Biological Evaluation

Effects of Implementing Standard Local Operating Procedures for Endangered Species in the Central and Western Pacific Region (Pac-SLOPES) on ESA-Listed Sea Turtles and Marine Mammals

July 2010

1.0 Background

This Biological Evaluation (BE) addresses the effects of implementing standard local operating procedures for endangered species in the central and western Pacific region (Pac-SLOPES) for numerous in-water and near-shore activities routinely permitted by the US Army Corps of Engineers Honolulu District (Corps) on marine species that are listed as endangered or threatened under the Endangered Species Act (ESA), and on their designated critical habitat.

On and around Hawaii, the Northwest Hawaiian Islands (NWHI), American Samoa, Guam, the Northern Mariana Islands, and the Pacific Remote Island Areas (PRIA)[1] the Corps is responsible for overseeing and permitting certain activities regulated under Section 10 of the Rivers and Harbors Act of 1899 (Section 10) and/or Section 404 of the Clean Water Act (Section 404). Structures or work in, above, or beneath navigable waters of the United States require a Department of the Army (DA) permit under Section 10 prior to the commencement of work. The law applies to any dredging or disposal of dredged material, excavation, filling, rechannelization, or any other modification of a navigable water of the United States, and applies to all structures, from the smallest floating dock to the largest commercial undertaking. It further includes, but is not limited to: construction or installation of any wharf, dolphin, weir, boom, breakwater, jetty, groin, bank stabilization, mooring structure, aerial or subaqueous power transmission line, intake or outfall pipe, permanently moored floating vessels, tunnels, artificial canals, boat ramps, aids to navigation, and any other permanent or semi-permanent obstacle or obstruction to navigation.

Section 404 requires a DA permit, issued by the Corps on behalf of the Office of the Secretary of the Army, prior to the discharge of dredged or fill material into any waters of the United States, including wetlands. Discharges of fill material generally include, but are not limited to: placement of fill necessary for the construction of any structure, or impoundment requiring rock, sand, dirt, or other material for its construction; site development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; artificial islands; property protection or reclamation devices such as riprap, groins, sea walls, breakwaters, and revetments; beach nourishment; levees; fill for intake and outfall pipes and subaqueous utility lines; fill associated with the creation of ponds; and other work involving the discharge of

[1] The PRIA comprise Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Wake Island, Palmyra Atoll, and Midway Atoll. Although physically located in the Hawaiian Archipelago, administratively, Midway is considered part of the PRIA because it is not a part of the State of Hawaii. However, for the purposes of this document, the PRIA do not include Midway Atoll. Midway is considered as part of the Northwest Hawaiian Islands.

dredged or fill material. A DA permit is required irrespective of whether the work is permanent or temporary. Examples of temporary discharges may include dewatering of dredged material before final disposal, and temporary fills for access roadways, cofferdams, and storage and work areas. The Corps annually receives several hundred permit requests for construction and repair projects that impact marine and aquatic environments in the central and western Pacific region.

Within the central and western Pacific region, nearly all nearshore marine waters, as well as the lower reaches of many freshwater streams, within the Corps' jurisdiction are occupied by ESA-listed marine species. Because the activities covered under Pac-SLOPES will occur within, near, or upstream of the marine environment, they have the potential to impact ESA-listed marine animals and their habitats across the region. The requirement for ESA consultation on the issuance of DA authorizations has resulted in a substantial and growing workload for both the Corps and the National Marine Fisheries Service (NMFS).

Many of these regulated actions involve similar activity types, and the frequently repeated consultation on them has resulted in standardized conservation practices necessary to minimize impacts on protected species and their habitats. The Corps examined the most frequently encountered regulatory actions in the region to determine the shared activity types with similar environmental effects and similar required conservation practices (conditions and best management practices) necessary for regulatory approval. In this BE the Corps has identified (through consultation with NMFS) those activity types and required practices that ensure predictably minor species impacts and environmental effects. Consequently, additional analysis or deliberation beyond confirmation that a given action meets the applicable constraints on design and the use of conservation practices, described herein, is not likely to be rewarded with additional conservation benefits.

Pac-SLOPES is designed to serve as a fundamental forum between NMFS, the Corps, and applicants for DA permits to streamline the consultation process while simultaneously reducing or eliminating the adverse effects of regulated actions on ESA-listed marine species and designated critical habitat. In Pac-SLOPES, the Corps and NMFS have established clear expectations to achieve consistent outcomes that should significantly reduce conflict over listed species and regulatory actions, thus improving public relations and creating new opportunities for further advances in listed species conservation.

The Corps intends to use Pac-SLOPES as conditioned by the consultation with NMFS PRD to guide its review of permit requests under Section 10 and Section 404. Under Pac-SLOPES, permits will be issued with conditions to ensure compliance with Section 7 of the ESA. Applications found to be outside this range of effects will be submitted to NMFS PRD for project-specific ESA consultation. As part of this programmatic consultation, NMFS will continue to review proposed Corps actions, and will confirm with the Corps during the comment period whether or not applications are within the scope of Pac-SLOPES. Communications will typically be brief and informal, such as electronic mail. Applications for actions that are found to be within the scope of Pac-SLOPES will be covered by the proposed programmatic consultation, and will require no further action by the Corps or NMFS. Additionally, the Corps and NMFS PRD will meet on an annual basis to summarize the actions permitted under Pac-SLOPES and to make recommendations to improve future effectiveness of the program.

The current scope of Pac-SLOPES is limited to those activity types that may affect, but are not likely to adversely affect ESA-listed marine species and designated critical habitat. However, Pac-SLOPES is intended to be adaptive, accountable, and credible as a conservation and regulatory tool. As such, additional categories of activities may be added and Pac-SLOPES may eventually be modified to include Essential Fish Habitat (EFH) consultations.

It is important to note here that due to the organizational structure of NMFS Pacific Islands Regional Office (PIRO), ESA and EFH consultations are completed by the Protected Resources and Habitat Conservation Divisions (PRD and HCD), respectively. Because the evaluation criteria for EFH consultation requires compliance under several laws, including the National Environmental Policy Act (NEPA), the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and the Fish and Wildlife Coordination Act, HCD is not currently in a position to participate in the proposed programmatic consultation. Although EFH considerations may eventually be incorporated into a future version of Pac-SLOPES, EFH consultations will continue to be completed with HCD on a project-specific basis. Additionally, while NMFS PRD has jurisdiction over ESA-listed sea turtles while in the water, those animals and their nests fall under the jurisdiction of the US Fish and Wildlife Service (USFWS) when above the waterline. Thus, although potential impacts on basking or nesting sea turtles, or their nests, are considered under Pac-SLOPES, those impacts will not be specifically analyzed in this BE or the resulting programmatic consultation with NMFS PRD. As such, projects that may impact those animals, nests, and above water habitats may require separate consultation with the USFWS.

This BE addresses the proposed action in compliance with Section 7(c) of the ESA of 1973, as amended. Section 7 of the ESA assures that, through consultation (or conferencing for proposed species) with NMFS and/or the U.S. Fish and Wildlife Service (USFWS), Federal actions do not jeopardize the continued existence of any threatened or endangered species or species proposed to be listed for protection under the ESA, or result in the destruction or adverse modification of critical habitat.

This BE considers modern construction equipment and methodologies, as well as the best management practices (BMPs) and both the general and the regional conditions under the Corps' Nationwide Permit (NWP) system, as well as affects analyses conducted in recent consultations with NMFS PRD for Corps actions throughout the region. This BE also considers information provided in the recovery plans and status reviews for the ESA-listed marine species known or believed to occur within the action area (refer to section 3.0 for the complete list), current scientific data, and anecdotal information.

2.0 Proposed Action & Action Area

Standard Local Operating Procedures for Endangered Species in the Central and Western Pacific Region (Pac-SLOPES)

As described above, the Corps intends to use Pac-SLOPES to ensure compliance with Section 7 of the ESA for certain activities regulated under Section 10 and Section 404. Under the proposed programmatic consultation, the Corps would use Pac-SLOPES to issue permits for the following types of actions:

1) Site preparation for above- or over-water construction;

2) Survey activities;
3) Marina or harbor repair & improvement;
4) Piling repair & removal;
5) Buoy installation & repair;
6) Maintenance dredging;
7) Other minor discharges and dredging/excavation;
8) Utility line installation & repair;
9) Outfall structure repair & replacement;
10) Bank stabilization;
11) Stream clearing;
12) Road construction, repair, and improvement;
13) Bridge repair & replacement; and
14) Vessel removal.

Use of Pac-SLOPES will ensure that these actions continue to meet requirements of the ESA with procedures that are simple to use, efficient, and accountable for all parties.

Any State Programmatic General Permit (SPGP) issued by the Corps, under Pac-SLOPES, to the State of Hawaii or to the Territorial Governments of American Samoa or Guam, or the Commonwealth of the Northern Mariana Islands (CNMI), to defer regulatory review and evaluation of permits under Section 10 and/or Section 404 will require the State or Territorial Government to administer the permit program using the same criteria the Corps applies under Pac-SLOPES, including the requirement that each applicable condition and BMP must be attached as an enforceable part of each permit document authorized under the SPGP.

Projects that are explicitly excluded from authorization under Pac-SLOPES, and as such require individual consultation, are those projects in or near the marine environment that utilize any of the following:

1) Blasting
2) Pile-driving, pre-drilling for pile-driving
3) New construction dredging or in-water trenching
4) Construction of new or expanded effluent discharge systems
5) Construction of new bank stabilization structures
6) Exploration or construction within estuaries or the marine environment that cannot be conducted from a work vessel or an existing bridge, dock, or wharf
7) Any use of treated wood in marine or aquatic habitats (other than pressure-treated)

As part of a permit evaluation or operational planning process:

1) The Corps will confirm whether or not a proposed project is within the present or historic range of an ESA-listed marine species or designated critical habitat, and make an effects determination;

2) If the Corps determines that the project may affect an ESA-listed marine species or critical habitat, the Corps will review the project for applicability under Pac-SLOPES based on the following criteria: a) The proposed project conforms with all applicable requirements and limitations described herein; b) that the general conditions below can be applied to project; and c) all potential effects on ESA-listed marine species or critical

habitats are within the range of effects considered in the programmatic consultation with NMFS PRD for the implementation of Pac-SLOPES. Actions that do not initially comply with Pac-SLOPES may be brought into compliance through technical assistance between the applicant, the Corps, and NMFS; and

3) NMFS PRD will confirm with the Corps that the given action complies with Pac-SLOPES.

As part of an adaptive management approach to improving the conservation value, efficiency, and accountability of this program; the Corps will coordinate an annual meeting with NMFS to discuss the projects completed under Pac-SLOPES and to share lessons learned in the application of this programmatic to actions throughout the region. If the Corps chooses to continue programmatic coverage for Pac-SLOPES, it will reinitiate consultation with NMFS PRD within five years of the date of completion of the current programmatic consultation.

GENERAL CONDITIONS: The Corps will apply the following set of general conditions to each action authorized under Pac-SLOPES. Additionally, specific BMPs described in section 5 under the specific activity types will be required as applicable.

1. Each applicable condition, BMP, and conservation measure will be included as an enforceable part of the permit document.

2. The Corps will retain the right of reasonable access to projects authorized under Pac-SLOPES to monitor the compliance with and effectiveness of permit conditions.

3. Each permit will contain the requirement that the permittee document and report to the Corps and NMFS, all interactions with listed species, including the disposition of any listed species that are injured or killed. Should an ESA-listed species be adversely affected, all work must stop pending reinitiation and completion of consultation between the Corps and NMFS PRD for that action.

4. Constant vigilance shall be kept for the presence of ESA-listed marine species during all aspects of the permitted action

a) A responsible party, i.e., permittee/site manager/project supervisor, shall designate a competent observer to survey work sites and the areas adjacent to the authorized work area for ESA-listed marine species;

b) Surveys shall be made prior to the start of work each day, including prior to resumption of work following any break of more than one-half hour. Periodic additional surveys throughout the work day are strongly recommended;

c) All in-water work will be postponed or halted when ESA-listed marine species are within 50 yards of the proposed work, and will only begin/resume after the animals have voluntarily departed the area, with the following exception: if ESA-listed marine species are noticed within 50 yards after work has already begun, that work may continue only if, in the best judgment of the responsible party, the activity is unlikely disturb or harm the animal(s), for

example, divers performing surveys or underwater work (excluding the use of toxic chemicals) is likely safe, the use of heavy machinery is not; and

d) No one shall attempt to feed, touch, ride, or otherwise intentionally interact with any protected species.

5. Project footprints must be limited to the minimum area necessary to complete the project.

6. The project area must be flagged to identify sensitive resource areas, such as seagrass beds, listed terrestrial plants, and turtle nests.

7. Work located waterward of the Mean Higher High Tide Line of a navigable water or waterward of the upward limits of adjacent wetlands must be timed to minimize effects on ESA-listed species and their habitats.

8. Project operations must cease under unusual conditions, such as large tidal events and high surf conditions, except for efforts to avoid or minimize resource damage.

9. A stormwater management plan, commensurate to the size of the project, must be prepared and carried out for any project that will produce any new impervious surface or a land cover conversion that will slow the entry of water into the soil to ensure that effects to water quality and hydrology are minimized.

10. A pollution and erosion control plan for the project site and adjacent areas must be prepared and carried out. As a minimum, this plan shall include:

a.) Proper installation and maintenance of silt fences, sausages, equipment diapers, and/or drippans;

b.) A contingency plan to control and clean spilled petroleum products and other toxic materials.

c.) Appropriate materials to contain and clean potential spills will be stored at the work site, and be readily available;

d.) All project-related materials and equipment placed in the water will be free of pollutants;

e.) Daily pre-work inspections of heavy equipment for cleanliness and leaks, with all heavy equipment operations postponed or halted until leaks are repaired and equipment is cleaned;

f.) Fueling of project-related vehicles and equipment will take place at least 50 feet away from the water, preferably over an impervious surface;

g.) A plan will be developed to prevent trash and debris from entering the marine environment during the project; and

h.) All construction discharge water (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) must be treated before discharge.

11. Erosion controls must be properly installed before any alteration of the area may take place.

12. Temporary access roads and drilling pads must avoid steep slopes, where grade, soil types, or other features suggest a likelihood of excessive erosion or failure; existing access routes must be utilized or improved whenever possible, in lieu of construction of new access routes.

13. All disturbed areas must be immediately stabilized following cessation of activities for any break in work longer than 4 days.

14. Drilling and sampling are restricted to uncontaminated areas, and any associated waste or spoils must be completely isolated and disposed of in an upland location.

15. Authorized work must comply with all applicable NWP General and Regional Conditions.

2.1 Action Area

The action area for the proposed action encompasses the lands and adjacent waters on and around the Hawaiian Islands, American Samoa, Guam, the Northern Mariana Islands, and the PRIA where ESA-listed marine species or their habitats may be impacted by Corps actions. This includes but is not limited to all navigable waters of the United States, other water bodies, and adjacent wetlands; such as nearshore marine waters, shoreline areas inland to the point where impacts to the marine environment and ESA-listed marine species are no longer reasonably possible, and upstream into upland watersheds to the point where impacts to the marine environment and ESA-listed marine species are no longer reasonably possible.

2.2 Activity Descriptions

The following activity type descriptions are taken in large part from the descriptions given in the Nationwide Permits (NWP) that pertain to those actions (33 CFR Part 330). Some actions which could be authorized by a Letter of Permission from the Corps or some actions that are conceivably covered under the Nationwide Permits system may fall outside the criteria for a "not likely to adversely affect" determination under the ESA. However, based on the programmatic requirements and conditions described above, and the activity-specific BMPs listed below, the following activity types have been determined not likely to adversely affect ESA-listed marine species or their habitats, and thus qualify for the proposed programmatic.

2.2.1 Site Preparation for Above- or Over-Water Construction

Under Pac-SLOPES, this activity type includes work done to prepare a site for construction or repair of any type of structure or building, driveway, parking area, garage, and storage or utility building that may take place out of the water (i.e. on over-water structures such as existing piers and docks) but still within waters of the U.S. under Corps jurisdiction. Site preparation may involve the use of heavy machinery, operated from the land, or from the deck of a barge or other vessel, for demolition of existing structures, clearing of vegetated areas, excavation, filling, grading, and laying pavement.

Vectors of potential impact include:

1. Collision with vessels;
2. Disturbance from human activity and equipment operation;
3. Exposure to elevated noise levels;
4. Exposure to elevated turbidity; and
5. Exposure to wastes and discharges.

2.2.2 Survey Activities

Under Pac-SLOPES, this activity type includes work done to determine certain characteristics of a substrate. Survey work may involve the use of heavy machinery, operated from the land, a dock or pier, or from the deck of a barge or other vessel. In-water survey work often involves the use of a small gage (approximately 3 inch diameter) pipe that is driven down into the substrate by an impact hammer or by a drill to determine the vertical constitutional makeup of the substrate from the mudline to sometimes down to more than 100 feet. Another type of in-water survey work may include the use of a grab-sampler, which is a spring-loaded clamshell bucket that takes a "bite" of the bottom sediments for chemical analysis or to determine the infauna. Another type of in-water survey includes work done to characterize marine biological communities though transects run by divers or submersibles. On-land, near water survey activities may include core sampling, exploratory trenching, seismic surveys, soil sampling, and historic resources surveys. Many activities in this category will be authorized under NWP # 6 (Survey Activities).

Survey work will likely involve the use of heavy machinery, operated from the land, from a pier or dock, or from the deck of a barge or other vessel. Heavy equipment would be used to drive core samplers, to lower and raise grab-samplers and submersibles, and to excavate trenches. Small boats may be used for diver support and to install and remove silt curtains and other in-water equipment.

The following actions are expressly excluded from coverage under Pac-SLOPES:

1) The use of active sonars and/or seismic profilers for hydrographic mapping of the seafloor;

2) In-water drilling of rock substrates is prohibited.

Potential vectors of impact include:

1. Collision with vessels;
2. Direct physical impact;
3. Disturbance from human activity and equipment operation;
4. Exposure to elevated noise levels;
5. Exposure to elevated turbidity; and
6. Exposure to wastes and discharges.

2.2.3 Marina or Harbor Repair & Improvement

Under Pac-SLOPES, this activity type includes work done to repair or replace harbor or marina structures and facilities such as buildings, driveways, and parking areas where these activities may extend into or above waters of the U.S.; the repair or replacement of overwater structures such as pier or dock surfaces (both floating and piling-supported), mooring aids (such as fenders, guards, and cleats), handrails, and ladders; the repair or replacement of in-water structures such as launch ramps, concrete steps (both pre-formed and poured in-place), or ladders that may extend below the water's surface; the removal or repair of existing pilings, and; the repair of existing breakwaters and seawalls (where the repair involves no pile-driving). Many activities in this category will be authorized under NWP # 3 (Maintenance) and NWP # 28 (Modifications of Existing Marinas).

Marina and harbor repair and improvements will likely involve the use of heavy machinery, operated from the land, or from the deck of a barge or other vessel. Heavy equipment would likely be utilized for demolition of existing structures, removal and replacement of pre-formed decks and finger piers, excavation, filling, grading, laying pavement, and replacement of breakwater stones. Small boats may be used for diver support and to install and remove silt curtains and other in-water equipment.

In addition to the general conditions listed above in Section 2.0 and the BMPs listed in Section 5, the following special conditions are required under Pac-SLOPES for this activity:

1) Repair and replacement of over- and in-water structures (such as piers, docks, and launch ramps) under Pac-SLOPES is expressly limited to their existing footprints.

2) No piling installation or piling replacement will be authorized;

3) Repair and removal work will be accomplished in a manner that minimizes the potential spread of invasive species that may reside on the pilings; and

4) Removed materials must be disposed of at an approved upland disposal site.

Potential vectors of impact include:

1. Collision with vessels;
2. Direct physical impact;
3. Disturbance from human activity and equipment operation;
4. Exposure to elevated noise levels;
5. Exposure to elevated turbidity;

6. Exposure to wastes and discharges; and
7. Loss of forage habitat.

2.2.4 Piling Repair & Removal

Under Pac-SLOPES, this activity type includes work done to repair or remove existing pilings. Repair work may take place above- or in-water, and may include the removal of cracked or spalled concrete, the application of concrete or epoxies, the welding of metal patches or sleeves, and the repair or replacement of metal structures attached to or imbedded in pilings. Removal work may include extracting entire pilings by pulling them up and out of the substrate, or it may involve divers using power tools, such as saws or cutting torches, to cut-off pilings at or below the mudline with the piling supported and lifted out by a large crane. Most activities in this category will be authorized under NWP # 3 (Maintenance).

Piling repair and removal will likely involve the use of heavy machinery operated from the land, or from the deck of a barge or other vessel. Heavy equipment would be used to support pilings or to pull them out of the substrate, or to remove cut-off pilings for disposal at an upland site. Small boats may be used for diver support and to install and remove silt curtains and other in-water equipment.

In addition to the general conditions listed above in Section 2.0 and the BMPs listed in Section 5, the following conditions are required under Pac-SLOPES for this activity:

1. Repair and removal work will be accomplished in a manner that minimizes the potential spread of invasive species that may reside on the pilings; and
2. Removed pilings must be disposed of at an approved upland disposal site; and
3. Installation of new or replacement pilings of any type is not authorized.

Potential vectors of impact include:

1. Collision with vessels;
2. Disturbance from human activity and equipment operation;
3. Exposure to elevated noise levels;
4. Exposure to elevated turbidity; and
5. Exposure to wastes and discharges.

2.2.5 Buoy Installation & Repair

Under Pac-SLOPES, this activity type includes work done to install, repair, or replace buoys used for mooring, area and regulatory markers, and aids to navigation. Many activities in this category will be authorized by NWP # 1 (Aids to Navigation), NWP # 10 (Mooring Buoys), and NWP # 11 (Temporary Recreational Structures). NWP # 1 authorizes the placement of aids to navigation and regulatory markers which are approved by and installed in accordance with the requirements of the USCG. NWP # 10 authorizes mooring buoys for non-commercial, single boat use. NWP # 11 authorizes temporary recreational structures, including temporary buoys, markers, and similar structures placed for recreation use during specific events provided the structures are removed within 30 days after use has been discontinued.

Buoy installation and repair will involve the use of vessels, and may involve the use of heavy machinery. Vessels will be used to transport buoy components, equipment, and personnel to and from deployment sites. Small boats may be used for diver support for installation and repair work. Heavy equipment may be needed for installation or removal of anchor assemblies and large buoys.

In addition to the general conditions listed above in Section 2.0 and the BMPs listed in section 5, the following conditions apply under Pac-SLOPES for this activity.

1. Anchoring locations and moorings must be designed to avoid, to the greatest extent practicable, impacts to live corals and other benthic organisms.
2. The following buoy deployments are expressly excluded from coverage under Pac-SLOPES:
   a.) Deployment of mooring buoys in or adjacent to seagrass beds;
   b.) Any new deployments or installations within the Hawaiian Islands Humpback Whale National Marine Sanctuary; and
   c) With the exception of certain wave and current monitoring systems that operate in frequency bands well outside the hearing ranges of ESA-listed marine life, the deployment of moored active acoustic devices.

Potential vectors of impact include:

1. Collision with vessels;
2. Direct physical impact;
3. Entanglement;
4. Disturbance from human activity and equipment operation;
5. Exposure to elevated noise levels;
6. Exposure to wastes and discharges; and
7. Loss of forage habitat.

2.2.6 Maintenance Dredging

Under Pac-SLOPES, this activity type includes work done to mechanically remove (e.g. clamshell buckets, backhoe, etc.) accumulated sediment for maintenance of previously authorized, existing marina basins, access channels to marinas or boat slips, and boat slips to previously authorized depths or controlling depths for ingress/egress, whichever is less. The removal of accumulated sediments and debris in the vicinity of and within existing structures (e.g., bridges, culverted road crossings, and water intake structures, etc.) is also authorized. The removal of sediment is limited to the minimum necessary to restore the waterway in the immediate vicinity of the structure to the approximate dimensions that existed when the structure was built, but cannot extend further than 100 feet in any direction from the structure. Many activities in this category will be authorized by NWP # 35 (Maintenance Dredging of Existing Basins).

Maintenance dredging will likely involve the use of heavy machinery operated from the land, from a pier or wharf, or from the deck of a barge or other vessel. Heavy equipment would be used to excavate and remove accumulated sediments for disposal elsewhere. Small boats may be used for diver support and to install and remove silt curtains and other in-water equipment.

In addition to the requirements and conditions listed above in Section 2.0 and the BMPs listed in Section 5, the following conditions apply under Pac-SLOPES for this activity:

1. With the exception of the actual dredging apparatus (e.g. clamshell buckets, or the scoop and articulated arm of a backhoe, etc.), heavy equipment will be operated from above and out of the water;
2. The portions of the equipment that enter the water will be clean and free of pollutants;
3. Appropriate silt containment devices must be used and properly installed to avoid degradation of adjacent coral reefs, and aquatic vegetation; and
4. Dredged material must be deposited at upland sites, or at EPA designated ocean disposal sites provided sediment standards are met.
5. Dredging of coral reefs, sites that support submerged aquatic vegetation (including sites where submerged aquatic vegetation is documented to exist but may not be present in a given year), and wetlands, is not authorized;
6. Use of hydraulic dredging (aka vacuum, suction, hopper) is not authorized;
7. Any form of blasting is not authorized; and
8. Any dredging for the purpose of connecting canals or other artificial waterways to navigable waters is not authorized.

Potential vectors of impact include:

1. Collision with vessels;
2. Direct physical impact;
3. Disturbance from human activity and equipment operation;
4. Exposure to elevated noise levels;
5. Exposure to elevated turbidity;
6. Exposure to wastes and discharges; and
7. Loss of forage habitat.

2.2.7 Minor Discharges and Excavations

This activity type is intended to cover small scale discharge and excavation activities that may be proposed but are not specifically considered elsewhere under Pac-SLOPES. It is anticipated that most activities in this category will be authorized by either under NWP # 18 (Minor Discharges) or under NWP # 19 (Minor Dredging).

NWP #18 authorizes minor discharges of dredged or fill material into all waters of the United States, provided the activity meets all of the following criteria:

1. The quantity of discharged material and the volume of area excavated do not exceed 25 cubic yards below the plane of the ordinary high water mark or the high tide line;

2. The discharge will not cause the loss of more than 1/10 acre of waters of the United States; and
3. The discharge is not placed for the purpose of a stream diversion.

NWP # 19 authorizes minor dredging below OHW or the high tide line from navigable waters of the United States, provided the activity meets all of the following criteria:

1. The dredging involves no more than 25 cubic yards below the plane of OHW or the mean high water mark;
2. The dredging will result in no degradation of coral reefs, submerged aquatic vegetation, or wetlands; and
3. The dredging involves no connection of canals or other artificial waterways to navigable waters.

In addition to the requirements and conditions listed above in Section 2.0 and the BMPs listed in Section 5, the following conditions apply under Pac-SLOPES for this activity:

1. The dredged or discharged material will be free of contamination; and
2. The site of excavation or discharge will contain no known forage or resting habitat for ESA-listed marine species.

Potential vectors of impact include:

1. Collision with vessels;
2. Direct physical impact;
3. Disturbance from human activity and equipment operation;
4. Exposure to elevated noise levels;
5. Exposure to elevated turbidity;
6. Exposure to wastes and discharges; and
7. Loss of forage habitat.

2.2.8 Utility Line Installation & Repair

Under Pac-SLOPES, this activity type includes work done to construct, maintain, repair, and remove utility lines and associated facilities. A utility line is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance; and any cable or wire transmission lines. The term does not include structures designed to drain a water of the U.S., such as drainage tiles, or French drains. However, the term does apply to pipes conveying drainage from another area. Many activities in this category will be authorized by NWP # 12 (Utility Line Activities).

Under Pac-SLOPES, this activity type includes work done to construct, repair, or replace utility lines and related structures and related facilities such as buildings, access roads, driveways, parking areas, foundations, and above ground utility line towers, poles, and anchors where any part of these structures impacts a water of the U.S.. It also includes the potential use of horizontal directional drilling (HDD) or similar technology to bore subterranean boreholes or tunnels through which pipelines or other conduits will be installed beneath Section 10 waters.

Utility line installation and repair work will involve the use of heavy machinery, operated from the land, or from the deck of a barge or other vessel. Heavy equipment will be used for activities that include demolition of existing structures, clearing of vegetated areas, excavation, filling, grading, laying pavement, construction, and directional-drilling or similar non-trenching technologies. Small boats may be used for diver support and to install and remove silt curtains and other in-water equipment.

In addition to the requirements and conditions listed above in Section 2.0 and the BMPs listed in Section 5, the following conditions apply to utility line installation and repair activities covered under Pac-SLOPES:

1. Utility line placement location and method must be designed to avoid to the greatest extent practicable, impacts to live corals, submerged aquatic or marine vegetation and other benthic organisms, and wetlands.
2. The following actions are expressly excluded from coverage under Pac-SLOPES:

a) New installations within the Hawaiian Islands Humpback Whale National Marine Sanctuary;

b) New installations in or adjacent to seagrass beds;

c) Installation of new or expanded outfall and/or intake structures;

d) Installation, removal, or abandonment of any pipeline used to convey toxic substances (e.g. crude oil or its derivatives, known toxic chemicals, etc.);

e) Any project that involves the installation of new power lines or other conveyances that may radiate or otherwise exude substances or energies into the marine environment;

f) Any projects that involve in-water trenching in the marine environment or in the lower reaches of freshwater streams and rivers where ESA-listed marine species may occur, or where downstream impacts of the trenching may impact those species or their habitats; and

g) Any projects that require new hydrographic surveys that employ acoustic devices such as sonars and seismic profilers.

Potential vectors of impact include:

1. Collision with vessels;
2. Direct physical impact;
3. Entanglement;
4. Disturbance from human activity and equipment operation;
5. Exposure to elevated noise levels;
6. Exposure to elevated turbidity;
7. Exposure to wastes and discharges; and
8. Loss of forage habitat.

2.2.9 Outfall Structure Repair & Replacement

Under Pac-SLOPES, this activity type includes work done to repair, modify, and/or remove outfall pipes and structures, including outfalls from wastewater treatment facilities, where the effluent is authorized, conditionally authorized, or specifically exempted by, or that are otherwise in compliance with regulations issued under the National Pollutant Discharge Elimination System Program. Included is the replacement of riprap or other approved stabilization materials to prevent erosion at an outfall structure. Many activities in this category will be authorized by NWP # 7 (Outfall Structures and Associated Intake Structures).

Outfall structure repair and replacement work will likely involve the use of heavy machinery, operated from the land, or from the deck of a barge or other vessel. Heavy equipment will be used for activities that include demolition of existing structures, clearing of vegetated areas, excavation, filling, grading, applying concrete, and other general construction. Small boats may be used for diver support and to install and remove silt curtains and other in-water equipment.

In addition to the requirements and conditions listed above in Section 2.0 and the BMPs listed in Section 5, the following conditions apply under Pac-SLOPES for this activity:

1. The following actions are expressly excluded from coverage under Pac-SLOPES:
   a.) Installation of new or expanded outfall structures;
   b.) Relocation of existing outfall structures.

Potential vectors of impact include:

1. Collision with vessels;
2. Direct physical impact;
3. Entanglement;
4. Disturbance from human activity and equipment operation;
5. Exposure to elevated noise levels;
6. Exposure to elevated turbidity; and
7. Exposure to wastes and discharges.

2.2.10 Bank Stabilization

Under Pac-SLOPES, this activity type includes work done to prevent shoreline erosion or to repair existing bank stabilization structures in or along marine or estuarine waters, or along nearshore streams and riverbanks. Work may include the demolition of existing structures, clearing of vegetated areas, excavation, grading, pouring concrete, and the placement of fill in the form of rock rip-rap, gabion baskets, concrete blocks or other pre-formed concrete shapes.

Although certain emergency measures may be taken under this programmatic to temporarily arrest erosion of natural shorelines or stream banks, construction of new permanent structures in these areas is expressly excluded from coverage under Pac-SLOPES. New construction in non-marine waterways may be covered when the project area has been confirmed to be devoid of ESA-listed marine species such as sea turtles, and appropriate conditions and BMPs are applied

to prevent downstream impacts from the action in waters potentially inhabited by those species. Most activities in this category will be authorized under NWP # 13 (Bank Stabilization).

Bank stabilization work may involve the use of heavy machinery, operated from the bank, or from the deck of a barge or other vessel.

In addition to the requirements and conditions listed above in Section 2.0 and the BMPs listed in Section 5, the following conditions apply under Pac-SLOPES to this activity:

1. No material will be discharged into special aquatic sites;
2. An activity will involve no more than 500 feet in total length along the bank;
3. The maximum amount of material placed shall not exceed the minimum needed for erosion protection;
4. No more than one cubic yard, per running foot, of new fill will be placed below ordinary high water (OHW) or the high tide line; and
5. All material will be placed in a manner that will avoid erosion by normal or expected high flows.

Potential vectors of impact include:

1. Collision with vessels;
2. Direct physical impact;
3. Disturbance from human activity and equipment operation;
4. Exposure to elevated noise levels;
5. Exposure to elevated turbidity; and
6. Exposure to wastes and discharges;

2.2.11 Stream Clearing

Under Pac-SLOPES, this activity type includes work done in rivers and streams to remove obstructions that restrict stream flow and increase the risk of upstream flooding or that pose other adverse environmental impacts. Obstruction may be the result of accumulated sediments, from improperly discarded rubbish and debris, from over-growth of invasive non-native plant species, or a combination of these or other factors. It is noted that there may be no DA permit required for such work if the work is located upstream of the Corps Section 10 jurisdictional cutoff. There is no NWP currently available for this activity. Any authorization would likely be issued under a Letter of Permission should the work fall within Corps Section 10 jurisdiction.

Stream clearing may involve the use of heavy machinery operated from the stream bank, or from the deck of a barge or other vessel, to remove debris or plant material, or to excavate sediments.

Potential vectors of impact include:

1. Collision with vessels;
2. Direct physical impact;
3. Disturbance from human activity and equipment operation;
4. Exposure to elevated noise levels;

5. Exposure to elevated turbidity; and
6. Exposure to wastes and discharges.

2.2.12 Road Construction, Repair, and Improvement

Under Pac-SLOPES, this activity type includes work done to repair existing roads through waters of the U.S. and related structures such as bridges adjacent to or over marine, estuarine, and nearshore freshwaters. Most activities in this category will be authorized under NWP # 14 (Linear Transportation Projects).

New construction in these areas is expressly excluded from coverage under Pac-SLOPES.

Road construction, repair, and improvement work may involve the use of heavy machinery for demolition of existing structures, clearing of vegetated areas, excavation, filling, grading, laying pavement, and installation or repair of bank stabilization structures (see 2.2.10 above).

In addition to the requirements and conditions listed above in Section 2.0 and the BMPs listed in Section 5, the following conditions apply under Pac-SLOPES for this activity:

1. Maximum road width shall be limited to the minimum width necessary;
2. Roads shall be designed and constructed in a manner that minimizes adverse impacts on surface and marine waters due to runoff and erosion;
3. Roads shall be constructed as near as possible to pre-construction contours and elevations;
4. Roads must be bridged or culverted in a manner that maintains surface flows with minimal modification to flow direction or velocity.

Vectors of potential impact include:

1. Direct physical impact;
2. Disturbance from human activity and equipment operation;
3. Exposure to elevated noise levels;
4. Exposure to elevated turbidity; and
5. Exposure to wastes and discharges.

2.2.13 Bridge Repair & Replacement

Under Pac-SLOPES, this activity type includes work done to repair, rehabilitate, or replace a previously authorized, currently serviceable bridge structure and associated fill, provided that the structure and/or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. This work may include discharges of dredged or fill material incidental to the repair, rehabilitation or replacement work, including cofferdams, abutments, foundation seals, piers, and

temporary construction and access fills. Many activities in this category will be authorized by NWP # 3 (Maintenance) and NWP#14 (Linear Transportation Projects).

Bridge repair, rehabilitation, or replacement will likely involve the use of heavy machinery, operated from the land, or from the deck of a barge or other vessel. Heavy equipment would be needed for demolition of existing structures, removal and replacement of structural components and debris, excavation, filling, grading, and laying pavement. Small boats may be used for diver support and to install and remove silt curtains and other in-water equipment.

In addition to the requirements and conditions listed above in Section 2.0 and the BMPs listed in Section 5, the following conditions apply under Pac-SLOPES for this activity:

1) Temporary fills must consist of stable materials, and be placed in a manner, that will not be eroded by expected high flows.
2) Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations within 30 days of project completion.
3) Installation of pilings, including steel sheetpile cofferdams, is expressly excluded from coverage under Pac-SLOPES, as is any in-water drilling.

Potential vectors of impact include:

1. Collision with vessels;
2. Direct physical impact;
3. Disturbance from human activity and equipment operation;
4. Exposure to elevated noise levels;
5. Exposure to elevated turbidity;
6. Exposure to wastes and discharges; and
7. Loss of forage habitat.

2.2.14 Removal of Structures or Vessels

Under Pac-SLOPES, this activity type includes work required for the removal of wrecked, abandoned, or disabled vessels, or the removal of man-made obstructions to navigation. This activity may require temporary structures or minor discharges of dredged or fill material. Many activities in this category will be authorized by NWP # 22 (Removal of Vessels) or by Letter of Permission.

Work to remove structures or vessels will likely involve the use of heavy machinery, operated from the land, or from the deck of a barge or other vessel. Heavy equipment will be used for activities that include demolition of existing structures, excavation, filling, and construction of temporary structures. Small boats may be used for diver support and to install and remove silt curtains and other in-water equipment.

Potential vectors of impact include:

1. Collision with vessels;
2. Direct physical impact;

3. Disturbance from human activity and equipment operation;
4. Exposure to elevated noise levels;
5. Exposure to elevated turbidity; and
6. Temporary Loss of forage habitat.

3.0 Listed Species & Critical Habitat in the Action Area

ESA-listed species under NMFS jurisdiction that are known to occur, or could reasonably be expected to occur in waters of the Western Pacific Region, include: green sea turtles (*Chelonia mydas*), hawksbill sea turtles (*Eretmochelys imbricata*), leatherback sea turtles (*Dermochelys coriacea*), loggerhead sea turtles (*Caretta caretta*), olive ridley sea turtles (*Lepidochelys olivacea*), blue whales (*Balaenoptera musculus*), fin whales *(B. physalus)*, humpback whales (*Megaptera novaeangliae*), North Pacific right whales (*Eubalaena japonica*), sei whales (*B. borealis*), sperm whales (*Physeter macrocephalus*), and Hawaiian monk seals (*Monachus schauinslandi*).

The activity types considered in this Programmatic Consultation are limited to on-land and nearshore actions within 3 miles of the shoreline. Based on that and on the preferred habitats of the ESA-listed marine species under NMFS jurisdiction in the central and western Pacific region, green and hawksbill sea turtles, along with Hawaiian monk seals, and humpback whales are the only ESA-listed species that are expected to occur within the action area. Therefore, the Corps has determined that the actions covered under this programmatic will have no effect on leatherback, loggerhead and olive ridley sea turtles, as well as blue, fin, North Pacific right, sei, and sperm whales.

Critical habitat was designated under the ESA for the Hawaiian monk seal on May 26, 1988. Designated critical habitat extends from shore to a depth of 20 fathoms in ten areas of the Northwestern Hawaiian Islands (NWHI). This is the only designated critical habitat within the action area. NMFS has been petitioned to revise monk seal designated critical habitat in the NWHI, and to designate monk seal critical habitat within the Main Hawaiian Islands (MHI). The potential impacts of Pac-SLOPES on designated critical habitat will be reconsidered when those revisions become proposed.

3.1 Green Sea Turtle. The green sea turtle was listed as threatened on July 28, 1978 (43 FR 32800), except for breeding populations found in Florida and the Pacific coast of Mexico, which were listed as endangered. These turtles are globally distributed, typically along continental coasts and islands in tropical and subtropical waters between 30° N and 30° S. They are highly migratory and use a wide range of broadly separated habitats throughout their lives. Post-hatchling and juvenile green sea turtles are believed to drift along major current systems for several years, where they are assumed to forage at, or near, the surface where currents converge. Their diet appears to be primarily carnivorous, and includes invertebrates and fish eggs. Upon reaching a carapace length of about 35 cm, juveniles recruit to nearshore habitats. Most adult green turtles appear to have a nearly exclusive herbivorous diet, consisting primarily of marine algae and seagrasses. However, greens from the eastern Pacific coast appear to have a more carnivorous diet. Every few years after reaching sexual maturity, green sea turtles make breeding

migrations that may span thousands of km between resident foraging grounds and their natal nesting areas. Green turtles in Hawaii are genetically distinct and geographically isolated, which is uncharacteristic of other regional sea turtle populations. Detailed information about the biology, habitat, and conservation status of this species is described in the recovery plan (NMFS & USFWS 1998a) and the 5-year status review (NMFS & USFWS 2007a). Globally, most of the important green sea turtle nesting populations declined substantially during the 20th century. Conservation efforts over the past 25 years or more appear to have had some positive results. Chaloupka, et. al. (2007) report that four green sea turtle index rookeries in the Pacific have shown significant increases in nester or nest abundance. However, threats and impacts persist for a number of Pacific sea turtle populations.

Foraging adult and juvenile green sea turtles occur in the nearshore waters around the all of the island archipelagos considered in this BE. Green sea turtles are very common in the main Hawaiian Islands (MHI), and the population is increasing (Chaloupka, et. al. 2007). Nesting is known to occur throughout the Hawaiian Archipelago, with about 90% taking place in the NWHI. Limited nesting also occurs in the Marianas, as well as Rose Atoll in the American Samoa Archipelago. Little is known about nesting in the PRIA, but some nesting is assumed to occur there.

3.2 Hawksbill Sea Turtle. The hawksbill sea turtle was listed as endangered on June 2, 1970 (35 FR 8490). These turtles are distributed globally in tropical and subtropical waters between 30° N and 30° S. They are highly migratory, use different habitats at different stages of their life cycle, and are most commonly associated with healthy coral reefs. Post-hatchlings and oceanic stage juveniles are believed to occupy the pelagic environment for several years where they probably drift along major current systems and feed primarily at the surface. At about 35 cm carapace length, juveniles recruit to nearshore foraging areas where they begin feeding on benthic sponges, other invertebrates, and algae. Every few years, adult hawksbill sea turtles make breeding migrations that may span thousands of km between their foraging and nesting areas. Detailed information about the biology, habitat, and conservation status of this species is described in the recovery plan (NMFS & USFWS 1998b) and the 5-year status review (NMFS & USFWS 2007b). Globally, hawksbill nesting populations declined substantially during the 20th century, and population declines appear to continue (NMFS & USFWS 2007b).

Foraging hawksbill sea turtles occur in the waters around the main Hawaiian Islands, Guam, and Tutuila in American Samoa. They also likely occur in the southern islands of the CNMI, and probably occur around at least some of the islands in the PRIA. Hawksbills are uncommon, occurring in much lower numbers than green sea turtles, but individuals are occasionally sighted foraging in nearshore waters around all of the island groups, particularly along the west side of the island of Hawaii and around Tutuila. Limited nesting is known to occur on the islands of Hawaii and Maui, on Guam, and on Tutuila. Little is known about nesting in the PRIA.

3.3 Humpback Whale. Humpback whales were listed as endangered on December 2, 1970 (35 FR 18319). They are globally-distributed baleen whales that typically inhabit waters over continental shelves, often relatively close to shore, and around some oceanic islands. They make seasonal pelagic migrations between their summer and winter ranges. In the north Pacific, they feed during the summer, in a wide arc of temperate to sub-arctic habitat that stretches from the

Kamchatka Peninsula, across the Bering Islands, and south to Canada. They prey on small schooling fishes and on large euphausiids (krill). They winter in subtropical to tropical waters, where they give birth and probably mate. Calving areas within U.S. jurisdiction are the Hawaiian Islands, Mariana Islands, and American Samoa. Little feeding is thought to occur on the wintering grounds. They reach sexual maturity between four and six years of age, and may live to be 80 years old, and may grow to 17 m long. Females typically produce a single calf about once every two or three years. Humpback whales travel singly, in pairs, or in groups of up to 15. They often form stable feeding groups that stay together throughout a summer and then reform in subsequent summers. Detailed information about the biology, habitat, and conservation status of this species is described in the recovery plan (NMFS 1991). Globally, humpback whale populations were nearly decimated by commercial whaling that persisted until the middle of the 20th century. Since gaining protection against commercial whaling, North Pacific humpback whale stocks have rebounded (Calambokidis et. al. 2008). Humpbacks are common in the shallow nearshore waters of the Main Hawaiian Islands between October and May. They are uncommon around the Mariana Islands, but are known to visit there in winter. They also occur in low numbers around American Samoa between July and December during the austral winter. There are no reports of humpback whales in the PRIA, except off Midway Island, where they are seen infrequently.

3.4 Hawaiian Monk Seal. The Hawaiian monk seal was listed as endangered on November 23, 1976 (41 FR 51611). They are among the most evolutionarily-primitive genera of seals, and are one of the most endangered marine mammals in the United States. They are endemic to the Hawaiian Archipelago, and are the only endangered marine mammal that exists wholly within the jurisdiction of the U.S.A. Although they have been reported at Johnston Atoll, in the PRIA, none have been observed since December 2003. To our current knowledge the range of the Hawaiian monk seal is limited to the NWHI and the MHI. The overwhelming majority of the population resides in the NWHI, but they are increasingly found in the MHI, where pupping is becoming more common. Monk seals spend about one third of their time on land and about two thirds in the water. They are non-migratory, but their home ranges are extensive, and inter-island movement is common. They are capable of dives of about 1,500 ft while foraging, and appear to be opportunistic feeders preying on fish, eels, mollusks, and crustaceans. Hawaiian monk seals are thought to live up to 30 years. Females reach sexual maturity at about five to ten years of age and pup a maximum of once a year. They are critically endangered, numbering approximately 1,200 animals, and decreasing by about 4% annually (NMFS 2008). The most current information to describe the biology, habitat, and conservation status of this species can be found in NMFS' 12-month finding for revision of monk seal critical habitat (74 FR 27988), published on June 12, 2009, and in the recovery plan (NMFS 2007).

4.0 Environmental Baseline Conditions

Green sea turtle populations have declined dramatically throughout the Pacific and continue to decline, with the exception of populations in the Hawaiian Islands and possibly Australia. Continued harvest by humans is considered a serious threat to green sea turtle recovery, and the turtles are vulnerable at both ends of their migratory routes. Adults and eggs are vulnerable to hunters who take them from nesting beaches in one location, and those same adults are again hunted at their nearshore feeding areas. Illegal harvest of turtles and eggs continues with

regularity in American Samoa and the Mariana Islands, and low level poaching also likely occurs in Hawaii. Habitat degradation and loss from coastal development, pollution, and global climate change are also serious threats to green sea turtles. Disease is also a significant threat to many green sea turtle populations. An often fatal tumor affliction, fibropapillomatosis, is increasing in scope and magnitude among many populations. Fisheries interactions and vessel collisions are also important threats in some areas (NMFS & USFWS 1998a).

Hawksbill sea turtle populations have also declined dramatically throughout the Pacific and almost all nesting populations continue to decline. As with the green sea turtle, continued harvest by humans is considered a serious threat to their recovery. Adults and eggs are vulnerable to hunters who take them from nesting beaches in one location, and those same adults are again hunted at their nearshore feeding areas. Illegal harvest of turtles and eggs continues with regularity in American Samoa and the Mariana Islands. Whereas greens are taken primarily for food, adult hawksbills are taken primarily for their shells. Hawksbills are not regularly eaten, probably due to their occasional toxicity and poor taste. However their eggs are readily consumed. Habitat degradation and loss from coastal development, pollution, and global climate change are also serious threats to hawksbill sea turtles. Fisheries interactions and vessel collisions are also important threats in some areas (NMFS & USFWS 1998b).

Humpback whale populations in the North and South Pacific Ocean were reduced to about a tenth of their original sizes until commercial whaling for this species was halted in1966. Since then, many populations have begun to rebound. However, humpbacks continue to be taken by some countries, such as Japan, under the auspices of scientific research, and a few other countries allow limited take in subsistence fisheries. Other anthropogenic threats include entanglement in fisheries gear such as lines and nets; ship strikes; exposure to elevated ambient noise and sonar; habitat degradation from coastal development, pollution, over fishing, and global climate change (NMFS 1991).

Hawaiian Monk Seals are in crisis and headed for extinction if urgent action is not taken. Beach counts of juveniles, sub-adults, and adults declined by 66% between the years 1958 and 2006. As of 2007, an estimated 1200 monk seals remain, with total abundance of the six main NWHI subpopulations declining at a rate of -3.9% per year (NMFS 2008). Due to low juvenile survival and an aging breeding female population, insufficient replacement of breeding females is expected to lead to declining birth rates over time, and the population is expected to fall below 1000 animals by 2012. Significant threats that face this species include: 1) Very low survival of juveniles and sub-adults in the NWHI due to starvation; 2) mortality due to entanglement in marine debris; 3) predation of juveniles by sharks; 4) loss of haul-out and pupping beaches due to erosion in the NWHI; and 5) limited available habitat in the MHI that might support relocation away from the deteriorating habitats of the NWHI, primarily due to development and human interactions, which include recreational fishery interactions, mother-pup disturbance on popular beaches, and exposure to disease (NMFS 2007).

5.0 Effects of the Action

The following section is structured to analyze the potential impacts of implementing Pac-SLOPES, as described above, on green and hawksbill sea turtles, humpback whales, and

Hawaiian monk seals. Each subsection will address the individual vectors of impact in general terms, and in terms of specific activity type when appropriate. The analyses are based on the construction methods, required BMPs and conditions, the biology and life history of the protected species considered, and on the overlaps between the habitats used by those species and the action area. Some or all the activity types can be reasonably expected to interact directly or indirectly with ESA-listed species though:

1. Collision with vessels;
2. Direct physical impact;
3. Entanglement; (w/moorings, cable, associated lines, etc.);
4. Disturbance from human activity and equipment operation;
5. Exposure to elevated noise levels;
6. Exposure to elevated turbidity;
7. Exposure to wastes and discharges; and
8. Loss of forage habitat.

5.1 Collision with vessels:

Many of the activity types described above involve the use of vessels in nearshore marine waters as well as in the lower reaches of rivers and streams. Vessels may range in size from small outboard boats used to install silt curtains or support divers, up to large tugboats and barges used to position heavy equipment at project locations.

Sea turtles and marine mammals must surface to breathe, and they are known to rest or bask at the surface. Therefore, when at or near the surface, these animals are at risk of being struck by vessels or their propellers as the vessels transit to and from as well as in and around project sites. Potential injuries and their severity will depend on the speed and size of the vessel, the part of the vessel that strikes the animal, and the body part impacted. Injuries from boat strikes may include bruising, broken bones or carapaces, and lacerations. In the case of sea turtles and seals, collisions with even small vessels can result in death. Being much larger, whales are less likely to be killed by a collision with a small boat, but they can be seriously injured by propellers, and collisions with large, fast moving oceangoing vessels is often fatal for even the largest whales.

The recovery plan for green sea turtles indicates that boat collision is a major threat around the MHI (NMFS & USFWS 1998a). Boat collision is not considered a significant risk for green sea turtles in the other archipelagos considered here, nor is it identified as a significant risk in any of the archipelagos for hawksbills, monk seals, or humpback whales. However, the recovery plans for all of these animals suggest that the incidence of collision is expected to increase as vessel size, speed, and traffic density increases, or as animal density increases (NMFS & USFWS 1998b, NMFS 1991 & 2007).

Existing information about sea turtle sensory biology suggests that sea turtles rely more heavily on visual cues, rather than auditory, to initiate threat avoidance. Research also suggests that sea turtles can not be expected to consistently notice and avoid vessels that are traveling faster than 2 knots (kts) (Hazel et al., 2007). Vanderlaan and Taggart (2007) report that the severity of injury to large whales is directly related to vessel speed. They found that the probability of lethal injury increased from 21%, for vessels traveling at 8.6 kts, to over 79% for vessels moving at 15 kts or

more. Additionally, since collisions with whales have been reported for both slow and fast moving craft, it appears that, in at least some situations, whales may either be unaware of a vessel's presence or unable to resolve the vessel's proximity and/or vector of approach based on available acoustic cues. Consequently, vessel operators must be responsible to actively watch for and avoid sea turtles and marine mammals, and to adjust their speed based on expected animal density and on lighting and turbidity conditions to allow adequate reaction time to avoid marine animals.

In addition to the general conditions described above, the following BMPs are added for activity types that may result in collision with vessels:

1. Vessel operators shall alter course to remain at least 100 yards from whales, and at least 50 yards from other marine mammals and sea turtles.
2. Reduce vessel speed to 10 knots or less when piloting vessels in the proximity of marine mammals, and to 5 knots or less when piloting vessels in areas of known or suspected turtle activity.
3. If approached by a marine mammal or turtle, put the engine in neutral and allow the animal to pass.
4. Do not encircle or trap marine mammals or sea turtles between multiple vessels or between vessels and the shore.

Based on the relatively low number of vessel trips expected to be conducted annually as part of actions covered under Pac-SLOPES, and on the expectation that the vessels will be operated in accordance with the general conditions described in section 2 and with BMPs here at 5.1, which collectively require operators to carefully watch for and avoid protected species, we consider the risk of collisions between action-related vessels and protected species to be discountable.

5.2. Direct physical impact:
Many of the activity types described above involve the use of heavy equipment such as back hoes and cranes that will be used to do work below the water's surface. Some projects also include the placement of large stones or concrete shapes in or near the water. Other projects include the placement of anchors or project materials on the seafloor. All of these activities have the potential to directly strike ESA-listed marine animals should those animals be present when the equipment or project materials strike the bottom. Potential injuries and their severity will depend on the animal's proximity to the bottom when struck, the angle of the strike, and the body part impacted, but may include cuts, bruises, broken bones, cracked or crushed carapaces, and amputations; any of which could result in the animal's death. Animals could also be pinned to the bottom and drowned.

In addition to the general conditions described above, the following BMPs are added for activity types that may result in direct physical impact:

1. Special attention will be given to verify that no ESA-listed marine animals are in the area where equipment, anchors, or materials are expected to contact the substrate before that equipment may enter the water. If practical, the use of divers to visually confirm the area is clear is preferred.

2. Equipment operators will employ "soft starts" when initiating work that directly impacts the bottom. Buckets and other equipment will be sent to the bottom in a slow and controlled manner for the first several cycles before achieving full operational impact strength or tempo.
3. All objects will be lowered to the bottom in a controlled manner. This can include the use of buoyancy controls such as lift bags, or the use of cranes, winches, or other equipment that affect positive control over the rate of decent.
4. Deployment sites will be devoid of live corals, sea grass beds, or other significant resources.

Given that marine animals will likely avoid project areas on their own due to on-going activities, that the general conditions and additional BMPs require that the project manager ensure the area is free of ESA-listed marine animals, and that all materials and equipment will lowered in a controlled manner, we have determined that the potential for impact is extremely remote and the risk of an ESA-listed animal being injured by material sent to the bottom is discountable.

5.3 Entanglement:
Many of the activity types described above involve the temporary or permanent deployment of markers, buoys, or other moorings in habitats where ESA-listed marine species may encounter lines in the water. Additionally, all actions could involve the discharge of waste materials and debris into the marine environment. Whales, sea turtles, seals, and other animals often become entangled with marine debris such as fishing nets, fishing lines, and mooring lines. As such these activities have the potential to result in the entanglement of ESA-listed marine animals. Drowning is the most serious potential effect of entanglement for air breathing marine animals that are unable to surface to breathe. Slow amputation of an appendage may occur if an entanglement becomes tighter over time, and animals may drag entangled material for the rest of their lives. This burden may require more exertion for movement, reduce foraging efficiency, and it may interfere with reproduction.

In addition to the general conditions described above, the following BMPs are added for activity types that may result in entanglement:

1. Mooring systems will employ the minimum line length necessary to account for expected fluctuations in water depth due to tides and waves.
2. Mooring systems will be designed to keep the line as tight as possible, with the intent to eliminate the potential for loops to form.
3. Mooring lines will consist of a single line. No additional lines or material capable of entangling marine life will be attached to the mooring line or to any other part of the deployed system.
4. Mooring systems will be designed to keep the gear off the bottom, by use of a mid-line float when appropriate, with the intent to eliminate scouring of corals or entanglement of the line on the substrate.
5. Proposals for permanent or long-term deployments will include an inspection and maintenance program to reduce the likelihood of failures that may result in loose mooring lines lying on the substrate or hanging below a drifting buoy.
6. Mooring systems, including those used for temporary markers, scientific sensor buoys, and vessel moorings, shall be completely removed from the marine environment

immediately at the end of a project or the mooring's service life. The only exceptions to this rule shall be mooring anchors such as eyebolts that are epoxied into the substrate and which pose little or no risk to marine life.

7. Specific BMPs to reduce or eliminate the discharge of wastes into the marine environment are listed in section 5.7

The BMPs described above are expected to result in well-maintained single line moorings that are designed to minimized slack and thus prevent loops from forming in the lines; it is most likely that mooring lines will pass harmlessly along any ESA-listed marine species that may encounter them. Additionally, the BMPs also require the complete removal of mooring systems at the end of a project's life, minimizing the time many moorings will be in the water. They also prohibit the discharge of wastes and debris. Based on this information we have determined that the risk of adverse affects on ESA-listed marine species due to entanglement related to actions covered under Pac-SLOPES is discountable.

5.4 Disturbance from human activity and equipment operation:
Nearly all of the activity types described above involve work in or near marine habitats where ESA-listed marine species may be directly exposed to project-related activity. Marine species may experience a startle reaction and resulting stress should they encounter site preparation and construction activities. The reaction could range from one extreme where an animal calmly approaches and investigates the activity, to an opposite reaction of panicked flight, where an animal injures itself in an attempt to flee. However, sea turtles and marine mammals typically avoid human activity. Thus, the most likely effect of this interaction will be moderate level stress with a moderate to high energy avoidance behavior leading to the animal rapidly leaving project areas without injury. The general conditions listed in section 2 require applicants to reduce the likelihood of this interaction by watching for and avoiding protected marine life before commencing work and by postponing or halting operations when protected species are within 50 yards of project activities. Based on that expectation, we have determined that disturbances related to actions covered under Pac-SLOPES will be infrequent and non-injurious, resulting in insignificant effects on the ESA-listed marine species discussed in this biological evaluation.

5.5 Exposure to elevated noise levels:
Activities such as blasting, pile-driving, pre-drilling, and construction dredging may produce in-air and in-water sound levels capable of injury or adverse behavioral modifications for marine mammals and other marine life. Consequently, those activity types are expressly excluded from consideration under Pac-SLOPES and will require specific consultation with NMFS. Among the activity types considered under Pac-SLOPES that are capable of producing significant in-water sound levels, maintenance dredging, in-water excavation and movement of large armor stones, and benthic core sampling are likely the loudest.

Effects vary with the frequency, intensity, and duration of the sound source, and the hearing characteristics of the affected animal. Effects may include: (1) physical injury and/or permanent hearing damage, also referred to as permanent threshold shift (PTS); and (2) behavioral impacts through temporarily reduced sensitivity also referred to as temporary threshold shifts (TTS), temporarily masked communications or acoustic environmental cues, and modified behavior such as attraction, areal avoidance.

The effects thresholds currently used by NMFS are marine mammal specific and based on levels of harassment as defined by the Marine Mammal Protection Act (MMPA). For exposure to sounds in water, ≥ 180 dB and ≥ 190 dB are the thresholds for Level A harassment (i.e. injury and/or PTS) for cetaceans and pinnipeds, respectively. The thresholds for Level B harassment for on all marine mammals in the form of TTS and other behavioral impacts are ≥ 160 dB for impulsive noises and ≥ 120 dB for continuous noises. Currently, no acoustic thresholds have been established for sea turtles. Consequently, the marine mammal thresholds will be used for sea turtles as well, under the assumption that they are likely conservative for sea turtles.

Sound can be measured and quantified in several ways, but the logarithmic decibel (dB) is the most commonly used unit of measure, and sound pressure level (SPL) is a common and convenient term used to describe intensity. In water, sound pressure is typically referenced to a baseline of 1 micropascal (re 1 μPa), vice the 20 μPa baseline used for in-air measurements. Consequently, 26 dB must be added to an in-air measurement to convert to an appropriate in-water value for an identical acoustic source (Bradley and Stern 2008). To assess the potential impact of a sound on marine resources, NMFS often assesses impacts based on the root-mean-square (dB_{rms}) of an acoustic pulse. This is the portion of a pulse that contains 90% of the sound pressure. For brevity, all further references to SPL assume dB_{rms} re 1 μPa, unless specified differently.

Transmission loss (attenuation of sound intensity over distance) varies according to several factors in water, such as water depth, bottom type, sea surface condition, salinity, and the amount of suspended solids in the water. Sound energy dissipates through mechanisms such as spreading, scattering, and absorption (Bradley and Stern 2008). Spreading refers to the apparent decrease in sound energy at any given point on the wave front because the sound energy is spread across an increasing area as the wave front radiates outward from the source. In unbounded homogenous water, sound spreads out spherically, loosing as much as 7 dB with each doubling of range. Toward the other end of the spectrum, sound expands cylindrically when vertically bounded such as by the surface and substrate, losing only about 3 dB with each doubling of range. Scattering refers to the sound energy that leaves the wave front when it "bounces" off of a surface or particles in the water. Absorption refers to the energy that is lost through conversion to heat due to fiction. Irregular substrates, rough surface waters, and particulates in the water column increase scattering loss, while soft substrates, such as mud and silt increase absorption loss. Sound typically dissipates more rapidly in shallow, turbid waters over soft substrates (74 FR 18492).The shallow nearshore waters of harbors and marinas, with silt and mud substrates, are considered poor environments for acoustic propagation.

Accurately predicting received noise levels at a given range (isopleth) requires complex equations and detailed information that is rarely available. Typically, predictions are made by estimating spreading loss based on the equations RL = SL – 20LogR, for spherical spreading, and RL = SL – 10LogR for cylindrical spreading (RL – received level; SL – source level; and R - range in meters). Actual spreading loss is thought to be somewhere between the two, with absorption and scattering increasing the loss. In the absence of site specific transmission loss data, RL = SL – 15LogR is often used to estimate the RLs for actions in the relatively shallow nearshore marine environments. That formula was used in this analysis.

Maintenance dredging, excavation, and movement of large stones: Dickerson, Reine, and Clarke (2001) characterized the underwater sounds from clamshell dredging of course sand and gravel with a cable-operated bucket. Dredging generated distinct, short duration in-water sounds between 20 and 1400 hertz (Hz) with most falling below 200 Hz. The strongest sounds were produced by the bucket's contact with the bottom. The authors recorded a peak SPL of 124 dB at 163 Hz, 158 m from the source, suggesting a SL between 156 and 167 dB. They also indicated that both frequency and intensity of the sound increased with the hardness and size of the material being dredged. They report SLs from other studies of 107 dB at 91 Hz in mud, to 162 dB at 250 Hz in coarse gravel and rocks. Based on the loudest estimated SL of 167 dB and using– 15LogR for transmission loss suggests that the 160 dB isopleth falls at 3 m from the source, whereas the 120 dB isopleth is out at about 1,260 m. The sound intensity at 50 and 100 m is about 142 dB and 137 dB, respectively. A mandatory shut-down range of 50 m for this type of work will ensure that no ESA-listed marine animals are exposed to sound levels anywhere near the TTS threshold, but they may experience an insignificant level of behavioral modification in the form of temporary avoidance of the area out as far as 1,260 meters.

Benthic core sampling: For the purposes of this BE benthic core sampling is limited to probes hammer-driven into relatively soft substrates, such as mud and sands in harbors and marinas. Hammer driving the probe is similar to impact pile-driving but normally less acoustically intense. Acoustic information for this source is limited. However, based on a recent core sampling action done in Hawaii, the in-air SL (dB re 20 μPa) for driving the probe was estimated at about 90 dB (Devin Nakayama personal communication). This would convert to an in-water SL (dB re 1 μPa) of 116 dB. Rounding up to 120 dB more than doubles the expected sound intensity, yet remains well below the TTS threshold, and the mandatory shut-down range of 50 yards for this type of work will ensure that no ESA-listed marine animals are exposed to RLs above 95 dB. Thus, it is discountable that ESA-listed marine animals will be exposed to sound levels approaching the behavioral disturbance threshold from benthic core sampling.

In addition to the general conditions described above, the following BMPs are added for activities that may result in exposure to elevated noise levels:

1. Acoustic analyses of prospective projects shall support the expectation that the 160 dB and 120 dB isopleths fall within the 50 yard shut-down range for impulsive and continuous sound sources, respectively.
2. Special attention will be given to ensure that no ESA-listed marine animals are within 50 yards of maintenance dredging, in-water excavation and movement of large armor stones, and benthic core sampling, and that those operations will immediately shut-down should an ESA-listed animal enter within that range.

Based on the information above, we have determined that exposure to elevated noise levels related to actions covered under Pac-SLOPES will be non-injurious and will result in insignificant effects on the ESA-listed marine species discussed in this biological evaluation.

5.6 Exposure to elevated turbidity:

Exposure to elevated turbidity: Given that sea turtles and marine mammals breathe air instead of water, increased turbidity should not adversely affect their respiration or other biological

functions. Although these animals may be found in turbid waters, it is likely that they may avoid dense turbidity plumes in favor of clearer water. Pac-SLOPES expressly excludes from coverage large scale in-water actions capable of generating large sediment plumes, such as in-water trenching and new construction dredging. The potential actions covered under Pac-SLOPES are relatively small scale with limited amounts of in-water substrate disturbance. Additionally, the requirements and conditions listed above in section 1, as well as the conditions and regional BMPs under the NWP system (DA 2007a & b) include measures intended to prevent or reduce erosion and contain mobilized sediments in the marine environment. As such, we expect an insignificant level of temporary avoidance as the most likely effect on ESA-listed sea turtles and marine mammals from this project component.

Based on the information above, we have determined that exposure to any plumes of elevated turbidity related to actions covered under Pac-SLOPES will be non-injurious and will result in insignificant effects on the ESA-listed marine species discussed in this biological evaluation.

5.7 Exposure to wastes and Discharges:
Construction and vessel wastes may include plastic trash and bags that may be ingested and cause digestive blockage or suffocation, or if large enough, along with discarded sections of ropes and lines, may entangle marine life. Equipment spills and discharges likely consist of hydrocarbon-based chemicals such fuel oils, gasoline, lubricants, hydraulic fluids and other toxicants, which could expose protected species to toxic chemicals. Depending on the chemicals and their concentration, exposure could result in a range of effects, from avoidance of an area to death. Local and Federal regulations prohibit the intentional discharge of toxic wastes and plastics into the marine environment. Additionally, the requirements and conditions listed above in section 1, as well as the conditions and regional BMPs under the NWP system (DA 2007a & b) include measures intended to prevent the introduction of wastes and toxicants into the marine environment.

Based on the information above, we expect that discharges and spills are unlikely to occur, but will be infrequent, small, and quickly cleaned if they do occur. Therefore, we have determined that exposure to construction wastes and discharges that may result from this action will result in insignificant effects on protected marine species.

5.8 Loss of forage habitat:
Nearly all of the activity types described above involve work in or near marine habitats where ESA-listed marine species may forage on various species of seagrass, algae, fish, and invertebrates such as mollusks, crustaceans, and sponges. Construction activities such as excavation, placement of armor stones, various concrete structures, and anchors may impact these resources through direct mechanical damage/destruction. Project components that can cause erosion and sediment mobilization also have the potential to smother forage resources. At the level of the individual, the loss of significant levels of available forage may lead to lower growth rates, reduced fitness, reduced reproductive success, and potential death by starvation. At the population level, significantly reduced forage opportunities may eventually cause local extirpation through the death or emigration of members of that population.

The actions covered under Pac-SLOPES with the greatest potential to remove or damage forage habitat are maintenance dredging and replacement of existing boat launch ramps and docks. Other potential vectors of impact include: bank stabilization, piling repair and removal, and actions that include the placement of anchors or support structures on marine substrates. The covered actions are relatively small scale with limited amounts of in-water substrate disturbance. For instance dredging is restricted to maintaining existing harbors, marinas, and channels. Harbor and marina improvements must remain within the existing footprint, and the placement of anchors and support structures must avoid important forage habitats such as seagrass beds and coral reefs. Any losses due to mechanical damage are expected to be temporary, because epibenthic life will likely re-colonize damaged areas and cover new structures soon after construction is complete. Additionally, the requirements and conditions listed above in section 1, as well as the conditions and regional BMPs under the NWP system (DA 2007a & b) include measures intended to prevent or reduce erosion and contain mobilized sediments that might smother forage resources.

Based on the information above, we expect that potential forage losses will be small in area and temporary in duration. Therefore, we have determined that the loss of forage habitat that may result from this action will result in insignificant effects on protected marine species.

6.0 ESA Determinations

Based on our analysis of the possible impacts on ESA-listed species and critical habitat, the Corps has initially determined that the proposed action; i.e., the use of Pac-SLOPES, as described above, to guide the administration of certain activities regulated under Section 10 and Section 404 is not likely to adversely affect endangered or threatened species under NMFS jurisdiction or to destroy or adversely modify critical habitat.

7.0 References

Bradley, D.L. and Stern, R. 2008. Underwater Sound and the Marine Mammal Acoustic Environment – A Guide to Fundamental Principles. Prepared for the U. S. Marine Mammal Commission. 67 pp. July, 2008.

Calambokidis, J. and 21 others. 2007. SPLASH: Structure of populations, levels of abundance and status of humpback whales in the North Pacific. Final report for contract AB133F-03-RP-00078. Cascadia Research, Olympia, WA. Available at: http://www.cascadiaresearch.org/reports/rep-NPAC.pdf

Chaloupka, M., Bjorndal, K.A., Balazs, G.H., Bolten, A.B., Ehrhart, L.M., Limpus, C.J., Suganuma, H., Troeng, S. and M. Yamaguchi. 2007. Encouraging outlook for recovery of a once severely exploited marine megaherbivore. Global Ecology and Biogeography: 1-8.

Department of the Army (DA). 2007a. 2007 Nationwide Permits, Conditions, Further Information, and Definitions (with corrections). In Part II of the *Federal Register* (72 FR 11092), reissuance of all existing Nationwide Permits (NWPs), general conditions, and definitions with some modifications. March 12, 2007. Available at: http://www.usace.army.mil/cw/cecwo/reg/nwp/nwp2007_gen_conditions_def.pdf

---. 2007b. Reissuance of Nationwide Permits and Final Regional Conditions for Honolulu District. August 31, 2007. Available at: http://www.poh.usace.army.mil/PA/PublicNotices/PN20070831-351.pdf

---. 2009a. DA Pre-Construction Notice regarding POH-2009-145, the application by the DLNR, DOBOR, State of Hawaii, to perform geotechnical exploration along Row 500 in the Ala Wai SBH, Honolulu, Oahu. June 23, 2009.

Dickerson, C., Reine, K.J., and Clarke, D.G. 2001. Characterization of underwater sounds produced by bucket dredging operations. DOER Technical Notes Collection (ERDC) TN-DOER-E14), U.S. Army Engineer Research and Development Center, Vicksburg, MS http://www.wes.army.mil/el/dots/doer

Hazel, J., I.R. Lawler, H. Marsh, and S. Robson. 2007. Vessel speed increases collision risk for the green turtle *Chelonia mydas*. Endangered Species Research 3: 105-113.

National Marine Fisheries Service (NMFS). 1991. Recovery Plan for the Humpback Whale *Megaptera novaeangliae*). 115 pp. Available from: http://www.nmfs.noaa.gov/pr/pdfs/recovery/whale_humpback.pdf

---. 2004. Biological Opinion (SLOPES III) on the Proposed Regulatory Amendments to the Fisheries management Plan for the Pelagic Fisheries of the Western Pacific Region. NMFS, Honolulu, HI. February 23, 2004. Available from: http://www.fpir.noaa.gov/DPR/dn_public_documents.html

---. 2007. Recovery Plan for the Hawaiian Monk Seal (*Monachus schauinslandi*). Second Revision. NMFS, Silver Spring, MD. 165 pp. Available from: http://www.nmfs.noaa.gov/pr/pdfs/recovery/hawaiianmonkseal.pdf

---. 2008. Stock Assessment Report for the Hawaiian Monk Seal (*Monachus schauinslandi*). 8 pp. December 15, 2008. Available at: http://www.nmfs.noaa.gov/pr/pdfs/sars/po2008sehm-hi.pdf

NMFS and U.S. Fish and Wildlife Service (USFWS). 1998a. Recovery Plan for U.S. Pacific Populations of the Green Turtle (*Chelonia mydas*). NMFS, Silver Spring, MD. 97 pp. Available from: http://www.nmfs.noaa.gov/pr/pdfs/recovery/turtle_green_pacific.pdf

---. 1998b. Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle (*Eretmochelys imbricata*). NMFS, Silver Spring, MD. 95 pp. Available from: http://www.nmfs.noaa.gov/pr/pdfs/recovery/turtle_hawksbill_pacific.pdf

---. 2007a. Green Sea Turtle (*Chelonia mydas*). 5-Year Review: Summary and Evaluation. 105 pp. Available from: http://www.nmfs.noaa.gov/pr/pdfs/species/greenturtle_5yearreview.pdf

---. 2007b. Hawksbill Sea Turtle (*Eretmochelys imbricata*). 5-Year Review: Summary and Evaluation. 93 pp. Available from: http://www.nmfs.noaa.gov/pr/pdfs/species/hawksbill_5yearreview.pdf

Vanderlaan, A.S.M., and C.T. Taggart. 2007. Vessel Collisions with Whales: The Probability of Lethal Injury Based on Vessel Speed. Marine Mammal Science 2(1): 144-156.