



**NOAA**  
**FISHERIES**

**Critical Habitat Information Report:  
Appendix C  
Economic Impact Analysis of  
Proposed Critical Habitat for Threatened  
Indo-Pacific Coral Species**



**Prepared for:  
Pacific Islands Regional Office  
March 2022**

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## **FOREWORD**

This document presents the Economic Impact Analysis developed by Northern Economics, Inc. (NEI), Lynker Technologies, LLC, and the National Marine Fisheries Service Office of Protected Resources. This analysis is intended to be incorporated into a larger Critical Habitat 4(a)(3) and 4(b)(2) Information Report that will provide most of the information upon which the National Marine Fisheries Service Pacific Islands Regional Office's (NMFS PIRO) new proposed coral critical habitat rule will be based. This Economic Impact Analysis follows the outline developed by NMFS PIRO and the NMFS Southeast Regional Office (NMFS SERO), as shown below. We understand that this document is being written concurrently with NMFS SERO's Economic Impact Analysis for the designation of coral critical habitat in its jurisdiction, and that the format of the documents should be comparable. We also understand that NMFS PIRO will need to ensure that the sections of this report are in agreement with other sections authored by NMFS PIRO.

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## **Outline of NMFS 4(a)(3) and 4(b)(2) Information Report:**

1. Background
  - a. Listing History
  - b. Natural History, distribution, genetics
2. Critical Habitat Identification and Designation
  - a. Geographic Areas Occupied by the Species
  - b. Physical or Biological Features Essential for Conservation
  - c. Specific Areas Within the Geographical Area Occupied by the Species
  - d. Unoccupied Areas
  - e. Special Management Consideration or Protections
3. Application of ESA Section 4(a)(3)(B)(I): Military Integrated Natural Resource Management Plans
4. Application of ESA Section 4(b)(2):
  - a. Activities that May be Affected
  - b. Economic Impact Analysis
    - i. Introduction
    - ii. Scope of the Analysis
    - iii. Sources of Economic Impacts
      1. Coextensive versus Incremental
      2. Direct Economic Impacts
      3. Indirect Economic Impacts
    - iv. Activities that May Trigger Section 7 Consultation
    - v. Projection of Future Section 7 Consultations
    - vi. Potential Project Modifications
    - vii. Estimated Section 7 Costs
      1. Administrative Section 7 Costs
      2. Project Modification Costs
    - viii. Benefits
  - c. National Security
  - d. Other Relevant

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## 1.0 INTRODUCTION

Section 4(b)(2) of the Endangered Species Act of 1973 (ESA) requires the National Marine Fisheries Service (NMFS) to consider the economic, national security, and other relevant impacts of designating a particular area as critical habitat. NMFS has discretion to consider excluding areas from critical habitat if it determines that the benefits of exclusion outweigh the benefits of specifying an area as part of the critical habitat, unless it also determines that the failure to designate the area as critical habitat will result in the extinction of the species concerned (16 U.S.C. § 1533(b)(1)(A)).

On November 27, 2020, NMFS proposed to designate critical habitat for Indo-Pacific reef-building coral species listed as threatened under the Endangered Species Act (ESA) within U.S. waters in Guam, the Commonwealth of the Northern Mariana Islands (CNMI), American Samoa, and the Pacific Remote Island Area (PRIA). The proposed rule included a draft economic analysis report in the supplementary materials. This new draft of the economic analysis builds upon and updates the original draft report. This analysis additionally considers the projected economic impacts of the inclusion of the French Frigate Shoals area of the Northwestern Hawaiian Islands (NWHI) in the critical habitat area.

The purpose of this economic analysis is to identify and analyze the potential economic impacts associated with the new proposed rule to designate marine critical habitat areas for the listed corals found in the waters surrounding Guam, CNMI, American Samoa, the NWHI, and the PRIA. These economic impacts represent some of the potential “benefits of exclusion.” In addition, identification of these impacts addresses the requirements of Executive Order 12866 (as affirmed and supplemented by Executive Order 13563), which directs federal agencies to assess the costs and benefits of regulatory actions.

To estimate the economic impacts of critical habitat designation, this analysis compared the extent of protections afforded the corals’ habitat in the “without critical habitat” and “with critical habitat” scenarios and then estimated the incremental costs of achieving compliance under the latter. The “without critical habitat” scenario represents the baseline for the analysis, considering protections already afforded the areas being considered for critical habitat as a result of the listing of the corals as threatened species, or as a result of other federal, territorial, or commonwealth regulations or protections. The “with critical habitat” scenario describes the incremental impacts associated specifically with

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the designation of critical habitat for the listed coral species. That is, the incremental impacts described in this analysis are those not expected to occur absent the designation of critical habitat for the listed coral species.

To describe the economic impacts of critical habitat designation for the listed coral species, this analysis undertakes the following general steps:

1. Assume that the areas considered for coral critical habitat are the same as what will actually be proposed. Characterize the areas considered for proposed critical habitat in terms of economic activities and existing management, as well as the presence of overlapping protections such as existing critical habitat designations or conservation areas.
2. Identify the types of activities that may result in the destruction or adverse modification of critical habitat and that may be subject to section 7 consultation pursuant to the ESA, and forecast the expected occurrences of these activities within the boundaries of the potential critical habitat.<sup>1</sup>
3. Describe the suite of potential project modifications for these activities that may be recommended by NMFS through section 7 consultation to ensure they are not likely to destroy or adversely modify critical habitat.
4. Estimate the economic impacts of complying with the ESA's critical habitat provisions. These incremental costs include the direct costs associated with additional administrative effort required to conduct section 7 consultations as well as the direct costs associated with project modifications that would not have been required under the baseline scenario to avoid jeopardizing the continued existence of the species.
5. Provide information on the distribution of economic impacts across the particular areas considered for proposed critical habitat.

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<sup>1</sup> Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR § 402.02).

- 
6. Evaluate the potential economic benefits stemming from the incremental project modifications.

This methodology is supported by the best available data, including focused interviews of key stakeholders and information from public comments submitted during the public comment period for the proposed coral critical habitat rule (November 27, 2020 to May 26, 2021).

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## 2.0 FRAMEWORK OF THE ECONOMIC ANALYSIS

### 2.1 LEGAL GUIDANCE

The U.S. Office of Management and Budget (OMB) directs federal agencies to provide an assessment of both the social costs and benefits of proposed regulatory actions. OMB's guidelines for conducting an economic analysis of regulations stipulate that federal agencies measure the impacts of a regulatory action against a baseline, which it defines as the "best assessment of the way the world would look absent the proposed action" U.S. Office of Management and Budget (2003). In other words, the baseline includes the existing regulatory and socioeconomic burden imposed on landowners, managers, or other resource users potentially affected by the designation of critical habitat. Impacts that are incremental to that baseline (i.e., occurring over and above existing constraints) are attributable to the proposed regulation. Significant debate has occurred regarding whether assessing the impacts of critical habitat rules using this baseline approach is appropriate.

In 2001, the U.S. Tenth Circuit Court of Appeals instructed FWS to conduct a full analysis of all economic impacts of critical habitat, regardless of whether those impacts are attributable co-extensively to other causes (*New Mexico Cattle Growers Assn v. United States Fish and Wildlife Service*, 248 F.3d 1277 (10th Cir. 2001)). Since that decision, however, courts in other cases have held that an incremental analysis of impacts stemming solely from the critical habitat rulemaking is acceptable. For example, in the March 2006 ruling that the August 2004 critical habitat rule for the Peirson's milk-vetch was arbitrary and capricious, the United States District Court for the Northern District of California stated, "To find the true cost of a designation, the world with the designation must be compared to the world without it" (*Center for Biological Diversity v. United States Bureau of Land Management*, 422 F.Supp.2d 1115 (N.D. Cal. 2006)). In 2010, the U.S. Ninth Circuit Court of Appeals came to similar conclusions during its review of critical habitat designations for the Mexican spotted owl and 15 vernal pool species (*Home Builders Association of Northern California v. United States Fish and Wildlife Service*, 616 F.3d 983 (9th Cir. 2010), cert. denied, 179 L. Ed 2d 301, 2011 U.S. Lexis 1392, 79 U.S.L.W. 3475 (2011); *Arizona Cattle Growers v. Salazar*, 606 F. 3d 1160 (9th Cir. 2010), cert. denied, 179 L. Ed. 2d 300, 2011 U.S. Lexis 1362, 79 U.S.L.W. 3475 (2011)). In 2013, NMFS and the U.S. Fish and Wildlife Service (USFWS) published a final rule addressing the content and timing of critical habitat economic analyses, confirming that the economic analyses of critical habitat rules should

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focus exclusively on the incremental effects of the designation (78 FR 53058; August 28, 2013). Accordingly, this economic analysis employs “without critical habitat” and “with critical habitat” scenarios. As discussed above, the “without critical habitat” scenario represents the baseline for the analysis, considering protections already afforded the areas being considered for critical habitat for the listed coral species. The “with critical habitat” scenario describes and, to the extent possible, monetizes the incremental impacts due specifically to designation of critical habitat for the corals.

## **2.2 OVERVIEW OF ANALYSIS AREAS**

Five U.S. jurisdictions within the geographical area potentially occupied by the listed Indo-Pacific coral species contain the features essential to the conservation of the corals that meet the definition of critical habitat in section 3 of the ESA. Four of these five are American Samoa, Guam, CNMI, and Hawaii (NWHI only). In addition, certain islands, reefs, and atolls within the group of unincorporated U.S. areas collectively referred to as the PRIA were considered for proposed critical habitat, including Howland Island, Jarvis Island, Kingman Reef, Palmyra Atoll, and Johnston Atoll (Figure 1). For the purposes of this economic impact analysis, all waters from a depth of zero to 50 meters around all islands, atolls, reefs, and banks in the five jurisdictions were considered for proposed coral critical habitat (from this point forward, the term “critical habitat” is used in this report as shorthand to refer to the areas considered for proposed coral critical habitat, as opposed to actual proposed coral critical habitat). While it was always unlikely that all such waters would be considered for proposed coral critical habitat, this approach of assuming the maximum possible area was intentionally used in order to portray an economic “worst-case” scenario.

Figure 1 shows the location of American Samoa, Guam, CNMI, Hawaii, and PRIA relative to each other and to other areas of the western and central Pacific.



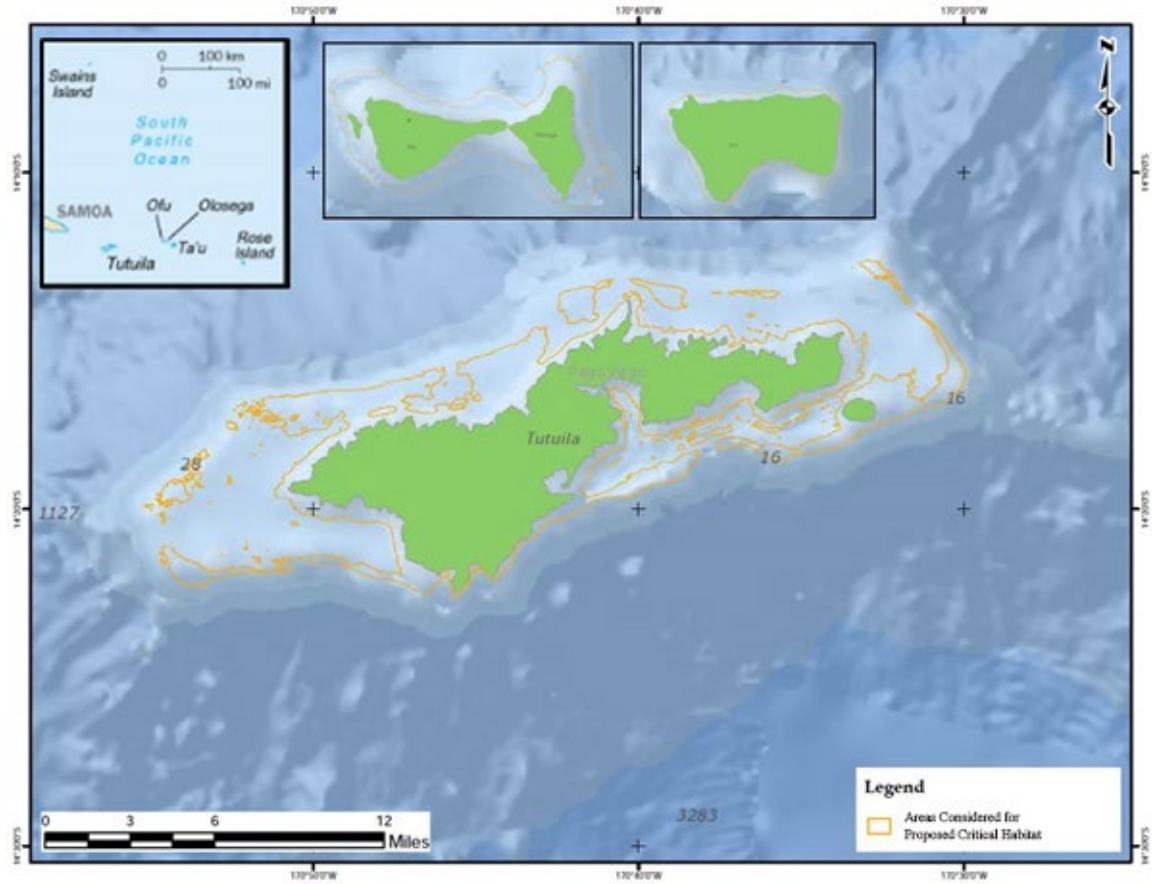
**Figure 1. U.S. Pacific Jurisdictions (American Samoa, Guam, CNMI, HI, PRIA) where ESA-listed Indo-Pacific coral species occur.**

Source: Adapted from U.S. Department of the Interior, Office of Insular Affairs

### *American Samoa*

American Samoa is a U.S. territory comprised of the main island (Tutuila) and several smaller oceanic islands: Aunu'u, the Manu'a Islands (Ofu, Olosega, and Ta'u), Swains Island, and Rose Atoll (Figure 2). The total land area is 76.8 square miles. In 2020, American Samoa had an estimated population of 49,437, of which about 98 percent lived on Tutuila. Tuna fishing and tuna processing plants are the backbone of the private sector with canned tuna the primary export. Transfers from the federal government add substantially to American Samoa's economic well-being (U.S. Central Intelligence Agency 2020a).





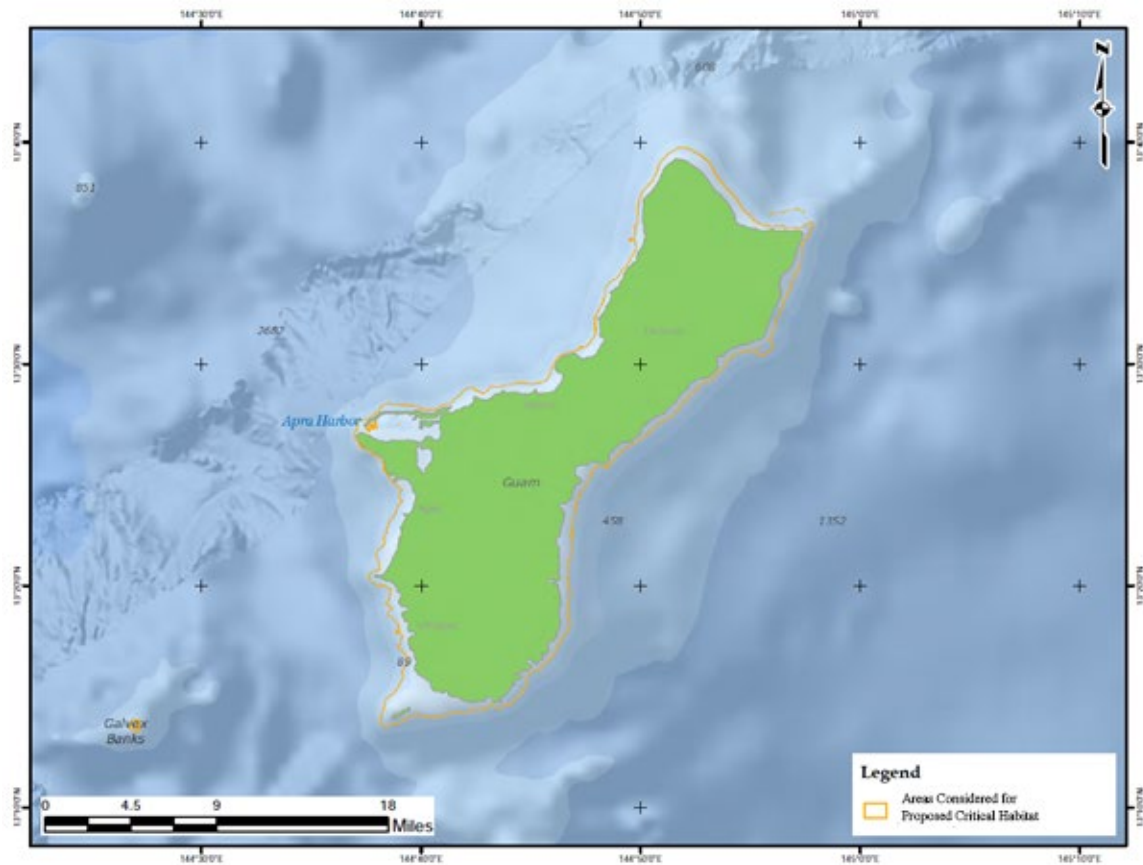
**Figure 2. American Samoa and areas considered in this analysis for proposed coral critical habitat.**

Source: Adapted from Miller et al. (2008)

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## Guam

Guam is a U.S. territory and is the largest and southernmost of the islands in the Mariana Islands Archipelago (Figure 3). In 2020, Guam had an estimated population of 168,485 (U.S. Central Intelligence Agency 2020b). The district of Tamuning, located on the island's western shore, is home to Guam's tourism industry, Harmon Industrial Park, and Antonio B. Won Pat International Airport (NOAA's Coral Reef Information System 2020b). The U.S. military maintains jurisdiction over approximately 39,000 acres of the island, or about 29 percent of Guam's total land area (Laney 2007). U.S. national defense spending is the main driver of Guam's economy, followed by international tourism (U.S. Central Intelligence Agency 2020b).



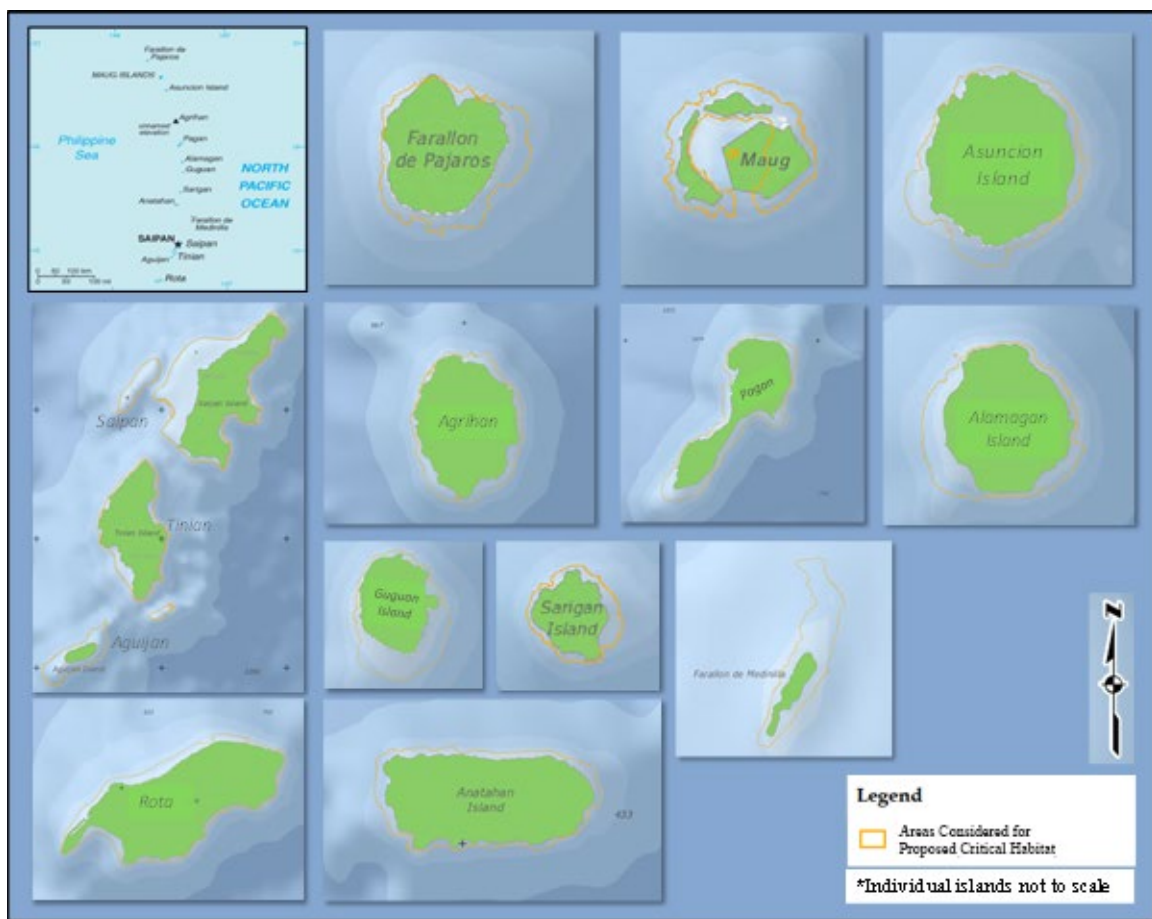
**Figure 3. Guam and areas considered in this analysis for proposed coral critical habitat.**

Source: Adapted from Miller et al. (2008)

## CNMI

CNMI is a U.S. island area with commonwealth status. It consists of 14 islands in the Mariana Islands archipelago and has a combined land mass of 183 square miles (Figure 4). Only Saipan, Rota, and Tinian are permanently inhabited.

CNMI was home to an estimated 51,433 persons in 2020, with about 90 percent of the total population residing on Saipan. As with the economies of American Samoa and Guam, the Northern Mariana Islands' economy benefits substantially from financial assistance from the federal government. In addition, international tourism continues to grow, with investment concentrated on hotels and casinos in Saipan (U.S. Central Intelligence Agency 2020c).



**Figure 4. Commonwealth of the Northern Mariana Islands and areas considered in this analysis for proposed coral critical habitat.**

Source: Adapted from Miller et al. (2008)

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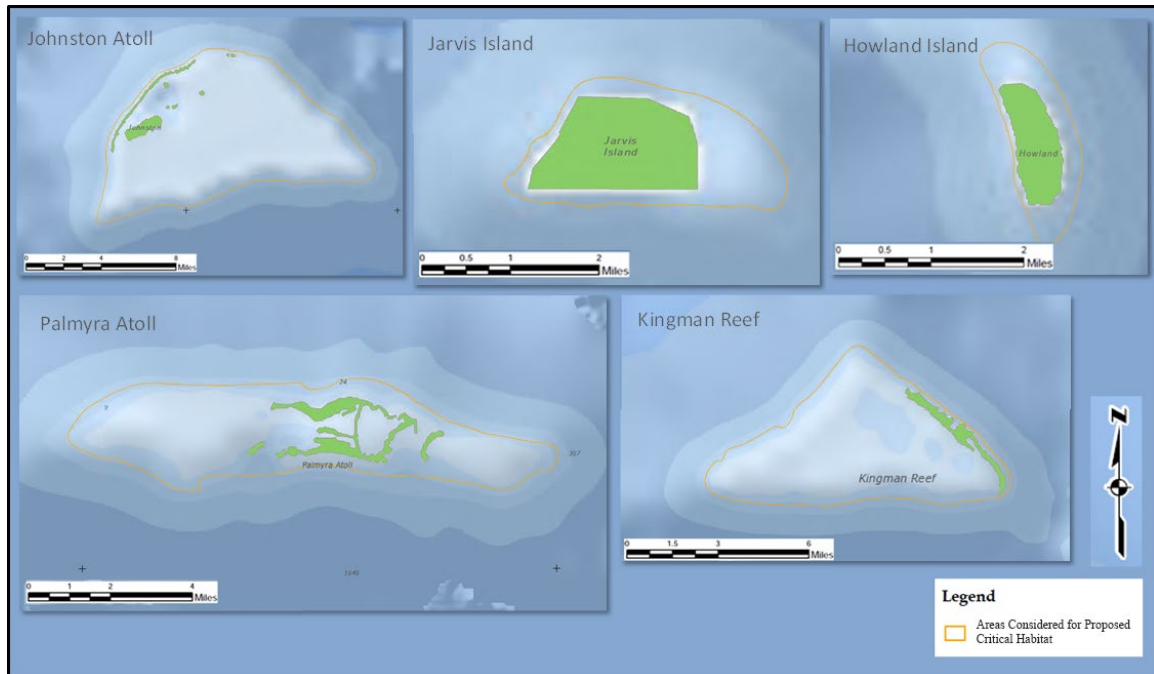
### *Hawaii (NWHI only)*

Located hundreds of miles northwest of Kauai, the NWHI are a string of small islands, atolls, shoals, and banks spanning 1,200 miles in the Pacific Ocean. With no permanent population, the NWHI comprise the Papahānaumokuākea Marine National Monument (PMNM), created in 2006 through Presidential Proclamation 8031 and significantly expanded in size in 2016 through Presidential Proclamation 8112 (The White House 2016). NOAA has primary responsibility for management of the Monument's marine areas. The areas being considered for critical habitat designation are the waters of French Frigate Shoals, an open atoll consisting of a large, crescent-shaped reef surrounding numerous small, sandy islets. The French Frigate Shoals reef system, with an area of approximately 744 square kilometers, supports the largest variety of coral species in the NWHI (FWS 2018).

### *PRIA*

The unincorporated U.S. islands considered for proposed critical habitat include Howland Island, Jarvis Island, Kingman Reef, Palmyra Atoll, and Johnston Atoll. Howland Island, which is part of the Phoenix Islands archipelago, is a seamount with an emergent land area of 1.0 square miles. Jarvis Island, Palmyra Atoll, and Kingman Reef are part of the Line Island archipelago. Jarvis Island is a sandy coral island with a total land area of 2.8 square miles, Palmyra Atoll comprises approximately 52 islets surrounding three central lagoons, and Kingman Reef is a series of fringing reefs around a central lagoon with no emergent land area. Johnston Atoll consists of a nine-mile reef, two highly modified natural islands, Johnston and Sand, and two completely man-made islands, North and East. The area of the atoll totals about 1.0 square mile in surface.

All of the unincorporated U.S. islands considered for proposed critical habitat are managed as National Wildlife Refuges by the USFWS. However, Johnston Atoll currently falls under the jurisdiction of the U.S. Department of Defense (DOD), which has management authority in coordination with the USFWS. Palmyra Atoll is owned by The Nature Conservancy (NOAA's Coral Reef Information System 2020a). Only Palmyra Atoll is accessible by air; the rest of the unincorporated U.S. islands considered for proposed critical habitat require ship access. Although none of the islands have any permanent residents, The Nature Conservancy constructed a research station at Palmyra Atoll in 2006 that accommodates up to 20 researchers for parts of the year (Miller et al. 2008).



**Figure 5. Pacific Remote Island Areas and areas considered in this analysis for proposed coral critical habitat.**

Source: Adapted from Miller et al. (2008)

### **2.3 IDENTIFYING BASELINE PROTECTIONS**

As described above, the "without critical habitat" scenario considers protections already afforded the listed coral species and represents the baseline for this analysis. These baseline protections include the listing of the species under the ESA, other federal laws, and territorial and commonwealth laws. In addition to these regulations, the baseline reflects factors beyond compliance with existing regulations that provide protection to the areas being considered for critical habitat. For example, initiatives for coral reef conservation may be relevant to addressing threats to corals and coral reefs.

A compilation of existing regulatory and non-regulatory mechanisms in American Samoa, Guam, CNMI, the NWHI, and the PRIA most relevant to addressing local threats to the listed coral species and their habitat can be found in Appendix A of National Marine Fisheries Service (2012). The baseline protections are separated into three categories: 1) fisheries and coastal management; 2) MPA management; and 3) non-regulatory U.S. conservation efforts. These three categories of baseline protections are described for both the federal and non-federal (territorial and commonwealth) levels.



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No critical habitat has been designated for any ESA-listed marine species within any of the areas being considered for proposed critical habitat for the listed coral species. However, baseline impacts and protections include implementation of section 7 of the ESA to the extent that they are expected to occur absent designation of critical habitat for the listed coral species. Section 7 of the ESA, absent critical habitat designation, requires federal agencies to consult with NMFS to ensure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species or destroy or adversely modify critical habitat that has already been designated for listed species. Baseline consultations under the jeopardy and destruction/adverse modification standards result in administrative costs, as well as costs of implementing any project modifications resulting from consideration of these standards. This analysis does not quantify the costs of baseline consultations under the jeopardy standard, as these costs are not affected by critical habitat designation.

The protection of listed species and critical habitat is not limited to the ESA. Other federal agencies, as well as territorial and commonwealth governments, may also seek to protect the natural resources under their jurisdiction. If compliance with the Clean Water Act (CWA), territorial and commonwealth environmental quality laws, or best management practices, for example, protects critical habitat for the species, such protective efforts are considered baseline protections. However, such efforts are not considered baseline protections if they would not have been implemented absent the designation of critical habitat.

## **2.4 IDENTIFYING INCREMENTAL IMPACTS**

As previously described, evaluating and, to the extent possible, monetizing the incremental impacts of critical habitat designation is the focus of this economic analysis. The incremental impacts stem from changes in the management of activities, above and beyond those changes resulting from existing required or voluntary conservation efforts undertaken due to other federal and territorial and commonwealth regulations or guidelines.

When critical habitat is designated, section 7 of the ESA additionally requires federal agencies to ensure that their actions are not likely to destroy or adversely modify critical habitat, as well as ensure that the actions are not likely to jeopardize the continued existence of the species. The direct costs associated with additional administrative effort required to conduct section 7 consultations as

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well as the direct costs associated with project modifications that would not have been required under the baseline scenario to avoid jeopardizing the continued existence of the species constitute the direct compliance costs of designating critical habitat.

## **2.5 LOW-END VS. HIGH-END SCENARIOS**

To address uncertainty associated with the likelihood that incremental project modifications would be required for Section 7 consultations, this economic analysis represents a range of potential economic impacts by using “low-end” and “high-end” scenarios to estimate incremental impacts:

1. The low-end scenario is based on the assumption that the relative proportions of informal and formal Section 7 consultations over the next ten years will be similar to the relative proportions of informal and formal consultations collected from PIRO’s section 7 consultation database. i.e., that coral critical habitat will not result in a higher proportion of formal consultations than in the past. Thus, the low-end scenario assumes that coral critical habitat will not result in any new project modifications. Therefore, the incremental costs of coral critical habitat under the low-end scenario are limited to administrative costs.
2. The high-end scenario is based on the assumption that all Section 7 consultations over the next ten years will be formal. i.e., that coral critical habitat will result in a much higher proportion of formal consultations than in the past, which typically result in some project modifications. Thus, the high-end scenario assumes that coral critical habitat will result in extensive project modifications. Therefore, the incremental costs of coral critical habitat under the high-end scenario include both project modifications and administrative costs.

As noted in Section 2.2 above, this economic impact analysis (i.e., both the low-end and high-end scenarios) assumes that all waters of 0 – 50 m depth around all islands will be proposed coral critical habitat in order to portray an economic worst-case scenario. Thus, the high-end scenario is an unrealistic worst-case economic impact scenario because it combines two unrealistic assumptions: (1) All waters of 0 – 50 m depth around all islands will be proposed coral critical habitat; and (2) all future consultations on coral critical habitat will be formal.

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### 3.0 SCOPE OF THE ECONOMIC ANALYSIS

This section discusses the types of incremental impacts considered in the analysis. The economic analysis focuses on the incremental impacts of critical habitat designation, including direct and indirect costs, as well as any incremental benefits that may stem from the rulemaking. Incremental impacts may include direct costs associated with additional administrative effort for consultations as well as the direct costs associated with project modifications that would not have been required either under the jeopardy standard or to protect critical habitat previously designated for other listed species. This analysis refers to “project modifications” as a generic term for recommendations that either NMFS may make to modify activities for the benefit of any listed species or their designated critical habitat or that action agencies or other entities may otherwise undertake to minimize or avoid adverse effects of their actions on listed species or their designated critical habitat. The ESA Section 7 Consultation Handbook includes descriptions for other terminology, as follows:

- **Conservation measures** are actions designed to benefit or promote the recovery of listed species that are included by the federal agency as an integral part of the proposed action. These actions will be taken by the federal agency or applicant and serve to minimize or compensate for project effects on the species under review. These may include actions taken prior to the initiation of the consultation or actions which the federal agency or applicant have committed to complete in a biological assessment or similar document.
- **Conservation recommendations** are the Services’ non-binding suggestions resulting from formal or informal consultation that: (1) identify discretionary measures that a federal agency can take to minimize or avoid the adverse effects of a proposed action on listed or proposed species, or designated as critical habitat; (2) identify studies, monitoring, or research to develop new information on listed or proposed species, or designated or critical habitat; and (3) include suggestions on how an action agency can assist species conservation as part of its action and in furtherance of its authorities under Section 7(a)(1) of the ESA.
- **Reasonable and prudent measures (RPMs)** are actions the Secretary believes necessary or appropriate to minimize the impacts, i.e., amount



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or extent, of incidental take. These measures are not imposed for effects to critical habitat; however, they may also reduce the impact of adverse effects to the critical habitat.

- **Reasonable and prudent alternatives (RPAs)** are recommended alternative actions identified during formal consultation that can be implemented in a manner consistent with the intended purpose of the action, that can be implemented consistent with the scope of the federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Secretary believes would avoid the likelihood of jeopardizing the continued existence of listed species or the destruction or adverse modification of designated critical habitat (U.S. Fish and Wildlife Service and National Marine Fisheries Service 1998).

### **3.1 DIRECT IMPACTS**

The two categories of direct incremental impacts of critical habitat designation are:

1. The additional administrative costs of considering the potential for adverse effects to critical habitat during section 7 consultations; and
2. Implementation of any project modifications recommended by NMFS through section 7 consultation to avoid potential destruction or adverse modification of critical habitat.

Section 7(a)(2) of the ESA requires federal agencies to consult with NMFS whenever activities that they undertake, authorize, or fund may affect a listed species or designated critical habitat. In some cases, consultations will only involve NMFS and the federal action agency, such as the U.S. Army Corps of Engineers (USACE).<sup>2</sup> Often, they will also include a third party involved in activities that involve a permitted entity, such as the recipient of a CWA section 404 permit and/or a Rivers and Harbors Act of 1899 section 10 permit issued by USACE.

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<sup>2</sup> Federal action agency means a department, agency or instrumentality of the United States which plans, constructs, operates or maintains a project; reviews, plans for or approves a permit, lease, or license for projects; or manages federal lands.

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During a consultation, NMFS, the federal action agency, and the entity applying for federal funding or permitting (if applicable) communicate in an effort to minimize potential adverse effects to the species and/or critical habitat.

Communication between these parties may occur via written letters, phone calls, in-person meetings, or any combination thereof. The duration and complexity of these interactions depends on a number of variables, including the type of consultation, species, activity of concern, potential effects to the species and designated critical habitat associated with the proposed activity, federal action agency, and whether there is a private applicant involved.

Section 7 consultations with NMFS may be either informal or formal, based on the determination of adverse effects to the species or critical habitat. Informal consultations consist of discussions between NMFS, the federal action agency, and applicant (if applicable) concerning an action that may affect a listed species or its designated critical habitat. These consultations are designed to identify and resolve potential concerns at an early stage in the planning process. Informal consultations are concluded by determining that the action is not likely to adversely affect listed species or designated critical habitat. By contrast, a formal consultation is required if the action agency or NMFS determines that a proposed federal action may adversely affect the listed species or designated critical habitat in ways that cannot be resolved through informal consultation. The formal consultation process results in NMFS's determination in its biological opinion of whether the action is likely to jeopardize a listed species or destroy or adversely modify designated critical habitat, as well as project modification recommendations to minimize the impacts of those adverse effects.

In addition to conducting standard informal and formal consultations on individual proposed federal activities, NMFS sometimes works with federal action agencies to develop guidance criteria for groups of similar actions within programs, then "programmatic consultations" are completed for those actions. Programmatic consultations streamline the procedures and time involved in consultations for broad agency programs or multiple similar, frequently occurring, or routine actions with predictable effects on listed species and/or critical habitat, thus reducing the amount of time spent on individual project-by-project consultations.

An example of a programmatic consultation in the Pacific Islands Region is the Standard Local Operating Procedures for Endangered Species in the Central and

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Western Pacific Region (Pac-SLOPES), which applies to waters surrounding American Samoa, Guam, CNMI, and the PRIA. The USACE Honolulu District uses Pac-SLOPES to issue permits for a suite of frequently repeated in-water and nearshore activities in the central and western Pacific region that are routinely permitted by the USACE and would consistently and predictably result in insignificant or discountable impacts on ESA-listed marine species and their designated critical habitat. With certain limitations and restrictions, the activities covered include 1) site preparation for above- or over-water construction; 2) survey activities; 3) marina or harbor repair & improvement; 4) piling repair & removal; 5) buoy installation and repair; 6) maintenance dredging; 7) other minor discharges and dredging/excavation; 8) utility line installation and repair; 9) outfall structure repair and replacement; 10) bank stabilization; 11) stream clearing; 12) road construction, repair, and improvement; 13) bridge repair and replacement; and 14) vessel removal. In conjunction with the NOAA Office of National Marine Sanctuaries, NMFS separately developed a programmatic ESA consultation in 2015 to cover a small number of activity categories (vessel entries, research, and non-commercial fishing) that represent the large majority of permitted activities occurring each year in the PMNM. The programmatic was re-initiated in 2020 to cover species that had been listed subsequent to development of the original programmatic (Hall 2021). Programmatic consultations are intended to streamline the consultation process, while reducing or eliminating adverse effects of regulated actions on ESA-listed marine species and their designated critical habitat. Activities proposed for authorization under programmatic consultations undergo review by NMFS to ensure they fit into the range of approved effects. Activities outside of the range undergo separate project-specific consultation with NMFS.

Finally, NMFS offers technical assistance (technical assists) on projects, such as providing species lists, providing information on potentially affected species, or recommending surveys or conservation measures to reduce adverse effects on species or designated critical habitat. Technical assists usually result in minimal or no modifications to a project in order to avoid project impacts to listed species or designated critical habitat. However, technical assists can require administrative effort on the part of all participants.

As described above, parties involved in section 7 consultations include NMFS, a federal action agency, and in some cases, a third-party applicant. While consultations are required for activities that involve a federal nexus and may

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affect a listed species regardless of whether critical habitat is designated, the additional consideration of critical habitat may increase the administrative effort for consultations if the activity in question may affect critical habitat. This additional administrative effort for future consultations results in incremental costs.

The incremental administrative costs of section 7 consultations resulting from critical habitat designation are likely to vary depending on the specifics of each activity. Absent specific information on the administrative burden expected for future activities, this analysis estimated the average incremental administrative cost per consultation for each consultation type (informal, formal, programmatic, or technical assist) using a methodology described in Appendix C of Industrial Economics (2020).

In addition to administrative costs, section 7 consultations in critical habitat areas may also include project modifications recommended specifically to address potential destruction or adverse modification of critical habitat. For future consultations, the economic impacts of project modifications undertaken to avoid destruction or adverse modification of critical habitat, above and beyond those that would have been undertaken to avoid jeopardy, are considered incremental impacts of critical habitat designation.

The listing of species under the ESA requires that activities with a federal nexus not jeopardize the species. Project modifications that are undertaken in order to avoid jeopardy may also avoid destruction or adverse modification of critical habitat. That is, while jeopardy and destruction or adverse modification are not the same standard, project modifications undertaken to avoid jeopardy may also result in the project avoiding destruction or adverse modification of critical habitat, depending on the species and project. This finding is often true for benthic marine species such as corals, as the condition of the habitat is inextricably linked to the health of the species. In other words, while avoidance of destruction or adverse modification of critical habitat requires protection of the essential biological and physical features on which the species' conservation depends, avoiding jeopardy to the species requires protection of these features even absent critical habitat. Listing protections are relevant to the baseline management of activities wherever the listed species are present.

In some cases, the critical habitat impacts may be more readily apparent than the species level effects. For example, turbidity in the water column at a project site

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may be a concern for the species as well as the critical habitat. NMFS may recommend project modifications to avoid both effects. However, measuring the impacts of turbidity on the species may be more difficult than on the habitat itself and, as such, NMFS may be more likely to examine and tie an activity to potential impacts of critical habitat within the section 7 consultation than to the species. Although the link to destruction or adverse modification of critical habitat may be drawn more readily, the outcome of the section 7 consultation is not expected to differ based on critical habitat designation. Nonetheless, where adverse modification provides a simpler means to recommend project modifications, but the outcome of consultation is not expected to change as a result of critical habitat designation, this analysis does not assume impacts of the project modifications are incremental to the designation. The direct economic impacts of coral critical habitat designation are described in Sections 6.1 and 6.2 of this report.

### **3.2 *INDIRECT IMPACTS***

The designation of critical habitat may, under certain circumstances, affect actions that do not have a federal nexus and thus are not subject to the provisions of section 7 under the ESA. Indirect impacts are unintended changes in economic behavior that may occur outside of the ESA, through other federal or non-federal actions, and that are caused by the designation of critical habitat. Economic effects expected to occur regardless of critical habitat designation are considered baseline impacts.

#### ***State, Territorial, and Commonwealth Laws***

Under certain circumstances, critical habitat designation may provide new information to a state, territorial, or commonwealth government about the sensitive ecological nature of a geographic region, potentially triggering additional economic impacts under local laws. In cases where these impacts would not have been triggered absent critical habitat designation, they are considered indirect incremental impacts of the designation.

#### ***Additional Indirect Impacts***

Project proponents, land managers, and landowners may face additional indirect impacts of critical habitat designation, including the following:

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- **Time Delays:** Both public and private entities may experience incremental time delays for projects and other activities due to requirements associated with the need to reinitiate the section 7 consultation process and/or compliance with other laws triggered by the designation. To the extent that delays result from the designation, they are considered indirect, incremental impacts of the designation.
  - **Regulatory Uncertainty or Stigma:** NMFS conducts each section 7 consultation on a case-by-case basis and issues a biological opinion on formal consultations based on species-specific and site-specific information. As a result, government agencies and affiliated private parties who consult with NMFS under section 7 may face uncertainty concerning whether project modifications will be recommended by NMFS and the nature of these modifications. This uncertainty may diminish as consultations are completed and additional information becomes available regarding the effects of critical habitat on specific activities. Where information suggests that this type of regulatory uncertainty stemming from the designation may affect a project or economic behavior, associated impacts are considered indirect, incremental impacts of the designation.

In addition, critical habitat may influence project plans in anticipation of consultation. In other words, if project proponents integrate additional conservation efforts into project plans in order to avoid potential project modifications recommended by NMFS via section 7 consultation, the associated costs of the additional conservation efforts would be considered incremental impacts of the designation. The indirect economic impacts of coral critical habitat designation are described in Sections 6.4 of this report.

### 3.3 BENEFITS

Under Executive Order 12866, OMB directs federal agencies to provide an assessment of both the social costs and benefits of proposed regulatory actions. OMB's Circular A-4 distinguishes two types of economic benefits: *direct benefits* and *ancillary benefits* (U.S. Office of Management and Budget 2003). Ancillary benefits are defined as favorable impacts of a rulemaking that are typically unrelated, or secondary, to the statutory purpose of the rulemaking.

In the context of critical habitat, the primary purpose of the rulemaking (i.e., the direct benefit) is the potential to enhance conservation of the species. The

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published economics literature has documented that social welfare benefits can result from the conservation and recovery of endangered and threatened species. In its guidance for implementing Executive Order 12866, OMB acknowledges that it may not be feasible to monetize, or even quantify, the benefits of environmental regulations due to either an absence of defensible, relevant studies or a lack of resources on the implementing agency's part to conduct new research (U.S. Office of Management and Budget 2003).

Critical habitat designation may also generate ancillary benefits. Critical habitat aids in the conservation of species specifically by protecting the essential biological and physical features of critical habitat on which the species' conservation depends. To this end, critical habitat designation can result in maintenance of particular environmental conditions that generate social benefits besides the conservation of the species. That is, management actions undertaken to conserve a species or habitat may have coincident, positive social welfare implications, such as increased recreational opportunities in a region. These ancillary benefits may also result in gains in employment, output, or income that may offset the negative impacts to a region's economy resulting from actions to conserve a species or its habitat. Section 7.0 of this analysis addresses the potential benefits of critical habitat designation.

### **3.4 PRESENTATION OF RESULTS**

This analysis presents impacts in present value and annualized terms, with a discount rate of seven percent applied throughout the body of the report. Present value and annualized impacts are calculated as shown in Equation 1 below. For purposes of comparison, and in accordance with OMB's Circular A-4 (U.S. Office of Management and Budget 2003), Appendix 1 provides the present and annualized values of impacts applying a three percent discount rate.



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## Equation 1. Calculating Present Value

This analysis compares economic impacts incurred in different time periods in present value terms. The present value represents the value of a payment or stream of payments in common dollar terms. That is, it is the sum of a series of past or future cash flows expressed in today's dollars. Translation of economic impacts of past or future costs to present value terms requires the following: a) past or projected future costs of critical habitat designation; and b) the specific years in which these impacts have been or are expected to be incurred. With these data, the present value of the past or future stream of impacts ( $PV_c$ ) from year  $t$  to  $T$  is measured in 2021 dollars according to the following standard formula:<sup>a</sup>

$$PV_c = \sum_t^T \frac{C_t}{(1+r)^{t-2022}}$$

$C_t$  = cost of incremental impacts in year  $t$

$r$  = discount rate<sup>b</sup>

Impacts for each activity are also expressed as annualized values. Annualized values are calculated to provide comparison of impacts across activities with varying forecast periods ( $T$ ). For this analysis, activities employ a forecast period of ten years, 2022 through 2031. Annualized future impacts ( $APV_c$ ) are calculated by the following standard formula:

$$APV_c = PV_c \left[ \frac{r}{1 - (1+r)^{-N}} \right]$$

$N$  = number of years in the forecast period (in this analysis, 10 years)

<sup>a</sup> To derive the present value of future impacts to development activities,  $t$  is 2022 and  $T$  is 2031.

<sup>b</sup> To discount and annualize costs, guidance provided by the OMB specifies the use of a real rate of seven percent. In addition, OMB recommends sensitivity analysis using other discount rates such as three percent, which some economists believe better reflects the social rate of time preference (U.S. Office of Management and Budget 2003).

The economic impacts of critical habitat designation are considered across all the areas being considered for designation, as previously defined in Section 2.2. Ideally, the timeframe of this analysis would be based on the time period over which the critical habitat regulation is expected to be in place. Specifically, the analysis would forecast impacts of implementing this rule through species



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recovery (i.e., when the rule is no longer required). Recent guidance from OMB indicates that “if a regulation has no predetermined sunset provision, the agency will need to choose the endpoint of its analysis on the basis of a judgment about the foreseeable future” (U.S. Office of Management and Budget 2011). The “foreseeable future” for this analysis includes, but is not limited to, the reasonable timeframe for activities that are currently authorized or funded, or for which proposed plans are currently available to the public. Accordingly, this analysis forecasts impacts over a ten-year time horizon. OMB supports this timeframe, stating that “for most agencies, a standard time period of analysis is ten to 20 years, and rarely exceeds 50 years” (U.S. Office of Management and Budget 2011). Therefore, this analysis considers economic impacts to activities over a ten-year period from 2022 through 2031.

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#### **4.0 ACTIVITIES THAT MAY TRIGGER SECTION 7 CONSULTATION**

As previously noted, activities that federal action agencies propose to authorize, fund, or carry out are subject to ESA section 7 consultation on critical habitat. That is, such proposed actions that federal action agencies believe may affect listed species or designated critical habitat require section 7 consultation between the action agency and NMFS to ensure the activities: a) are not likely to jeopardize the continued existence of the species; and b) are not likely to destroy or adversely modify critical habitat.

To identify the types and geographic distribution of activities that may trigger section 7 consultation for the listed coral species, this analysis first reviewed NMFS PIRO's section 7 consultation history from 2005 through 2020 for consultations occurring in American Samoa, Guam, CNMI, the NWHI, and the PRIA. The consultation database was queried to identify consultations on listed species in the NMFS Pacific Islands Region that involved activities with the potential to affect the essential features of coral critical habitat. We believe this historical consultation record provides a reasonable representation of the types of future federal actions that may occur in the areas considered for proposed critical habitat.

The consultation history included technical assistance, Pac-SLOPES and PMNM programmatic, informal, and formal consultations within the geographic boundaries of the areas considered for proposed critical habitat for the listed coral species. In cases in which a consultation addressed two or more categories of activities, the consultation was divided across the relevant categories (e.g., for consultations that overlapped the activity categories of in-water and coastal construction and dredging and disposal, half of the consultation was assigned to in-water and coastal construction and half to dredging and disposal). Similarly, in cases in which a consultation included two or more jurisdictions, the consultation was divided across the relevant jurisdictions (e.g., for consultations that included both Guam and CNMI, half of the consultation was assigned to Guam and half to CNMI).

In addition, this analysis conducted stakeholder outreach and a literature review to identify future activities likely to destroy or adversely modify the critical habitat of the listed coral species that may have been omitted by relying on the past section 7 consultation history. The literature review included government planning documents as well as recent environmental reviews of proposed federal

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actions in the critical habitat areas. This literature review was supplemented with targeted outreach to key stakeholders, including the USACE and territorial and commonwealth permitting agencies.

The only additional category of federal activities identified by the stakeholder outreach and literature review was Beach Nourishment/Shoreline Protection, defined as placement of sand onto eroding beaches from onshore or offshore borrow sites. Two beach nourishment projects conducted in CNMI prior to 2005 triggered section 7 consultations. More recently, a study by the USACE Honolulu District (2017) of erosion of the Saipan Lagoon shoreline examined a range of shoreline protection measures that could be implemented to address the problem, including beach nourishment. Since there are no beach nourishment/shoreline protection consultations in our 2005-2020 section 7 database, we are unable to estimate future economic impacts due to coral critical habitat in this report. However, beach nourishment/shoreline protection is included as one of the categories of federal activities considered in this report, in order to acknowledge that such activities could be affected by coral critical habitat in the future.

Based on this information, the following list of the categories of activities that may adversely affect the essential features of the critical habitat and involve a federal nexus was developed:

- In-water & Coastal Construction: Construction and maintenance of roads, bridges, or culverts; installation and maintenance of wharfs, docks, and pilings; placement of buoys, moorings, anchorages, and navigation aids; boat ramp construction or maintenance; shoreline protection (revetments, seawalls, breakwaters, jetties, excavation, fill, etc.); and construction or repair of submarine pipelines and cables.
- Dredging and Disposal: Dredging harbors and navigable waterways, as well as the disposal of dredged material.
- Water Quality and Discharges: Issuance of National Pollutant Discharge Elimination System (NPDES) permits and review of water quality standards; pesticide regulation; activities that release heavy metals, hydrocarbons, pesticides, organic compounds, and other contaminants into the marine environment.
- Fishery Management: Development of management measures in federally managed commercial and recreational fisheries.
- Military Activities: In-water military training exercises.

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- Shipwreck and Marine Debris Removal: Shipwreck response and removal and marine debris removal.
  - Scientific Research & Monitoring: Issuance of permits for marine-related research and monitoring projects.
  - Aquaculture: Coastal and offshore facilities used for the culture of organisms for commercial, subsistence, or research purposes.
  - Protected Area Management: Management of national parks, national marine sanctuaries, and federal wildlife refuges.
  - Beach Nourishment/Shoreline Protection: Placement of sand onto eroding beaches from onshore or offshore borrow sites.

It is important to note that these categories of activities may include activities authorized or funded by federal agencies that are carried out by territorial and commonwealth governments or other non-federal entities. The incremental impacts of critical habitat designation on the activities described above will be the focus of the economic analysis. Indirect effects (potential effects of the rule not associated with section 7 consultation) are discussed in Section 6.4.

Table 1 summarizes historical section 7 consultation activity for each of these activity categories from 2005 through 2020. Informal consultations accounted for the largest share (approximately 41 percent) of historical consultations occurring within the critical habitat. The limited subset of formal consultations (19 actions) was primarily associated with in-water and coastal construction activities (8 actions) and scientific research & monitoring (6 actions), with a relatively small number of actions associated with dredging and disposal, fishery management, and aquaculture. Approximately 35 percent of the consultations involved activities authorized under Pac-SLOPES and the PMNM programmatic, and 19 percent were technical assists.

**Table 1. NMFS Pacific Islands Region Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Activity and Consultation Type, 2005 – 2020**

Activity Category	Number of Formal Consultations	Number of Informal Consultations	Number of Programmatic Consultations	Number of Technical Assists	Total
In-water & Coastal Construction	8.0	91.9	54.0	55.0	208.9
Dredging and Disposal	2.0	7.4	3.5	8.0	20.9
Water Quality and Discharges	0.0	10.4	1.0	10.0	21.4
Fishery Management	2.0	3.5	0.0	0.0	5.5
Military Activities	0.0	1.0	0.0	1.0	2.0
Shipwreck and Marine Debris Removal	0.0	15.4	9.5	4.0	28.9
Scientific Research & Monitoring	6.0	42.4	46.0	4.0	98.4
Aquaculture	1.0	1.0	6.0	0.0	8.0
Protected Area Management	0.0	0.0	30.0	0.0	30.0
Beach Nourishment/ Shoreline Protection	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>19.0</b>	<b>173.0</b>	<b>150.0</b>	<b>82.0</b>	<b>424.0</b>
Source: NMFS PIRO's section 7 consultation database. Provided via email to NEI and Lynker Technologies by NMFS on March 2, 2021.					
Fractions of consultations occurred as a result of assigning some consultations to two or more activity categories.					

Table 2 displays the distribution of consultations across American Samoa, Guam, CNMI, the NWHI, and the PRIA. The largest share of consultations (approximately 43 percent) occurred in Guam. American Samoa, CNMI, and the

NWHI each accounted for 18 percent of the consultations, while the PRIA accounted for 3 percent.

**Table 2. NMFS Pacific Islands Region Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Jurisdiction and Consultation Type, 2005 – 2020**

Jurisdiction	Number of Formal Consultations	Number of Informal Consultations	Number of Programmatic Consultations	Number of Technical Assists	Total
American Samoa	10.1	47.0	9.0	10.3	76.3
Guam	5.6	74.5	47.0	55.3	182.3
CNMI	2.6	36.5	24.0	14.8	77.8
NWHI	0.0	5.5	70.0	0.5	76.0
PRIA	0.8	9.5	0.0	1.3	11.5
Total	19.0	173.0	150.0	82.0	424.0

Source: NMFS PIRO's section 7 consultation database. Provided via email to NEI and Lynker Technologies by NMFS on March 2, 2021.

Fractions of consultations occurred as a result of assigning some consultations to two or more jurisdictions.

This analysis considered each of the five U.S. jurisdictions as a whole. However, the activities that resulted in section 7 consultations were not evenly distributed within a given jurisdiction. Rather, with the exception of the unpopulated French Frigate Shoals (NWHI), the majority of historical consultations were concentrated in regions that are heavily populated. In American Samoa the activities that resulted in section 7 consultations occurred mainly on Tutuila; in CNMI they occurred mainly on Saipan; and in Guam they occurred mainly in the region around Hagåtña.

The remainder of this section provides an overview of each of the activities potentially affected by critical habitat for the listed coral species, including how they may affect the essential features of the critical habitat and a description of how they are currently managed under the baseline regulatory environment. In addition to the specific baseline impacts and protections identified for each activity category, there is one baseline protection that applies to all activities: the listing status of the listed coral species. As stated above, the listing of the listed corals as threatened under the ESA requires that activities with a federal nexus

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are carried out in such a way as to not jeopardize the continued existence of the species in the wild. However, coral listing protections are relevant to the baseline management of activities only where any of the listed coral species are present and may be affected. Other potential baseline protections in American Samoa, Guam, CNMI, the NWHI, and the PRIA that are not specified here can be found in Appendix A of National Marine Fisheries Service (2012).

#### **4.1 IN-WATER AND COASTAL CONSTRUCTION**

Generally, the USACE is charged with permitting any construction in the waters of the United States. The USACE is empowered to regulate artificial islands, installations, and “devices” on the seabed of the United States’ outer continental shelf by section 10 of the Rivers and Harbors Act of 1899, as amended by the Outer Continental Shelf Lands Act of 1953. The USACE’s regulatory review examines potential impacts on navigation and national security, as well as a number of other public interest review factors such as conservation, economics, aesthetics, fish and wildlife values, recreation, shore erosion and accretion, and food and fiber production.

##### ***Description of Threat***

As described above, the in-water and coastal construction category encompasses a number of activities. All of the activities can potentially impact critical habitat of the listed coral species or the corals present in the footprint of the project. In addition to direct removal of substrate, sedimentation and turbidity can be caused by the activities and have adverse effects on water quality. Structures can create shaded areas over coral habitat, reducing the light necessary for coral growth. Additionally, structures could be constructed directly over hardbottom substrate, potentially damaging or removing it.

##### ***Extent of Activity within Critical Habitat Areas***

In-water and coastal construction activities are the most frequently occurring potential threat to the listed corals’ critical habitat. From 2005 through 2020, NMFS completed 209 consultations related to in-water and coastal construction activities (Table 3). These consultations were concentrated most heavily in Guam, where 60 percent of the consultations took place. American Samoa and CNMI accounted for 21 percent and 18 percent of the consultations, respectively. PRIA and NWHI accounted for the remaining two percent of consultations. Of all the consultations in this activity category, 44 percent were informal consultations, 26

percent were Pac-SLOPES programmatic consultations, 26 percent were technical assists, and 4 percent were formal consultations.

**Table 3. In-Water and Coastal Construction Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Jurisdiction and Consultation Type, 2005 – 2020**

Jurisdiction	Number of Formal Consultations	Number of Informal Consultations	Number of Pac-SLOPES Programmatic Consultations	Number of Technical Assists	Total
American Samoa	3.5	26.1	6.0	8.0	43.6
Guam	4.5	47.6	34.0	39.0	125.1
CNMI	0.0	16.1	14.0	7.0	37.1
NWHI	0.0	1.0	0.0	0.0	1.0
PRIA	0.0	1.1	0.0	1.0	2.1
<b>Total</b>	8.0	91.9	54.0	55.0	208.9
Source: NMFS PIRO's section 7 consultation database. Provided via email to NEI and Lynker Technologies by NMFS on March 2, 2021. Fractions of consultations occurred as a result of assigning some consultations to two or more activity categories and/or jurisdictions.					

In-water and coastal construction activities observed in NMFS PIRO's section 7 consultation history were spread across a large number of construction subcategories, including wharf, pier, harbor, marina construction/maintenance; shoreline protection; road and bridge construction repair; moorings and buoy installation/repair; drainage, culvert, and streambed improvement; subsea cables; and utilities.

In-water and coastal construction projects in American Samoa that triggered a section 7 consultation include a submarine fiber optic cable project that involved recovering a fiber optic cable laid in the 1990s from the seabed southeast of American Samoa, and then cutting it and laying it into American Samoa at Pago Pago. During the pick-up process, additional cable was recovered for re-laying between Pago Pago and Apia, Samoa. The action area included either side of the cable as it is extended from the cable-laying vessel to the shore. In addition, within the past several years, funds from the Federal Emergency Management Agency were used for a number of in-water and coastal construction projects



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intended to repair the damage caused by the tsunami that struck American Samoa in 2009. These projects included the construction or restoration of shoreline revetments, seawalls, boat ramps, and docks in Tutuila and the Manu'a Islands.

In Guam, in-water and coastal construction projects undertaken by the U.S. Navy in Apra Harbor in recent years include the rehabilitation and upgrading of existing wharves at U.S. Naval Base Guam, installation of navigation buoys, and construction of mooring dolphins. In 2006, the Alpha/Bravo Wharves' Improvements Project in Inner Apra Harbor involved the removal of 7.1 acres of coral reef habitat. The military also expanded the ammunition Kilo wharf located on Orote Peninsula to accommodate a new class of ammunition ships. The Kilo wharf expansion involved the removal of 4.75 acres of coral reef habitat (Burdick et al. 2008). Apra Harbor Wharf Improvements Phase 1, Naval Base, Guam project in January, 2014. This Design-Build/Design-Bid-Build wharf improvement project restored and upgraded a large wharf complex that was badly damaged from a magnitude 8.2 earthquake in 1989.

In-water and coastal construction projects undertaken in CNMI in recent years include the repair of Sugar Dock and the wharf and piers at Tinian Harbor, as well as the installation of mooring and marker buoys in coastal waters. In addition, fish aggregation devices (FADs) were installed in the waters around CNMI under a FAD program funded by a Sport Fish Restoration and Enhancement grant from the USFWS. FADs are buoys anchored offshore that are intended to attract pelagic fish species targeted by commercial and recreational fishermen. While USACE's Nationwide Permit 4 authorizes the deployment of FADs, no activity is authorized under any Nationwide Permit which "may affect" a listed species or critical habitat, unless section 7 consultation addressing the effects of the proposed activity has been completed (U.S. Army Corps of Engineers 2012a). However, FADs are typically deployed several miles offshore in deep-water locations outside of critical habitat. For example, the FADs installed in CNMI are deployed from 5 to 10 miles offshore at depths between 1,000 and 6,000 feet (Villagomez 2013). Therefore, past FAD deployment projects were not included in this analysis.

In-water and coastal construction projects undertaken in the PRIA include the removal of derelict structures in the waters around Johnston Atoll. The lone in-

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water and coastal construction project completed in NWHI involved pipe movement and seawall work at Tern Island.

### *Regulatory Baseline*

For in-water and coastal construction projects, some baseline protection for the listed coral species and the essential features of their critical habitat occurs even absent the designation of critical habitat for the corals. As a condition of permitting, USACE often requires applicants to minimize impacts to corals and coral reef habitats; the USACE Honolulu District developed Regional Conditions for projects authorized under its Nationwide Permit Program that include specific measures to protect corals and coral reefs (U.S. Army Corps of Engineers 2012b). The conditions also advise that absence of live coral in a particular sample or location does not necessarily indicate the absence of impacts to a coral reef by a given project. Condition 1.6 specifies that no activity that directly results in a permanent loss of coral reef may be authorized if it is determined that compensatory mitigation is required. While the Honolulu District determines specific protections on a case-by-case basis after consulting with appropriate agencies (Paahana 2015), some measures are required by the 2012 Regional Conditions to protect coral and coral reef habitat, including installation of sediment containment devices, avoidance of work during coral spawning periods, avoidance of loss of coral reefs, no placement of project materials on or in close proximity to reef flats, removal of all construction debris, and avoidance of degradation of water quality.

Additionally, USACE has developed general and special conditions and Best Management Practices (BMPs) for in-water and near-shore activities within the scope of the agency's Pac-SLOPES (U.S. Army Corps of Engineers 2010b). Following a Biological Evaluation of the most frequently encountered activities, their shared environmental effects, and similar conservation requirements (U.S. Army Corps of Engineers 2010a), permit conditions were prepared for each activity included in Pac-SLOPES.

As a result of these regulatory baseline protections, USACE has frequently required coral protection measures that include installation of turbidity barriers, monitoring of sedimentation levels, and limiting the shading impacts from dock construction. However, considerable uncertainty remains regarding the overall frequency and consistency with which these measures have been included in permit applications.

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No alteration of submerged lands is permitted within the PMNM. This includes construction, placement, or abandonment of any structure, material, or other matter, except for scientific instruments (The White House 2016).

## **4.2 DREDGING AND DISPOSAL**

The USACE issues permits for dredge and fill activities regulated under section 404 of the Clean Water Act. Dredging is the removal of material from the bottoms of water bodies, and it is most often performed to deepen, widen, or maintain navigation corridors, anchorages, or berthing areas. Dredging for navigation purposes may also involve disposal of dredge spoil material within the marine environment.

### ***Description of Threat***

Impacts to critical habitat from dredging and disposal can include direct loss from burial or excavation. In addition, dredging and disposal produces turbidity and sedimentation that can impact substrate and impair or kill corals. Sediment deposition can cause corals to expend energy by producing mucous to clear sediment from their surfaces, and reduce hard surface area available for recruitment (Baird & Associates 2004). Dredging can also have an adverse impact on water quality. These impacts can be particularly adverse with the dredging of coral rock, as limestone and coral materials tend to break into extremely fine particles when dredged. This creates milky white “clouds” of suspended fine sediments and these clouds can stay in suspension for a long time, spreading over a large area and often causing increased sedimentation. Because they result in significantly reduced light penetration, even in low concentrations, they can impact corals over a wide area, reducing growth and calcification rates in coral reefs, thereby indirectly impacting the quality of the critical habitat (Aller and Dodge 1974; Dodge and Vaisnys 1977; International Association of Dredging Companies 2011). Moreover, the resuspension of contaminated sediments during dredging activities may amplify the adverse impacts on water quality caused by dredging (Guam Environmental Protection Agency 2000). All of the above impacts of dredging could adversely affect any listed Indo-Pacific corals present within the area impacted by dredging as well as the essential features of their critical habitat.

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### *Extent of Activity within Critical Habitat Areas*

Channel dredging encompasses two primary activities: maintenance dredging of existing channels and disposal of dredged materials. USACE is charged with these activities in federally maintained waterways and federal waters. While some existing channels may not contain the essential features of critical habitat, maintenance dredging has the potential to affect adjacent coral critical habitat through sedimentation of surrounding areas.

From 2005 through 2020, NMFS completed about 21 consultations related to dredging and disposal activities (Table 4). These consultations were concentrated most heavily in Guam, where 60 percent of the consultations took place. CNMI and American Samoa accounted for 27 percent and 12 percent of the consultations, respectively. No consultations related to dredging and disposal activities occurred in the PRIA or the NWHI. Of all the consultations in this activity category, 38 percent were technical assists, 35 percent were informal consultations, 17 percent were Pac-SLOPES programmatic consultations, and 10 percent were formal consultations.

**Table 4. Dredging and Disposal Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Jurisdiction and Consultation Type, 2005 - 2020**

Jurisdiction	Number of Formal Consultations	Number of Informal Consultations	Number of Pac-SLOPES Programmatic Consultations	Number of Technical Assists	Total
American Samoa	1.5	0.1	1.0	0.0	2.6
Guam	0.5	5.1	1.0	6.0	12.6
CNMI	0.0	2.1	1.5	2.0	5.6
NWHI	0.0	0.0	0.0	0.0	0.0
PRIA	0.0	0.1	0.0	0.0	0.1
Total	2.0	7.4	3.5	8.0	20.9

Source: NMFS PIRO's section 7 consultation database. Provided via email to NEI and Lynker Technologies by NMFS on March 2, 2021.

Fractions of consultations occurred as a result of assigning some consultations to two or more activity categories and/or jurisdictions.

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Within the critical habitat areas, the USACE maintains several harbors with navigation channels that are periodically dredged or expanded. In American Samoa, maintenance dredging occurs in harbors at Ta'u and Ofu. This periodic dredging is necessary to ensure the continued bi-weekly ferry service operated by the American Samoa Port Administration between Tutuila and the Manu'a Islands on the MV *Sili*. In addition, the USACE maintains the small boat harbors at 'Au'asi and Aunu'u Island that accommodate vessels transporting goods and people between Aunu'u and Tutuila. In Guam, dredging is essential for maintaining safe navigation at port and naval facilities in Apra Harbor, which is the largest U.S. deep-water port in the Western Pacific and the busiest port in Micronesia. The harbor is shared by the Port Authority of Guam and U.S. Navy, and both require maintenance dredging. The USACE also maintains the Agat Marina located in the southern village of Agat. In CNMI, maintenance dredging occurs at Rota's West Harbor, which allows vessels to deliver essential goods to the Commonwealth's southernmost island. Dredging activity in CNMI also includes the continued removal of sand accretion at the Sugar Dock boat launching point and the maintenance dredging of Sugar Dock in Saipan Lagoon by the Commonwealth Ports Authority.

The USACE indicates that the timing of dredging of these harbors varies, depending on the shoaling rate monitored for each harbor. However, on average, each federally maintained harbor is dredged approximately every 10 to 15 years (Chow 2015).

Of note, USACE also issues permits for off-shore dumping of dredged material under the Marine Protection, Research and Sanctuaries Act, also known as the Ocean Dumping Act, using EPA's environmental criteria and subject to EPA's concurrence. In 2010, EPA designated the Guam Deep Ocean Disposal Site, located offshore 11 nm west of Apra Harbor, as a permanent ocean dredged material disposal site. Concurrent with dredging operations, dredged spoils are placed in a scow or barge and towed to the disposal site. Existing information indicates that a large proportion of material likely to be dredged from Apra Harbor in the future would probably qualify as suitable for ocean disposal. However, suitability will be assessed during each project's USACE permitting process. Only dredged material meeting USEPA suitability guidelines may be considered for ocean disposal (U.S. Environmental Protection Agency 2010). While the areas being considered for critical habitat of the listed Indo-Pacific corals is confined to water depths much shallower than the Guam Deep Ocean

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Disposal Site, barges transporting dredged material site may transit in close proximity to critical habitat while in Guam's harbors and nearshore waters. However, the Site Monitoring and Management Plan specifies BMPs for the safe transport of dredged material to the Guam Deep Ocean Disposal Site, and the potential for accidental spillage, discharges, or groundings associated with barges is no greater than for any other vessels entering or leaving Apra Harbor (U.S. Environmental Protection Agency 2010).

### ***Regulatory Baseline***

As with other USACE-permitted activities, the CWA provides some baseline protection to corals with respect to the management of channel dredging projects, and some of these coral protection measures may also prevent adverse effects to critical habitat essential features. For example, water quality standards developed by American Samoa and CNMI under section 303 of the CWA include the following measures to prevent adverse impacts of dredging to coral reefs and sea grass beds (U.S. Environmental Protection Agency 2015):

- The use and maintenance of BMPs, including such measures as "silt curtains," closed ("environmental") buckets, hydraulic dredges, or other methods as appropriate to control the drift and extent of suspended sediment plumes beyond the location of the dredge or fill activity;
- Water quality monitoring requirements for turbidity, contaminants, and other pollutants of concern that may be identified or expected in the dredge spoil or fill material. Periodic aquatic ecosystem monitoring may also be required for the purpose of assessing the effects of the activity on resources of concern and determining the necessity of additional mitigative measures;
- For activities which have the potential to adversely affect coral reproduction, a stoppage period of no less than 60 days, starting five days after the October full moon, is required in American Samoa; in CNMI, a stoppage period of no less than 21 days starting around the June or July full moon is required. In determining whether an activity has the potential to affect coral spawning, the applicable territorial or commonwealth regulatory agency shall consider all of the following: 1) the magnitude of the sediment plume generated by the proposed activity; 2) the most likely extent and direction(s) of drift of the sediment plume; 3) the type of

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sediment and its composition; and 4) the proximity of broadcast spawning coral species to the proposed activity and expected sediment plume;

- A specified distance up-current and down-current from the permitted activity at which applicable water quality criteria must be met (i.e., an effect zone). Effect zones for dredge and fill activities shall be kept as small as practicable and shall not exceed 300 feet down-current and 150 feet up-current. Down-current distance may be increased to 600 feet where typical currents can be shown to make the use of BMPs ineffective; and
- Any additional protective measures, limitations, monitoring, or mixing zone requirements that the applicable territorial or commonwealth regulatory agency identifies as necessary for the protection of resources of concern.

Additionally, USACE has developed general and special conditions and BMPs for in-water and near-shore activities within the scope of the agency's Pac-SLOPES (U.S. Army Corps of Engineers 2010b). Following a Biological Evaluation of the most frequently encountered activities, their shared environmental effects, and similar conservation requirements (U.S. Army Corps of Engineers 2010a), permit conditions were prepared for each activity included in Pac-SLOPES. Dredging is listed as a prohibited activity within the PMNM (The White House 2016).

### **4.3 WATER QUALITY AND DISCHARGES**

EPA is responsible for promulgating water quality criteria, reviewing state, territorial, and commonwealth water quality standards, listing impaired water bodies, issuing NPDES permits, and identifying the Total Maximum Daily Load (TMDL) for waterbodies resulting from point and non-point source pollution.

#### ***Description of Threat***

Sewage, industrial effluent, storm water runoff, river discharge, and groundwater are sources of nutrients, sediments, turbidity, and contaminants that may adversely affect the listed Indo-Pacific coral species or the essential features of their critical habitat. Two components of discharges from land are nitrogen and phosphorus (inorganic nutrients). Nutrifaction (excess nutrients) from ocean outfall discharges contribute to algal and bacteria blooms that



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smother or shade the coral species or reduce the quantity or quality of areas suitable for coral colonization and growth.

This threat includes the release of contaminants that have been shown to induce adverse effects in corals (both listed and non-listed species) into the marine habitat. Categories of such contaminants are described in the Physical and Biological Features section of the Information Report, and include heavy metals (also called trace metals), pesticides, hydrocarbons, and chemicals in personal care products. These contaminants are delivered to the water column via several sources: wastewater discharge, shipping and industrial activities, coastal and in-water construction, and agriculture and urban runoff, and in the case of personal care products, recreational activities. Many of these sources (e.g., wastewater, dredging) are the same as those for other water quality attributes that may adversely affect the essential features of critical habitat (e.g., nutrients, turbidity). However, different federal actions may also affect contaminant levels that are not the same as those considered in this critical habitat rule, such as: (1) the registration of pesticides by EPA, (2) release of heavy metals, hydrocarbons, and herbicides by ships, and (3) release of organic compounds by any federal action.

#### *Extent of Activity within Critical Habitat Areas*

A review of the section 7 consultation history from 2005 to 2020 identified more than 21 consultations involving water quality and discards (Table 5). Of these, 10 were informal consultations, and 10 were technical assists. The majority of the consultations occurred in Guam (57 percent), while American Samoa and CNMI accounted for 33 percent and 10 percent of the consultations, respectively.



**Table 5. Water Quality and Discharges Section 7 Consultations Areas Considered for Proposed Critical Habitat by Jurisdiction and Consultation Type, 2005 – 2020**

<b>Jurisdiction</b>	<b>Number of Formal Consultations</b>	<b>Number of Informal Consultations</b>	<b>Number of Pac-SLOPES Programmatic Consultations</b>	<b>Number of Technical Assists</b>	<b>Total</b>
<b>American Samoa</b>	0.0	5.1	0.0	2.0	7.1
<b>Guam</b>	0.0	3.1	1.0	8.0	12.1
<b>CNMI</b>	0.0	2.1	0.0	0.0	2.1
<b>NWHI</b>	0.0	0.0	0.0	0.0	0.0
<b>PRIA</b>	0.0	0.1	0.0	0.0	0.1
<b>Total</b>	0.0	10.4	1.0	10.0	21.4
<p>Source: NMFS PIRO's section 7 consultation database. Provided via email to NEI and Lynker Technologies by NMFS on March 2, 2021.</p> <p>Fractions of consultations occurred as a result of assigning some consultations to two or more activity categories and/or jurisdictions.</p>					

EPA's Pacific Southwest (Region 9) acts as the NPDES permitting authority for point sources in American Samoa, Guam, and CNMI, as the territorial and commonwealth governments do not have approved NPDES permitting programs.<sup>3</sup> As of November 2020, there were six NPDES permits issued by EPA within American Samoa: Starkist Samoa Company, COS Samoa Packing Company, Utulei Wastewater Treatment Facility, Tafuna Wastewater Treatment Facility, American Samoa Terminal, Satala Power Plant, and MYD Samoa Shipyard (U.S. Environmental Protection Agency 2020c). The tuna processing facilities (Starkist Samoa and COS Samoa Packing) are sited on the northeastern side of Pago Pago Harbor in the village of Atu'u, along with a can making plant, the Satala Power Plant, and the MYD Samoa Shipyard, which is a repair facility

<sup>3</sup> The Clean Water Act prohibits anybody from discharging pollutants through a point source into a water of the United States unless they have an NPDES permit. The permit contains limits on what can be discharged, monitoring and reporting requirements, and other provisions to ensure that the discharge does not hurt water quality or people's health. The term "point source" means any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural stormwater discharges and return flows from irrigated agriculture (U.S. Environmental Protection Agency 2020a).

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for tuna fishing vessels. The American Samoa Terminal is an American Samoa Government-owned fuel dock and bulk fuel storage terminal operated by Pacific Energy South West Pacific Ltd. The fueling dock, which is located in Pago Pago Harbor, is used both to unload oil tankers and to fuel vessels, including the tuna fishing fleet. American Samoa Power Authority was issued permits for the Tafuna Wastewater Treatment Plant and Utulei Wastewater Treatment Plant on Tutuila. None of these point sources are considered major contributors to poor water quality in the Territory (Aeby et al. 2008), although EPA fined Starkist Samoa in 2019 for failing to institute the required upgrades needed to reduce water pollution and the risk of releases of hazardous substances coming from its tuna processing facility (U.S. Environmental Protection Agency 2019).

Presently, there are 21 NPDES permitted discharges in Guam (U.S. Environmental Protection Agency 2020c). Wastewater treatment plants issued permits include two plants operated by the U.S. Navy, six operated by Guam Waterworks Authority, and one operated by Unitek Environmental Guam, which operates a mobile treatment facility that treats bilge water from vessels using the Port of Guam in Apra Harbor. Mobil Oil Guam Inc. and South Pacific Petroleum Corporation were issued permits for their fueling docks and bulk fuel storage terminals at the Port of Guam. In addition, a NPDES general permit was issued for discharges from bulk fuel storage facilities in the Territory. Guam Power Authority was issued a permit to allow the discharge of treated effluent from the Cabras Power Plant to Piti Channel in Apra Harbor. Tristar Terminals Guam Inc. was issued permits for the discharge of treated effluent from tank bottom water draws and storm water runoff from its bulk petroleum storage terminal located at Agat Terminal, which discharges to the Big Guatali River, and from its bulk petroleum storage terminal located at F-1 Pier on Cabras Island, which discharges to Apra Harbor. Guam Power Authority was also issued a permit for its bulk fuel storage terminal located south of the Piti Channel. Guam Waterworks Authority was issued permits to authorize the discharge of treated effluent from the Northern District and Agaña/Hagåtña Sewage Treatment Plants to the Pacific Ocean. Cabras Marine Corporation and Guam Shipyard were issued permits to discharge from their floating dry docks located in the Apra Harbor Complex. Both the Guam Department of Public Works and U.S. Navy were issued permits for discharges from the municipal separate storm sewer systems. The University of Guam Marine Laboratory was issued a permit to allow the discharge of treated effluent from its flow-through seawater system used to hold marine organisms (U.S. Environmental Protection Agency 2020c).

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CNMI currently has five NPDES permitted discharges (U.S. Environmental Protection Agency 2020c). Tasi Tours and Transportation, Inc. was issued a permit for operating a wastewater treatment plant on Managaha islet, a tourist day-use island managed by the CNMI Department of Public Lands. Mobil Oil Mariana Islands, Inc. was issued a permit to allow the discharge of stormwater, tank bottom water draws, hydrostatic test water, and miscellaneous maintenance discharges from its facility on Saipan. The CNMI Department of Public Works was issued a permit to discharge storm water runoff from the municipal storm sewer system serving the urbanized portion of the Island of Saipan. The Commonwealth Utilities Corporation was issued permits for the Sadog Tasi wastewater treatment plant and Agingan wastewater treatment plant on Saipan (U.S. Environmental Protection Agency 2020c).

### ***Regulatory Baseline***

In addition to issuing NPDES permits, EPA reviews the water quality standards that American Samoa, Guam, and CNMI have adopted for their waters. Current water quality standards for marine waters in each of the three U.S. Pacific Island areas include criteria for nutrients and turbidity. EPA must approve these standards before they become effective under the CWA. In addition, EPA conducts a triennial review of those water quality standards.

The water quality standards in American Samoa were revised in 2014, and in Guam and CNMI in 2018 (U.S. Environmental Protection Agency 2020b). EPA approval of a new or revised water quality standard is considered a federal action which may be subject to a section 7 consultation.

Extensive prohibitions on activities within the PMNM preclude the need for the issuance of NPDES permits in this area. No wastewater discharge, shipping and industrial activities, coastal and in-water construction, agriculture and urban runoff, or commercial recreational activities occur within the PMNM.

## **4.4 FISHERY MANAGEMENT**

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), regional councils develop management plans for marine commercial and recreational fisheries in the exclusive economic zone (EEZ) (also referred to as federal waters) of their individual regions, and these plans are implemented by NMFS. Fisheries in the EEZ around American Samoa, Guam, CNMI, and the

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PRIA are under the jurisdiction of the Western Pacific Regional Fishery Management Council (WPRFMC). Commercial fishing is prohibited throughout the PMNM, which includes French Frigate Shoals.

Beginning in the 1980s, WPRFMC managed fisheries through separate species-based fishery management plans (FMPs): the Bottomfish and Seamount Groundfish FMP, the Crustaceans FMP, the Precious Corals FMP, the Coral Reef Ecosystems FMP, and the Pelagic FMP. In 2010, however, WPRFMC began moving towards an ecosystem-based approach to fisheries management and restructured its management framework from species-based FMPs to place-based fishery ecosystem plans (FEPs). WPRFMC currently has five place-based FEPs: one each for Hawaii, American Samoa, the Mariana Archipelago (Guam and CNMI), the PRIA, and Pacific pelagic fisheries.

### *Description of Threat*

For purposes of the MSA, the inner boundary of the EEZ extends from the seaward boundary of each coastal state to a distance of 200 nautical miles. The Territory of American Samoa and Territory of Guam have title to all submerged lands and marine resources within waters 0–3 nautical miles from their shorelines. CNMI has jurisdiction over submerged lands and marine resources extending three nautical miles seaward from its coasts, except for the three northernmost islands of Uracus, Maug, and Asuncion, and the island of Farallon de Medinilla, where federal jurisdiction extends to the shoreline. At Tinian, federal waters also extend to the shoreline around certain lands leased by the DOD. In the PRIA the submerged lands and marine resources from the shoreline to 200 nautical miles are managed by the federal government. In general, the extent of the critical habitat of the listed Indo-Pacific coral species in waters under federal jurisdiction in American Samoa, Guam, and CNMI is limited because the topography in these islands drops off steeply beyond three nautical miles of the shoreline.

The federally managed fisheries in American Samoa, Guam, CNMI, and the PRIA can be broadly categorized in terms of habitat and target species as pelagic fisheries, bottomfish fisheries on mesophotic reefs, coral reef fisheries, and crustacean fisheries. According to WPRFMC, the predominant fishing gear types—hook and line, longline, troll, traps—used in these fisheries cause few fishing-related impacts to the habitat utilized by coral reef species. In the FEPs for American Samoa, the Mariana Archipelago, and the PRIA, the use of bottom

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trawls, bottom-set nets, explosives, and poisons is prohibited in these fisheries to protect habitat and reduce bycatch. Only selective and non-destructive gear may be allowed to fish for coral reef ecosystem management unit species (MUS) (Western Pacific Regional Fishery Management Council 2009d; 2009c; 2009a).

WPRFMC has determined that current management measures to protect fishery habitat are adequate and that no additional measures are necessary at this time. However, WPRFMC has identified potential sources of fishery-related impacts to benthic habitat that may occur during normal fishing operations, including 1) anchor damage from vessels attempting to maintain position over productive fishing habitat, and 2) heavy weights and line entanglement occurring during normal hook-and-line fishing operations (Western Pacific Regional Fishery Management Council 2009d; 2009c; 2009a; 2009b).

In addition, NMFS considers coral reef fisheries to present a potential threat to the areas being considered for critical habitat due to the trophic effects of fishing. The final rule which listed the Indo-Pacific coral species as threatened described these trophic effects as a Medium Importance Threat to the corals (77 FR 53852; September 10, 2014). As discussed in a biological evaluation prepared by National Marine Fisheries Service (2015c), a major concern regarding the effects of fishing on corals is that removal of certain herbivorous fish can reduce predation on algae, thus providing algae a competitive advantage over corals. Such trophic effects can potentially lead to less coral and more algae on coral reefs, reducing coral populations through competition for space and inhibition of coral recruitment. Even fishing pressure that does not rise to the level of overfishing potentially can alter trophic interactions that are important in structuring coral reef ecosystems.

However, National Marine Fisheries Service (2015c) concluded that there is insufficient information to assess if, or to what degree, fishing may be causing trophic effects on Indo-Pacific coral reefs. The biological evaluation notes that while trophic effects from fishing, such as coral-algae shifts, may result from the removal of herbivorous fish species, functional redundancy may mitigate trophic effects. Reduced herbivory on Indo-Pacific reefs does not necessarily correlate with more algae and less coral. Additionally, high populations of herbivores could also have a deleterious effect on the reefs due to predation on coral polyps.

WPRFMC notes that poaching by foreign fishing fleets is suspected at Guam's southern banks, in the PRIA, and possibly in other areas. Poachers usually target

high-value and often rare or overfished coral reef resources. These activities are already illegal but difficult to detect (Western Pacific Regional Fishery Management Council 2009a).

### *Extent of Activity within Critical Habitat Areas*

The query of NMFS PIRO's section 7 consultation database yielded four informal and two formal section 7 consultations for management measures pertaining to fisheries occurring in the EEZ around the U.S. Pacific jurisdictions where one or more of the listed threatened Indo-Pacific coral species occur (Table 6). The majority (94 percent) of consultations occurred in American Samoa and CNMI.

**Table 6. Fishery Management Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Jurisdiction and Consultation Type, 2005 – 2020**

Jurisdiction	Number of Formal Consultations	Number of Informal Consultations	Number of Pac-SLOPES Programmatic Consultations	Number of Technical Assists	Total
American Samoa	1.3	1.0	0.0	0.0	2.3
Guam	0.3	0.0	0.0	0.0	0.3
CNMI	0.3	2.5	0.0	0.0	2.8
NWHI	0.0	0.0	0.0	0.0	0.0
PRIA	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	2.0	3.5	0.0	0.0	5.5
Source: NMFS PIRO's section 7 consultation database. Provided via email to NEI and Lynker Technologies by NMFS on March 2, 2021.					
Fractions of consultations occurred as a result of assigning some consultations to two or more activity categories and/or jurisdictions.					

### *Regulatory Baseline*

The MSA calls for direct actions to stop or reverse the continued loss of fish habitats (16 U.S.C. 1801–1883). Toward this end, Congress mandated the identification of habitats essential to managed species and measures to conserve and enhance this habitat. Under the MSA, Congress directs NMFS and the eight regional fishery management councils to describe and identify essential fish habitat (EFH) in FMPs and FEPs; minimize, to the extent practicable, the adverse effects of fishing on EFH; and identify other actions to encourage the



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conservation of EFH. The MSA defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity” (16 U.S.C. §1802(10)). The listed Indo-Pacific coral species are “fish” for purposes of the MSA.

WPRFMC designated EFH for coral reef ecosystem MUS using a two-tiered approach based on the division of MUS into the Currently Harvested Coral Reef Taxa and Potentially Harvested Coral Reef Taxa categories. The Potentially Harvested Coral Reef Taxa include literally thousands of species encompassing almost all coral reef fauna and flora, including the listed Indo-Pacific coral species. However, there is very little scientific knowledge about the life histories and habitat requirements of the thousands of species of organisms that compose these taxa. In fact, a large percentage of these biota have not been described by science. Therefore, WPRFMC used the precautionary approach in designating EFH for Potentially Harvested Coral Reef Taxa so that enough habitat is protected to sustain managed species. For all life stages of Potentially Harvested Coral Reef Taxa, EFH is described as “...the water column and bottom habitat from the shoreline to the outer boundary of the EEZ to a depth of 50 fm” (Western Pacific Regional Fishery Management Council 2001).

In addition, some baseline protection is provided by non-regulatory measures that mitigate impacts to areas being considered for critical habitat caused by dropped anchors and discarded fishing lines have been implemented. These measures include installation of FADs and/or recreational mooring buoys. By providing both sport and commercial fishermen with a cost-effective way of catching pelagic fish in deeper, offshore waters, FADs can divert fishing effort away from coral reef areas. As discussed in Section 4.1, FADs have been installed in the waters around CNMI, and American Samoa and Guam also have undertaken FAD programs (American Samoa Department of Marine and Wildlife Resources 2009; Guam Department of Agriculture 2017). An example of a mooring buoy program can be found in Guam, where the Guam Division of Aquatic and Wildlife Resources has installed “shallow water moorings” at popular fishing and recreational diving locations to minimize anchor damage to coral reef habitats (Guam Department of Agriculture 2017). With funding from NMFS, the CNMI Division of Coastal Resources Management also has installed mooring buoys and reef lines at numerous sites around Saipan, although the emphasis of this project has been on making scuba diving less damaging to the

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coral reef resources (Commonwealth of the Northern Mariana Islands Coastal Resources Management Office 2011).

All commercial fishing is prohibited within the PMNM, and non-commercial fishing is heavily regulated (The White House 2016).

#### **4.5 MILITARY ACTIVITIES**

The primary military installation located within or adjacent to the areas being considered for critical habitat is the Navy's Joint Region Marianas (JRM) facility and the Air Force's Wake Atoll facility. JRM is a combination of Naval Base Guam and the Air Force's Andersen Air Force Base. In addition, submerged lands under the jurisdiction of DOD in CNMI encompass the areas being considered for critical habitat of the listed Indo-Pacific coral species, including submerged lands immediately adjacent to U.S. Navy-leased lands on Tinian and Farallon De Medinilla.

##### ***Description of Threat***

The development, operation, and maintenance of the above military installations involve many of the activities already discussed. In particular, DOD may need to build and maintain navigation channels, marinas, and ports, and it may regulate discharges to surface waters from their installations. The potential effects of these activities to the critical habitat of the listed Indo-Pacific corals are discussed above in the in-water and coastal construction section (Sections 4.1), dredging and disposal section (Section 4.2), and discharges to navigable waters section (Section 4.3).

Other activities undertaken by the military besides those discussed in earlier sections also have the potential to adversely affect the listed Indo-Pacific coral species and damage their critical habitat. Training activities conducted by the Navy present the primary threat. These activities may result in ships dragging anchors or ammunition landing on the ocean floor, which have the potential to physically damage critical habitat. Ammunition training may also reduce water quality by generating turbidity or lead to sedimentation of the substrate.

##### ***Extent of Activity within Critical Habitat Areas***

The query of NMFS PIRO's section 7 consultation database yielded one formal and one informal section 7 consultation specifically related to military activities



(Table 7). The informal consultation was on a U.S. Coast Guard (USCG) update to the Hawaii and American Samoa Area Contingency Plan in 2012, and the technical assist occurred in CNMI.

**Table 7. Military Activity Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Jurisdiction and Consultation Type, 2005 – 2020**

Jurisdiction	Number of Formal Consultations	Number of Informal Consultations	Number of Programmatic Consultations	Number of Technical Assists	Total
American Samoa	0.0	0.5	0.0	0.0	0.5
Guam	0.0	0.0	0.0	0.0	0.0
CNMI	0.0	0.0	0.0	1.0	1.0
NWHI	0.0	0.5	0.0	0.0	0.5
PRIA	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	0.0	1.0	0.0	1.0	2.0
Source: NMFS PIRO's section 7 consultation database. Provided via email to NEI and Lynker Technologies by NMFS on March 2, 2021.					

### *Regulatory Baseline*

The establishment of mitigation zones by the 2015 biological opinion on the U.S. Navy's training and testing activities in Guam and CNMI provide some baseline protection for critical habitat. These mitigation zones require that explosive and non-explosive gunnery, missile, and bombing exercises maintain a distance of 350 yards (320 meters) from surveyed shallow coral reefs and avoid precision anchoring within the anchor swing diameter of shallow coral reefs (National Marine Fisheries Service 2015a).

The Sikes Act Improvement Act of 1997 also provides baseline protection for critical habitat located in or near military installations. The Act requires military installations to work with the USFWS and NMFS to prepare and implement an Integrated Natural Resources Management Plan (INRMP). INRMPs are designed to promote:

- Conservation and rehabilitation of natural resources on military installations;

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- Sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and non-consumptive uses; and
  - Subject to safety requirements and military security, public access to military installations to facilitate the use of the resources.

There is an INRMP in place for Joint Region Marianas, which includes U.S. Navy and U.S. Air Force holdings on Guam, and Navy-leased lands on Tinian and Farallon de Medinilla (U.S. Navy 2019).

Additionally, DOD's 2005 publication *Coral Reef Conservation Guide for the Military* is intended to create awareness and outline procedures the military services should use to ensure safe and environmentally responsible behavior in and around coral reefs. The guide helps military forces conduct their operations in these sensitive areas while minimizing the potential for adverse impacts to coral reefs.

#### **4.6 SHIPWRECK AND MARINE DEBRIS REMOVAL**

Under section 19 of the Rivers and Harbors Appropriations Act, USACE has the authority to undertake projects to remove and dispose of derelict objects such as sunken vessels and waterfront debris if they are determined to be obstructions to navigation. USACE's Nationwide Permit 22 authorizes temporary structures or minor discharges of dredged or fill material required for the removal of wrecked, abandoned, or disabled vessels, or the removal of man-made obstructions to navigation. The permittee must submit a pre-construction notification to the USACE district engineer prior to commencing the activity if the activity is conducted in a special aquatic site, including coral reefs and wetlands, or if the vessel is listed or eligible for listing in the National Register of Historic Places. In addition, the USCG is responsible for implementing the Oil Pollution Act by responding to vessel groundings that present the risk of an oil spill. Prior to responding to an incident, the USCG typically conducts an emergency consultation with NMFS to reduce impacts to listed species.

##### ***Description of Threat***

The removal of a grounded vessel could adversely affect the listed Indo-Pacific coral species and/or the essential features of their critical habitat if care is not taken to identify an egress path to avoid additional damage. Moreover, the method of removal of the oil from a grounded vessel could be more or less

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detrimental depending on the properties of the oil and the hydrodynamics of the system.

Marine debris may accumulate on near-shore reefs presenting a hazard to the listed Indo-Pacific coral species as well as other ESA-listed species. Many types of marine debris, including building materials, plastics, tires, disposable diapers, and fishing gear, may be snagged in coral reefs, and break, dislodge, or scar coral branches. Marine debris removal efforts are regularly initiated to alleviate these threats. These efforts could adversely affect the listed Indo-Pacific coral species and/or the essential features of their critical habitat if care is not taken to remove the debris in a manner that will not cause additional damage.

#### *Extent of Activity within Critical Habitat Areas*

The query of NMFS PIRO's section 7 consultation database yielded 25 shipwreck and marine debris removal projects that resulted in section 7 consultations (Table 8). Of these, approximately 15 were informal consultations, 10 were Pac-SLOPES programmatic consultations, and 4 were technical assists. The largest share of the consultations occurred in CNMI (47 percent), while Guam accounted for 21 percent of the consultations, NWHI accounted for 14 percent, American Samoa accounted for 11 percent, and the PRIA accounted for 7 percent.

**Table 8. Shipwreck and Marine Debris Removal Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Jurisdiction and Consultation Type, 2005–2020**

Jurisdiction	Number of Formal Consultations	Number of Informal Consultations	Number of Pac-SLOPES Programmatic Consultations	Number of Technical Assists	Total
American Samoa	0.0	2.1	1.0	0.0	3.1
Guam	0.0	4.1	2.0	0.0	6.1
CNMI	0.0	3.1	6.5	4.0	13.6
NWHI	0.0	4.0	0.0	0.0	4.0
PRIA	0.0	2.1	0.0	0.0	2.1
<b>Total</b>	0.0	15.4	9.5	4.0	28.9
Source: NMFS PIRO's section 7 consultation database. Provided via email to NEI and Lynker Technologies by NMFS on March 2, 2021. Fractions of consultations occurred as a result of assigning some consultations to two or more activity categories and/or jurisdictions.					

American Samoa, Guam, and CNMI all have major ports that service large numbers of vessels of various sizes (Pago Pago Harbor in American Samoa, Apra Harbor in Guam, and Port of Saipan in CNMI). Approximately one to three vessel groundings per year historically have occurred in each of these jurisdictions as a result of the heavy vessel traffic associated with these ports as well as other factors such as the occurrence of typhoons (NOAA Office of Response and Restoration 2002). American Samoa lies within the typhoon area of the Western Pacific, and typhoons frequently form south and east of the Mariana Islands Archipelago and routinely pass in the vicinity of Guam and CNMI. In recent years, the frequency of typhoons impacting Guam has risen (U.S. Environmental Protection Agency 2010). The shipwreck removals included a 97-ft. fishing vessel that grounded in 5 ft. of water near a boat ramp in Saipan, a 63-ft. fishing vessel that grounded on Sasanlago-Tatqua Beach in Rota, and several recreational boats that sank in Agat Marina and Hagana Marina during Typhoon Pongsona.

A survey of abandoned vessel sites conducted in CNMI and Guam by NOAA in 2003 found that 76 percent of the vessels surveyed (32 of 42) in CNMI were

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military or government owned, and 27 of these 32 were rusting WWII-era barges. It is unknown when most of these went aground but several are deeply mired in the sediment or in some cases have corals and other organisms growing on them. In total, 26 percent of the abandoned vessels were located on coral reef or hardbottom habitats. Twenty-three percent of the abandoned vessels surveyed (7 of 31) in Guam were associated with coral reef or hardbottom habitats. Live coral cover typically was not prevalent where abandoned vessels were surveyed in Guam (Lord et al. 2003).

Despite the high number of grounded and abandoned vessels in American Samoa, Guam, CNMI, and the PRIA, vessel removal occurs infrequently. Many groundings involve fishing vessels that lack the ability to pay for insurance, and except for an incident where the Oil Pollution Act applies, jurisdictions generally lack the funding and legal authority to address groundings. Further, habitat injuries and removal costs generally increase over time as the vessel degrades (NOAA Office of Response and Restoration 2002).

The Pacific Islands Region is the NOAA Marine Debris Program's largest geographic region. Pacific Ocean currents carry marine debris from afar to these remote archipelagos, making even its uninhabited islands home to some of the most polluted beaches in the world. The Marine Debris Program works with local partners to address marine debris in the Pacific Islands through removals and prevention through education and outreach (NOAA Marine Debris Program 2021c). The Marine Debris Program works to remove derelict fishing gear and other marine debris from the beaches and coral reefs surrounding the NWHI. The fishing gear, which accumulates at a rate of more than 50 metric tons per year in the NWHI, is particularly damaging to coral reefs, in addition to posing threats to numerous other threatened and endangered marine species and seabirds. As of 2018, the Program had removed approximately 850 metric tons of derelict fishing gear from the NWHI (NOAA Fisheries 2019).

Since 2019, the Guam Environmental Protection Agency, with the support of a NOAA Marine Debris Program Removal Grant, has worked with the Guam Coral Reef Response Team, Guam Department of Agriculture, University of Guam Marine Lab, U.S. Environmental Protection Agency, NMFS PIRO, NOAA Office for Coastal Management, National Park Service, and U.S. Fish and Wildlife Service to remove an artificial reef constructed of tires from Cocos Lagoon in Guam. In addition to the removal of the tires, the project is conducting

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environmental surveys of the reef before and after the removal effort; identifying specific coral colonies that are suitable to be moved to an alternate location; and conducting outreach efforts to the local community to bring awareness to the marine debris issue (NOAA Marine Debris Program 2021b). Another current marine debris removal project involves the assessment, removal, and disposal of debris generated by Typhoon Yutu in CNMI. The project is supported by the Hurricane Response Marine Debris Removal Fund, a partnership between the NOAA Marine Debris Program and National Fish and Wildlife Foundation, and the Mariana Islands Nature Alliance. The project is focusing on the removal of 70,000 pounds of marine debris from over 1,800 acres of coral reef and other sensitive coastal habitats in Tinian and Saipan (NOAA Marine Debris Program 2021a).

### ***Regulatory Baseline***

Some baseline protection for critical habitat is provided by the National Response Team's guidance for federal On-Scene Coordinators and Area Committees that develop solutions for the abatement of pollution from abandoned vessels and examine options applicable to the removal and disposition of abandoned vessels (U.S. Environmental Protection Agency 2014). In addition, the Coral Reef Task Force and Injury Resource Tools Working Group, through NOAA Office of Response and Restoration, funded the development of Rapid Assessment Protocols for Small Vessel Groundings. These grounding protocols include the Live Coral Triage protocol, which describes how to salvage and stabilize live coral and associated resources in a coral reef or hardbottom habitat that have been physically fractured, dislodged, or overturned (Michel et al. 2008).

In Guam there are a collection of administrative rules administered through the Department of Parks and Recreation (Title 23) and Commercial Port of Guam (Title 10) that address abandoned and unsafe or wrecked vessels.

Conservation efforts with the potential to address marine debris threats to the listed Indo-Pacific coral species and/or the essential features of their critical habitat include an array of marine debris removal projects conducted by federal agencies, local governments, and non-governmental organizations.

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#### **4.7 SCIENTIFIC RESEARCH AND MONITORING**

NOAA and the Department of the Interior conduct scientific research and issue permits for various research and monitoring activities in the coastal waters of American Samoa, Guam, CNMI, and the PRIA.

##### ***Description of Threat***

Research and monitoring activities that may affect critical habitat include installation of scientific instrumentation and deployment of nets and other marine resource collection devices. However, these activities usually have a minor footprint. For example, the autonomous reef monitoring structures that researchers with the NMFS Coral Reef Ecosystem Division affix to the seafloor to aid the survey of reef benthos consist of a tier of nine 23-cm by 23-cm PVC plates designed to mimic the structural complexity of a coral reef and attract colonizing invertebrates (National Marine Fisheries Service 2015b). Additionally, strict protocols are typically observed during field work permitted by NOAA and the Department of the Interior to ensure minimal disturbance to the environment. Therefore, scientific research and monitoring activities are unlikely to adversely modify critical habitat.

##### ***Extent of Activity within Critical Habitat Areas***

The query of NMFS PIRO's section 7 consultation database yielded 98 consultations related to scientific research and monitoring (Table 9). Of these, 42 were informal consultations, 6 were formal consultations, 46 were Pac-SLOPES or PMNM programmatic consultations, and 4 were technical assists. The consultations occurred in all the U.S. Pacific jurisdictions where one or more of the listed threatened Indo-Pacific coral species occur, with the largest share (41 percent) occurring in the NWHI.

**Table 9. Scientific Research and Monitoring Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Jurisdiction and Consultation Type, 2005 – 2020.**

Jurisdiction	Number of Formal Consultations	Number of Informal Consultations	Number of Programmatic Consultations	Number of Technical Assists	Total
American Samoa	3.8	12.1	1.0	0.3	17.1
Guam	0.3	14.6	3.0	2.3	20.1
CNMI	1.3	9.6	2.0	0.8	13.6
NWHI	0.0	0.0	40.0	0.5	40.5
PRIA	0.8	6.1	0.0	0.3	7.1
<b>Total</b>	6.0	42.4	46.0	4.0	98.4
<p>Source: NMFS PIRO's section 7 consultation database. Provided via email to NEI and Lynker Technologies by NMFS on March 2, 2021.</p> <p>Fractions of consultations occurred as a result of assigning some consultations to two or more activity categories and/or jurisdictions.</p>					

#### 4.8 AQUACULTURE

Under section 10 of the Rivers and Harbors Act, marine aquaculture projects require a permit from the USACE for the installation of structures in navigable waters used to cultivate the species in marine waters. USACE may add conditions to the section 10 permit to ensure that the aquaculture facility does not substantially interfere with navigation.

The CWA section 404, administered by USACE,, establishes a permitting program to regulate the discharge of dredged and fill material into waters of the United States. Examples of activities related to aquaculture that may be subject to section 404 permitting requirements include the discharge of dredged or fill material into open waters, wetlands, or vegetated shallows to prepare the bottom substrate for larval shellfish attachment and growth, or to construct fishery impoundments.

In addition, certain aquaculture facilities are subject to CWA section 402 NPDES permits issued by EPA, while other facilities are exempt. NPDES permits are needed for discharges associated with:



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1. Aquaculture Projects – An aquaculture project means a “defined managed water area which uses discharges of pollutants into that designated area for the maintenance or production of harvestable freshwater estuarine or marine plants or animals” (40 CFR 122.25(b)(1)).
  2. Concentrated Aquatic Animal Production Facilities (CAAP) – CAAP means a “hatchery, fish farm, or other facility” which is designated by EPA per 40 CFR 122.24(c), or which satisfies the following criteria, found in 40 CFR 122 Appendix C:
    - a. Discharges at least 30 days per year; and either
      - i. Produces more than 9,090 harvest weight kilograms (about 20,000 pounds) of cold water fish (e.g., trout, salmon) per year and feeds more than 2,272 kilograms (about 5,000 pounds) of food during the calendar month of maximum feeding; or
      - ii. Produces more than 45,454 harvest weight kilograms (about 100,000 pounds) of warm water fish (e.g., catfish, sunfish, minnows) per year.
      - iii. Closed ponds which discharge only during periods of excess runoff do not need a NPDES permit.

NMFS is responsible for considering and preventing and/or mitigating the potential adverse environmental impacts of planned and existing offshore aquaculture facilities in federal waters through the development of FMPs, sanctuary management plans, permit actions, proper siting, and consultations with other regulatory agencies at the federal, state, and local levels (National Oceanic and Atmospheric Administration 2011). In 2021, NMFS PIRO, in coordination with the WPRFMC, published a Draft Programmatic Environmental Impact Statement (DPEIS) pursuant to the National Environmental Policy Act (NEPA) that analyzes the potential environmental impacts of a Federal aquaculture management program for the Pacific Islands Region. The proposed program would support sustainable development of offshore aquaculture and ensure protection for the region's physical, biological and socioeconomic environment. After analyzing the public comments on the DPEIS and any new information, PIRO will publish the final PEIS and Record of

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Decision (ROD). After that, WPRFMC may decide to amend its FEPs to allow for aquaculture management, using the alternatives outlined in the PEIS as guidance.

### ***Description of Threat***

Aquaculture projects may affect the listed Indo-Pacific coral species and the essential features of their critical habitat in the following ways: 1) aquaculture activities that include the placement of fixed structures or cages or net pens that are anchored in the marine environment have the potential to damage corals and substrate; and 2) discharges of effluents from aquaculture activities may impact water quality by increasing sedimentation and nutrient concentrations.

### ***Extent of Activity within Critical Habitat Areas***

The query of NMFS PIRO's section 7 consultation database yielded a limited number of consultations on aquaculture activities. The focus of these activities, all of which have occurred in recent years, has been on coral propagation and restoration, with the goal of enhancing the resilience of Guam's and CNMI's coral reef ecosystems to the impacts of climate change (Guam Coral Reef Initiative 2018; CNMI Bureau of Environmental and Coastal Quality 2019). These projects involve propagating various types of corals in floating offshore nurseries, and then outplanting the cultured corals onto reef flats. A review of the section 7 consultation history from 2005 through 2020 indicated that six consultations related to aquaculture took place in Guam, while two consultations occurred in CNMI (Table 10). Of the eight total consultations related to this activity, one was a formal consultation, one was an informal consultation, and six were Pac-SLOPES programmatic consultations. While aquaculture per se is not an activity authorized under Pac-SLOPES, the aquaculture projects in Guam and CNMI involved certain types of in-water and coastal construction that are authorized activities.

**Table 10. Aquaculture Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Jurisdiction and Consultation Type, 2005 – 2020**

Jurisdiction	Number of Formal Consultations	Number of Informal Consultations	Number of Pac-SLOPES Programmatic Consultations	Number of Technical Assists	Total
American Samoa	0.0	0.0	0.0	0.0	0.0
Guam	0.0	0.0	6.0	0.0	6.0
CNMI	1.0	1.0	0.0	0.0	2.0
NWHI	0.0	0.0	0.0	0.0	0.0
PRIA	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	1.0	1.0	6.0	0.0	8.0
Source: NMFS PIRO's section 7 consultation database. Provided via email to NEI and Lynker Technologies by NMFS on March 2, 2021.					

No consultations on commercial aquaculture activities were identified in NMFS PIRO's section 7 consultation database for the 2005–2020 period. However, the governments of American Samoa, Guam, and CNMI have a long record of promoting aquaculture as an emerging industry in their coastal waters. The history of commercial aquaculture development in American Samoa includes attempts to culture topminnows as bait for pole-and-line tuna vessels, giant clams and corals for sale in the aquarium trade, and tilapia and mangrove crabs for local consumption (SPC Aquaculture Portal 2011a; Temple undated). The diversification of candidate species for culture indicates the potential American Samoa has to offer aquaculture production facilities (SPC Aquaculture Portal 2011a). Aquaculture development in American Samoa has been supported by the University of Hawaii Sea Grant College Program at the American Samoa Community College and the Center for Tropical and Subtropical Aquaculture at Oceanic Institute and University of Hawaii at Manoa.

In Guam a large array of aquatic organisms have been considered for commercial aquaculture over the years, including seaweed, milkfish, freshwater eel, freshwater and marine shrimp, oysters, tilapia, and freshwater turtles (SPC Aquaculture Portal 2011b). The development of the Guam Aquaculture Development Plan in 2010 increased the capacity of the University of Guam to provide potential investors with information on the status, opportunities, and

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impediments for aquaculture investment in Guam. In particular, Asian investors have exhibited greater interest in shrimp broodstock production in Guam (Center for Tropical and Subtropical Aquaculture 2010; U.S. Department of Agriculture 2020). In 2016, the University of Guam received a five-year grant from the National Institute of Food and Agriculture to introduce these new opportunities for aquaculture on Guam and in the Micronesian region, to examine feasibility of introducing new stocks and related sustainable technologies/practices into the industry, to develop strategies for expanding and diversifying aquaculture, and to prompt the sustainable aquaculture practices on Guam and in the region (U.S. Department of Agriculture 2020).

Commercial aquaculture activities in CNMI have been mainly limited to tilapia and marine shrimp culture, although the culture of giant clams has also been attempted (SPC Aquaculture Portal 2011c). Lack of investor capacity has impeded attempts to further develop viable aquaculture operations in CNMI. However, the Northern Marianas College, Cooperative Research Extension and Education Service has begun researching marine fish and invertebrate culture in recent years, and a plan has been prepared to strengthen the development of aquaculture in CNMI (The Northern Marianas College 2011).

With respect to commercial aquaculture in federal waters, a policy issued by NMFS in 2011 indicated its intention to promote expanded aquaculture activity nationally (National Oceanic and Atmospheric Administration 2011). In addition, Executive Order 13921 *Promoting American Seafood Competitiveness and Economic Growth* facilitates offshore aquaculture projects by promoting regulatory transparency and long-term strategic planning (The White House 2020). As noted above, NMFS PIRO, in coordination with the WPRFMC, published a DPEIS in 2021 on a Federal aquaculture management program that is intended to support offshore aquaculture development in the U.S. Pacific Islands Region, including appropriate management of unit species for aquaculture, reasonably foreseeable types of offshore aquaculture operations, and permitting and reporting requirements for persons conducting aquaculture activities in federal waters (National Marine Fisheries Service 2016). These initiatives could lead to increased offshore aquaculture activity in the Pacific Islands Region, although most aquaculture activity in federal waters surrounding American Samoa, Guam, CNMI, or the PRIA would occur in waters greater than 50 meters in depth, and impacts to critical habitat are considered unlikely.

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### ***Regulatory Baseline***

Applicable existing baseline protections for critical habitat are discussed above in the in-water and coastal construction section (Sections 4.1), dredging and disposal section (Section 4.2), and discharges to navigable waters section (Section 4.3). Additional baseline protections are described in the Gulf of Mexico Aquaculture FMP. Specifically, the FMP prohibits siting offshore aquaculture activities facilities in coral areas, which are defined as marine habitat in the Gulf or South Atlantic EEZ where coral growth abounds and includes patch reefs, outer bank reefs, deep water banks, and hard bottoms (Gulf of Mexico Fishery Management Council and National Marine Fisheries Service Southeast Regional Office 2009). This FMP is expected to serve as a model for future offshore aquaculture FMPs under NOAA's aquaculture policy, including a future FMP (or amendments to the WPRFMC's existing FEPs) for offshore aquaculture operations in the EEZ of the U.S. Pacific Islands Region (i.e., Hawaii, American Samoa, Guam, CNMI, and the PRIA).

### ***4.9 FEDERAL PROTECTED AREA MANAGEMENT***

A number of marine protected areas administered by federal agencies overlap with the critical habitat of the listed coral species. These federal protected areas include national marine sanctuaries, national parks, national marine monuments, national wildlife refuges, and ecological reserve areas. The federal agencies administering these marine protected areas have developed management plans for the areas that include restrictions on human activities within the areas. The management of non-federal protected areas, such as territorial and commonwealth marine protected areas, is not included in this section. In some cases, federal funding is used for activities within such non-federal areas, and such actions are categorized in this report based on the type of action that was funded (e.g., scientific research and monitoring).

### ***Description of Threat***

Adverse impacts to the listed Indo-Pacific coral species or the essential features of their critical habitat could arise from human uses of marine protected areas, such as boating, fishing, scuba diving, and snorkeling, although these are limited to the smaller federal marine protected areas within critical habitat. There is the potential for inadvertent damage to critical habitat from vessel anchoring or grounding. In addition, reef habitat at popular dive sites often is adversely impacted when numerous divers visit the site within a short period. Besides

direct physical impacts, such as trampling of coral colonies, impacts to water quality, such as increased turbidity and the dispersion of harmful sunscreen chemicals, are also possible (Burdick et al. 2008; National Ocean Service 2020).

### *Extent of Activity within Critical Habitat Areas*

Protected area management activities at French Frigate Shoals in NWHI resulted in 30 programmatic consultations from 2005 to 2020. NMFS, the National Ocean Service, and U.S. Fish and Wildlife Service, accounted for all 30 consultations, most of which were on activities comprising Native Hawaiian practices and vessel support for research and scientific exploration. In the past, federal action agencies managing marine protected areas in American Samoa, Guam, CNMI, and the PRIA generally have determined that their management plans for these areas will not affect listed species and, therefore, have not been required to consult with NMFS during the preparation and revision of these plans. However, most of these federal marine protected areas are still developing management plans, especially the larger ones that include the most potential coral critical habitat (e.g., the Marine National Monuments). Thus, it is not possible to determine at this time if and how they would be subject to Section 7 consultation due to potential effects on coral critical habitat.

**Table 11. Protected Area Management Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Jurisdiction and Consultation Type, 2005 – 2020**

Jurisdiction	Number of Formal Consultations	Number of Informal Consultations	Number of PMNM Programmatic Consultations	Number of Technical Assists	Total
American Samoa	0.0	0.0	0.0	0.0	0.0
Guam	0.0	0.0	0.0	0.0	0.0
CNMI	0.0	0.0	0.0	0.0	0.0
NWHI	0.0	0.0	30.0	0.0	30.0
PRIA	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	0.0	0.0	30.0	0.0	30.0
Source: NMFS PIRO's section 7 consultation database. Provided via email to NEI and Lynker Technologies by NMFS on March 2, 2021.					

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### *Regulatory Baseline*

While human use of federally managed marine protected areas has the potential to adversely impact the critical habitat, many protected areas provide specific regulations to protect corals and their habitat. As detailed in Table 12, the level of protection from the effects of fishing differs across protected areas. In some protected areas all fishing is prohibited, while in other areas certain types of fishing (e.g., subsistence fishing by traditional means) are permitted. Examples of other regulations that protect the listed corals and their critical habitat in some federally managed marine protected areas include:

- Restrictions on vessel anchoring and requiring use of mooring buoys
- Prohibiting activities such as mining, drilling, and construction of structures on the seabed
- Prohibiting, destroying, or removing hard substrate
- Prohibiting discharges into the waters

**Table 12. Federal Marine Protected Areas and Fishing Restrictions in Areas Considered for Proposed Critical Habitat by Jurisdiction**

Protected Area	Manager	Fishing Restrictions
American Samoa		
National Park of American Samoa	National Park Service	Only subsistence fishing by traditional means is permitted. Traditional means of fishing are considered rod and reel, net or basket, or pole spear methods only.
National Marine Sanctuary of American Samoa	NOAA Office of National Marine Sanctuaries	All fishing prohibited in Fagatele Bay Unit. Fishing from a vessel without providing notification to the Sanctuary Superintendent or his/her designee in the village of Aunu'u prior to each fishing trip is prohibited in Area A of Aunu'u Unit. Fishing for bottom-dwelling species is prohibited in Area B of Aunu'u Unit.
Rose Atoll Marine National Monument	USFWS/NOAA/American Samoa Government	Commercial fishing prohibited. All fishing prohibited within 12 nm of atoll. Both the owner and operator of a vessel used to fish in the Monument must hold either a non-commercial fishing permit or a recreational charter fishing permit. NMFS may issue a permit only to a community resident of American Samoa or a charter business established legally under the laws of American Samoa.
Guam		
Guam National Wildlife Refuge	USFWS	Fishing using rod and reel, talaya (traditional throw net), spears, hand collecting, and Hawaiian slings is permitted in open area of Ritidian Unit.



Protected Area	Manager	Fishing Restrictions
War in the Pacific National Historical Park	National Park Service	Fishing is allowed at Asan Beach, Ga'an Point, and Apaca Point.
Orote Peninsula Ecological Reserve Area	DOD	All fishing prohibited.
Haputo Ecological Reserve Area	DOD	All fishing prohibited.
Andersen Air Force Base (Pati Point) Marine Preserve	DOD <sup>a</sup>	Fishing is restricted to hook and line gear from the beach and small boat trolling and bottomfish fishing in offshore waters. Use of nets and spearguns is prohibited.
CNMI		
Marianas Trench Marine National Monument	USFWS/NOAA/CNMI Government	Commercial fishing prohibited in Islands Unit. Commercial fishing in Trench and Volcanic Units not prohibited. Both the owner and operator of a vessel used to fish in the Islands Unit must hold either a non-commercial fishing permit or recreational charter fishing permit. NMFS may issue a permit only to a community resident of Guam or CNMI or a charter business established legally under the laws of Guam or CNMI.
PRIA		

Protected Area	Manager	Fishing Restrictions
Pacific Remote Islands Marine National Monument	USFWS/NOAA	Commercial fishing prohibited. All fishing prohibited within 12 nm of islands, subject to USFWS authority to allow non-commercial fishing in consultation with NMFS and WPRFMC. Both the owner and operator of a vessel used to fish in the Monument must hold a recreational charter fishing permit or permit issued under 50 CFR 665.603, 665.624, 665.642, 665.662, or 665.801.
Howland Island National Wildlife Refuge	USFWS	All fishing prohibited within 12 nm of islands, subject to USFWS authority to allow non-commercial fishing in consultation with NMFS and WPRFMC.
Jarvis Island National Wildlife Refuge	USFWS	All fishing prohibited within 12 nm of islands, subject to USFWS authority to allow non-commercial fishing in consultation with NMFS and WPRFMC.
Johnston Atoll National Wildlife Refuge	USFWS	All fishing prohibited within 12 nm of islands, subject to USFWS authority to allow non-commercial fishing in consultation with NMFS and WPRFMC.
Kingman Reef National Wildlife Refuge	USFWS	All fishing prohibited within 12 nm of islands, subject to USFWS authority to allow non-commercial fishing in consultation with NMFS and WPRFMC.

Protected Area	Manager	Fishing Restrictions
Palmyra Atoll National Wildlife Refuge	USFWS	<p>Recreational bonefish fishing is allowed on a catch-and-release basis with artificial flies and barbless hooks. A total of eight anglers are allowed in the lagoons at one time, with no more than 2 fishing outings permitted per day. Catch rates are monitored through daily logs and tagging studies in order to assure sustainable fishery conditions.</p> <p>The offshore sport fishing program allows visitors access to pelagic game-fish, including tuna, wahoo, and mahi-mahi. Fishing is limited to 8 people per trip, with no more than 2 boats at a time, with up to 3 trips per day. Fishing logs are required for each trip. Only pelagic species are permitted to be kept for on-island consumption.</p>
NWHI		
Papahānaumokuākea Marine National Monument	NOAA	All commercial fishing, as well as possession of commercial fishing gear, is prohibited.
<p>Sources: National Marine Fisheries Service (2013); SWCA Environmental Consultants (2010); Guam National Wildlife Refuge and U.S. Fish and Wildlife Service (2009); NOAA Office of National Marine Sanctuaries (2012); U.S. Fish and Wildlife Service (2019); Davtian (2015); Amesbury et al. (1995); The White House (2016).</p> <p><sup>a</sup> Managed jointly with the Government of Guam.</p>		

#### 4.10 BEACH NOURISHMENT AND SHORELINE PROTECTION

Under section 404 of the CWA, USACE is responsible for permitting beach nourishment and shoreline protection projects that involve potential impacts to the critical habitat. Both beach nourishment and shoreline protection projects can involve the placement of sand onto eroding beaches. The replacement sand is either dredged from offshore deposits (i.e., a sand borrow area) or retrieved from another source on land.

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### ***Description of Threat***

Beach nourishment and shoreline protection activities may affect the critical habitat of the listed coral species. Both the dredging and placement of sand are likely to create turbidity, which reduces water quality. Additionally, sand that becomes suspended in the water column has the potential to settle on hardbottom substrate, reducing the habitat's suitability for coral colonization. Moreover, if the listed Indo-Pacific corals are present within the area impacted by a beach nourishment or shoreline protection project, they could be adversely affected.

### ***Extent of Activity within Critical Habitat Areas***

Since there are no beach nourishment/shoreline protection consultations in our 2005-2020 section 7 database, we are unable to estimate future economic impacts due to coral critical habitat in this report. However, beach nourishment/shoreline protection is included as one of the categories of federal activities considered in this report, in order to acknowledge that such activities could be affected by coral critical habitat in the future.

### ***Regulatory Baseline***

As with other USACE-permitted activities, the CWA provides some baseline protection against the potential impacts of beach nourishment projects. USACE aims to avoid coral habitat when selecting offshore sand deposits and may require turbidity controls to minimize negative impacts to water quality and substrate.

Under CNMI's Coastal Resources Rules & Regulations of 1990, activities related to the prevention of beach erosion through non-structural means are among those listed within the highest use priority category for shoreline areas. The taking of sand, gravel, or other aggregates and minerals from the beach and near shore areas is prohibited. All persons proposing to conduct any activities that may affect the coastal resources of the commonwealth must apply for a Coastal Resources Management permit from the CNMI Division of Coastal Resources Management. For example, a Coastal Resources Management permit is required for dredging and filling, discharge of dredged materials, and shoreline modification. In addition, a One-Start Earthmoving and Erosion Control Permit issued by the CNMI Division of Environmental Quality requires an "erosion and

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sedimentation prevention plan” as part of project design to avoid/mitigate the adverse impacts of erosion and sedimentation on coastal waters.

Guam has no beach nourishment policy, as coastal erosion is not a major issue for the Territory because of Guam’s soil types and its barrier/fringe/patch reef system of protection (National Oceanic and Atmospheric Administration 2000). However, the Guam Territorial Seashore Protection Act requires that any person wishing to perform any development within the seashore reserve obtain a permit from the Guam Territorial Seashore Protection Commission. The seashore reserve includes the land and water area of Guam extending seaward to the ten fathom contour, including all offshore islands within the Government’s jurisdiction (except Cabras and those villages where residences have been constructed along the shoreline prior to the effective date of the Act), and extending inland to the nearest of the following points: 1) from the mean high water line for a distance on a horizontal plane of ten meters; 2) from the mean high water line to the inland edge of the nearest public right-of way. The definition of development includes: the discharge or disposal of any dredged material or gaseous liquid, solid, or thermal waste; and, grading, removing, dredging, mining, or extraction of any materials.

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## 5.0 PROJECTION OF FUTURE SECTION 7 CONSULTATIONS

### 5.1 METHODOLOGY

This section discusses the methods applied to forecast the quantity and distribution of future section 7 consultations considering the listed coral species' critical habitat. Significant uncertainty exists with respect to the levels and locations of future projects and activities that may require section 7 consultation considering critical habitat for the listed coral species. This analysis relies on the best available information to forecast future projects and activities, including:

- Information on the historical frequency and location of projects with a federal nexus as indicated by the NMFS PIRO section 7 consultation history from 2005 through 2020
- Targeted interviews with key federal action agencies and relevant territorial and commonwealth government agencies, together with a literature review, to identify anticipated future projects that may affect critical habitat for the listed coral species.

As discussed in Section 4.0, this analysis identified new (i.e., not previously consulted on) federal activity categories that may occur in the future and, if they do occur, may affect the essential features of the critical habitat. These categories of activities include marine protected area management for American Samoa, Guam, PRIA, and the CNMI. However, the number of management plans in these jurisdictions for federally managed marine protected areas that would be subject to section 7 consultation as a result of designation of the critical habitat is speculative. Consequently, this analysis limited the estimation of the number of section 7 consultations that may result from management of federal marine protected areas over the next 10 years to NWHI, where federal action agencies have historically consulted with NMFS on these activities. In addition, because no section 7 consultations occurred for beach nourishment and shoreline protection projects within the historical time frame selected for this analysis (2005–2020), the number of section 7 consultations that may result from such projects over the next 10 years was not estimated.

While the historical consultation rate is likely to be an imperfect predictor of the number of future actions, the designation of critical habitat for the listed coral species is not expected to result in any new section 7 consultations that would

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not have already been expected to occur absent designation (i.e., triggered by the designation of critical habitat). This is because, given the listing of the listed corals, as well as the overlap of the critical habitat with the range of other listed species (e.g., green sea turtle) where most activities are occurring, section 7 consultations are already likely to occur for activities with a federal nexus throughout the critical habitat.

The consultation forecast of this analysis assumes that annual trends in the location and frequency of consultations during the ten-year period 2022–2031 will be similar to annual trends from 2005 through 2020. Accordingly, the historical data on the consultation frequency by activity category and location was used to estimate an average annual historical consultation rate in each of the critical habitat areas. This consultation rate was then projected for the 2022–2031 period. To verify that this was a reasonable approach for estimating future section 7 consultation efforts that would need to consider impacts to the listed corals’ critical habitat, the following steps were undertaken:

- Reviewed historical section 7 consultation history from NMFS to identify any potential trends in levels or locations of consultations that should be incorporated into the forecast. This analysis identified that the annual number of section 7 consultations fluctuated from 2005 through 2020, with no discernable trend.
- Conducted outreach to various permitting agencies including USACE, EPA, and various territorial and commonwealth agencies to identify potential future federal actions that could change the rate of section 7 consultations for one or more activities from historical levels. These interviews were supplemented with a literature review to identify proposed federal actions. One proposed action that was identified by both permitting agencies and the existing literature is the proposed military expansion in Guam. In 2004, the bilateral U.S. and Japanese Security Consultative Committee began a series of sustained security consultations that led to an agreement to reduce the U.S. force structure in Japan while maintaining the U.S. force presence in the Pacific theater by relocating units to other areas, including Guam. The troop movement that began in FY 2010 and will continue through FY 2028 currently plans to relocate about 5,000 troops and 1,300 dependents to Guam. The relocation will eventually be accompanied by an expansion of military facilities and



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operations in both Guam and CNMI, including port improvements at U.S. Naval Base Guam in Apra Harbor, and an increase in joint military training capabilities on Tinian and Pagan through the development of live-fire ranges and amphibious training areas. In addition, DOD has indicated improvements to Guam's public infrastructure, including public water/wastewater improvements, would be required to accommodate the population increase related to the military expansion. Construction of facilities and infrastructure to support incoming military personnel and expanded military operations would occur over several years, with gradual phase out (Naval Facilities Engineering Command Pacific 2010; Naval Facilities Engineering Command Pacific 2014; U.S. Marine Corps Forces Pacific 2015).

However, the level and rate at which military expansion occurs, together with the associated upgrades in existing DOD properties and construction of new facilities, is uncertain. A lack of Congressional funding has delayed the military expansion and accompanying large-scale development efforts. Given this uncertainty, this analysis could not reliably estimate the number of section 7 consultations that may result from activities related to military expansion over the next 10 years. Moreover, consultations which cover activities occurring in areas where listed species are not present are unlikely.

## **5.2 PROJECTED CONSULTATIONS**

In total, we forecast that approximately 288 section 7 consultations are likely to consider the listed coral species critical habitat over the 2022–2031 period. To forecast the location of future consultations, we identified the critical habitat area associated with each historical consultation. We then projected the future number of consultations expected to occur in each critical habitat area based on the consultation history. Table 13 displays the expected number of future consultations from 2022 through 2031 by jurisdiction and consultation type. The largest share of consultations (44 percent) is expected to occur in Guam, followed by CNMI (19 percent), American Samoa and NWHI (17 percent each), and the PRIA (2 percent). Programmatic (40 percent) and informal (38 percent) consultations are projected to account for the large majority of consultations.

**Table 13. Projected Number of Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Jurisdiction and Consultation Type, 2022–2031.**

Jurisdiction	Number of Formal Consultations	Number of Informal Consultations	Number of Programmatic Consultations	Number of Technical Assists	Total
American Samoa	6.3	29.4	8.2	6.4	50.3
Guam	3.5	46.6	42.7	34.5	127.3
CNMI	1.6	22.8	21.8	9.2	55.5
NWHI	0.0	3.4	43.8	0.3	47.5
PRIA	0.5	5.9	0.0	0.8	7.2
<b>Total</b>	11.9	108.1	116.5	51.3	287.7

Source: Estimated by NEI, Lynker Technologies, and NMFS.

Fractions of consultations occurred as a result of assigning some consultations to two or more activity categories and/or jurisdictions.

This analysis forecasted the number of section 7 consultations for each of the five U.S. jurisdictions as a whole. However, the activities that result in consultations will likely be unevenly distributed within a given jurisdiction. As discussed in the introduction of Section 4.0, the majority of historical consultations in all jurisdictions except NWHI were concentrated in heavily populated regions. Consequently, future section 7 consultations in American Samoa are expected to occur mainly on Tutuila; in CNMI they are expected to occur mainly on Saipan; and in Guam they are expected to occur mainly in the region around Hagåtña.

Table 14 disaggregates projected annual consultations over the years 2022–2031 by jurisdiction and activity category. Reflecting historical occurrence of consultations, this analysis anticipates that consultations related to in-water and coastal construction will constitute just over half of consultations over the 2022–2031 period. This equates to an annual predicted average of about 14 consultations per year in this category. Scientific research and monitoring is expected to account for 22 percent of consultations. Consultations related to shipwreck and marine debris removal and protected area management are each expected to account for 7 percent of consultations, with consultations related to water quality and discharges, dredging and disposal, aquaculture, fishery

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management, and military activities each representing 5 percent or less of consultations.

**Table 14. Projected Number of Section 7 Consultations in Areas Considered for Proposed Critical Habitat by Jurisdiction and Activity Category, 2022–2031.**

Jurisdiction	In-Water and Coastal Const.	Dredging and Disposal	Water Quality and Discharges	Fishery Mgmt.	Military Activities	Shipwreck and Marine Debris Removal	Scientific Research & Monitoring	Aquaculture	Protected Area Mgmt.	Total
American Samoa	29.0	1.9	4.4	1.5	0.3	2.2	11.0	0.0	0.0	50.3
Guam	87.8	8.2	7.8	0.2	0.0	4.4	13.4	5.5	0.0	127.3
CNMI	27.2	3.9	1.3	1.8	0.6	10.3	9.1	1.3	0.0	55.5
NWHI	0.6	0.0	0.0	0.0	0.3	2.5	25.3	0.0	18.8	47.5
PRIA	1.3	0.1	0.1	0.0	0.0	1.3	4.4	0.0	0.0	7.2
Total	145.9	14.1	13.7	3.4	1.3	20.8	63.2	6.7	18.8	287.7
<b>Percent of Total</b>	<b>51%</b>	<b>5%</b>	<b>5%</b>	<b>1%</b>	<b>0%</b>	<b>7%</b>	<b>22%</b>	<b>2%</b>	<b>7%</b>	<b>100.0%</b>
Source: Estimated by NEI, Lynker Technologies, and NMFS. Numbers by jurisdiction and activity may not add up to total due to rounding.										

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### 5.3 CAVEATS AND UNCERTAINTIES

The forecast of future section 7 consultations is the basis for the calculation of incremental administrative and project modification costs presented in Section 6.0. As such, it is important to recognize the limitations of these forecasts. Namely, data are not available to determine whether the frequency or locations of activities or projects subject to consultation are likely to change over time. Based on review of historical consultations, we have not seen an overall trend in the frequency of consultations for any particular activity. To the extent that the rate of consultations changes from 2022 through 2031, this analysis may under- or overestimate the potential economic burden of critical habitat designation for the listed coral species.

Uncertainties with respect to the estimated incremental impacts of the critical habitat designation, as well as the forecast of section 7 consultations, are summarized in Section 6.0.

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## **6.0 ESTIMATED INCREMENTAL IMPACTS**

Section 2.4 notes that the focus of this economic analysis is to evaluate and, to the extent possible, monetize the incremental impacts due specifically to designation of critical habitat for the listed corals. The incremental impacts stem from changes in the management of activities, above and beyond those changes resulting from existing required or voluntary conservation efforts undertaken due to other federal and territorial and commonwealth regulations or guidelines. As discussed previously, the analysis considers both direct and indirect impacts of critical habitat designation. Direct impacts include the costs associated with additional administrative effort required to conduct section 7 consultations, as well as the direct costs associated with project modifications that would not have been required under the baseline “world without critical habitat for the listed coral species” scenario.

Indirect impacts are those changes in economic behavior that may occur due to critical habitat designation for reasons other than direct ESA requirements, i.e., those impacts which are “triggered” by critical habitat designation through other federal, territorial, or commonwealth actions, or which are otherwise unintended by NMFS. Some common types of indirect impacts include time delays, regulatory uncertainty, and stigma effects.

To calculate present value and annualized impacts, guidance provided by OMB specifies the use of a real annual discount rate of seven percent (U.S. Office of Management and Budget 2003). In addition, OMB recommends sensitivity analysis using other discount rates, such as three percent, which some economists believe better reflects the social rate of time preference (i.e., the willingness of society to exchange the consumption of goods and services now for the consumption of goods and services in the future). Accordingly, this analysis presents results applying a seven percent discount rate, together with a sensitivity analysis in Appendix C(1) that presents impacts assuming a discount rate of three percent.

### **6.1 INCREMENTAL ADMINISTRATIVE SECTION 7 COSTS**

As discussed in Section 5.0, designation of critical habitat for the listed coral species is in itself unlikely to result in any new section 7 consultations. Given the listing of the listed corals, and the fact that the critical habitat overlaps the range of other listed species (e.g., green sea turtle), section 7 consultations are already likely to occur for activities with a federal nexus throughout the critical habitat.

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This analysis anticipates that all activity categories will continue to be subject to section 7 consultation considering the listed coral species and other listed species. In addition, the analysis expects that the need to address the destruction or adverse modification of critical habitat for the listed coral species in future consultations will add an incremental administrative burden. The analysis recognizes, however, that uncertainty exists regarding the level of additional effort required. As a result, a range of incremental costs associated with the additional administrative effort is estimated.

The low-end cost estimate assumes that the relative proportions of informal and formal consultations from 2022 through 2031 will be similar to the relative proportions of informal and formal consultations collected from PIRO's section 7 consultation database. In addition, it is assumed that inclusion of an analysis of adverse effects to the listed corals' critical habitat in future consultations will always result in at least some additional administrative cost and effort, including time spent attending meetings, making phone calls, preparing letters, and, in some cases, developing a biological assessment.

Estimates of the incremental administrative costs to federal agencies and third parties, such as permittees or grantees participating in the consultation process, were derived from a model provided in Appendix C of Industrial Economics (2020). The model was specifically developed to calculate the administrative costs of section 7 consultations to inform economic analyses of critical habitat rules. The model's assumptions are based on interviews with Federal agency staff with significant experience implementing section 7 consultations.

Table 15 summarizes the key assumptions made when the model was applied to the current analysis. The levels of effort for technical assists, informal consultations, and formal consultations reflect the average across the low and high levels reported in Industrial Economics (2020). The effort level for consultations involving activities authorized under Pac-SLOPES and PMNM programmatic consultations was estimated to be equal to the midpoint between the effort levels for technical assists and informal consultations. Hourly wage rates for NMFS and federal action agency staff were based on the 2021 GS Schedule for Hawaii, available in U.S. Office of Personnel Management (2021). Wages reflect the midpoint between Step 1 and Step 10 within each GS level using the GS hourly rates, and they were multiplied by 2.5 to account for overhead. The differences in hourly rates result from the different levels of technical expertise required for the different types of consultations from

most to least difficult: Formal, informal, programmatic, technical assist. Hourly wage rates for third parties and biological assessments were assumed to be \$100.

**Table 15. Hours and Wage Rate Assumptions by Consultation Type.**

Cost Element	Formal Consultations	Informal Consultations	Programmatic Consultations	Technical Assists
<b>NMFS Costs</b>				
Total Hours	59.5	32.0	20.5	9.0
Hourly Rate	\$48.19	\$38.73	\$36.74	\$33.44
Total Cost	\$7,169	\$3,099	\$1,883	\$752
<b>Federal Action Agency Costs</b>				
Total Hours	75.0	39.5	19.8	-
Hourly Rate	\$44.03	\$40.38	\$36.74	-
Total Cost	\$8,256	\$3,988	\$1,814	-
<b>Third Party Costs</b>				
Total Hours	35.0	20.5	-	10.5
Hourly Rate	\$100.00	\$100.00	-	\$100.00
Total Cost	\$3,500	\$2,050	-	\$1,050
<b>Biological Assessment Cost (Shared by NMFS, Federal Action Agency, and Third Parties)</b>				
Total Cost	\$4,800	\$2,000	\$1,000	-
<b>Combined Total</b>	<b>\$23,724</b>	<b>\$11,136</b>	<b>\$4,696</b>	<b>\$1,802</b>
Source: Estimated by NEI and Lynker Technologies based on information in Industrial Economics (2020) and U.S. Office of Personnel Management (2021). The levels of effort by consultation type and entity reflect the average across the low and high levels reported in Industrial Economics (2020). Wages reflect the midpoint between Step 1 and Step 10 within each GS level using the GS hourly rates, multiplied by 2.5 to account for overhead.				

The total hours presented in Table 15 reflect the level of effort for consultations that considered both the listing of the species and critical habitat. Of the total consultation costs based on level of effort and hourly wage rates, the model provided in Industrial Economics (2020) assumed that the costs to consider destruction or adverse modification of critical habitat are approximately 25 percent of the total consultation costs. Based on time spent on consultations and subsequent labor costs, average incremental administrative costs are estimated to be \$451 per



technical assist; \$1,174 per Pac-SLOPES programmatic consultation; \$2,784 per informal consultation; and \$5,931 per formal consultation (Table 16). This analysis conservatively assumes that third parties are involved in all informal and formal consultations and technical assists within the critical habitat. Third parties are typically not involved in Pac-SLOPES programmatic consultations.

**Table 16. Estimated Incremental Administrative Costs per Consultation for Activities in Areas Considered for Proposed Critical Habitat by Consultation Type and Entity.**

Consultation Type	NMFS	Federal Action Agency	Third Party	Biological Assessment Cost	Total Cost
Informal	\$775	\$997	\$513	\$500	\$2,784
Programmatic	\$471	\$453	-	\$250	\$1,174
Formal	\$1,792	\$2,064	\$875	\$1,200	\$5,931
Technical Assistance	\$188	-	\$263	-	\$451
Source: Estimated by NEI and Lynker Technologies based on information in Industrial Economics (2020) and U.S. Office of Personnel Management (2021).					

As shown in Section 4.0, the query of PIRO's section 7 consultation database yielded both informal and formal consultations. Whether past consultations for a given activity were informal, formal, programmatic, or technical assists was based on the specific nature of the activity and its effects on listed species. However, because all the activity categories described in Section 4.0 could potentially adversely affect the critical habitat of the listed coral species, to be conservative (i.e., more likely to overstate impacts than understate them), this analysis includes a high-end cost scenario that assumes all projected future activities that do not involve programmatic consultations or technical assists cannot be concluded informally because adverse effects to the critical habitat are expected. Given that these projected future activities would require formal consultations, it is assumed that a higher level of administrative effort would be required. In some cases, applicants may incur the costs of developing, under the direction of NMFS, a biological assessment to evaluate the potential effects of a proposed project on designated critical habitat. In addition, NMFS is required to prepare a biological opinion of whether the action is likely to destroy or adversely modify designated critical habitat.

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This analysis also includes a low-end cost scenario that assumes that the relative proportions of informal and formal consultations from 2022 through 2031 will be similar to the relative proportions of informal and formal consultations collected from PIRO's section 7 consultation database. As discussed in Section 5.0, this analysis relies on the location and frequency of past consultations to forecast the annual number of future actions anticipated to require consultation on critical habitat. Based on the forecast of informal consultations presented in Table 13, this analysis projects that approximately 108 informal consultations will occur from 2022 through 2031.

As shown in Table 17, under the low-end scenario, incremental administrative costs of critical habitat designation are expected to total approximately \$373.2 thousand from 2022 through 2031, with an annualized cost of roughly \$53.1 thousand (discounted at seven percent). Under the high-end scenario, incremental administrative costs are expected to total about \$612.2 thousand from 2022 through 2031, with an annualized cost of around \$87.2 thousand.

**Table 17. Low-End and High-End Estimated Incremental Administrative Costs for Activities in Areas Considered for Proposed Critical Habitat by Jurisdiction, 2022–2031 (\$2021; 7% Discount Rate).**

<b>Jurisdiction</b>	<b>Present Value Impacts (Seven Percent Discount Rate)</b>	<b>Annualized Impacts</b>
<b>Low-End</b>		
American Samoa	\$92,468	\$13,165
Guam	\$151,749	\$21,606
CNMI	\$72,244	\$10,286
NWHI	\$42,899	\$6,108
PRIA	\$13,810	\$1,966
<b>Total</b>	<b>\$373,171</b>	<b>\$53,131</b>
<b>High-End</b>		
American Samoa	\$157,396	\$22,410
Guam	\$254,666	\$36,259
CNMI	\$122,666	\$17,465
NWHI	\$50,497	\$7,190
PRIA	\$26,934	\$3,835
<b>Total</b>	<b>\$612,159</b>	<b>\$87,158</b>
Source: Estimated by NEI, Lynker Technologies, and NMFS.		

Table 18 presents the net present value of forecasted low-end incremental administrative costs by activity category and area assuming a seven percent discount rate. In-water and coastal construction has the highest incremental administrative costs, with a present value totaling approximately \$184.5 thousand over ten years. These costs account for 49 percent of the total estimated incremental administrative costs. Scientific research and monitoring accounts for an additional 25 percent of total incremental administrative costs and at least 18 percent of incremental administrative costs for all jurisdictions except PRIA.

**Table 18. Low-End Estimated Incremental Administrative Costs for Activities in Areas Considered for Proposed Critical Habitat by Jurisdiction and Activity Category, 2022–2031 (\$2021, 7% Discount Rate).**

Activity Category	American Samoa	Guam	CNMI	NWHI	PRIA	Total
In-water & Coastal Construction	\$47,091	\$103,093	\$31,557	\$1,222	\$1,542	\$184,505
Dredging and Disposal	\$4,777	\$9,471	\$4,087	–	\$122	\$18,457
Water Quality and Discharges	\$6,629	\$6,121	\$2,567	–	\$122	\$15,438
Fishery Management	\$4,694	\$868	\$3,923	–	–	\$9,485
Military Activities	\$611	–	\$198	\$611	–	\$1,420
Shipwreck and Marine Debris Removal	\$3,316	\$6,510	\$9,453	\$4,889	\$2,567	\$26,734
Scientific Research & Monitoring	\$25,351	\$21,188	\$16,635	\$20,715	\$9,457	\$93,346
Aquaculture	–	\$4,498	\$3,826	–	–	\$8,324
Protected Area Management	–	–	–	\$15,462	–	\$15,462
<b>Total</b>	<b>\$92,468</b>	<b>\$151,749</b>	<b>\$72,244</b>	<b>\$42,899</b>	<b>\$13,810</b>	<b>\$373,171</b>
Source: Estimated by NEL, Lynker Technologies, and NMFS.						

Table 19 shows the present value of forecasted high-end incremental administrative costs by activity category assuming a seven percent discount rate. The present value of high-end incremental administrative costs across all activity categories is \$612.2 thousand over ten years, with consultations associated with in-water and coastal construction activities accounting for approximately \$311.5 thousand of this total.

**Table 19. High-End Estimated Incremental Administrative Costs for Activities in in Areas Considered for Proposed Critical Habitat by Jurisdiction and Activity, 2022–2031 (\$2021, 7% Discount Rate).**

Activity Category	American Samoa	Guam	CNMI	NWHI	PRIA	Total
In-water & Coastal Construction	\$83,146	\$168,850	\$53,798	\$2,604	\$3,062	\$311,459
Dredging and Disposal	\$4,915	\$16,516	\$6,988	–	\$260	\$28,680
Water Quality and Discharges	\$13,674	\$10,403	\$5,468	–	\$260	\$29,805
Fishery Management	\$6,075	\$868	\$7,377	–	–	\$14,320
Military Activities	\$1,302	–	\$198	\$1,302	–	\$2,801
Shipwreck and Marine Debris Removal	\$6,217	\$12,174	\$13,735	\$10,414	\$5,468	\$48,008
Scientific Research & Monitoring	\$42,066	\$41,357	\$29,897	\$20,715	\$17,884	\$151,919
Aquaculture	–	\$4,498	\$5,207	–	–	\$9,705
Protected Area Management	–	–	–	\$15,462	–	\$15,462
<b>Total</b>	<b>\$157,396</b>	<b>\$254,666</b>	<b>\$122,666</b>	<b>\$50,497</b>	<b>\$26,934</b>	<b>\$612,159</b>
Source: Estimated by NEI, Lynker Technologies, and NMFS.						

## 6.2 INCREMENTAL PROJECT MODIFICATION COSTS

Once critical habitat is designated, section 7 of the ESA requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to destroy or adversely modify critical habitat. Thus, the focus of this analysis is to determine whether the designation of critical habitat would trigger project modifications specifically to avoid potential destruction or adverse modification of critical habitat. That is, we evaluate whether and where critical habitat designation may generate project modifications beyond those undertaken under the baseline, for example to avoid jeopardy to the listed coral species. Through communications with the USACE Honolulu District, and review of project modifications required for projects

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evaluated from 2005 through 2020 in the Pacific Islands Region, this analysis identified the types of project modifications that likely would be undertaken to avoid destruction or adverse modification of the listed coral species' critical habitat.

### ***Potential Incremental Project Modifications***

This section provides an overview of potential project modifications and identifies whether those project modifications would likely be incremental (i.e., would not be expected to occur absent the designation of critical habitat for the listed coral species).

As discussed in Section 3.0, one of the primary determinants of whether future section 7 impacts will be incremental impacts of critical habitat designation is whether there are critical habitat areas in which listed species are not present. However, this determinant was not applicable to this analysis. A review of the consultation history revealed that the majority of activities occurred in areas determined to be occupied by at least one of the listed coral species.

Instead, this analysis determined potential incremental project modifications based on review of project modification types and applications. The analysis focused its review on NMFS PIRO's EFH consultation history, together with permit conditions of the USACE Honolulu District, for relevant project modifications applied in areas of proposed coral critical habitat. As discussed in Section 1, the listed Indo-Pacific coral species are "fish" for purposes of EFH designation and protection. Project modifications were categorized into groups and evaluated for applicability to proposed coral critical habitat. Project modifications that possibly could be required for protection of critical habitat above what would be required to prevent jeopardy to the listed coral species were considered to be incremental.

It is important to note that project relocation could be included as a modification across all activity categories. In some cases, a proposed project will have direct impacts on some or all of the essential features of the critical habitat given the project footprint within the geographic area of the critical habitat. In such circumstances, NMFS might recommend that the project be relocated to avoid potential destruction or adverse modification of critical habitat. However, project relocation may not always be feasible, and therefore it would not be required. Moreover, the cost of project relocation would be dependent on the specific project and the circumstances of the new project location. Therefore, an estimate of the

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number of project relocations or average relocation cost or range of costs cannot be reasonably made at this time.

The potential for incremental project modifications as a result of critical habitat designation are described by activity category in the sections below.

#### *USACE-Permitted Activities*

As discussed in Section 4.1, permit conditions developed by the USACE Honolulu District include specific measures to protect corals and coral reefs. However, a review of these conditions and discussions with the USACE Honolulu District suggest that three types of potential incremental project modifications may be considered to protect the critical habitat: biological and physico-chemical conditions monitoring; restricted or assisted anchoring/mooring installation; and submarine cable anchoring. Below are the rationales for including these as types of project modifications we would consider incremental. These project modifications are associated with certain USACE-permitted activities such as in-water and coastal construction, dredging and disposal, and beach nourishment/shoreline protection.

- Biological and physico-chemical conditions monitoring: Although monitoring and performance measures have been typically implemented for project modifications involving mitigation of coral reef resources, the monitoring has not always been in-kind (e.g., for impacts to nearly 5 acres of coral reef habitat from the Kilo Wharf extension in Apra Harbor, Guam, compensatory mitigation required was out-of-kind, meaning that restoration of an offsite and non-coral habitat was decided for the project. Performance standards for the restoration project were not tied to coral health). Future in-kind monitoring of coral reef habitat, even absent the listed coral species, is expected.
- Restricted or assisted anchoring/mooring installation: In areas where surveys do not indicate the presence of any of the listed coral species, these types of project modifications may be incremental. For instance, Pac-SLOPES special conditions require anchoring locations and moorings be designed to avoid impacts to live corals to the extent practicable. Although the listing of the corals would require avoidance, in some instances the existence of critical habitat may result in the need for additional assisted anchoring/mooring buoy use or placement. This measure could thus be incremental if the listed corals are not present in the footprint of proposed actions.

- Submarine cable anchoring: Clamps and articulated pipe are often required to secure submarine cable installations out to the 20-m contour. Although the listing of the corals would require avoidance, in some instances the existence of critical habitat may result in the need for additional assisted submarine cable anchoring. This measure could thus be incremental if the listed corals are not present in the footprint of proposed actions.

As shown in Table 14, approximately 56 percent of the forecasted section 7 consultations are related to in-water and coastal construction and dredging and disposal. However, not all future projects involving these activities would incur incremental project modification costs. Section 4.1 lists consultations for in-water and coastal construction activities observed in NMFS PIRO's section 7 consultation database were spread across a large number of construction subcategories. The incremental project modifications described in the three rationales above would not necessarily be applicable to all subcategories of in-water and coastal construction activities. Nor would they necessarily be applicable to other categories of USACE-permitted activities such as dredging and disposal. Based on a review of the consultation history, the percentage of future USACE-permitted activities likely to be subject to incremental project modifications was estimated (Table 20).

The percentage of future beach nourishment/shoreline protection projects subject to project modifications was not estimated because, as discussed in Section 5.0, the number of section 7 consultations for this activity category were not forecasted due to the absence of such projects in NMFS PIRO's section 7 consultation database from 2005 through 2020.

**Table 20. Estimated Percentage of Future USACE-Permitted Activities Subject to Potential Incremental Project Modifications in Areas Considered for Proposed Critical Habitat by Activity Category and Project Modification Type.**

Project Modification Type	In-water and Coastal Construction	Dredging and Disposal
Biological and physico-chemical conditions monitoring	100%	100%
Restricted or assisted anchoring/mooring installation	39%	37%
Submarine cable anchoring	5%	0%
Source: Estimated by NEI and Lynker Technologies.		



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### *Water Quality and Discharges*

NMFS indicates that the on-going process of reviewing NPDES permits and reviewing and revising water quality standards in American Samoa, Guam, and CNMI would consider what discharges and water quality criteria would protect the listed coral species and other ESA-listed species. Accordingly, the effect of water quality and discharges is a consideration even absent critical habitat designation for the coral species.

In addition, EPA notes that critical habitat designation would not necessarily affect its review of water quality standards. Rather, territorial and commonwealth government agencies would consider habitat designation during their triennial reviews to consider whether water quality standards should be revised to protect designated habitat for listed corals (Roser 2015). The types of potential project modifications are unknown due to the unknown scope and extent to which the standards might need to be modified. Therefore, no incremental project modifications for this activity type were considered.

### *Fishery Management*

Although WPRFMC and NMFS recognize that management measures such as restricting annual catch limits in critical habitat areas are possible, near-term changes to fisheries management to accommodate critical habitat designation for the listed Indo-Pacific coral species appear unlikely because of a lack of data that links any particular federally-managed fishery to disturbance or destruction of critical habitat. As discussed in Section 4.4, WPRFMC has determined that current management measures to protect EFH utilized by the listed Indo-Pacific corals and other coral reef species are adequate. However, WPRFMC has indicated that, should future research demonstrate a need, it will take action to protect habitat necessary to maintain sustainable and productive fisheries in its region (Western Pacific Regional Fishery Management Council 2001; Western Pacific Regional Fishery Management Council 2009d; 2009c; 2009a; 2009b).

This analysis recognizes that it is possible that management of fisheries occurring in federal waters around American Samoa, Guam, CNMI, and the PRIA could change as a result of critical habitat designation. However, potential changes in the management regime are not described because the implementation of fishery management regulations that would limit the potential disturbance or destruction of critical habitat of the listed Indo-Pacific corals from 2022 through 2031 is highly speculative.

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### *Military Activities*

The establishment of mitigation zones by the 2015 biological opinion on the U.S. Navy's training and testing activities in Guam and CNMI provide some baseline protection for critical habitat. However, information is lacking regarding the likelihood, frequency, and location of additional project modification recommendations specifically addressing potential destruction or adverse modification of critical habitat by military training and testing activities. Consequently, this analysis does not forecast incremental project modifications for these military activities. We acknowledge that activities in this category could occur in the future, and could be affected by coral critical habitat, thereby representing a source of potential under-estimation of economic impacts (see Table 26, row 1).

### *Shipwreck and Marine Debris Removal*

No project modifications were identified that would be required to reduce the impact of a ship removal or marine debris removal project on the essential features of the critical habitat. NMFS would recommend the same types of project modifications to avoid or minimize destruction or adverse modification of the critical habitat as it would to avoid or minimize adverse impacts to the listed corals.

### *Scientific Research & Monitoring*

Future scientific research and monitoring activities are unlikely to adversely modify the critical habitat. Therefore, critical habitat designation is not expected to generate any modifications in these activities.

### *Protected Area Management*

As discussed in Section 4.9, federal action agencies managing marine protected areas in American Samoa, Guam, CNMI, and the PRIA have generally determined that their management plans for these areas will not affect listed species; therefore, they have not been required to consult with NMFS. While federal agencies consult with NMFS on protected area management activities occurring within French Frigate Shoals, all such activities historically have been handled under the PMNM programmatic and have been determined not likely to adversely affect listed corals and other protected species. Thus, critical habitat designation is not expected to generate any modifications in the management of marine protected areas.

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### *Aquaculture*

As discussed in Section 5.1, the query of NMFS PIRO's section 7 consultation database yielded a limited number of consultations on aquaculture activities. The focus of these activities has been on coral propagation and restoration, and they are unlikely to adversely modify the critical habitat. Therefore, critical habitat designation is not expected to generate any modifications in these activities.

Section 5.1 noted that no consultations on commercial aquaculture activities were identified in NMFS PIRO's section 7 consultation database during the 2005-2020 period, but the governments of American Samoa, Guam, and CNMI have a long record of promoting aquaculture as an emerging industry in their coastal waters. Information is insufficient to identify potential project modifications to commercial aquaculture activities. Project modifications that may be recommended to ensure that commercial aquaculture activities avoid destruction or adverse modification of critical habitat for the listed coral species will depend on the specific nature and location of the aquaculture activities. In addition, NMFS may recommend project modifications for aquaculture projects to avoid jeopardy to the coral species, regardless of the critical habitat designation.

### *Cost of Project Modifications per Project*

Earlier in Section 6.2, we described how three project modifications could be considered incremental in certain circumstances. These project modifications are associated primarily with categories of activities permitted by the USACE, including in-water and coastal construction and dredging and disposal. As shown in Table 21, the estimated per project costs of these project modifications may vary significantly depending on the nature, geographic scope, and timeframe of the project. These costs are included within the high-end scenario of incremental costs of critical habitat designation described in Section 6.0. The low-end scenario assumes no incremental project modification costs due to critical habitat designation.

**Table 21. Estimated Per Project Cost of Potential Incremental Project Modifications in Areas Considered for Proposed Critical Habitat (2021\$).**

Potential Project Modification	Cost Description	Range of Per Project Costs
Biological and physico-chemical conditions monitoring	Per-day costs of monitoring range from an average of \$1,400 per day for small projects, such as inshore/nearshore projects that require only one person and no diving to monitor turbidity, water quality, and protected species, to an average of \$7,800 per day for a larger (five person minimum) dive team to conduct more extensive monitoring. <sup>a,b</sup> Remote or offshore sites, common in the U.S. Pacific Islands region, may require \$24,000 per day for a 12-person offshore scientific dive team plus live-aboard diving support vessel. <sup>c</sup> For purposes of cost estimation, projects are assumed to last an average of 5 days. <sup>d</sup>	\$7,000 – \$39,000 for small or local projects; \$120,000 for large or remote project sites
Restricted or assisted anchoring/mooring installation	Determining a cost estimate for this project modification is difficult because assisted anchoring during coastal construction projects is often included in the overall day rates of contractors. The cost of mooring installations was used, as it is more feasible to estimate on a per-installation basis. Cost estimates ranged from \$1,900 to \$11,000 per installation, depending on the type of mooring and the substrate in which it is installed. <sup>e</sup> Because these cost estimates consider contractor rates for only full days rather than partial days, they are likely an overestimation of the cost associated with this project modification.	\$1,900 – \$11,000
Submarine cable anchoring	An estimate of \$1,300 per anchor was used. <sup>f</sup> 6-10 installations per day were assumed, and a total of eight days to cross a reef area. <sup>g</sup> Total costs will vary based on size of reef area and number of anchors required.	\$65,000 – \$110,000
<p>Source: Estimated by NEI and Lynker Technologies based on the following:</p> <p><sup>a</sup> Cost estimate based on an average of quotes provided by environmental consulting firms.</p> <p><sup>b</sup> A 1-person boat crew can be safely deployed only in inshore waters or protected nearshore waters.</p>		

Potential Project Modification	Cost Description	Range of Per Project Costs
<sup>c</sup> Rates based on 2015 Tetra Tech contract for Port of Miami Expansion, modified for per-day diving vessel support in Oahu. Assumes field-based conditions monitoring with lab-based follow-up for select parameters. <sup>d</sup> Staffing in the U.S. Pacific Islands region cannot always be completed with local personnel, and travel is often required for certain skillsets. Rates do not include travel, but this can be approximated as a one-time cost per person, per project. <sup>e</sup> NMFS personnel and Broward County Beach and Marine Resources Section staff. <sup>f</sup> Unit cost obtained from NMFS (2008). This cost estimate was verified as reasonable through email communication with Tetra Tech. Actual cost may vary depending on design and installation requirements of the unit. <sup>g</sup> The analysis assumed that simple anchors drilled 2 ft. into rock and set in concrete can be completed at a rate of approximately 6-10 per day in depths of 0-30 meters using a 5-person diving team.		

### *Estimated Incremental Project Modification Costs*

As discussed above, of the activities projected to occur in the areas of critical habitat, most categories of activities are unlikely to be subject to incremental project modifications due to existing baseline regulatory protections. These activity categories include water quality and discharges, fishery management, military activities, shipwreck and marine debris removal, scientific research and monitoring, protected area management, and aquaculture. The remaining activities may be subject to incremental project modifications as a result of the designation of critical habitat for the listed coral species. As described above, these activities include certain USACE-permitted activities such as in-water and coastal construction, dredging and disposal, and beach nourishment/shoreline protection.

For all categories of future activities that may affect the critical habitat, it is too speculative to predict whether those adverse effects will rise to the level of destruction or adverse modification—that will depend on such factors as the size and specific location of the project. Thus, we cannot at this time state with certainty whether project modifications associated with predicted adverse effects would constitute RPAs. Given the uncertainty with respect to the likelihood that consultations will be subject to additional project modifications due to the presence of critical habitat, this analysis estimates a range of incremental project modification costs.

The high-end scenario assumes incremental project modification costs for future projects related to in-water and coastal construction and dredging and disposal. The incremental project modifications are described above, and cost information is presented in Table 21. While per project modification costs would vary significantly

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depending on the location and nature of the project, this analysis used the maximum cost estimates to calculate total incremental costs in order to be consistent with the conservative approach of the high-end scenario. As shown in Table 21, the maximum per project modification costs were \$120,000 for biological and physico-chemical conditions monitoring; \$11,000 for restricted or assisted anchoring/mooring installation; and \$110,000 for submarine cable anchoring. In addition, this analysis assumed that these incremental costs would be incurred by their respective categories of activities regardless of the area of critical habitat in which the activities occurred.

Under the low-end scenario, incremental project modification costs are zero, and the incremental effects of critical habitat designation are limited to additional administrative effort to consider effects on critical habitat as part of section 7 consultation.

Table 22 presents the high-end incremental project modification costs by jurisdiction that could occur as a result of the critical habitat designation for future projects related to in-water and coastal construction and dredging and disposal. Estimated high-end incremental project modification costs total about \$6.2 million, discounted at seven percent, from 2022 through 2031. Approximately 53 percent of the estimated high-end project modification costs would occur in Guam.

Table 23 presents the total incremental project modification results for in-water and coastal construction and dredging and disposal. Approximately 91 percent of the estimated high-end project modification costs result from these activities.

**Table 22. High-End Estimated Incremental Project Modification Costs for In-water & Coastal Construction and Dredging & Disposal Activities in Areas Considered for Proposed Critical Habitat Areas by Jurisdiction, 2022–2031 (\$2021, 7% Discount Rate)**

Jurisdiction	Present Value Impacts (Seven Percent Discount Rate)	Annualized Impacts
American Samoa	\$1,773,584	\$252,519
Guam	\$3,273,363	\$466,053
CNMI	\$1,031,661	\$146,885
NWHI	\$56,974	\$8,112
PRIA	\$68,118	\$9,699
Total	<b>\$6,203,701</b>	<b>\$883,267</b>
Source: Estimated by NEI, Lynker Technologies, and NMFS.		

**Table 23. Total High-End Estimated Incremental Project Modification Costs for In-water & Coastal Construction and Dredging & Disposal Activities in Areas Considered for Proposed Critical Habitat by Jurisdiction and Activity Category, 2022–2031 (\$2021, 7% Discount Rate).**

Activity Category	American Samoa	Guam	CNMI	NWHI	PRIA	Total
In-water & Coastal Construction	\$1,686,443	\$2,968,367	\$917,288	\$56,974	\$62,672	\$5,691,744
Dredging and Disposal	\$87,142	\$304,996	\$114,373	–	\$5,446	\$511,957
Total	<b>\$1,773,584</b>	<b>\$3,273,363</b>	<b>\$1,031,661</b>	<b>\$56,974</b>	<b>\$68,118</b>	<b>\$6,203,701</b>
Source: Estimated by NEI, Lynker Technologies, and NMFS.						

### *Caveats and Uncertainties*

There are several uncertainties associated with the identification of incremental project modifications and their average costs. As discussed earlier, data are not available to determine the frequency or locations of future activities subject to consultation. The forecast of activity distribution and frequency is based on historical patterns of section 7 consultation. To the extent that more (or fewer) activities occur than anticipated, our analysis may underestimate (or overestimate)



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costs of incremental project modifications. It is also worth noting that this analysis applies maximum per project costs of anticipated incremental project modifications, which may overstate impacts, depending on the project. NMFS will review each project or activity at the time of consultation to determine whether additional project modifications may be needed to avoid destruction or adverse modification of critical habitat.

The uncertainties affecting incremental project modifications and estimated incremental impacts of the critical habitat designation are summarized in Table 27. In general, these uncertainties are not expected to significantly impact the results presented in Section 6.3.

### **6.3 TOTAL INCREMENTAL COSTS**

The low-end estimation of total incremental costs (administrative and project management) that could occur as a result of critical habitat designation assumes no incremental project modifications and, further, that trends in the frequency of informal consultations from 2022 through 2031 will resemble those from 2005 through 2020. The high-end scenario assumes that there will be incremental project modification costs for future projects related to in-water and coastal construction and dredging and disposal and that all projected future actions that do not involve programmatic consultations or technical assists will require formal consultations.

Low-end and high-end total incremental costs by jurisdiction are presented in Table 24. Total incremental costs resulting from the listed corals' critical habitat are estimated to range from just under \$373.2 thousand to about \$6.8 million over ten years (discounted at seven percent), with an annualized cost of \$53.1 thousand to \$970.4 thousand. Nearly 95 percent of total high-end incremental costs result from project modifications assumed to be required in the high-end impact scenario. As illustrated in Table 24, the jurisdiction with the greatest costs is Guam, due to the high number of expected section 7 consultations in this area. Total high-end incremental costs for Guam alone are estimated at \$3.5 million over ten years (discounted at seven percent), which translates to an annualized cost of \$502.3 thousand.



**Table 24. Low-End and High-End Estimated Total Incremental Costs (Administrative and Project Modification) for Activities in Areas Considered for Proposed Critical Habitat by Jurisdiction, 2022–2031 (\$2021, 7% Discount Rate)**

Jurisdiction <sup>a</sup>	Present Value Impacts	Annualized Impacts
<b>Low-End</b>		
American Samoa	\$92,468	\$13,165
Guam	\$151,749	\$21,606
CNMI	\$72,244	\$10,286
NWHI	\$42,899	\$6,108
PRIA	\$13,810	\$1,966
Total	<b>\$373,171</b>	<b>\$53,131</b>
<b>High-End</b>		
American Samoa	\$1,930,980	\$274,928
Guam	\$3,528,029	\$502,312
CNMI	\$1,154,328	\$164,350
NWHI	\$107,471	\$15,302
PRIA	\$95,052	\$13,533
Total	<b>\$6,815,860</b>	<b>\$970,425</b>
<sup>a</sup> Beach Nourishment/Shoreline Protection not included because there are no consultations on this activity in our 2005-2020 section 7 database, thus we are unable to estimate future economic impacts due to coral critical habitat. However, if beach nourishment/shoreline protection activities are proposed in the future, then could be affected by coral critical habitat.		
Source: Estimated by NEI, Lynker Technologies, and NMFS.		

Table 25 and Table 26 show the present value of forecasted total low and high-end incremental costs by activity category and jurisdiction assuming a discount rate of seven percent. The activity with the highest costs is in-water and coastal construction, ranging from \$184.5 thousand to \$6.0 million over ten years (discounted at seven percent). At the high-end, in-water and coastal construction represents approximately 88 percent of total incremental costs.

**Table 25. Low-End Estimated Total Incremental Costs (Administrative and Project Modification) for Activities in Areas Considered for Proposed Critical Habitat by Jurisdiction and Activity Category, 2022–2031 (\$2021, 7% Discount Rate)**

Activity Category <sup>a</sup>	American Samoa	Guam	CNMI	NWHI	PRIA	Total
In-water & Coastal Construction	\$47,091	\$103,093	\$31,557	\$1,222	\$1,542	\$184,505
Dredging and Disposal	\$4,777	\$9,471	\$4,087	–	\$122	\$18,457
Water Quality and Discharges	\$6,629	\$6,121	\$2,567	–	\$122	\$15,438
Fishery Management	\$4,694	\$868	\$3,923	–	–	\$9,485
Military Activities	\$611	–	\$198	\$611	–	\$1,420
Shipwreck and Marine Debris Removal	\$3,316	\$6,510	\$9,453	\$4,889	\$2,567	\$26,734
Scientific Research & Monitoring	\$25,351	\$21,188	\$16,635	\$20,715	\$9,457	\$93,346
Aquaculture	–	\$4,498	\$3,826	–	–	\$8,324
Protected Area Management	–	–	–	–	\$15,462	\$15,462
<b>Total</b>	<b>\$92,468</b>	<b>\$151,749</b>	<b>\$72,244</b>	<b>\$42,899</b>	<b>\$13,810</b>	<b>\$373,171</b>
<sup>a</sup> Beach Nourishment/Shoreline Protection not included because there are no consultations on this activity in our 2005-2020 section 7 database, thus we are unable to estimate future economic impacts due to coral critical habitat. However, if beach nourishment/shoreline protection activities are proposed in the future, then could be affected by coral critical habitat.						
Source: Estimated by NEI, Lynker Technologies, and NMFS.						

**Table 26. High-End Estimated Total Incremental Costs (Administrative and Project Modification) for Activities in Areas Considered for Proposed Critical Habitat by Jurisdiction and Activity Category, 2022–2031 (\$2021, 7% Discount Rate)**

Activity Category	American Samoa	Guam	CNMI	PRIA	NWHI	Total
In-water & Coastal Construction	\$1,769,589	\$3,137,217	\$971,086	\$59,578	\$65,734	\$6,003,203
Dredging and Disposal	\$92,057	\$321,512	\$121,361	–	\$5,707	\$540,637
Water Quality and Discharges	\$13,674	\$10,403	\$5,468	–	\$260	\$29,805
Fishery Management	\$6,075	\$868	\$7,377	–	–	\$14,320
Military Activities	\$1,302	–	\$198	\$1,302	–	\$2,801
Shipwreck and Marine Debris Removal	\$6,217	\$12,174	\$13,735	\$10,414	\$5,468	\$48,008
Scientific Research & Monitoring	\$42,066	\$41,357	\$29,897	\$20,715	\$17,884	\$151,919
Aquaculture	–	\$4,498	\$5,207	–	–	\$9,705
Protected Area Management	–	–	–	\$15,462	–	\$15,462
<b>Total</b>	<b>\$1,930,980</b>	<b>\$3,528,029</b>	<b>\$1,154,328</b>	<b>\$107,471</b>	<b>\$95,052</b>	<b>\$6,815,860</b>
Source: Estimated by NEI, Lynker Technologies, and NMFS.						

#### 6.4 INDIRECT COSTS

Project proponents may incur indirect costs of critical habitat designation, including project delays attributable to increased duration of project reviews. Another potential indirect cost of critical habitat designation relates to the Guam’s and CNMI’s ability to compete with other Pacific islands for business, particularly given the highly competitive nature of the international tourism industry. As described in Section 2.2, the private sector economies of Guam and CNMI are heavily dependent on tourism. Investors may shy away from conducting business in the Territory and Commonwealth because of the regulatory burdens imposed by critical habitat

designation; for example, hotels may be discouraged from locating in Guam and CNMI due to the length of time that may be required to add an amenity such as a dock. However, forecasting the costs associated with the regulatory uncertainty and potential project delays resulting from the designation of critical habitat for the listed coral species is too speculative to be quantified in this analysis. Moreover, for most projects, delays attributable to the additional time to consider the listed corals' critical habitat as part of future section 7 consultation are expected to be minor, given that most projects would already have to consider jeopardy concerns with respect to the listed coral species and other listed species.

## 6.5 CAVEATS AND UNCERTAINTIES

Several uncertainties underlie the calculation of incremental costs that could result from the designation of critical habitat for the listed coral species. These uncertainties, and their particular significance with respect to the results of this analysis, are summarized in Table 27. In general, these uncertainties are not expected to significantly impact the results of the analysis.

**Table 27. Summary of Uncertainties**

Assumption/Source of Uncertainty	Direction of Potential Bias	Likely Significance with Respect to Estimated Impacts
This analysis relies on patterns of section 7 consultations from 2005 through 2020 to forecast future rates and locations of consultation activity. The analysis assumes that past consultation rates provide a good indication of future activity levels and distribution of activities.	Unknown. May underestimate or overestimate incremental impacts.	Data are not available to determine whether the rates or locations of activities subject to consultation are likely to change over time. To the extent that activities increase from 2022 through 2031, our analysis may underestimate or overestimate incremental costs.
The analysis assumes no new consultations will be triggered by the designation of critical habitat for the listed coral species.	May underestimate incremental impacts.	Likely minor. Consultations which cover activities occurring in areas where listed species are not present are unlikely. However, to the extent that any future section 7 consultations occur solely due to critical habitat designation, incremental impacts will be underestimated.

Assumption/Source of Uncertainty	Direction of Potential Bias	Likely Significance with Respect to Estimated Impacts
This analysis assumes that inclusion of a critical habitat destruction/adverse modification analysis in future consultations, in addition to the jeopardy analysis, will always result in additional administrative cost and effort.	May overestimate costs.	Likely minor. While the critical habitat rule may provide additional information that assists in the analysis of effects under both the jeopardy and the destruction/adverse modification standard, each consultation will still need to include both jeopardy and critical habitat destruction/adverse modification analyses. To the extent that new information in the critical habitat rule provides justification for effects analysis, administrative costs may be overstated.
It is uncertain if critical habitat designation for the listed coral species would result in all future consultations being formal.	Range of results captures this uncertainty.	To address this uncertainty, the analysis presents a range of incremental administrative costs. At the low end, assuming past informal consultation rates provide a good indication of future rates may understate impacts. At the high end, assuming all future consultations will be formal may overstate impacts.
It is uncertain if baseline protections (e.g., typical USACE permit conditions or project modifications recommended due to presence of listed coral species) provide sufficient protection to avoid destruction or adverse modification of critical habitat or are consistently applied to all projects within critical habitat.	Range of results captures this uncertainty.	To address this uncertainty, the analysis presents a range of incremental project modification costs. At the low end, assuming none of the projects require additional project modifications may understate impacts. At the high end, assuming baseline protections are not sufficient and additional project modifications are required for certain categories of activities may overstate impacts.
This analysis does not quantify potential indirect impacts associated with time delays.	May result in an underestimate of costs.	Likely minor. For new projects, action agencies will be required to consult with NMFS due to the presence of the listed coral species or other listed species or critical habitat. Therefore, the indirect incremental impact associated with time delay on new projects would be limited to any costs incurred specifically during the additional time necessary to complete the analysis of destruction/adverse modification of the critical habitat. Time delays would be expected to remain largely unchanged regardless of the critical habitat designation. It is also important to note that the ESA requires a biological opinion be submitted to the federal action agency within 135 days of initiating formal consultation. This requirement may help reduce time delays. At the high end, this analysis assumed that all future consultations will be formal.

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## 7.0 ECONOMIC BENEFITS

Those physical and biological features essential to the conservation of the listed coral species are also essential to the conservation of most other coral reef species in American Samoa, Guam, CNMI, NWHI, and the PRIA. Thus, implementation of project modifications undertaken to avoid destruction and adverse modification of the critical habitat of the listed corals would provide better protection of corals and coral reef ecosystems as a whole in the designated critical habitat areas. This section provides a brief summary of the reported economic benefits of coral reef ecosystems in the critical habitat areas and discusses the potential contribution of critical habitat designation to the realization of those benefits.

### 7.1 OVERVIEW OF ECONOMIC BENEFITS OF CORAL REEF ECOSYSTEMS

Commensurate with the analysis of the costs of critical habitat designation, this evaluation of the benefits of the designation appropriately focuses on the *incremental* benefits specifically generated by implementation of the critical habitat designation. The primary intended benefit of critical habitat is to support the conservation of threatened and endangered species, such as the listed Indo-Pacific corals.<sup>4</sup> That is, in protecting the essential features that are, by definition, essential to the conservation of the species, critical habitat directly contributes to the conservation and recovery of the species. Thus, attempts to develop monetary estimates of the benefits of this critical habitat designation focus primarily on the public's willingness to pay to achieve the conservation benefits to the coral species resulting from this designation. In the context of welfare economics, value is most frequently measured in terms of people's "willingness-to-pay" (WTP) for a good or service, where WTP is the maximum amount (typically in monetary terms) that an individual would be willing to pay rather than do without a particular benefit. OMB recognizes WTP as the appropriate measure for valuing costs and benefits in the context of regulatory analysis (U.S. Office of Management and Budget 2003).

A number of published studies estimate the value the public places on protecting coral species. For example, Table 27 of NMFS' Section 4(b)(2) report for elkhorn and staghorn coral critical habitat in the Caribbean summarized economic valuation

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<sup>4</sup> The term "conservation" means "the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary" (16 U.S.C. 1532).

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literature related to coral reefs (National Marine Fisheries Service 2008). More recently, the NOAA Coral Reef Conservation Program summarized existing economic valuation studies focused on values of U.S. coral reefs in a 2013 literature review and synthesis (Brander and van Beukering 2013). These economic valuation studies provide insight into why healthy coral reefs benefit people. In particular, coral reefs are associated with the following ecosystem service benefits:

- **Provide essential habitat and nursery functions for recreationally and commercially valuable fish species:** Reefs in the critical habitat areas support valuable fish and shellfish populations. Despite dramatic changes in marine resources and ecosystems, human populations, and food sources, the people of American Samoa, Guam, and CNMI continue to depend on fishing and locally caught seafood to earn income, meet subsistence needs, and reinforce and perpetuate cultural traditions (Allen and Bartram 2008; Levine and Allen 2009; Allen and Amesbury 2012).
- **Increased quality or quantity of reef-related recreational opportunities:** Reefs provide sources of enjoyment for residents and tourists, for example, diving and snorkeling. As discussed in Section 2.2, tourism-related sectors are key sources of income and employment in Guam and CNMI.
- **Shoreline protection:** Reefs help protect both natural and developed shoreline from wave action, thereby reducing beach erosion and flood risk (Reguero et al. 2021).
- **Education and Research:** Coral reefs provide opportunities to gain knowledge about the functioning of marine ecosystems. For example, substantial funds have been spent monitoring and researching Guam's and CNMI's reefs (van Beukering et al. 2006; van Beukering et al. 2007).
- **Amenity values:** The presence a coral reef can have a positive effect on home prices (Brander and van Beukering 2013).

A host of methods are available to estimate dollar measures of the value of these ecosystem services. Drawing on the results of various studies that quantified the economic value of ecosystem services, the NOAA Coral Reef Conservation Program estimated the mean annual values for various ecosystem services for coral reefs in American Samoa, Guam, and CNMI on a per hectare basis (Table 28). Based on these data and the coral reef area in each jurisdiction (shown in hectares/Ha in Table 28),

the estimated total coral reef value in 2021 dollars is \$13.4 million per year in American Samoa, \$165.0 million per year in Guam, and \$60.4 million per year in CNMI. The magnitude of these value estimates supports the conclusion that healthy coral reefs contribute to people's well-being.

**Table 28. Mean Annual Values per Hectare (\$/Ha) for Selected Ecosystem Services from Coral Reefs in American Samoa, Guam, and CNMI (2021\$)<sup>a</sup>**

Ecosystem Service	American Samoa (22,220 Ha)	Guam (7,159 Ha)	CNMI (6,568 Ha)
Fishing	\$24	\$768	\$259
Diving, Snorkeling, Other	\$3	\$18,369	\$4,982
Coastal Protection	\$28	\$1,630	\$1,666
Education and Research	-	\$389	\$1,666
Amenity	-	\$1,864	\$622
Non-Use <sup>b</sup>	\$550	-	-

Sources: NOAA Coral Reef Conservation Program (2013), Spurgeon et al. (2004), Van Beukering et al. (2007).

<sup>a</sup> Values adjusted to 2021 dollars using GDP deflators obtained from Federal Reserve Bank of St. Louis (2021).

<sup>b</sup> Local non-use values are associated with traditional and social customs related to the reefs. NOAA Coral Reef Conservation Program (2013) acknowledges the high uncertainty and methodological challenges associated with estimating non-use values for environmental resources.

## 7.2 BENEFITS OF CRITICAL HABITAT DESIGNATION

By furthering the conservation of the listed coral species, critical habitat designation would likely contribute to the realization of the above types of coral reef ecosystem benefits across the critical habitat areas. Taylor et al. (2005) found that listed species with designated critical habitat are more than twice as likely to move toward recovery than species without designated critical habitat. However, determining the incremental effect of critical habitat on coral species conservation and recovery is complicated. Such an evaluation would require the ability to isolate and quantify the effect of the designated critical habitat separately from all other ongoing or planned conservation efforts for these coral species in particular, and coral reef ecosystems in the critical habitat areas in general. A major limitation with respect to predicting the incremental effect of the designation on the conservation and recovery of the species is the uncertainty regarding whether and where the designation may generate changes in the way projects are managed (i.e., project modifications) to avoid destruction or adverse modification of critical habitat. As described in previous sections of this analysis, in most areas, critical habitat designation is not expected to change how a project or activity is implemented, as the listing status of the listed



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coral species and other baseline protections already affords these areas significant protections.

In some instances, however, NMFS may determine that a project or activity may adversely modify critical habitat and recommend additional conservation beyond what would be recommended to avoid jeopardy or take of the species. While consultations considering effects of projects and activities on critical habitat are anticipated to occur across all of the areas being considered for critical habitat designation, Section 6.0 explains that some of these consultations may potentially result in recommendations for additional project modifications. Specifically, certain USACE-permitted activities, including in-water and coastal construction and dredging and disposal, may be subject to additional project modification recommendations explicitly to avoid destruction or adverse modification of critical habitat. Given that these activities account for the majority of expected future consultations, designation of critical habitat for the listed coral species may contribute to the realization of coral reef related ecosystem services across the critical habitat areas. However, this contribution cannot be assessed given the uncertainty that these incremental project modifications would be required or, if they are required, what their benefit to coral protection and recovery would be.

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**APPENDIX C(1) – INCREMENTAL COST SENSITIVITY RESULTS**

**Table 29. Low-End and High-End Estimated Incremental Administrative Costs for Activities in Areas Considered for Final Critical Habitat by Jurisdiction, 2022–2031 (\$2021, 3% Discount Rate)**

<b>Jurisdiction</b>	<b>Present Value Impacts (Three Percent Discount Rate)</b>	<b>Annualized Impacts</b>
<b>Low-End</b>		
American Samoa	\$112,303	\$13,165
Guam	\$184,301	\$21,606
CNMI	\$87,741	\$10,286
NWHI	\$52,101	\$6,108
PRIA	\$16,773	\$1,966
<b>Total</b>	<b>\$453,219</b>	<b>\$53,131</b>
<b>High-End</b>		
American Samoa	\$191,158	\$22,410
Guam	\$309,295	\$36,259
CNMI	\$148,979	\$17,465
NWHI	\$61,329	\$7,190
PRIA	\$32,712	\$3,835
<b>Total</b>	<b>\$743,473</b>	<b>\$87,158</b>
Source: Estimated by NEL, Lynker Technologies, and NMFS.		

**Table 30. Low-End Estimated Incremental Administrative Costs for Activities in Areas Considered for Final Critical Habitat by Jurisdiction and Activity Category, 2022–2031 (\$2021, 3% Discount Rate)**

Activity Category	American Samoa	Guam	CNMI	NWHI	PRIA	Total
In-water & Coastal Construction	\$57,192	\$125,208	\$38,326	\$1,484	\$1,873	\$224,083
Dredging and Disposal	\$5,802	\$11,503	\$4,963	–	\$148	\$22,416
Water Quality and Discharges	\$8,050	\$7,434	\$3,117	–	\$148	\$18,749
Fishery Management	\$5,700	\$1,054	\$4,765	–	–	\$11,519
Military Activities	\$742	–	\$240	\$742	–	\$1,725
Shipwreck and Marine Debris Removal	\$4,028	\$7,907	\$11,480	\$5,937	\$3,117	\$32,469
Scientific Research & Monitoring	\$30,788	\$25,733	\$20,203	\$25,159	\$11,486	\$113,369
Aquaculture	–	\$5,463	\$4,646	–	–	\$10,109
Protected Area Management	–	–	–	\$18,779	–	\$18,779
<b>Total</b>	<b>\$112,303</b>	<b>\$184,301</b>	<b>\$87,741</b>	<b>\$52,101</b>	<b>\$16,773</b>	<b>\$453,219</b>
Source: Estimated by NEI, Lynker Technologies, and NMFS.						

**Table 31. High-End Estimated Incremental Administrative Costs for Activities in in Areas Considered for Final Critical Habitat by Jurisdiction and Activity, 2022-2031 (\$2021, 3% Discount Rate)**

Activity Category	American Samoa	Guam	CNMI	NWHI	PRIA	Total
In-water & Coastal Construction	\$100,982	\$205,069	\$65,338	\$3,162	\$3,718	\$378,270
Dredging and Disposal	\$5,970	\$20,059	\$8,487	-	\$316	\$34,832
Water Quality and Discharges	\$16,607	\$12,635	\$6,640	-	\$316	\$36,198
Fishery Management	\$7,378	\$1,054	\$8,959	-	-	\$17,391
Military Activities	\$1,581	-	\$240	\$1,581	-	\$3,402
Shipwreck and Marine Debris Removal	\$7,551	\$14,785	\$16,682	\$12,648	\$6,640	\$58,307
Scientific Research & Monitoring	\$51,089	\$50,229	\$36,310	\$25,159	\$21,720	\$184,507
Aquaculture	-	\$5,463	\$6,324	-	-	\$11,787
Protected Area Management	-	-	-	\$18,779	-	\$18,779
<b>Total</b>	<b>\$191,158</b>	<b>\$309,295</b>	<b>\$148,979</b>	<b>\$61,329</b>	<b>\$32,712</b>	<b>\$743,473</b>

**Table 32. High-End Estimated Incremental Project Modification Costs for Activities in Areas Considered for Final Critical Habitat Areas by Jurisdiction, 2022–2031 (\$2021, 3% Discount Rate)**

Jurisdiction	Present Value Impacts (Seven Percent Discount Rate)	Annualized Impacts
American Samoa	\$2,154,034	\$252,519
Guam	\$3,975,528	\$466,053
CNMI	\$1,252,962	\$146,885
NWHI	\$69,196	\$8,112
PRIA	\$82,730	\$9,699
Total	<b>\$7,534,450</b>	<b>\$883,267</b>
Source: Estimated by NEI, Lynker Technologies, and NMFS.		

**Table 33. High-End Estimated Incremental Project Modification Costs for Activities in Areas Considered for Final Critical Habitat by Jurisdiction and Activity Category, 2022–2031 (\$2021, 3% Discount Rate)**

Activity Category	American Samoa	Guam	CNMI	NWHI	PRIA	Total
In-water & Coastal Construction	\$2,048,200	\$3,605,108	\$1,114,055	\$69,196	\$76,116	\$6,912,674
Dredging and Disposal	\$105,834	\$370,420	\$138,907	–	\$6,615	\$621,776
Total	<b>\$2,154,034</b>	<b>\$3,975,528</b>	<b>\$1,252,962</b>	<b>\$69,196</b>	<b>\$82,730</b>	<b>\$7,534,450</b>
Source: Estimated by NEI, Lynker Technologies, and NMFS.						

**Table 34. Low-End and High-End Estimated Total Incremental Costs (Administrative and Project Modification) for Activities in Areas Considered for Final Critical Habitat by Jurisdiction, 2022–2031 (\$2021, 3% Discount Rate)**

Jurisdiction	Present Value Impacts	Annualized Impacts
<b>Low-End</b>		
American Samoa	\$112,303	\$13,165
Guam	\$184,301	\$21,606
CNMI	\$87,741	\$10,286
NWHI	\$52,101	\$6,108
PRIA	\$16,773	\$1,966
Total	<b>\$453,219</b>	<b>\$53,131</b>
<b>High-End</b>		
American Samoa	\$2,345,192	\$274,928
Guam	\$4,284,823	\$502,312
CNMI	\$1,401,942	\$164,350
NWHI	\$130,525	\$15,302
PRIA	\$115,442	\$13,533
Total	<b>\$8,277,924</b>	<b>\$970,425</b>
Source: Estimated by NEL, Lynker Technologies, and NMFS.		



**Table 35. High-End Estimated Total Incremental Costs (Administrative and Project Modification) for Activities in Areas Considered for Final Critical Habitat by Jurisdiction and Activity Category, 2022–2031 (\$2021, 3% Discount Rate)**

Activity Category	American Samoa	Guam	CNMI	PRIA	NWHI	Total
In-water & Coastal Construction	\$2,149,182	\$3,810,178	\$1,179,392	\$72,358	\$79,834	\$7,290,944
Dredging and Disposal	\$111,804	\$390,479	\$147,394	–	\$6,931	\$656,608
Water Quality and Discharges	\$16,607	\$12,635	\$6,640	–	\$316	\$36,198
Fishery Management	\$7,378	\$1,054	\$8,959	–	–	\$17,391
Military Activities	\$1,581	–	\$240	\$1,581	–	\$3,402
Shipwreck and Marine Debris Removal	\$7,551	\$14,785	\$16,682	\$12,648	\$6,640	\$58,307
Scientific Research & Monitoring	\$51,089	\$50,229	\$36,310	\$25,159	\$21,720	\$184,507
Aquaculture	–	\$5,463	\$6,324	–	–	\$11,787
Protected Area Management	–	–	–	\$18,779	–	\$18,779
<b>Total</b>	<b>\$2,345,192</b>	<b>\$4,284,823</b>	<b>\$1,401,942</b>	<b>\$130,525</b>	<b>\$115,442</b>	<b>\$8,277,924</b>
Source: Estimated by NEI, Lynker Technologies, and NMFS.						