Programmatic Environmental Assessment

Marine Turtle Assessment Program (MTAP)

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National Marine Fisheries Service,
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Summary

This Programmatic Environmental Assessment (PEA) was prepared in accordance with National Environmental Policy Act of 1969 (42 U.S.C. §4321, *et seq*.), as implemented by the Council of Environmental Quality regulations (40 C.F.R. §1500-1508); and NOAA Administrative Order Series (NAO) 216-6, *Environmental Review Procedures for Implementing the National Environmental Policy Act*, of May 20, 1999.

The green, hawksbill, loggerhead, leatherback, and olive ridley sea turtles are all listed under section 4(c) of the Endangered Species Act of 1972 (16 U.S.C. §1531, *et seq*.). Under the proposed action, the Marine Turtle Assessment Program (MTAP) proposes to continue its research activities with the addition of field data collection and new studies in the U.S. Insular Areas of the Pacific Islands Region. The research activities include collecting biological and ecological data on marine turtle stocks in the U.S. Insular Area of the Pacific Islands Region, providing analytical population assessment modeling to, and collaborating with, marine turtle researchers across the Pacific Islands Region, and contributing to the scientific literature through publications relevant to the recovery of these stocks. The MTAP also includes responding to and aiding stranded turtles. The potential impacts on the human environment of the proposed action, and a range of reasonable alternatives, are discussed and analyzed in this PEA.

Contents

Acronym	Full description
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CNMI	Commonwealth of the Northern Mariana Islands
DAR	State of Hawaii, Division of Aquatic Resources
DLNR	State of Hawaii, Department of Land and Natural Resources
DOI	Department of the Interior
DPS	Distinct Population Segment
EA	Environmental Assessment
EOD	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act of 1973
FBSAD	Fisheries Biology and Stock Assessment Division of PIFSC
FFS	French Frigate Shoals
FONSI	Finding of No Significant Impact
FP	Fibropapillomatosis disease
GPS	Global Positioning System
IACUC	Institutional Animal Care and Use Committee
IUCN	International Union for Conservation of Nature and Natural Resources
KRF	Kewalo Research Facility
MHI	Main Hawaiian Islands
MPA	Marine Protected Area
MTAP	Marine Turtle Assessment Program of PSD/PIFSC
MTRP	Marine Turtle Research Program of PSD/PIFSC
NEPA	National Environmental Policy Act of 1969
NGO	Non-Governmental Organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOC	National Ocean Council
NPS	United States National Park Service
NRC	National Research Council
NWHI	Northwestern Hawaiian Islands
PEA	Programmatic Environmental Assessment
PIFSC	NMFS Pacific Islands Fisheries Science Center
PIRO	NMFS Pacific Islands Regional Office
PIT	Passive Integrated Transponder
PMNM	Papahānaumokuākea Marine National Monument
PSD	Protected Species Division of PIFSC
RIA	Radioimmunoassay
RPM	Responsible Program Manager
SPREP	South Pacific Regional Environmental Program
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

1 Purpose of and Need for Action

1.1 Status of Sea Turtles in the Pacific

Green, hawksbill, loggerhead, leatherback, and olive ridley sea turtles are protected throughout United States waters under the Endangered Species Act of 1972 (ESA) . In the central and western Pacific, this includes: Hawaii, Guam, the Commonwealth of the Northern Mariana Islands (CNMI), American Samoa, Howland Island, Baker Island, Wake Island, Jarvis Island, Midway Atoll, Johnston Atoll, Palmyra Atoll, and Kingman Reef (NMFS and USFWS 1998a, 1998b, 1998c, 1998d, 1998e). Inclusion of these species into the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has made it illegal to trade any products made from these species among the U.S. and 169 other countries. Recovery plans for all U.S. Pacific populations of sea turtles were finalized in 1998 and serve as guidance in actions to recover these stocks.

The green turtle (*Chelonia mydas*) is listed as threatened under the ESA throughout its Pacific Range, except for the endangered population nesting on the Pacific coast of Mexico. The green turtle in Hawaii is a genetically distinct stock. Analysis of mitochondrial DNA demonstrates the genetic discontinuity of the Hawaii population from other green turtle populations in the Pacific (Bowen *et al.* 1992, Balazs and Chaloupka 2004b, Dutton *et al.* 2008). Furthermore, protection and management of the Hawaiian stock are not complicated by international migrations because this stock forages and nests within the jurisdiction of only one country. Foraging grounds are primarily located in the waters surrounding the Main Hawaiian Islands (MHI), whereas nesting primarily occurs on sandy beaches 500 miles to the northwest of Honolulu in the Northwestern Hawaiian Islands (NWHI), with 90% of all nesting occurring at French Frigate Shoals (FFS) (Figure 1) (Balazs 1976). The Hawaiian green turtle stock is demonstrating encouraging signs of population recovery after years of protective efforts as indicated by a steady long-term increase in the number of nesting females in the NWHI as well as increases in the number of immature green turtles residing in foraging pastures of the MHI (Balazs 1996, Balazs and Chaloupka 2004, Balazs and Chaloupka 2006, Chaloupka and Balazs 2007, Chaloupka *et al.* 2008a). However, outside of Hawaii, green turtle populations have seriously declined throughout most of the Pacific. The harvest of green turtles by humans for meat and eggs is the most serious threat. Other threats include habitat loss, incidental capture in commercial and recreational fishing gear, boat collisions, shark attack, and the tumor disease fibropapillomatosis (FP) (NMFS and USFWS 1998a, Chaloupka *et al.* 2008b).

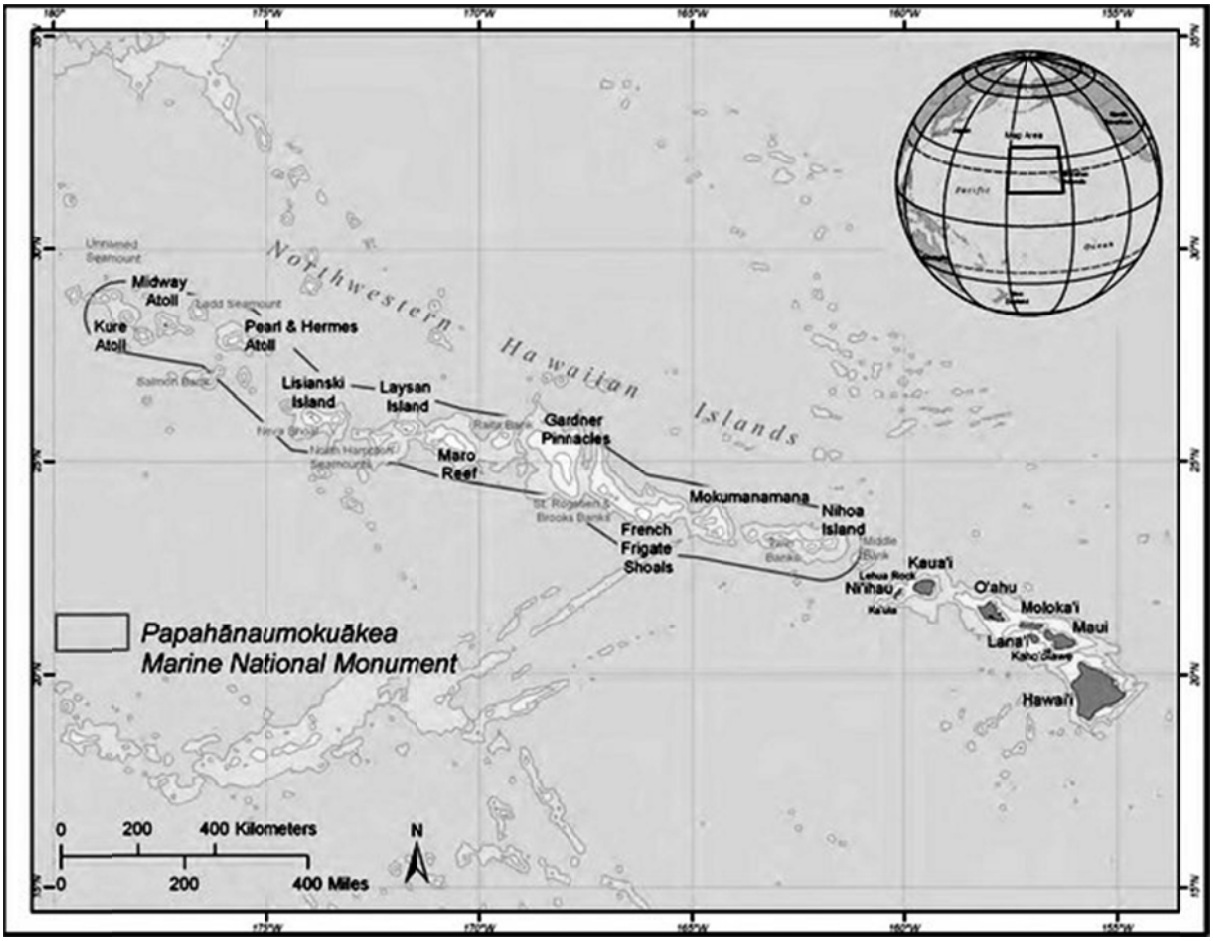

Figure 1. The Hawaiian Archipelago, showing the Northwestern Hawaiian Islands, Main Hawaiian Islands, and boundaries of the Papahanaumokuakea Marine National Monument (from noaa.gov)

The hawksbill turtle (*Eretmochelys imbricata)* is globally listed as endangered. Hawksbill populations have declined dramatically in the Pacific (Mortimer and Donnelly 2008) and the species is rapidly approaching extinction because of a number of factors. The intentional harvest of this species for meat and eggs and the illegal international trade of tortoiseshell are the greatest threats to its survival. Other threats to the continued existence of this species include beach erosion, coastal construction, habitat loss, capture in fishing nets, and boat collisions (NMFS and USFWS 1998b). Hawksbills nest in small numbers and are generally rare in the MHI (Parker *et al.* 2009) but they also occur in the NWHI and likely nested their historically (Van Houtan *et al.* 2012). Hawksbills are uncommon in nearshore waters throughout the PIR, in Guam, CNMI, and American Samoa and nesting is not regularly monitored (Grant et al. 1987, Hutchinson et al. 2008). Their occurrence and distribution in the PRIAs is not well understood.

The loggerhead turtle (*Caretta caretta*) is listed as an endangered species for the North and South Pacific distinct population segments (76 FR 58868). Loggerheads in the North Pacific are derived primarily from nesting beaches in Japan (Bowen *et al.* 1995, Kamezaki *et al.* 2003); whereas, loggerheads in the South Pacific are derived primarily from nesting beaches in eastern Australia and New Caledonia (Limpus and

Limpus 2003, Boyle *et al.* 2009). These stocks are threatened primarily by incidental capture in commercial fishing gear (i.e., longline gear and nets) and loss or degradation of nesting habitat (NMFS and USFWS 1998d, Polovina *et al.* 2000, 2003, 2004, 2006, Peckham *et al.* 2007, Howell *et al.* 2008, Howell *et al.* 2010, Kobayashi *et al.* 2008, Chaloupka *et al.* 2008c).

The leatherback turtle (*Dermochelys coriacea*) is listed as endangered throughout its range. Leatherback populations in the Pacific are in decline. The decline is primarily attributed to incidental take in coastal and high seas fisheries, the killing of nesting females by humans for meat, and the collecting of eggs at nesting beaches. Leatherbacks encountered in Hawaii represent individuals in transit between nesting beaches and foraging grounds. Some of the largest nesting populations of leatherback turtles in the world border the Pacific Ocean, but no nesting occurs on beaches under U.S. jurisdiction (NMFS and USFWS 1998c).

The olive ridley turtle (*Lepidochelys olivacea*) is listed as threatened in the Pacific, except for the Mexican nesting population, which is classified as endangered. The olive ridley is widely regarded as the most abundant sea turtle in the world; however, it is rare in the central Pacific since there are no nesting beaches in the Pacific Islands. Occasionally, a wayward female is found nesting in the Hawaiian Islands, most recently in 2009 on the Island of Oahu. Individuals also occasionally strand in the MHI and are incidentally captured in the Hawaii-based deep-set longline fishery more frequently than the other species. The primary threats to this species throughout the Pacific are incidental take in fisheries and harvest of eggs and adults on Mexican and Central American nesting beaches (NMFS and USFWS 1998e).

1.2 Background of the Marine Turtle Assessment Program (MTAP)

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share responsibility for the conservation and recovery of sea turtles pursuant to ESA mandates. NMFS has the lead responsibility for the conservation and recovery of sea turtles in the marine environment and USFWS has the lead on land. Within the Pacific Islands Region, NMFS has two independent offices that carry out different aspects of the sea turtle recovery. At NMFS's Pacific Islands Fisheries Science Center (PIFSC), the duties of collecting and analyzing data are carried out. The Marine Turtle Assessment Program (MTAP) plays a key role in supporting this mandate in coordination with the Marine Turtle Research Program (MTRP). At NMFS's Pacific Islands Regional Office (PIRO), the Protected Resources Division is responsible for the management aspects of sea turtle recovery, such as writing biological opinions per Section 7 of the ESA.

The MTAP was created at PIFSC when a need for analytical modeling of turtle population dynamics was identified. Prior to the formation of the MTAP, in 1981, NMFS created the MTRP to study the biology and ecology of green sea turtles at its Honolulu Laboratory, now the PIFSC. The MTRP serves as the primary data collection and analysis entity of sea turtles in Hawaii. The MTRP has focused its data collection efforts on the Hawaiian Archipelago because of the threats posed to green sea turtles in the islands. The creation of the MTAP naturally follows the maturation of the MTRP and the databases it maintains. It also coincides with the expansion of U.S. commercial fisheries in the Pacific Ocean. The MTAP started under the direction of the stock assessment team of the Marine Mammal Research Program and became an independent program in 2005. Since its inception, the MTAP has focused on

providing analytical services to resource managers. The MTAP also collaborates with researchers from around the Pacific Islands Region on data planning and gathering across the Pacific Islands Region. These tasks focus on green, hawksbill, loggerhead, and leatherback turtles, though olive ridley turtles receive attention as they are incidentally captured in commercial fisheries. The MTAP is proposing to expand the data gathering efforts and build research infrastructure in the U.S. Insular Areas because the sea turtle populations in these areas are poorly understood. These programs would be modeled after the MTRP.

1.2.1 Population Assessments, Models, and other Analytical Services

Evaluating population variability, growth, and viability are a fundamental components of wildlife ecology and management (Pimm 1991). Such assessments are useful for: (i) distinguishing how anthropogenic and natural forces regulate sea turtle populations (Van Houtan and Halley 2011, Van Houtan 2011), (ii) establishing historical baselines (Jackson et al. 2001, Lotze et al. 2006), (iii) designing recovery and management plans, (iv) conducting regular assessments of protected species as mandated by the Endangered Species Act, and (v) providing scientific advice under ESA Section 7 Consultations or EIS. As the lead analytical program for NMFS in the PIR, MTAP generates the models, assessments, and other analytical services for the PIRO, the MTRP, and other partner agencies.

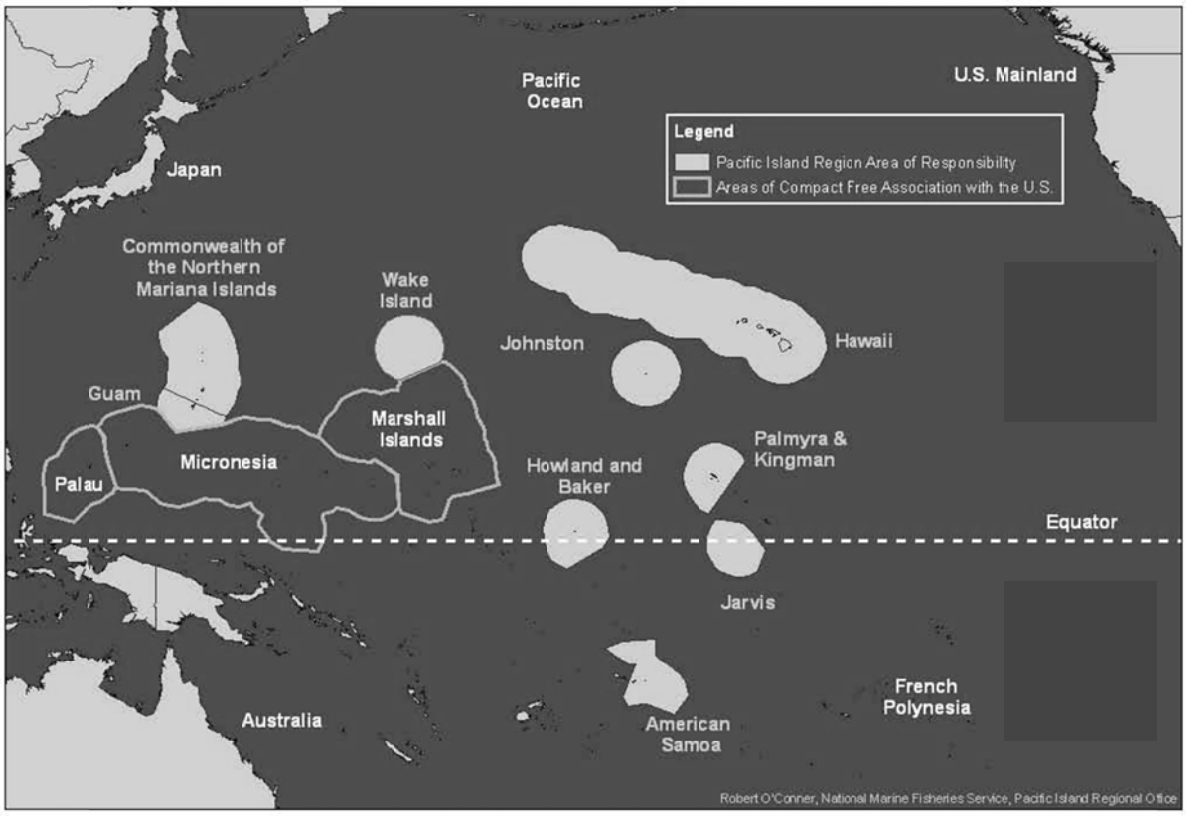

Figure 2. Pacific Islands Region, with the United States Exclusive Economic Zone shaded around each island under United States sovereignty (from noaa.gov)

1.2.2 Nesting Surveys to Assess Abundance, Trends, Survival, and Threats

Nesting surveys are the most common method used to monitor marine turtle populations. Appropriately designed nesting beach surveys can provide information on the size of the adult female population, hatchling production, and inter-annual variability in production (Schroeder and Murphy 1999). Threats to these life-stages (i.e., nesting females and hatchlings) can be quantified such as: (1) nest destruction from predation, inundation, and other females attempting to nest; (2) habitat loss from beach erosion and sea level rise; and (3) hatchling predation on land and in the water. When new turtles are identified during nesting surveys, they are tagged, measured, and sampled (e.g., tissue for genetic analysis and health), and tags of previously tagged turtles are recorded. Satellite tags, or time-depth recorders, or both are deployed on nesting green turtles to determine habitat use, migration routes between breeding and foraging grounds (Balazs and Ellis 2000), daily and seasonal use of foraging and resting habitat, and localized movements of breeding males and gravid females between nesting and breeding sites and associated basking sites. Temperature data loggers are deployed in the substrate of East Island to provide data relevant to temperature-dependent sex determination and sex ratios of green turtle hatchlings.

Recognizing the importance of these data, MTAP is focused on replicating the nesting survey efforts implemented by the MTRP on East Island at FFS (Figure 3) for the last 38 years. The MTAP will work across the Pacific Islands Region at key nesting locations for regional turtle populations, especially those known to be incidentally captured in U.S. commercial fisheries.

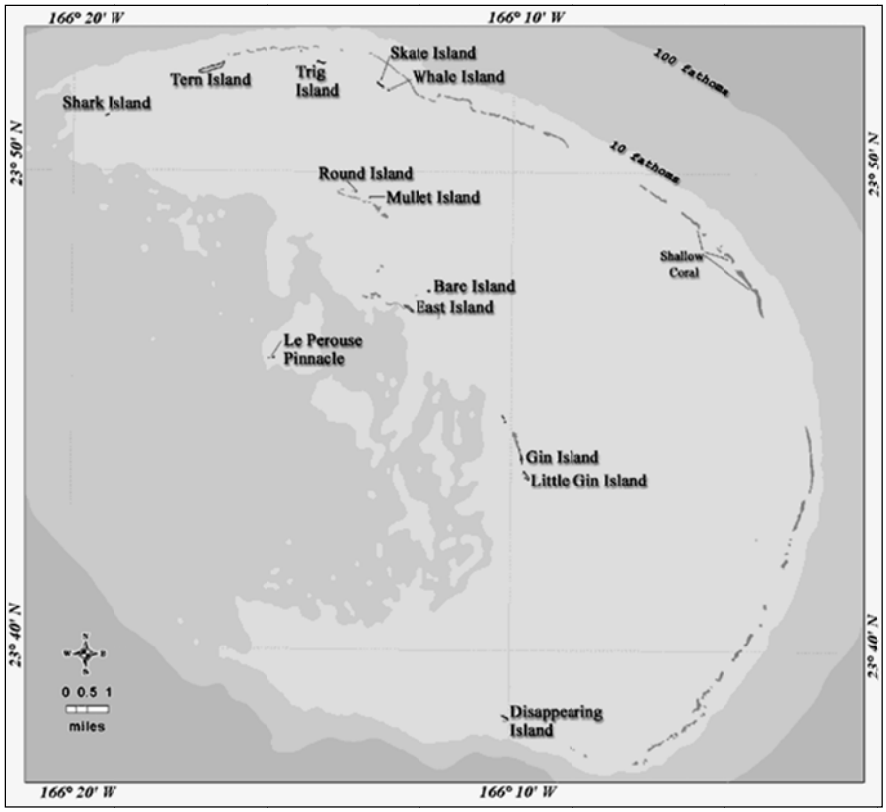

Figure 3. Map of French Frigate Shoals (from noaa.gov).

1.2.3 Foraging and Resting Habitat Surveys to Assess Abundance, Trends, Survival, Growth, and Other Demographic Factors

Research directed towards sea turtles on foraging and aquatic resting grounds can provide a wealth of information on the abundance, trends, survival and growth of juvenile and adult turtles. Well-designed monitoring studies include animal tagging to provide information on individuals, habitat use, growth, diet, health and disease, survival, and residency. A primary goal of foraging ground research is to integrate data from genetic analysis, flipper tagging, and satellite telemetry to reveal the population structure of turtles occurring in near-shore ecosystems across the Pacific Islands Region.

Turtles are captured in shallow coastal and reef waters for these studies using various methods, including: hand net, scoop net, hand capture while snorkeling, hand capture while diving from a slowly moving boat, or entanglement net capture (Balazs *et al.* 1987, Balazs *et al.* 1998). All of these methods have been successfully and safely employed to study and tag green turtles in coastal waters of the Hawaiian Islands. Turtles are released at or very close to the capture site shortly after they have been processed.

1.2.4 Stranding Response and Research

The stranding research program of the MTRP has responded to sick, injured, or dead marine turtles in Hawaii since 1982. Necropsies of stranded turtles provide information on species distribution, stock structure, sex ratio, health and disease, diet, age and growth, and cause of mortality and have been the

source of data for numerous scientific publications (Work and Balazs 2002, Work *et al.* 2004, Work *et al.* 2005, Zug *et al.* 2002, Chaloupka *et al.* 2008b). The MTAP has collaborated with the MTRP and researchers in the Hawaiian Archipelago, for example, to understand the occurrence and variability of fibropapilloma (FP) tumors, largely through interpreting data from the strandings program (Van Houtan *et al.* 2010). This study led to a new set of hypotheses involving coastal eutrophication, algae invasions, and the foraging promotion of the herpes viruses that cause FP. In this instance and others, strandings programs and the knowledge they generate are essential scientific information, which is not provided through other means.

1.3 Purpose of the Proposed Action

The purpose of the MTAP is to conduct ecological research on sea turtle populations in the Pacific Island Region specifically related to population dynamics. While the focus of the research is assessing and modeling population dynamics, original life history data will also need to be collected in underrepresented locations in the Pacific Islands Region. The objectives of the program are:

1. Conduct population assessments of green, hawksbill, loggerhead, and leatherback sea turtles in the Pacific Islands Region and develop geospatial and climate-related analytical tools.
2. Collect data on the basic biology, life history, demographics, population structure, and reproductive habits of sea turtles in their near-shore, pelagic, and nesting beach habitats. Establish, compile, and continue long-term data streams for population assessments and other relevant ecological analyses.
3. Design, implement, and monitor sea turtle stranding and salvage networks throughout the Pacific Islands Region.
4. Develop knowledge of disease ecology and disease-related population dynamics for Pacific sea turtle populations through epidemiological studies and modeling.
5. Train research personnel from various Pacific Islands and along the Pacific Rim in sea turtle research techniques, and continue to share data, analyses, experience, and information to increase international research capacity.
6. Conduct educational outreach to the public, focused on sea turtle research projects and results to build public support for sea turtle research.
7. Collaborate with federal, state, local, and non-governmental organizations on sea turtle surveys, especially for the purposes of generating data streams such as photographic individual identification methods.

1.4 Need for the Proposed Action

Research suggests marine turtle populations today are less than ten percent of their historical numbers (Lotze *et al.* 2006). The systematic human exploitation of sea turtles for eggs, meat, and shells is considered a major factor in their decline (McClenachan *et al.* 2006). These threats continue today, with the added impacts from incidental commercial fisheries capture, beach development, and climate

change. Climate, for example, is the least understood threat yet may be the dominant influence on sea turtles worldwide (Van Houtan 2010, Van Houtan & Halley 2011). Additional research into the population dynamics and environmental influences is essential to ensure the recovery of these species in the region. In the U.S. Insular Areas this is especially needed because these populations are poorly understood. Therefore the MTAP will advance scientific studies, collect data, and produce new analyses to generate better understanding of the historical and current population ecology of Pacific sea turtle populations.

1.4.1 Natural Impediments to Recovery

Habitat Loss

Many sea turtle nesting beaches are located on low-lying, small, sand islands located in the central and western Pacific. Habitat loss due to sea level rise may impose the greatest risk to the continued existence of this population. Most of the land at the primary nesting grounds of FFS in the Northwestern Hawaiian Islands is less than two meters above sea level. Substantial loss of habitat has already occurred at FFS from 1963 – 2004 (Antonelis *et al.* 2006) and projected loss of habitat due to sea level rise for East Island is between 3 and 33 percent for a rise in sea level of 9 to 88 centimeters, whereas land loss at some of the other islets at FFS (Trig, Gin, Little Gin) may be as great as 99 percent (Baker *et al.* 2006). Laysan and Lisianski Islands may provide refuge for nesting turtles since their elevation is higher (Baker *et al.* 2006) provided other environmental conditions (e.g., sand temperature and ocean currents) are conducive to the survival of hatchlings.

Reproduction

Natural changes in climate affect animals, such as sea turtles, whose reproductive success is determined by environmental factors. The sex of hatchling sea turtles is determined by nest temperatures. Increasing beach temperatures may lead to skewed sex ratios and ultimately a female biased population. Additionally, if beach sand temperatures increase considerably, the overall success of each nest may decrease due to embryonic mortality at high temperatures. Changes in sea surface temperatures may also change the timing of breeding and nesting (Van Houtan 2010).

Food availability

Competition for herbivorous food resources among green turtles may lead to reduced growth rates and increased time to maturity. This population exhibits slow and declining rates of growth at several sites in the MHI (Balazs and Chaloupka 2004b). As this population continues to recover, competition for resources will increase, not only between turtles but also between turtles, herbivorous fishes, and other reef creatures. Green sea turtles are extremely resilient in harsh conditions (as are many reptilian species), so the overall impact of reduced food resources may not ultimately lead to death, however it may lead to even slower growth rates and greater age to maturity which could impact the recovery rate of the population.

Predation

Green sea turtles are preyed upon by sharks, finfish, and presumably sea birds in the marine environment. The protected status of the NWHI and the resulting elimination of fishing pressures will allow all species and stocks to recover to higher population levels. This in turn may lead to higher predation rates of hatchlings by fin-fishes off the nesting beaches and higher rates of interactions between sharks and adult turtles in the inter-nesting habitat resulting in injury and potentially death.

Disease

The tumor disease, FP, which is caused by a herpes virus, is an ongoing threat to green sea turtles in the Hawaiian Archipelago. It has been estimated that FP causes approximately 28 percent of the injuries and mortalities to green turtles in Hawaii (Chaloupka *et al.* 2009). While some individuals may contract the disease and eventually overcome it, many others are plagued with large tumors that interfere with their ability to see and forage, and eventually lead to death. At some sites in the MHI, the disease has declined in both severity and prevalence (Chaloupka *et al.* 2009). At other sites, such as around the island of Maui, the disease still affects a large proportion of the population, but the overall trend is decreasing.

1.4.2 Anthropogenic Impediments to Recovery

Commercial harvest

The Hawaiian green turtle population was listed in 1978 as a threatened species under the ESA. The listing was primarily because the stock had been over-harvested. Even though this stock is currently increasing, it has demonstrated in the past that over-harvesting will cause the stock to crash because the population is relatively small and individuals are particularly slow growing, taking 35 years or more to reach maturity.

Fishing Interactions

The incidental capture of sea turtles in commercial and recreational fishing gear is a continuing concern. The interaction between green turtles and recreational fishing gear is the second most common cause of strandings in the MHI (seven percent). Discarded monofilament fishing line, fishing hooks, and gillnets pose serious threats to green turtles including injury, flipper amputation, and death. The cause of approximately half of all strandings is undetermined. Because drowning is difficult to determine (Work and Balazs 2010), it is possible that fishing gear interactions are responsible for a greater percentage of sea turtle fatalities than we currently believe (Chaloupka *et al.* 2009). New regulations on gillnet fishing have been imposed in the MHI which should reduce the number of turtles incidentally caught and killed in gillnets.

Marine Debris

The entanglement in and ingestion of marine debris is a potential threat to this population. Such debris includes discarded or abandoned fishing gear such as nets and lines as well as plastics such as bags, six-pack rings, tar balls, Styrofoam, and other refuse that might ensnare or be consumed by a green turtle.

Entanglement in discarded nets and lines, as well as ingestion of plastics and other discarded debris may lead to injury or death.

Habitat Degradation

Green turtles depend upon algae, sea grass, and coral reef habitats for food and refuge. The degradation of these habitats poses a serious threat to the recovery of sea turtle stocks. Degradation of these habitats occurs through pollution, over-fishing, disease, anchoring, climate change, and other anthropogenic factors (Jackson *et al.* 2001, Rogers and Garrison 2001, Orth *et al.* 2006).

Climate Change

Climate is one of the least studied factors, but may have the largest influence on marine turtle populations. The accelerating pace of global greenhouse gas emissions suggests that surface temperatures will very likely increase nearly 3^{o}C this century, with extreme heat becoming more frequent (IPCC 2009). The clearest threat from these changes appears to be the direct impact of higher sand temperatures to eggs. Though empirical incubation studies are very limited across spatial and temporal scales, absolute temperature thresholds for egg survival and sex-determination appear likely with multi-year extreme heat events increasing. Changes in sea surface temperatures may also change the timing of breeding and nesting. Though island systems have dynamic geomorphology, they have a potentially greater risk of nesting beach loss due to rising sea levels. Climatic changes may inter-react synergistically with the various factors to further exacerbate population threats (Van Houtan 2010).

1.4.3 National Research Council Assessment

In 2010, the National Research Council (NRC), Committee on the Review of Sea Turtle Population Assessment Methods, published a report entitled *Assessment of Sea-Turtle Status and Trends: Integrating Demography and Abundance*. The report addressed programs from across the nation and found that current monitoring generally does not provide enough information on sea turtle populations to evaluate the effectiveness of protective measures and additional data are needed for stock assessments. A thorough population assessment needs to include a description and evaluation of change over time and space in the following areas:

- population structure (e.g., species, subspecies, distinct population segments)
- population lifecycle and demography (e.g., life stages, rates of survival, reproduction)
- population abundance and trends (e.g., evaluation and extrapolation of population indices)
- population ecology and behavior (e.g., habitat, distribution and movements, predators and prey, disease, parasites, contaminants)
- population size (e.g., numbers of individuals, age structure, sex ratio)
- current and projected threats (e.g., human-caused injury or mortality, habitat destruction, climate change)
- sources of variability (e.g., genetic, demographic, environmental, catastrophic).

To be useful in decision making, an assessment requires more than simple description of trends; the large and diffuse nature of sea turtle populations make extrapolation of trends over time, space, and generations difficult at best and potentially misleading. Observed and potential changes in sea turtle populations through time need to be assessed with age-structured models to determine population-wide status accurately and to diagnose causes of population change. As described in the Proposed Action, the MTAP has been working with the MTRP, which has been collecting these types of data for the last 38 years. The MTAP proposes to supplement these types of data collection activities in the Pacific Islands Region and to improve the sophistication of the existing population assessment models (National Research Council 2010).

1.5 Geographic Scope of Analysis

The geographical scope of MTAP activities includes the Hawaiian Archipelago and the U.S. Insular Areas of the Pacific Ocean. Together these areas constitute the Pacific Islands Region. In the State of Hawaii, the MTAP collaborates with other researchers, primarily the MTRP, on sea turtle data collection and analysis. The MTAP would expand field research and data gathering in the U.S. Insular Areas of the Pacific Ocean. The U.S. Insular Areas of the Pacific Ocean include eleven islands, reefs, and atolls (Figure 4). The United States has sovereignty (see U.S. GAO 1997) over Guam (an organized unincorporated territory), American Samoa (an unorganized unincorporated territory), and the Commonwealth of the Northern Mariana Islands (CNMI) (a commonwealth in political union with the United States). Meanwhile, Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Atoll, and Wake Island are unincorporated and unorganized territories of the United States. Palmyra Atoll is an unorganized incorporated territory of the United States, meaning that it is subject to all provisions of the U.S. Constitution (U.S. GAO 1997). This large geographical area roughly encompasses the range of the five sea turtle species being studied.

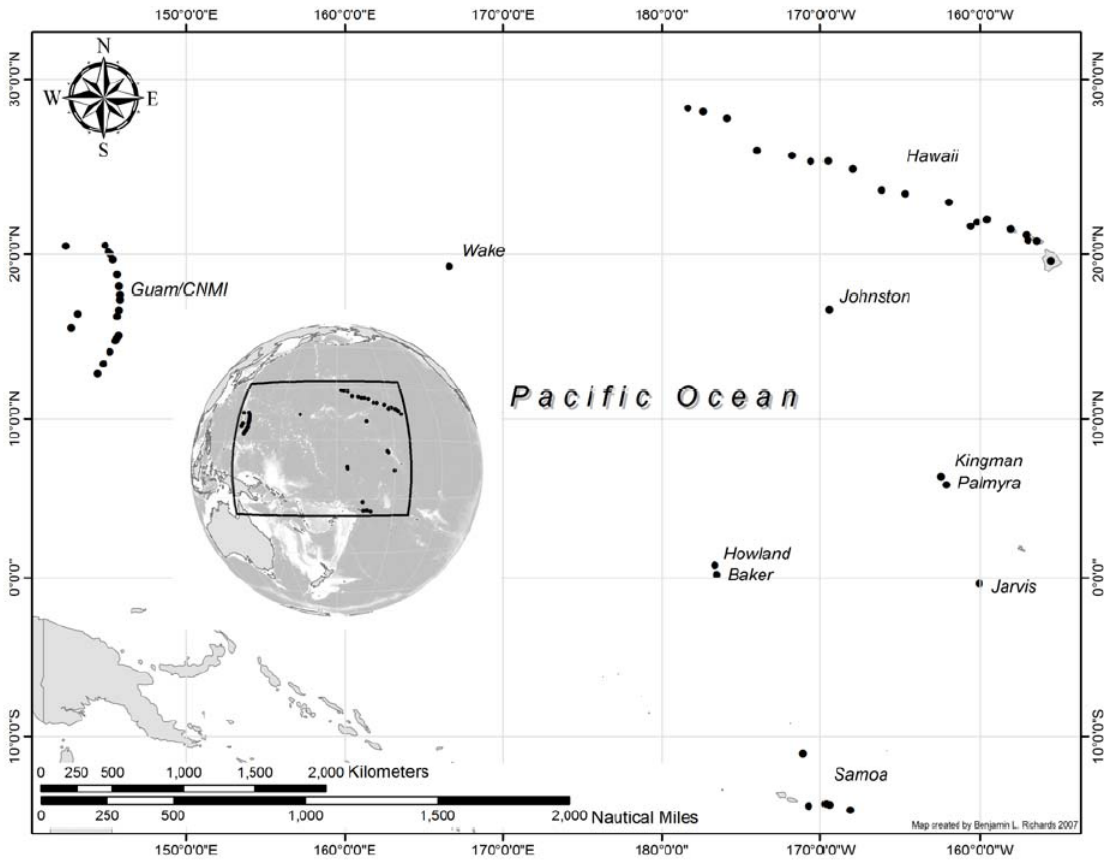

Figure 4. U.S. Insular Areas of Pacific Ocean and the State of Hawaii in the Pacific Islands Region (from noaa.gov).

The MTAP collaborates and assists other sea turtle researchers located in and around the Pacific Islands Region. Coordination, collaboration, or assistance may take the form of data collection (including technical instruction), financial support, or both. These coordinated research efforts would be conducted in a manner consistent with the Proposed Action. If future research projects are not consistent with the type or scope of activities analyzed in this document, then they will be subject to an additional and separate NEPA analysis. A listing of these persons and agencies who have been involved with the MTAP is included in Section 6. Future coordination and collaboration may include other individuals from these agencies, institutions, and non-governmental organizations, or different but related organizations.

1.5.1 Relevant Resource Issues within the Geographic Scope of Analysis

The majority of the population modeling and assessments of the proposed action would be conducted in an office setting using computers and existing data sets. The adverse impacts from working in an office setting on the human environment are negligible and therefore this aspect of the MTAP will not be

discussed in detail. The relevant resource issues discussed herein will focus on the field research aspects of the MTAP.

The Hawaiian Archipelago provides habitat for the five federally threatened and endangered sea turtle species discussed in Section 1.1. It also provides habitat for the federally endangered Hawaiian monk seal (HMS). Most of the HMS population lives on the same islands and atolls in the Northwestern Hawaiian Islands were green sea turtles nest. The Northwestern Hawaiian Islands have been designated as critical habitat for HMS. The MTAP doesn't propose conducting surveys in the Northwestern Hawaiian Islands because sea turtle surveys there are already carried out by the MTRP. In the Main Hawaiian Islands, it is unlikely the MTAP would encounter an HMS, but if they did, it would be avoided. Hawaiian monk seals are also known to occur at Johnston Atoll but no field surveys are being proposed there. Therefore, the MTAP activities would not affect HMS and will not be discussed in detail.

The Hawaiian Archipelago and U.S. Insular areas are habitat for a large and diverse community of seabird species. Millions of seabirds breed, nest, roost, and forage on these islands. The proposed action will include data collection and stranding response activities on sandy beaches and in near-shore shallow waters, which will be near these seabird colonies. Therefore, these impacts will be discussed in detail.

Green sea turtles also have an important cultural relationship with Pacific Islanders. Known as *honu* in the Hawaiian language, green sea turtles are part of regional traditions, chanted in stories, and found in ancient petroglyphs. Historically, green sea turtles also provided meat and eggs for food, and shell and bone for tools and weapons. Given the important role of sea turtles to the cultures and traditions of the Pacific Islands Region, the MTRP and MTAP have worked with local communities to help in achieving the goal of recovery for all of the sea turtle species in the region. The proposed action includes a number of measures to avoid and minimize adverse effects to sea turtles and these are discussed in detail.

Given that the proposed action does not include constructing any permanent infrastructure, discharges of fill material, dredging, or using any hazardous materials that could be released into the environment, it has been determined that the potential impacts to water quality, noise, aesthetics, traffic, public access to the coastline, vegetation, air quality, are negligible. The proposed action does include the infrequent use of small quantities of over-the-counter chemicals (e.g., topical antiseptics for cleaning the site of a skin puncture, epoxy resin to attach a satellite tag) but these would be used in accordance with all relevant laws and regulations. Therefore, impacts to these resources have been considered, but will not be discussed in detail.

On July 19, 2010, concurrent with the release of the *Final Recommendations of the Interagency Ocean Policy Task Force* issued by the White House Council on Environmental Quality (CEQ), President Obama released an Executive Order (EO; rescinds EO 13366 of December 17, 2004) entitled *Stewardship of the Ocean, Our Coasts, and the Great Lakes*. This EO adopts the recommendations of the CEQ Task Force and directs executive agencies to implement the recommendations under the guidance of the National Ocean Council (NOC) created by the EO. The proposed action is consistent with these recommendations and will contribute to the scientific understanding of our ocean ecosystems.

Executive Order 12898 requires federal agencies to address actions affecting environmental justice in minority populations and low-income populations. The proposed research will take place primarily in unpopulated areas (e.g., federal monuments, public beaches) involving principally short-term temporary data collection activities. Collaboration with other researchers, agencies, and NGOs will be only a mutual basis. As such, the proposed research will have negligible environmental effects on minority and low-income communities, and therefore will not be discussed in detail.

Executive Order 13089 requires federal agencies to identify actions that may affect coral reefs, protect and enhance the condition of coral reef ecosystems through existing programs, and ensure their actions do not degrade the conditions of coral reef ecosystems. The proposed sea turtle research activities would include work in the vicinity of coral reefs and this will be discussed in detail. The proposed action does not involve any direct impacts to coral reefs.

Executive Order 13158 requires federal agencies to avoid harm of Marine Protected Areas. Parts of the proposed action would take place in MPAs (e.g., the new marine national monuments). The MTAP will avoid harm of MPAs to the maximum extent practicable while conducting the proposed action through implementation of the various avoidance and minimization measures described below.

Executive Order 12114 requires federal agencies to consider the environmental effects of their actions outside of the United States and its territories. The proposed action would be implemented in the United States, its territories, and commonwealth's in covenant with the United States. Given the wide geographic range and migration routes of sea turtles in the Pacific Islands Region, the MTAP may coordinate or collaborate with organizations in neighboring countries. These actions in foreign nations would be implemented using the same methods and materials described in this NEPA document and in accordance with all relevant foreign laws.

Within the geographic scope of analysis occur a number of archeological and cultural resources. Along with being home to a diverse range of peoples and traditions, the PIR was the setting for many battles during World War II. Consequently, there are several hundred sites listed on the National Register within the PIR and many more are eligible. The island of Guam alone has 121 sites listed on the National Register. While many of the listed structures have been identified (e.g., the Agana Spanish Bridge), some of these sites have their addresses restricted in order to protect the resources. In the State of Hawaii, the NWHI are an important cultural resource in the Hawaiian traditions. Native Hawaiian seafarers travelled frequently between the MHI and NWHI. The NWHI are home two of the most important Hawaiian archeological sites, Nihoa Island and Mokumanamana (Necker Island). These islands are both listed as archeological districts on the National Register of Historic Places. Another notable example is the World War II-related resources on Wake Atoll (i.e., Wake, Wilkes, and Peale Islands), which were designated a National Historic Landmark on September 16, 1985. The Proposed Action does not involve working on or around any structures (i.e., the sea turtle field work would be conducted on sandy beaches or in near-shore shallow waters) and does not involve erecting any structures or excavations. Therefore, impacts to these resources have been considered, but will not be discussed in detail.

2 Proposed Action and Alternatives

This analysis includes a range of reasonable alternatives that address the purpose of the MTAP and need for sea turtle research across the Pacific Islands Region (PIR). Since its establishment, the MTAP has conducted sea turtle population assessments, developed models, and collected data in collaboration with the MTRP (Status Quo - Alternative A). While related, and having overlapping geographical study areas, the two programs have separate distinct research missions. In response to increasing data and analysis needs, the MTAP is proposing to continue the sea turtle population assessments and modeling in the PIR, but will also begin collecting data from areas (i.e., the U.S. Insular Areas) and on subjects (using the same methods currently applied in the Hawaiian Archipelago by the MTRP) that have been under-represented in the past (Proposed Action - Alternative B). These data will be used to properly assess regional population dynamics of the five sea turtle species. The No Federal Action Alternative (Alternative C) has been included in the range of alternatives.

2.1 Alternative A: Status Quo – No Change to the Current Action

The MTAP, in collaboration with the MTRP, studies all five species of sea turtles occurring in the Pacific Islands Region: green, hawksbill, loggerhead, leatherback, and olive ridley. The focus of the MTAP has been providing analytical services to resource managers using data collected with the MTRP and other researchers in the Hawaiian Archipelago. The research components, techniques and methods, and standard operating procedures have been developed and refined by the MTRP over the last 38 years are described herein. The MTRP finalized a separate programmatic environmental assessment and finding of no significant impact on June 23, 2011 for their activities (NMFS 2011).

2.1.1 Components of the Current MTAP

Using the techniques and methods described below, which have been implemented using the associated standard operating procedures, the MTAP conducts investigations that can be grouped into four broad categories: (a) analytical population assessments, (b) field research associated with beach and nearshore habitats, (c) field research associated with pelagic habitat, and (d) investigations associated with technical assistance, training, international collaboration, and analytic actions.

2.1.1.1 Research on Sea Turtle Population Dynamics across the Pacific Islands Region

a. **Characterizing and explaining population variability.** Collects and analyzes existing datasets of population indices from a variety of species and locations to understand population trends and viability, demographic and environmental stochasticity, and spatial density patterns. Collaborates with foreign and domestic colleagues to expand spatial extent, species, and time series coverage of data.

b. **Assessing natural and anthropogenic population impacts.** Quantifies local population impacts – and their trends through time – using advanced climate modeling, historical data and more traditional sources, such as injury data compiled from stranded turtles and incidental bycatch and fisheries statistics.

c. **Evaluation of management and fishery activities to population recovery.** Provides scientific advice to resource managers on the population impacts from potential actions. These modeling activities are based on established population ecological dynamics and existing datasets.

d. **Epidemiology.** Researches and models the existence, distribution, and cause of turtle diseases. Analyses include data obtained from stranded turtles, remotely-sensed data (e.g., land use, human population statistics), and data from turtle capture studies.

e. **Development of statistical analyses and simulations to identify data needs.** Designs future research goals and activities based on: (i) sensitivity analyses of parameters in population analyses; (ii) known data needs resulting in analytical limitations; (iii) results from geospatial gap analyses; or (iv) anticipated future resource management needs. Essentially this is the adaptive management framework.

f. **Development of chronology analytical techniques for aging stranded turtles.** Refines, matures, and expands the MTAP aging laboratory to be a regional expert analytical lab for aging analyses of stranded and seized turtles performed by MTAP staff for both NOAA and non-NOAA collaborators. This research is largely analytical of data already collected, or is primary research on bone and shell tissue from (dead) stranded and seized turtles. Collection of turtle specimens and analyses are done in collaboration with MTRP and USFWS Offices of Law Enforcement.

2.1.1.2 Research on Sea Turtle Populations in the Hawaiian Archipelago on Beach and Shoreline Habitats

a. **Nesting Beach Surveys.** Working with the MTRP, collecting data on nesting, nest counts, locations, substrate type, vegetation cover, beach area, baseline sand temperatures, conservation management practices, and remotely sensed data.

b. **Nesting Females.** Working with the MTRP, monitoring egg laying to include recording the clutch size of nests as well as basic measurements of the nester and tissue sampling – both after the nest is laid.

c. **Nest-level Inventories.** Working with the MTRP, evaluating incubation periods, emergence rates, hatching rates, depredation activity, and assisting hatchling emergence when opportune.

d. **Stranding Response Networks.** Working with the MTRP, evaluating sea turtle strandings throughout the Hawaiian Archipelago.

e. **DNA Analysis.** Working with the MTRP, collecting skin, blood, or tissue from live or dead turtles for genetic analyses (e.g., DNA, MtDNA, microsatellites) used in stock delineation to establish distinct population segments.

f. **Stable Isotope Analysis.** Working with the MTRP, collecting of skin, blood, or tissue from live or dead turtles for stable isotope analyses used for stock structure, demographic, and dietary studies.

g. **Fibropapillomatosis**. Working with the MTRP, collecting data related to the existence, causes, extent, and progression or regression of the tumor forming disease known as fibropapillomatosis. Opportunistic collection of skin, blood, or tissue from dead turtles with tumors for genetic, virological, and histopathological analyses.

h. **Algae Luxury Consumption.** Working with the MTRP, nutrient enrichment experiments on contained aquaria at NOAA's Kewalo Research Facility (Honolulu, HI) to measure N-sequestration, storage, and growth in macroalgae species.

i. **Parasitology and Toxicology.** Working with the MTRP, collecting of epibiota (i.e., animals and plants attached to sea turtle exterior) for identification and study. Collection of blood and tissue samples from captured live and dead turtles to study internal parasites and toxin accumulation.

j. **Dietary Habits.** Working with the MTRP, collecting data from live and dead turtles, including evaluation of food found in the mouth, stomach, crop, gastrointestinal tract, feces, and esophageal or stomach lavages.

k. **Basking Sea Turtles.** Working with the MTRP, collecting data from basking green turtles regarding, when appropriate, life stage, sex, health status, tags, and DNA.

l. **Evaluation of Physical Condition.** Working with the MTRP, collecting physical dimension measurements of live captured and injured or dead stranded turtles for calculating of body mass indices.

m. **Collaborations with Authorized Hatcheries or Aquaria**. Research conducted on turtles at authorized facilities for nest and hatchling research, blood or tissue sampling, allometric growth, facial pattern recognition techniques, and educational outreach.

2.1.1.3 Research on Sea Turtle Populations in the Hawaiian Archipelago in Pelagic Habitats

a. **Capture-Mark-Recapture.** Working with the MTRP, capturing live turtles in the ocean for tagging and subsequent recapture studies.

b. **Nearshore Movements, Fidelity, and Tracking.** Working with the MTRP, installing satellite transmitters on live captured turtles to document the spatial behavior of juveniles, subadults, adults, and inter-nesting adults.

c. **Incidental Fishery Bycatch.** Manages and evaluates data collected from turtles incidentally caught in recreational or commercial fisheries (including fisheries in the Pacific Islands Region, outside of the Hawaiian Archipelago, managed by PIRO).

d. **Release of Captive-Reared Turtles into the Environment.** Provides scientific advice and assistance on the release of hatchery and captive-reared turtles into suitable offshore habitat in cooperation with local agencies and authorized local programs.

2.1.1.4 Research on Sea Turtle Stocks in the Pacific Islands Region through Technical Assistance, Training, Collaboration, and Analytic Actions

a. **International Collaboration.** Collaborates with sea turtle researchers from other Pacific Rim and Pacific Island nations and providing assistance to research programs to build research capacity, including training in research techniques, sharing information and data exchange, and providing scientific advice.

b. **Training Fishery Observers in Research Techniques.** Trains fishery observers aboard commercial fishing vessels in collection of sea turtle data from sea turtles caught incidentally by commercial fishery.

c. **Education and Outreach.** Develops and distributes written educational materials, in conjunction with on-site field activities, making presentations at adult- and children-oriented venues, publishing in periodicals and peer-reviewed journals, and providing specimens to museums on-loan and other public and educational institutions.

d. **Modeling Population Dynamics.** Stores and analyzes data in developing models of sea turtle population dynamics and population recovery. This is done in collaboration with national and international programs and collaborators.

e. **Age and Growth Rates.** Analyzes morphometric data from live turtles and and chronology and morphometric data from dead turtles to evaluate population age structure and individual growth rates.

2.1.2 Techniques and Methods Used by the MTAP for Sea Turtle Research Involving Varying Levels of Interaction with Dead and Living Sea Turtles

A. Encounter. This involves observing turtles from a distance.

1. Observe feeding and other behavior, either visually or with a camera.
2. Record presence, either visually or with a camera.
3. Count numbers, either visually or with a camera.

B. Capture. This involves the actual handling of individual turtles.

1. Capture using gear in the water, such as a scoop net, a tangle net, or trapping in a pen.
2. Capture by hand, either on land or in the nearshore waters.
3. Capture on beaches, with open “box pen.”
4. Capture of hatchlings and collection of eggs, either in the nest or on the beach.
5. Capture of dead or live stranded individuals, involving primarily capture by hand at the stranding site.
6. Incidental bycatch in commercial fisheries in the Pacific Ocean.

C. Inspect. This involves handling and manipulating the individual turtle after capture.

1. Measure for size and growth rate.
2. Weigh.
3. Attempt to determine sex visually.
4. Conduct external and oral exam for health status.
5. Search for presence of biota on the skin or carapace, such as barnacles or leeches.
6. Conduct exam for external injuries, such as evidence of attempted predation, fishing line entanglement, or boat strike.
7. Record existence of and information from tag(s).
8. Count and describe FP tumors.
9. Conduct laparoscopy for sex determination of juveniles and breeding condition of adults.

D. Sample. This involves handling and taking physical samples from individual turtles, alive and dead, after capture.

1. If animal is alive, in addition to the external inspections above, the following may be collected:

a. Blood samples for total protein, packed cell volume, serum chemistry, or parasites and other desired considerations.
b. Samples of biota living on skin or carapace, such as barnacles, leeches, and algae.
c. FP tumors (if recapture, measure for progression or regression of disease).
d. Skin or blood for DNA identification.
e. Food samples from crop or mouth, including esophageal lavage.
f. Feces.
g. Tissue for stable isotope study.

2. If the animal is dead, during external exam or necropsy, in addition to the above samples (other than blood), the following may be collected:

a. Humerii bones and other tissue samples.
b. Food from gastrointestinal tract.
c. Urine or feces.
d. Reproductive organs for sex identification and reproductive status and fertility.
e. Tumor samples (if a recapture, evaluate for progression or regression of disease).
f. Skeletal materials.
g. Skin or other tissue for DNA identification.
h. Tissue for stable isotope study.

i. Epibiota (plants and animals attached to the skin and shell of a turtle).

j. Tissues from nest remains.

E. Tag. This involves placing a physical tag either into tissue of the flipper, under the skin surface, or affixed to the shell of the individual turtle.

- Passive tags:
  - External flipper tag (metal or plastic);
  - PIT tag injected under the skin that can then be electronically scanned;
  - External shell mark (alphanumeric identification etched into shell and painted white)
- Active Tags:
  - Radio transmitter that either transmits globally using satellites or short-range using sonic and VHF frequencies attached to the shell;
  - Archival tag (collects and stores temperature, depth, time, or location data)

F. Veterinarian Care. This involves the handling and manipulation of individual turtles by licensed veterinary professionals for the purposes of rehabilitation and captive care.

1. Rehabilitate sick or injured turtles for release into the wild, including transport, holding, handling, diagnosis, observation of behavior, treatment (such as dosing with medicine and surgery performed by a licensed veterinarian), feeding and other necessary care. Veterinary procedures typically performed may include but are not limited to:
   - radiographs
   - surgical flipper amputation under gas anesthesia
   - medications administered (antibiotics, fluids, mineral oil, GasX, etc.)
   - force feeding
   - fishing line extracted from mouth or cut short at mouth if unable to extract
   - fish hook removed with or without minor surgery and local anesthetic
   - shell repaired with fiberglass/resin/epoxy/stainless steel wire
   - tumor surgically removed (cryosurgery or cutting) or treated with topical ointment (blood root) or injection (Dermex)
   - Endoscopy
2. Conduct humane euthanasia of a sick or injured sea turtle if two or more veterinarians decide it has no chance to recover or survive in the natural environment. There are only two Institutional Animal Care and Use Committee (IACUC) approved methods of euthanasia for reptiles,

barbiturate overdose and penetrating captive bolt, and the MTRP only uses barbiturate overdose.

3. Conduct a comprehensive necropsy of all euthanized turtles by a licensed veterinary pathologist.

G. Transport of Captured Turtles. This involves handling, stabilizing, and transporting living turtles.

1. Using a certified animal carrier, with the turtle covered with a wet pad for cooling on a plane, in the back of a vehicle, or on a boat if the individual is captured at sea.
2. Transport of salvaged and frozen dead turtles or turtle tissues, boxed and shipped by ground or air transport.

H. Release of Wild Turtles Back into the Natural Environment. This involves tagging, transporting to the appropriate release point, and release of individuals into suitable habitat, as defined by sea turtle experts.

I. Collection of Environmental Samples. This involves collection of information and physical samples from the environment in support of sea turtle research.

1. Collect invertebrates such as sponges, algae and sea grasses in known turtle foraging areas.
2. Collect reef fish observed to groom sea turtles, such as saddleback wrasse, surgeonfish, and tangs for presence of viruses and other pathogens.
3. Collect sediments for presence of viruses and other pathogens.
4. Record and archive seawater temperature data.
5. Record and archive sand temperature data.
6. Collect seawater for presence of viruses and other pathogens.
7. Record and archive weather data and associated oceanographic characteristics.
8. Collect beach sand for analysis of beach physiology (sand grain size, porosity, water content, etc.).
9. Collect invertebrates and non-cleaning fish from foraging habitats for presence of viruses and other pathogens.

J. Technical Assistance, Modeling, Data Analysis, Educational Outreach, and International Collaboration. This involves data storage and manipulation, developing and using population models, educational outreach, and collaborating with international sea turtle researchers from the Pacific Rim and Pacific Island nations to further research in support of the recovery of Pacific stocks of sea turtles. Technical assistance involves the transfer of specific scientific expertise to train professionals in other countries, assist in data analysis, provide supplies, and perform other noninvasive actions.

2.1.3 Standard Operating Procedures for Implementation of Methods and Techniques

2.1.3.1 Standard Operating Procedures Accepted Worldwide

The MTAP ensures the safety of research and technician personnel first and foremost in all program activities, and conducts constant training of all personnel in the implementation of techniques and methods, both in the laboratory and in the field.

All research techniques and methods are conducted consistent with accepted standards within the sea turtle research community (Eckert *et al.* 1999) based on efficacy and the experience gained through 34 years of implementation.

Eckert *et al.* (1999) incorporates standards for:

- Capturing (L.M. Ehrhart and L.H. Ogren. *Studies in Foraging Habitats: Capturing and Handling Turtles*; see also: Balazs *et al.* 1987 and Balazs *et al.* 1998);
- Tagging (S.A. Eckert. *Data Acquisition Systems for Monitoring Sea Turtle Behavior and Physiology*; G.H. Balazs. *Factors to Consider in the Tagging of Sea Turtles*; see also: Balazs *et al.* 1996);
- Collecting physical measurements (A.B. Bolten. *Techniques for Measuring Sea Turtles*);
- Diet sampling and diet component analysis, including the use of esophageal lavage (Forbes and Limpus 1993, G.H. Balazs 1992);
- Measuring growth and growth rates (R.P. Van Dam. *Measuring Sea Turtle Growth*);
- Genetic population sampling (N. FitzSimmons, C. Moritz, and B.W. Bowen. *Population Identification;* also see: Bowen *et al.* 1992);
- Determining clutch size and reproductive success (J.D. Miller. *Determining Clutch Size and Hatching Success*);
- Diagnosing sex of sea turtles in foraging habitats (T. Wibbels. *Diagnosing the Sex of Sea Turtles in Foraging Habitats*);
- Techniques for evaluating infectious diseases of sea turtles (L.H. Herbst. *Infectious Diseases of Sea Turtles*);
- Tissue sampling and biopsy techniques (E.R. Jacobsen. *Tissue Sampling and Necropsy Techniques;* see also Dutton and Balazs 1996);
- Techniques for sampling blood and conducting laparoscopy for determining reproductive cycles (D. Wm. Owens. *Reproductive Cycles and Endocrinology*);
- Conducting stranding and salvaging networks (D.J. Shaver and W.G. Teas. *Stranding and Salvage Networks*)

2.1.3.2 MTAP Standard Operating Procedures

The following standard operating procedures are incorporated into the protocols for implementing the techniques and methods described in Section 2.1.2. These standard operating procedures are designed to minimize the impact of MTAP's techniques and methods on the environment, and turtles in particular.

- Nesting females can become skittish or disturbed if a light is shined on their face during egg deposition, or if they see the researcher or the researcher's shadow. To reduce the likelihood of disturbance, flashlight use is minimized and the light is covered with the hand with the first two fingers spread slightly to focus the beam. Researchers always approach a nesting turtle slowly from the rear. Before contact is made with the turtle, her activity is noted, and an attempt to identify her by shell etching or tag is made. Based on her activity, the researcher decides if it is the appropriate time to safely tag and sample (if necessary) the turtle without disrupting the nesting process. The best time for the researcher to interact with the turtle is after egg laying is complete.
- PIT tags are best inserted directly under the skin into the hind flipper after the female has completed egg laying, when she typically goes into a trance-like state, or, secondarily, when the turtle is crawling, making a body pit, covering the eggs, or backfilling, but never while excavating the egg chamber or depositing eggs to avoid any potential for nest abandonment. Every pre-sterilized needle is used only once and disposed of properly.
- Skin sites for all activities that require puncturing the skin, such as tag application activities that require attachment to skin (physical tags or PIT tags), and collecting biopsies and blood samples, and use of tools for carapace marking and measuring, are cleaned with an antiseptic.
- Skin biopsies are taken from turtles incidentally caught in commercial fisheries, confiscated by law enforcement, captured during fieldwork, encountered on a nesting beach, and stranded turtles. The biopsy (a small plug of skin and tissue) is quickly taken from the edge of a hind flipper or from the soft skin near the hind flippers using a sharp pre-sterilized punch tool.
- When possible, satellite and VHF radio transmitters are attached, removed, and/or replaced on nesting females only when the turtle has finished nesting to avoid nest abandonment.
- All wild turtles are typically held for field research activities for periods of time varying from minutes to one to two hours, unless a satellite or radio transmitter is being attached, at which point holding could extend to three hours.
- All drugs, including topical medications, vitamins and dietary supplements, and antibiotics are administered to turtles only by trained staff under the supervision of licensed veterinarians using approved IACUC protocols.
- Release of wild turtles from anywhere in the Hawaiian Islands back into the natural environment either during research activities or after rehabilitation at the NMFS Kewalo Research Facility (KRF) in Honolulu, Hawaii includes:

- Any potentially diseased individual (known to be or potentially exposed) will not be released into areas having no known evidence of disease. When necessary, the animal is placed in quarantine for an appropriate duration, and the animal is observed for abnormal physical, physiological, or behavioral conditions; blood samples are collected to ensure absence of or an acceptable level of medical problems, as determined by a veterinary pathologist, prior to release.
- Turtles stranded in areas not known to have the FP disease (i.e., leeward coast of Hawaii) are never released back into the original stranding site because the seawater used at KRF is recycled from the Oahu coast and the turtles could have been infected during their rehabilitation. All such turtles are released at sites on Oahu.
- Turtles with or without FP tumors stranded from waters known to have the disease are released into calm waters close to the capture site, or in Kaneohe or Kailua Bays. Kaneohe Bay has the highest prevalence of FP disease in Hawaii and has calm waters; therefore, it is an appropriate release site for animals that have previously been exposed to the disease.
- Turtles with one or more flipper amputated in the wild or by surgery because of severe entanglement or physical damage are released into calm waters of Kailua Bay or Maunalua Bay on Oahu to facilitate swimming.
- Turtles are transported by truck to the release site in an approved container, covered with a wet absorbent pad, and are then carried by hand to be released near the water's edge, or gently from a boat.
- After release, observers watch for the turtle to surface several times to breathe to ensure that the turtle is behaving normally and moving away from shore.

2.1.3.3 Standard Operating Procedures for Avoiding Disturbance to Other Species, Especially Monk Seals on Sea Turtle Nesting Beaches

Prior to going into the field to conduct MTAP activities, all personnel undergo training, study the program's standard operating procedures manual, and are prepared to adhere to all requirements.

- Monk seals typically rest facing inland, therefore researchers always scan with the flashlight from the shoreline berm towards the center of the island to avoid shining the light in the eyes of monk seals.
- If a monk seal happens to be facing the researcher, the light is turned off and the researcher slowly moves away.
- Researchers encountering monk seals remain at an appropriate distance at all times.
- Nesting research surveys would be conducted no more than once per hour to minimize disturbance to nesting turtles, seabirds, and monk seals unless a particular turtle needs to be identified or observed.

- Researchers maintain a low profile during daylight when encountering a monk seal, and whenever possible, pass it from downwind.
- Researchers attempt to keep noise or sudden sounds to a minimum.
- If a monk seal notices the researcher, the person crouches down and slowly moves away.

2.2 Alternative B: Proposed Action – Implementation and Expansion of the Current Program to include the U.S. Insular Areas of the Pacific Islands Region.

The MTAP proposes to apply the components, techniques and methods, and standard operation procedures described under Alternative A (Section 2.1) to the U.S. Insular Areas within the Pacific Islands Region that have historically been underrepresented in population assessments. For completeness, some of these components, techniques, and methods have been repeated and incorporated into this section. As described under Alternative A, the MTAP collaborates with other researchers across the Pacific Island Region. Alternative B, the Proposed Action, would expand the data collection activities (e.g., nesting surveys, deploying satellite tags) to the U.S. Insular Areas of the Pacific Islands Region in order to improve the sea turtle population assessments, while still providing collaborative analytical services in the Hawaiian Archipelago. As discussed in Section 1.1, the five sea turtle species found in the Pacific Islands Region migrate vast distances and face threats to survival everywhere they travel. The Proposed Action by the MTAP would begin to fill some of these data gaps through enhanced and improved data collection and analyzes. The MTAP would continue to collaborate with the MTRP and other researchers who collect biological and ecological data in the Hawaiian Archipelago by providing field and analytical services. Together, these sea turtle research activities will further the understanding of all five listed species that are found in NMFS Pacific Islands Region.

2.2.1 Components of the Proposed Action

Using the techniques and methods described below, which have previously been implemented under Alternative A using the associated standard operating procedures, the MTAP proposes conducting investigations that can be grouped into four broad categories: (a) analytical population assessments, (b) field research associated with beach and near-shore habitats, (c) field research associated with pelagic habitat, and (d) investigations associated with technical assistance, training, international collaboration, and analytic actions.

2.2.1.1 Research on Sea Turtle Population Dynamics across the Pacific Islands Region

a. **Characterizing and explaining population variability.** Collects and analyzes existing datasets of population indices from a variety of species and locations to understand population trends and viability, demographic and environmental stochasticity, and spatial density patterns. Collaborates with foreign and domestic colleagues to expand spatial extent, species, and time series coverage of data.

b. **Assessing natural and anthropogenic population impacts.** Quantifies local population impacts – and their trends through time – using advanced climate modeling, historical data and more

traditional sources, such as injury data compiled from stranded turtles and incidental bycatch and fisheries statistics.

c. **Evaluation of management and fishery activities to population recovery.** Provides scientific advice to resource managers on the population impacts from potential actions. These modeling activities are based on established population ecological dynamics and existing datasets.

d. **Epidemiology.** Researches and models the existence, distribution, and cause of turtle diseases. Analyses include data obtained from stranded turtles, remotely-sensed data (e.g., land use, human population statistics), and data from turtle capture studies.

e. **Development of statistical analyses and simulations to identify data needs.** Designs future research goals and activities based on: (i) sensitivity analyses of parameters in population analyses; (ii) known data needs resulting in analytical limitations; (iii) results from geospatial gap analyses; or (iv) anticipated future resource management needs. Essentially this is the adaptive management framework.

f. **Development of chronology analytical techniques for aging stranded turtles.** Refines, matures, and expands the MTAP aging laboratory to be a regional expert analytical lab for aging analyses of stranded and seized turtles performed by MTAP staff for both NOAA and non-NOAA collaborators. This research is largely analytical of data already collected, or is primary research on bone and shell tissue from (dead) stranded and seized turtles. Collection of turtle specimens and analyses are done in collaboration with MTRP and USFWS Offices of Law Enforcement.

2.2.1.2 Research on Sea Turtle Populations in the Pacific Islands Region on Beach and Shoreline Habitats

a. **Nesting Beach Surveys.** Leading, training, and assisting federal, state, and local personnel with collection of data from green and hawksbill turtle nests. Dates of nesting, nest counts and locations will be recorded in addition to abiotic beach characteristics. The latter consists of describing substrate type, vegetation cover, beach area, baseline sand temperatures, conservation management practices, and remotely sensed data.

b. **Nesting Females.** Monitoring egg laying to include recording the clutch size of nests as well as basic measurements of the nester and tissue sampling – both after the nest is laid. Additionally, when conditions permit, satellite transmitters will be installed on females to track their inter-nesting spatial behavior.

c. **Nest-level Inventories.** Evaluation of incubation periods, emergence rates, hatching rates, depredation activity, and assisting hatchling emergence when opportune. Post-hatching nest inventories will include data to evaluate sex ratios (i.e., in-nest data loggers and post-mortem analysis of remaining hatchlings).

d. **Stranding Response Networks.** Initiate stranding response programs throughout the U.S. Insular Areas in partnership with local agencies. Collect data from live and dead stranded sea turtles, and support local care and rehabilitation of live animals, and necropsy of dead animals.

e. **DNA Analysis.** Collection of skin, blood, or tissue from live or dead turtles for genetic analyses (e.g., DNA, MtDNA, microsatellites) used in stock delineation to establish distinct population segments.

f. **Stable Isotope Analysis.** Collection of skin, blood, or tissue from live or dead turtles for stable isotope analyses used for stock structure, demographic, and dietary studies. For comparable isotope references, trivial amounts of reef forage (common macroalgae species) will be collected.

g. **Fibropapillomatosis**. Collection of data related to the existence, causes, extent, and progression or regression of the tumor forming disease known as fibropapillomatosis. Opportunistic collection of skin, blood, or other tissue from dead turtles with tumors for genetic, virological, and histopathological analyses.

h. **Algae Luxury Consumption.** Nutrient enrichment experiment on contained aquaria at NOAA's Kewalo Research Facility (Honolulu, HI) to measure N-sequestration, storage, and growth in macroalgae species. This research – conducted in collaboration with the UH Manoa, Botany Department – examines the potential impacts from coastal eutrophication to the distribution and nutrient content of common green turtle forage items. Algal samples will be collected for non-native, invasive, as well as non-invasive species that are known forage for green sea turtles. This work will be done in collaboration with UH Manoa.

i. **Parasitology and Toxicology.** Collection of epibiota (animals and plants attached to sea turtle exterior) for identification and study. Collection of blood and tissue samples from captured live and dead turtles to study internal parasites and toxin accumulation.

j. **Dietary Habits.** Collection of data from live and dead turtles, including evaluation of food found in the mouth, stomach, crop, gastrointestinal tract, feces, and esophageal or stomach lavages.

k. **Basking Sea Turtles.** Collection of data from basking green turtles (not at French Frigate Shoals) regarding, when appropriate, life stage, sex, health status, tags, and DNA.

l. **Evaluation of Physical Condition.** Physical dimension measurements of live captured and injured or dead stranded turtles for calculating of body mass indices. These data provide insights for nutrition, carrying capacity, general health, or geographic variation within species.

m. **Collaborations with Authorized Hatcheries or Aquaria**. Research conducted on turtles at authorized facilities for nest and hatchling research, blood or tissue sampling, allometric growth, facial pattern recognition techniques, and educational outreach.

2.2.1.3 Research on Sea Turtle Populations in the Pacific Islands Region in Pelagic Habitats

a. **Capture-Mark-Recapture.** Captures live turtles in the ocean for tagging and subsequent recapture studies. Turtles are measured, blood or tissues taken, two PIT tags inserted in rear flippers, and numerical identification etched on their shell exteriors. Less commonly satellite transmitters are installed when available.

b. **Nearshore Movements, Fidelity, and Tracking.** Installs satellite transmitters on live captured turtles to document the spatial behavior of juveniles, subadults, adults, and inter-nesting adults. Spatial location and dive behavior will be incorporated into stock structure (i.e., range and distribution) and foraging ecology studies.

c. **Incidental Fishery Bycatch.** Manages and evaluates data collected from turtles incidentally caught in recreational or commercial fisheries. When appropriate, satellite and other tracking devices are installed on healthy turtles to evaluate post-interaction survival and spatial behavior after release.

d. **Release of Captive-Reared Turtles into the Environment.** Provides scientific advice and assistance on the release of hatchery and captive-reared turtles into suitable offshore habitat in cooperation with local agencies and authorized local programs.

2.2.1.4 Research on Sea Turtle Stocks in the Pacific Islands Region through Technical Assistance, Training, Collaboration, and Analytic Actions

a. **International Collaboration.** Collaborates with sea turtle researchers from other Pacific Rim and Pacific Island nations and providing assistance to research programs to build research capacity, including training in research techniques, sharing information and data exchange, and providing scientific advice.

b. **Training Fishery Observers in Research Techniques.** Trains fishery observers aboard commercial fishing vessels in collection of sea turtle data from sea turtles caught incidentally by commercial fishery.

c. **Education and Outreach.** Develops and distributes written educational materials, in conjunction with on-site field activities, making presentations at adult- and children-oriented venues, publishing in periodicals and peer-reviewed journals, and providing specimens to museums on-loan and other public and educational institutions.

d. **Modeling Population Dynamics.** Stores and analyzes data in developing models of sea turtle population dynamics and population recovery. This is done in collaboration with national and international programs and collaborators.

e. **Age and Growth Rates.** Analyzes morphometric data from live turtles and and chronology and morphometric data from dead turtles to evaluate population age structure and individual growth rates.

2.2.2 Techniques and Methods Used by the MTAP for Sea Turtle Research Involving Varying Levels of Interaction with Dead and Living Sea Turtles

A. Encounter. This involves observing turtles from a distance.

1. Observe feeding and other behavior, either visually or with a camera.
2. Record presence, either visually or with a camera.

3. Count numbers, either visually or with a camera.

B. Capture. This involves the actual handling of individual turtles.

1. Capture using gear in the water, such as a scoop net or tangle net.
2. Capture by hand, either on land or in the nearshore waters.
3. Capture on beaches, with open "box pen."
4. Capture of hatchlings and collection of eggs, either in the nest or on the beach.
5. Capture of dead or live stranded individuals, involving primarily capture by hand at the stranding site.
6. Incidental bycatch in commercial fisheries in the Pacific Ocean.

C. Inspect. This involves handling and manipulating the individual turtle after capture.

1. Measure for size and growth rate.
2. Weigh.
3. Attempt to determine sex visually.
4. Conduct external and oral exam for health status.
5. Search for presence of biota on skin/carapace, such as barnacles or leeches.
6. Conduct exam for external injuries, such as evidence of attempted predation, fishing line entanglement, or boat strike.
7. Record existence of and information from tag(s).
8. Count and describe FP tumors.
9. Conduct laparoscopy for sex determination of juveniles and breeding condition of adults.

D. Sample. This involves handling and taking physical samples from individual turtles, alive and dead, after capture.

1. If animal is alive, in addition to the external inspections above, the following may be collected:

a. Blood samples for total protein, packed cell volume, serum chemistry, and/or parasites and other desired considerations.
b. Samples of biota living on skin or carapace, such as barnacles, leeches, and algae.
c. FP tumors (if recapture, measure for progression orregression of disease).
d. Skin or blood for DNA identification.
e. Food samples from crop or mouth, including esophageal lavage.
f. Feces.
g. Tissue for stable isotope study.

2. If the animal is dead, during external exam or necropsy, in addition to the above samples (other than blood), the following may be collected:

a. Humerii bones and other tissue samples.

b. Food from gastrointestinal tract.

c. Urine or feces.

d. Reproductive organs for sex identification and reproductive status and fertility.

e. Tumor samples (if a recapture, evaluate for progression or regression of disease).

f. Skeletal materials.

g. Skin or other tissue for DNA identification.

h. Tissue for stable isotope study.

i. Epibiota (i.e., plants and animals attached to the skin and shell of a turtle).

j. Tissues from nest remains.

E. Tag. This involves placing a physical tag either into tissue of the flipper, under the skin surface, or affixed to the shell of the individual turtle.

- Passive tags:
  - External flipper tag (metal or plastic);
  - PIT tag injected under the skin that can then be electronically scanned;
  - External shell mark (alphanumeric identification etched into shell and painted white)
- Active Tags:
  - Radio transmitter that either transmits globally using satellites or short-range using sonic and VHF frequencies attached to the shell;
  - Archival tag (collects and stores temperature, depth, time, or location data)

F. Veterinarian Care. This involves the handling and manipulation of individual turtles by licensed veterinary professionals for the purposes of rehabilitation and captive care.

1. Rehabilitate sick or injured turtles for release into the wild, including transport, holding, handling, diagnosis, observation of behavior, treatment (such as dosing with medicine and surgery performed by a licensed veterinarian), feeding and other necessary care. Veterinary procedures typically performed may include but are not limited to:
   - radiographs
   - surgical flipper amputation under gas anesthesia
   - medications administered (antibiotics, fluids, mineral oil, GasX, etc.)

- force feeding
- fishing line extracted from mouth or cut short at mouth if unable to extract
- fish hook removed with or without minor surgery and local anesthetic
- shell repaired with fiberglass/resin/epoxy/stainless steel wire
- tumor surgically removed (cryosurgery or cutting) or treated with topical ointment (blood root) or injection (Dermex)
- Endoscopy

2. Conduct humane euthanasia of a sick or injured sea turtle if two or more veterinarians decide it has no chance to recover or survive in the natural environment. There are only two Institutional Animal Care and Use Committee (IACUC) approved methods of euthanasia for reptiles, barbiturate overdose and penetrating captive bolt, and the MTRP only uses barbiturate overdose.
3. Conduct a comprehensive necropsy of all euthanized turtles by a licensed veterinary pathologist.

G. Transport of Captured Turtles. This involves handling, stabilizing, and transporting living turtles.

1. Using a certified animal carrier, with the turtle covered with a wet pad for cooling on a plane, in the back of a vehicle, or on a boat if the individual is captured at sea.
2. Transport of salvaged and frozen dead turtles or turtle tissues, boxed and shipped by ground or air transport.

H. Release of Wild Turtles Back into the Natural Environment. This involves tagging, transporting to the appropriate release point, and release of individuals into suitable habitat, as defined by sea turtle experts.

I. Collection of Environmental Samples. This involves collection of information and physical samples from the environment in support of sea turtle research.

1. Collect invertebrates such as algae or sea grasses in known turtle foraging areas.
2. Collect sediments for presence of viruses and other pathogens.
3. Record and archive seawater temperature data.
4. Record and archive sand temperature data.
5. Collect seawater for presence of viruses and other pathogens.
6. Record and archive weather data and associated oceanographic characteristics.
7. Collect beach sand for analysis of beach physiology (e.g., sand grain size, porosity, water content).

J. Technical Assistance, Modeling, Data Analysis, Educational Outreach, and International Collaboration. This involves data storage and manipulation, developing and using population models,

educational outreach, and collaborating with international sea turtle researchers from the Pacific Rim and Pacific Island nations to further research in support of the recovery of Pacific stocks of sea turtles. Technical assistance involves the transfer of specific scientific expertise to train professionals in other countries, assist in data analysis, provide supplies, and perform other noninvasive actions.

2.2.3 Standard Operating Procedures for Implementation of Methods and Techniques

2.2.3.1 Standard Operating Procedures Accepted Worldwide

The MTAP ensures the safety of research and technician personnel first and foremost in all program activities, and conducts constant training of all personnel in the implementation of techniques and methods, both in the laboratory and in the field.

All research techniques and methods are conducted consistent with accepted standards within the sea turtle research community (Eckert *et al.* 1999) based on efficacy and the experience gained through 34 years of implementation.

Eckert *et al.* (1999) incorporates standards for:

- Capturing (L.M. Ehrhart and L.H. Ogren. *Studies in Foraging Habitats: Capturing and Handling Turtles*; see also: Balazs *et al.* 1987 and Balazs *et al.* 1998);
- Tagging (S.A. Eckert. *Data Acquisition Systems for Monitoring Sea Turtle Behavior and Physiology*; G.H. Balazs. *Factors to Consider in the Tagging of Sea Turtles*; see also: Balazs *et al.* 1996);
- Collecting physical measurements (A.B. Bolten. *Techniques for Measuring Sea Turtles*);
- Diet sampling and diet component analysis, including the use of esophageal lavage (Forbes and Limpus 1993, G.H. Balazs 1992);
- Measuring growth and growth rates (R.P. Van Dam. *Measuring Sea Turtle Growth*);
- Genetic population sampling (N. FitzSimmons, C. Moritz, and B.W. Bowen. *Population Identification;* also see: Bowen *et al.* 1992);
- Determining clutch size and reproductive success (J.D. Miller. *Determining Clutch Size and Hatching Success*);
- Diagnosing sex of sea turtles in foraging habitats (T. Wibbels. *Diagnosing the Sex of Sea Turtles in Foraging Habitats*);
- Techniques for evaluating infectious diseases of sea turtles (L.H. Herbst. *Infectious Diseases of Sea Turtles*);
- Tissue sampling and biopsy techniques (E.R. Jacobsen. *Tissue Sampling and Necropsy Techniques;* see also Dutton and Balazs 1996);
- Techniques for sampling blood and conducting laparoscopy for determining reproductive cycles (D. Wm. Owens. *Reproductive Cycles and Endocrinology*);

- Conducting stranding and salvaging networks (D.J. Shaver and W.G. Teas. *Stranding and Salvage Networks*)

2.2.3.2 MTAP Standard Operating Procedures

The following standard operating procedures are incorporated into the protocols for implementing the techniques and methods described in Section 2.2.2. These standard operating procedures are designed to minimize the impact of MTAP's techniques and methods on the environment, and turtles in particular.

- Nesting females can become skittish or disturbed if a light is shined on their face during egg deposition, or if they see the researcher or the researcher's shadow. To reduce the likelihood of disturbance, flashlight use is minimized and the light is covered with the hand with the first two fingers spread slightly to focus the beam. Researchers always approach a nesting turtle slowly from the rear. Before contact is made with the turtle, her activity is noted, and an attempt to identify her by shell etching or tag is made. Based on her activity, the researcher decides if it is the appropriate time to safely tag and sample (if necessary) the turtle without disrupting the nesting process. The best time for the researcher to interact with the turtle is after egg laying is complete.
- PIT tags are best inserted directly under the skin into the hind flipper after the female has completed egg laying, when she typically goes into a trance-like state, or, secondarily, when the turtle is crawling, making a body pit, covering the eggs, or backfilling, but never while excavating the egg chamber or depositing eggs to avoid any potential for nest abandonment. Every pre-sterilized needle is used only once and disposed of properly.
- Skin sites for all activities that require puncturing the skin, such as tag application activities that require attachment to skin (physical tags or PIT tags), and collecting biopsies and blood samples, and use of tools for carapace marking and measuring, are cleaned with an antiseptic.
- Skin biopsies are taken from turtles incidentally caught in commercial fisheries, confiscated by law enforcement, captured during fieldwork, encountered on a nesting beach, and stranded turtles. The biopsy (a small plug of skin and tissue) is quickly taken from the edge of a hind flipper or from the soft skin near the hind flippers using a sharp pre-sterilized punch tool.
- When possible, satellite and VHF radio transmitters are attached, removed, and/or replaced on nesting females only when the turtle has finished nesting to avoid nest abandonment.
- All wild turtles are typically held for field research activities for periods of time varying from minutes to 1 to 2 hours, unless a satellite or radio transmitter is being attached, at which point holding could extend to 3 hours.
- All drugs, including topical medications, vitamins and dietary supplements, and antibiotics are administered to turtles only by trained staff under the supervision of licensed veterinarians using approved IACUC protocols.

- Release of wild turtles from anywhere in the Hawaiian Islands back into the natural environment either during research activities or after rehabilitation at the NMFS Kewalo Research Facility (KRF) in Honolulu, Hawaii includes:
    - Any potentially diseased individual (known to be or potentially exposed) will not be released into areas having no known evidence of disease. When necessary, the animal is placed in quarantine for an appropriate duration, and the animal is observed for abnormal physical, physiological, or behavioral conditions; blood samples are collected to ensure absence of or an acceptable level of medical problems, as determined by a veterinary pathologist, prior to release.
    - Turtles stranded in areas not known to have the FP disease (i.e., leeward coast of Hawaii) are never released back into the original stranding site because the seawater used at KRF is recycled from the Oahu coast and the turtles could have been infected during their rehabilitation. All such turtles are released at sites on Oahu.
    - Turtles with or without FP tumors stranded from waters known to have the disease are released into calm waters close to the capture site, or in Kaneohe or Kailua Bays. Kaneohe Bay has the highest prevalence of FP disease in Hawaii and has calm waters; therefore, it is an appropriate release site for animals that have previously been exposed to the disease.
    - Turtles with one or more flipper amputated in the wild or by surgery because of severe entanglement or physical damage are released into calm waters of Kailua Bay or Maunalua Bay on Oahu to facilitate swimming.
    - Turtles are transported by truck to the release site in an approved container, covered with a wet absorbent pad, and are then carried by hand to be released near the water's edge, or gently from a boat.
    - After release, observers watch for the turtle to surface several times to breathe to ensure that the turtle is behaving normally and moving away from shore.

2.2.3.3 Standard Operating Procedures for Avoiding Disturbance to Other Species, Especially Monk Seals on Sea Turtle Nesting Beaches

Prior to going into the field to conduct MTAP activities, all personnel undergo training, study the program's standard operating procedures manual, and are prepared to adhere to all requirements.

- Monk seals typically rest facing inland, therefore researchers always scan with the flashlight from the shoreline berm towards the center of the island to avoid shining the light in the eyes of monk seals.
- If a monk seal happens to be facing the researcher, the light is turned off and the researcher slowly moves away.
- Researchers encountering monk seals remain at an appropriate distance at all times.

- Nesting research surveys would be conducted no more than once per hour to minimize disturbance to nesting turtles, seabirds, and monk seals unless a particular turtle needs to be identified or observed.
- Researchers maintain a low profile during daylight when encountering a monk seal, and whenever possible, pass it from downwind.
- Researchers attempt to keep noise or sudden sounds to a minimum.
- If a monk seal notices the researcher, the person crouches down and slowly moves away.

2.3 Alternative C: No Federal Action

The no Federal action alternative would stop the MTAP research activities. This would not be consistent with the recovery plans of all five species of sea turtles found in the PIR (NMFS and USFWS 1998a, 1998b, 1998c, 1998d, 1998e). Sea turtle populations have not recovered per the recovery plans, and the large-scale biological and ecological factors that have contributed to sea turtle population declines across the Pacific Islands Region are poorly understood and need to be analyzed in order to achieve the recovery goals of all five sea turtle species. Furthermore, the NRC has identified population assessments as one of the most critical research topics in sea turtle ecology.

If the MTAP stopped conducting research on sea turtles, then data would not be collected on sea turtle stocks or life history (i.e., nesting, foraging, movement, genetics), and the necessary population assessments would not be conducted. Furthermore, the program would not engage in international collaboration, training, technical assistance, education, outreach, population modeling, or data analysis. As agents and federal employees of the NMFS, MTAP staff would continue to aid stranded sea turtles in accordance with the programmatic permit described at 50 CFR § 222.310.

This alternative would fail to meet the purpose of the MTAP at the PIFSC and would fail to fulfill the data needs of the federal government as the entity responsible for sea turtle recovery. Furthermore, data that otherwise would have been collected and analyzed by the MTAP would not be published in the peer-reviewed literature and other technical reports. Therefore, it would be difficult for the federal government and related management organizations to develop or implement management strategies for sea turtle species in the Pacific Ocean because they would not have the necessary biological and ecological information about the species.

This alternative would result in a short-term reduction in minor adverse impacts to the environment (i.e., turtles and similarly affected species) because researchers would not be actively working in the field handling turtles and collecting data. Handling turtles causes a small amount of non-lethal stress to the animal, but implementation of the standard operating procedures described in minimizes these temporary effects. The long-term impact of this alternative would be a lack of data necessary to analyze population trends and make management decision to recover these species (i.e., remove them from the list of threatened and endangered species). This would have moderate direct and indirect adverse ramifications on the local cultures that identity with sea turtles, tourism, the fishing industry, and ecological services (e.g., food-web maintenance) in the Pacific Ocean region.

The lack of research staff in the field would also likely reduce the overall response to stranded turtles because there would be fewer people in locations where turtles occur. It is anticipated that non-federal governmental agencies and non-governmental agencies (NGOs) would take over some of those data collection tasks, but the extent that these agencies would fill the roles of the MTAP and MTRP is difficult to predict. Given that the MTRP serves as the primary data collecting entity in the region, it is unlikely these agencies would have the same focused purpose or level funding, staff, or expertise to meet the data needs.

3 Description of Affected Environment

The focus of the proposed MTAP data collection and population assessment activities is on the U.S. Insular Areas of the Pacific Islands Region. The MTAP would continue population assessments and modeling of data collected by the MTRP in the Hawaiian Archipelago. Because historic data collection activities in the U.S. Insular Areas have been sporadic, the MTAP would initially need to survey a number of islands and atolls in the PIR to identify appropriate long-term monitoring locations. The initial MTAP data collection activities (e.g., a nesting survey) would include: Rose Atoll, Tau, and Tutuila in American Samoa; Rota, Saipan, and Tinian in CNMI; Guam; Jarvis Island; Howland Island; Baker Island; and Palmyra Atoll. These data collection activities would take place on beaches and in near-shore shallow water habitats as described in the Section 2.2. While the exact characteristics of each beach and near-shore environment will vary from island to island, and site to site, the processes that shaped these dynamic habitats (e.g., wave action, reef-building corals, volcanoes) in the PIR are similar and therefore they will be considered in general. A detailed description of the physical, chemical, and biological conditions the PIR can be found in the Final Environmental Impact Statement *Toward and ecosystem approach for the western Pacific region: from species-based fishery management plans to place-based fishery ecosystem plans*, and is incorporated by reference here (NMFS 2009). The EIS is available at the PIRO website under the heading of Public Documents, subheading National Environmental Policy Act Documents: http://www.fpir.noaa.gov/Library/PUBDOCs/environmental_impact_statements/FPEIS_FEP/NEPA%20Final%20PEIS%20with%20Appendices%20AU71%20FEPs%20%282009-09-24%29.pdf .

Along with the natural processes of wave action, reef-building corals, and volcanoes, the PIR is subject to the forces of open-ocean tropical phenomenon such as tsunamis and typhoons (i.e., referred to as hurricanes in the Atlantic or eastern and central Pacific Ocean, and cyclones in southern Pacific Ocean). For example, in September 2009 an earthquake and resulting tsunami devastated American Samoa (CIA 2012). Tsunami waves up to 20 feet tall washed over American Samoa up to one mile inland. In November 1991 Super Typhoon Yuri, a category 5 hurricane with wind gusts up to 115 mph, devastated Micronesia and cause 33 million dollars of damage in Guam.

3.1 Hawaiian Archipelago

3.1.1 Main Hawaiian Islands

The eight main islands make up only one quarter of the Hawaiian Archipelago's area, but are home to almost all 1.3 million people that live in the state. The eight high volcanic islands include (from southeast to northwest): Hawaii, Maui, Kahoolawe, Lanai, Molokai, Oahu, Kauai, and Niihau. The islands are located approximately 2,000 nautical miles from North America and 3,000 nautical miles from Asia. Despite these distances, tourism constitutes the largest part of the Hawaiian economy. Tourists are attracted to the tropical climate and diverse marine resources including coral reefs, sandy beaches, and surf breaks. The sandy beaches are generally protected by the fringing reefs but the sediment dynamics are vulnerable to disruption of near-shore currents. Agriculture and the military are the other main sources of state income. Consequently, the marine resources of the MHI experience pressures for

overuse at tourist destinations and shipping traffic at the military bases and ports. Oahu is the most populous island and one of the most densely populated areas in the United States.

The MTAP is based at the Pacific Islands Fisheries Science Center in Honolulu, Hawaii. The rehabilitation facility of sea turtles is located at the Kewalo Research Facility also in the city of Honolulu. The facility is equipped with three tanks of various sizes allowing for the rehabilitation of turtles of all sizes and conditions. Tanks have active saltwater filtration and pump systems. All tanks and equipment are thoroughly cleaned to avoid disease transfer from individuals. Furthermore one tank is dedicated for turtles with FP. The PIFSC and its facilities will be moving, with NOAA's other line offices, to the Pacific Region Center (which is started construction in 2011) located on Ford Island in Pearl Harbor beginning in approximately 2013.

3.1.2 Northwestern Hawaiian Islands

The NWHI were are an assemblage of islands, atoll, reefs, banks, pinnacles, and seamounts that stretch approximately 1,200 miles northwest of the Island of Kauai. The NWHIs are the oldest part of the Hawaiian archipelago and are also known as the Leeward Islands. There are ten main islands and atolls (from southeast to northwest): Nihoa Island, Mokumanamana (Necker Island), French Frigate Shoals, Garnder Pinnacles, Maro Reef, Laysan Island, Lisianski Island, Pearl and Hermes Atoll, Midway Atoll (Midway Islands), and Kure Atoll. The two southernmost islands, Nihoa and Mokumanamana, are basaltic islands with little beach areas. Four of the five middle landmasses are open atolls (French Frigate Shoals [FFS] and Maro Reef) and sandy islands (Laysan and Lisianski). La Perouse Pinnacle (at FFS) and Gardner Pinnacles are small basaltic outcrops, remnants of islands similar to Nihoa and Mokumanamana. The three northernmost landmasses, Pearl and Hermes, Midway, and Kure, are classical atolls. The beaches of the NWHI are highly dynamic given their low-lying topography and exposure to waves and currents from the northern and southern hemisphere. The texture of beaches ranges from fine sand to corral rubble. This emergent land is vital habitat to the 14 million resident and migratory seabirds, which rely on these islands for roosting and breeding habitat and on the surrounding waters for food and which are protected under the Migratory Bird Treaty Act (PMNM 2008). The NWHI are part of the State of Hawaii (except for Midway Atoll, which is under control by the Federal government).

The NWHI have had varying levels of legal protection since their discovery. In response to the slaughter of millions of seabirds by poachers, President Theodore Roosevelt created the Hawaiian Islands Bird Reservation in 1909. In 1940, President Franklin Delano Roosevelt renamed it the Hawaiian Islands National Wildlife Refuge. Since 1940, most of the populations of plants and animals on the islands have rebounded to their pre-exploitation levels (Rauzon 2001). The entire chain is now part of the Papahanaumokuakea Marine National Monument (U.S. President 2006 and 2007). As a National Monument, access to the islands and atolls, and activities within in 50 nautical miles of the shoreline are regulated through a permitting system co-administered by the NMFS, USFWS, and State of Hawaii.

French Frigate Shoals is the primary location of the green sea turtle nesting surveys. Occasionally, abundance surveys are also opportunistically completed on other islands as part of the PIFSC research

program. FFS is the largest atoll in the chain, with approximately 9,300 hectares of coral reef habitat and only 27 hectares of emergent land. The islets within the atoll are highly dynamic systems made of coral sand and the total area of emergent land can fluctuate from year to year. The focus of the nesting surveys is East Island, a sparsely vegetated sand island. Tern Island has been modified from a naturally sand island to an airplane runway, with a number of associated permanent buildings. These buildings and associated infrastructure serve as the base for research at FFS. The modifications of Tern Island are a result of dredge and fill operations within the atoll. Aside from the USFWS and NMFS staff live on Tern Island, FFS is not inhabited by humans.

3.2 U.S. Insular Areas of the Pacific Ocean

The U.S. Insular Areas of the Pacific Ocean comprise the other portion of the Pacific Islands Region located in the central and western Pacific Ocean – an area that roughly covers the range of the sea turtles being studied by the MTAP. It coincides with the management area of the National Marine Fisheries Service, Pacific Islands Region, and includes all areas with the U.S. Exclusive Economic Zone. This includes American Samoa, Guam, the Commonwealth of the Northern Mariana Islands (CNMI), Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Atoll, Wake Island, and Palmyra Atoll.

3.2.1 American Samoa

American Samoa is an unincorporated and unorganized territory of the United States. American Samoa became a U.S. territory with the Tripartite Convention of 1899 and President McKinley's Executive Order of February 19, 1900. With the neighboring independent nation of Samoa (located to the northwest) the islands comprise the Samoan Archipelago. It is located approximately 2,500 nautical miles south of Honolulu. American Samoa includes seven islands: Tutuila, Aunu'u, Ofu, Olosega, Ta'ū, Swains Atoll, and Rose Atoll. The total surface area for American Samoa is approximately 76 square miles. Tutuila is the largest island and center of the island nation's politics and economy. The 2010 census population was 55, 519 people, with 95 percent living on Tutuila. The overwhelming majority of the population is native Samoan. The harbor in the capital city, Pago Pago, is the heart of the fishing industry. The National Park of American Samoa is located on the islands of Tutuila, Ofu, Olosega, and Ta'ū. The park includes mountain peaks, river valleys, beaches, and coral reefs.

Rose Atoll, which is also called Muliāva in Samoan, is a low-lying coral atoll located approximately 130 nautical miles east-southeast of rat the southeast from Pago Pago Harbor at the end of the archipelago. The atoll is roughly square-shaped and comprised of two islands: Rose Island and Sand Island. Rose Island is heavily vegetated with Pisonia trees and beach heliotrope shrubs (*Tournefortia argentea*). Sand Island is mostly bare sand. The total land area of the atoll is approximately 7.8 acres. The islands surround an approximately 2.5 square mile lagoon that has a mostly sandy bottom, which is up to 65 feet deep (USFWS 2000). The atoll has only been briefly inhabitated by human over the years as a fishing station and coconut plantation, and for scientific explorations (Sachet 1954).

The emergent lands of Rose Atoll were declared a National Wildlife Refuge on July 5, 1973 with an agreement between American Samoa and the U.S. (USFWS 2011a). The Rose Atoll Marine National

Monument was established on January 6, 2009 through Presidential Proclamation 8337 (U.S. President 2009c). Management of the Monument resources is shared between the Departments of the Interior and Commerce. NOAA, Office of Marine Sanctuaries, is considering adding the marine areas of Rose Atoll Marine National Monument to the Fagatele Bay National Marine Sanctuary, which will be known as the America Samoa National Marine Sanctuary (NOAA 2011).

Rose Atoll is known for containing the rare giant clam (*Tridacna gigas*) (USFWS 2011a). It is also unique for being dominated by crustose coralline algae, unlike most of the coral reefs of Samoa, which are dominated by hermatypic corals (Kenyon et al. 2010). There have been a total of 143 species of anthozoan and hydrozoan coral observed at the atoll (Kenyon et al. 2010). The atoll is home to twelve seabird species and approximately 270 reef fish species (USFWS 2011a). The atoll is used as a nesting location for green and hawksbill sea turtles.

3.2.2 Commonwealth of the Northern Mariana Islands

CNMI is a commonwealth of fourteen islands that is in political union with the United States. In 1976 the United States Congress approved the Covenant that transformed the CNMI from a United States territory to a commonwealth. The Covenant, with its legal agreements, was fully implemented in 1986. CNMI was a U.S. territory from 1947 to 1986 as part of the United Nations Trust Territory of the Pacific Islands agreement following World War II.

CNMI is located approximately 3,500 nautical miles west of Honolulu. The total land area of all the islands is approximately 180 square miles. The volcanically active northern islands include Anatahan, Sarigan, Guguan, Alamagan, Pagan, Agrihan, Ascuncion, Maug, and Farallon de Pajaros. Of the fourteen islands, only Saipan, Tinian, and Rota support a permanent population of people. Approximately 90 percent of the CNMI population lives on Saipan. The CNMI population is comprised mostly of people of Chamorro, Carolinian, Micronesian, European, and East Asian descent. The major industries of CNMI are tourism and garment production. The older, southern islands support coral reefs, seagrass beds, and some mangroves (NMFS 2009). Both green and hawksbill sea turtles are known to occur around CNMI.

On January 6, 2009 the Marianas Trench Marine National Monument was created with Presidential Proclamation 8335 (U.S. President 2009a). The Mariana Volcanic Arc is part of a subduction system where the Pacific Plate plunges beneath the Philippine Sea Plate and into the Earth's mantle, creating the Mariana Trench. The Mariana Trench is approximately 940 nautical miles long and 38 nautical miles wide within the United States' Exclusive Economic Zone. The deepest known point in the global ocean, Challenger Deep at 10,916 meters below sea level, is located within the Mariana Trench. However, this point is located just outside of U.S. jurisdiction in the neighboring waters of the Federated States of Micronesia. The monument includes the waters and submerged lands of the three northernmost Mariana Islands (the "Islands Unit") and only the submerged lands of designated volcanic sites (the "Volcanic Unit") and the Mariana Trench (the "Trench Unit") to the extent described as follows: The seaward boundaries of the Islands Unit lie approximately 50 nautical miles from the mean low water line of Farallon de Pajaros (Uracas), Maug, and Asuncion. The inland boundary of the Islands Unit of the monument is the mean low water line. The boundaries of the Volcanic Unit of the monument include a

circle drawn with a one nautical mile radius centered on each of the volcanic features. The boundary of the Trench Unit of the monument extends from the northern limit of the Exclusive Economic Zone of the United States in the CNMI to the southern limit of the Exclusive Economic Zone of the United States in Guam.

3.2.3 Guam

Guam is an organized, unincorporated territory of the U.S. It was ceded by the Spanish to the U.S. in 1898 in the Treaty of Paris following the Spanish-American War. During World War II it was occupied by the Japanese for 31 months, but recaptured by the U.S. in 1944 during the second Battle of Guam. It is located immediately south of the CNMI and is the fifteenth island in the Mariana Archipelago (the entire Mariana Archipelago is approximately 480 miles long). Tourism is the largest sector of the economy followed by the military. The U.S. military occupies approximately one-third of the land area on Guam. Apra Harbor is the major deep water port.

The land area of Guam is approximately 212 square miles. It supports one of the largest populations of people in the region, approximately 160,000 people based on the 2010 Census. The indigenous language and people of Guam are Chammoro. The island is surrounded by coral reefs, which range in health from degraded, in the south, to good condition, in the north. The major threats to the health of the reef are overfishing and sedimentation. Both green and hawksbill sea turtles nest on Guam.

3.2.4 Pacific Remote Island Areas

The Pacific Remote Island Areas (PRIAs) include Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Wake Island, and Palmyra Atoll. They are usually grouped together because they are under the jurisdiction of U.S. and are small, sparsely populated islands and atolls set in the central and western Pacific Ocean. They are grouped together in spite of the fact they span an area that is approximately 3,000 miles by 1,500 miles (or roughly the same area as the continental United States). All seven islands and atolls make up the Pacific Remote Islands Marine National Monument, which was created on January 6, 2009 through Presidential Proclamation 8336 (U.S. President 2009b). Management of the Monument resources is shared between the Departments of the Interior and Commerce. These islands are also sometimes referred to as the U.S. Minor Outlying Islands for statistical purposes.

3.2.4.1 Johnston Atoll

Johnston Atoll is an unorganized, unincorporated territory of the United States. Johnston Atoll is located approximately 700 nautical miles west-southwest of Honolulu. The atoll was created by volcanic action and natural coral reef building. The atoll is comprised of four islands: Johnston, Sand, North (Akua), and East (Hikina). The islands make up approximately one square mile of land. North and East Islands were created entirely by dredge and fill operations, while Johnston and Sand were natural islands that have been expanded by filling the lagoon around the island. Johnston Island includes a 6,100-foot-long runway, a dock, and numerous buildings. The atoll also features a nine-mile-long emergent reef located on the northwest side the islands.

On July 29, 1926, President Coolidge established the Johnston Atoll federal bird refuge, through Executive Order 4467, and placed it under the control of the U.S. Department of Agriculture. On December 29, 1934, control of Johnston Atoll was transferred to the U.S. Navy, through Executive Order 6935, and an air station was established. Through the same order, management of the bird refuge was transferred to the Department of the Interior. In 1936, the U.S. Navy began developing a military facility on the atoll. On February 14, 1941, the atoll was designated as a Naval Defensive Sea Area and Airspace Reservation by Executive Order 8682. The Secretary of the Navy agreed to transfer operational control of Johnston Atoll to the U.S. Air Force on July 1, 1948. A LORAN station was built on Johnston Island in 1957, and then transferred onto Sand Island in 1959. The Department of the Air Force signed an agreement with the Defense Nuclear Agency (now called the Defense Threat Reduction Agency) on July 1, 1973, to administer host-management of the island. (OIA 2012). The military facilities are in the process of being dismantled and the area remediated, and ultimately will be turned over to the U.S. Fish and Wildlife Service (USFWS 2011). Currently the atoll is managed as both the Johnston Atoll National Wildlife Refuge (formally the bird refuge) and Pacific Remote Islands Marine National Monument.

Johnston Atoll is unique because it is the only landmass and shallow-water reef system for hundreds of miles in any direction of the central Pacific Ocean. The atoll is home to fourteen species of seabirds, five species of wintering shorebirds, the federally endangered Hawaiian monk seal, and a nesting population of green sea turtles. Surveys of the reef system in 2000 identified 668 taxa of macroalgae, invertebrates, and fishes (Coles *et al.* 2001). Of these, less than 2% were found to be non-indigenous.

Genetic studies of the coral-eating crown-of-thorns sea star have shown that Johnston Atoll and the Hawaiian Archipelago are connected in terms of gene flow (Timmers *et al.* 2011). Other studies of reef fish have shown that this connectivity may be unique, as species found in both locations are genetically different than related species in the rest of the central or eastern Pacific Ocean (Lessios and Robertson 2006). Approximately 90 percent of the aquatic species found at Johnston Atoll during a survey in 2000 were also known to occur in the Hawaii Archipelago (Cole *et al.* 2001).

The physical and biological resources at Johnston Atoll occur in spite of the fact that the island been subjected to many stressors over the year. From the 1850s through the 1900s the atoll was heavily disturbed through guano mining activities. Military activities at the atoll included airplane operations, submarine refueling, nuclear testing, missile launching, and chemical weapons incineration. During the height of activity at the atoll, approximately 1,300 people lived on Johnston Island. The lingering effects of all of these activities include soil and water contamination from nutrients, dioxin, plutonium, PCBs, and petroleum (USFWS 2011a).

3.2.4.2 Wake Atoll

Wake Atoll (also known as Wake Island) is an unorganized, unincorporated territory of the U.S. The atoll consists of three coral islands (Wake, Peale, and Wilkes) with a large central lagoon. The lagoon is approximately thirteen square kilometers in area and five meters deep at its deepest. It is located approximately 2,000 nautical miles west of Honolulu. The total land area of all three islands is approximately three acres. Wake atoll is the northern most atoll in the Marshall Islands geological ridge.

The atoll was claimed by the U.S. on January 17, 1899 (Bryan 1959). In 1935 Pan American Airways established an airport and small hotel on the atoll (Bryan 1959). During World War II the atoll was the site of many battles because of its strategic location. It was captured by the Japanese in 1941 and surrendered to the U.S. on September 7, 1945. The U.S. military currently supports approximately 300 people on the atoll, a 9,800-foot-long runway on Wake Island, a missile launch facility, a series of roads and bridges, and a retired LORAN station on Peale Island (DOI 2012). The infrastructure on the atoll has been severely damaged (and repaired) several times by typhoons.

While the atoll lacks a freshwater supply it supports colonies of twelve species of nesting seabirds and six species of migratory shorebirds (U.S. President 2009a). The native flightless bird, the Wake Island rail, went extinct in the 1940's. The atoll has been infested with both rats and mosquitoes since it was discovered (Bryan 1959). The lagoon and waters around Wake Atoll support over 300 species of fish and 100 species of corals (USFWS 2011a). In particular, the atoll is home to one of the last healthy populations of bumphead parrotfish in the Pacific Ocean. The fact that Wake Atoll may be the oldest living atoll in the world contributes to its diversity.

3.2.4.3 Howland Island

Howland Island is an unorganized, unincorporated territory of the United States. Howland Island is located approximately 1,800 nautical miles southwest of Honolulu, and 40 miles north of Baker Island. The island is part of the Phoenix Islands group. The island is approximately two miles long and half a mile wide, covering approximately 450 acres. The island has been administered by the U.S. Fish and Wildlife Service since June 27, 1974 as a National Wildlife Refuge (USFWS 2011a).

The island is currently uninhabited and has no natural freshwater supply. It is believed that Polynesians and Micronesians have sporadically visited the island since 1000 B.C.E. It was originally claimed in 1857 by the United States under the Guano Islands Act of 1856. From 1858 through the early 1900s the island was mined for guano. After being reclaimed by the United States from the United Kingdom on March 26, 1935, the Department of Interior established a colony on the island. From 1935 to 1942 the colonists, mostly young men from Kamehameha School of Honolulu, Hawaii, lived on the island in a settlement known as Itascatown. A lighthouse and runway were constructed on Howland Island and were to be used during Amelia Earhart's fateful around-the-world flight of 1937. The island was abandoned on January 31, 1942 in response to a Japanese attack as World War II waged. U.S. Marines occupied the island the island through 1944. Since then it has been episodically visited, mostly by scientists. Aside from a lighthouse-shaped day beacon, few remnants of its past infrastructure remain on the island, which is sometimes washed over by storm surges (USFWS 2011a).

Howland Island is covered with low-growing vegetation such as Pisonia trees. A narrow fringing reef surrounds the island (DOI 2012). Howland Island is one of the few islands in the world exposed to the Equatorial Undercurrent, which creates localized nutrient-rich upwelling in its shallows. These nutrients sustain a diverse and abundant fish population around the island (U.S. President 2009b). Howland Island also supports approximately a dozen seabird colonies and eight shorebird colonies. A feral cat and rat population (that was established by the guano miners) was completely removed by 1990. The

climate is equatorial with scant rainfall, constant wind, and intense sunshine (CIA 2011). The fringing reef surrounding the island supports approximately 109 coral species, including table and staghorn corals. Approximately 50 percent of the reef terrace is covered by live coral. Hawksbill and green sea turtles are known to forage in the near-shore waters (USFWS 2011a).

3.2.4.4 Baker Island

Baker Island is an unorganized, unincorporated territory of the United States. Baker Island is located approximately 1,800 nautical miles southwest of Honolulu. Like Howland Island, Baker Island is part of the Phoenix Island Archipelago. The total land area of the island is approximately 500 acres. The island has been administered by the U.S. Fish and Wildlife Service since June 27, 1974 as a National Wildlife Refuge.

The island is currently uninhabited and has no natural freshwater supply. It is believed that Polynesians and Micronesians have sporadically visited the island since 1000 B.C.E. It was originally claimed in 1857 by the United States under the Guano Islands Act of 1856. From 1858 through the early 1900s the island was mined for guano. After being reclaimed by the United States from the United Kingdom on March 26, 1935, the Department of Interior established a colony on the island. From 1935 to 1942 the colonists, mostly young men from Kamehameha School of Honolulu, Hawaii, lived on the island in a settlement known as Meyerton. A lighthouse and runway were constructed on Baker Island. The island was abandoned on January 31, 1942 in response to a Japanese attack as World War II waged. U.S. Marines occupied the island the island through 1944. Since then it has been episodically visited, mostly by scientists. Aside from a lighthouse-shaped day beacon, a derelict runway, a LORAN station, crashed airplanes, and abandoned bulldozers, few remnants of its past infrastructure remain on the island, which is sometimes washed over by storm surges (USFWS 2011a).

Baker Island is covered with low-growing vegetation and a small patch of introduced coconut palms. A narrow fringing reef surrounds the island (DOI 2012). Baker Island is one of the few islands in the world exposed to the Equatorial Undercurrent, which creates localized nutrient-rich upwelling in shallows. These nutrients sustain a diverse and abundant fish population around the island (U.S. President 2009b). Baker Island also supports approximately a dozen seabird colonies and eight shorebird colonies. A feral cat and rat population (that was established by the guano miners) was completely removed in 1965. The climate is equatorial with scant rainfall, constant wind, and intense sunshine (CIA 2011). The fringing reef surrounding the island supports approximately 62 coral species, including table and staghorn corals. Approximately 50 percent of the reef terrace is covered by live coral. Hawksbill and green sea turtles are known to forage in the near-shore waters (USFWS 2011).

3.2.4.5 Jarvis Island

Jarvis Island is an unorganized, unincorporated territory of the United States. Jarvis Island is located approximately 1300 nautical miles south of Honolulu. The island has been administered by the U.S. Fish and Wildlife Service since June 27, 1974 as a National Wildlife Refuge. The island is one of the chain of Line Islands. The island is approximately two miles long and one mile wide. A narrow fringing reef surrounds the island.

The island is currently uninhabited. It was originally claimed by the United States under the Guano Islands Act in March 1857. From 1858 through the early 1900s the island was mined for guano. After being reclaimed by the United States from the United Kingdom on March 26, 1935, the Department of Interior established a colony on the island. From 1936 to 1942 the colonists, mostly young men from Hawaii, lived on the island in a settlement known as Millersville. The island was abandoned on February 7, 1942 in response to a Japanese attack as World War II waged. Since then is episodically visited, mostly by scientists. Aside from a lighthouse-shaped day beacon, few remnants of its past infrastructure remain on the island, which is sometimes washed over by storm surges.

Jarvis Island supports colonies of seabirds. A feral cat and rat population (that was established by the guano miners) was completely removed in 1990. The fringing reef surrounding the island supports approximately 62 coral species, including table and staghorn corals. Approximately 50 percent of the reef terrace is covered by live coral (USFWS 2011).

3.2.4.6 Kingman Reef

Kingman Reef is an unorganized, unincorporated territory of the United States. It is located approximately 930 nautical miles southwest of Honolulu. The coral atoll is approximately 18,000 acres in size, but has less than 3 acres of emergent land area (i.e., coral rubble). These islands do not support permanent vegetation and are routinely washed over by ocean swells. Kingman Reef is the northernmost island in the Line Islands chain, and located approximately 36 nautical miles northwest of Palmyra Atoll.

Kingman Reef was annexed by the U.S. in 1922 under the Guano Act (CIA 2012). The lagoon in the atoll was used by seaplanes as a shelter during Hawaii-to-American Samoa flights. The U.S. Navy also used the lagoon during World War II and still maintains jurisdiction over the atoll as a Naval Defensive Sea Area and Airspace Reservation by Executive Order (OIA 2012). The island has been administered by the U.S. Fish and Wildlife Service since January 18, 2001 as a National Wildlife Refuge (USFWS 2011a).

The waters around Kingman Reef are renowned for their diverse and abundant life. It has been reported that the reef supports 168 species of fish, 102 species of coral, giant clams, and green sea turtles. In 2001, the reef and waters out to 12 nautical miles were declared a National Wildlife Refuge (USFWS 2001a).

3.2.4.7 Palmyra Atoll

Palmyra Atoll is an unorganized, incorporated Territory of the United States. It is located approximately 960 nautical miles southwest of Honolulu. The classic Darwinian atoll consists of approximately 50 islands with a land area of approximately 1000 acres (4.6 square miles). It is part of the Line Islands chain. The island has been administered by the U.S. Fish and Wildlife Service since January 18, 2001 as a National Wildlife Refuge (USFWS 2001b).

The Kingdom of Hawaii took possession of the atoll in 1862. After the overthrow of the Hawaiian Kingdom in 1893, the U.S. annexed Hawaii on July 7, 1898. The new Territory of Hawaii included

Palmyra Atoll. However, on August 21, 1959 when Hawaii became a state, Palmyra Atoll was excluded from the statehood boundaries and remained an incorporated Territory. Most of the lands of Palmyra Atoll are currently privately owned by the Nature Conservancy. The atoll's landscape has been modified by infrastructure development projects, including: two runways, boat docks, roads, causeways connecting the islands, and other buildings.

Unlike the other islands and atolls of the PRIA, Palmyra Atoll receives up to 200 inches of rain per year, which supports a lush terrestrial vegetation community (CIA 2012). The plants are divided into three distinct habitat types: (1) native wet Pisonia forest, (2) introduced coconut forest, and (3) native beach naupaka. Pisonia trees are a distinctive feature in the region because they can reach 100 feet tall and provide roosting habitat for a variety of seabirds. The atoll supports tens of thousands of birds, including ten species of seabirds, and four species of migratory shorebirds. The coconut crab (*Birgus latro*), the world's largest terrestrial arthropod, also lives at Palmyra Atoll (USFWS 2011a). A rat eradication project was implemented in 2011 by the USFWS at the atoll using bait pellets containing the anticoagulant rodenticide brodifacoum (USFWS 2011b). The purpose of project is to restore the natural plant and animal communities of the atoll by eliminating rat predation of birds and native plant seedlings. The three lagoons and waters around the atoll support over 200 species of corals, fish, and marine mammals. The circulation of water through the lagoons was adversely affected by dredge and fill operations conducted before and after World War II. Green sea turtles are known to nest at Palmyra Atoll (USFWS 2011a).

4 Environmental Impacts of the Proposed Action and Alternatives

The proposed action (Alternative B) involves primarily short-term, temporary research actions (i.e., collection of small amounts of biological and ecological data at any one time or location) and stranding response activities. Alternative A represents the status quo and continuation of the current research program (i.e., no change to the current action). Alternative C is the no Federal action alternative, which means the MTAP's current research activities would stop. Because the five species of sea turtles being studied are listed under the ESA, the direct, indirect, and cumulative effects of the research on the turtles is focus of this part of the assessment. As described in Section 2, the MTAP has worked with the MTRP in the development of many avoidance and minimization measures for handling and working with sea turtles. As described in Section 3, the existing baseline conditions within the geographic scope of analysis vary from place to place and with the level of human activity (i.e., from an uninhabited island to a heavily developed beachfront city). This section will discuss the impacts of the proposed action and alternatives on each relevant resource component. These impacts will be compared to the existing baseline conditions by rating them as negligible, minor, moderate, or major. These ratings are made by taking into consideration the context, intensity, and likelihood of the impact.

4.1 Impacts to Sea Turtles

4.1.1 Impacts of Capturing and Handling Sea Turtles

As with any marine habitat capture program, there is a possibility that captured turtles could experience short- and long-term adverse impacts from capture. These adverse impacts range from near-drowning

to actual drowning by entanglement. To minimize the potential for adverse impacts, when nets are in the water to capture turtles, they are constantly monitored and turtles are immediately retrieved from the net (Ehrhart and Ogren 1999). Additionally, several field personnel are in the water during all capture activities to ensure that stress to the animal is minimized. A veterinarian is on call during capture activities in the event consultation is required. If a turtle is encountered during capture activities in a comatose state, resuscitation is attempted. Handling time is minimized to reduce the potential for additional stress. Turtles are only handled for the amount of time necessary to complete sampling, measuring, examination, and tagging. Capture and handling generally takes a matter of minutes, but sometimes up to one or two hours. No stranded tagged turtles have been determined to have died from capture-related activities over the past 24 years (Balazs, pers. comm.).

For the propose action (Alternative B), capturing sea turtles would have short-term temporary direct minor adverse impacts to any sea turtle that is captured. These impacts would be in the form of non-lethal stress to the wild animal. The MTAP has applied for ESA research permits to capture up to 220 green and 165 hawksbill sea turtles over the next five years (i.e., approximately 44 and 33 sea turtles per year, respectively) for the entire PIR with a focus on the U.S. Insular Areas. The indirect adverse impacts would be negligible because the sea turtles are captured, handled, sampled, and then released on-site in a short period of time. The long-term minor beneficial indirect impact of capturing sea turtles would be the increased understanding of the sea turtle populations of the PIR though additional data collection.

For Alternative A, the MTAP would not capture any sea turtles in the U.S. Insular Areas of the Pacific Islands Region, hence there would be no direct adverse impacts to sea turtles in those areas. The MTAP would continue to collaborate with the MTRP in the Hawaiian Archipelago (mainly in the form of analytical services). These collaborations may include capturing sea turtles. Capturing sea turtles would have short-term temporary direct minor adverse impacts to any sea turtle that is captured. These impacts would be in the form of non-lethal stress to the wild animal. The indirect adverse impacts would be negligible because the sea turtles are captured, handled, sampled, and then released on-site in a short period of time. However, there would be a long-term minor indirect adverse effect from not collecting data on these poorly understood sea turtle populations in the U.S. Insular Areas of the Pacific Islands Region.

For Alternative C, no sea turtles would be captured in the PIR by the MTAP, hence there would be no direct or indirect adverse impacts to sea turtles. However, there would be a long-term minor indirect adverse effect from not collecting data on these poorly understood sea turtle populations.

4.1.2 Impacts of Handling and Transporting Stranded Sea Turtles

Handling and transport of live sea turtles is essential for diagnosis and treatment, but due to logistical constraints in the PIR, will be only rarely employed by the MTAP under the proposed action. All live stranded sea turtles – other than individuals that are lightly entangled (i.e., not injured) in fishing gear and can be disentangled and released on site – are captured by trained staff and collaborators and when logistically possible transported to a facility for diagnosis and treatment by a licensed veterinarian. Given the remote nature of our proposed study sites, such access or facilities are frequently not possible. In

these instances, the highest level of treatment possible would be administered on-site, and the sea turtle would not be transported. Whenever possible, turtles are rehabilitated and ultimately released back into their natural environment.

For the propose action (Alternative B), it is anticipated that fewer than five stranded sea turtles would be handled and transported per year at each of the islands within the PIR. Handling and transporting sea turtles will have a minor short-term temporary direct adverse impact on the animal's condition because they are wild animals not accustomed to being restrained by humans. Direct minor adverse impacts of transporting sea turtles, such as over-heating, are minimized through a variety of techniques, such as, covering the turtle with a wet pad during transport. The long-term minor beneficial indirect impacts of handling and transporting stranded turtles would be the enhanced survival of individual sea turtles that would have succumb to treatable injuries (e.g., entangled in fishing line), and analytical or predictive models for sea turtle stranding.

For Alternative A, the MTRP, not the MTAP, conducts the response activities of the sea turtle stranding response program in the Hawaiian Archipelago. Therefore the MTAP would have no direct impacts on stranded sea turtles. The MTAP would have a minor beneficial indirect impact on the environment from analyzing the data collected by the MTRP and by creating predictive stranding models for the Hawaiian Archipelago.

For Alternative C, no stranded sea turtles would be encountered or treated by the MTAP in the PIR because the MTAP would not be in the field collecting data, hence there would be no direct adverse impacts. However, there would be a long-term minor adverse effect from not treating stranded turtles in the PIR. Still, as agents and federal employees of the NMFS, MTAP staff during their normal course of activities would continue to aid stranded sea turtles in accordance with the programmatic permit described at 50 CFR § 222.310.

4.1.3 Impacts of Collecting Biological Samples from Sea Turtles

For a complete understanding of sea turtle population dynamics and life history, it is necessary to identify individuals and obtain biological samples for genetics, diet, disease, and habitat use. Turtles are flipper tagged with metal inconel tags and PIT using standard techniques (Balazs 1999); blood samples are taken using a medical grade needle and syringe (Bolten 1999, Owens 1999); diet samples are safely obtained by esophageal lavage (Forbes and Limpus 1993); and tissue biopsies are taken using a biopsy punch (Dutton and Balazs 1996). All methods used are performed by trained personnel and have been peer-reviewed and used by sea turtle researchers worldwide. The MTRP does not perform unnecessary sampling on sick or injured animals unless a veterinarian determines the animal is sufficiently healthy for samples to be taken. No mortality is expected from tagging, blood sampling, or tissue biopsy. Esophageal lavage, when implemented as proposed will have no long-term adverse impacts to the turtle. Many individual turtles have been lavaged multiple times without any known detrimental effect. Individuals have been recaptured from the day after the procedure up to many years later and appear to be healthy and feeding (Forbes and Limpus 1993).

For the propose action (Alternative B), it is anticipated that collecting biological samples from sea turtles would have short-term temporary direct minor adverse impacts to that sea turtle. The MTAP has applied for ESA research permits to collect biological samples from up to 220 green and 165 hawksbill sea turtles over the next five years (i.e., approximately 44 and 33 sea turtles per year, respectively) for the entire PIR with a focus on the U.S. Insular Areas. These would be the same sea turtles that are captured on land or in the water as described at section 4.1.1. These impacts would be in the form of non-lethal stress to the wild animal. The indirect adverse impacts would be negligible because the sea turtles are captured, handled, sampled, and then released on-site in a short period of time. The long-term minor beneficial indirect impact of capturing sea turtles would be the increased understanding of the sea turtle populations of the PIR though additional data collection.

For Alternative A, the MTAP would not collect biological samples from any sea turtles in the U.S. Insular Areas of the Pacific Islands Region, hence there would be no direct adverse impacts to sea turtles in those areas. The MTAP would continue to collaborate with the MTRP in the Hawaiian Archipelago (mainly in the form of analytical services). These collaborations may include collecting biological samples from sea turtles. Sampling sea turtles would have short-term temporary direct minor adverse impacts to any sea turtle that is captured. These impacts would be in the form of non-lethal stress to the wild animal. The indirect adverse impacts would be negligible because the sea turtles are captured, handled, sampled, and then released on-site in a short period of time. However, there would be a long-term minor indirect adverse effect from not collecting data on these poorly understood sea turtle populations in the U.S. Insular Areas of the Pacific Islands Region.

For Alternative C, no sea turtles would be sampled in the PIR by the MTAP, hence there would be no direct adverse impacts to sea turtles. However, there would be a long-term minor indirect adverse effect from not collecting data on these poorly understood sea turtle populations.

4.1.4 Stress from capturing sea turtles with FP that are already immunosuppressed because of the disease

Both sea turtles with and without FP are captured and sampled to document the prevalence of FP disease, though at the present FP is only known to occur in Hawaii and not in the rest of the PIR. The progression or regression of the disease is also studied for previously captured individuals and evaluated at the population level. It has been documented that all turtles experience some minor level of stress when captured (Jessop and Hamann 2005). However, behavioral indications of capture-related stress have been found to be temporary (T. Work, DVM, USGS, pers. comm. May 2006).

Green sea turtles severely afflicted with FP were determined to be immunosuppressed and chronically stressed prior to capture (Aguirre *et al.* 1995). Because capture methods are identical for diseased and non-diseased turtles, any observed differences in blood chemistry are likely related to disease and not attributed to stress from capture.

Turtles that are lightly or moderately afflicted with the disease appear to function at normal levels once returned to the ocean. (Unfortunately, turtles with severe tumor burdens are in a health condition that is often beyond our ability to remedy.) This has been documented through the subsequent recapture of

many of these individuals. In many instances, turtles initially captured with mild to moderate FP tumors have been recaptured with reduced tumor load or no evidence of tumors at all, further indicating that capture stress was not detrimental to the animal's health and well-being. Turtles with severe FP are removed from the study site and evaluated by two veterinarians, a clinical vet and a wildlife disease pathologist. This is not only done for the welfare of the animal, it also removes potentially infectious agents from the water. Additionally, both tumored and non-tumored turtles have been captured and held in captivity, and no behavioral differences were observed. (T. Work, DVM, USGS, pers. comm. May 2006). These impacts are the same for all the alternatives.

4.1.5 Impacts of Nesting Surveys

During nesting surveys, researchers walk the beach to record data, including: identification of the female, date of encounter or nest deposition, date of nest hatching, location of nest, and nest density. Surveys are conducted no more than once per hour to minimize disturbance. Nesting females can become skittish or disturbed if a light is shined on their face during egg deposition, or if they see the researcher or the researcher's shadow. To reduce the likelihood of disturbance, flashlight use is minimized and the light is covered with the hand with the first two fingers spread slightly to focus the beam. Researchers always approach a nesting turtle slowly from the rear. Before contact is made with the turtle, her activity is noted, and an attempt to identify her by shell etching or tag is made. Based on her activity, the researcher decides if it is the appropriate time to safely tag and sample (if necessary) the turtle without disrupting the nesting process. The best time for the researcher to interact with the turtle is after egg laying is complete to minimize adverse impacts. PIT tags are best inserted directly under the skin into the hind flipper after the female has completed egg laying, when she typically goes into a trance-like state. Alternatively, PIT tags are inserted when the turtle is crawling, making a body pit, covering the eggs, or backfilling, but never while excavating the egg chamber or depositing eggs to avoid any potential for nest abandonment. Every pre-sterilized needle used to install the tag is used only once and disposed of properly after the work. PIT tags are minute, and have negligible long-term adverse impacts to the turtle. The presence of researchers conducting the nesting surveys has a negligible impact on turtles while they rest on the beach prior, during, and after nesting as a result of these avoidance and minimization measures.

For the propose action (Alternative B), conducting nesting surveys would have short-term temporary direct minor adverse impacts to any sea turtle that is studied. These impacts would be in the form of non-lethal stress to the wild animal, but as described above would be mitigated through flashlight control and approaching the animal from the rear. The indirect adverse impacts would be negligible because the nesting surveys would be conducted within a matter of minutes. The long-term minor beneficial indirect impact of capturing sea turtles would be the increased understanding of the sea turtle populations of the PIR though additional data collection.

For Alternative A, the MTAP would not conduct nesting surveys in the U.S. Insular Areas of the Pacific Islands Region, hence there would be no direct adverse impacts to sea turtles in those areas. The MTAP would continue to collaborate with the MTRP in the Hawaiian Archipelago (mainly in the form of analytical services). These collaborations may include conducting nesting surveys. Conducting nesting

surveys would have short-term temporary direct minor adverse impacts to any sea turtle that is studied. These impacts would be in the form of non-lethal stress to the wild animal. The indirect adverse impacts would be negligible because the nesting surveys would be conducted within a matter of minutes. However, there would be a long-term minor indirect adverse effect from not collecting data on these poorly understood sea turtle populations in the U.S. Insular Areas of the Pacific Islands Region.

For Alternative C, no sea turtle nesting surveys would be conducted in the PIR by the MTAP, hence there would be no direct adverse impacts to sea turtles. However, there would be a long-term minor indirect adverse effect from not collecting data on these poorly understood sea turtle populations.

4.1.6 Public Perception of Adverse Impacts to Sea Turtles during Research Activities

To prevent misconception by the public of potential harm inflicted on sea turtles during research activities, the MTAP has an active public outreach and education program providing pamphlets and literature at all active field sites. Informal and formal presentations at public events, schools, and hospitals are an active and continuous part of the program. The MTAP also supports an extensive marine turtle stranding network and the MTRP stranding hotline phone number is made available to the public through magnets, mailings, newspaper advertisements, phonebook listing, television public service announcements, and through long-term cooperation with state agencies. All persons who call the stranding hotline or who are encountered in the field are offered a full explanation of research and conservation activities and their purpose, as well as educational sea turtle literature. As a result of directed outreach effort on turtle research activities, we anticipate minimal, if any, adverse public opinion associated with these activities. These impacts are the same for all alternatives.

4.1.7 Impacts of Satellite Tags

The attachment of satellite tags to the shell of a sea turtle may potentially interfere with mating or cause increased drag to sea turtles that affect migration. Females with satellite tags from previous years have been observed nesting, however, and post hatching nest inventories indicated these nests contained fertilized eggs (S. Hargrove, pers. comm., July 2010). Certain transmitters, if improperly attached, because of their size, position, and weight increase drag and may substantially interfere with normal migration patterns, disrupting mating (Jones and Seminoff *in press*). To avoid these adverse indirect impacts, the Proposed Action would implement the recommendations of Jones (2010): use an array of smaller transmitters (no larger than 6cm x 3cm x 10cm), and apply attachment methods to reduce additional drag. Specifically, the proposed action includes using only Wildlife Computers SPOT5 and MK10 style tags, which are within the recommendations of Jones (2010). Satellite tags remain on a turtle for a maximum of three years, but most likely for only several months.

For the proposed action (Alternative B), the process of attaching a satellite tag may take up to three hours and result in short-term temporary adverse impacts to the animal. These impacts would be in the form of non-lethal stress. The actual satellite tag on the sea turtles would result in minor long-term temporary direct and indirect adverse impacts to sea turtles from having a small foreign object attached to its shell for several months before falling off. The MTAP has applied deploy a maximum of 20 satellite tags on green sea turtles and an additional 15 tags to hawksbill sea turtles per year in the entire PIR.

For Alternative A, the MTAP would not attach satellite tags to sea turtles in the U.S. Insular Areas of the Pacific Islands Region, hence there would be no direct adverse impacts to sea turtles in those areas. The MTAP would continue to collaborate with the MTRP in the Hawaiian Archipelago (mainly in the form of analytical services). These collaborations may include attaching satellite tags to sea turtles. The process of attaching a satellite tag may take up to three hours and result in short-term temporary adverse impacts to the animal. These impacts would be in the form of non-lethal stress. The actual satellite tag on the sea turtles would result in minor long-term temporary direct and indirect adverse impacts to sea turtles from having a small foreign object attached to its shell for several months before falling off.

For Alternative C, no satellite tags would be attached to sea turtles in the PIR by the MTAP, hence there would be no direct adverse impacts to sea turtles. However, there would be a long-term minor indirect adverse effect from not collecting data on these poorly understood sea turtle populations.

4.1.8 Euthanizing Individual Sea Turtles

Humane euthanasia is only performed by a licensed veterinarian if he determines that an individual cannot survive or function in the wild. These animals are typically in extremely poor health and in a condition beyond treatment. Examples of such cases include animals severely afflicted with FP for which there is no cure, or animals with severe physical trauma beyond repair because of shark attack or boat strike. In such cases, euthanasia is performed for humane reasons and the animal is used for furthering scientific understanding of marine turtle disease and basic biology. For the propose action (Alternative B) and Alternative A, the impacts of humanely euthanizing sea turtles that are beyond treatment and incapable of surviving in the wild is negligible. For alternative C, no turtles would be euthanized by licensed veterinarian during MTAP activities in the PIR, hence there would be no direct adverse impacts.

4.2 Impacts to the Environment

4.2.1 Impacts to Beach Environments

The proposed action (Alternative B) includes a number of activities on beaches (e.g., nesting surveys, stranding response, the collection of biological or physical samples). The impacts of carrying out the proposed action on beach environments would be negligible because the activities would involve walking, sitting, and standing on beaches while collecting data on the sea turtles. The proposed action does not involve erecting any structures or conducting any excavations. A handful of substrate may be collected next to or in a former nest to evaluate grain size distribution of the beach, but this would be a negligible amount of material. In remote locations where no other accommodations are available, MTAP staff may camp overnight during surveys. These camping activities would be conducted in accordance with standard backcountry best management practices (e.g., packing out all waste). These beach activities would take up to several days, per year, at any particular beach within the PIR.

For Alternative A, the MTAP would not conduct any activities on beaches in the U.S. Insular Areas of the Pacific Islands Region, hence there would be no direct or indirect adverse impacts to these resources in those areas. The MTAP would continue to collaborate with the MTRP in the Hawaiian Archipelago (mainly in the form of analytical services). These collaborations may include activities on beaches. The impacts of carrying out the research activities on beach environments would be negligible because the

activities would involve walking, sitting, and standing on beaches while collecting data on the sea turtles.

For Alternative C, no activities would be conducted on beaches in the PIR, hence there would be no direct or indirect adverse impacts to beach environments.

4.2.2 Impacts to Near-shore Shallow Water Environments

The proposed action (Alternative B) includes, in part, capturing sea turtles in near-shore shallow water environments. These capture activities would either be conducted by wading on foot, snorkeling, or from a small boat. During wading and snorkeling activities, the MTRP staff would target working in sandy substrates, and avoid touching all coral reefs. Coral reefs would be avoided because they are an important part of the sea turtles habitat and touching corals can result in an unpleasant skin infection. If a coral reef was accidently stepped during capture activities, the adverse impacts would be short-term and minor because the magnitude of the activity is limited to a few individuals on-foot. The proposed action involves using small boats to access the remote beaches of the PIR and to capture sea turtles. Small boats would be operated by trained individuals. When operating small boats, coral reefs would be avoided because the risk of damaging the boat or propeller in a remote location is undesirable.

For Alternative A, the MTAP would not conduct any activities in near-shore shallow water environments in the U.S. Insular Areas of the Pacific Islands Region, hence there would be no direct or indirect adverse impacts to these resources in those areas. The MTAP would continue to collaborate with the MTRP in the Hawaiian Archipelago (mainly in the form of analytical services). These collaborations may include activities in near-shore shallow water environments. The impacts of carrying out the research activities in near-shore shallow water environments would be negligible because the activities would involve only short-term small-scale activities such as wading and snorkeling.

For Alternative C, no activities would be conducted by the MTAP in the PIR, hence there would be no direct or indirect adverse impacts to near-shore shallow water environments.

4.2.3 Impacts to Algae and Sea Grass populations

Green sea turtles in the PIR feed primarily on algae and, to a lesser degree, sea grass. Sampling algae and sea grass from foraging grounds is useful for studies such as diet, growth rates, and FP disease. For the proposed action (Alternative B), samples collected would amount to less than 1 kg km^{-2} day^{-1} during the study. Algae samples are hand-clipped as required by the regulations, not taken by the holdfast, causing only short-term temporary adverse impacts to the algal population. Algae found in green turtle diets can grow at least 10-12% per day, easily replacing any loss from collecting activities (Russell and Balazs 1994). Therefore, the direct adverse impacts of collecting algae samples are minor. The indirect adverse impacts of collecting small amounts of algae and sea grass are negligible.

For Alternative A, the MTAP would not collect any algae or sea grass samples in the U.S. Insular Areas of the Pacific Islands Region, hence there would be no direct or indirect adverse impacts to these resources in those areas. The MTAP would continue to collaborate with the MTRP in the Hawaiian Archipelago (mainly in the form of analytical services). These collaborations may include collecting algae or sea

grass. Samples collected would amount to less than 1 kg km^{-2} day^{-1} during the study. Algae samples are hand-clipped as required by the regulations, not taken by the holdfast, causing only short-term temporary adverse impacts to any algal population. Algae found in green turtle diets can grow at least 10-12% per day, easily replacing any loss from collecting activities (Russell and Balazs 1994). Therefore, the direct adverse impacts of collecting algae samples are minor. The adverse indirect impacts of collecting small amounts of algae and sea grass are negligible

For Alternative C, the MTAP would not collect any samples in the PIR, hence there would be no direct or indirect adverse impacts to algae or sea grass.

4.2.4 Potential to Spread Invasive Species

A number of plant and animal species have previously become established on various islands in the PIR. Non-native invasive species can have an adverse impact on the native flora and fauna of islands by outcompeting, preying on, and replacing native species, as well as providing habitat for non-native species, requiring large-scale efforts to eradicate these species, although with mixed results.

The proposed action (Alternative B) and Alternative A use strict procedures to minimize the potential introduction of non-native invasive species by research activities conducted at the remote field sites. All tents are placed and all work is done on the perimeter of the island, generally seaward of the vegetation zone. Stringent protocols are used to ensure that no species are introduced to the islands. These protocols include:

- 48-hour freezing of all non-sensitive food and equipment,
- removal of all packaging materials which may harbor foreign plants or animals;
- packing all food, personal effects, and small equipment in plastic bags which are in turn placed in sterilized 5-gallon plastic buckets;
- packing all large equipment in either plastic cases or pallet tubs, all of which are fumigated prior to landing;
- all soft gear (e.g., daypacks, straps, nets, bags, bedding, tents, clothing, footwear) used at each field site is either new or has not been used at any other location; and No use of any fresh food item which either may become established (tomatoes, sunflower, mustard, or alfalfa seeds) or foods which may harbor molds or fungi will be used.

Therefore, for the proposed action (alternative B) and alternative A the direct and indirect adverse impacts from potentially introducing non-native invasive species are negligible.

For Alternative C, the MTAP would not spread any invasive species in the PIR because there would be no activities in the PIR.

4.2.5 Impacts on Fish

The proposed action (alternative B) may use large-mesh entanglement nets to capture sea turtles in near-shore waters. These nets are constructed of two mm diameter nylon twine with a stretched

diagonal mesh of 46 cm (23 cm^2 mesh). The lengths of the nets range from 20 to 100 m and the depths range from 1.5 to 8.0 m. The nets are set at the surface extending vertically through the water column. Floats are embedded in the top line of the net and the bottom line is weighted. Nets are deployed close to shore (< 100 m) in shallow, sandy or muddy (estuarine) habitats, generally of seagrass or macro-algae, and continuously monitored (hand checked every half hour) by boat (with four crew members at a minimum). No more than two nets are ever set at one time and these are set in series. Entangled turtles are promptly removed from the net and brought to shore or placed inside the boat as described above (Balazs et al. 1987; Seminoff et al. 2002, 2003; Seminoff and Jones 2006). Set times vary by location, but typically do not exceed 12 hours (nets monitored every 30 min). Typical capture for a twelve hour soak time is two to six sea turtles. If many turtles are caught within the first couple hours the nets will be pulled to allow adequate time for the researchers to mark, measure, and release the turtles. In addition to sea turtles we do expect to capture stingrays (family Dasyatidae, not threatened) but the large mesh avoids catching most fish. All bycatch will be removed from the net and released alive.

The proposed action (Alternative B), would have short-term temporary adverse impacts to near-shore fish that are accidently caught in the net and then released. These impacts would be in the form of non-lethal stress to the animal. The use of scoop nets and the hand capture of turtles would have no direct or indirect impacts on fish in the area as these animals are not targeted. Because the use of nets under the proposed action would be for short periods of time there are no long-term adverse impacts to fish.

For Alternative A, the MTAP would not conduct any net capture activities in the U.S. Insular Areas of the Pacific Islands Region, hence there would be no direct or indirect adverse impacts to these resources in those areas. The MTAP would continue to collaborate with the MTRP in the Hawaiian Archipelago (mainly in the form of analytical services). These collaborations may include net capture activities. These activities would have short-term temporary adverse impacts to near-shore fish that are accidently caught in the net and then released. These impacts would be in the form of non-lethal stress to the animal. The use of scoop nets and the hand capture of turtles would have no direct or indirect impacts on fish in the area as these animals are not targeted. Because the use of nets under Alternative A would be for short periods of time there are no long-term adverse impacts to fish.

For Alternative C, no net capture activities would be conducted by the MTAP in the PIR, hence there would be no direct or indirect adverse impacts to fish.

4.2.6 Impacts on Seabirds

The proposed action (Alternative B) would occur along the coast and in the ocean in the PIR where seabirds would be encountered. However, the proposed action does not involve killing, capturing, or intentionally disturbing any seabirds. Seabirds may be indirectly and temporarily adversely affected by researchers conducting sea turtle survey activities. Generally, these activities include a few researchers walking along a beach where seabirds may be roosting or nesting, or during small boat activities. These indirect adverse impacts would be limited to a bird moving from one area of the beach, or water surface, to another several meters away. Surveys and stranding response activities would avoid seabird nests to the maximum extent practicable. Overall, these adverse impacts will be short-term, temporary,

and minor because any bird flushed by such activities would either return to the site after the researcher has passed, or the bird would occupy another section of beach.

For Alternative A, the MTAP would not conduct any activities in the U.S. Insular Areas of the Pacific Islands Region, hence there would be no direct or indirect adverse impacts to these resources in those areas. The MTAP would continue to collaborate with the MTRP in the Hawaiian Archipelago (mainly in the form of analytical services). These collaborations may include activities that could indirectly adversely affect seabirds. Seabirds may be indirectly and temporarily adversely affected by sea turtle survey activities that involve a few researchers walking along a beach where seabirds may be roosting or nesting. These indirect adverse impacts would be limited to a bird moving from one area of the beach, or water surface, to another several meters away. Surveys and stranding response activities would avoid seabird nests to the maximum extent practicable. Overall, these adverse impacts will be short-term, temporary, and minor because any bird flushed by such activities would either return to the site after the researcher has passed, or the bird would occupy another section of beach.

For alternative C, the MTAP would not conduct any activities in the PIR, hence there would be no direct or indirect adverse impacts to seabirds.

4.2.7 Impacts on Cultural and Historic Resources

Island and coastal communities in the PIR are intricately connected with the coral reef ecosystems that surround them. Much of the mythology, legends, and customs of native islanders encompass the surrounding marine environment as crucial components of life, especially sea turtles. Local coral reef resources provide food, cultural activities, subsistence, and revenue through artisanal, recreational, and commercial fisheries. Indigenous Pacific Island communities have a strong cultural and economic dependence on the marine environment. For example, traditional Hawaiian fishery management activities centered on strictly enforced social and cultural controls on fishing. These fishery management activities were based on time or area closures to keep fisheries from disturbing natural processes and habitats of food resources considered important. Recently, the cultural focus has been reinforced when the state of Hawaii supported the development of community-based subsistence fisheries areas in a few communities. Fisheries management plans have been prepared by these communities and are based on integrating traditional observational methods and modern scientific techniques. Traditional fishing activities are used to restore community values and stewardship while revitalizing a locally sanctioned code of fishing conduct.

Ancient Hawaiians developed a special relationship with the land and sea, which provided them with sustenance and recreation, molded their cultural values, and cultivated their deep connection to ecosystems. Fishing, gathering of ocean algae (*limu*), and subsistence use of ocean resources have been a traditional way of life for native Hawaiians. Fishes also provided the primary source of protein in the Hawaiian diet. The strict enforcement of traditional *kapu* system (forbidden or taboo) was an effective control to prevent overharvesting of ocean resources. *Kuleana* (responsibility), which interweaves honor and duty, describes the approach to Hawaiian resource management, and reinforces the idea of resource stewardship as opposed to resource management.

The longest recorded traditional Hawaiian chant, the *Kumulipo* (source of deep darkness) is a history of how all life forms came and evolved, beginning with the coral polyp as the building block of all life. This creation chant tells the story of Native Hawaiians' ancestral connection with the gods who created the coral polyps, the NWHI, which are seen as *kūpuna* (or respected elders), and everything else in the Hawaiian Archipelago, including Native Hawaiians. The symbolism of the union of earth mother, Papahānaumoku, and sky father, Wākea, is the foundation for the name of the Papahānaumokuākea Marine National Monument.

Punalu'u beach on the island of Hawaii has been an MTRP study location and is the setting for the most well known Hawaiian sea turtle legend (Balazs *et al.* 1994). As documented by Hawaiian historian Mary Kawena Pukui, in ancient time two sea turtles (honu-po'o-kea and honu-'ea) came to Punalu'u beach where the mother gave birth to an egg she buried in the sand. With her digging, the mother released a freshwater spring that is seen today. Later, the mother's egg hatched becoming the "turtle girl" named Kauila. Kauila the turtle was able to assume human form and play with local children, but would change into a turtle again before going back into the water. "Children used to catch fish and shrimp in the spring, and Kauila watched lest the little ones fall in. The people loved Kauila for this and because her spring gave them drinking water" (Handy *et al.* 1972). Local Hawaiians believe Kauila's presence can still be felt at Punalu'u today and that Kauila is the "mystical mother" of all Hawaiian sea turtles.

Historic fishing methods in American Samoa were documented in a 2008 PIFSC report (Herdrich and Armstrong 2008). Throughout the Samoan islands, common fishing techniques included gleaning, diving, rod and line, netting and trapping (including communal fish drives), and boat fishing, but there were slight differences in practices according to particular village rules and techniques related to the habits of marine resources. The village has been, and remains, an important organizing unit in Samoan society (Keesing 1934), and the village customarily controlled the usage rights to a lagoon and its produce. While individual and family fishing occurred on an almost daily basis, there were times when the village organized a communal drive for certain fish or when men fished outside the lagoons under the leadership of a fishing expert, a *tautai.* There were rules that certain fish were to be given to the chiefs, and restrictions were occasionally made regarding the lagoon and its produce. All of these practices were, in essence, under the control of the village and its decision-making body, the village *fono*.

The first people to arrive in the Mariana Archipelago about 3500 years ago were skilled fishermen. The aboriginal culture of Guam and the CNMI was based on fishing, agriculture, and gathering. A 2008 PIFSC report and a 1989 Western Pacific Regional Fishery Management Council report (Allen and Bartram 2008; Amesbury *et al.* 1989) describe the dependence on and engagement in fishing activities of the people of Guam and the CNMI, respectively, throughout history. Prior to the arrival of Europeans in the Mariana Archipelago, the indigenous Chamorro people possessed large sailing canoes, *proas*, which they used for fishing on offshore banks. A noble caste of deep-sea fishermen and interisland traders within Chamorro communities, the *matua*, monopolized the manufacture of these canoes. Over the centuries of acculturation, beginning with the Spanish conquest in the late 17th century, many elements of traditional Chamorro culture were lost. Despite dramatic changes in marine resources and ecosystems, human populations, and food sources, many of the indigenous people of Guam and the CNMI and their

immigrant communities continue to depend on fishing and locally caught seafood to reinforce and perpetuate cultural traditions such as community sharing of food. Although fishing has made and continues to make economic contributions to these territories, the socio-cultural influences of fishing are far deeper.

Given that the proposed action (Alternative B) would take place primarily in an office setting, or in the case of field activities, along beaches or in near-shore waters all the historic properties in uplands will be avoided. Given that the context of the proposed action is observing, handling, and modeling population of sea turtles on computers, there will be no construction, earth-moving, or other land-use activities along the beaches or in near-shore waters that would have the potential to affect historic properties. The intensity of the field activities is extremely low, and involves infrequently visiting the nesting beaches and foraging areas used by sea turtles and walking or swimming through their habitats. These low intensity field activities would also be spread out over the vast geographic area of the PIR.

The MTAP recognizes the importance of marine turtles and near-shore ecosystems to Pacific Island cultures. All Federal and contracted MTAP staff are briefed according to local cultural histories and practices to raise appropriate awareness and sensitivity. The MTAP works with the public and local volunteers to avoid and minimize any misconception of the research that the public may have. While the proposed action involves field research and stranding response activities, which will have minor short-term, temporary direct adverse impacts on individual sea turtles, the long-term beneficial effects of a greater scientific understanding of the species will contribute to their recovery and therefore be considered a moderate beneficial effect on this resource. The proposed action (Alternative B) and Alternative A will avoid all impacts to historic properties. There would be no adverse impacts on these resources from Alternative C because there would be no field work associated with this alternative.

4.3 Cumulative Impact Analysis

The Council on Environmental Quality (CEQ) defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The size of the Pacific Islands Regions is enormous – the U.S. Exclusive Economic Zone within the Pacific Islands Region covers approximately 1.5 million square nautical miles. While the proposed action includes research, stranding response, and technical collaboration within this entire region, each activity is implemented on a small-scale (e.g., only a few researchers at any one time capturing and measuring a single sea turtle) and for a short time period (e.g., a stranding response may take a couple of hours). Still, the five federally listed sea turtle species have not met their recovery goals.

4.3.1 Impacts of Past Actions within the Scope of Analysis

The first human inhabitants of the PIR were Polynesian explorers more than thousands of years ago. When Captain James Cook arrived in Hawaii in 1778 several hundred thousand Hawaiians lived in the MHI. At that time, the NWHI were unpopulated (Cleghorn 1988). However, prior to Cook's arrival, the islands of Nihoa and Mokumanamana in the NWHI were visited by people from the MHI. Most notably,

people sailed frequently between communities located on Niihau, Kauai, and Nihoa Islands (PMNM 2008). It is believed that Nihoa supported a permanent population for several hundred years as evidenced by archeological sites that include substantial habitation sites and agricultural terraces (Cleghorn 1988). Meanwhile, Mokumanamana was believed to be only temporarily inhabited for cultural and religious purposes (Cleghorn 1988). Both islands contain many religious structures such as heiau (places of worship) and platform foundations with upright stones that mark the important journey of the sun through the seasons (PMNM 2008). Nihoa and Mokumanamana Islands also provided valuable natural resources such as birds, bird eggs, loulu palm wood, makiukiu grass, and fish (PMNM 2008).

Since their discovery, the shallow coral atolls of the NWHI have been the sites for many shipwrecks (PMNM 2008). Often stranded sailors slaughtered and ate green sea turtles and Hawaiian monk seals to survive, and early records suggest hawksbills were harvested there in large numbers (Van Houtan et al. 2012). The first shipwreck on FFS was in 1786. The most recent shipwreck occurred at Pearl and Hermes Atoll on July 2, 2005 (DOC et al. 2011). The 145-foot-long research vessel M/V Casitas ran aground on the reef while working in PMNM on a marine debris removal mission. The grounding of the vessel, and its ultimate removal, damaged approximately 0.42 acres of reef, of which 0.11 was coral (DOC et al. 2011). Other early inhabitants of the atoll included feather hunters, sealers, whalers, guano miners, and fishermen. More recently East Island, and then Tern Island, was home to a Coast Guard long-range navigation transmission (LORAN) station. A runway was constructed on Tern Island by the Navy in 1940. After the Navy's departure, the runway was used to transport sea turtles to market. Sea turtles were actively harvested for their meat and shells until 1978 when they were listed on the Endangered Species List. Since 1978 the number of nesting female green sea turtles at FFS has continued to increase (Figure 4).

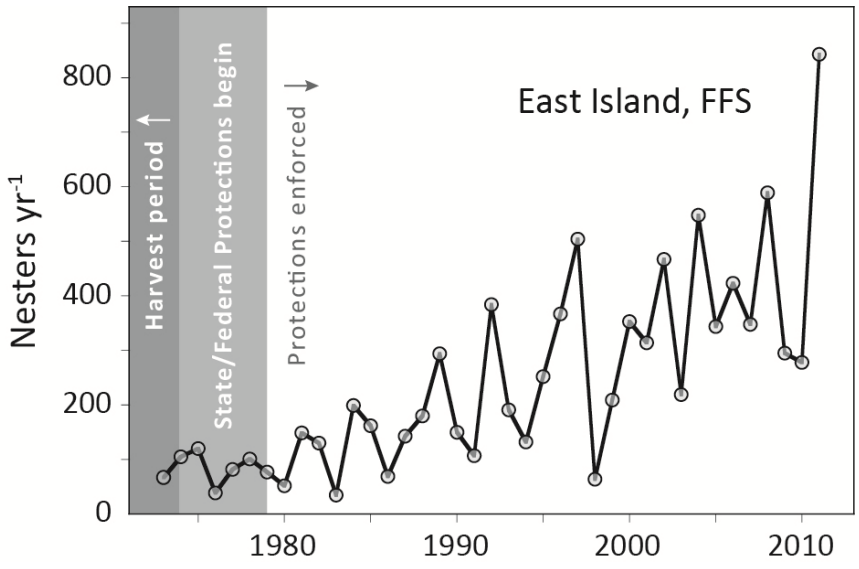

Figure 4. Nester counts at French Frigate Shoals, Northwestern Hawaiian Islands. Nesting green turtles from annual surveys at East Island, from 1973-2011. The increasing trend documents the ongoing population recovery since the prohibition of harvests in the mid-1970s. Shaded areas represent different management regimes during the study period (from Van Houtan et al. *in review*).

These data document the steady increase in the green sea turtle population. The MTRP has conducted nesting surveys on East Island at FFS for 38 consecutive years and provides a critical index of abundance for the Hawaiian green turtle stock. New turtles are tagged, measured, and sampled (i.e., tissues are taken for genetic analysis and health assessments such as FP tumors), and tags of previously tagged turtles are recorded. Research on the MHI has similarly captured, tagged, measured and sampled thousands of green sea turtles in the MHI (Figure 5).

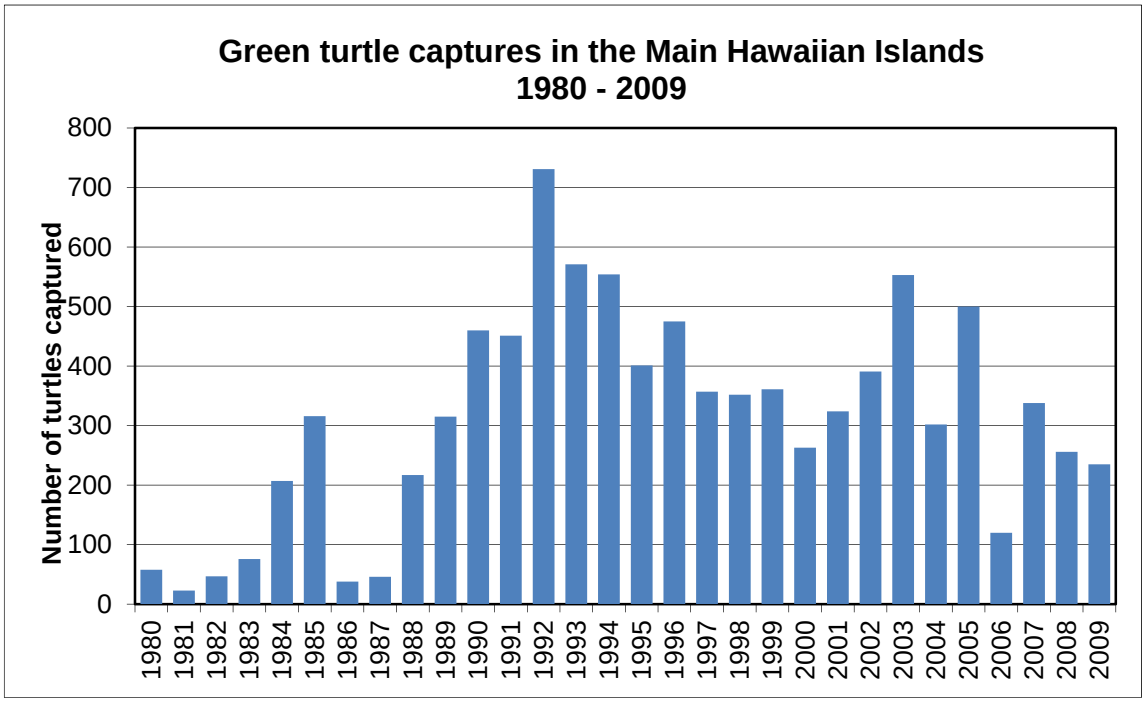

Figure 5. Number of green sea turtle captured during the year (some caught more than once per year).

As a complement to the nesting, foraging, and resting habitat research surveys, the MTRP has responded to sick, injured, and dead sea turtle strandings in the Hawaiian Archipelago. From 1982 through February 2006, the MTRP collected information from 4,451 stranded turtles. Of these individuals, 135 (3 %) were previously tagged by the MTRP. The most common cause of mortality among tagged turtles was FP (21%). Recent trends in the diversity and abundance of sea turtles cared for in the stranding response program is shown in Table 4. Green turtles make up the largest proportion of strandings in Hawaii, with only incidental strandings of hawksbill, olive ridley, loggerhead, and leatherback turtles, which is assumed to be representative of their presence.

Table 4. The number and species of sea turtles stranded in the Hawaiian Islands.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Green turtle	260	250	269	274	263	288	256	267	237	245
Hawksbill	5	4	5	3	4	7	6	9	6	5
Olive ridley	6	0	1	4	3	0	1	1	1	0
Loggerhead	1	0	0	0	1	0	0	0	0	0
Total	271	254	275	281	270	295	263	277	244	250

The U.S. Insular Areas of the Pacific have had a similar series of historical impacts as the Hawaiian Archipelago but with unique characteristics. Ranging from exploration, colonization, resource extraction, infrastructure expansion, to militarization, the islands and atolls have experienced actions that have changed their natural setting. A brief description of the historical events that shaped the landscape are described in Section 3.2. As the setting for many battles during World War II the reefs and beaches of the U.S. Insular Areas of the Pacific were modified by bombs and bulldozers. Many of the enduring sites are listed on the National Register of Historic Places, but many of the other sites located along the coast have faded away with beach and wave erosion.

In 1993, a 135-foot-long Taiwanese longline fishing vessel grounded on Rose Atoll in 1993 and spilled oil approximately 100,000 gallons of oil into refuge waters (USFWS 2000). By 2007, approximately 37 tons of metal from the ship wreckage were removed from the reef. The grounding of the ship and the oil spill directly killed many organisms on the reef. The slow release of iron from the wreckage into the water column contributed algal blooms that have indirectly inhibited natural reef regeneration.

4.3.2 Impacts of Present Actions within the Scope of Analysis

PIFSC currently conducts a number of research projects in the Pacific Islands Region. The research is divided over several disciplines including oceanography, fisheries, coral reefs, marine mammals, and sea turtles. Given the long-distance migrations of many pelagic species, and the vital ecological and commercial role that marine resources serve, the PIFSC works with a number of local (e.g., fisherman, universities), national (e.g., U.S. Fish and Wildlife Service), and international (e.g., foreign educational institutes) collaborators.

PIFSC oceanographic research spans the Pacific Islands Region and includes both insular and pelagic habitat and ecological research. Oceanographic data collection generally involves measuring ocean and atmospheric variables using several different platforms. Ship-based instruments, such as CTD systems and echosounders, are used to measure ocean conditions ranging from temperature to micronekton density. Submersibles and remotely operated vehicles are used to collect data in remote parts of the Pacific Ocean. The majority of oceanographic research has negligible direct impact on marine resources

because it conducted using remote sensing technology. The collection of small amounts of ocean water, such as samples used to study plankton, have minimal, localized, and only temporary adverse impacts on the ocean and negligible impacts on sea turtles.

PIFSC fisheries research involves collecting and analyzing data on the regional fisheries. Data are collected from the log books of fishing vessels, during targeted fishing surveys, and through socio-economic studies of the fishing industry. One of these programs specifically measures the bycatch of sea turtles, seabirds, and marine mammals in the regional fisheries and identifies methods to minimize this incidental capture. These bycatch reduction efforts have a small though beneficial effect on the environment in general and sea turtles in particular. The largest potential for direct and indirect adverse impacts to the environment is from the active fishing data collection component. However, these fishing activities are conducted infrequently, on a very limited scale, and targeted to the species being studied thereby resulting in only short-term temporary adverse impacts to marine resources. The potential direct and indirect adverse impacts of the fisheries research on sea turtles is negligible.

PIFSC coral reef research focuses on long-term ecological monitoring surveys, biodiversity research, and marine debris removal. These activities occur across the Pacific Islands Region. Surveys are conducted from research ships using echosounders, autonomous underwater vehicles, and cameras, or underwater by SCUBA divers and snorkelers. In general, research cruises range for couple days to couple months in length, and occur a few times per year. A number of instruments are also temporarily deployed on the ocean floor to remotely study coral reef communities and ecological processes. These include: ecological acoustic recorders, autonomous reef monitoring structures, calcification acidification units, acoustic Doppler current profilers, wave and tide recorders, ocean data platforms, and transect markers. These instruments may be temporarily secured to the substrate using metal stakes or heavy weights. During monitoring surveys voucher specimens of algae, invertebrates, substrate, fish, and coral are collected for identification and genetic analysis. The voucher samples are collected on a small scale and represent a fraction of the biomass being studied. Occasionally, cores of corals are collected and analyzed using computed tomography (CT or CAT) scans. These cores are only taken from massive corals by skilled biologist to analyze growth patterns to minimize impacts. Marine debris removal has a short-term adverse on coral reefs because pieces of the reef may be broken when derelict fishing nets and fishing line are removed, however there is long-term beneficial effect on the coral reefs and marine life after the debris is removed from the ecosystem. Sea turtles may be encountered during the monitoring surveys, but the direct and indirect adverse impacts of coral reef research on sea turtles will be negligible.

PIFSC marine mammal research focuses on cetaceans (i.e., whales and dolphins) of the central and western Pacific Ocean, as well as Hawaiian monk seals in the Hawaiian Archipelago. Cetacean abundance and distribution surveys are conducted aboard ships and boats using visual and acoustic scan. Passive acoustic surveys of cetaceans are conducted by temporarily deploying a high-frequency acoustic recording package on the ocean floor. Genetic samples are episodically collected by taking a small piece of skin without long-term harm to the animal. The Hawaiian monk seal research includes field camps in the NWHI and surveys in the MHI. Sea turtles have been and will be encountered during

the marine mammal monitoring surveys. These encounters result in no greater than short-term disturbance and it is unlikely the research will have any long-term or indirect adverse affects to sea turtles because the biologist are trained to minimize interactions with sea turtles.

The U.S. Fish and Wildlife Service and State of Hawaii, Department of Land and Natural Resources, also staff field camps in the NWHI to collect ecological data and conduct other management activities. The U.S. Fish and Wildlife Service works on FFS, Midway Atoll, and Laysan Island in conjunction with NMFS. The USFWS also conducts seabird and plant research projects in each of their other refuges located in the PIR. The focus of USFWS research is seabirds, while the focus of their ecological restoration is the re-vegetation of native plant communities. Seabirds are a natural predator of newly hatch sea turtles. The State activities are based on Kure Atoll and they work with both the USFWS and NMFS to collect ecological data, conduct re-vegetation activities, and remove marine debris. These activities in the NWHI are regulated by the Papahanaumokuakea Marine National Monument. Access to the Monument and each research site is by ship, small boat, or airplane (i.e., to runways located on Tern Island at FFS and on Sand Island at Midway Atoll). The principle ships used as a platform for the research are NOAA research vessels Oscar Elton Sette and Hi'ialakai. Occasionally chartered ships are used to conduct the necessary support trips. Small boats (approximately 20 feet in length) transport people and gear from the ships at sea to the islands when there are not dock facilities. Each NOAA ship spends approximately 100 days per year in the PMNM. The diesel-powered ships operate as efficiently as possible (i.e., drives directly from point to point) to minimize fuel consumption because supplies are limited in this remote area. Consequently, the amount of diesel air pollution (e.g., NOx, SOx, particulate matter) is negligible, especially considering the vast size of the Pacific Ocean and lack of other air pollution emitters in the island region. Furthermore, the State of Hawaii is considered to have one of the best air quality records in the nation, with criteria pollutant levels below state and federal ambient air quality standards (Hawaii 2007). The contribution of these few research ships to greenhouse gas emissions is negligible relative to other emitters. Given that the ships rarely anchor when stopped to conduct small boat operations (e.g., on- and off-loading supplies), impacts to coral reef habitat is avoided. The ships are equipped with Type 2 marine sanitation device wastewater treatment systems. To minimize the short-term adverse impacts to water quality, treated wastewater is discharged outside of Special Preservation Areas and Special Management Areas (PMNM 2008). These direct adverse impacts to water quality are negligible considering the relatively small size of the ships, limited number of sea days, and volume of water in the Pacific Ocean. The number of ship days in the MHI is small fraction of the commercial and recreation shipping industry ship days. The ships are relatively slow, cruising at less than 10 knots. The small boats similarly operate at slow speeds and are required to look for sea turtles swimming in their path so that they can be avoided. There are approximately 70 flights into the Monument per year by airplane. Researchers that live on each island for one to six month periods are required to abide by strict conditions. All food and most of the water is imported. The remaining water is generated by reverse-osmosis. The researchers burn a limited supply amount of propane to cook and generate electricity. The direct and indirect adverse impacts of non-MTRP research activities in the NWHI on sea turtles is minor.

Within the Pacific Ocean a number of other public and private organizations also conduct sea turtle research under the jurisdiction of NMFS. A review of the NMFS Authorizations and Permits for Protected Species (APPS) website (accessed May 11, 2011, last updated February 2, 2011) identified a total of eight permits (Table 5). Stretching approximately 6,000 miles from CNMI to California, these permits cover all five listed sea turtle species.

Table 5. NMFS APPS active listed sea turtle research permits in the Pacific Ocean.

File Number	Project Title	Organization	Location	Expiration	Species
10027	Research in the Palmyra Atoll National Wildlife Refuge	American Museum of Natural History	Palmyra Atoll	7/31/2013	Green and hawksbill sea turtles
14097	NMFS SWFSC pinniped, cetacean, and sea turtle studies	SWFSC	North Pacific Ocean	6/30/2015	Green, hawksbill, leatherback, loggerhead, and olive ridley sea turtle
14381	Sampling sea turtle bycatch in the Hawaiian longline fisheries	PIRO	Hawaiian and American Samoa longline fishery	3/1/2015	Green, hawksbill, leatherback, loggerhead, and olive ridley sea turtle
14510	Scientific research in Sam Gabriel River and Los Alamitos Bay, CA; strandings; and power plant entrainments	SWFSC	Coastal California	4/30/2015	Green, hawksbill, leatherback, loggerhead, and olive ridley sea turtle
1556	Scientific Research	CNMI	Saipan, Tinian, and Rota	6/1/2011	Green and hawksbill sea turtles
1581	Scientific Research	PIFSC	Hawaiian Islands	12/31/2011	Green and hawksbill sea turtles
1591	Scientific Research	SWFSC	San Diego Bay, CA	10/31/2011	Green, loggerhead, and olive ridley sea turtle
1596	Scientific Research	SWFSC	Pacific Ocean	2/1/2012	Leatherback sea turtle

Non-research activities within the Pacific Islands Region that occur in vicinity of the proposed action range from commercial fisheries, to trans-Pacific commercial shipping, to recreational activities such as fishing, boating, and snorkeling. In particular, the incidental capture (i.e., bycatch) and mortality of sea turtles in commercial fisheries has been well documented (Lewison and Crowder 2007). Sea turtles are either caught directly in fishing gear by hooks or in nets (both gillnets and trawl nets), or indirectly in

derelict fishing gear floating in the ocean. Commercial fisheries in the Pacific Ocean for highly migratory species (e.g., tunas and billfish) are managed by the Western and Central Pacific Fisheries Commission because they cross international boundaries. Commercial domestic fisheries (i.e., fisheries within the U.S. Exclusive Economic Zone) are managed by the NMFS Pacific Islands Regional Office with the Western Pacific Regional Fisheries Management Council. Currently, the Hawaii-based longline shallow-set fishery has an annual limit of sea turtle interactions that are permissible before the fishery is closed. For the calendar year 2012, the limit is 16 leatherback sea turtles and 17 loggerhead sea turtles (50 CFR 665.813). The number of past interactions for this fishery ranged from 0 to 17 (Table 6). The incidental capture of sea turtles by foreign vessels on the high seas and in foreign waters is difficult to quantify because of the lack of comprehensive onboard observers and inconsistent reporting (NMFS 2012). However, NMFS has estimated that in 2009, for just part of the western Pacific region, international fisheries interacted with thousands of loggerhead, leatherback, olive ridley, green, and hawksbill sea turtles and the mortalities numbered in the hundreds of sea turtles (NMFS 2012). Loggerhead and leatherback sea turtles have the highest interaction rates with the pelagic longline fisheries of the central and western Pacific.

Table 6. Historical number of interactions between the Hawaii-based longline shallow-set fishery and sea turtles (www.fpir.noaa.gov/SFD/SFD_turtleint.html).

	Leatherback Sea Turtles	Loggerhead Sea Turtles
2011	16	12
2010	8	7
2009	9	3
2008	2	0
2007	5	15
2006	1	17
2005	8	12
2004	1	1

Historically, fisheries in the Western Pacific Region were managed with species-specific Fishery Management Plans (FMP) (i.e., Pelagics, Bottomfish and Seamount Groundfish, Crustaceans, Precious Corals, and Coral Reefs), but beginning in 2010 are being managed under Fishery Ecosystem Plans (FEP) (WPRFMC 2009). These FEPs include: the Hawaii Archipelago, American Samoa Archipelago, Mariana Archipelago, Pacific Remote Islands Areas, and the Pacific Pelagic. These FEP are intended to accomplish the objectives of the Magnuson-Stevens Act through the incorporation of ecosystem science and

principles. Furthermore, each of these organizations has implemented measure to reduce the bycatch of sea turtles. For example, in Hawaii sea turtle bycatch was reduced in the longline swordfish fishery by replacing traditional J-hooks with circle, and squid bait with fish bait, while maintaining target species catch rates (Gilman *et al.* 2007). Furthermore, the WPRFMC has banned the use of drift gillnets and increased the number of trained observers on fishing boats. PIFSC and PIRO also actively search for and remove marine debris from within the Pacific Islands Region. Together, these management activities and the MTRP stranding response program have reduced the unintentional mortality of sea turtle compared with historical levels.

Within the PIR, sea turtles are still poached for their meat, eggs, and shells (NMFS 2009). While illegal, these activities persist out of the sight of law enforcement. Another continuing threat to sea turtles in the region is the destruction or degradation of foraging and nesting habitats. In many parts of the PIR, near-shore reefs, seagrass beds, and beaches have been either dredged or filled as part of coastal development projects. The accumulation of sediments on near-shore habitats is another slow but relentless threat, especially in tropical high-rainfall areas.

4.3.3 Reasonably Foreseeable Actions in Scope of Analysis

This level of PIFSC research will likely continue into the near future given the existing statutory requirements and Executive Orders for fisheries, coral reefs, marine mammals, and sea turtles. It is also anticipated that the same non-federal actions will continue into the future. No information is available to suggest these actions will change substantially in the reasonably foreseeable future that would be related to sea turtles.

On Guam, the U.S. military is proposing to expand the existing military facilities to house an additional 8,600 Marines and 9,000 of their dependents (Department of the Navy 2010). While most of this development would take place in uplands, outside of the scope of analysis, Apra Harbor is proposed to be dredged and modified to create a new aircraft carrier berth. The harbor dredging would potentially impact approximately 100 acres of submerged lands in and adjacent to the existing naval base. This build-up and transfer has been delayed and may not take place until 2020.

5 Environmental Permits and Regulatory Requirements

MTAP activities conducted within the land and waters in the jurisdictions of marine protected areas, marine national monuments, wildlife refuges, or areas managed by federal, state, or local agencies will be conducted under established scientific research and collection permits issued by the responsible managing agencies. These include:

5.1 Activities in the United States, the U.S. Insular Areas, or upon the high seas

5.1.1 Endangered Species Act

Research that would "take" (i.e., harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in such conduct) a federally threatened or endangered species for scientific purposes or to enhance the propagation or survival of listed species:

- Section 10(a)(1)(A) Permit from NMFS or USFWS.

Any federal action that may affect a federally listed threatened or endangered species or its designated critical habitat:

- Section 7 Consultation with the National Marine Fisheries Service or U.S. Fish and Wildlife Service. An action that may adversely affect a listed species requires formal consultation, which concludes with a biological opinion (BO; states the opinion of the Service as to whether or not the Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat). A BO may include an incidental take statement for an otherwise legal action.

5.1.2 Animal Welfare Act

Research that would use live marine mammals or sea turtles may require a:

- Approved Protocol and Assurance from the NMFS regional Animal Care and Use Committee (IACUC).

5.1.3 Marine Mammal Protection Act

Research that would "take" (i.e., harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal) an ESA-listed marine mammal or involve Level A Harassment (i.e., has the potential to injure a marine mammal or marine mammal stock in the wild) of a non-ESA-listed marine mammal for scientific or enhancement purposes:

- Scientific Research and Enhancement Permit from the NMFS.

Research that would involve Level B Harassment (i.e., has the potential to disturb a mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild) of a non-ESA-listed marine mammal:

- General Authorization from the NMFS.

For maritime activities that may result in the incidental take of a marine mammal:

- Incidental Take Authorization or Letter of Authorization (LOA) from NMFS.

For maritime activities that may incidentally take small numbers of marine mammals by harassment (i.e., any act of pursuit, torment, or annoyance).

- Incidental Harassment Authorization (IHA) from NMFS.

5.1.4 Migratory Bird Treaty Act

Regarding birds included in the respective international conventions between the U.S. and Great Britain, the U.S. and Mexico, the U.S. and Japan, and the U.S. and the Russia, research that would take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter any migratory bird, or the parts, nests, eggs, or product may require a:

- Scientific Collecting or Special Purposes Permit from USFWS.

5.1.5 Magnuson-Stevens Fishery Conservation and Management Act

Research that may adversely affect Essential Fish Habitat (EFH) in the U.S. Exclusive Economic Zone requires consultation with NMFS. EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. EFH has been designated for the Pelagics, Bottomfish and Seamount Groundfish, Crustaceans, Precious Corals, and Coral Reef Ecosystems Management Unit Species. Within the Pacific Islands Region, this designated EFH includes the water column down to 1,000 meters and other specific habitats within that range, and may require a:

- Consultation and EFH Conservation Recommendations from NMFS.

5.1.6 Clean Water Act

Research that involves discharging dredged and/or fill material (e.g., placing rock or concrete) into waters of the U.S. may require a:

- Section 404 permit from the U.S. Army Corps of Engineers.

5.1.7 River and Harbor Act

Research that involves work (e.g., placing equipment on the sea floor or in the water column) that could affect navigation, or the construction or maintenance of structures such as any permanent mooring structure may require a:

- Section 10 Permit from the U.S. Army Corps of Engineers.

5.1.8 National Historic Preservation Act

Per Section 106, research that has the potential to affect properties listed on, or eligible for, the National Register of Historic Places may require a:

- Section 106 consultation with a SHPO or TPHO.

5.2 Activities in the Hawaiian Islands

5.2.1 Hawaii Revised Statutes and Administrative Rules

Research in Hawaii state waters that collects aquatic life or uses certain fishing gear and methods may require a:

- Special Activity Permit from Hawaii Department of Land and Natural Resources, Division of Aquatic Resources.

5.2.2 Coastal Zone Management Act

Research in the coastal zone that would cause coastal effects may require a:

- Concurrence with a Consistency Determination from the Hawaii Coastal Zone Management Program.

5.2.3 Papahānaumokuākea Marine National Monument (PMNM)

All activities within the PMNM require a permit and must be categorized under one of six permit types: research, education, conservation and management, Native Hawaiian practice, special ocean use, and recreational (Midway only). Research within the PMNM may require a:

- Research, or Conservation and Management Permit issued by Co-Trustees of the PMNM.

5.2.4 Hawaiian Islands Humpback Whale National Marine Sanctuary (HIHWNMS)

The HIHWNMS encompasses approximately 1,218 square nautical miles of coastal and ocean waters around the main Hawaiian Islands. The sanctuary extends seaward from the shoreline to the 100-fathom isobath. It includes areas around the islands of Maui, Lana`i, and Moloka`i, and parts of O`ahu, Kaua`i and Hawai`i. The following activities are prohibited within the HIHWNMS:

1. Approaching, or causing a vessel or other object to approach, within the sanctuary, by any means, within 100 yards of any humpback whale except as authorized under the Marine Mammal Protection Act (MMPA);
2. Operating any aircraft above the sanctuary within 1,000 feet of any humpback whale;
3. Taking any humpback whale in the sanctuary except as authorized under the MMPA and the Endangered Species Act (ESA);
4. Possessing within the sanctuary (regardless of where taken) any living or dead humpback whale or part thereof taken in violation of the MMPA or the ESA;
5. Discharging or depositing any materials or other matter in the sanctuary; altering the seabed of the sanctuary, or discharging and depositing any material or other matter outside of the sanctuary if the discharge or deposit subsequently enters and injures a humpback whale or humpback whale habitat; and
6. Interfering with, obstructing, delaying, or preventing an investigation, search, seizure, or disposition of seized property in connection with enforcement with either of the Acts.

Research that involves a prohibited activity or collection of materials in the Sanctuary may require a:

- General or Special Use Permits issued by the NOAA National Marine Sanctuary.

5.3 Activities in American Samoa

Research in the territorial waters of American Samoa may require a:

- Federal Consistency Review of all projects by the American Samoa Coastal Management Program.
- Scientific Collection Permit to undertake any of a number of prohibited marine activities. Note that use of scuba to take marine organisms is prohibited. Also, annually, the government issues a proclamation that articulates restricted fishing areas and other fishing restrictions.

5.3.1 American Samoa National Parks

The National Park is divided into three units Tutuila Unit , Ta'u Unit, and Ofu, Olosega Unit. Research in the park may require a:

- Scientific Research and Collection Permit from National Park Service, DOI.

5.3.2 Fagatele Bay National Marine Sanctuary (FBNMS)

FBNMS is a 0.25 square mile coastal embayment on the island of Tutuila, Territory of American Samoa. A proposed rule has been published (76 FR 65566) that would expand the FBNMS to include other areas, including Rose Atoll (also called Muliava). Research in FBNMS that involves collecting plants, animals, or other materials such as corals may require a:

- Permit from NOAA, Office of Ocean and Coastal Resource Management

5.3.3 Rose Atoll Marine National Monument (RAMNM)

In the Pacific Ocean approximately 130 nautical miles east-southeast of Pago Pago Harbor, American Samoa, lies Rose Atoll – the easternmost Samoan island and the southernmost point of the United States. This atoll includes the Rose Atoll National Wildlife Refuge with about 20 acres of land and 1,600 acres of lagoon. The monument includes all lands and interests in lands owned or controlled by the Government of the United States within the boundaries that lie approximately 50 nautical miles from the mean low water line of Rose Atoll. This is equivalent to approximately 13,451 square miles of emergent and submerged lands and waters of and around Rose Atoll in American Samoa.

- The Proclamation establishing the monument specifically provides that scientific exploration or research by or for the Secretaries of Commerce and Interior shall not need a permit. The Proclamation provides the national marine monument shall be dominant over any other existing Federal withdrawal, reservation, or appropriation.

5.4 Activities in Pacific Remote Island Areas

5.4.1 Pacific Remote Islands Marine National Monument

The monument includes the waters and submerged and emergent lands of the Pacific Remote Islands approximately 50 nautical miles from the mean low water lines of Wake, Baker,

Howland, and Jarvis Islands, Johnston Atoll, Kingman Reef, and Palmyra Atoll. The Federal land and interests in land reserved consists of approximately 86,888 square miles.

- The Proclamation establishing the monument specifically provides that scientific exploration or research by or for the Secretaries of Commerce and Interior shall not need a permit. The Proclamation provides the national marine monument shall be dominant over any other existing Federal withdrawal, reservation, or appropriation.

5.4.2 Pacific Reefs National Wildlife Refuge Complex

The Pacific Reefs National Wildlife Refuge Complex is encompassed by the Pacific Remote Island Marine National Monument. As provided in Presidential Proclamation 8336 (2009b), "the national monument shall be dominant over any other existing federal withdrawal, reservation, or appropriation." Therefore, research conducted by or for the Secretaries of Commerce and Interior in the national wildlife refuges of Howland Island, Baker Island, Jarvis Island, Palmyra Atoll, Kingman Reef, the terrestrial areas and waters out to 12 nautical miles; and the land areas of Johnston Atoll (the waters were not part of the original bird refuge established in 1926) shall not need a permit. Research not conducted by or for the Secretaries of Commerce and Interior may require a:

- Special Use Permit issued by the National Wildlife Refuge, U.S. Fish and Wildlife Service.

5.5 Activities in Commonwealth of Northern Mariana Islands (CNMI)

5.5.1 Marianas Trench Marine National Monument (MTMNM)

The monument includes the waters and submerged lands of the three northernmost Mariana Islands (the "Islands Unit") and only the submerged lands of designated volcanic sites (the "Volcanic Unit") and the Mariana Trench (the "Trench Unit") to the extent described as follows: The seaward boundaries of the Islands Unit lie approximately 50 nautical miles from the mean low water line of Farallon de Pajaros (Uracas), Maug, and Asuncion. The inland boundary of the Islands Unit of the monument is the mean low water line. The boundary of the Trench Unit of the monument extends from the northern limit of the Exclusive Economic Zone of the United States in the Commonwealth of the Northern Mariana Islands to the southern limit of the Exclusive Economic Zone of the United States in Guam. The boundaries of the Volcanic Unit of the monument include a circle drawn with a 1 nautical mile radius centered on each of the volcanic features.

- The Proclamation establishing the monument specifically provides that scientific exploration or research by or for the Secretaries of Commerce and Interior shall not need a permit. The Proclamation provides the national marine monument shall be dominant over any other existing Federal withdrawal, reservation, or appropriation.

5.5.2 Mañagaha Marine Conservation Area (MMCA)

Mañagaha Island is a small (4 ha) reef-island located 2.5 kilometers (1.6 miles) off the west coast of Saipan in the CNMI. MMCA encompasses 500 ha (1,235 ac) within the Tanapag Lagoon and the adjacent reef slope. MMCA is a fully protected no-take area. Research that involves the collection of plants, animals, or materials in the MMCA may require:

- Scientific Research License from the CNMI, Department of Lands and Natural Resources, Division of Fish and Wildlife.

5.5.3 Forbidden Island Marine Sanctuary (FIMS)

The Forbidden Island Marine Sanctuary is located on the east-central coast of Saipan, Commonwealth of the Northern Mariana Islands (CNMI). FIMS encompasses 265 ha (655 ac) of marine environment extending 1,000 feet seaward from low tide line, including Forbidden Island, which is 3 ha (8 ac). FIMS is a fully protected no-take area. Research that involves the collection of plants, animals, or materials in the FIMS may require:

- Scientific Research License from the CNMI, Department of Lands and Natural Resources, Division of Fish and Wildlife.

5.5.4 Bird Island Marine Sanctuary (BIMS)

The Bird Island Wildlife Conservation Area and the Bird Island Marine Sanctuary are adjoining (and overlapping) conservation areas encompassing 268 ha (662 ac) of land and ocean on the northeastern coast of Saipan, CNMI. The Bird Island Sanctuary covers from Lichan Point to Bird Island Lookout, including Grotto, Bird Island, and Bird Island Bay. The sanctuary extends 1,000 feet from the low tide line seaward and 500 feet up the face of the cliff line. BIMS is a fully protected no-take area. Research that involves the collection of plants, animals, or materials in the BIMS may require:

- Scientific Research License from the CNMI, Department of Lands and Natural Resources, Division of Fish and Wildlife.

5.5.5 Sasanhaya Bay Fish Reserve (SBFR)

The Sasanhaya Bay Fish Reserve is located on the Island of Rota, CNMI. SBFR encompasses 81.3 acres between Mushroom Rock and Puňa Point. SBFR is a fully protected no-take area. Research that involves the collection of plants, animals, or materials in the BIMS may require:

- Scientific Research License from the CNMI, Department of Lands and Natural Resources, Division of Fish and Wildlife.

5.5.6 Tinian Marine Reserve Area

The Tinian Marine Reserve is located on the Island of Tinian between Southwest Carolinas Point to Puntan Diablo Point, specifically encompassing all the areas from Tachogna Beach, Taga Beach, YCC Beach, Kammer Beach, Tinian Harbor, Breakwater area to Leprosarium Beach (aka Nasarinu) and Barcinas Bay, from the high tide line to one-half mile out to the reef. SBFR is a

fully protected no-take area. Research that involves the collection of plants, animals, or materials in the BIMS may require:

- Scientific Research License from the CNMI, Department of Lands and Natural Resources, Division of Fish and Wildlife.

5.6 Activities in Guam

5.6.1 Marine Preserves

The Tumon Bay, Piti Bomb Holes, Sasa Bay, Achang Reef Flat, and Pati Point Marine Preserves are located on Guam and prohibit shell collecting, the use of gaffs, and removal of sand and rocks. Fishing is prohibited except for bottom fishing in the Tumon Bay Preserve from the 100 foot depth seaward and trolling for pelagic fishes from the reef margin seaward. The use of SCUBA to collect specimens is prohibited. Research that includes collecting specimens may require:

- Permit from Division of Aquatic and Wildlife Resources, Guam.

Research within the coastal zone (i.e., the entire island and seaward to 3 nmi) may require:

- Concurrence with Federal Consistency from Guam Coastal Management Program, Bureau of Planning.

6 List of Agencies and Persons Consulted

6.1 Federal Agencies

6.1.1 National Oceanic and Atmospheric Administration

- Dr. Malia Chow, Superintendent, HIHWNMS
- Ms. Patty Miller, HIHWNMS: Coordinates Maui stranding response volunteers.
- Mr. Justin Vizbeicke, HIHWNMS: Coordinates Kona stranding response volunteers.
- Ms. Sarah Courbis and Ms. Lisa White, HIHWNMS and State of Hawaii.

6.1.2 U.S. Geological Survey

- Dr. Thierry Work: Veterinarian, Wildlife Disease Specialist; conducts necropsies, performs euthanasia, participates in ocean capture research.

6.1.3 U.S. Fish and Wildlife Service

- Mr. Frank Pendleton, Manager, Rose Atoll National Wildlife Refuge
- Ms. Susan White, PMNM, Mr. Mike Silbernagle and Mr. David Ellis, James Campbell NWR: coordination of nesting research activities in either the NWHI or MHI.
- Ms. Joy Browning, and Mr. Ray Born, hawksbill research and recovery team.

6.1.4 National Park Service

- Ms. Sallie Beavers, Kaloko-Honokohau National Historic Park: Long-term collaborator in ocean capture research.

- Mr. Will Seitz, Hawaii Volcanoes National Park: Manages Hawksbill nesting beach project on the Big Island. Provides MTRP with biological samples from nest remains and strandings.

6.1.5 Department of the Navy

- Mr. Sean Hanser and Ms. Kate Winters, Naval Facilities Engineering Command Pacific
- Mr. Paul Wenninger, Natural Resources Specialist, Guam

6.2 State and U.S. Insular Areas Agencies

6.2.1 State of Hawaii

- Dr. Celia Smith, Department of Botany, University of Hawaii at Manoa.
- Mr. Alton Miyasaki, Department of Land and Natural Resources, Division of Aquatic Resources (DAR), Oahu: Provides assistance with State of Hawaii permitting.
- Mr. Skippy Hau, DAR, Maui: Strandings and nesting beach research on Maui.
- Mr. Don Heacock, DAR, Kauai: Strandings and nesting beach research on Kauai.
- Mr. John Coney and Dr. Jason Turner, University of Hawaii (UH) at Hilo: Big Island stranding response.
- Mr. Jeffrey Kuwabara, UH at Manoa, Marine Option Program: Coordinates student employees for after hours, weekend, and holiday stranding response on Oahu.
- Ms. Donna Brown, UH, Maui College, Marine Option Program: Coordinates student employees for stranding response on Maui.
- Dr. David Hyrenbach, Hawaii Pacific University: Collaborator on ocean capture research.

6.2.2 U.S. Insular Areas Agencies

- Mr. Alden Tagarino, American Samoa Department of Marine & Wildlife Resources
- Mr. Arnold Palacios, CNMI Department of Fisheries and Wildlife
- Mr. Richard Dela Cruz Farrell, CNMI Department of Fish and Wildlife, Tinian
- Ms. Marianne Teregeyo, CNMI Department of Land and Natural Resources
- Mr. Tino Aguon, Mr. Jay Guitierrez, and Mr. Shawn Wusstig Division of Aquatic and Wildlife Resources, Guam

6.3 Non-governmental Agencies

- Dr. William Gilmartin, Hawaii Wildlife Fund, Hawaii
- Ms. Cheryl King, Hawaii Wildlife Fund, Maui
- Mr. Jeffrey Pawlowski, Sea Life Park Hawaii: Collaborator on research related to captive-bred and reared green turtles.
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