adverse impact on indigenous species and their habitat. Most of the islands within Midway Atoll are designated as the Revegetation/Habitat Zone to focus efforts on restoring atoll habitat and enhancing species populations.

Beach Zone

Shoreline that is open to the public for passive recreation and educational activities such as walking, bird and wildlife watching, and beach viewing. Primarily this zone occurs on the north beach of Sand Island. No beach access is available on Spit Island, and the only access allowed on Eastern Island is via the boat dock.

Inner Harbor Zone

This zone includes the historic Inner Harbor and its associated shoreline, piers, and facilities. One of two approaches to the island (by boat or plane), the inner harbor zone is critical to visitor arrival, transportation of services and goods, and water-based activities (e.g., ecotourism via cruise ships or mid-sized vessels, marine research, rescue operations, security).

Airfield Operations Zone

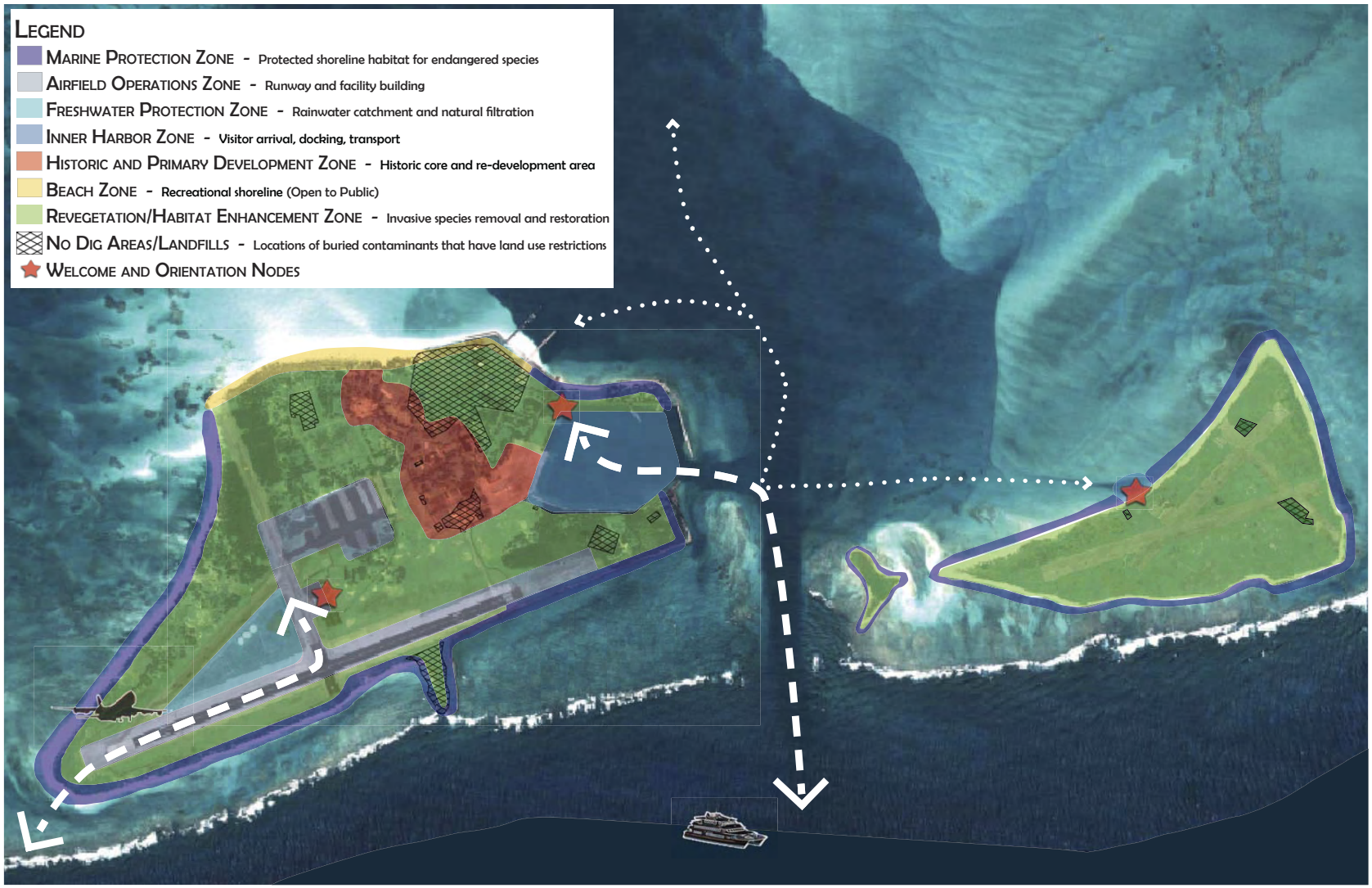
The Airfield Operations Zone on Sand Island comprises the active Henderson Airfield and includes the new operations center, the old hangar, the active runway, and inactive runway portions. One of two approaches to the island (by boat or plane), the airfield operations zone is critical to visitor arrival, transportation of services and goods, and aviation activities (ecotourism via air travel, research, emergency operations, security).

Freshwater Protection Zone

The Freshwater Protection Zone is a large triangular portion of the runway area from which surface water is collected in the catchment basin and then pumped into the three freshwater storage tanks.

Historic and Primary Development Zone

The Historic and Primary Development Zone designates Sand Island's historic core and redevelopment area. It delineates an area that is highly significant in terms of historic development patterns on Sand Island related to the Cable Company historic period (early 1900s) and World War II historic period (1940s). Several historic structures and features are contained within this zone. Conversely, this zone indicates the primary area where development of new facilities or adaptive reuse of existing or historic structures is an appropriate activity.



February 2008

Sand, Spit & Eastern Islands Management Zones

Midway Atoll Conceptual Site Planning

June 2007 Aerial Image from FWS

Management Zones and Site Zones

No Dig Areas/Landfill Zone

The "No Dig" areas are sites that contain contaminated soils or other materials, and cannot be built upon or otherwise disturbed. These sites include Old Bulky Waste Landfill on the south beach point, and the old fuel farm on the north beach.

The "No Dig" areas were designated in the Base Realignment and Closure process (BRAC) as Land Use Controls where digging below 4 feet is prohibited (or FWS assumes all responsibility). These areas, and several landfills, were determined to not necessitate further cleanup unless the controls were not effective. The Old Bulky Waste Landfill, however, is an example where the control is not sufficient and further remediation needs to be addressed through the BRAC process.

Sand Island Building Treatment and Site Zones

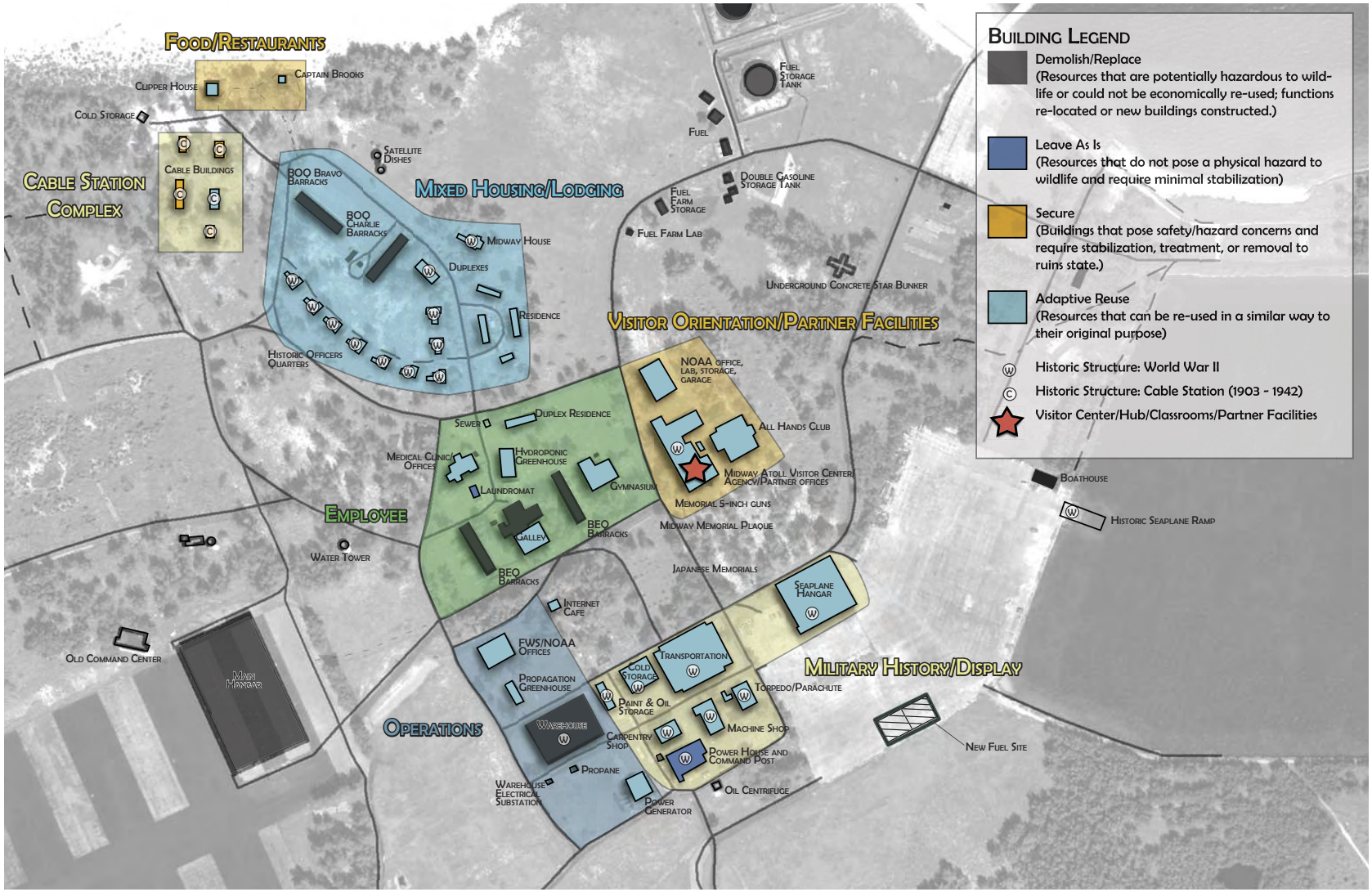
The Planning Team assessed site zones and building treatment opportunities within Sand Island's Core Historic Zone. Evaluation factors included the following: 1. FWS historic treatment recommendations; 2. current and historic functions as well as potential future uses; 3. architectural and structural integrity; and 4. spatial organization of roads, operations, buildings, and landscape.

BOQ barracks

Officers' Quarters

Cable Station building complex

Termite damage to structural roof members of historic Machine Shop



Sand Island Building Treatment and Site Zones

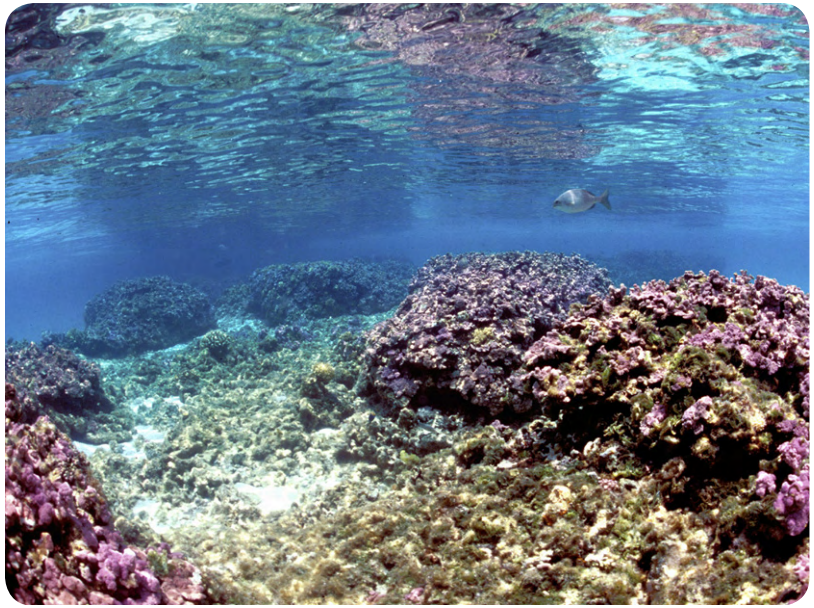
Midway Atoll Conceptual Site Planning

February 2008

0 135 270 540 Feet

Alternative A—No Action/Limited Action

Alternative A is described as maintaining current management activities in place at Midway at the time of the Proclamation. Programs that are currently underway or planned, such as the Interim Visitor Services Plan, fit within Alternative A. Short-term overnight visitation would not exceed 40 people, while seasonal or long-term contractors and researchers would not exceed 80 people, thus totaling no more than 120 people on any given overnight. Day-trippers would be limited to 3 cruise ships per year at about 800 people per visit. Some baseline changes in management programs, e.g., enhanced biological and cultural resource protection, are anticipated to help fulfill the purpose and mission of Midway Atoll NWR and the Papahānaumokuākea Marine National Monument.



Coral reef and shallow water protection is a vital activity

Key activities implemented under Alternative A include the following:

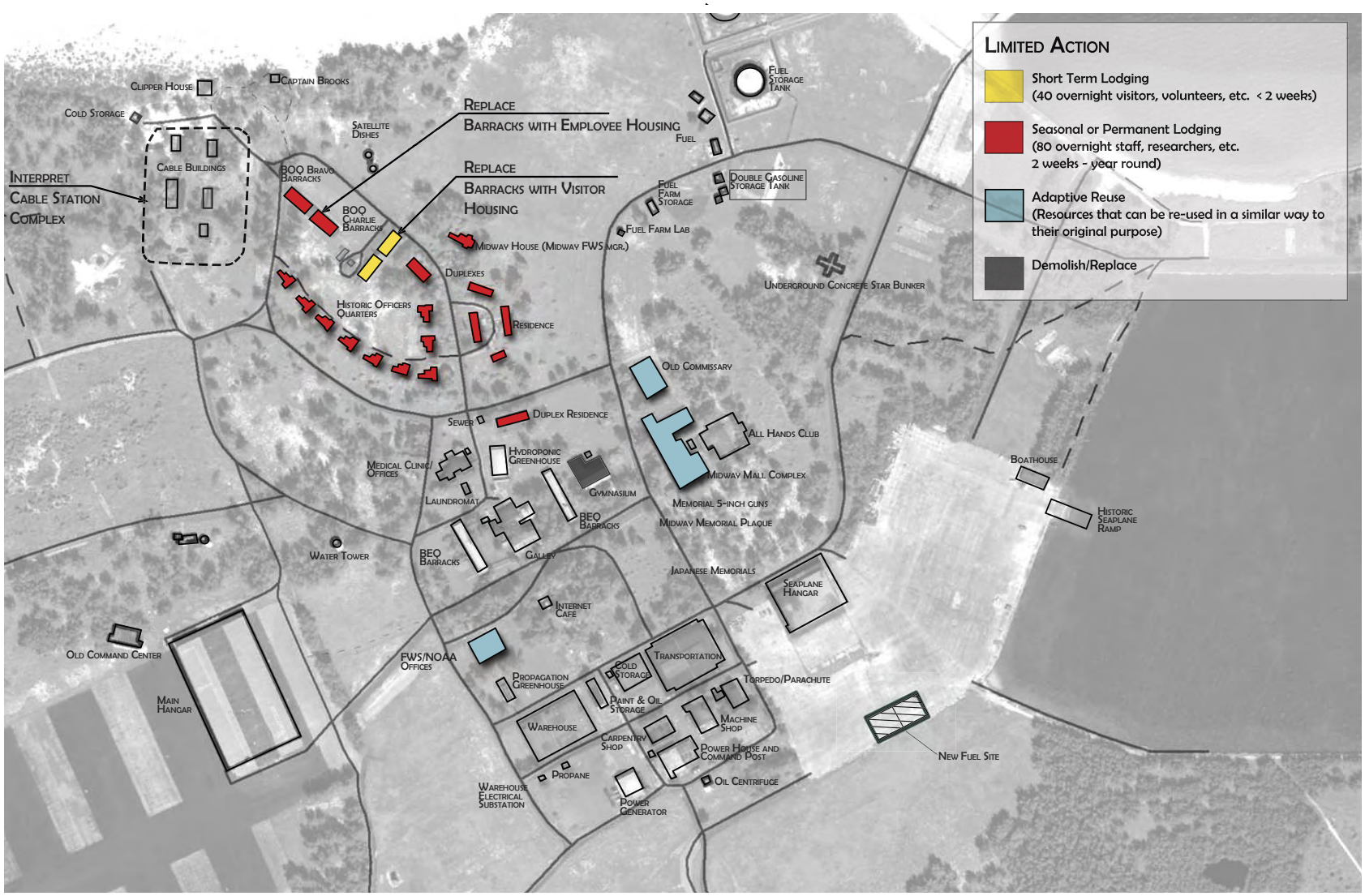
- Stabilize and clean-up approximately 7–8 World War II-era historic buildings (e.g., rehabilitation, lead-based paint removal) to use for lodging and operations
- Treat 5 Cable Station historic structures that can be stabilized and treated; otherwise take structures down to ruins state
- Replace B, C barracks with multi-unit lodgings
- $1.2 million funds allocated to address serious health and safety issues in employee and visitor housing and for lead-based paint abatement
- Continue biological enhancement and research programs as part of multi-agency effort

PROs

- o Lower visitation volumes do not exceed Midway Atoll's carrying capacity
- o Fewer infrastructure improvements and construction required
- o Less funding required
- o Baseline improvements are implemented to enhance biological and cultural resources and upgrade facilities and infrastructure

CONs

- o Net loss of biological and historic resources continues to occur
- o Full enhancement potential of Midway Atoll's unique biological and historic resources is not achieved
- o Educational and interpretive opportunities limited; less public outreach and involvement
- o Funding and staffing likely to be more limited
- o Limited access capacity for MMB partners



Sand Island Building Program - Alternative A

Midway Atoll Conceptual Site Planning

February 2008

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Alternative B—"Model for Sustainability:" Integrated Biological, Historic, and Visitor Programs

Alternative B is the preferred alternative. This alternative proposes an integrated approach for enhancing protection and understanding of biological and historic resources at Midway Atoll/Sand Island while providing a moderate increase in visitor services and interpretive, educational, and research programs and facilities. It also provides an operational hub for agencies within the Monument.

Resources would be allocated to elevating the programs and facilities in all three areas: 1. biological protection, understanding, and restoration, 2. historic resource preservation and adaptive reuse, 3. Visitor education and interpretation.

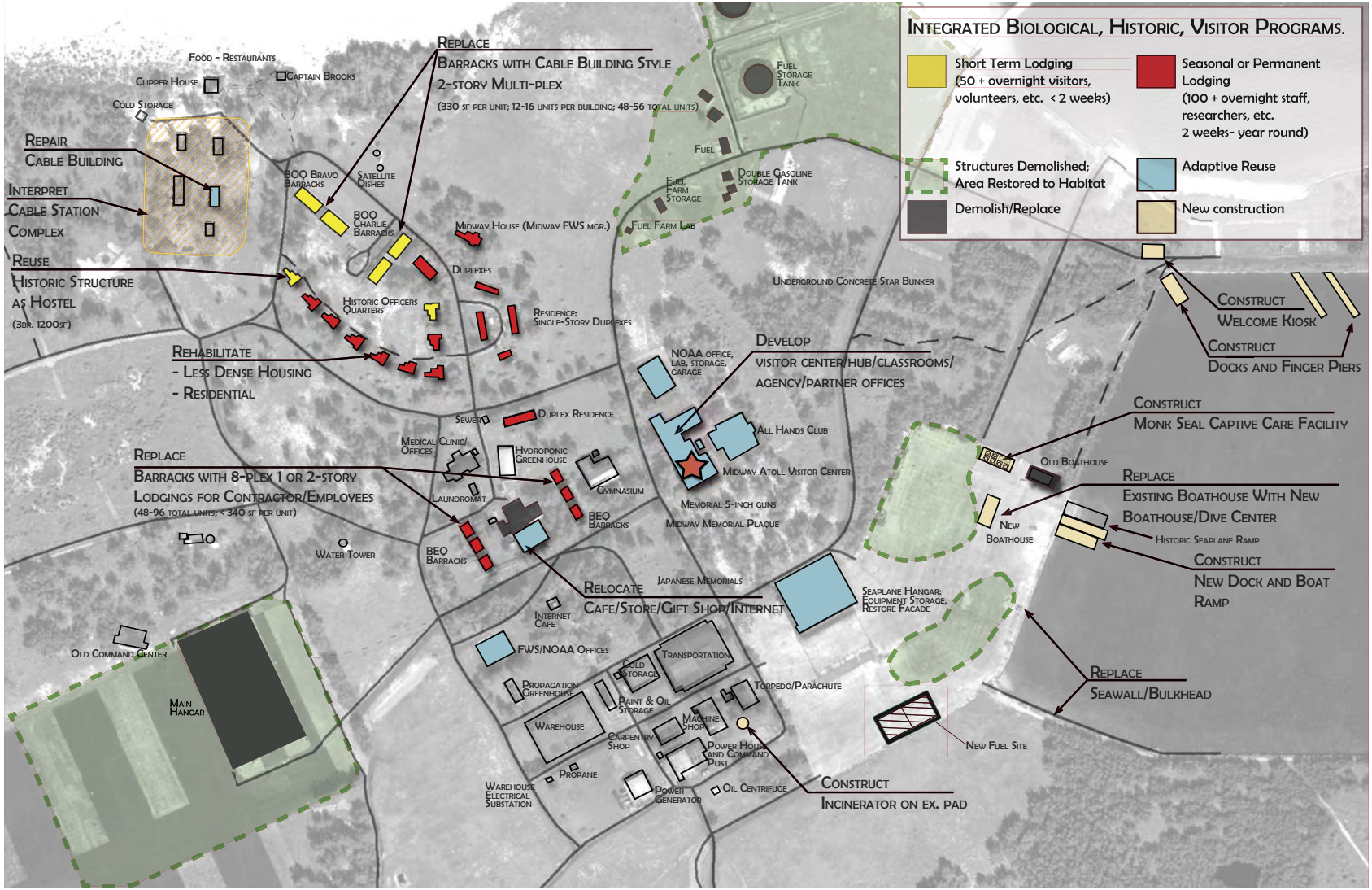
Short-term overnight visitation would not exceed 50 people, while seasonal or long-term contractors and researchers would not exceed 100 people, thus totaling no more than 150 people on any given overnight. The increased island population from the current regular capacity of 120 people would require enhancements in utility systems infrastructure. Day-trippers would primarily access the island via one of the maximum 3 cruise ships per year (approximately 800 cruise travelers per ship).

Green sea turtle © James Watt

New facilities and systems would utilize green design and energy principles. Midway's physical structures as well as interpretive and education programs would emphasize the atoll's sensitive resources and its role in worldwide conservation ecology and human history.

Key activities implemented under Alternative B include the following:

- Treat, stabilize, and clean-up all World War II-era historic buildings (e.g., rehabilitation, lead-based paint removal) to use for lodging, operations, and visitor services (approximately 18 buildings)
- Take four Cable Station historic structures down to ruins state and salvage recyclable materials. Rehabilitate/repair Cable building #643 for interpretation
- Demolish B, C, and BEQ Barracks (4 buildings total) and replace in same footprint with smaller scale, energy-efficient multiplex units on pilings
- Construct low-impact-style lodgings (< 200 sf) on existing concrete pad(s) or demolished building footprints as temporary lodging or ecotourism overnight facilities
- Reuse one Officers Quarters building as a hostel to accommodate overnight visitors
- Rehabilitate historic Midway Mall to serve as the new "Midway Atoll Visitor Center;" facility will be a multi-purpose center containing visitor facilities, multi-agency offices, and classrooms
- Demolish non-historic structures or structures that do not meet the Secretary of the Interior Standards for historic preservation, and create habitat in vacated areas
- Expand biological enhancement and research programs as part of multi-agency and partnership effort



Sand Island Building Program - Alternative B (Preferred)

Midway Atoll Conceptual Site Planning

February 2008

- Plan, design, and build a wet laboratory/quarantine facility
- Construct a Hawaiian Monk Seal Captive Care facility
- Clean up all lead-based paint and other toxic materials related to structures, facilities, and soils that are creating exposure hazards to humans and wildlife within 15 years
- Monitor landfills and, if necessary, enact further remediation within 15 years
- Construct a new boathouse, dive center, and storage facility to facilitate marine-based activities
- Expand the new fuel farm to meet NOAA and State needs
- Construct new ramp/boat dock near location of historic seaplane ramp
- Construct two welcome facilities for visitors arriving by vessel and by plane
- Construct 3 additional finger piers in Inner Harbor
- Expand drinking-water capacity to meet needs for 30 additional people
- Expand sewage and solid waste disposal capacity

PROs

- Visitation volumes do not exceed Midway Atoll's carrying capacity
- No further net loss of biological and historic resources occurs
- Significant improvements are implemented to enhance biological and historic resources
- Midway's exceptional historic resources are preserved and interpreted
- Facilities and infrastructure are upgraded to meet projected lodging, operations, visitation, and maintenance needs
- Several biological research and habitat initiatives are implemented, e.g., Monk Seal Captive Care Facility
- Educational and interpretive program is greatly enhanced; public outreach and stewardship opportunities are actively promoted at local, onsite scale to global, remote scale
- Partnerships and coalitions encouraged under this alternative may attract more funding dedicated to biological and historic preservation activities on Midway and throughout the Monument
- Sustainable low-impact development at Midway will serve as a model of sustainability for remote field operations fostering conservation, recycling, and reduction of fossel fuel use
- Facilities, whether renovated or new, would incorporate sustainable design principles to enable the reduction of fossil fuel usage
- Implementation of priority projects will enable Co-Trustee investment in the atoll, greatly enhancing the field operational capacity of the Monument overall

CONs

- Moderate increases in visitation may impact some resources
- Improvements target several areas at once (biological, historic, and visitor services) and will require longer time period to achieve full plan
- Significant funding will be necessary to implement the plan over the 15-year period
- Added costs to expand utility infrastructure capacity

Midway Atoll provides important habitat to albatross birds

Alternative C—Enhanced Operations: Habitat Restoration and Historic Preservation

Alternative C is focused on accelerated restoration of Midway Atoll habitat and species, as well as on historic preservation efforts. As much onsite treatment as possible would occur under Alternative C. Resources, staff, facilities, and programs would be primarily dedicated to restoring Midway Atoll's natural habitat and historic landscape to the highest functioning state over the next 15 years.

Toxic materials and debris cleanup, exotic species removal, habitat restoration, species protection, and research studies are examples of management programs that would be emphasized under this alternative. Specialized facilities and equipment would be required to assist habitat and species recovery. Protection and stabilization of historic resources for the purpose of historic preservation and species protection would occur. Historic structures would be stabilized to protect birds and wildlife, and non-historic structures that are beyond repair or abandoned would be removed and restored to native habitat.

Public visitation would be limited and focused on volunteerism opportunities. Onsite interpretive and educational facilities would be minimal. The total number of agency staff, researchers, and restoration specialists would be highest of any alternative. Short-term overnight visitation would not exceed 50 volunteer-visitors, while seasonal or long-term contractors, researchers, and habitat specialists would be up to 130 people, thus totaling no more than 180 people on any given overnight.

The increased island population from the current regular capacity of 120 people would require enhancements in utility systems infrastructure.

Key activities implemented under Alternative C include the following:

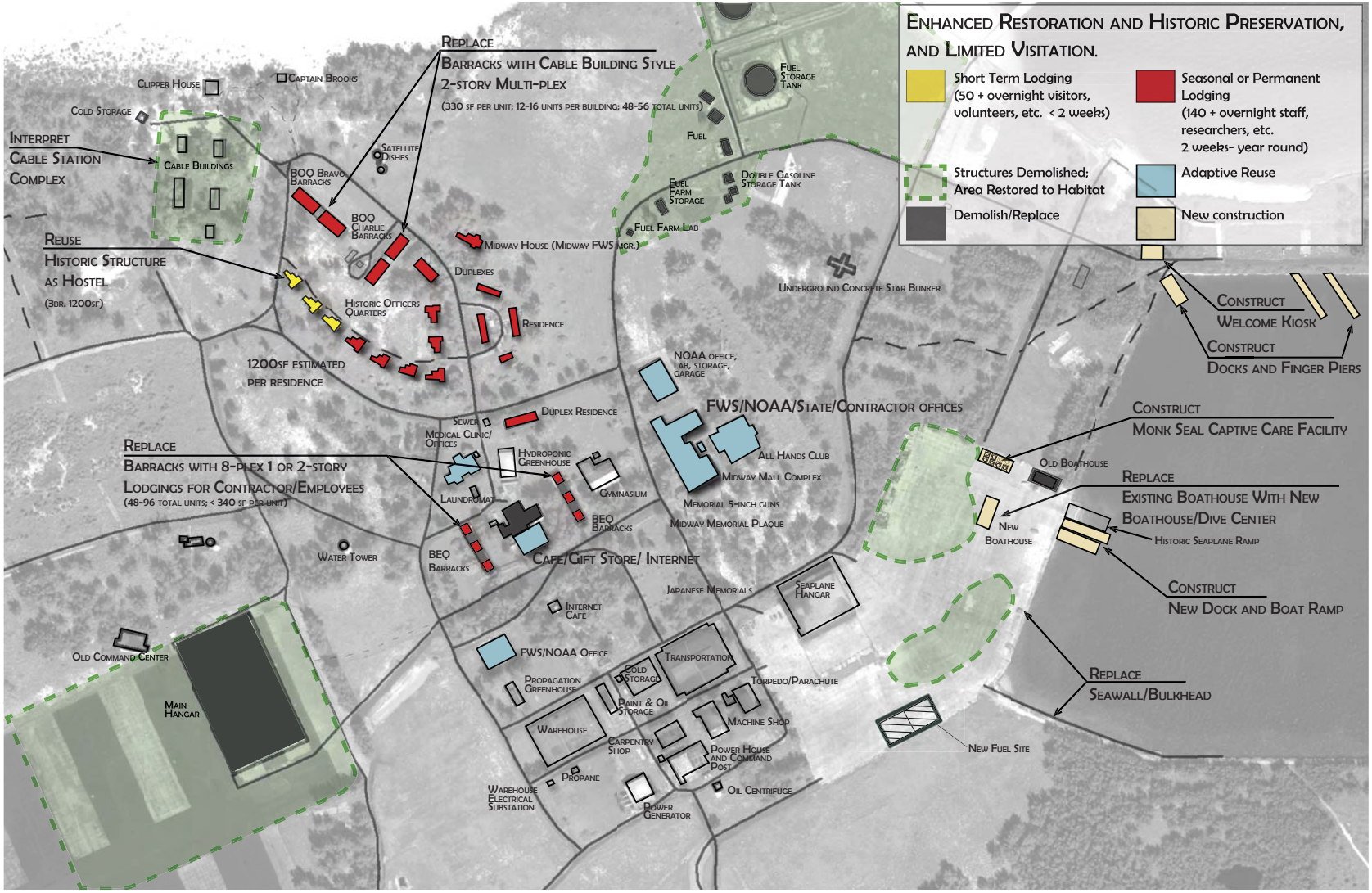
- Extensive on-site treatment as possible would occur to remove exposure to hazardous materials, restore habitat, and protect and increase native species populations
- Restoration processes accelerated
- Historic structures stabilized and preserved while non-historic structures removed to increase land and marine habitat
- More active management
- Limited visitor facilities
- Seasonal and permanent lodgings improved
- Expand drinking-water capacity to meet needs for 50 additional people
- Expand electric generation to meet increased demand
- Expand sewage and solid waste disposal capacity

PROs

- Restoration and biological enhancement programs are implemented to bring Midway Atoll to a "state of health"
- More staff and funding dedicated to speed up restoration efforts
- Visitation limited to restorationists, biologists, researchers, agency staff, and citizen volunteers
- Shared agency and contractor offices at Midway Mall

CONs

- Greater increases in visitor volumes may impact some resources and may exceed Midway's carrying capacity
- Significant funding will be necessary in the short-term (to the detriment of other refuge programs) to implement an aggressive toxic materials abatement and clean-up and habitat restoration program
- Less focus on interpretative and educational programs
- Less focus on support for Monument activities beyond Midway Atoll
- Added costs to expand utility infrastructure capacity
- Limits opportunities for nonworking visitors to experience Midway or the Monument



Sand Island Building Program - Alternative C

Midway Atoll Conceptual Site Planning

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0 135 270 540 Feet

Matrix of Midway Atoll/Sand Island Conceptual Site Alternatives

Definitions of User Groups based on Length of Stay on Sand Island

Day Visitors No overnight stay. People visiting the island for a single day, typically cruise ship passengers.
Lodging type: none.

Transient Overnight 1–2 nights, e.g., VIPs, agency representatives.
Lodging type: hostel, barracks converted to 2-story structures.

Short-Term Overnight 3–14 nights or < 2 weeks, e.g., volunteer service workers, visitors, agency staff.
Lodging type: hostel, historic officers' quarters, barracks.

Seasonal Overnight 2 weeks to 8 months, e.g., volunteers, seasonal staff.
Lodging type: historic officers' quarters, duplexes, barracks converted to 2-story structures.

Permanent Overnight up to one year, e.g., staff, contractors.
Lodging type: historic officers' quarters, duplexes, barracks converted to 2-story structures.

NOTE: The numbers in this table reflect a projection of staff/visitors/transients who may be on island at varying times over the year; thus the total exceeds the maximum overnight capacity. If the total island population at any one time will exceed the numbers identified as maximum overnight population in the alternatives outlined below, FWS would first need to determine that such use would be compatible with the purposes of the Refuge and the mission of the National Wildlife Refuge System, as required by the National Wildlife Refuge System Administration Act of 1966, as amended.

Spectacled parrotfish © James Watt

Black-footed albatross chick

Green sea turtle

	Alternative A No Action	Alternative B (Preferred) Integrated Biological, Historic, and Visitor Programs	Alternative C Enhanced Operations: Restoration and Historic Preservation
Alternative Description/Theme	Current Mgmt; FWS-centric with some cooperative programs	Coordinated Mgmt program at Midway; more conservative (less cost) than Alt C. Primary PMNM Operations at Honolulu with some operations at Midway	More aggressive Mgmt program to address habitat restoration, contaminants, and historic preservation (less eco-tourism, more volunteer service workers). Midway serves as PMNM operational hub within 15 years
Max. Overnight Population	**120**	**150**	**180**
Average Population Range	60–80	100–120	140–160
Short-Term or Transient			
Visitors (Ecotourists & VIPS)	40	50	0
Volunteer Service Workers	0	0	50
Transients	37	86	16
Short-Term/Transient Subtotal	**77**	**136**	**76**
Seasonal or Permanent			
FWS Staff			
Permanent	7	14	12
Seasonal (Volunteers)	4	6	10
FWS Subtotal	**11**	**20**	**22**
NOAA Staff			
Permanent	0	8	8
Seasonal/Temporary	2	26	26
NOAA Subtotall	**2**	**34**	**34**
State Staff			
Permanent	0	0	0
Transient (inc. in transients above)	(6)	(6)	(6)
FWS Contractors			
Permanent	50	65	70
Seasonal	15	20	20
Contractor Subtotal	**65**	**85**	**90**
Seasonal/Permanent Subtotal	**78**	**139**	**146**
Day Visitors (Cruise Ships)	3 cruise ships max. annually/ 800 peak visitors per day	3 cruise ships max. annually/ 800 peak visitors per day	3 cruise ships max. annually/ 800 peak visitors per day

Matrix of Midway Atoll/Sand Island Conceptual Site Alternatives

	Alternative A **No Action**	Alternative B (Preferred) **Integrated Biological, Historic, and Visitor Programs**	Alternative C **Enhanced Operations: Restoration and Historic Preservation**
Utility Systems			
Drinking Water	Current capacity is adequate	Increase capacity for up to 30 added people during regular periods	Increase capacity for up to 50 added people during regular capacity
Electricity	Current capacity is adequate	Increase capacity for up to 30 added people during regular periods	Increase capacity for up to 50 added people during regular capacity
Sewage	Current capacity is adequate	Increase capacity for up to 30 added people during regular periods	Increase capacity for up to 50 added people during regular capacity
Solid Waste Disposal	Improve recycling to reduce volume going to landfill	Increase capacity for up to 30 added people during regular periods	Increase capacity for up to 50 added people during regular capacity
Lodging Facilities			
Officers' Quarter Residences			
Reuse 1 officers' quarter structure as hostel for short-term visitors	No	Yes	Yes
Reuse 9 officers' quarter structures for short-term visitors or seasonal and permanent staff, contractor, or agency housing	8 structures for seasonal or permanent staff	1 structure for short-term visitors 7 structures for seasonal or permanent staff	2 structures for short-term visitors 6 structures for seasonal permanent staff
Barracks			
BOQ Bravo	Replace barracks structure for seasonal/long term staff lodging	Replace B barracks structure with (2) cable-style multi-unit 2-story structures for short-term visitor lodging	Replace B barracks structure with (2) cable-style multi-unit 2-story structures for short-term visitor lodging
BOQ Charlie	Replace barracks structure for short-term visitor lodging	Repair C barracks to maximize capacity for interim. Eventually replace barracks structure with (3) multiunit 2-story structures for short-term visitor lodging	Replace barracks structure with (3) 2-story multi-unit structures for seasonal or permanent staff lodging
BEQ Barracks (1)	Abandoned/no change	Replace B barracks structure with (3) 8-plex 1 or 2-story structures for employees	Replace barracks structure with (3) 8-plex single or 2-story structures for employees
BEQ Barracks (2)	Abandoned/no change	Replace barracks structure with (3) 8-plex 1 or 2-story structures for employees	Replace barracks structure with (3) 8-plex single or 2-story structures for employees

	Alternative A **No Action**	Alternative B (Preferred) **Integrated Biological, Historic, and Visitor Programs**	Alternative C **Enhanced Operations: Restoration and Historic Preservation**
Duplexes	Maintained as seasonal/permanent staff lodging	Maintained as seasonal/permanent staff lodging	Maintained as seasonal/permanent staff lodging
Low-Impact Shelters	Not constructed	Up to 12 new primitive shelters constructed	Up to 12 new primitive shelters constructed
Midway House	Maintained as FWS Midway Mgr residence	Maintained as FWS Midway Mgr residence	Maintained as FWS Midway Mgr residence
Number of Housing Units (Hostel style 1200 sf)	0	3	3
Number of Housing Units (Duplex Style <900 sf)	11	11	11
Number of Housing Units (2-story 12 x 24 Units 330 sf)	0	48–56	48–56
Number of Lodging Units (8-plex 1 or 2-story structures <340 sf)	0	48–96	96
Number of Lodging Units (Barracks/ Hotel Style)	72–144	0	0
Number of Lodging Units (Officers Quarter residences)	6	10	10
<200 sf)	0	3	3
Total Number of Housing Units	89–161	123-179	168–176
Cable Station Buildings	Treat structures that exhibit historic and structural integrity; structures that cannot be treated are stabilized and go to ruins state	Repair one cable station building (#643). Remaining cable structures are taken down to ruins state and are secured, historic landscape is interpreted	Document and remove structures that do not exhibit structural integrity. Restore area to habitat and interpret cable complex
Food Service and Entertainment Facilities			
Clipper House	Maintain as is	Expand or replace for additional kitchen and cold storage facilities	Expand or replace for additional kitchen and cold storage facilities
Captain Brooks	Maintain as is	Maintain as is	Maintained as is
Galley Bldg	Demolish	Reuse as café/store/entertain. center	Reuse as café/store/entertain. center; demolish rear half

Matrix of Midway Atoll/Sand Island Conceptual Site Alternatives

	Alternative A **No Action**	Alternative B (Preferred) **Integrated Biological, Historic, and Visitor Programs**	Alternative C **Enhanced Operations: Restoration and Historic Preservation**
All Hands Club	Maintained as is	Demolished or reused for partner facilities; functions moved to other buildings (e.g., Galley)	Demolished or reused for partner facilities; functions moved to other buildings (e.g., Galley)
Agency Facilities			
Admin/Offices/Visitor			
FWS Office Building	FWS and NOAA share office space at existing office building	Agency offices and visitor services move into Midway Mall Visitor Center; maintain existing office building	FWS, State, and NOAA share office facilities at Midway Mall; FWS building used for additional office space
Midway Mall	Maintained as is	Midway Atoll Visitor Center established with visitor services, agency offices, and classrooms	FWS, State, and NOAA and contractor share Midway Mall offices; some existing functions move to another structure
Contractor Admin Building	Maintained as is	Maintained as is	Contractor admin function relocated to Midway Mall with FWS,NOAA,and State. Medical and administration functions expanded.
Gymnasium	Demolished	Repaired and operational; used for emergency shelter	Repaired and operational; used for emergency shelter
Research/Lab/Storage			
Old Commissary Building	Maintained as is	Reused for NOAA offices, and shared research facilities, e.g., cold storage/lab	Reused for NOAA offices, and shared research facilities, e.g., old storage/lab
Equipment Storage	Maintained as is	Expanded in existing structures	Expanded in existing structures
Seaplane Hangar	Repair roof	Use for equipment storage; replace roof and restore glass façade for interpretation and/or exhibitory	Repair roof
Educational Classrooms/lab/library/ workroom	No	Yes—Phase I of Midway Mall Visitor Center	Possibly within shared offices at Midway Mall
Holding Tanks	No	Yes	Yes
Quarantine Facility	No	Yes	Yes
Monk Seal Facility	No	Yes	Yes

	Alternative A **No Action**	Alternative B (Preferred) **Integrated Biological, Historic, and Visitor Programs**	Alternative C **Enhanced Operations: Restoration and Historic Preservation**
Boating Facilities			
Large Dock for Barges or Ships	Cargo pier not maintained; fuel pier abandoned	Cargo pier maintained as is; fuel pier abandoned—disposition TBD	Cargo pier maintained as is; fuel pier demolished
Mid-size Dock for medium research vessels	Existing tug pier maintained	Existing tug pier rehabilitated	Existing tug pier rehabilitated
Seaplane/boat ramp for small vessels	Existing dock and seaplane/boat ramp maintained	New dock constructed in NW Inner Harbor; new dock/ramp built near seaplane ramp	Existing dock and seaplane ramp rehabilitated
Finger Docks for small vessels	Existing finger docks maintained as is	Existing finger docks maintained as is; three new finger docks are constructed	Existing finger docks maintained as is
Boat House	Maintained as is	Replaced with new facility combined with dive infrastructure	Replaced with new facility
Airport Facilities			
Runway	Maintained as is	North strip removed and restored to habitat within 10 years	North strip removed and restored to habitat within 5 years
Main Hangar	Abandoned in place	Demolished and restored to habitat within 10 years	Demolished and restored to habitat within 5 years
Airport Terminal Welcome Building and Staging Area	Constructed	Constructed	Constructed
Habitat Enhancement			
Existing Fuel Tank Area	Abandoned; new fuel tank area located south of seaplane hangar	Demolished and area restored to habitat; new fuel tank area located south of seaplane hangar	Demolished and area restored to habitat; new fuel tank area located south of seaplane hangar
Abandoned, derelict, or non-historic structures	Maintain as is	Reuse, maintain as is, or demolish	Demolish and restore to native habitat
Vegetative Buffer in Inner Harbor Area	No	Yes	Yes
Upland Habitat	Invasive vegetation controlled within 15 years	Invasive vegetation removed and restored to native habitat (controlled within 15 years)	Invasive vegetation aggressively removed and restored to native habitat (controlled within 8 years)
Shoreline Edge	Maintained as is	Additional protection to direct public access away from sensitive areas	Restoration and protection to direct public access away from sensitive areas
Coral Reef System	Maintain as is	Investigate coral reef habitat improvements; metal wreckage removal	Investigate coral reef habitat improvements; metal wreckage removal

Preferred Midway Atoll Conceptual Site Plan

5

5. Preferred Midway Atoll Conceptual Site Plan

Introduction

The Planning Team recommends Alternative B, "**Integrated Biological and Historic Preservation and Visitor Services—A Model for Sustainability**," as the Preferred Midway Atoll Conceptual Site Plan.

Alternative B was selected because it best meets all management concerns including a moderate increase in overall capacity for people, the ability to accommodate the new demands of the Monument designation, and the plan's ability to protect Midway Atoll's populations of wildlife and its historic resources.

This alternative proposes an integrated approach for enhancing protection of biological and historic resources at Midway Atoll/Sand Island while providing a moderate increase in visitor services and interpretive and educational programs and facilities. The alternative meets the Monument-wide vision to protect forever "the health, diversity, and resources of the vast NWHI ecosystems and the wildlife they support—unique in the world" by focusing on species and habitat recovery. The preferred site concept also recognizes Midway's special role as a hub of the Monument, and as the only atoll open to the public, the touchstone where humans can be immersed in the Northwestern Hawaiian Islands' rich history, wildlife, and Pacific marine environment.

Resources will be allocated to elevating the programs and facilities in three primary areas: 1. Biological understanding, protection, and restoration, 2. Historic resource preservation and adaptive reuse, and 3. Visitor education and interpretation.

Protection, research, and restoration of atoll systems and species, and protection of historic resources are promoted activities within the appropriate level of human interaction. Consideration is given to the atoll's carrying capacity—how many people, structures, and facilities the island system can support without adverse impact to its health. Visitation will be increased approximately 16% over the recommended capacity targeted in the Interim Visitors Services Plan and the "No Action/Limited Action" Alternative A (from 120 people maximum per overnight to 150 people maximum). Short-term overnight visitation will not exceed 50 people, while seasonal or long-term contractors and researchers will not exceed 100 people, thus totaling no more than 150 people on any given overnight. Day visitors would continue to visit the island via cruise ship, with up to 3 cruise ships per year, and about 800 people peak visitors per day visit.

The focus of management and development of Midway facilities and programs will be on sustainability and sustainable tourism; creating the lowest carbon footprint possible on Midway Atoll is a primary goal. New and adapted facilities and systems will utilize green design and energy principles, and reduce consumption and waste. Midway's physical structures in combination with its interpretive and education programs will emphasize the atoll's sensitive resources and its role in worldwide conservation, ecological systems, and human history.

Patterns of uses were grouped into Site Zones:

- Visitor Orientation and Partner Facilities
- Mixed Housing/Lodging
- Employee
- Cable Station
- Food/Restaurants
- Military History and Display
- Operations

Each primary building within the Historic and Primary Development Zone is identified by color code in the map on the facing page, in terms of appropriate historic treatment. The treatment categories are: 1. Demolish and replace functions to another building, or replace existing structure; 2. Leave as is, and stabilize structures that do not pose threats to wildlife or humans; 3. Secure structures that pose hazards to wildlife or humans; 4. Adaptive reuse of structures that have sufficient historic or structural integrity to be used as a Midway Atoll facility.

February 2008

Sand Island Conceptual Plan

Midway Atoll Conceptual Site Planning

Sand, Eastern, and Spit Islands Management Zones

As described in Chapter 4, Sand Island is zoned according the following physical areas where specific management, planning, and development activities are appropriate: Marine Protection Zone, Revegetation/Habitat Zone, Beach Zone, Inner Harbor Zone, Freshwater Protection Zone, Airfield Operations Zone, No Dig/Landfill Zone, and Historic and Primary Development Zone.

The Historic and Primary Development Zone designates Sand Island's historic core and redevelopment area; it delineates an area that is highly significant and contains several historic structures and features eligible for listing on the National Register of Historic Sites. This zone indicates the primary area where development of new facilities or adaptive reuse of existing or historic structures should occur. This proposal will not only help preserve the integrity of the historic landscape, but will also protect wildlife and their habitat by limiting development to existing structures or impacted areas.

Specific proposals for Sand Island are described in detail in the following section, **Sand Island Conceptual Site Plan.**

Eastern Island

Eastern Island is primarily zoned in Marine Protection Zone and Revegetation/Habitat Zone. No new major development or structures are proposed for this unoccupied island, which provides critical shoreline and island habitat for birds and marine wildlife. Limited human access is provided via a boat dock and trails. Eastern Island's role during World War II is instrumental in the interpretation of Midway Atoll's incredible history. Numerous historic features remain, including the World War II runway, artillery, bunkers, and sand dune airplane revetments.

Eastern Island has been the focus of successful restoration and wildlife enhancement efforts. Volunteers and staff have removed large areas of the exotic species *Verbesina encelioides* and have planted native bunchgrass *Eragrostis* species. Biologists successfully created freshwater wetlands and established a Laysan duck population on Eastern Island.

Ongoing activities will continue to focus on habitat protection and restoration, and the interpretation of historic and biological features. No overnight visitation occurs on Eastern Island, and visitors will arrive for day visits only for the purpose of interpretation, volunteerism, or study of the island's history and ecology.

WWII airplane revetment on Eastern Island

Proposals for Eastern Island include the following:

- Continued restoration of native habitat and species (e.g., remove invasive plants, enhance bird habitat, reintroduce native species, etc.)
- Participatory restoration and research programs
- Build upon Eastern Island historic interpretation and educational program, guided tours, and protection and rehabilitation of historic sites
- Reconstruct sand dune airplane revetment with built-in crew/sleeping area
- Improved trail system linking historic features and memorials
- Determine appropriate treatment of historic runway, e.g., trails, historical interpretation, or partial habitat restoration

Spit Island

Spit Island is primarily zoned in Marine Protection Zone and Revegetation/Habitat Zone. It is important habitat for monk seals, sea turtles, birds, and other wildlife. No public access is allowed, and no development will occur on Spit Island to promote thriving wildlife populations and habitat. Spit Island will continue to support research and biological programs.

Marine and Shoreline Protection

The Marine Protection zone designates protected shoreline and marine habitat on Sand Island that supports wildlife and their critical life activities such as resting, feeding, nesting, fledging, migrating, etc. Public access is generally not allowed in these sensitive shoreline areas, and these areas will remain undeveloped. However, biological programs, research, and management activities will continue to occur. Key proposals for this zone are as follows:

- Limit human access mainly to the pursuit of biological programs, research, and management
- Install permanent moorings at regularly used anchorages to prevent coral reef damage
- Conduct reef rehabilitation projects as appropriate
- Reinforce, repair, or improve limited trail access, viewpoints, and signage, create viewing stations for wildlife watching
- Evaluate the potential for natural beach restoration, particularly along hardened or rip-rapped shorelines such as the South beach, and the shoreline near Turtle Beach. Further studies are required to determine feasibility.

Reef habitat recommendations from the Draft Monument Management Plan include the following strategies and activities:

Strategy HMC-1: Within 15 years, develop and implement a plan for restoring the health and biological diversity of shallow reefs and shoals where anthropogenic disturbances are known to have changed the ecosystem.

Activity HMC-1.1: Identify and prioritize restoration needs in shallow water reef habitats impacted by anthropogenic disturbances within 5 years.

Activity HMC-1.2: Analyze historic and present impacts on reef growth at Midway Atoll and determine factors limiting nearshore patch reef growth to facilitate natural reef building.

Activity HMC-1.3: Implement appropriate restoration activities.

Habitat Recovery

Despite the incredible abundance of terrestrial and aquatic wildlife, wonderful beaches, and crystal clear water, Midway Atoll is a highly disturbed atoll system containing invasive plant species, toxic materials in building materials and soils, and human developments that have created significant adverse impact on indigenous species and their habitat. Most of the Midway Atoll is designated as the Revegetation/Habitat Zone in this Conceptual Site Plan to focus efforts on restoring atoll habitat and enhancing species populations.

The preferred alternative for habitat management and restoration at Midway Atoll over the next 15 years is to increase the amount of habitat available for all species of breeding seabirds, overwintering migratory birds, Laysan ducks, and future translocated native birds by removing abandoned structures and pavement installed by the U.S. Navy, controlling and eradicating nonnative vegetation, and planting and seeding appropriate native plants.

As described in the Draft Monument Management Plan's section 3.3.2, **Alien Species Action Plan**, FWS will control or eradicate golden crown-beard (*Verbesina encelioides*), ironwood (*Casuarina* spp.), haole koa (*Leucaena leucocephala*), castor bean (*Ricinus comunus*), Spanish needle (*Bidens* sp.), lantana (*Lantana camara*), pluchea (*Pluchea indica*), cheeseweed (*Malva parviflora*), poinsettia (*Euphorbia cyathophora*), Guinea grass (*Panicum maximum*), vervain (*Verbena litoralus*), umbrella plant (*Cyperus alternifolius*), nonnative morning glory (*Convolvulaceae*), ivy gourd (*Coccina grandis*), black mustard (*Brassica nigra*), buffel grass (*Cenchrus ciliaris*), New Zealand spinach (*Tetragonia tetragonioides*), Chinese banyan (*Ficus microcarpa*), Sand bur (*Cenchrus echinatus*), and spiny pigweed (*Amaranthus spinosus*).

Black-footed albatrosses

Sand Island Conceptual Site Plan

Over the 15-year life of the plan approximately 937 acres of nonnative vegetation (coastal mixed grasses and shrubs) will be restored to a native dominated landscape. Native species used for restoration will be chosen on the basis of historical records at Midway and historical and pollen records from Laysan Island and will include bunchgrass (*Eragrostis variabilis*), naupaka (*Scaevola sericea*), morning glory (*Ipomoea pes caprae, I. indica*), *Solanum nelsonii, Capparus sandwichiana, Chenopodium oahuense,* and *Lepidium bidentatum.*

Approximately 118 acres of abandoned buildings and paved areas will be removed and converted into useable habitat. Demolition costs are estimated at several million dollars, however, so this will likely be a longer-term activity. The refuge will remediate lead-based paint from buildings and the surrounding soil to prevent adverse affects to wildlife.

Additionally, the Draft Monument Management Plan proposes the following activities related to habitat recovery in Midway Atoll (for detailed information, see section 3.2.3, **Habitat Management and Conservation Action Plan**):

Strategy HMC-4: Within 10 years, restore and maintain coastal mixed grasses and shrubs on all the coralline islands and atolls of the Monument using best available historical information about the original indigenous ecosystem.

> ***Activity HMC-4.1***: Propagate and outplant native species chosen on the basis of historical records at Midway and historical and pollen records from Laysan Island in 937 acres of vegetated area at Midway Atoll, focusing on the original footprint of the island and then moving to the dredge spoils section.

Strategy HMC-8: Maintain no more than 150 acres of ironwood woodlands on Sand Island, Midway Atoll, to provide nesting and roosting habitat for the life of the plan.

> ***Activity HMC-8.1***: Remove ironwood on Sand Island from 50 acres outside designated woodland and control young ironwood in areas managed for grass and shrubs.

Strategy HMC-2: Within 10 years, investigate and inventory sources of known contamination from historic human use of the NWHI and, where appropriate, coordinate with responsible parties to develop plans and complete cleanup actions.

> ***Activity HMC-2.7***: Conduct ecological risk assessment to determine allowable lead levels in soils at Midway and remove lead from buildings and soils to no risk levels.

South point at Old Bulky Waste landfill

No Dig Areas/Landfills

The "no dig" areas are sites that contain contaminated soils or other materials that cannot be disturbed. These sites include the Old Bulky Waste Landfill on the south beach point and the old fuel farm on the north beach.

The "No Dig" areas were designated in the Base Realignment and Closure process (BRAC) as Land Use Controls where digging below four feet is prohibited (or FWS assumes all responsibility). These areas, and several landfills, were determined to not necessitate further cleanup unless the controls were not effective. The Old Bulky Waste Landfill, however, is an example where the control is not sufficient and further remediation needs to be addressed through the BRAC process.

To the extent feasible, it is recommended that the "No Dig/Land Fill" areas that contain contaminated soils and/or facilities be enhanced for habitat. The largest area is in the vicinity of the old fuel tanks in the northeast part of Sand Island. It is proposed that the tanks and associated facilities be removed, and nonnative vegetation be replaced with native vegetation. Further plans and procedures for remediation of an area such as the fuel farm are required to ensure that contaminated areas are clean and will not impair wildlife.

Additionally, the Draft Monument Management Plan proposes the following activities related to land fills and dumps in Midway Atoll (see section 3.2.3, **Habitat Management and Conservation Action Plan**):

Strategy HMC-2: Within 10 years, investigate and inventory sources of known contamination from historic human use of the NWHI and, where appropriate, coordinate with responsible parties to develop plans and complete cleanup actions.

> ***Activity HMC-2.2***: Work with partners and responsible parties to verify the integrity of known landfills and dumps and to conduct additional remediation if necessary.

Historic Resources

Within the Draft Monument Management Plan (see section 3.1.3, **Historic Resources Action Plan**), five strategies affecting historic resources at Midway Atoll are identified for achieving the desired outcome of identifying, interpreting, and protecting historic resources in the NWHI.

Strategy HR-1: Update the Midway Historic Preservation Plan to meet the present needs of the Refuge and Monument within 1 year.

Strategy HR-2: Implement, supervise, and monitor the historic preservation treatments identified in the Midway Historic Preservation Plan at two historic properties each year.

Strategy HR-3: Update and maintain the Battle of Midway National Historic Landmark within 4 years.

> ***Activity HR-3.4***: Implement repair and maintenance treatments at National Historic Landmark features within 6 years.

Strategy HR-4: Improve the function and capacity of the Midway museum within 8 years.

> ***Activity HR-4.1***: Prepare a Scope of Collections Statement within 5 years.
>
> ***Activity HR-4.2***: Remodel the Midway Museum space within 7 years.
>
> ***Activity HR-4.3***: Organize and curate collections within 8 years.

Strategy HR-6: Conduct archaeological and historical research on the historical events and structures at Midway Atoll NWR within 15 years.

> ***Activity HR-6.2***: Conduct archaeological investigation of the Commercial Pacific Cable Station site within 10 years.

Additional strategies and activities targeted at understanding and protecting Midway Atoll's submerged historic resources are found in the Draft Monument Management Plan in Section 3.1.4, **Maritime Heritage Action Plan**:

Strategy MH-1: Document and inventory maritime heritage resources throughout the life of the plan.

> ***Activity MH-1.2***: Plan and carry out coordinated field mapping surveys of selected sites annually.

Midway Mall interior: ideal space for offices, classrooms, and visitor services

Native bunchgrass successfully restored on Eastern Island

Midway Atoll offers important historic preservation and intepretation opportunities

Historic WWII Torpedo shop with parachute tower

Sand Island Conceptual Site Plan

Coordinated Field Operations

As a hub of operations for the Monument, Midway Atoll is the primary focus of the Coordinated Field Operations Action Plan in the Draft Monument Management Plan. The following activities related to an integrated program in Midway Atoll are proposed (see section 3.6.3, **Coordinated Field Operations Action Plan**, for details):

Strategy CFO-1: Conduct necessary site planning and infrastructure development to enhance Monument field operations capacity over the life of the plan.

- ***Activity CFO-1.1***: Initiate and complete necessary planning to implement the draft Midway Atoll Conceptual Site Plan.
- ***Activity CFO-1.3***: Develop a plan for long-term sustainability for operations throughout the Monument using alternative energy systems and waste reduction within 2 years.
- ***Activity CFO-1.4***: Plan for use of sustainable construction and landscape architecture for facilities and assets throughout the Monument.

Strategy CFO-3: Maintain and enhance housing and field camp capacity using short-, medium-, and long-term approaches across the life of the plan.

- ***Activity CFO-3.1***: Construct low-impact structure pilot project at Midway Atoll.
- ***Activity CFO-3.2***: Replace Bravo Barracks at Midway Atoll.
- ***Activity CFO-3.3***: Replace Charlie Barracks at Midway Atoll.
- ***Activity CFO-3.4***: Rehabilitate "Officers Row" Housing at Midway Atoll.

Strategy CFO-4: Meet fuel requirements for aircraft, vessel, utility, and equipment needs at Midway Atoll.

- ***Activity CFO-4.1***: Maintain recently replaced fuel farm at Midway Atoll.
- ***Activity CFO-4.2***: Develop biodiesel fuel capacity or other sustainable fuel types at Midway Atoll within 2 years.

Strategy CFO-5: Rehabilitate critical utility systems and ailing structures and facilities at Midway Atoll within 5 to 15 years.

- ***Activity CFO-5.1***: Rehabilitate water catchment and distribution system.
- ***Activity CFO-5.2***: Rehabilitate septic and wastewater systems.
- ***Activity CFO-5.3:*** Treat all wooden historic structures at Midway Atoll for termites.
- ***Activity CFO-5.4***: Evaluate and expand food services as necessary.
- ***Activity CFO-5.5***: Rehabilitate seaplane hangar.
- ***Activity CFO-5.6***: Repair inner harbor sea wall.

Strategy CFO-6: Within 5 years improve the small boat operational capacity to enable quick, reliable access to the region in support of management and continue to enhance the program throughout the life of the plan.

- ***Activity CFO-6.1***: Inventory, maintain, and coordinate the use of small boats and related field resources.
- ***Activity CFO-6.2***: Within 2 years, station additional vessels at Midway for use during the summer marine research field season.
- ***Activity CFO-6.3***: Within 5–10 years station a small research/enforcement vessel at Midway Atoll.
- ***Activity CFO-6.4***: Construct new finger piers along the north wall of Midway's inner harbor.
- ***Activity CFO-6.5***: Redevelop existing boathouse at Midway into a multi-use facility.
- ***Activity CFO-6.6***: Evaluate needed improvements to Pier No. 1 in the ship basin and the Tug Pier at Midway Atoll.
- ***Activity CFO-6.7***: Make needed improvements to or replace the pier at Eastern Island.

Strategy CFO-8: Develop a comprehensive dive operations program for Monument management activities within 5 years.

Activity CFO-8.1: Refurbish or replace the dive recompression chamber at Midway.

Activity CFO-8.3: Incorporate a dive operations center into refurbished boathouse facility at Midway.

Strategy CFO-9: Develop necessary research, education, visitor and administrative facilities across the life of the plan.

Activity CFO-9.1: Design a marine laboratory at Midway and develop in phases.

Activity CFO-9.2: Complete planning for and construct captive care monk seal facility on Sand Island.

Activity CFO-9.4: Complete Phase I rehabilitation of Midway Mall and the commissary building.

Activity CFO-9.5: Construct airport welcome center on Sand Island within 2 years.

Sand Island Building Program

The four guiding principles of architectural design and construction on Midway are defined as: Sustainability, Historical Integrity, Biological Integrity, and Tropical Aesthetic.

Each construction project at Midway will be considered through the lens of sustainability and a low carbon footprint, taking into account: use of nontoxic, durable materials; recycling building materials; natural solar and ventilation techniques; high energy efficiency; shared facilities and infrastructure; low massing of smaller buildings in place of cumbersome 3-story structures; on-site renewable power generation, on-site water catchment, and on-site waste treatment at each building; etc.

The Historic and Primary Development Zone designates Sand Island's historic core and redevelopment area; it delineates an area that is highly significant in terms of historic development patterns. Several historic structures and features are contained within this zone. This zone indicates the primary area where development of new facilities or adaptive reuse of existing or historic structures is an appropriate activity. Reusing existing historic structures is a very high priority to protect the cultural landscape and historic structures. Reuse of existing structures or the construction of new structures will fit the historic character of Sand Island (1900s Cable House style or 1940s Albert Kahn style), and will have either no impact or a positive impact on wildlife and habitat.

Design of new or renovated buildings will also take into account the tropical building vernacular, including platform construction, peaked roofs, and overhangs.

Clustering development to reduce the extent of disturbance and create efficiencies in infrastructure and operations is a key recommendation. Reusing existing facilities and keeping the building program within the "Historic Zone" is another sustainability strategy in that it reduces the requirement to extend utilities, roads, equipment, and resources across the island.

With the limited window for construction and the likelihood that any construction will have to be tightly contained with limited areas for staging because of albatross habitat, the need for quality pre-manufactured, component construction would be desirable. This is not to be confused with mobile trailer type construction, which is contrary to the building guidelines that gained general acceptance with the client group.

Sand Island Conceptual Site Plan

Performance Standards for New Construction should be applied, as follows:

1. Energy Efficiency Measures—Areas for Energy Savings:
    - Conservation through Building Design: Reduce Energy Consumption
    - Insulated building envelope, possibly "green roofs"
    - Weatherproofing
        - Airtight seals at windows and doors
    - Energy efficient window glazing (Low-E)
    - Optimize daylighting strategies
    - Optimize natural ventilation strategies
    - Economize heating/cooling system
    - Energy-efficient equipment and appliances
        - Energy Star rated
2. Landscape and Site Design
    - Wind protection
        - Native landscape plantings clustered around buildings
        - Earthen berms to provide wind protection
    - Solar orientation
3. Alternative Energy Systems
    - Solar hot water heater
    - Full photovoltaic system
    - Fuel cells
        - Powered by hydrogen generated from electrolysis
        - Only if system does not impact local coral reef ecosystems

Strategies to Address Sea Level Rise and Climate Change

Midway power currently relies entirely on fossil fuel. Alternative energy systems should be explored, such as solar power, hydrogen fuel cells, or water-powered micro-turbines. Further study is required to measure the benefits of these alternative energy methods and their potential impacts to wildlife, birds, and marine systems. A goal for Sand Island is to have a plan in place within 15 years for alternative energy system(s) such as solar to replace the current power generation.

Midway's islands will be affected by sea level rise through loss of land and higher spring tides, therefore restoration activities should be focused on the highest elevational areas and the original footprints of the islands. One possible mitigation measure to counter the effects of sea level rise in the NWHI may be beach nourishment, whereby sand is strategically deposited onto beaches (Baker et al. 2006).

Selective removal of rip-rap and bulkheads to restore natural beach deposition processes and shoreline habitat is one strategy that has successfully been applied to marine shorelines. It is recommended that a shoreline restoration/stabilization study performed within the next 5 years. Careful study is required to assess the current condition of seawalls, and to determine which seawalls need to be retained to protect the structures and landfill behind them, and which shoreline sections may be restored to a natural beach condition.

Managing a significant portion of the atoll as native grass and shrublands and a smaller portion of the atoll as ironwood will not only be beneficial to seabirds for breeding and resting habitat but will also demonstrate a commitment for carbon sequestering whenever possible (Conant et al. 2001; Shan et al. 2001).

Acquisition of a new airplane and small research vessel would enable fewer overall trips and increased transportation efficiency. Vessels should also be fueled by appropriately sourced biodiesel or other fuels if possible.

Sand Island Building Program within Core Historic/Development Zone

Lodging

The Planning Team evaluated visitor capacity, visitor type, and length of stay as indicated in the Preferred Alternative description. The maximum total population for any given overnight is set for 150 overnight visitors. Short-term lodging is required for visitors, researchers, agency staff, and others who stay on Sand Island from 1 night to 2 weeks. Longer-term lodging is required for volunteers, staff, researchers, and others who stay on the island on a seasonal or permanent basis from 2 weeks to year-round. Additionally, emergency overnight lodging may be required due to the island's remoteness and isolation.

Given the varying lodging needs, the Planning Team proposes a range in housing facility types to accommodate these diverse visitors while maximizing the existing structures and minimizing development impacts. Refer to Matrix Table for details on housing units and visitor capacity. Under the Preferred Alternative, the lodging types are as follows:

Officers' Quarters– Reuse eight historic officers' quarters as residences (approximately 1600 sf each) for visitors, seasonal, or permanent staff. Convert one building into a hostel to accommodate overnight visitors. The officers' quarters and hostel could accommodate about 14 people.

Duplexes—Repair and maintain existing duplexes (approximately 900 sf per unit). Duplexes can accommodate about 11 people, generally seasonal or permanent staff.

2-Story Cable-Style Units—Construct piling-design module units in place of Charlie and Bravo Barracks. Make structural repairs to Charlie Barracks immediately, and replace within 15 years. Replace Bravo Barracks by year 2010. New module structures will be constructed on existing pads, but designed in smaller units and on pilings to allow better flow of wildlife and habitat, and higher energy efficiency. These units would primarily house short-term visitors, researchers, and staff, but could easily accommodate seasonal or permanent staff and volunteers as well. Space and capacity: 12' x 24' units at 330 sf will house 48–56 people.

8-plex 1 or 2-story Units—Construct 1- or 2-story 8-plex units in place of BEQ Barracks 1 and 2. New module structures will be constructed on existing pads, but designed in smaller units and on pilings to allow better flow of wildlife and habitat, and higher energy efficiency. These units would primarily house seasonal or permanent staff. Space and capacity: 12' x 25' units at 340 sf will house 48–96 people, depending on whether the structure is a single- or double-story building.

Low-Impact Shelters—As an optional shelter type, construct clusters of low-impact shelters on pilings on existing concrete pads or on pads of demolished buildings within the residential district. Potential sites would be evaluated to rule out conflict with wildlife. These shelters would incorporate the design principles of Pacific Island regional architecture, e.g., simple structures, durable, nonpolluting and/or recycled materials, etc. These shelters would not be air-conditioned spaces. Natural ventilation, cooling, and weather protection

Cable House architectural vernacular may be applied to new lodging design

Energy efficient and smaller scale multiplex units will replace BOQ barracks

Officers' Quarters rehabilitated as residences

Sand Island Conceptual Site Plan

would be designed into the structures. The footprint of each structure would be <200 square feet. These units would provide lodgings for ecotourists, visitors staying less than 1–2 nights, or emergency guests, and would demonstrate sustainable design principles.

Emergency Shelter—The existing gymnasium could be used for emergency shelter. Repairs to the gymnasium are required, e.g., roof replacement.

Other Sand Island Buildings

Cable Station Buildings—Most of these early 1900s structures are in extremely derelict condition and pose hazards to birds, wildlife, and humans. However, they are critical to telling the early Midway story related to the Commercial Pacific Cable Company period. FWS Cultural Resources staff has assessed these structures and their recommendations are incorporated in the preferred alternative. All but one structure (#643) would be taken down to a "ruins" state. Building materials would be removed and recycled, as well as hazardous paint and materials, yet the structures' remnants would remain in place for the preservation and interpretation of the historic landscape. Further assessment is required to determine the exact extent and methods for deconstruction. Building #643 would be stabilized and repaired to a level where the structure does not pose safety or toxicity hazards, and could be interpreted.

Seaplane Hangar—Repair of the roof is required to maintain the current structure. Under the preferred alternative, the Seaplane Hangar is rehabilitated to the extent feasible to achieve functions of storage and potential military display. For example, the glass façade would be replaced.

Military Historic Structures—Several World War II-era structures still exist that historically were and still are part of island maintenance and operations. These include, among others, the Paint Shop, the Metal Shop, and the Carpentry Shop. These structures require repair and maintenance to protect the historic integrity of the buildings, and to remove hazardous materials, such as lead-based paint and asbestos, that pose threats to wildlife and humans.

Visitor Services and Facilities

Midway Atoll Visitor Center—The preferred alternative proposes that Midway Mall be rehabilitated and reused as the hub of Midway Atoll. It would become a multifunctional building, including visitor center, educational facilities and classrooms, museum/library, agency offices, and partner offices. Designed by 1940s industrial architect Albert Kahn, Midway Mall offers a lot of character and interest, and has a large amount of space to accommodate diverse activities. Its strategic location in the core historic/development area and easy access for Sand Island visitors are also positive features.

Visitor Welcome Centers—Welcome centers are required at the Inner Harbor and at Henderson Airfield, to greet, orient, and stage visitors arriving by boat or airplane. These would be modest, possibly open-air structures that would also display some interpretive exhibits.

Additionally, the Draft Monument Management Plan and Visitor Services Action Plan recommend the following strategies and activities (see section 3.4.3, **Midway Atoll Visitor Services Action Plan**):

Strategy VS-1: Implement the Midway Atoll Visitor Services Plan, providing visitor opportunities for up to 50 overnight guests at any one time.

- ***Activity VS-1.1***: Provide visitors with opportunities for wildlife-dependent recreation to enhance their knowledge and appreciation of the Monument's natural resources.
- ***Activity VS-1.2***: Provide visitors with opportunities to learn about and appreciate the Monument's cultural and historic resources.

Midway Atoll Visitor Center: hub of agency offices, educational facilities, and visitor services

Food Services

Clipper House—The Clipper House presently serves as the primary food service facility for Midway. Overall food services will need to be expanded to accommodate future population increases and enlargement of the Clipper House, reuse of older existing food service facilities, or construction of a new dining facility will be evaluated.

All Hands Club—Structure would be reused for agency operations and management due to its proximity to Midway Mall. Alternatively, the existing structure would be demolished and the area restored for habitat. Current functions would be moved to other facilities, e.g., the Galley building or Captain Brooks.

Clipper House

Captain Brooks

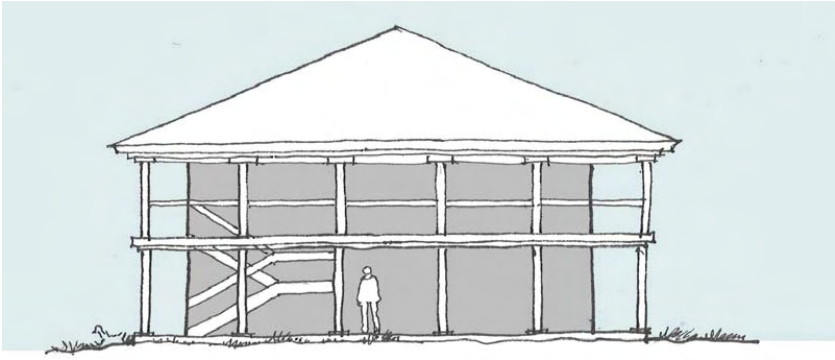
Captain Brooks—Will be maintained as is.

Galley Building—Galley Building would be reused as gift shop, snack bar, and Internet service for both visitors and staff. The rear half of the structure is in poor condition and would be demolished.

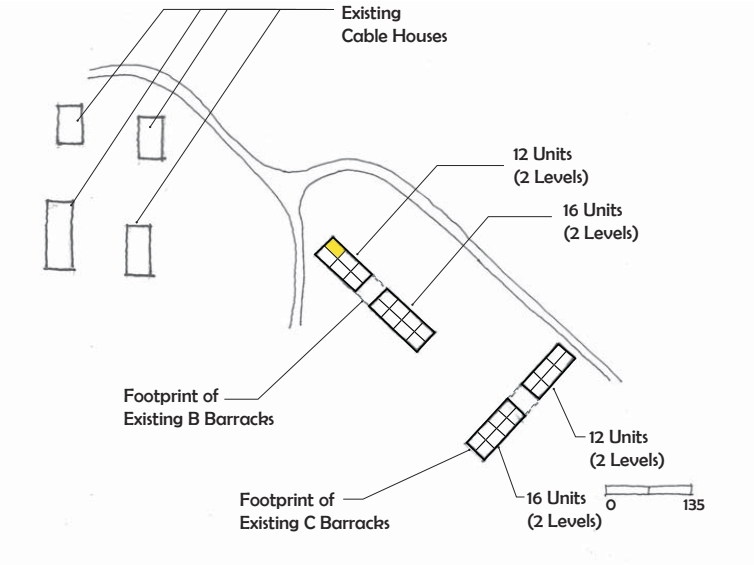
Hydroponic Greenhouse—Hydroponic greenhouse may be used for growing produce so that Midway is more self-sufficient in terms of food production.

Sand Island transportation: foot, cart, or bicycle

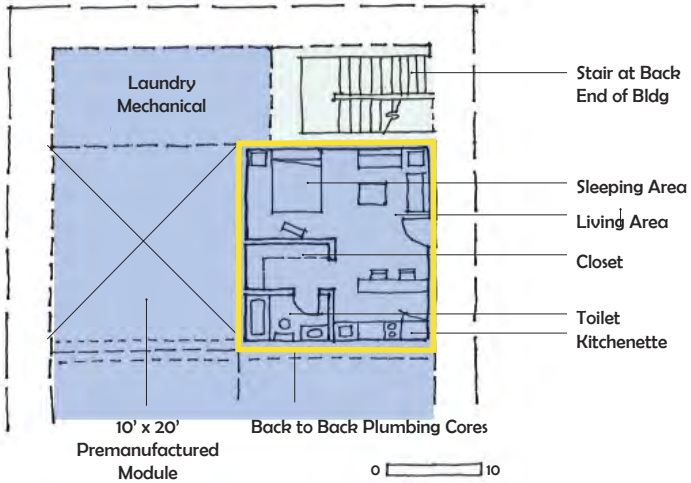
Sand Island Conceptual Site Plan



ELEVATION



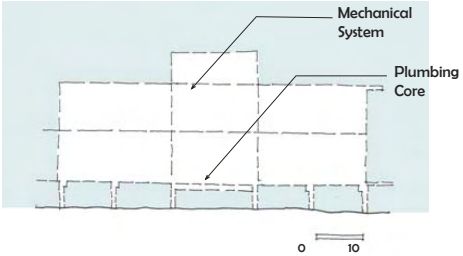
SITE PLAN



PLAN

Cable House Style ~ 1900s

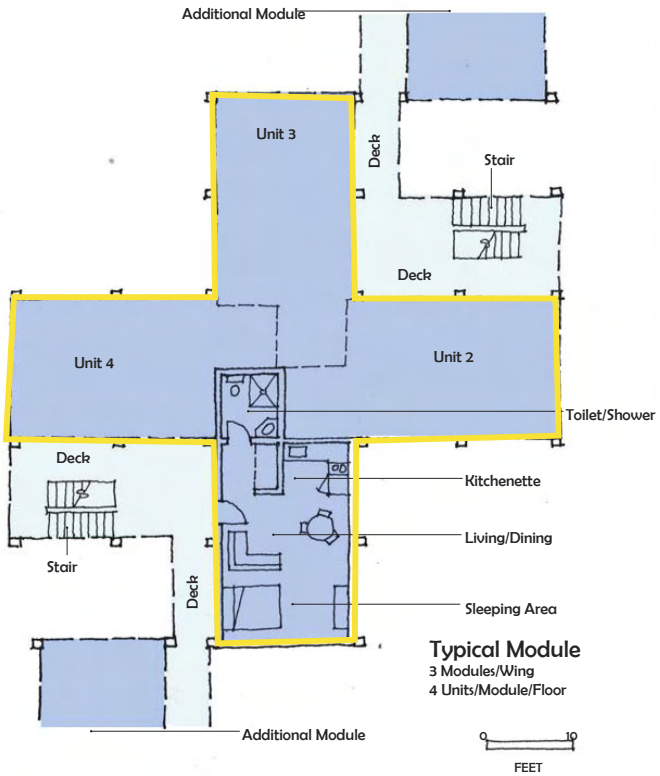
- Construct on existing concrete pads or pads of demolished buildings
- Incorporate design aesthetic of historic cable station buildings
- Smaller units allow higher energy efficiency and flow of wildlife
- Provide lodging for short-term visitors, volunteers, and staff, or seasonal and permanent staff



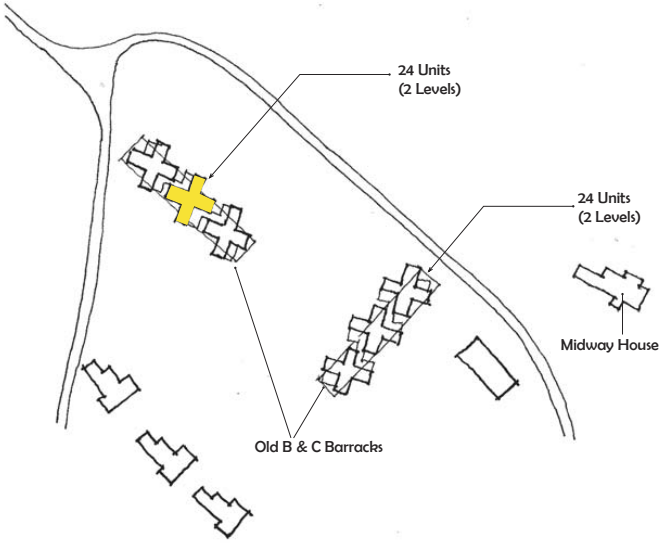
DIAGRAMMATIC ELEVATION

With "piling" design, this could be built in many locations without major disruption of the Albatross.

This plan better reflects the Kahn Builings. No attempt was made to express architectural character.



PLAN

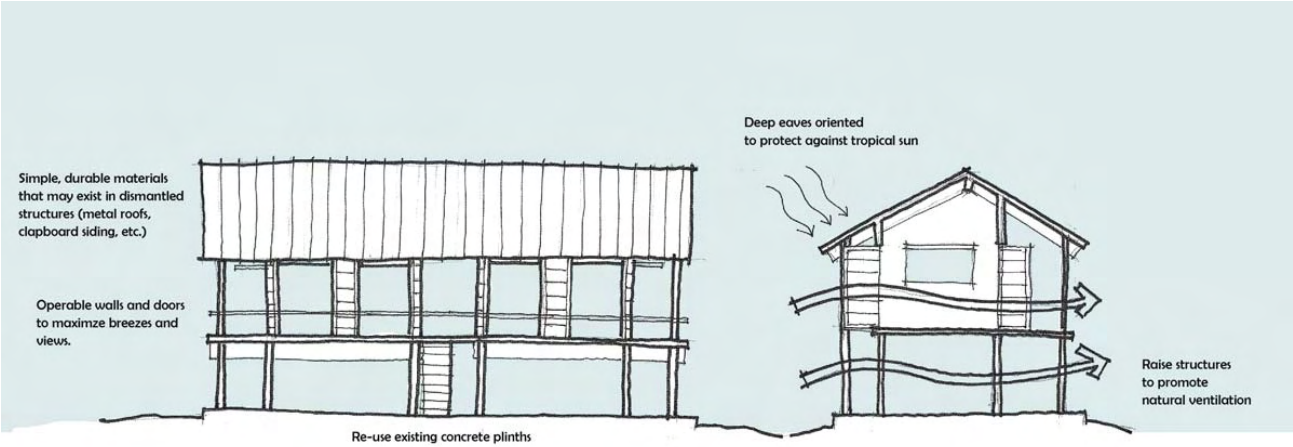


SITE PLAN
48 individual units shown on Sites of B & C Barracks

Kahn Modules ~1940s

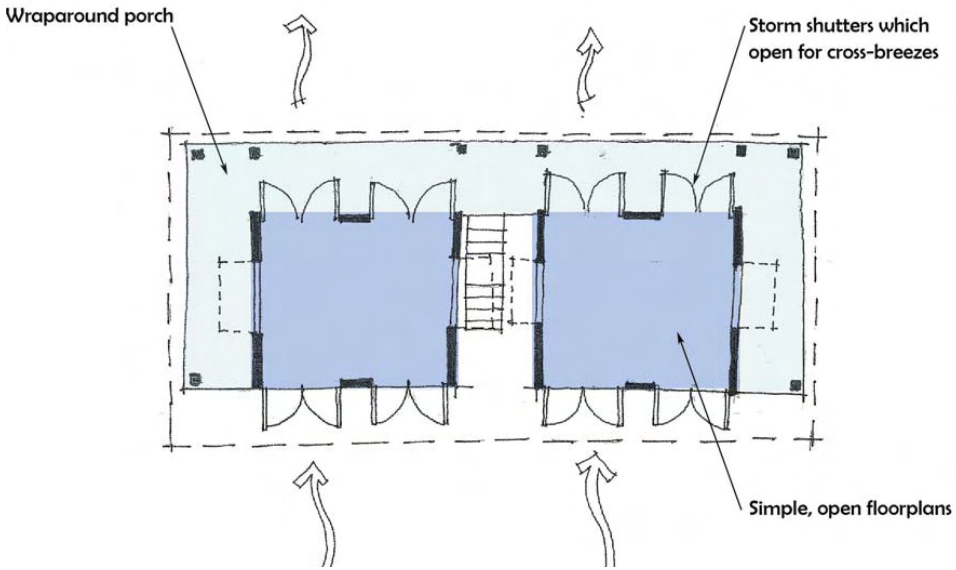
- Construct on existing concrete pads or pads of demolished buildings
- Incorporate design aesthetic of architect albert kahn
- Smaller units allow higher energy efficiency
- Provide lodging for seasonal or permanent staff

Sand Island Conceptual Site Plan



Low Impact Shelters

- Construct on existing concrete pads or pads of demolished buildings
- Incorporate design principles of Pacific Island regional architecture
- Natural ventilation, cooling, and weather protection
- Demonstrate sustainable design principles
- Provide lodging for eco-tourists, visitors staying less than 1-2 nights, or emergency guests



Architectural Concept for New Lodging: Tropical Vernacular

Midway Atoll Conceptual Site Planning

Albatross chick

Agency Research and Operations Facilities Concept

Midway Mall—FWS, NOAA, and State of Hawai'i Department of Land and Natural Resources offices and other partner facilities move into Midway Mall, which will also provide visitor services, classrooms, and other functions. Midway Mall is the hub of agency operations on Midway Atoll. The primary hub of operations for NWHI is based in Honolulu FWS, NOAA, and State offices.

Fish and Wildlife Services Office—FWS office retained for additional office facilities.

Marine Laboratory—Wet lab, dry lab, refrigeration, quarantine, and office space will be integrated into a Marine Laboratory building. The Old Commissary Building's proximity to Midway Mall suggests reuse of the building for agency research or biological programs. However, several buildings will be evaluated for this purpose.

Monk Seal Captive Care Facility—NOAA has expressed interest in creating a new Monk Seal Captive Care Facility on Sand Island. The preferred alternative locates this facility near the Inner Harbor on existing asphalt pad. This location is close to water, transportation, and the agency facilities housed in Midway Mall.

The following facilities needs were outlined by Dr. Robert Braun, contract veterinarian for the NMFS monk seal research program:

Seal Holding

a. For the first 5 years seal holding would consist of pools sufficient to hold 10–12 seals and the potential to isolate individuals. This could be accomplished with four 20' diameter holding tanks each enclosed with dry resting area to a combined foot print of 30' x 30' for each of the four tanks.

b. It would be anticipated that after 3–5 years, twice that holding would be used.

c. The total footprint in the first phase would be about 4500 sq ft with an addition expandable capacity to approximate total of 8–9000 sq ft.

Water

a. Source—there would need to be 1000–1200 gpm sea water for 10–12 juvenile seals.

b. Semi-open or closed systems could be considered when conducting environmental analysis.

Ancillary Structures

a. Fish prep—200 sq ft area would be necessary to support the 10–12 seals

b. Freezer—seal food would depend on the potential schedule of resupply.

c. Housing for 6 animal care personnel and 2–3 associated seal scientists/biologists

Quarantine Facility—required for biological species protection and recovery programs administered by FWS and/or NOAA.

Holding Tanks—required for biological species protection and recovery programs administered by FWS and/or NOAA.

Midway Mall interior

Midway Mall reused as Midway Atoll Visitor Center

Monk seal

Chugach offices and Medical Clinic

Biological research is a vital Midway Atoll activity

Nursery pen for Laysan duck reintroduction on Eastern Island

Inner Harbor Concept

The Inner Harbor area includes the historic Inner Harbor and its associated shoreline, piers, and facilities. One of two approaches to the island (by vessel or plane), theInner Harbor zone is critical to visitor arrival, transportation of services and goods, and water-based activities (e.g., ecotourism via cruise ships or mid-sized vessels, marine research, rescue operations, security).

The preferred alternative recommends several improvements to the Inner Harbor zone. The current seawall around the perimeter of the basin is extremely degraded and requires assessment and repair. Additionally, concrete rubble and other materials in-water near the west docking area impede vessel travel and anchoring; these materials need to be removed after determination of toxicity issues.

A new ramp and pier is proposed at or near the vicinity of the historic seaplane ramp in the west Inner Harbor area. The present ramp is too shallow to launch or load boats onto trailers without "floating the trailer out" beyond the launching vehicle. Further historic analysis is needed to determine if the seaplane ramp may be redesigned as a ramp suitable for boat launching, or whether it should remain in place and a new ramp and pier be constructed nearby. Additionally, a series of finger piers are needed to accommodate small or mid-sized boats. These could be constructed on the north side of the harbor in the original locations of the historic piers (demolished).

If an additional mid-sized pier is required to separate uses (e.g., operations versus visitors), a second pier could potentially be sited in the northwest corner of the boat basin.

The existing boat shop is periodically flooded by surface flows across the large asphalt surface. The structure should be demolished and a new boathouse/ dive center should be constructed further upland and possibly elevated. The Boathouse will include a dive center and storage for marine-associated equipment.

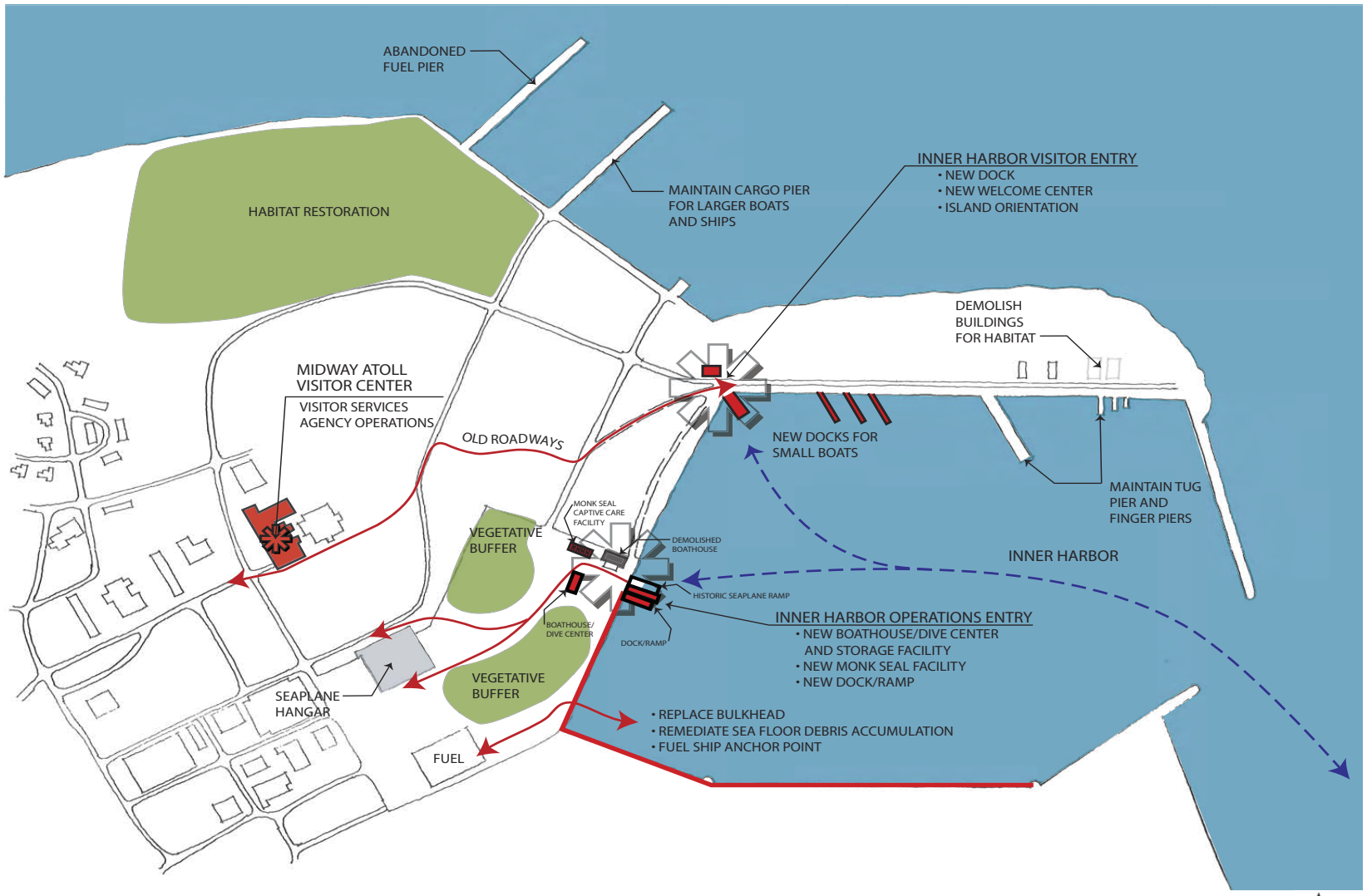
A small welcome kiosk may be appropriate onshore in the Inner Harbor in the northwest corner of the Inner Harbor to greet and orient visitors arriving by water. Paths and circulation routes to Midway Atoll Visitor Center would be clearly delineated along existing or historic routes.

Visitor arrival by boat

Historic seaplane ramp and existing boathouse

Inner Harbor seawall

new FWS boat



Inner Harbor Conceptual Plan

Midway Atoll Conceptual Site Planning

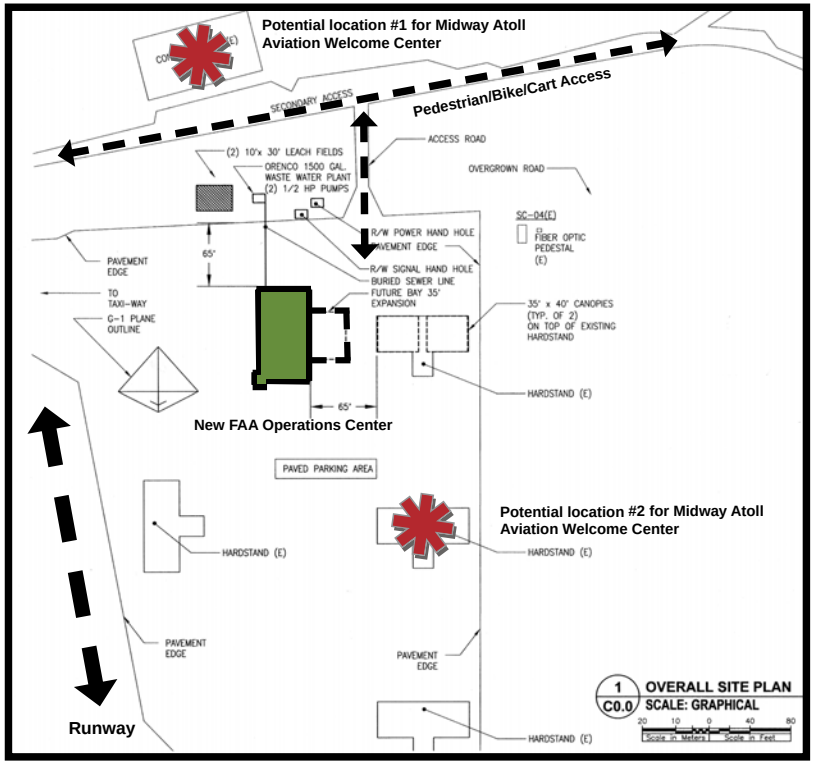
February 2008

5. Preferred Midway Atoll Conceptual Site Plan

Airport Welcome Center Concept

The Airfield Operations Zone on Sand Island includes the runway and the new Henderson Airfield operations center. One of two approaches to the island (by boat or plane), the Airfield Operations zone is critical to visitor arrival, transportation of services and goods, and aviation activities (ecotourism via air travel, research, emergency operations, security).

A new small Welcome Center would be appropriate to greet and orient visitors arriving by airplane. While the new operations center is now in place, there is no shelter to gather or greet visitors. Preliminary concepts for a Welcome Center indicate two potential locations that may be appropriate to build this facility. The proposed alternatives locate the structure on existing concrete or asphalt pads that are in close proximity to existing circulation routes but avoid conflict with airplane operations. Further analysis and coordination with FAA and Midway operations will be necessary to finalize the location of the Welcome Center.



Midway Atoll Aviation Node

Visitor arrival on Sand Island is a big event

Priority Actions and Next Steps

6

6. Priority Actions and Next Steps

Prioritization and Implementation

This Plan provides long-term guidance for management decisions at Midway, including best estimates of future needs and project activities. These estimates are substantially above current construction budget allocations, and are included primarily for strategic planning and program prioritization purposes, although they also serve to make the public aware of the costs of possible actions. Neither this draft nor the subsequent final plan constitutes a commitment of funds, or a commitment to request funds, by Federal or State agencies. All funding for actions proposed here is subject to the budgeting and appropriations processes.

The following narrative provides a preliminary framework for beginning to organize Preferred Alternative actions in terms of implementation schedule. Agency partners will work together to identify project priorities, roles and responsibilities, and potential funding sources. These projects are important to support Monument operations as a whole, benefiting all of the agencies involved with its management.

Annual Maintenance

Through the Base Operations and Support Services (BOSS) contract for operation of Midway, FWS and the Federal Aviation Administration (FAA) fund routine cyclical preventive maintenance and minor repairs of equipment and facilities. Larger maintenance projects, such as roofing replacement, are also routinely completed as an addition to the contract. Both FWS and FAA add funds for routine maintenance projects that are over and above the scope of the BOSS contract.

These two funding sources allow for required maintenance work to be completed over the course of a year to both historic and non-historic buildings and facilities. This ongoing program will continue throughout the life of the plan and will ensure that Midway's infrastructure is maintained in the best possible condition within available funding.

Larger, more expensive projects are developed and put into the Service's database for Deferred Maintenance projects for which the Service receives an annual appropriation from Congress. Midway's extensive infrastructure needs have provided justification for those larger Midway projects and their resultant funding. This has allowed the Service to systematically work towards reducing the large maintenance backlog at Midway, and it is anticipated that this level of support will continue throughout the life of this plan.

Historic Resources

Maintenance of many of Midway's significant historic buildings and facilities is included in the BOSS contract described above and as such is ongoing. However, it does not include all the historic elements as described in the Historic Preservation Plan, which makes maintenance of those elements outside the scope of the contract and a management challenge for the Service. As outlined in the Monument Management Plan (Section 3.1.3 Historic Resources Action Plan), the Historic Preservation Plan will be rewritten within the next year to be consistent with this Conceptual Site Plan and reflect the Service's commitment to reuse as many of Midway's historic buildings as possible to meet the Monument's and Refuge's needs at Midway. To maintain those buildings, structures, and facilities, additional funding must be found. The Service will work with other federal agencies, private organizations, veterans' groups, and others to find the support needed to maintain these important aspects of Midway's history.

Priority Maintenance/Construction Projects at Midway Atoll

Design and Construct Airport Welcome Center on Sand Island

$500,000 — 2 years

A small passenger terminal/welcome facility will be constructed at the airport to handle passenger arrival and departures from Midway. This simple facility will offer restrooms, baggage handling, information, and a waiting area for staging passengers out of the weather.

Develop Biodiesel or Appropriate Alternative Fuel Capacity

$750,000 — 2 years

In an effort to advance the use of sustainable technologies at Midway, small boats, vehicles, and heavy equipment will be evaluated and, where feasible, transitioned to the use of biodiesel. This fuel could be stored on the existing concrete pad along the north wall of the inner harbor near the location where new finger piers will be constructed. Alternatively tanks would be located near the newly constructed fuel farm on the southwest corner of the inner harbor.

Design and Construct a Low Impact Shelter

$1.3M — 2 years

Construct low impact shelter for short term housing in the housing zone. The housing will be constructed as a sustainable design pilot project intended to showcase the synergistic potential of innovative design on the island. The design will elevate the building off the ground, providing for human habitation while increasing the total amount of available wildlife habitat, and providing environmental security from tsunamis and storm surges. This structure will incorporate Pacific Island regional design principles to consider local wind and sunlight patterns, will aim to be nonpolluting, and will incorporate recycled materials. The use of solar power, composting toilets, and, if needed, a small rain catchment system will be explored in an effort to sustain the building off the power grid and minimize wildlife impacts.

Replace Bravo Barracks

$10M — 3 years

Demolition costs for existing building must be included in construction cost. Bravo Barracks replacement is essential in order to provide safe housing for permanent island residents and transients working on future maintenance/construction projects.

Complete Phase I Rehabilitation of the Commissary Building and Midway Mall

$2M — 3 years

Collectively the commissary building and the Midway Mall present ideal central locations for Co-Trustee and partner office, classroom, storage, and basic laboratory space. Phase I rehabilitation of the commissary will include cleaning and maintenance, construction of office and classroom space, and a feasibility study of how best to incorporate solar power and other sustainable design principles. The Midway Mall will require more substantial design and a preservation plan for renovation to provide basic office and storage space along with visitor information.

6. Priority Actions and Next Steps

Prioritization and Implementation

Termite Treatment on All Wooden/Hhistoric structures

$2M — 5 years

By treating all wooden/historic structures immediately we buy ourselves 5–10 more years to find funding for ultimate rehabilitation/restoration. Without treatment these structures either need to be rehabilitated immediately or abandoned forever.

Metal pillbox, Eastern Island

Rehabilitate Water Catchment/ Distribution System

$3M — 5 years

Reliable water will be required to support any future build-up.

Rehabilitate Septic/Wastewater System

$2M — 5 years

Reliable septic/wastewater systems will be required to support any future build-up. To reduce the required capacity and cost of the system, on-site composting and waste reduction will be considered.

Redevelop Existing Boathouse into New Boathouse, Dive Center, and Water-based Storage Facilities

$1.5M — 5 years

Redevelop the existing boathouse at Midway into a multipurpose boathouse, dive center, and storage facility to support agency operations in the northwestern end of the Monument. The facility will have maintenance bays and equipment for servicing small boats; a dive locker including a compressor, recompression chamber; and appropriate storage and work areas. The dive center may also support the visitor program. The building will be re-sited or reconstructed and potentially raised to address concerns of flooding on the seaplane pad.

Construct New Finger Piers along North Wall of Inner Harbor

$450,000 — 5 years

To meet small boat needs, within 5 years construct three finger piers along the north wall of the inner harbor across from the existing concrete pad. These piers may be used for fueling, loading, and short-term in-water storage of vessels. These vessels will be used to support programs at Midway and neighboring atolls in the future.

Design and Construct Marine Laboratory

$2.25M — 5 years

A variety of needs will be met by a marine laboratory at Midway. An evaluation and planning effort will help determine if the research and educational needs of potential users will be best met by developing several small facilities over time, or by a modular design that allows new requirements to be filled as they arise. Initially the lab would provide basic amenities to augment research and education capacity including field schools, seasonal research, and long-term monitoring. Wet/dry lab infrastructure, quarantine standards, and possibly freezer space will be included in the plan. Several locations are well-suited for a small laboratory, including the old commissary building adjacent to the Midway Mall, as well as several sites on the seaplane apron. The commissary building may be ideal for a first phase location but could help support the monk seal captive care program.

Green sea turtle on Eastern Island

Complete Full Rehabilitation of Midway Mall

$8M — 10 years

Midway Mall would be rehabilitated as the "Midway Atoll Visitor Center" and would be used as office space for FWS, NOAA, State of Hawai'i and other potential partner personnel, as well as a hub for visitor services, classrooms, and education. Phase I rehabilitation would allow for agency offices and be completed within 3 years.

Rehabilitate Officers' Row Housing

$5M — 10 years

The 10 historic Officers' row houses serve as examples of historic Albert Kahn architecture and will be restored. This increased housing capacity will accommodate increased agency and partner personnel.

Remodel or Replace Clipper House

$1.75M — 10 years

The Clipper House presently serves as the primary food service facility for Midway. Overall food services will need to be expanded to accommodate future population increases and enlargement of the Clipper House, reuse of older existing food service facilities, or construction of a new dining facility will be evaluated.

Rehabilitate Seaplane Hangar

$2.5M — 10 years

Due to its size (large enough to hold heavy equipment, boats, workshops, etc.), its location (short distance from inner harbor and boat ramp) and its historic significance (designed by Albert Kahn, still contains scars from the Battle of Midway), this building needs to be utilized and preserved. Rehabilitation work will be guided by a detailed preservation plan.

Replace Charlie Barracks

$10M — 10 years

Charlie Barracks replacement is essential in order to provide safe housing for island visitors and transient personnel. Demolition costs for the existing building must be included in the construction cost. This replacement is expected to take place within 10 years.

Repair Inner Harbor Sea Wall

$20M — 15 years

The harbor is critical to operations at Midway. Any future expansion of docking/pier facilities in the southwest corner of the harbor must be preceded by the repair of the existing sea wall.

Prioritization and Implementation

Requirements Process

Many of the priority projects listed above are the result of a Monument-wide field requirements process that took place in the fall of 2007. The goals of this process were to outline general infrastructure requirements within the Monument by matching projected field requirements with priority management needs. During this process the MMB analyzed current and future management needs and projected personnel, infrastructure, and equipment requirements to meet them. In addition, efforts were made to identify areas of overlap that could be consolidated to make field operations as efficient as possible.

The results of this process constitute a detailed vision of the long-term field requirements, primarily for Midway and neighboring atolls, but also for the Monument as a whole. These detailed requirements must have the appropriate infrastructure such as buildings, power, and water; as well as associated means of transportation, such as vessels and aircraft. The priority maintenance and construction projects listed above along with the activities in the Monument Management Plan's section 3.6.3, **Coordinated Field Operations Action Plan**, will support these requirements over the next 15 years.

Specific field requirements that were identified during the field requirements process include increases in visiting and permanently stationed personnel to oversee regular research, education, cultural, historic, management, and protected species work based out of Midway, but servicing neighboring atolls as well. Activities associated with this work will be phased in over time as the attendant infrastructure and modes of transport are developed in a way that is compatible with resource protection. The small boat and diving assets, supply needs, air transport, laboratory facilities, housing, and visitor outreach needs that were coarsely defined during the requirements process have been refined in the Midway Conceptual Site Plan and will be thoroughly evaluated and acted upon based on the strategies and activities found in the Monument Management Plan.

Summary

Several other high-priority projects (habitat, cleanup, and visitor services projects) have been identified for Midway Atoll during the process of developing this Conceptual Site Plan and the larger Monument Management Plan. For detailed information on these projects, please refer to the appropriate Actions Plans contained in the Monument Management Plan.

As the Monument Management Board and partners work toward implementation of the Monument Management Plan, it is important for all parties to find ways to make incremental steps that will lead toward the many larger projects described in this document and the Plan. By working together and combining resources to achieve common goals, agencies and partners can realize the benefits and synergy that come from people working together. This Conceptual Site Plan offers an achievable view of Midway's future considering the resources that already exist and those that hopefully will be available in the future. The vision of Midway as presented in this plan is something that can be completed within the next 15 years—it will be a challenge and an opportunity for all involved to be a part of that transformation.

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Laysan ducks in created wetland

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