DRAFT

ENVIRONMENTAL ASSESSMENT

For

GLASS BREAKWATER EMERGENCY BREACH REPAIRS

At

NAVAL BASE GUAM, APRA HARBOR, GUAM

SEPTEMBER 2024

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Abstract

Designation:	Environmental Assessment
Title of Proposed Action:	Glass Breakwater Emergency Breach Repairs
Project Location:	Naval Base Guam
Lead Agency for the EA:	Department of the Navy
Affected Region:	Apra Harbor, Guam
Action Proponent:	Naval Base Guam
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Date:	September 2024

Unique Identification Number: EAXX-007-17-USN-1723124740

Naval Base Guam has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), as implemented by Council on Environmental Quality and Navy NEPA regulations. The Proposed Action is to undertake emergency repairs to the Glass Breakwater. As a result of recent storms, the breakwater is severely eroded and susceptible to imminent breaching due to normal wave action. Repairs will occur on the Philippine Sea ocean-side of the breakwater, where significant "armor" rocks, safeguarding the breakwater's inner core, have displaced or been washed away into the ocean. Repair activities will involve temporarily relocating intact armor rock from neighboring breakwater crest areas and repositioning them on the failing areas of the breakwater. The goal of the proposed action analyzed in this EA is to stabilize the breakwater in the short-term so that long-term lasting repairs can eventually be made to restore the breakwater to its original condition. The Navy estimates that future maintenance repairs will occur in mid-2025 and will be addressed in subsequent environmental analysis.

This EA comprehensively evaluates the potential environmental impacts associated with the one action alternative, Alternative 1, and the No Action Alternative to the following resource areas: air quality, water resources, cultural resources, biological resources, public health and safety, and greenhouse gases/climate change.

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EXECUTIVE SUMMARY

ES.1 Proposed Action

The Proposed Action is to undertake emergency repairs to the Glass Breakwater. As a result of recent storms, the breakwater is severely eroded and susceptible to imminent breaching due to normal wave action. Repairs will occur on the ocean-side of the breakwater, where significant "armor" rocks, safeguarding the breakwater's inner core, have displaced or been washed away into the ocean. Repair activities would involve temporarily relocating intact armor rocks from neighboring breakwater crest areas and repositioning them on the failing areas of the breakwater. The goal of the proposed action is to stabilize the breakwater in the short-term so that long-term lasting repairs can eventually be made to restore the breakwater to its original condition. The Navy estimates that future maintenance repairs will occur in mid-2025 and will be addressed in subsequent environmental analysis.

ES. 2 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to conduct emergency repairs to failing sections of the Glass Breakwaters' armor rock slope protection.

The Proposed Action is needed to prevent a breach of the breakwater, thereby safeguarding the harbor, shoreline, and vital Navy/Port of Guam infrastructure that is essential to sustain critical military and civilian missions on Guam.

There is an imminent risk of breaching of the Glass Breakwater, which would have significant impacts on Navy mission readiness and operational capabilities. The degraded condition of the breakwater, exacerbated by normal wave action, storms, and typhoons, heightens the likelihood of breach. Continued exposure to even normal wave action not only increase the risk of breach, but also poses a risk of potential environmental damage, including to Endangered Species Act (ESA) - listed coral and ESA-candidate clam species located in the submerged areas of the structure.

ES.2 Alternatives Considered

The Navy is considering one action alternative (Alternative 1) that meets the purpose of and need for the Proposed Action and a No Action Alternative. Alternative 1 would relocate intact armor rocks from neighboring breakwater crest areas and repositioning them on failing areas of the breakwater. The No Action Alternative would not repair the eroded areas of the breakwater, thus increasing the likelihood of a breach.

ES.3 Summary of Environmental Resources Evaluated in the EA

The Council on Environmental Quality (CEQ) regulations, National Environmental Policy Act (NEPA), and Navy instructions for implementing NEPA, specify that an Environmental Assessment (EA) should address those resource areas potentially subject to impacts. In addition, the level of analysis should be commensurate with the anticipated level of environmental impact.

The following resource areas have been addressed in detail in this EA: air quality, water resources, cultural resources, biological resources, public health and safety, climate change and greenhouse gases.

Because potential impacts were considered to be insignificant, negligible or nonexistent, the following resources were not evaluated in this EA: airspace, geological resources, land use, infrastructure,

transportation, socioeconomics, environmental justice, visual resources, noise, and hazardous materials and waste.

ES.4 Summary of Potential Environmental Consequences of the Action Alternatives

Table ES-1 provides a tabular summary of the potential environmental impacts of the alternatives analyzed.

ES.5 Public Involvement

The Navy has prepared this Draft EA to inform the public of the Proposed Action and to allow the opportunity for public review and comment. The Draft EA review period begins with a public notice published the Guam Daily Post and Pacific Daily News indicating the availability of the Draft EA and the locations where public review copies are available. The Draft EA is also available on the following website, https://pacific.navfac.navy.mil/About-Us/National-Environmental-Policy-Act-NEPA-Information.

Table ES-1 Summary of The Potential Environmental Impacts of the Alternatives Analyzed

Resource Area	*No Action Alternative*	*Alternative 1*
Air Quality	No Impact	Less than significant impact. Temporary construction period impacts due to equipment and vehicle exhaust with implementation of BMPs.
Water Resources	No Impact	Less than significant impact. Temporary construction period impacts on marine waters due to in-water work.
Cultural Resources	Significant Impact	Less than significant impact. Construction and operational period impacts. No historic properties affected.
Biological Resources	Significant Impact	Less than significant impact. Construction period impacts with implementation of BMPs and avoidance, minimization, and offset measures.
Public Health and Safety	Significant Impact	Less than significant impact. Construction period impacts. BMPs would be employed in the event munitions and explosives of concern (MEC) is encountered during construction. Contractors would manage any oil wastes and fluids in accordance with NBG management plans.
Climate Change and Greenhouse Gases	No Impact	Less than significant impact.

Environmental Assessment

Glass Breakwater Repairs

Naval Base Guam, Apra Harbor, Guam

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Abbreviations and Acronyms

Acronym	Definition
AAQS	ambient air quality standard
APE	Area of Potential Effects
BMP	best management practice
CAA	Clean Air Act
CCD	Coastal Consistency Determination
CEM	Coastal Engineering Manual
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DoD	United States Department of Defense
DON	United States Department of the Navy
DPS	Distinct Population Segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FEPs	Fishery Ecosystem Plans
FONSI	Finding of No Significant Impact
GHG	greenhouse gas
GWQS	Guam Water Quality Standards
HAP	hazardous air pollutant
HAPC	habitat areas of particular concern
MEC	munitions and explosives of concern
MMPA	Marine Mammal Protection Act
MUS	Management Unit Species
NAAQS	National Ambient Air Quality Standards
NBG	Naval Base Guam
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOA	notice of availability
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
Pb	lead
PCB	polychlorinated biphenyl
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
RONA	Record of Non-Applicability
ROI	region of influence
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	sulfur dioxide
SWPPP	Storm Water Pollution Prevention Plan
TCPs	traditional cultural properties
tpy	tons per year
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency

Acronym	Definition	Acronym	Definition
USFWS	U.S. Fish and Wildlife Service		
WPRFMC	Western Pacific Regional Fishery Management Council		

1 Purpose of and Need for the Proposed Action

1.1 Introduction

Naval Base Guam (NBG) has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) and Navy NEPA regulations.

The Proposed Action is to undertake emergency repairs to the Glass Breakwater. As a result of recent storms, the breakwater is severely eroded and susceptible to imminent breaching due to normal wave action. Repairs will occur on the ocean-side of the breakwater, where significant "armor" rocks, safeguarding the breakwater's inner core, have displaced or been washed away into the ocean. Repair activities would involve temporarily relocating intact armor rocks from neighboring breakwater crest areas and repositioning them on the failing areas of the breakwater. The goal of the proposed action is to stabilize the breakwater in the short-term so that long-term lasting repairs can eventually be made to restore the breakwater to its original condition. The Navy estimates that future maintenance repairs will occur in mid-2025 and will be addressed in subsequent environmental analysis.

1.2 Background

The Glass Breakwater in Apra Harbor, Guam has played a critical role in the island's maritime infrastructure since its construction. Initially planned before World War II, the breakwater's development was expedited after the war, primarily by the U.S. Navy Seabees, and completed in 1946. This structure was named in honor of Navy Captain Henry Glass, who played a significant role in capturing Guam from the Spanish during the 1898 Spanish-American War. Apra Harbor is a vital maritime hub for Guam, serving both military and commercial purposes. The harbor supports NBG, which includes facilities for U.S. Navy ships and submarines, and the Port of Guam, the island's primary commercial port handling cargo, fuel, and passenger vessels.

The breakwater is essential in order to shelter and protect U.S. Navy vessels, as well as commercial and local government ships, that use Apra Harbor. The breakwater also safeguards the shore facilities and infrastructure within the harbor from severe wave action during typhoons and other heavy weather events. On May 24, 2023, Super Typhoon Mawar passed north of Guam, bringing destructive winds and swells that severely damaged sections of the breakwater. The storm's impact caused significant erosion and displacement of the protective armor rock on the Western Point-Ocean Side, compromising the breakwater's integrity. The recent damage created an urgent need for repairs to maintain the harbor's functionality and prevent further degradation, which could lead to increased damage, higher future repair costs, and potentially significant environmental impacts. The Glass Breakwater is vital to the Navy's mission because without it, Apra Harbor would be open to severe wave action that accompanies typhoons and other heavy weather events originating from the Philippine Sea. Wave heights of 25 to 30 feet have been recorded during previous super typhoons that occur in seven to 15 years intervals. The worsening condition of the breakwater affects the position of the existing United States Coast Guard (USCG) navigational aid tower. The navigational aid tower is the only physical means to guide all incoming vessels into the mouth of the outer Apra Harbor.

Assessments conducted in February 2024 revealed that one-third of the breakwater has lost more than 20% of its armor rock, while the remaining two-thirds have experienced a loss of 5-10%, classifying the breakwater as “failed” according to the U.S. Army Corps of Engineers (USACE) Coastal Engineering

Manual (USACE 2002). Furthermore, a recent visual inspection conducted on May 9, 2024, showed an increased rate of degradation from normal wave action. If left unaddressed, this deterioration is likely to result in a breach, posing significant risks to military and commercial ships, facilities, operations, and the overall logistical use of Apra Harbor. In the event of even a partial breach, the maintenance road at the top of the breakwater crest would become impassable, leading to exponential increases in repair costs and time. The acceleration of breakwater failure underscores the urgent need for repair.

1.3 Location

The Navy on Guam supports naval activities to maintain operational readiness—maintaining the ability of units to respond to regional threats and to protect interests of the U.S. and its allies. The NBG at Apra Harbor is the Navy's operations center and is located on the southwest coast of Guam around Apra Harbor, including the Orote Peninsula. It serves as the forward deployment base and logistics hub, including main munitions storage and distribution center for sea, land, and air forces operating in Asia and the Western Pacific.

Navy-controlled lands at Apra Harbor have land uses ranging from industrial to recreational. Other lands on Guam are used for communications facilities; family housing/community support, two petroleum, oil and lubricant storage areas; munitions storage facilities; the Naval Hospital; a DoD Education Activity high school; and a Military Operations on Urban Terrain training range.

NBG covers about 4,500 acres on the west-central coast of Guam. It surrounds Apra Harbor and includes all of Orote Peninsula, as well as a low, largely marshy area along the east side of the harbor. Apra Harbor is located on the western shore of Guam, midway down the island and about 10 km (6 miles) southwest of the capital city of Hagåtña. The Philippine Sea surrounds the outside of the harbor and western Guam. Apra Harbor has two recognized zones: Outer Apra Harbor and Inner Apra Harbor. Water depths in Outer Apra Harbor are over 52 meters (170 feet) near the mouth and decrease to shallower waters around shoals (National Oceanic and Atmospheric Administration [NOAA] Chart 81054_Public Apra Harbor). Inner Apra Harbor is 9 to 12 meters (30 to 40 feet) deep, and Sasa Bay ranges as deep as 9 to 12 meters (30 to 40 feet) near the mouth but is generally much shallower, with numerous shallow shoals and mangroves (Figure 1 2). The majority of submerged land within Outer Apra Harbor is administered by the Navy and is used for military training and recreational activities. It also provides access for civilian vessels and the Government of Guam's Port Authority, which is in the northeastern portion of Outer Apra Harbor. The Navy authority over Inner Apra Harbor restricts its use to military vessels, which include naval and USCG vessels from allied nations. No recreational uses are permitted in Inner Apra Harbor. Fourteen wharves are located within Inner Apra Harbor to support the Navy and USCG vessels and operations (Department of the Navy [DoN] 2022). Sumay Cove is an enclosed embayment on the southern shore of Outer Apra Bay, extending approximately 850 meters (2,790 feet) to the south and ranging from about 40 meters across to 180 meters at its widest point. The entrance to Sumay Cove is flanked by Sumay Point on the west and EOD Point on the east.

Figure 1-1 Location Map

1.4 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to conduct emergency repairs to failing sections of the Glass Breakwaters' armor rock slope protection. During a May 9, 2024 inspection, the Navy determined that four areas of the breakwater have failed to the extent they have potential to breach the crest road within the next 12 months. These areas are likely to grow in size, height, depth, and thickness through typical wave events. If a typhoon occurs, the probability of further failure is high. Currently, the crest road is 35 feet wide. Construction equipment requires a road width of 35-40 feet. Any loss of road width would delay future repair efforts and expose the breakwater to further loss while the crest road is modified or repaired to allow equipment access.

The Proposed Action is needed to prevent a breach of the breakwater, thereby safeguarding the harbor, shoreline, and vital Navy/Port of Guam infrastructure that is essential to sustain critical military and civilian missions on Guam. There is an imminent risk of breaching of the Glass Breakwater, which would have significant impacts on Navy mission readiness and operational capabilities. The degraded condition of the breakwater, exacerbated by normal wave action, storms, and typhoons, heightens the likelihood of breach. Continued exposure to even normal wave action not only increase the risk of breach, but also poses a risk of potential environmental damage, including to Endangered Species Act (ESA) listed coral and ESA-candidate clam species located in the submerged areas of the structure.

1.5 Scope of Environmental Analysis

This EA includes an analysis of potential environmental impacts associated with the action alternative and the No Action Alternative. The environmental resource areas analyzed in this EA include: air quality, water resources, cultural resources, biological resources, public health and safety, and greenhouse gases/climate. The study area for each resource analyzed may differ due to how the Proposed Action interacts with or impacts the resource. For instance, the study area for cultural resources may only include the construction footprint of a structure, whereas the public health and safety study area would expand outside of the construction area.

1.6 Key Documents

Key documents are sources of information incorporated into this EA. Documents are considered to be key because of similar actions, analyses, or impacts that may apply to this Proposed Action. CEQ guidance encourages incorporating documents by reference. Documents incorporated by reference in part or in whole include:

- U.S. Army Corps of Engineers (USACE) Coastal Engineering Manual (USACE 2002)

1.7 Relevant Laws and Regulations

The Navy has prepared this EA based upon federal and state laws, statutes, regulations, and policies pertinent to the implementation of the Proposed Action, including the following:

- National Environmental Policy Act (NEPA) (42 United States Code [U.S.C.] sections 4321et seq.
- Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations parts 1500–1508)
- Navy regulations for implementing NEPA (32 Code of Federal Regulations part 775)
- Clean Air Act (42 U.S.C. section 7401 et seq.)

- Clean Water Act (33 U.S.C. section 1251 et seq.)
- Rivers and Harbors Act (33 U.S.C. section 401 et seq.)
- Coastal Zone Management Act (16 U.S.C. section 1451 et seq.)
- National Historic Preservation Act (54 U.S.C. section 3001018 et seq.)
- Endangered Species Act (16 U.S.C. section 1531 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (16 U.S.C. section 1801 et seq.)
- Marine Mammal Protection Act (16 U.S.C. section 1361 et seq.)
- EO 12088, Federal Compliance with Pollution Control Standards
- EO 13089, Coral Reef Protection
- EO 14008, Tackling Climate Crisis at Home and Abroad
- Guam Air Pollution Control Standards and Regulations (Regulation 1302, Chapter 1, Title 22 of Guam Administrative Rules and Regulations)

A description of the Proposed Action's consistency with these laws, policies and regulations, as well as the names of regulatory agencies responsible for their implementation, is presented in Chapter 5 (Table 5-1).

1.8 Public and Agency Participation and Intergovernmental Coordination

Regulations from the CEQ direct agencies to involve the public in preparing and implementing their NEPA procedures.

The Navy has prepared this Draft EA to inform the public of potential environmental impacts of the Proposed Action and to allow the opportunity for public review and comment. The Draft EA review period begins with a Notice of Availability (NOA) published in Guam Daily Post and Pacific Daily News. The NOA announces the availability of the Draft EA and the locations where public review copies are available. The Draft EA is also available on the following website, https://pacific.navfac.navy.mil/About-Us/National-Environmental-Policy-Act-NEPA-Information.

The Navy has coordinated or consulted with the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), U.S. Army Corps of Engineers (USACE), and Guam EPA regarding the proposed action.

A Coastal Consistency Determination was submitted to Guam Coastal Management Program. Concurrence with the Navy's determination is under review.

The Navy also consulted with the Guam State Historic Preservation Office (SHPO) regarding this Proposed Action. Concurrence of a "No Adverse Effect" determination was issued by letter dated 28 February 2024.

2 Proposed Action and Alternatives

2.1 Proposed Action

The Navy proposes to perform emergency repairs on the breakwater's ocean-side, where the large armor rocks that protect the breakwater's inner core have slid and/or washed into the ocean, leaving the inner core vulnerable to rapid erosion from constant wave and storm action.

Repair activities would involve relocating intact armor rocks from neighboring breakwater crest areas and repositioning them on the failing areas of the breakwater. The Navy estimates that future maintenance repairs will occur in mid-2025 and will be addressed in subsequent environmental analysis.

2.2 Screening Factors

NEPA's implementing regulations provide guidance on the consideration of alternatives to a federally proposed action and require rigorous exploration and objective evaluation of reasonable alternatives. Only those alternatives determined to be reasonable and to meet the purpose and need require detailed analysis.

Potential alternatives that meet the purpose and need were evaluated against the following screening factors:

- **Timeliness:** Repairs must begin once approvals and permits are obtained following completion of the NEPA process.
- **Construction Style:** Repairs must conform to the existing rubble-mound construction style.
- **Longevity:** Repairs must ensure a minimum lifespan of 25 years.
- **Criteria Compliance:** Repairs must meet current criteria specified in relevant manuals (e.g., USACE) to:
    - Provide stability and withstand severe environmental conditions.
    - Provide sufficient wave dissipation to reduce the force of incoming waves before they reach harbor infrastructure and the shoreline.

2.3 Alternatives Carried Forward for Analysis

Based on the alternative screening factors for meeting the purpose and need of the Proposed Action, one action alternative was identified and is analyzed within this EA, along with the No Action Alternative.

2.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. Critical repairs would not be completed, and the breakwater would continue to degrade. Failure to execute this project would continue to expose the breakwater to more serious damage including partial collapse of the breakwater head and breach of the breakwater trunk. If there were a partial collapse, future breakwater repairs would be costly and difficult to execute. Additionally, sections of the breakwater head (offshore end) would experience accelerated deterioration. Strong waves, especially during typhoon conditions, would expose more of the slope and additional failure would occur. Large segments of the breakwater could fail and damaging waves would impact U.S. Navy ships, submarines, facilities, and infrastructure. If the breakwater is not repaired, the position of the existing USCG navigational aid tower would worsen

affecting the safety of all incoming and outgoing vessels through the mouth of the outer Apra Harbor. The degraded condition of the breakwater, exacerbated by normal wave action, storms, and typhoons, heightens the likelihood of breach. Continued exposure to even normal wave action stressors not only increase the risk of breach, but also poses a risk of potential environmental damage, including to Endangered Species Act (ESA)-listed coral and ESA-candidate clam species located in the submerged areas of the structure.

The No Action Alternative would not meet the purpose of and need for the Proposed Action; however, as required by NEPA, the No Action Alternative is carried forward for analysis in this EA. The No Action Alternative will be used to analyze the consequences of not undertaking the Proposed Action.

2.3.2 Alternative 1 - Natural Rock Armor Layer Repair

This alternative would relocate intact armor rocks from neighboring breakwater crest areas and reposition them on the failing areas of the breakwater. This alternative strategically relocates armor rocks from adjacent, less critical areas of the breakwater sections to construct a rubble-mound overlay up to the original structure crest along the ocean-side, targeting failed and deteriorating areas as identified in Figure 2-1 and Figure 2-2. The repair areas would extend 132 feet seaward from the center of the crest road. Construction would be limited to 2.0 meters (6.56 feet) seaward from the High Tide Line to avoid the bathymetric contour where corals and other biota are dense and diverse The width of the failed areas along the length of the breakwater range from 30 feet to 150 feet wide; with a thickness (i.e., depth) of approximately 15 feet.

The repair work would include the following steps:

1. **Temporary Slope Protection Removal:** Remove compromised/damaged slope protection to facilitate targeted regrading efforts in designated areas 1-4 (Figure 2-1). Recover unstable armor rocks on the slope that are reachable with conventional equipment already available on island. (Note that the Biological Assessment (Appendix B) describes two main work areas, which are concurrent with the four work areas shown in Figure 2-1. The EA discusses each one with additional granularity).

2. **Strengthening the Toe Foundation:** Enhance structural robustness by reinforcing the in-water foundational integrity at the breakwater's base, ensuring steadfast stability under varying environmental pressures.

3. **Optional Geofabric Installation:** Depending on site conditions, a geofabric filter may be integrated to augmented filtration and structural support, elevating resilience against dynamic forces.

4. **Rock Relocation:** Strategically relocate armor rocks from two adjacent, less critical areas of breakwater sections to revitalize eroded areas prone to breaching, thus maximizing resource efficiency (Figure 2-1). Rocks would be removed from the breakwater crest. Rocks would be approximately 15 feet thick and 30 feet wide. Only the rocks at the upper crest would be removed so as to not destabilize the slopes of the adjacent armoring. Only 75% of the failed areas would require temporary breach protection repair, thus approximately 1,518 feet of adjacent rocks from other sections of the breakwater would be required to be relocated. Rocks nearest the breakwater head would be relocated as the repair would focus on the primary failed

areas and then proceed with work beginning at the head and work landward. This sequential approach reduces the risk of exposing the breakwater to further failure potential

5. **Riprap Bedding Application:** Implement laying of riprap bedding, selected to optimize structural reinforcement and fortify the breakwater against erosive forces.
6. **Precision Armor Rock Deployment:** Methodically position rocks and place where critical repairs are needed to prevent a breach.

These critically needed repairs to the Glass Breakwater would prevent imminent breaching. Implementation of less critical long-term repairs would be performed at a later date and evaluated in separate environmental analysis.

Site preparations would include earthwork to create work areas on the breakwater access road, accommodating crane pads and heavy truck traffic. One proposed contractor staging area has been proposed for use within the existing track lane on the crest of the outer breakwater, adjacent to emergency repair areas

This alternative would ensure that emergency repairs are implemented to stabilize the breakwater until follow-on long-term repairs can be completed. This alternative would ensure the breakwater maintains its structural integrity and protects Apra Harbor from severe wave action. This would safeguard both military and commercial maritime operations.

Figure 2-1 Damage Assessment of Glass Breakwater and Critically Damaged Areas

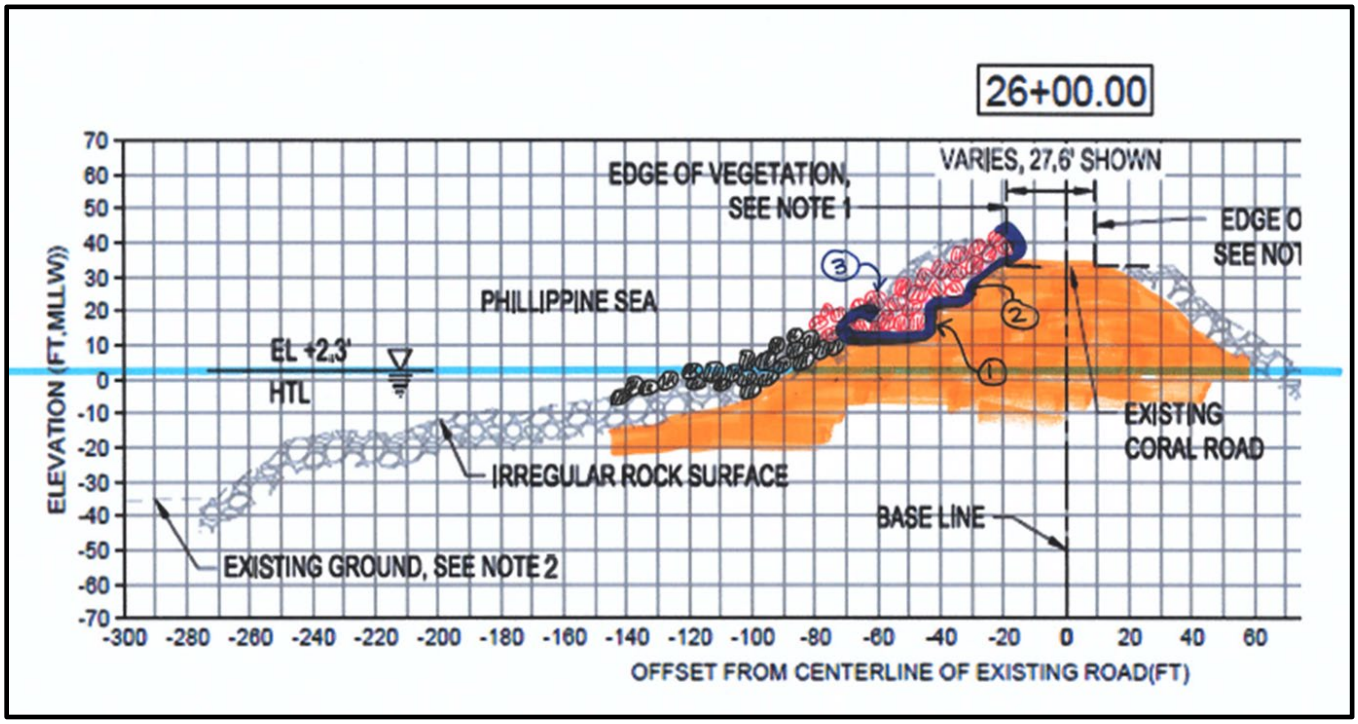
Areas of Discovered Failure and Proposed Borrow Areas

Failure Area	Slope Length (ft)	Width (ft)	Thickness
1	132	115	15
2	132	125	15
3	132	30	15
4	132	150	15
Total Volume (CF)		910,800	
Assumed 75% Repair Volume (CF)		683,100	

	Borrow
Length (ft)	1,518
Width (ft)	30
Height (ft)	15
Volume	683,100

Volumes are equal which proves sufficient armor stones are available

Figure 2-2 Natural Rock Armor Layer Repair



2.4 Alternatives Considered but not Carried Forward for Detailed Analysis

The following alternatives were considered, but not carried forward for detailed analysis in this EA as they did not meet the purpose and need for the project or satisfy the reasonable alternative screening factors presented in Section 2.2.

2.4.1 Construction of a New Breakwater

This alternative would demolish the current breakwater and construct a new breakwater structure in its place. Construction of a new breakwater would offer adequate harbor protection, but would require significantly more time and resources than currently available to address the immediate needs for critical repairs and harbor protection. The lengthy design and construction timelines would not address the immediate need to provide protection to the harbor; therefore, does not meet the purpose and need. This alternative will not be carried forward for detailed analysis in the EA.

2.4.2 Steel Sheet Pile Repair

The alternative would include encasing the damaged breakwater areas with sheet pile walls on both the harbor side and ocean side. The space between the existing structure and the sheet pile walls would be filled with granular material, anchored with tie rods, and capped with concrete. While this method would stabilize the breakwater, it does not align with the existing rubble-mound construction style. This alternative does not meet the purpose and need in that it would not conform to the existing breakwater construction style or maintain the breakwater's original design and functionality. This alternative will not be carried forward for detailed analysis in the EA.

2.4.3 Monolithic Construction Repair

This alternative would include monolithic construction techniques to repair the failed and failing portions of the breakwater. Repairing a rubble mound breakwater using monolithic construction techniques is generally not feasible due to:

1. **Structural Incompatibility**: Monolithic construction involves creating a single, continuous structure, often using materials like concrete. In contrast, rubble mound breakwaters are composed of multiple layers of loose rocks. The fundamental design principles and behavior under wave action differ significantly between these two types, making integration challenging.
2. **Flexibility and Adaptation**: Rubble mound breakwaters are designed to be flexible and absorb wave energy through the movement of individual rocks. Monolithic structures, being rigid, do not provide the same level of energy dissipation. This could lead to structural failure when subjected to the dynamic forces typically absorbed by a rubble mound design.
3. **Construction Techniques**: The construction methods for monolithic breakwaters are substantially different from those used for rubble mounds. Implementing monolithic construction techniques would likely require completely re-engineering the breakwater, leading to increased costs and extended timelines, which do not meet the urgent needs for timely repairs.

This incompatibility with the current structure means it fails to meet the project’s purpose and need for efficient repairs that maintain the breakwater's original design and functionality. Therefore, it will not be carried forward for detailed analysis in the EA.

2.5 Best Management Practices Included in Proposed Action

This section presents an overview of the best management practices (BMPs) that are incorporated into the Proposed Action in this document. BMPs are existing policies, practices, and measures that the Navy would adopt to reduce the environmental impacts of designated activities, functions, or processes. Although BMPs mitigate potential impacts by avoiding, minimizing or reducing/eliminating impacts, BMPs are distinguished from potential mitigation measures because BMPs are (1) existing requirements for the Proposed Action, (2) ongoing, regularly occurring practices, or (3) not unique to this Proposed Action. In other words, the BMPs identified in this document are inherently part of the Proposed Action and are not potential mitigation measures proposed as a function of the NEPA environmental review process for the Proposed Action.

BMPs include actions required by federal or state law or regulation. The recognition of the general management measures prevents unnecessarily evaluating impacts that are unlikely to occur.

- BMPs A through C (Section 2.5.1) avoid and minimize effects from the Project on ESA-listed sea turtles and sharks;
- BMPs D through J (Section 2.5.2) avoid and minimize effects from the Project on ESA-listed corals and Essential Fish Habitat (EFH);
- BMP-J (Section 2.5.3) avoids and minimizes effects from the Project from water pollution; and
- BMP-K (Section 2.5.4) avoids and minimizes effects from the Project on in-water sedimentation levels.
- BMP-L (Section 2.5.5) avoids and minimizes effects from the Project on fugitive dust.

2.5.1 BMPS to Avoid and Minimize Effects on ESA-listed Sea Turtles and Sharks

As applicable to mobile ESA-listed marine species (including non-listed marine mammals, although they are not expected to occur in the Action Area), the following BMPs will be employed to avoid and minimize adverse effects:

A. During limited in-water activities such as placement and resetting of armor rocks and concrete armor units, a dedicated and competent observer who is familiar with local marine species will use binoculars to detect the presence of ESA-listed marine species and notify construction crews to cease work if the ESA-listed species approaches the shutdown zone, as described below.
    1. The Contractor will comply with the following monitoring requirements:
        a) From the breakwater, a competent observer will use binoculars to monitor the Action Area for ESA-listed sea turtles and scalloped hammerhead sharks during all in-water activities. If all work associated with a particular activity takes place above the High Tide Line, an observer will not be required for that element of the Proposed Action.
        b) Observations will begin each day 30 minutes prior to the start of in-water activities:
            i. If no ESA-listed sea turtles or sharks are seen during the 30-minute pre-clearance survey period, Action activities may commence.
            ii. If an ESA-listed sea turtle or shark is seen during the 30-minute pre-clearance survey period, the observer will notify the Project Manager immediately and monitor the animal. If the animal is

within 46 meters (50 yards) of the in-water activity, animal behavior observations will be recorded. Work will not begin until the animal departs the area voluntarily or after 30 minutes have passed since the last animal sighting.

iii. During in-water activities, the observer will record environmental and action-related information, including but not limited to date, time, weather, action undertaken, status and effectiveness of BMPs, and ESA-listed marine species observed.

iv. During in-water activities, all in-water work shall stop when an ESA-listed sea turtle or shark approaches or is sighted within 46 meters (50 yards) of the proposed in-water work. Work shall begin/resume after the animal has departed the area voluntarily or after 30 minutes have passed since the last animal sighting.

v. All sightings of ESA-listed marine species shall be recorded.

2. No placement of in-water armor rocks or concrete armor units will take place after dark.
3. NBG will document and report quarterly to NMFS on all interactions with ESA-listed sea turtles or sharks.

B. During limited in-water activities, the following measures will be implemented to reduce the potential for collisions with mobile ESA-listed species:
    1. Vessel operators will halt or alter course to remain at least 46 meters (50 yards) away from ESA-listed marine animals.
    2. Vessel operators will reduce vessel speed to 10 knots or less when piloting vessels in the proximity of marine mammals and to 5 knots or less when piloting vessels in areas of known or suspected sea turtle activity. Operators will be particularly vigilant to watch for sea turtles at or near the surface in areas of known or suspected sea turtle activity.
    3. If approached by an ESA-listed marine animal, the vessel operator will put the engine in neutral until the animal is at least 15.2 meters (50 feet) away and then slowly move to 46 meters (50 yards) away from the animal.
    4. Vessel operators will not encircle or trap ESA-listed marine animals between multiple vessels or between vessels and the shore or breakwater.
C. During limited in-water activities, the following measures will be employed to reduce potential direct physical impacts on ESA-listed species:
    1. No personnel will attempt to disturb, touch, ride, feed, or otherwise intentionally interact with any protected species. Entangled animals will be freed and photographed if possible, and each incident will be reported to NMFS. Entanglement is not expected because the work area will be monitored, and therefore, no take for entanglements is requested.
    2. All personnel will stay more than 46 meters (50 yards) away from sea turtles, in the unlikely event they haul out on land in proximity to construction activities.
    3. Before any equipment or material enters the water, the Contractor will verify that no ESA-listed species are in the area.
    4. Any heavy equipment used (i.e. crane) will be operated from above and out of the water.
    5. Construction related equipment that may pose an entanglement hazard will be removed from the project site if not actively being used.

2.5.2 BMPs to Avoid and Minimize Effects on ESA-listed Corals and EFH

D. All in-water activities will cease during the primary Guam coral spawning event for soft (order Alcyonaria) and hard (order Scleractinia) corals (see Table 2-1). The coral spawning period is estimated to be approximately 21 days total each year, including 8 days prior to the full moon and 14 days after (Richmond and Hunter 1990):

Table 2-1. Estimated Coral Spawning Events from 2024-2025 for Soft (order Alcyonaria) and Hard (order Scleractinia) Corals

Year	Soft Corals		Hard Corals	
	Date of Full Moon	Estimated Spawning Period	Date of Full Moon	Estimated Spawning Period
2025	May 12	May 4 – May 26	July 1 0	July 2 - July 24th

E. The development and adherence to an inclement weather and typhoon contingency plan must include a large swell plan whereby in-water activities will be conducted during safe weather conditions (i.e., calm seas) and will cease during high surf, winds, or currents.
F. Construction will be limited to 2.0 meters (6.56 feet) from the High Tide Line to avoid the bathymetric contour where corals and other biota are dense and diverse.
G. All construction-related equipment must be operated to avoid impacting sensitive marine habitat or contacting coral reef resources during in-water activities or extreme weather conditions:
    1. The portions of the equipment that enter the water will be clean and free of pollutants, including aquatic invasive species. In compliance with Guam Executive Order 91-37, all vessels and equipment (including barges and cranes) will be free from fouling organisms before entering Guam's coastal waters.
    2. The portions of the equipment entering the water (if at all) will be clean and free of pollutants, including aquatic invasive species. The Project Manager and heavy equipment operator will perform daily pre-work equipment inspections for cleanliness and leaks. Should a leak be detected, all work will be halted until leak is repaired and equipment is cleaned.

2.5.3 BMPs to Avoid and Minimize Effects from Water Pollution

H. A Storm Water Pollution Prevention Plan (SWPPP) will be developed by the Construction Contractor to reduce on-site erosion and sedimentation. The SWPPP will include, at a minimum, the following BMPs:

    1. Silt socks, filter fabric, or an equivalent will be used around out-of-water repair sites along the Glass Breakwater.
    2. An Oil Spill Contingency Plan to control and clean spilled petroleum products and other toxic materials will be included in the SWPPP and implemented throughout construction of the Project:
        a) Oil or other hazardous substances will be prevented from seeping into the ground or entering any drainage inlet or local bodies of water.
        b) When applicable, all temporary fuel oil or petroleum storage tanks will be surrounded with a temporary berm of sufficient size and strength to contain the contents of the tanks (plus 10 percent freeboard for precipitation) in the event of an accidental release.

c) Fueling of Project-related vehicles and equipment will take place at least 46 meters (150 feet) away from the water and within a containment area, preferably over an impervious surface. With respect to equipment that cannot be fueled on land, spill prevention booms will be employed in the water to contain potential spills. All fuel spilled will be cleaned up immediately.
d) Lubricants and excess oil will be disposed of in accordance with applicable federal, territorial, and local regulations, laws, ordinances, and permits.
e) Appropriate materials to contain and clean potential spills will be stored at the work site and be readily available.
f) All Project-related materials and equipment placed in the water will be free of pollutants.
g) Daily pre-work inspections of heavy equipment for cleanliness and leaks will be conducted. All heavy equipment operations will be postponed or halted until leaks are repaired and equipment is cleaned.
h) All Project-related debris and other waste will be contained and will not enter or remain in the marine environment.

2.5.4 BMPs to Avoid and Minimize Effects on In-Water Sedimentation

I. Turbidity and siltation from Project-related work shall be minimized and contained through the appropriate use of erosion control practices and curtailment of work during adverse weather and tidal/flow conditions:

1. The Construction Contractor must continuously monitor to ensure that control measures are in place and functioning properly.
2. As practicable, work will be conducted during calm seas with work stoppages during high surf, winds, and currents.

2.5.5 BMPs to Avoid and Minimize Effects of Fugitive Dust

J. No person shall cause or permit visible fugitive dust to become airborne without taking reasonable precautions. Examples of reasonable precautions are:

1. Use of water or suitable chemicals for control of fugitive dust in the demolition of existing buildings or structures, construction and retrofitting operations, the grading of roads, or the clearing of land;
2. Application of asphalt, water, or suitable chemicals on roads, material stockpiles, and other surfaces which may allow release of fugitive dust;
3. Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials. Reasonable containment methods shall be employed during sandblasting, spray painting, or other similar operations;
4. Covering all moving, open-bodied trucks transporting materials which may release fugitive dust;
5. Maintenance and sealing of road-ways and parking lots so as to prevent the exposure of such surfaces to wind, water, or vehicular travel erosion; and
6. Prompt removal of earth or other materials from paved streets which have been transported there by trucking, earth-moving equipment, erosion, or other means.

3 Affected Environment and Environmental Consequences

This chapter presents a description of the environmental resources and baseline conditions that could be affected from implementing any of the alternatives and an analysis of the potential direct and indirect effects of each alternative.

All potentially relevant environmental resource areas were initially considered for analysis in this Environmental Assessment (EA). In compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ), and Department of Navy guidelines; the discussion of the affected environment (i.e., existing conditions) focuses only on those resource areas potentially subject to impacts. Additionally, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact.

"Significantly," as used in NEPA, requires considerations of both context and intensity. Context means that the significance of an action must be analyzed under several perspectives such as society as a whole, the affected region, the affected interests, and the locality. Significance varies with the setting of a proposed action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant. Intensity refers to the severity or extent of the potential environmental impact, which can be thought of in terms of the potential amount of the likely change. In general, the more sensitive the context, the less intense a potential impact needs to be in order to be considered significant. Likewise, the less sensitive the context, the more intense a potential impact would be expected to be significant.

The potential impacts to the following resource areas are considered to be negligible or non-existent; therefore, they were not analyzed in detail in this EA:

Airspace: The Proposed Action would not involve impacts to military or civilian airspace or facilities. Therefore, no additional analysis is required with respect to airspace impacts.

Geological Resources: The Proposed Action would take place within the existing footprint of the Glass Breakwater. No on land or shore side construction would take place as part of the Proposed Action. Terrestrial components of the project would involve one temporary staging areas within the existing track lane on the crest of the outer breakwater, adjacent to emergency repair areas. BMPs would be implemented to avoid soil erosion and offsite storm water discharge. The project area does not include any prime farmland and no existing agricultural lands would be affected by either alternative. The Proposed Action would result in relatively minor changes to geological or topographic features in the project area, and would not increase the likelihood of seismic activity and related liquefaction impacts. Therefore, geological resources do not require additional analysis in this EA.

Land Use: Land and water use would remain the same as under existing conditions. Terrestrial components of the project involve one temporary staging area within the existing track lane on the crest of the outer breakwater, adjacent to emergency repair areas Therefore, land use requires no additional analysis in this EA.

Socioeconomics: Construction of the Proposed Action would not impact population; employment/industry characteristics; demand for schools, housing, recreational facilities; or demographic, economic, or fiscal conditions of the Territory of Guam. Economic benefits of construction job creation would be temporary and associated with project construction. Therefore, the project would

not result in secondary impacts related to increasing development capacity or population growth. Socioeconomics is not further analyzed in this EA.

Environmental Justice: Consistent with Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (February 11, 1994), EO 13045, Protection of Children from Environmental Health and Safety Risks (April 21, 1997), and EO 14008, Tackling the Climate Crisis at Home and Abroad (February 1, 2021), the Navy has evaluated the Proposed Action and determined that it would not cause disproportionately high and adverse human or environmental effects of its actions on minority and low-income populations. The Proposed Action would occur within Navy-controlled lands and waters and secured to prevent public access. The type and nature of Glass Breakwater Emergency Breach Repairs would not substantively change existing land and water use or the type, tempo, and nature of NBG operations and activities. Therefore, no additional evaluation is required with respect to Environmental Justice.

Visual Resources: All the project components would be within the footprint of the existing Glass Breakwater. All materials to be used in the repairs would be similar to materials used in the original breakwater construction. Boulders and riprap would match existing erosion control measures. No new permanent structures would be constructed and the visual landscape of Apra Harbor would not be altered. Therefore, no additional analysis of visual resources is needed in this EA.

Noise. The Proposed Action would not involve actions that would create elevated noise such as pile driving, sand blasting, boat traffic, etc. Noise generated by the project would be the operation of construction equipment including trucks and cranes. Concrete armor units and armor rocks would be placed in water carefully as each unit must interlock with its neighbors to form a strong structure. Careful placement would minimize noise levels associated with armor placement. The nearest physical receptor is approximately 2.0 miles away, making it unlikely that construction noise would be audible. The distance from Area 1 to the first house on Lockwood Terrace is 10,229 feet (1.94 miles). The distance to the upper northwest corner of McCool Elementary and Middle School is 11,653 feet (2.21 miles). The nearest civilian residences are 23,066 feet (4.37 miles) east of Area 1. Ambient noise levels at the project area are generally low due to its remote location with low activity levels. The predominant noise sources consist of ship and harbor operations at the Apra Harbor wharves, commercial and recreational vessels transiting the harbor, wind, and vehicle traffic on local streets. Other components such as construction, landscape maintenance, helicopter training, and recreational use of nearby areas produce noise, but such noise generally represents a transitory and negligible contribution to the average noise level environment. Therefore, no additional analysis of noise resources is needed in this EA.

Hazardous Materials and Waste: No known hazardous materials or waste contamination sites are located within the project areas. Construction activities would not generate hazardous materials or waste. Munitions and explosives of concern (MEC) are analyzed in the Public Health and Safety section. Therefore, additional analysis of hazardous materials and waste are not included in this EA.

The following resource areas have the potential to experience impacts from the Proposed Action and require additional analysis: air quality, water resources, cultural resources, biological resources, public health and safety, and greenhouse gases/climate.

3.1 Air Quality

This section evaluates potential impacts to air quality that could result from implementation of the Proposed Action. Air quality in a given location is defined by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors, including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and local meteorological conditions.

Most air pollutants originate from human-made sources, including mobile sources (e.g., diesel-fueled vehicles) and stationary sources (e.g., concrete batch plants, refineries, power plants), as well as indoor sources (e.g., some building materials and cleaning solvents). Air pollutants are also released from natural sources such as volcanic eruptions and forest fires. Some pollutants are formed through atmospheric chemical reactions from other pollutant emissions (called precursors) that are influenced by weather, ultraviolet light, and other atmospheric processes. Note that Climate Change and Greenhouse Gases are discussed separately in Section 3.6

3.1.1 Regulatory Setting

3.1.1.1 Criteria Pollutants and National Ambient Air Quality Standards

The principal pollutants defining air quality, called "criteria pollutants," include carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone, suspended particulate matter less than or equal to 10 microns in diameter (PM_{10}), fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). CO, SO_2, Pb, NO_2, and some particulates are emitted directly into the atmosphere from emissions sources. Ozone, NO_2, and some particulates are formed through atmospheric chemical reactions that are influenced by weather, ultraviolet light, and other atmospheric processes.

Under the Clean Air Act (CAA), the U.S. Environmental Protection Agency (USEPA) has established National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for these pollutants. NAAQS are classified as primary or secondary. Primary standards protect against adverse health effects; secondary standards protect against welfare effects, such as damage to farm crops and vegetation and damage to buildings. Some pollutants have long-term and short-term standards. Short-term standards are designed to protect against acute, or short-term, health effects, while long-term standards were established to protect against chronic health effects. Ambient air is defined as that portion of the atmosphere, external to buildings, to which the general public is exposed. Each ambient air quality standard (AAQS) has its own criteria, known as the "form" of the standard, related to if and how many times it may be exceeded before the AAQS is considered violated. The concentration that follows the form of the standard and that is used to compare with an AAQS is a design value. Pollutant concentrations at or near ground level are of particular interest because this is where most environmental impacts from air pollution occur.

Areas that are and have historically been in compliance with the NAAQS are designated as attainment areas. Areas that violate a federal air quality standard are designated as nonattainment areas. Areas that have transitioned from nonattainment to attainment are designated as maintenance areas and are required to adhere to maintenance plans to ensure continued attainment.

The CAA requires states to develop a general plan to attain and maintain the NAAQS in all areas of the country and a specific plan to attain the standards for each area designated nonattainment for a NAAQS. These plans, known as State Implementation Plans (SIPs), are developed by state and local air quality management agencies and submitted to USEPA for approval.

3.1.1.2 Guam Air Pollution Control Standards and Regulations

Guam adopted ambient air quality standards defined in Title 22-1, Article 3 of the Guam Administrative Rules. Guam standards have been established for SO_2, particulate matter (measured as PM_{10}), CO, ozone, NO_2, and Pb. The Guam AAQS are given in terms of primary standards, which define levels of air quality necessary "with an adequate margin of safety, to protect the public health" and secondary standards, which define levels of air quality necessary "to protect the public welfare from any known or anticipated adverse effects of a pollutant."

3.1.1.3 Hazardous Air Pollutants

USEPA has identified 188 hazardous air pollutants (HAPs), also referred to as toxic air pollutants or air toxics that are known or suspected to cause cancer or other serious health and environmental effects. AAQS have not been established for HAPs because USEPA's strategy is to use reductions of HAP emissions from stationary industrial, mobile, and indoor sources as a means to providing nationwide health protections. National emission standards exist for controlling HAPs from stationary sources, which are regulated under Section 112(b) of the 1990 CAA Amendments. The primary control methodologies for these pollutants for mobile sources involves reducing their content in fuel and altering the engine operating characteristics to reduce the volume of pollutant generated during combustion. To assess risk from exposure to toxics, the USEPA has tabulated long-term (chronic) and short-term (acute) dose-response assessments that could be used for risk assessments of HAPs (EPA, 2024).

3.1.1.4 General Conformity

The USEPA General Conformity Rule applies to federal actions that generate the criteria pollutant (or its precursors) for which the area is designated nonattainment or maintenance. The emissions thresholds that trigger requirements for a conformity analysis are called *de minimis* levels. *De minimis* levels (in tons per year [tpy]) vary by pollutant and also depend on the severity of the nonattainment status for the air quality management area in question.

A conformity applicability analysis is the first step of a conformity evaluation and assesses if a federal action must be supported by a conformity determination. This is typically performed by quantifying applicable direct and indirect emissions that are projected from the implementation of the federal action. Indirect emissions are those emissions caused by the federal action and originating in the region of interest, but which can occur at a later time or in a different location from the action itself and are reasonably foreseeable. The federal agency can control and will maintain control over the indirect action due to a continuing program responsibility of the federal agency. Reasonably foreseeable emissions are projected future direct and indirect emissions that are identified at the time the conformity evaluation is performed. The location of such emissions is known and the emissions are quantifiable, as described and documented by the federal agency based on its own information and after reviewing any information presented to the federal agency. If the results of the applicability analysis indicate that the total emissions would not exceed the de minimis emissions thresholds, then a conformity determination is not required.

3.1.1.5 Permitting

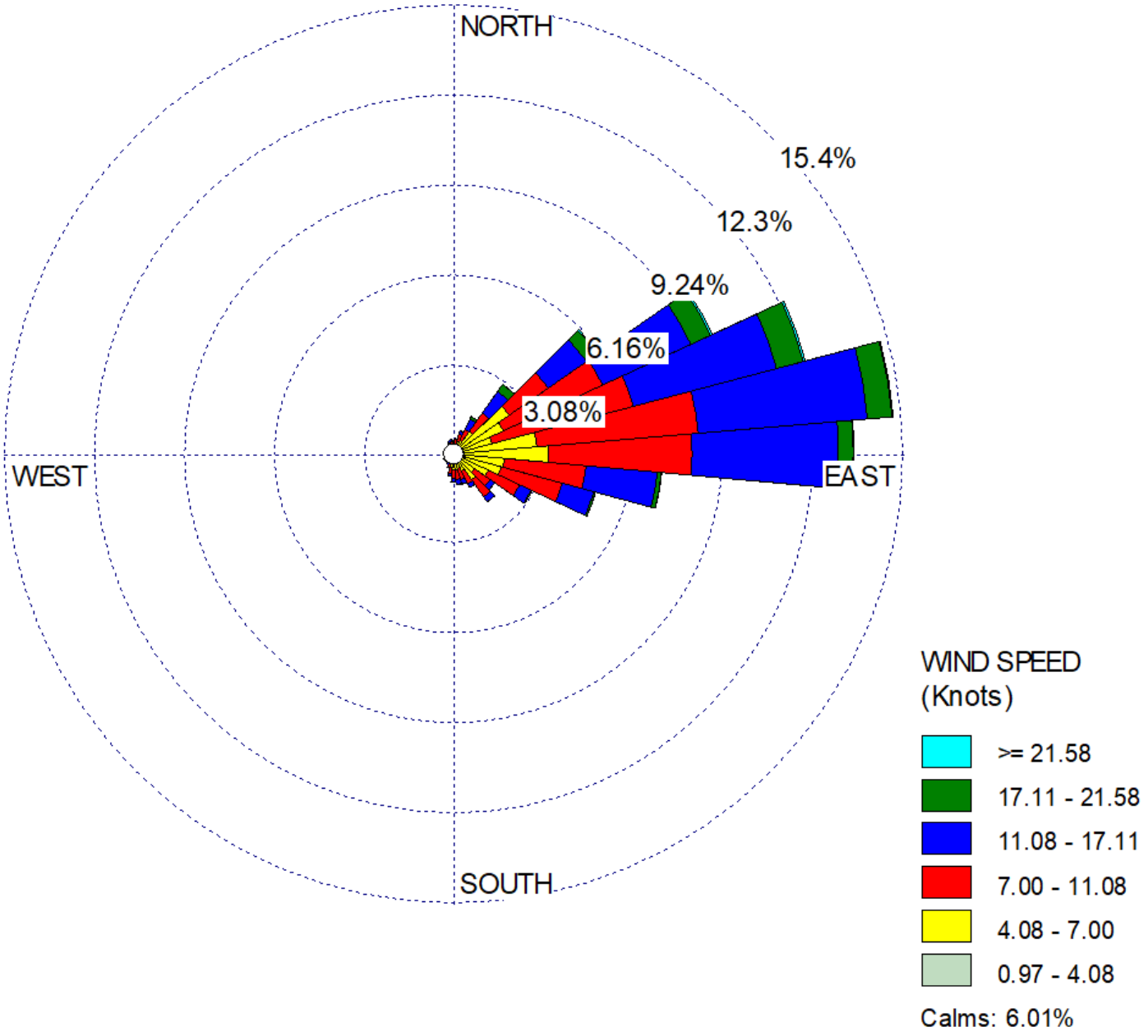
New Source Review (Pre-Construction Permit)

New stationary sources and modifications at existing stationary sources are required by the CAA to obtain an air pollution permit before commencing construction. This permitting process for stationary sources is called 'New Source Review' and is required whether the source or modification is planned for nonattainment areas or attainment and unclassifiable areas. Because no new and no modifications to existing stationary sources are associated with the Proposed Action, permitting is not carried forward as part of the air quality analysis.

3.1.2 Affected Environment

The air quality region of influence (ROI) includes Apra Harbor, mainly near the proposed action activities. Sensitive receptors are nearby at a recreational beach located approximately 2,500 feet (762 meters) east of the proposed action. Ambient air receptors at Orote Point are 2,500 feet (762 meters) southwest of the proposed action. Meteorological conditions affect the dispersion and transport of air pollutants and the resulting air quality. Figure 3-1 depicts a wind rose for data collected from 2018 to 2022 by the weather station (PGUM) located at Antonio B. Won Pat International Airport. The wind rose represents the directions around a compass, and the length of the petal or spoke indicates wind direction and frequency toward the center point. Individual segments of the spoke represent the frequency of winds for defined wind speed categories, with the slowest winds closest to and the fastest winds furthest from the center of the diagram. The windier part of the year lasts for six months, from November to May, with average wind speeds of more than 13.8 miles per hour. The calmer season has an average hourly wind speed of 10.9 miles per hour (WeatherSpark, 2022).

Figure 3-1 Wind Rose for Guam



Ambient air quality conditions around Outer Apra Harbor and NBG are affected primarily by stationary sources at Piti and to a lesser extent by mobile emission sources, including vessels and on-road vehicles in the area. There are several large stationary emission sources in operation, including the Guam Power Authority's Cabras Power Plant in Piti Point area with two steam turbines and two slow speed diesel generators. In the same area, the Taiwan Electrical and Mechanical Engineering Services Power Plant operates a 40-megawatt combustion turbine known as Piti #7, and the Marianas Energy Company Power Plant operates two slow speed diesel generators, each rated at 44-megawatt (also known as Piti #8 and #9).

There are currently no air monitoring stations operating on Guam. Ambient air quality data has not been collected since 1991. There is currently no emissions inventory for the island of Guam, although the Guam Environmental Protection Agency (GEPA) is working towards producing an annual emissions inventory for the island. USEPA's Technical Support Document for Intended Round 3 Area Designations for the 2010 SO_2 Primary NAAQS for Guam reported 2011-2013 actual SO_2 emissions for Cabras (8,891 tpy Marianas Energy Company (4,828 tpy), and TEMES (2 tpy), which can be used as a reference point for assessing potential impacts from the proposed alternatives.

Guam is designated unclassifiable/attainment for all criteria pollutants with the exception of SO_2. The proposed action is within the Piti-Cabras area designated nonattainment for the 2010 SO_2 primary NAAQS. The de minimis threshold for SO_2 is presented in Table 3-1.

Table 3-1 SO_2 General Conformity *de minimis* level

Pollutant	***Area Type***	***tpy***
SO_2	All nonattainment & maintenance	100

tpy = tons per year

3.1.3 Environmental Consequences

Effects on air quality are based on estimated direct and indirect emissions associated with the action alternatives, and the dispersion and transport of those emissions. The ROI for assessing air quality impacts for this project is in the immediate vicinity of proposed action activities.

Air quality effects are changes to the environment resulting from project impacts that are reasonably foreseeable and have a reasonably close causal relationship to the action. These effects may include but are not limited to:

- Risks to populations resulting from the exposure to HAPs
- Changes in ambient concentrations for criteria pollutants and their effects on compliance with ambient air quality standards

The primary source of emissions from the Proposed Action would be from fuel-burning equipment and fugitive dust from ground disturbance. To assess air quality impacts from emissions released from the proposed action, the analysis evaluated expected locations of pollutant plumes and receptors to determine if they overlap to assess exposure potential and how the exposure compares to AAQS and dose-response assessments. Activity duration and how changes in pollutant concentrations would affect design values are considered. For example, the 1-hour nitrogen dioxide NAAQS is based on a 3-year average, but if Proposed Action activities do not occur for the entire duration of the 3-year period, the

period of no activity would lower the 3-year average. Therefore, the duration and intensity of pollutant exposure within the adjacent neighborhood of each activity area were considered in evaluating air quality impacts from the proposed temporary activities.

3.1.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to baseline air quality. Therefore, no significant impacts to air quality or air resources would occur with implementation of the No Action Alternative.

3.1.3.2 Alternative 1- Natural Rock Armor Layer Repair

Potential Impacts

Alternative 1 would not introduce any new permanent stationary sources of air emissions. Short-term, temporarily-emitted air emissions (e.g., fugitive dust, combustion of fossil fuels) would be generated during the activity period, which is estimated to be 36 weeks, 6 days per week, 12 hours per day. BMPs would be implemented to minimize fugitive dust during construction. Example BMPs include watering of active work areas, using wind screens, keeping adjacent paved roads clean, covering of open-bodied trucks, limiting the area that is disturbed at any given time and/or mulching or chemically stabilizing inactive areas that have been worked. Fugitive dust and emissions released from the tailpipes of on-road and nonroad mobile sources lack plume rise. Thus, air emissions are expected to initially disperse in the immediate vicinity of activities and then transported downwind of release. Observations at the Guam International Airport indicate wind directions are mostly from the east, which would transport emissions away from public areas and sensitive receptors most of the time. Transport of air emissions to public areas and sensitive receptors would be infrequent and when they occur, air pollutant concentrations are expected to be low, commensurate with the activity level.

Anticipated air quality impacts from the Alternative 1 are not expected to interfere with the attainment of AAQS or appreciably increase human health risks from HAP exposure in areas where sensitive receptors and/or public presence are expected.

General Conformity

The Navy completed an applicability analysis to comply with the General Conformity requirements. The proposed action is subject to the General Conformity rule but a conformity determination is not required. Annual SO_2 emissions from Alternative 1 would not exceed the SO_2 *de minimis* level of 100 tpy. The Record of Non-Applicability (RONA) provided in Appendix A documented this analysis.

3.2 Water Resources

This discussion of water resources includes marine waters. Surface water, groundwater, wetlands, floodplains, and shorelines are not discussed as these water resources are not located in the project area and/or have little to no potential to be affected by the Proposed Action.

Marine waters typically include estuaries, waters seaward of the historic height of tidal influence, and offshore high salinity waters. Marine water quality is described as the chemical and physical composition of the water as affected by natural conditions and human activities. Additionally, marine waters may include areas that require special protection to avoid adverse water quality impacts in order to prevent damage to marine resources.

3.2.1 Regulatory Setting

The USACE regulates the discharge of dredge or fill material into wetlands under Section 404 of the CWA as a subset of all "Waters of the United States." Waters of the United States is defined as (1) the territorial seas and traditional navigable waters, (2) tributaries, (3) certain lakes ponds, and impoundments, and (4) adjacent wetlands, and are regulated by USEPA and the USACE. The CWA requires that Guam establish a Section 303(d) list to identify impaired waters and establish TMDLs for the sources causing the impairment.

Section 404 of the CWA authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredge or fill material into wetlands and other Waters of the United States. Any discharge of dredge or fill material into Waters of the United States requires a permit from the USACE.

Section 10 of the Rivers and Harbors Act provides for USACE permit requirements for any in-water construction in navigable waters. USACE and some states require a permit for any in-water construction. Permits are required for construction of piers, wharfs, bulkheads, pilings, marinas, docks, ramps, floats, moorings, and like structures; construction of wires and cables over the water, and pipes, cables, or tunnels under the water; dredging and excavation; any obstruction or alteration of navigable waters; depositing fill and dredged material; filling of wetlands adjacent or contiguous to navigable waters; construction of riprap, revetments, groins, breakwaters, and levees.

The Coastal Zone Management Act of 1972 (CZMA) provides assistance to states, in cooperation with federal and local agencies, for developing land and water use programs in coastal zones. Actions occurring within the coastal zone commonly have several resource areas that may be relevant to the CZMA.

3.2.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under water quality resources at NBG. Surface water, groundwater, wetlands, floodplains, and shorelines are not discussed as these water resources are not located in the project area and/or have little to no potential to be affected by the Proposed Action.

3.2.2.1 Marine Waters

Apra Harbor is the only deep lagoon in Guam and is enclosed on its north and northwest sides by the Glass Breakwater and on its southwest by Orote Peninsula. There are four distinct areas of the harbor: (1) Outer Apra Harbor, deep water with direct access to the Philippine Sea at Orote Point, (2) Commercial Port (dredged by the Government of Guam), (3) Sasa Bay located north of Polaris Point, and (4) Inner Apra Harbor.

Guam tides are semidiurnal with a mean range of 1.6 feet and diurnal range of 2.3 feet. Extreme predicted tide range is about 3.5 feet (GEPA, 2006). Surface seawater temperatures on Outer Apra Harbor are typically 79 to 86 degrees Fahrenheit (Smith et al., 2013 in DON, 2018). Temperature fluctuations are more pronounced at the eastern stations compared to those toward the mouth of the harbor.

Water quality in the marine environment is determined by a complex set of interactions between chemical and physical processes operating continuously in the ocean system. This dynamic equilibrium is expressed by a variety of indicators, including temperature, salinity, dissolved oxygen, and nutrient

levels. Nutrients are chemicals necessary to produce organic matter. Basic nutrients include dissolved nitrogen, phosphates, and silicates. Dissolved inorganic nitrogen occurs in ocean water as nitrates, nitrites, and ammonia, with nitrates as the dominant form. Water pollutants alter the basic chemistry of seawater in various ways (DON, 2010).

The vast expanse of offshore waters, their distance from the shore, and mixing and transport effects of currents work together to maintain a generally high quality of water. The major chemical parameters of marine water quality include pH, amount of dissolved oxygen, and nutrient concentrations. The quality of coastal ocean waters, or nearshore waters, is strongly affected by nonpoint source pollution.

Apra Harbor receives freshwater inflows from the Atantano, Sasa, Aguada, and Laghas rivers, with the Atantano River emptying into Inner Apra Harbor (and the other three emptying into Sasa Bay). These rivers primarily drain the areas around the municipalities of Piti and Santa Rita. Stormwater runoff from these areas carries large amounts of sediments, most of which originates from the widespread soil erosion that occurs in the highlands and from improperly managed construction activities within the drainage basin (Guam DPW, 2010, as cited in HDR, 2011). Over time, the sediments deposited by rivers and streams flowing into the inner harbor and Sasa Bay are transported by the combined actions of winds, waves, currents, and tides to the outer harbor where they adversely impact in-harbor water quality and coral reefs (HDR, 2011).

Guam Water Quality Standards (GWQS), adopted by GEPA in 2001, establish three categories of waters: groundwater, marine waters, and surface waters. The waters of Outer Apra Harbor are categorized as "marine waters." Marine waters include all coastal waters offshore from the mean high water mark, including estuarine waters, lagoons, bays, brackish areas, wetlands and other special aquatic sites, and other inland waters that are subject to tidal influence. Marine waters are further divided into three sub-categories: Excellent (M-1), Good (M-2) and Fair (M-3).

The waters within Outer Apra Harbor—including the project area—are designated M-2. According to the GWQS, water in the M-2 category must be of sufficient quality to allow for the propagation and survival of marine organisms, particularly shellfish and other similarly harvested aquatic organisms, corals and other reef related resources, and whole-body contact recreation. Other important and intended uses include mariculture activities, aesthetic enjoyment, and related activities. The Piti Channel empties into Outer Apra Harbor and is characterized as M-3 (Fair), which is defined as being marine waters that are intended for general, commercial, and industrial use, while allowing for protection of aquatic life, aesthetic enjoyment, and compatible recreation with limited body contact. Specified intended uses of M-3 waters include shipping, boating and berthing, industrial cooling water and marinas. Saltwater acute, saltwater chronic and human health standards are applicable to all toxic pollutants discharged in M-3 waters.

3.2.3 Environmental Consequences

In this EA, the analysis of water resources focuses on the potential impacts on marine waters.

3.2.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to baseline water resources. Therefore, no significant impacts to water resources would occur with implementation of the No Action Alternative.

3.2.3.2 Natural Rock Armor Layer Repair (Alternative 1) Potential Impacts

The study area for the analysis of effects to water resources associated with the Alternative 1 includes Outer Apra Harbor marine waters in the vicinity of the Glass Breakwater.

Construction of the Alternative 1 may temporarily affect the marine waters directly surrounding the Guam Glass Breakwater. On the ocean-side of the breakwater, where significant armor rocks have been displaced or been washed away into the ocean, repair activities will involve temporarily relocating armor rocks from neighboring breakwater crest areas, and repositioning them on the failed areas. This will involve work above and below the high tide line; therefore, the use of construction BMPs listed in Section 2.5 would minimize the transport of resuspended sediments in the water column, soil erosion, and runoff and avoid adverse impacts to marine water resources.

Therefore, implementation of the Alternative 1 would not result in significant impacts to water resources.

3.3 Cultural Resources

This section describes baseline conditions for cultural resources within the ROI and assesses the effect to historic properties caused by implementation of the Proposed Action or the No Action Alternative, as detailed in Chapter 2.

Cultural Resources include the physical evidence associated with human activities. This includes precontact and historic archaeological sites, buildings, structures, objects, and elements or areas of the natural landscape. Cultural resources include *historic properties,* defined in the NHPA as any precontact or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places. The term *historic properties* also includes traditional cultural properties (TCPs). TCPs are eligible for inclusion in the National Register of Historic Places (NRHPs) for association with cultural practices or beliefs of a living community. Such practices or beliefs are important in maintaining the continuing cultural identity of the community. TCPs may include archaeological sites, buildings, structures, neighborhoods, prominent topographic features, habitat, plants, animals, and/or minerals that Native Americans or other groups consider essential for the preservation of their identity or way of life

3.3.1 Regulatory Setting

The Navy has prepared this EA based upon federal and state laws, statutes, regulations, and policies pertinent to the implementation of the Proposed Action, as detailed in Section 1.7. Federal laws and regulations governing cultural resources include the National Historic Preservation Act (NHPA) of 1966, Archeological and Historic Preservation Act of 1974, American Indian Religious Freedom Act of 1978, Archaeological Resources Protection Act of 1979, and Native American Graves Protection and Repatriation Act of 1990. Federal agencies' responsibility for preserving historic properties is defined primarily by Sections 106 and 110 of the NHPA. Section 106 requires agencies to consider the effects of their actions on *historic properties* and Section 110 mandates proactive identification and management of cultural resources.

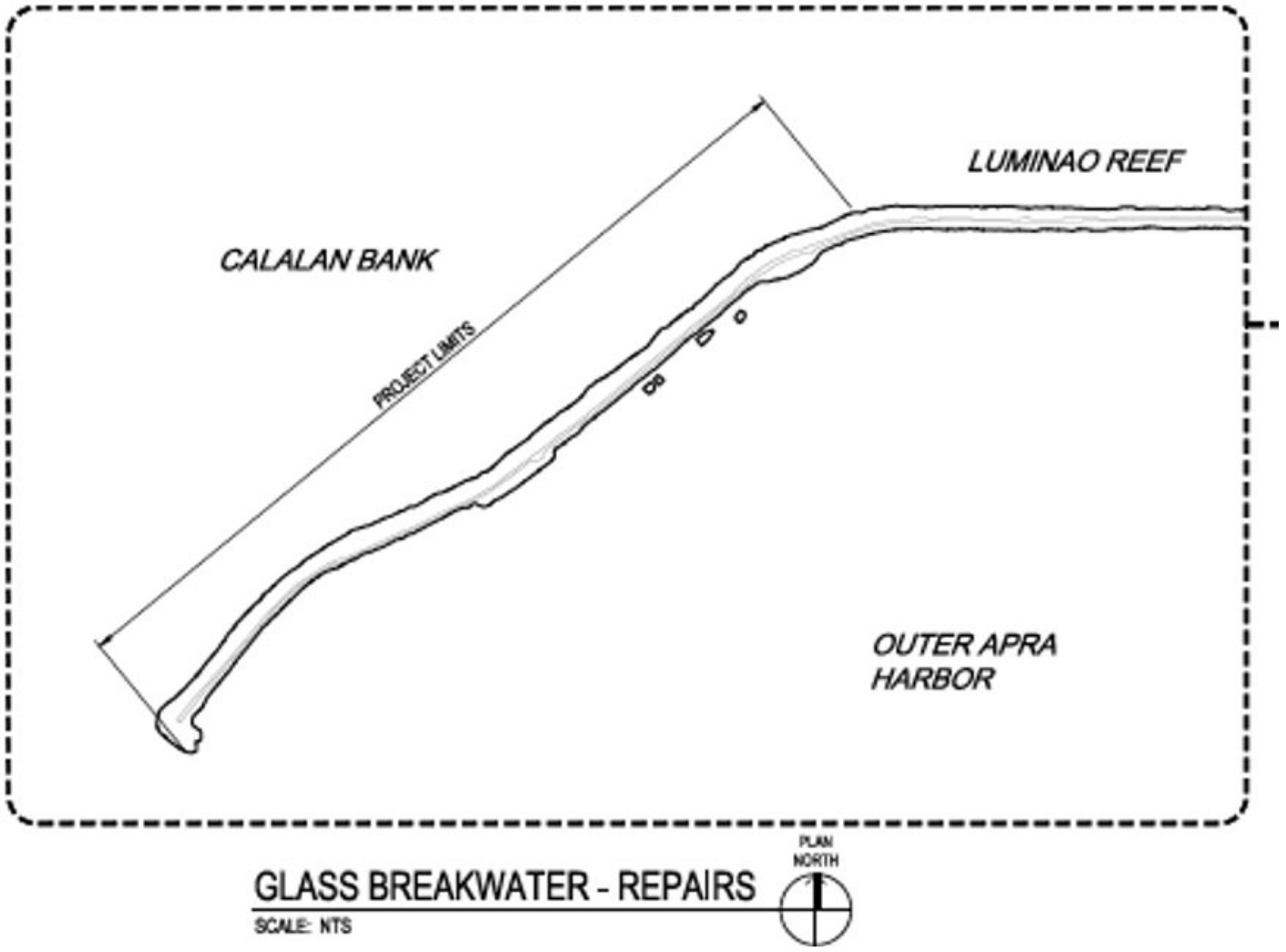
3.3.2 Affected Environment

The ROI for cultural resources is referred to as the area of potential effects (APE). The APE is the geographic area or areas within which an undertaking may disturb archaeological resources and/or directly or indirectly cause alterations in the character or use of historic properties. In this context, an

undertaking is defined as a project, activity, or program funded in whole, or in part, under the direct or indirect jurisdiction of a federal agency, including, among other things, processes requiring a federal permit, license, or approval. The term undertaking is synonymous with the Proposed Action and includes any demolition and construction activities occurring within the APE.

The entirety of the proposed undertaking would occur within Apra Harbor. The APE is defined as the project limits encompassed by the Proposed Action. The APE includes 87.7 acres (354,838 square meters) and consists of an area within and immediately adjacent to the Glass Breakwater within Apra Harbor (Figure 3-2).

Figure 3-2 Area of Potential Effect



3.3.2.1 Archaeological Resources

There are four known archaeological sites located within the APE (Table 3-6). Although the sites are located within the APE, the construction footprint does not overlap the sites; therefore, Navy reached a finding of *no adverse effects* for the proposed undertaking. In accordance with Section 106 of the NHPA, Navy provided the Guam State Historic Preservation Officer (SHPO) an opportunity to comment on the undertaking. The Navy received a letter from the SHPO, dated February 28, 2024 (Reference No. RC2024-0091), concurring with the *no adverse effects* finding. Appendix C provides the Section 106 Documentation.

Table 3-2 Archaeological Sites Located Within APE

Site	*Site Name*	*Recorded*	*Site Type*	*NRHP Status*
66-03-2206	Yosemite 2	Carrell 2009; Jeffery and Moran 2007	Artifact scatter from early-20th century shipwreck	Eligible
66-03-1078	American Tanker	Carrell et. al. 2020	Shipwreck	Eligible
66-03-2191	Seabee Junkyard	Jeffery 2012; Applegate-Palmer and Jeffery 2014; Applegate-Palmer 2015; Bush et al. 2017; Jeffery and Applegate-Palmer 2017	Dump Site	Eligible
66-03-2263	Val Bomber	Lauter-Reinman 1997, Jeffery and Drew 2007	Aircraft Wreck	Eligible

3.3.2.2 Architectural Resources

The Glass Breakwater, the only architectural resource located in the APE, is *eligible* for inclusion in the NRHP. The breakwater has been previously disturbed within the APE from construction of the service road along the crest and from damage related to multiple storms and typhoons. Extensive natural wave battering and erosion have also damaged the structure over time. The Proposed Action will utilize like-kind materials for the breakwater repair. Boulders/rip rap will match existing erosion measures in the area and will have minimal effects to the architectural integrity of the breakwater or surrounding visual landscape. Repairs of the Glass Breakwater are essential to maintain and ensure structural integrity. Failure to provide these repairs would lead to further damage to the historic property.

3.3.2.3 Traditional Cultural Properties

A TCP study for Guam was conducted in 2009, which included interviews, existing information on archaeological sites, ethnographic associations, and Chamorro myths (Griffin et al., 2010 in SEARCH, 2015). The study is considered preliminary in scope and additional research and consultation would be required to further define and evaluate the potential TCPs identified therein. According to the 2015 ICRMP, the remains of Sumay Village (Guam Register of Historic Places Site No. 66-03-1038) was the only site located at NBG identified as a potential TCP in Griffin et al. (2010). Sumay Village is a documented seventeenth-century community located on the north coast of the Orote Peninsula, outside the APE.

3.3.3 Environmental Consequences

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Direct impacts may be the result of physically altering, damaging, or destroying all or part of a resource, altering characteristics of the surrounding environment that contribute to the importance of the resource, introducing visual, atmospheric, or audible elements that are out of character for the period the resource represents (thereby altering the setting), or neglecting the resource to the extent that it deteriorates or is destroyed. Indirect effects to historic properties are those caused by the undertaking that are later in time or farther removed in distance but are still reasonably foreseeable.

3.3.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. Natural wave battering and erosion would continue to occur and damage the structure over time. Forthcoming storms and typhoons would accelerate structure damage to the structure. Failure to provide these repairs will lead to further damage, and eventual destruction, to the eligibly historic property. Therefore, significant impacts to cultural resources could occur with implementation of the No Action Alternative.

3.3.3.2 Alternative 1- Natural Rock Armor Layer Repair Potential Impacts

Alternative 1 would have no adverse effects to cultural resources. In accordance with Section 106 of the NHPA, the DON consulted with the Guam SHPO regarding the undertaking. The construction footprint does not overlap the archeological sites located within the APE as construction will be limited to 2.0 meters (6.56 feet) from the High Tide Line. The Glass Breakwater itself would have integrity restored with no appreciable changes to the visual or structural historic integrity. In consideration of the information on underwater archaeology and the built environment, DON determined that there would be *no adverse effect* to historic properties by the Proposed Action under NHPA Section 106. By letter dated February 28, 2024 (Reference No. RC2024-0091), the Guam SHPO concurred with the Navy's determination (see correspondence in Appendix C).

In the unlikely event that historic properties are inadvertently discovered within the project's APE during activities associated with the subject undertaking, then the Standard Operating Procedures contained within the Final Integrated Cultural Resources Management Plan NBG, Joint Region Marianas would be followed, as well as provisions of 36 CFR 800.13 Post-Review Discoveries.

Therefore, implementation of Alternative 1 would not result in significant impacts to cultural resources.

3.4 Biological Resources

Biological resources include living, native, or naturalized plant and animal species and the habitats within which they occur. Plant associations are referred to generally as vegetation, and animal species are referred to generally as wildlife. Habitat can be defined as the resources and conditions present in an area that support a plant or animal.

Within this EA, biological resources are divided into two major categories: (1) marine vegetation and non-coral benthic invertebrates and (2) marine wildlife. Threatened, endangered, and other special status species are discussed in their respective categories.

3.4.1 Regulatory Setting

Special-status species, for the purposes of this assessment, are those species listed as threatened or endangered under the Endangered Species Act (ESA) and species afforded federal protection under the Marine Mammal Protection Act (MMPA) or the Magnuson-Stevens Fishery Conservation and Management Act.

The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to conserve and recover listed species. Section 7 of the ESA requires action proponents to consult with the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) Fisheries to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species, or result in the destruction or adverse modification of designated critical habitat. Critical habitat cannot be designated on any areas owned, controlled, or designated for use by the DoD where an Integrated Natural Resources Management Plan has been developed that, as determined by the Department of Interior or Department of Commerce Secretary, provides a benefit to the species subject to critical habitat designation.

All marine mammals are protected under the provisions of the MMPA. The MMPA prohibits any person or vessel from "taking" marine mammals in the United States or the high seas without authorization. The MMPA defines "take" to mean "to harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal."

The Magnuson-Stevens Fishery Conservation and Management Act provides for the conservation and management of the fisheries. Under the Act, EFH consists of the waters and substrate needed by fish to spawn, breed, feed, or grow to maturity.

3.4.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under biological resources at NBG. Threatened and endangered species are discussed in each respective section below with a composite list applicable to the Proposed Action provided in Table 3-10.

Along with literature from prior studies, the marine biological resources information presented in this section includes results from the February and March 2024 of the Outer Harbor of the Glass Breakwater survey report.

3.4.2.1 Marine Vegetation and Non-Coral Benthic Invertebrates

Marine vegetation includes plants occurring in marine or estuarine waters. These may include mangroves, algae, and various grasses. Estuaries, sea grass beds, and mangrove forests occur in Apra Harbor, but not within the project area. Animals that live on the sea floor are called benthos. Most of these animals lack a backbone and are called invertebrates. Typical benthic invertebrates include sea anemones, sponges, corals, sea stars, sea urchins, worms, bivalves, crabs, and many more. (Note: Corals are discussed separately in Section 3-4.2.2).

Divers conducting benthic surveys in February and March 2024 noted damage on the Outer Breakwater in the form of boulder slides and locations where boulders were dislodged from the above-water structure and into the sea. Underwater locations of rockslides were indicated by the presence of white limestone boulders devoid of marine growth. Some boulders were also sheared and broken into pieces. Other boulders, some at a distance from one another, had rubbed against each other, yielding scarred white limestone (Kilarski et al. 2024).

The Outer Breakwater is a highly dynamic area with considerable wave energy. This location experiences the brunt of storms generated to the north as well as turbulent sea surface conditions from locally generated wind. The northeast section of the Outer Breakwater nearest the shallow reef flat of Luminao Reef experiences a strong southwesterly current that flows off the reef flat. The Outer Breakwater benthic habitat is composed of predominantly large limestone boulders that either have light turf algal growth or are encrusted by crustose coralline algae. The depths along the surveyed Outer Breakwater area range between 2 and 5 meters (7 to 15 feet).

Table 3-3. Inventory of Marine Vegetation and Non-Coral Benthic Invertebrates Observed during Transects in Outer Glass Breakwaters, February and March 2024

Species	Common Name	Status[a]	Abundance[b]
			Outer Breakwater
Macroalgae			
BRYOPSIDALES			
Bryopsidaceae			
Bryopsis pennata	N/A	Ind	—
Caulerpaceae			
Caulerpa racemosa var. *macrophysa*	N/A	Ind	—
Caulerpa serrulata	N/A	Ind	—
Codiaceae			
Tydemania expeditionis	N/A	Ind	—
Halimedaceae			
Chlorodesmis fastigiata	N/A	Ind	O
Halimeda sp.	N/A	—	—
Halimeda opuntia	N/A	Ind	—
CLADOPHORALES			
Valoniaceae			
Valonia ventricosa	N/A	Ind	—
Cyanobacteria			
COLEOFASCICULALES			
Coleofasciculaceae			
Symploca hydnoides	N/A	Ind	—
Brown Algae			
FUCALES			
Sargassaceae			
Turbinaria ornata	N/A	Ind	—
DICTYOTALES			

Dictyotaceae			
Dictyota grossedentata	N/A	Ind	—
Padina boryana	N/A	Ind	—
Red Algae			
BONNEMAISONIALES			
Bonnemaisoniaceae			
Asparagopsis taxiformis	N/A	—	—
CORALLINALES			
Lithophyllaceae			
Amphiroa Tribulus	N/A	—	—
NEMALIALES			
Galaxauraceae			
Actinotrichia fragilis	N/A	—	—
Non-coral Invertebrates			
Crustaceans			
DECAPODA			
Unidentified hermit crab	N/A	—	C
Echinoderms			
VALVATIDA			
Ophidiasteridae			
Linckia laevigata	N/A	Ind	—
Linckia multifora	N/A	Ind	—
Oreasteridae			
Culcita novaeguineae	N/A	Ind	—
CAMARODONTA			
Echinometridae			
Echinostrephus aciculatus	Needle-spined urchin	Ind	U
Echinometra mathaei	N/A	Ind	R
HOLOTHURIIDA			
Holothuriidae			
Actinopyga mauritiana	N/A	—	—
Actinopyga obesa	Plump sea cucumber	—	—
Actinopyga varians	White-spotted sea cucumber	—	—

Bohadschia argus	Leopard sea cucumber	Ind	—
Holothuria atra	N/A	Ind	—
SYNALLACTIDA			
Stichopodidae			
Stichopus chloronotus	N/A	Ind	U
Bivalves			
CARDIIDA			
Cardiidae			
Tridacna maxima	Maxima clam, giant clam	Ind	—
Gastropods			
CYCLONERITIDA			
Neritidae			
Nerita plicata	N/A	—	—
NEOGASTROPODA			
Muricidae			
Sistrum albolabris	N/A	—	—
TROCHIDA			
Tegulidae			
Rochia nilotica	Top shell	Ind	—
Sponges			
POECILOSCLERIDA			
Microcionidae			
Clathria (Thalysias) eurypa	N/A	—	—
TETHYIDA			
Hemiasterellidae			
Liosina paradoxa	N/A	—	—

Source: Kilarski et al, 2024
Note: N/A = not applicable.
[a] Status = distributional status for the Mariana Islands: Ind = Indigenous, native to Guam, but not unique to the Mariana Islands.
[b] Abundance: A = Abundant, observed in large numbers and widely distributed; C = Common, observed everywhere, although generally not in large numbers; O = Occasional, seen irregularly in small numbers; U = Uncommon, several to a dozen individuals observed; R = Rare, only one or two individuals observed.

3.4.2.2 Marine Wildlife

Coral

Corals are invertebrates that are related to anemones, jellyfish, and hydras. They are made of invertebrate polyps and can generally be categorized as either hard or soft. Hard corals have calcium carbonate skeletons, grow in colonies, and are reef-building animals that live in symbiosis with phytoplankton called zooxanthellae. Soft corals are flexible, have calcareous particles in their body walls for structural support, can be found in both tropical and cold ocean waters, do not grow in colonies or build reefs, and do not always contain zooxanthellae.

During a marine biological survey conducted along the Inner and Outer Breakwaters in February and March 2024 (Kilarski et al. 2024), data was collected on coral abundance, size-class distribution, and species composition. Table 3-4details the inventory of coral species observed in the Outer Glass Breakwaters during the 2024 survey.

Table 3-4 Inventory of Coral Species Observed in Outer Glass Breakwaters, February and March 2024

Species	Abundance[a]
	Outer Breakwater
Soft Corals	
OCTOCORALLIA	
Helioporidae	
Heliopora coerulea	—
Sinulariidae	
Sinularia sp.	—
Hard Corals	
SCLERACTINIA	
Acroporidae	
Acropora sp.	C
Acropora digitifera	O
Acropora globiceps[b]	O
Acropora humilis	O
Acropora hyacinthus	C
Acropora monticulosa	—
Acropora nana	—
Acropora nasuta	U
Acropora palmerae	O

Acropora polystoma	O
Acropora retusa	R
Acropora tenuis	U
Acropora valida	—
Astreopora ocellata	U
Astreopora gracilis	—
Montipora sp.	O
Montipora informis	—
Agariciidae	
Pavona chiriquiensis	U
Pavona duerdeni	—
Pavona varians	—
Astrocoeniidae	
Stylocoeniella armata	—
Diploastraeidae	
Diploastrea heliopora	U
Euphylliidae	
Euphyllia glabrescens	—
Galaxea fascicularis	—
Fungiidae	
Fungia fungites	—
Lithophyllon concinna	—
Leptastreidae	
Leptastrea sp.	U
Leptastrea purpurea	—
Lobophylliidae	
Echinophyllia orpheensis	—
Lobophyllia hemprichii	—
Lobophyllia robusta	—
Merulinidae	
Astrea annuligera	R
Astrea curta	O

Cyphastrea sp.	—
Dipsastraea pallida	U
Favites sp.	—
Goniastrea sp.	C
Goniastrea edwardsi	—
Goniastrea retiformis	—
Hydnophora microconos	U
Leptoria phrygia	O
Platygyra sinensis	R
Pocilloporidae	
Pocillopora sp.	A
Pocillopora ankeli	C
Pocillopora brevicornis	C
Pocillopora damicornis	—
Pocillopora grandis	U
Pocillopora ligulata	—
Pocillopora meandrina	O
Pocillopora verrucosa	O
Poritidae	
Porites sp.	C
Porites cylindrica	—
Porites lichen	—
Porites rus	C
Psammocoridae	
Psammocora sp.	—
Psammocora nierstraszi	—
ANTHOATHECATA	
Milleporidae	
Millepora exaesa	U
Millepora platyphylla	C

Source: Kilarski et al. 2024

[a] Abundance: A = Abundant, observed in large numbers and widely distributed; C = Common, observed everywhere, although generally not in large numbers; O = Occasional, seen irregularly in small numbers; U = Uncommon, several to a dozen individuals observed; R = Rare, only one or two individuals observed.

[b] ESA-listed species.

Based on the survey results, corals along the Outer Breakwater are generally scarce within two meters of the shoreline and become more abundant, diverse, and larger at approximately the three- to four-meter depth contour. The corals observed often showed signs of mechanical damage. Over the length of the Outer Breakwater, the highest abundance and diversity of corals within two meters of the shoreline occurs in the northeast section nearest the reef flat. The lowest coral cover is found in the in the distal third, including the breakwater tip, from shoreline to the breakwater toe.

Marine Mammals

Jurisdiction over marine mammals is maintained by NOAA Fisheries and the USFWS. NMFS maintains jurisdiction over whales, dolphins, porpoises, seals, and sea lions. The USFWS maintains jurisdiction for certain other marine mammal species, including walruses, polar bears, dugongs, sea otters, and manatees.

While it is common to observe marine mammals in the waters surrounding Apra Harbor (Hill et al. 2014, 2017, 2020; Martin et al. 2016), they are rarely observed within the harbor (Hill et al. 2017). A partially decomposed specimen recognized as a pygmy sperm whale (*Kogia breviceps*) was discovered at Naval Supply Depot Beach at NBG in 1989 (Sherwood 1989, as cited in Eldredge 2003). A group of six or more humpback whales (*Megaptera novaeangliae*) was photographed at the Apra Harbor entrance in January 1996 (Eldredge 2003; McNulty 2013). In 2016, filtered satellite tag locations from short-finned pilot whales (*Globicephala melas*) and a pantropical spotted dolphin (*Stenella attenuata*) were located inside Apra Harbor (Hill et al. 2017). The quality of at least one of the short-finned pilot whale tag locations was sufficient to confirm that the whale was inside the harbor (Hill et al. 2017).

Fish

Fish are vital components of the marine ecosystem. They have great ecological and economic aspects. To protect this resource, NMFS works with the regional fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. EFH has been described for approximately 1,000 managed species to date. EFH includes all types of aquatic habitat including wetlands, coral reefs, seagrasses, and rivers; all locations where fish spawn, breed, feed, or grow to maturity.

Myers and Donaldson (2003) conducted a literature review dating back to 1901 of fish species found in the Mariana Islands and adjacent territorial waters. In total, they listed 1,106 species of fishes known to be found in the region. Approximately 1,020 of the species detailed in the review were found in the inshore and epipelagic zones to a depth of 200 meters, and the vast majority of those fishes inhabit coral reefs.

In Outer Apra Harbor, visual transect surveys conducted at 5-meter depths found variable species richness between 10 sites, ranging from 48 different fish species at Polaris Point to 73 species at San Luis Beach (Schils et al. 2017). Although species richness and diversity varied among sites, the most common species observed among all sites was the bullethead parrotfish (*Chlorurus sordidus*). Fish abundance was also variable, ranging from 748 individuals to over 4,000 individuals observed at each site. Researchers determined that the abundance at most sites was comprised of damselfishes (Pomacentridae) or cardinalfishes (Apogonidae) and noted that cardinalfishes were particularly abundant at a number of protected sites in Outer Apra Harbor. The researchers also noted that two surgeonfishes, brown surgeonfish (*Acanthurus nigrofuscus*) and the striped bristletooth (*Ctenochaetus striatus*), were the most abundant acanthurids among sites.

In addition to benthic composition, coral abundance and distribution, coral species composition, and the presence of ESA-listed species, marine biological surveys conducted specifically for the Proposed Action also assessed fish abundance in multiple locations within the Action Area (Kilarski et al. 2024). Due to hazardous access conditions, fish surveys along the Outer Breakwater were limited to two 50-meter

transects adjacent to the entrance to Apra Harbor at water depths of 2 to 5 meters (approximately 7 to 15 feet). Individual fish were identified down to species, when feasible, and qualitative abundance ratings are provided for all species. Over the length of the breakwater, observations generally consisted of large schools of surgeonfishes and parrotfishes, in addition to a few snappers and trevally jack along the edges of the boulders at the toe of the breakwater. Overall, 16 fish species within six families were documented at the Outer Breakwater. A total of 37 individual fishes were observed at the tip of the Outer Breakwater, the majority of which were from the genus *Acanthurus*.

3.4.2.3 Essential Fish Habitat

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-297), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal fisheries management plan. Pursuant to the MSA, federal agencies must consult with NMFS on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH (MSA Section 305[b][2]). EFH is defined as those waters and substrate necessary to fish (or other species) for spawning, breeding, feeding, or growth to maturity (50 CFR 600.10).

Under the MSA, the United States has exclusive fishery management authority over all fishery resources found within its Exclusive Economic Zone (EEZ). The EEZ extends from the seaward boundary of each coastal state, including any Commonwealth, territory, or possession of the United States, to a distance of 200 nautical miles from the baseline from which the breadth of the territorial sea of the United States is measured (50 CFR 600.10). In the Pacific Islands, EFH has been designated for federally managed species referred to as Management Unit Species (MUS) that are cooperatively managed by NMFS and the Western Pacific Region Fishery Management Council (WPRFMC) (or Council). MUS in the Pacific Islands are fully described in the Council's Fishery Ecosystem Plans (FEPs) and include bottomfish, crustaceans, coral reef ecosystems, precious coral, and pelagic fish species caught in quantities sufficient to warrant management or monitoring by NMFS and the Council (NMFS 2023c).

The Proposed Action is located within the boundaries of the following FEPs: (1) Fishery Ecosystem Plan for the Mariana Archipelago (WPRFMC 2009a) and (2) Fishery Ecosystem Plan for Pacific Pelagic Fisheries of the Western Pacific Region (WPRFMC 2009b). The Mariana Archipelago FEP boundary includes all waters and associated marine resources within the EEZ surrounding the Commonwealth of the Northern Mariana Islands and the Territory of Guam (WPRFMC 2009a). Although there is overlap between the Mariana Archipelago FEP boundary and the Pacific Pelagic FEP boundary, the Mariana Archipelago FEP specifically manages demersal resources and habitats associated with the federal waters of the Mariana Archipelago (WPRFMC 2009a). The Pacific Pelagic FEP boundary encompasses all areas of pelagic fishing operations in the EEZ or in the high seas for any domestic vessels that (1) fish for, possess, or transship Pacific Pelagic MUS within the EEZ waters of the Western Pacific Region; or (2) land Pacific Pelagic MUS within the states, territories, commonwealths, or unincorporated U.S. island possessions of the Western Pacific Region (WPRFMC 2009b).

EFH has been designated within the project area for various MUS and life stages including eggs, larvae, juveniles, and adult bottomfish and Pacific pelagic species and all life stages of coral reef fauna and flora that comprise Mariana Islands coral reef ecosystems (NMFS 2024b). In addition to EFH, the Council has designated Habitat Areas of Particular Concern (HAPC) within EFH for all MUS. HAPCs are specific areas that are considered essential to the life cycle of MUS based on one or more of the following criteria: (1) the ecological function provided by the habitat is important; (2) the habitat is sensitive to human-induced environmental degradation; (3) development activities are, or will be, stressing to the habitat

type; or (4) the habitat type is rare (WPRFMC 2009a, 2009b). For Pacific pelagic species, HAPC is designated as the water column down to 1,000 meters that lie above all seamounts (i.e., undersea mountains) and banks within the EEZ shallower than 2,000 meters (WPRFMC 2009b) and is therefore not located within the project area in Apra Harbor. The Council designated all slopes and escarpments between 40 and 280 meters as HAPC for bottomfish, based on the known distribution and habitat requirements of adults (WPRFMC 2009a); these areas are not present within the project area.

One coral reef ecosystem HAPC has been designated in the Commonwealth of the Northern Mariana Islands, and five have been designated in Guam (WPRFMC 2009a). Of those HAPC areas that occur near Guam, one is located in Apra Harbor: Jade Shoals. Jade Shoals is considered a coral reef ecosystem HAPC due to rarity of habitat, ecological function, and susceptibility to human impact (WPRFMC 2009a). Although Jade Shoals is located within Apra Harbor, it is approximately 3.9 km (2.4 miles) east of the southernmost extent of Glass Breakwater and is therefore outside of the Action Area for the Proposed Action.

Table 3-5. Essential Fish Habitat within the Proposed Action Area

MUS	Species Complexes	Description of EFH in Action Area	HAPC in Action Area?
Pelagic	Temperate species Tropical species Sharks Squid	Eggs and larvae: the water column down to a depth of 200 meters (100 fathoms) from the shoreline to the outer limit of the EEZ. Juveniles and adults: the water column down to a depth of 1,000 meters (500 fathoms) from the shoreline to the outer limit of the EEZ.	No HAPC located within Apra Harbor or the Action Area.
Bottomfish	Shallow-water species (0–50 fathoms) Deep-water species (50–200 fathoms)	Eggs and larvae: the water column extending from the shoreline to the outer limit of the EEZ down to a depth of 400 meters (200 fathoms). Juveniles and adults: the water column and all bottom habitat extending from the shoreline to a depth of 400 meters (200 fathoms), encompassing steep drop-offs and high-relief habitats that bottomfish use throughout the Western Pacific Region.	No HAPC located within Apra Harbor or the Action Area.
Coral Reef Ecosystems	All currently or potentially harvested coral reef taxa[a]	Includes the water column and all benthic substrate to a depth of 50 fathoms from the shoreline to the outer limit of the EEZ.	Jade Shoals HAPC located within Apra Harbor but not within the Action Area.

Source: WPRFMC 2009a, 2009b.

Note: 1 fathom = 6 feet = 1.8 meters. Units provided in table are reported as presented in applicable FEPs (see Table 25 in WPRFMC 2009a and Table 14 in WPRFMC 2009b). EEZ = Exclusive Economic Zone; EFH = Essential Fish Habitat; HAPC = Habitat Areas of Particular Concern ; MUS = Management Unit Species.

[a] Currently harvested coral reef taxa include a variety of species assemblages (e.g., fishes, sharks, octopuses, eels, and turban shells) that are currently being harvested in state and federal waters (and for which some fishery information is available) and species that are likely to be targeted in the near future based on historical catch data. Potentially harvested coral reef taxa include "literally thousands of species encompassing almost all coral reef fauna and flora" (WPRFMC 2009a).

3.4.2.4 Threatened and Endangered Species

Threatened and endangered marine species protected under the ESA with NMFS jurisdiction that are reasonably likely to occur in the project area (Table 3-6) were identified from previous Navy Mariana Islands Training and Testing Supplemental Environmental Impact Statements/Overseas Environmental

Impact Statements (DoN 2015, 2020a), the Navy Marine Resources Assessment for the Marianas Operating Area (DoN 2005), Biological Opinions (NMFS 2020a), Navy Biological Assessments (NAVFAC and AECOS Inc. 2021), the Integrated Natural Resources Management Plan (INRMP) for Joint Region Marianas (DoN 2022), Biological Reports (NMFS 2023a), the NMFS ESA Critical Habitat Mapper (NOAA Fisheries 2024b), and recent biological surveys conducted in Apra Harbor (Gaos et al. 2020a, 2020b; Budd et al. 2023;Kilarski et al. 2024).

Table 3-6 lists the marine ESA-listed species that may be encountered during the Proposed Action.

Table 3-6 Threatened and Endangered Species Known to Occur or Potentially Occurring in the ROI and Critical Habitat Present in ROI

Scientific Name	*Common Name and DPS*	*Federal Status*	*Habitat*	*Presence in Action Area*	*Critical Habitat Designated in the Action Area*
Sea Turtles					
Chelonia mydas	Green turtle, Central West Pacific DPS	Endangered	Nearshore waters, nesting beaches, and offshore waters	Yes[a]	Nesting Areas: No Marine Areas: Proposed
Eretmochelys imbricata	Hawksbill turtle			Yes[a]	No
Fish					
Sphyrna lewini	Scalloped hammerhead shark, Indo-West Pacific DPS	Threatened	Coastal seas from intertidal to depths of 1,640 feet (500 meters); nearshore nursery habitat includes bays and estuaries	Yes[b]	No
Invertebrates					
Acropora globiceps	Hard coral	Threatened	Intertidal zone, upper reef slopes, and reef flats at depths <8 meters (<26 feet)	Yes	No, see Section 4.4.3 for exclusion
Tridacna derasa[c] *Tridacna squamosa* *Tridacna gigas*[d] *Hippopus hippopus*[d]	Giant clam Hi	Candidate	Shallow reefs, outer reef slopes, lagoons, and sandy bottoms	No	No

Source: 80 FR 221; Gaos et al. 2020a, 2020b; DoN 2022; NOAA Fisheries 2024c; Kilarski et al. 2024.
Note: DPS = Distinct Population Segment.
[a] Indicates nesting activity near the Action Area. Source: Gaos et al. 2020a, 2020b; NMFS 2023a.
[b] Apra Harbor may contain nursery habitat, but this supposition is based only on anecdotal observations of juvenile sharks in Sasa Bay and both adults and juveniles in the channel connecting Inner Apra Harbor and Sasa Bay (80 FR 221; DoN 2022).
[c] Likely to be functionally extinct on Guam. Source: Wells 1997; Paulay 2003b.
[d] Locally extinct on Guam. Source: Teitelbaum and Friedman 2008.

Sea Turtles

Of the six sea turtle species that are found in U.S. waters or that nest on U.S. beaches, all are designated as either threatened or endangered under the ESA. Sea turtles are highly migratory and utilize the waters of more than one country in their lifetimes. The USFWS and NOAA Fisheries share federal jurisdiction for sea turtles with the USFWS having lead responsibility on the nesting beaches and NOAA Fisheries, the marine environment. Population trends of green turtles vary among regions and nesting populations. In 2016, NOAA Fisheries and the USFWS issued a final rule to identify 11 populations as distinct population segments (DPS). The Central West Pacific DPS was classified as an “endangered” population due to their depleted status and continuing vulnerability (NOAA-NMFS & USFWS, 2016).

Green and hawksbill turtles are often associated with coral reef habitat (Becker et al. 2019). Based on vessel-based survey observations and captures as well as the analysis of Guam aerial survey data, the following areas appear to have high turtle density: (1) nearshore waters inside Apra Harbor near San Luis Beach and Gab Gab Beach; (2) nearshore waters near Spanish Steps; and (3) nearshore waters near Dadi Beach and Tipalao Beach outside of the harbor to the south (Gaos et al. 2020a). These areas are dominated primarily by patch reef communities where the sea turtles both forage and rest (Gaos et al. 2020a). Sea turtle densities are highest where there are healthy coral reefs and seagrass beds, low human densities, and marine protected areas (Martin et al. 2016). Though human population density is correlated with sea turtle density, a major concern is coastal development and the resulting degradation of nesting beaches and foraging areas. Threats to nesting beaches include construction and associated lighting, military activities such as testing and training, public use of beaches, and beach driving (NMFS and USFWS 1998a; 81 FR 20057). Vessel collisions may pose a risk to sea turtles in the nearshore waters of Apra Harbor and western Guam (DoN 2020a). Last, changes in temperature and climate change may cause nesting beach habitat to shift or disappear, changing the significance or position of nearby marine reproductive zones (88 FR 46693).

The Central West Pacific DPS green turtle is the most commonly observed sea turtle in the waters off Guam (Wiles et al. 1995; Martin et al. 2016; DoN 2022). Green turtles use the nearshore waters of Apra Harbor and Outer Apra Harbor and nest on three beaches within NBG Main Base: Spanish Steps, Dadi Beach, and Kilo Wharf (DoN 2022). Regular surveys of green turtle nests are carried out at Dadi Beach and Spanish Steps. During the nesting season, inspections are also occasionally carried out at other beaches on the NBG Main Base such as Gab Gab, San Luis, Polaris Point, and Tipalao, which may support sea turtle nesting (DoN 2022). The Spanish Steps at Orote Point are considered one of the main nesting sites on the island of Guam (Gaos et al. 2020a). Nesting activity is observed mainly from March through July, with some activity from December through February (DoN 2022). Based on the construction schedule, the Proposed Action will not overlap with the sea turtle nesting season.

In 2023, NMFS and the USFWS proposed additional critical habitat areas for threatened and endangered DPSs of green turtles in locations under U.S. jurisdiction (NMFS 2023a; 88 FR 46376; 88 FR 46572; 88 FR 46693). In accordance with the ESA, NMFS proposed critical habitat for DPSs of the green turtle that are vulnerable or endangered in regions under U.S. control to include the nearshore waters off the coast of Guam. NMFS proposed critical habitat includes marine portions of the project area and would extend from the mean high-water line to a depth of 20 meters to protect access to nesting beaches, migratory corridors, and important feeding and resting areas (88 FR 46572). Concurrently, the USFWS proposes to designate terrestrial habitat for five DPSs of green turtles as critical habitat, which includes the Central West Pacific DPS (88 FR 46376). This designation includes lands where green turtles bask, nest, incubate, hatch, and travel to the sea. One acre of critical habitat for green turtles has been proposed by USFWS inside Apra Harbor, but is not within the Proposed Action Area. No other critical habitat is designated or proposed near the Proposed Action.

Compared to green sea turtle, hawksbill turtle occurs in low numbers in Guam waters and does not occur in large numbers anywhere within the Marianas (NMFS and USFWS, 2007; Martin et al., 2016, as cited in DON, 2018) except possibly around Rota. Hawksbill turtles have been seen within all areas of Apra Harbor, which may provide important foraging and resting areas for this species (Kolinski, 2001; Smith et al., 2009; Brindock, 2015; Guam DAWR, 2015; Jones et al., 2015, in DON 2018). Two sightings of hawksbill sea turtles occurred along Orote Peninsula: one in November 2003 and the other in October

2004 (Smith & Marx, 2006). No hawksbill turtles were observed in the 2019 and 2020 biological surveys of the project area (NAVFAC Marianas, 2019, 2020 in NAVFAC Pacific, 2021). The portion Glass Breakwater to be repaired under the Proposed Action is unlikely to support hawksbill turtle nesting activity due to its rocky shoreline and limited amount of sandy coastal habitat (DoN 2022).

Scalloped Hammerhead

The scalloped hammerhead shark is a warm-water species distributed widely throughout the tropics and composed of four endangered or threatened DPSs (Miller et al. 2014). All scalloped hammerhead sharks near Guam are included in the Indo-West Pacific DPS, which was listed as threatened in 2014 (79 FR 38213). There have been few confirmed sightings of scalloped hammerhead sharks in Guam; both confirmed and anecdotal sightings have been rarely reported since 1968 (Kami 1971; MacNeil et al. 2020). Recent environmental DNA (eDNA) studies have confirmed the occurrence of scalloped hammerhead shark eDNA within Apra Harbor at both Inner Apra Harbor and Orote Point (Budd et al. 2021). Budd et al. (2021) report that this represents the first confirmed occurrence since the sighting reported in 1968 by Kami (1971). Further studies have positively identified scalloped hammerhead shark eDNA collected from the Inner Harbor, Sasa Bay, Orote Point, Middle Shoals, and Blue Hole during a monthly study from February 2019 to July 2020 (Budd et al. 2023). Sasa Bay has previously been suggested as a potential nursery area based only on anecdotal observations (Miller at al. 2014). Budd et al. (2023) documented positive detections of scalloped hammerhead sharks in most months of the year but most commonly from September through April. Detections occurred in nearly all months in Inner Apra Harbor (Budd et al. 2023), with other locations being more sporadic. No further evidence of Sasa Bay acting as a nursery has been identified, and no mention of Sasa Bay was included in the most recent 5-year status review by NMFS (NMFS 2020b). Furthermore, the high level of human activity and the lack of quality habitat in Inner Apra Harbor may limit their presence in the area (DoN 2019a), and no critical habitat has been designated or proposed in Apra Harbor. With the lack of observational evidence, large numbers of scalloped hammerhead sharks are unlikely to occur in the project area, and the likelihood of encountering a solitary shark is remote.

Hard Coral

Acropora globiceps is a reef-building, branching hard coral species found in the Indo-Pacific that was listed as threatened under the ESA by NMFS in 2014 (79 FR 53852).On Guam, *A. globiceps* is widely distributed on reef flats and upper reef slopes around the island and seems to favor conditions where reasonably intense wave motion is possible (DoN 2022; NMFS 2023b). It has the most records (n = 24) from different places on Guam among the federal ESA-listed species that are known to occur there (DoN 2022). In Apra Harbor, coral-supporting shallow reef flats are present in Sasa Bay, San Luis, Gab Gab, and Spanish Steps (DoN 2022).

Coral assessments in 2010 for a proposed aircraft carrier wharf in Apra Harbor did not record *A. globiceps* as being present (DoN 2022). During a non-systematic search of the nearshore area at Dadi Beach in September 2016, a solitary colony measuring roughly 25–30 centimeters (10–15 inches) across was discovered from the reef crest south of Dadi Beach (DoN 2022). Biological monitoring near Kilo Wharf also revealed the presence of *A. globiceps* (Schils et al. 2011, as cited in DoN 2022), which has not been documented in that area of the harbor since the survey (DoN 2022). During recent marine biological surveys conducted in February and March 2024 for this Project, 29 colonies of *A. globiceps* were located in the Proposed Action Area (Kilarski et al. 2024).

Giant Clam

In June 2017, NMFS published a 90-day finding and concluded that seven species of giant clams may be eligible for listing under the ESA (82 FR 28946). The seven candidate species include two species in the genus Hippopus (*H. hippopus* and *H. porcellanus*) and five species in the genus Tridacna (*T. derasa, T. gigas, T. mbalavuana* [tevoroa], T. *squamosa*, and *T. squamosina* [costata]) (82 FR 28946). A status review is currently underway for these species, and the proposed listing(s) have not yet been determined as warranted.

Four of the seven candidate giant clam species have been known to occur in Guam (*Hippopus hippopus, Tridacna derasa, T. gigas*, and *T. squamosa*) (Paulay 2003b; bin Othman et al. 2010). *H. hippopus* and *T. gigas* are considered to be extirpated, or locally extinct, on Guam (Teitelbaum and Friedman 2008). Wells (1997) reported *T. derasa* as extinct on Guam and the Northern Mariana Islands, and that T. squamosa may also be extinct on Guam. In 1982, Guam's Department of Agriculture started a giant clam restocking program to translocate three species of giant clams (*T. derasa, T. gigas*, and *T. squamosa*) to Guam (Teitelbaum and Friedman 2008). The translocated *T. derasa* species were introduced from Palau, and while the introduced animals survived, no recruitment has been observed (Paulay 2003b). The attempt to translocate *T. gigas* to Guam was unsuccessful (Paulay 2003b). Starting in 2021, there have been new and increased efforts to develop community-run giant clam aquaculture projects on Guam, particularly in two southern villages, Inalåhan and Malesso (NOAA Fisheries 2022). Initially, giant clams were collected from various Guamanian reefs and planted into Inalåhan tide pools located on the southeast side of the island. A more recent effort funded by NOAA has led the Aquaculture Association of Palau to supply Guam with 1,000 giant clams (*T. maxima*), some of which will serve as broodstock for future projects (NOAA Fisheries 2022; NMFS Letter of Concurrence [LOC] PIRO-2021-03457). No ESA-candidate giant clam species have been translocated as part of the aquaculture effort that began in 2021.

Tridacna maxima, commonly known as the small giant clam or maxima clam, is the most common giant clam species found on Guam (Smith et al. 2009; Wells 1997). While *T. maxima* was one of the giant clam species petitioned, it was not listed as one of the candidate species (82 FR 28946). *T. maxima* have been found widely dispersed across the Orote Peninsula ERA and Dadi Beach outside of Apra Harbor (Smith et al. 2009).

During marine biological surveys for Apra Harbor waterfront repairs, giant clams (*Tridacna* spp.) were located three times in the Outer Breakwater (Kilarski et al. 2024). The marine biological survey report does not identify which species of giant clams were observed. While it is more probable that all observed giant clam species were *T. maxima*, there is a remote possibility that some individuals could be the ESA-candidate species *T. squamosa*.

Candidate species have no protections under the ESA, therefore ESA-candidate *Tridacna* spp. are not discussed beyond this section in this assessment. As a candidate species, no critical habitat for the Tridacninae giant clams is proposed or designated in the project area.

3.4.3 Environmental Consequences

This analysis focuses on marine vegetation and non-coral benthic invertebrates, and marine wildlife that are important to the function of the ecosystem or are protected under federal law or statute.

3.4.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. However, there could be impacts to biological resources if the breakwater continues to degrade and erode. As noted in 2024 benthic surveys, damage on the Outer Breakwater is already occurring in the form of boulder slides and locations where boulders were dislodged from the above-water structure and into the sea (Kilarski et al. 2024). Underwater locations of rockslides were indicated by the presence of white limestone boulders devoid of marine growth. Some boulders were also sheared and broken into pieces. (Kilarski et al. 2024). Continued erosion of rock and stone along the slope would occur, thus further damaging marine vegetation and non-coral benthic invertebrates, threatened and endangered corals, and associated EFH. Therefore, significant impacts to biological resources could occur with implementation of the No Action Alternative.

3.4.3.2 Alternative 1- Natural Rock Armor Layer Repair Potential Impacts

The study area for the analysis of effects to biological resources associated with Alternative 1 includes marine waters directly surrounding the Guam Glass Breakwater.

Marine Vegetation and Non-Coral Benthic Invertebrates

Alternative 1 is unlikely to result in significant effects to marine vegetation and non-coral benthic invertebrates. Construction activities will be contained within the existing breakwater footprint, and repairs will likely be carried out using a land-based crane from the top of the existing breakwater. The areas requiring repairs will focus on sections of the breakwater that are in critical condition. These areas are located on the oceanside (outer) portion of the existing breakwater. Any in-water work has the potential to impact marine vegetation and non-coral benthic invertebrates; however, based on the nature of the Proposed Action and the proposed BMPs described, most elements of the Proposed Action are expected to have minimal and temporary impacts. Therefore, the project would have less than significant impacts on marine vegetation and non-coral benthic invertebrates.

Marine Wildlife

Marine Mammals

Alternative 1 is unlikely to result in significant effects to marine mammals. Concrete armor units and armor rocks will be placed in water carefully because each unit must interlock with its neighbors to form a strong structure. Careful placement will minimize noise levels associated with armor placement. Based on the rarity of marine mammal sightings within Apra Harbor, the limited size of the project area along outer shorelines of Glass Breakwater, and the 46-meter (50-yard) shutdown zone for marine mammals, no effects on marine mammals from the Proposed Action are anticipated. No critical habitat for marine mammals is designated in the project footprint.

Essential Fish Habitat

The MSA defines an adverse effect on EFH as “any impact that reduces quality and/or quantity of EFH,” including direct or indirect physical, chemical, or biological alterations of waters or substrate and loss of or injury to benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH (50 CFR 600.10). Adverse effects on EFH may result from actions occurring directly within EFH or outside of EFH and may include site-specific or habitat-wide impacts including individual, cumulative, or synergistic consequences of actions. As noted

previously, the WPRFMC has designated EFH and management objectives for various life stages of three MUS that occur within, occur near, or are dependent on the Action Area: bottomfish MUS, pelagic MUS, and MUS associated with coral reef ecosystems. In the absence of detailed survey data, it is assumed that all life stages of some species from each of the three MUS could occur within the Action Area.

The Project-specific marine biological surveys documented a modest community of sessile (i.e., fixed in place) invertebrates and algae and a diverse assemblage of fish along the inner and outer portions of the breakwater. Observed fish consist of juveniles and adults from a variety of species typically found in coral reefs, including some from the genera described in the Mariana Archipelago FEP for shallow-water complex bottomfish that occur at depths of less than 100 meters (i.e., *Lethrinus*, *Cephalopholis*, and *Caranx*). Relative to bottomfish MUS and pelagic MUS, none of the fish species specifically listed in the Mariana Archipelago FEP or Pacific Pelagic FEP were observed within the study area. However, numerous MUS that are designated as "Currently Harvested Coral Reef Taxa" in the Mariana Archipelago FEP (see Table 21 and Table 22 in WPRFMC 2009a) were observed during the Project-specific marine biological surveys (e.g., various species of surgeonfishes [Acanthuridae], wrasses [Labridae], and parrotfishes [Scaridae]). As noted previously, the ESA-listed coral *A. globiceps* was observed in small numbers along the Outer Breakwater.

The Proposed Action involves emergency resetting of existing armor rock and concrete units that have shifted in position, and placing new armor rock or concrete armor units to rebuild the Glass Breakwater to engineering standards. Construction activities will be contained within the existing breakwater footprint, and repairs will likely be carried out using a land-based crane from the top of the existing breakwater. The areas requiring repairs will focus on sections of the breakwater that are in critical condition. These areas are located on the oceanside (outer) portion of the existing breakwater.

In-water work has the potential to impact EFH in the marine environment. Effects on EFH for coral reef ecosystems will be commensurate with those described in the Biological Assessment/Essential Fish Habitat Assessment with respect to ESA-listed corals (Appendix B). Based on the nature of the Proposed Action and the proposed BMPs described, most elements of the Proposed Action are expected to have minimal and temporary impacts and risks of adversely affecting EFH (Table 3-7).

Table 3-7 shows that potential effects on EFH may result from exposure to the following environmental stressors:

- Removal of Marine Invertebrate Community
- Increased Turbidity and Suspended Sediments
- Elevated Noise Levels
- Wastes and Discharges
- Aquatic Invasive Species
- Chemical Contaminants
- Hypoxia

The Proposed Action will temporarily reduce water quality due to an increase in turbidity and suspended sediments during in-water work. Adverse effects will be minimized through the implementation of

numerous BMPs including, but not limited to, avoiding in-water work during coral spawning periods, limiting construction to within 2 m (6.56 ft) of the high tide line, and safe equipment use and management. Due to implementation of appropriate BMPs, the relative quantity and quality of existing EFH within the Action Area, and the size and scale of anticipated effects, the Proposed Action is not expected to appreciably diminish habitat value over the long term. In addition, considering the actions will be beneficial to EFH over the long term, the project would have less than significant impacts on EFH.

Table 3-7 Summary of Potential Effects of the Proposed Action on EFH

Environmental Stressor	Probability of Occurrence	Severity[a]	Risk Level[b]	Anticipated Effects on EFH	Measures to Minimize Adverse Effects
Removal and relocation of marine invertebrate community	Unlikely	Significant	Low	• Temporal loss of ecological function and habitat structure	• Safe equipment use and management • Avoid work during coral spawning periods • Minimizing in-water work to greatest extent possible and no more than 2 m from HTL
Increase in turbidity and suspended sediment	Unlikely	Moderate	Low	• Temporary reduction in water quality in the immediate Project footprint.	• Avoid work during coral spawning periods • Erosion control practices • Inclement weather contingency • Careful and precise placement of armor rocks
Elevated underwater noise levels	Unlikely	Moderate	Low	• Temporary degradation of underwater soundscape for the duration of pile installation and removal. • Risk of exposure during other activities unlikely due to implementation of minimization measures and BMPs.	• Safe equipment use and management
Wastes and discharges	Unlikely	Negligible	Low	• Risk of exposure unlikely due to implementation of minimization measures and BMPs	• Safe equipment use and management • Oil spill contingency plans
Aquatic invasive species					
Chemical contaminants					
Hypoxia					

Note: BMPs = best management practices; EFH = Essential Fish Habitat.

[a] Level of severity (i.e., negligible, moderate, or significant) is determined by the anticipated intensity, duration, and frequency of exposure to a particular environmental stressor.

[b] Risk level (i.e., low, moderate, or high) provides an overall summary of the likelihood of potential effects of the Proposed Action ("Probability of Occurrence") combined with the potential severity of exposure to a particular environmental stressor ("Severity").

Threatened and Endangered Species

Under the ESA, the effects of the action refer to the direct and indirect effects of an action on the species or critical habitat together with the effects of other activities that are interrelated or interdependent with that action and that would be added to the environmental baseline. Indirect effects are those that are caused by the Proposed Action and are later in time, but still are reasonably certain to occur (50 CFR § 402.02). Section 7(a)(2) states that each Federal agency shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species, or destroy/adversely modify designated critical habitat, as is responsible for making one of the following effects determinations: No Effect; May Affect, but Not Likely to Adversely Affect; or Likely to Adversely Affect.

The Navy initiated informal consultation with NMFS under ESA Section 7 (Appendix B). In its assessment, the Navy considered potential impacts resulting from the Proposed Action on ESA-listed species that may occur within the Action Area. The Navy also considered project designs and BMP measures that would be implemented to avoid and/or minimize such anticipated impacts to the greatest extent practicable. Based on the anticipated low occurrence of ESA-listed species within the project area, the Navy determined that Proposed Action has the potential to affect, but is not likely to adversely affect ESA-listed species, as such adverse effects have been determined either insignificant or discountable.

The Proposed Action has the potential to affect the following ESA-listed species: the endangered Central-West Pacific DPS of green turtle (*Chelonia mydas*), the endangered hawksbill turtle (*Eretmochelys imbricata*), the threatened Indo-West Pacific DPS of scalloped hammerhead shark (*Sphyrna lewini*), and the threatened *Acropora globiceps* hard coral.

The following environmental stressors were evaluated:

- Elevated Noise Levels
- Increased Suspended Sediments
- Disturbance from Human Activity and Equipment Operation
- Direct Physical Contact
- Wastes and Discharges
- Entanglement

Table 3-8 ESA- Listed Species Environmental Risk Assessment Summary

Environmental Stressor	Probability of Occurrence	Severity[a]	Exposure to Consequences of Proposed Action: Risk Level[b]	Measures to Offset Effects of Action	Risk Assessment for ESA-listed Turtles and Sharks[c]	Risk Assessment for ESA-listed Corals[c]
Elevated underwater noise levels	Unlikely	Negligible	Low	• Marine fauna observers • Shutdown zone	Insignificant	Discountable
Increased suspended sediments	Unlikely	Negligible	Low	• Erosion control practices • Avoiding in-water work, and if so limiting to 2 m from high tide line • Inclement weather contingency • Avoid work during coral spawning	Insignificant	Discountable
Disturbance from human activity and equipment operation	Unlikely	Negligible	Low	• Shutdown zone • equipment use & management • Safe vessel use & management	Discountable	Insignificant
Direct physical contact	Unlikely	Moderate	Low	• Marine fauna observers • Shutdown zone • Safe equipment use & management • Debris containment • Oil spill contingency plans • Avoiding in-water work, and if so limiting to 2 m from high tide line	Discountable	Insignificant
Wastes and discharges	Unlikely	Negligible	Low	• Debris containment • Oil spill contingency plans	Discountable	Discountable
Entanglement	Unlikely	Negligible	Low	• Debris containment • Marine fauna observers	Discountable	Discountable

Note: ESA = Endangered Species Act of 1973.

[a] Level of severity (i.e., negligible, moderate, or significant) is determined by the anticipated intensity, duration, and frequency of exposure to a particular environmental stressor.

[b] Risk level (i.e., low, moderate, or high) provides an overall summary of the likelihood of potential effects of the Proposed Action ("Probability of Occurrence") combined with the potential severity of exposure to a particular environmental stressor ("Severity").

[C] Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur.

The following sections summarize potential impacts to ESA-protected species from the expected environmental stressors. Detailed discussion on each stressor and its expected impacts on ESA species is found in Appendix B (NAVFAC Pacific, 2021).

Sea Turtles and Scalloped Hammerhead Shark

The Proposed Action is expected to have minimal impacts and risks to sea turtles and the scalloped hammerhead shark (Table 3-8) due to the low likelihood of their occurrence in the project area, in addition to the BMPs incorporated into the project design.

On-shore critical habitat for the green turtle has been proposed by USFWS but not yet designated (88 *Federal Register* [FR] 46376). One acre of critical habitat for green turtles has been proposed inside Apra Harbor, but it is not located along the section of Glass Breakwater planned for repair. In the same *Federal Register* publication, NMFS concurrently proposed in-water critical habitat for the green turtle that includes the nearshore waters off the coast of Guam from the mean high-water line to a depth of 20 meters to protect access to nesting beaches, migratory corridors, and important feeding and resting areas (88 FR 46572). This proposed critical habitat is located along the section of Glass Breakwater planned for repair. No critical habitat for other ESA-listed species has been proposed for or is designated in Apra Harbor.

Noise

The Proposed Action has the potential to produce temporary and intermittent elevated in-air and underwater noise levels. Activities that have the potential to produce elevated in-air and underwater noise include:

- Placement of armor rock and concrete armor units above the water
- Placement of armor rock and concrete armor units in water
- Equipment use on the Glass Breakwater road

The Proposed Action does not overlap with the green turtle nesting season (March through July, with some activity seen from December through February [DoN 2022]), and none of the activities associated with the Proposed Action are likely to generate noise levels in air that extend to areas used by nesting sea turtles. Nesting beaches do not occur in the Action Area, and nesting is not known to occur along the areas planned for repair or construction staging areas on the Glass Breakwater.

Concrete armor units and armor rock will not be dropped onto the breakwater. Placement of concrete armor units and armor rock in water will take place with intention, as each unit must interlock with its neighbors to form a strong structure. Careful placement will reduce in-air noise levels. Operation of heavy equipment, such as a crane or trucks carrying armor rock along the breakwater road is highly unlikely to generate sound or vibration levels high enough to disturb marine animals in the water column. Sound does not transmit well through the air-water interface, and most of the sound energy moving from air to water will be scattered and dispersed in the irregular, rocky nearshore environment. Additionally, BMPs will be implemented to avoid potential exposure to elevated noise.

In-water noise will be generated if concrete armor units and armor rock need to be placed in water. As described above, placement of armor is an exacting process, and armor will not be dropped into

the water but will be placed carefully in each location, minimizing noise and sediment displacement. Implementation of BMPs will avoid potential exposure to elevated noise.

High ambient in-water noise levels are likely to result from regular harbor traffic. As a result, any sea turtles and scalloped hammerhead sharks in the area may already be habituated to moderate levels of anthropogenic noise.

No elements of the Proposed Action have the potential to generate sound levels intense enough to cause injury or harm to marine species likely to occur in the Action Area. In addition, implemented BMPs will further reduce the potential for acoustic impacts, as all in-water work will stop when an ESA-listed sea turtle or shark approaches or is sighted within a shutdown zone of 46 meters (50 yards) of the proposed in-water work.

Increased Suspended Sediments

The Proposed Action is unlikely to increase suspended sediments in the water column during armor rock placement. Ship traffic within the harbor is known to increase suspended sediments in the water column. The process of placing concrete armor units on existing armor or bedding stone may cause silt to be deposited into the marine environment from movement of the armor or from runoff, but the armor rocks will be placed precisely to avoid this to the maximum extent. Additionally, construction activities and agitation of the existing breakwater may result in sediment deposition into marine waters.

The introduction of silt to the marine harbor may increase turbidity. This increase may worsen with the creation of sediment plumes due to removal and the placement of armor rock. Sediment plumes from the removal and placement of armor rock along the Outer Breakwater are expected to dissipate quickly due to high wave and current energy and be temporary in nature. Direct impacts of suspended sediments on sharks and sea turtles are understudied and generally unknown. However, ESA-listed species that use vision to locate prey may be temporarily disadvantaged by increases in turbidity, as it reduces their ability to locate prey. Reduced visibility may also impact the ability of ESA-listed species to avoid predators (Johnson 2018). Shark respiration may be altered by increased suspended sediment in the water column if introduced to respiratory pathways. Respiratory impacts are not anticipated to affect sea turtles, as they respire with air from the terrestrial environment.

While mobile ESA-listed species may be able to depart from areas if increased suspended sediments disrupt their typical behavior, the ability to flee may be negated if plumes are created that are large enough to confine these species (Johnson 2018). However, because rocks would be placed individually and methodically, sediment plumes are not expected, let alone plumes large enough to have an effect on these species. Further, BMPs will be implemented to minimize the effects of sedimentation to the greatest extent possible.

Disturbance from Human Activity and Equipment Operation

The Proposed Action will increase human activity and equipment use within and adjacent to the marine environment for the duration of the Project.

Project-related activity in the Action Area will increase human presence, ambient noise levels, and potential for interaction with ESA-listed sea turtles and sharks. However, Apra Harbor is a site of regular human and mechanical activity onshore and in the water, and animals that enter and remain in Apra Harbor are expected to be habituated to some degree to human activity. Despite their likely

habituation to ambient activity levels, increased human activity has the potential to disturb normal behavior of ESA-listed sea turtles and sharks in Apra Harbor. Expected reactions range from benign investigation of or attraction to the activity, avoidance of the area, or the extreme, panicked fleeing with potential self-injury during flight.

Green and hawksbill turtles are known to be present in Apra Harbor, although occurrences are expected to be rare for hawksbill turtles and low for green turtles. In the unlikely case that either species swims into the marine portion of the Action Area, it is expected that they will avoid Project activity along the nearshore and affected in-water work areas. Because scalloped hammerheads have not been visually observed in the harbor for over a decade, it is unlikely that they occur in numbers or at frequencies that would expose individual sharks to Project-related disturbance.

BMPs will be implemented to ensure that intentional interactions with ESA-listed sea turtles and sharks are avoided and that unintentional interactions are minimized to the greatest extent practicable. In-water work is limited to 2m from the high tide line, which avoids these species altogether, as sea turtles have not been observed resting or nesting along this portion of the shore.

Direct Physical Contact

The Proposed Action involves the use of heavy and handheld machinery. All of this machinery will be operated from land and will only minimally enter the water when placing the armor rock. Project activities occurring in water have an unlikely potential for direct physical contact with ESA-listed sea turtles and sharks. With BMPs in place to avoid intentional interactions with ESA-listed sea turtles and sharks, the potential for direct physical impact by heavy machinery or equipment operated in the marine environment is discountable. Direct physical impact of ESA-listed marine species will be avoided to the greatest extent practicable through the implementation of BMPs.

Wastes and Discharges

The Proposed Action will utilize heavy equipment and machinery nearshore for the placement of armor rock in water. The use of such equipment presents potential risks to the marine environment from leaked fuel, petroleum lubricants, and other hydrocarbon-based pollutants, exposing ESA-listed species to toxic substances.

Chemical pollutants resulting from accidental spills and discharge from construction activities harm biologically important nearshore ecosystems and can result in mortality of ESA-listed species including sea turtles (NMFS and USFWS 1998a). If released in large quantities, the toxic substances may cause avoidance of the affected area, serious injury, or, in severe cases, death. The effects of pollutants and contaminants on scalloped hammerhead sharks have not been conclusively determined; however, it is likely contaminants bioaccumulate in this species because of their role as an apex predator in the marine ecosystem (84 FR 46938). If a chemical is accidentally discharged or spilled during the Project, it is likely that the quantity would be small in volume (e.g., less than 25 liters [DoN 2020b, as cited in NMFS 2020c]); however, due to the implementation of BMPs, it is unlikely that this event would occur.

The severity of marine debris as a threat in Guam is unknown (NMFS and USFWS 1998a); however, the effects can be severe (Nama et al. 2023). Project wastes such as plastic trash or bags are especially of concern due to the risk of ingestion or entanglement (NMFS and USFWS 1998a). In

marine vertebrate species, marine debris can result in dietary dilution, ingestion of contaminants, digestive blockage and tearing (Domènech et al. 2018), restricted mobility, drowning, starvation, smothering, and wounding, potentially leading to infections, amputation of limbs, and death (Gamage and Senevirathna 2020). The leaching of chemicals from marine debris, specifically of plastic debris, could result in compromised immunity and infertility in exposed species (Gamage and Senevirathna 2020).

No debris will be allowed to enter the water during the Proposed Action. To reduce the potential for Project-related marine debris generation, all waste will be controlled and disposed into trash dumpsters or roll-off bins in the Project base yard or storage area.

The occurrence of exposure to wastes and discharges such as these will be avoided and minimized to the greatest extent practicable through development and implementation of an Oil Spill Contingency Plan contained within the SWPPP, which includes measures to prevent (and respond to) inadvertent discharges of construction wastes into the marine environment. Petroleum-spill-containment devices (e.g., absorbent pads, containment booms) will be located on site in sufficient quantity and available and accessible for immediate deployment at all times. However, in the unlikely event of a spill or discharge, the effects would be insignificant because accidental spills or discharge will be of small amounts and cleaned quickly.

Entanglement

Marine animals could be entangled by trash and debris during the Proposed Action. Materials could be encountered by and have the potential to entangle animals at the surface, in the water column, and along the seafloor. Potential impacts depend on how a marine animal encounters and reacts to the items that pose an entanglement risk, which depend on risk factors such as animal size, sensory capabilities, and foraging methods. Most entanglements are attributable to encounters with fishing gear or other materials that float or are suspended at the surface. Smaller entangled animals are inherently less likely to be detected than larger ones, but larger animals may subsequently swim off while still entangled, towing lines or fishing gear behind them.

If severely entangled, sea turtles cannot forage underwater or breathe at the surface. Serious injury may result in a lost limb and/or increased vulnerability to predation. Animals that become entangled in nets, lines, ropes, or other foreign objects under water may suffer temporary impairments to movement before they free themselves, or they may remain entangled. Entangled individuals may suffer temporary, minor injuries but recover fully, or they may be severely injured or die.

For sharks, entanglement most commonly occurs from ghost fishing gear and other anthropogenic debris and may result in starvation, suffocation, immobilization, and death (Parton et al. 2019). If these individual impacts increase to greater levels within shark or sea turtle populations, entanglement may have negative implications on reproductive success and survival rates beyond the potential effects of any single project.

Entanglement from equipment and gear typically used for breakwater armoring projects is unlikely. Project debris and trash will be controlled so that they do not enter harbor waters. There will be no lines, chains, or flexible elements deployed in the water.

A. globiceps

ESA-listed corals could be negatively impacted by human disturbance and equipment operation from the Proposed Action through the placement and movement of armor rock. *A. globiceps* colonies within

the Project footprint along the Outer Breakwater may be partially or fully buried by armor rock. Contact between heavy equipment or armor rock and *A. globiceps* colonies would likely result in tissue abrasion or loss through fracture and fragmentation, which could result in partial or full colony mortality. As part of the Proposed Action and to the best extent practicable, the Navy will attempt to avoid movement of armor rock with ESA-listed corals attached and/or placement of armor rock onto ESA-listed corals.

Acropora globiceps, is known to occur in outside the Action Area. The coral spawning period is estimated to be approximately 21 days total each year, including 8 days prior to the full moon and 14 days after (Richmond and Hunter 1990). If applicable, no in-water work will occur during coral spawning periods to avoid sensitive spawn timing and maximize the reproductive success of *A. globiceps*.

Noise

ESA-listed corals may be affected by elevated noise levels during larval dispersal and settlement. Studies have shown that healthy coral reef soundscapes can function as habitat cues for larvae of coral, as well as other marine reef species, to settle (Popper and Hawkins 2018; Suca et al. 2020; Aoki et al. 2024). Anthropogenic sounds such as vessel noise may disrupt the settlement behaviors of coral planulae (Lecchini et al. 2018). BMPs would prevents in-water activities from occurring during hard and soft coral spawning season. Elevated noise levels as a result of the Proposed Action are not anticipated impact established ESA-listed coral colonies.

Increased Suspended Sediments

ESA-listed corals may be impacted by elevated turbidity through increased suspended sediments leading to light attenuation and/or sediment smothering. The primary concern for corals is light attenuation as a result of elevated turbidity, rather than the increased suspended sediments themselves (Bessell-Browne et al. 2017). Corals are phototrophic epibenthic organisms that may be negatively impacted by low light periods (Jones et al. 2020). While some coral species may be more susceptible to sediment smothering, branching corals are highly resilient due to their morphology (Jones et al. 2019). Elevated turbidity and increased suspended sediments as a result of the Proposed Action is expected to be absent, and in the occasion that some sedimentation does occur it will be extremely temporary, and unlikely to rise to a level that could cause harm to Acropora globiceps. In an experiment to examine the impacts of dredging on corals, Jones et al. (2020) found that while some coral species exhibited partial mortality as a result of being exposed to low light conditions, all species and colonies survived the 42-day exposure period of the experiment.

Turbidity throughout the Apra Harbor is higher than outside the harbor, and this ambient condition will minimize minor Project-related effects on ESA-listed species from elevated turbidity. Project activities such as armor rock placement are unlikely to generate the same elevated levels of increased suspended sediments as dredging activities and will be taking place intermittently. Additionally, because the outer breakwater experiences high levels of wave energy and water movement, any increased sediments will disperse from the area quickly. Therefore, *A. globiceps* colonies within the Project footprint along the Outer Breakwater are not expected to experience effects from elevated turbidity and increased suspended sediments.

Disturbance from Human Activity and Equipment Operation

ESA-listed corals are highly unlikely to be negatively impacted by human disturbance and equipment operation from the Proposed Action through the placement and movement of armor rock. *A.*

globiceps colonies outside the Project footprint along the Outer Breakwater will not be impacted by the placement of armor rock.

Direct Physical Contact

While the direct physical contact of equipment or humans with an individual vertebrate species would likely constitute an adverse effect, the same assumption does not hold for listed corals due to two key biological characteristics (as described in NMFS LOC PIRO-2023-02697 from December 2023):

- All corals are sessile invertebrate animals that rely on their stinging nematocysts for defense, rather than predator avoidance via flight response. While it may be logical to assume that physical contact with a vertebrate organism results in stress that constitutes harm, harassment, or take, the same does not apply to corals because they have no flight response.
- Most reef-building corals, including all listed species, are clonal organisms. This means that a single larva settles and develops into the primary polyp, which then multiplies into a colony of hundreds to thousands of genetically-identical polyps that are connected through tissue and skeleton. Colony growth is achieved mainly through the addition of more polyps, and colony growth is indeterminate. The colony can continue to exist even if numerous polyps die, or if the colony is broken apart or otherwise damaged. The individual of these listed species is defined as the colony, not the polyp, in the final coral-listing rule (79 FR 53852). Thus, affecting some polyps of a colony does not necessarily constitute harm to the individual colony.

Wastes and Discharges

Chemical pollutants resulting from accidental spills and discharge from construction activities harm biologically important nearshore ecosystems and can result in mortality of ESA-listed species including coral communities (NMFS and USFWS 1998a). As stated previously, if a chemical is accidentally discharged or spilled during the Project, it is likely that the quantity would be small in volume and BMPs would in place if this event would occur.

Marine debris could damage ESA-listed corals via tissue abrasion, fracturing or fragmentation, and light attenuation (Chiappone et al. 2005; Arindra Putra et al. 2021; Muhammad et al. 2021). No debris will be allowed to enter the water during the Proposed Action. To reduce the potential for Project-related marine debris generation, all waste will be controlled and disposed into trash dumpsters or roll-off bins in the Project base yard or storage area.

Entanglement

ESA-listed corals are fragile and susceptible to damage from entanglement, such as from fishing gear and other marine debris (Yoshikawa and Asoh 2004; Beneli et al. 2020; Figueroa-Pico et al. 2020; Suka et al. 2020; Arindra Putra et al. 2021). Damage from entanglement can cause tissue abrasion, fracturing, and fragmentation, which may lead to mortality (Chiappone et al. 2005; Figueroa-Pico et al. 2020). Branching corals are particularly vulnerable to entanglement due to their morphology (Chiappone et al. 2005; Valderrama Ballesteros et al. 2018). If exposed to marine debris or equipment and gear associated with the Proposed Action, *A. globiceps* could be affected through entanglement.

Summary of Determination

Based on its Biological Assessment (Appendix B), the Navy determined the following with respect to ESA:

- The project is ***not likely to adversely affect*** the Central West Pacific DPS green turtle
- The project is ***not likely to adversely affect*** the hawksbill turtle
- The project is ***not likely to adversely affect*** the Indo-west Pacific DPS scalloped hammerhead shark
- The project is ***not likely to adversely affect*** the ESA-listed coral *A. globiceps*

There would be no significant impact on threatened and endangered species. Informal consultation with NMFS is currently ongoing.

3.5 Public Health and Safety

This discussion of public health and safety includes consideration for any activities, occurrences, or operations that have the potential to affect the safety, well-being, or health of members of the public. A safe environment is one in which there is no, or optimally reduced, potential for death, serious bodily injury or illness, or property damage. The primary goal is to identify and prevent potential accidents or impacts on the general public. Public health and safety within this EA discusses information pertaining to construction activities, operational safety, as well as hazardous materials, hazardous waste, toxic substances, and contaminated sites. However, MEC are analyzed in detail, as there are no known hazardous materials or waste contamination sites within the project areas.

Public health and safety during construction activities is generally associated with construction traffic, as well as the safety of personnel within or adjacent to the construction zones.

Operational safety refers to the actual use of the built-out proposed project, and potential risks to inhabitants or users of adjacent or nearby land and water parcels.

3.5.1 Regulatory Setting

Hazardous materials are defined by 49 CFR section 171.8 as “hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table, and materials that meet the defining criteria for hazard classes and divisions in 49 CFR part 173.” Transportation of hazardous materials is regulated by the U.S. Department of Transportation regulations. Hazardous wastes are defined by the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments, as: “a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.” Certain types of hazardous wastes are subject to special management provisions intended to ease the management burden and facilitate the recycling of such materials. These are called universal wastes and their associated regulatory requirements are specified in 40 CFR part 273. Four types of waste are currently covered under the universal wastes regulations: hazardous waste batteries, hazardous waste pesticides that are either recalled or collected in waste pesticide collection programs, mercury containing equipment, and hazardous waste lamps, such as fluorescent light bulbs.

The DoD established the Defense Environmental Restoration Program (DERP) to facilitate thorough investigation and cleanup of contaminated sites on military installations (active installations, installations subject to Base Realignment and Closure, and formerly used defense sites). The Installation Restoration Program and the Military Munitions Response Program are components of the DERP. The Installation Restoration Program requires each DoD installation to identify, investigate, and clean up hazardous waste disposal or release sites. The Military Munitions Response Program addresses nonoperational rangelands that are suspected or known to contain unexploded ordnance, discarded military munitions, or munitions constituent contamination. The Environmental Restoration Program is the Navy's initiative to address DERP.

3.5.2 Affected Environment

The Guam Glass Breakwater is maintained in order to provide the safe navigation of Outer Apra Harbor for both military logistics as well as the protection of life and safety of the civilian population.

The Navy has implemented a strict Hazardous Material Control and Management Program and a Hazardous Waste Minimization Program for all activities. These programs are governed Navy-wide by applicable Office of the Chief of Naval Operations instructions and at the installation by specific instructions issued by the Base Commander. The Navy continuously monitors its operations to find ways to minimize the use of hazardous materials and to reduce the generation of hazardous wastes.

NBG has been classified into areas of high likelihood or low likelihood of encountering MEC. The construction footprint of Alternative 1 is located in an area of low likelihood of encountering MEC.

3.5.3 Environmental Consequences

The ROI for public health and safety concerns during construction and operational activities includes the health and well-being of military personnel and civilians living on or in the vicinity of NBG, as well across the entire island of Guam.

The ROI for concerns related to MEC is focused on the project area of the Glass Breakwater and Apra Harbor. As noted earlier, the analysis contained in this section focuses on potential for encountering MEC during project repairs.

3.5.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur. No repairs would be done to the Guam Glass Breakwater. A fully maintained and functioning breakwater provides for the safe navigation of Outer Apra Harbor for both military logistics at NBG, as well as the protection of life and safety of the civilian population on Guam. If the breakwater is breached, severe wave action and siltation of the Outer Apra Harbor would likely occur. This would adversely impact marine navigation channels and make it impassable for commercial vessels, military vessels, and submarines. Commercial vessels support fuel, bulk materials, produce, and container transport, which are critical to maintain essential services, such as power, transportation, medical care, groceries, and more. Marine traffic movements are critical to support military missions in this part of world.

Under the No Action Alternative, the Proposed Action would not occur and there would be no MEC concerns.

Therefore, significant impacts would occur to Public Health and Safety with implementation of the No Action Alternative due to the impacts of a non-functioning breakwater.

3.5.3.2 Alternative 1- Natural Rock Armor Layer Repair Potential Impacts

Alternative 1 would provide the needed emergency repairs to the Guam Glass Breakwater; therefore, safeguarding the shore facilities and infrastructure within the harbor from severe wave action during typhoons and other heavy weather events. Military and commercial vessel would be able to safely and effectively pass through the marine navigations channels, thus continuing to support and provide vital services to the island of Guam.

BMPs would be employed in the event MEC is encountered during construction. Contractors would manage any oil wastes and fluids in accordance with NBG management plans.

Therefore, implementation of Alternative 1 would not result in significant impacts to Public Health and Safety.

3.6 Climate Change and Greenhouse Gases

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. These emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere helps regulate the earth's temperature and contributes to global climate change. GHGs include water vapor, carbon dioxide, methane, nitrous oxide, ozone, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential, which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the earth's surface.

3.6.1 Regulatory Setting

The USEPA specifically identified carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride as GHGs (U.S. Environmental Protection Agency, 2009) (74 Federal Register 66496). These gases influence global climate by trapping heat in the atmosphere that would otherwise escape to space. Increased concentrations of these gases due to human activities is the primary cause of global warming observed over the last 70 years and contributes significantly to climate change (National Academy of Sciences, 2020). GHGs have varying global warming potential (GWP). GWP is a measure of how much energy the emissions of 1 ton of a gas absorb over a given period of time (usually 100 years), relative to the emissions of 1 ton of CO2 (U.S. Environmental Protection Agency, 2023a). The reference gas for GWP is CO2; therefore, CO2 has a GWP of 1. Other common GHGs that result from human activity include CH4, which is estimated to have a GWP of 27–30 over 100 years; and N2O, which has a GWP of 273. CO2, and to a lesser extent, CH4 and N2O, are products of combustion and are generated from stationary combustion sources as well as vehicles, aircraft, and vessels. High GWP gases include GHGs that are used in refrigeration/cooling systems, such as chlorofluorocarbons and hydrofluorocarbons.

Currently, there are no regulatory thresholds of significance for GHG emissions; however, the CEQ released interim guidance on when and how federal agencies should consider GHG emissions and climate change in NEPA analyses (Council on Environmental Quality, 2023). The guidance emphasizes that when conducting climate change analyses in NEPA reviews, agencies should consider the following: (1) the potential effects of a proposed action on climate change, including by assessing both GHG emissions and reductions from the proposed action; and (2) the effects of climate change on a proposed action and its environmental impacts.

The guidance states that federal agencies should quantify the reasonably foreseeable direct and indirect GHG emissions of their proposed actions and reasonable alternatives (as well as the no action

alternative). The guidance also recommends that "agencies provide additional context for GHG emissions, including through the use of the best available social cost of GHG estimates, to translate climate impacts into the more accessible metric of dollars, allow decision makers and the public to make comparisons, help evaluate the significance of an action's climate change effects, and better understand the tradeoffs associated with an action and its alternatives." (Council on Environmental Quality, 2023).

Guam currently does not have a GHG program in place.

3.6.2 Affected Environment

The Proposed Action is anticipated to release GHGs into the atmosphere. These emissions are quantified for the Proposed Action and compared to the No Action Alternative. Global GHG in 2022 reached a high of 54.59 billion metric tons (MT) of CO2e (Ritchie et al., 2020). CO2e is a measurement of the total greenhouse gases emitted, expressed in terms of the equivalent measurement of carbon dioxide. As shown in Table 3-9, in 2021, the U.S. emitted over 6,300 million MT of CO2e.

Table 3-9 Trends U.S. Greenhouse Gas Emissions, Million MT CO2e

Economic Sector	2017	2018	2019	2020	2021
Industry	1,973.9	2,033.2	2,011.2	1,852.9	1,909.2
Transportation	1,846.0	1,876.2	1,879.2	1,629.2	1,809.5
Commercial	1,060.4	1,074.5	1,029.7	930.5	972.2
Residential	962.3	1,034.9	982.0	918.3	953.8
Agricultural	693.0	709.8	690.7	671.5	671.5
U.S. Territories	26.3	26.3	25.1	23.6	24.1
Total	**6,561.8**	**6,754.8**	**6,617.9**	**6,026.0**	**6,340.2**

Source: U.S. Environmental Protection Agency (2023b)
Note: Emissions from U.S. Territories are based on the fuel consumption in American Samoa, Guam, Puerto Rico, U.S. Virgin Islands, Wake Island, and other outlying U.S. Pacific Islands

On Guam, the primary GHGs emitted are CO2, CH4, and N2O from combustion of fuel (U.S. Environmental Protection Agency, 2024b).

Table 3-10 presents the 2022 reported GHG emissions for large emitting facilities on Guam. These facilities are required to submit data to the USEPA's Greenhouse Gas Reporting Program. AAFB, MCBCB, and NBG are not among the large emitting facilities that are subject to USEPA GHG reporting.

Table 3-10 Facilities GHG Emissions – 2022, MT CO2e

Facility Name	City	GHG Emissions
Dededo Combustion Turbine Generating Facility	Dededo	116,446
Guam Power Authority - Cabras Power Plant	Piti	509,914
Layon Municipal Solid Waste Landfill	Inarajan	57,575
Macheche Combustion Turbine	Dededo	35,806
Marianas Energy Company	Piti	282,195
Piti 7 Combustion Turbine	Piti	158,737
Tenjo Vista Power Plant	Piti	6,505
Yigo Combustion Turbine	Yigo	86,779
Yigo Diesels	Yigo	54,234
Total GHG Emissions from Large Emitting Facilities - 2022		**1,308,218**

Note: Numbers may not add up due to rounding
Source: U.S. Environmental Protection Agency 2023a

3.6.2.1 Sources of Emissions

The following activities would generate GHG emissions during the proposed action, primarily by the combustion of fuel.

- Emissions from government and construction vehicles

3.6.3 Environmental Consequences

Climate change presents a global problem caused by increasing concentrations of GHG in the atmosphere. This section discusses the potential effects that could result from implementation of the Proposed Action's GHG emissions on climate change. GHG emissions generated from the Proposed Action contribute to the global atmosphere, regardless of the specific location within the ROI that they are produced.

3.6.3.1 No Action Alternative

Under the No Action Alternative, there would be no change from current levels of construction in Apra Harbor. Proposed breakwater repairs would not occur; therefore, no significant impacts on climate change and greenhouse gases would occur as a result of implementation of the No Action Alternative. If the proposed breakwater repairs do not occur, the breakwater will continue to erode and degrade with increased wave action and storms. Wave action and storms are intensifying due to climate change; therefore, climate change and greenhouse gases could have a significant effect on the breakwater itself.

3.6.3.2 Alternative 1- Natural Rock Armor Layer Repair Potential Impacts

Per Table 3-11, GHG emissions generated from the Proposed Action would total 189 MT of CO2e in 2024 and 881 MT of CO2e in 2025.

Table 3-11 Increase in GHG Emissions from Proposed Action, CO2e (MT) per year

Source Type	Emissions Increase, CO_2e (MT) in 2024	Emissions Increase, CO_2e (MT) in 2025
100-T Crawler Crane	23	108
Air Compressor	6	29
Backhoe	5	25
Compressor	5	21
Dozer	32	149
End Dump Truck	1	8
Excavator	19	87
Flatbed Truck	1	6
Forklift Truck	7	30
Generator	6	29
Generator	41	191
Passenger Truck	0	3
Pickup Truck	1	5
Rough Terrain Crane	14	66
Skid Steer Loader	3	13
Truck Crane	20	94
Water Truck	4	30
Total	**189**	**881**

Source: Appendix A

This total is equivalent to the following greenhouse gas emissions per US. EPA's Greenhouse Gas Equivalencies Calculator (US Environmental Protection Agency 2024a):

- 255 gasoline-powered passenger vehicles driven for one year
- 2,736,597 miles driven by an average gasoline-powered passenger vehicle

This total is equivalent to the following CO_2 emissions per US. EPA's Greenhouse Gas Equivalencies Calculator (US Environmental Protection Agency 2024a):

- 120,401 gallons of gasoline consumed
- 105,108 gallons of diesel consumed
- 140 homes' energy use for one year
- 0.003 natural gas-fired power plants in one year
- 2,477 barrels of oil consumed
- 70,637,852 number of smartphones charged

The GHG emissions temporarily generated from proposed site preparations and construction would result in a minor increase of GHG emissions and no detectable GWP changes resulting from the emission levels associated with these activities. Therefore, climate change and greenhouse impacts would be less than significant as a result of implementation of the Proposed Action.

3.7 Summary of Potential Impacts to Resources and Impact Avoidance and Minimization

A summary of the potential impacts associated with the action alternative and the No Action Alternative and impact avoidance and minimization measures are presented in Tables 3-12.

Table 3-12 Summary of Potential Impacts to Resource Areas

Resource Area	*No Action Alternative*	*Alternative 1*
Air Quality	No Impact	Less than significant. Temporary construction period impacts due to equipment and vehicle exhaust with implementation of BMPs.
Water Resources	No Impact	Less than significant. Temporary construction period impacts on marine waters due to in-water work.
Cultural Resources	Significant Impact	Less than significant. Construction and operational period impacts. No historic properties affected.
Biological Resources	Significant Impact	Less than significant. Construction period impacts with implementation of BMPs and avoidance, minimization, and offset measures.
Public Health and Safety	Significant Impact	Less than significant. Construction period impacts. BMPs would be employed in the event MEC is encountered during construction. Contractors would manage any oil wastes and fluids in accordance with NBG management plans.
Climate Change and Greenhouse Gases	No Impact	Less than significant.

4 Cumulative Impacts

This section (1) defines cumulative impacts, (2) describes past, present, and reasonably foreseeable future actions relevant to cumulative impacts, (3) analyzes the incremental interaction the Proposed Action may have with other actions, and (4) evaluates cumulative impacts potentially resulting from these interactions.

4.1 Definition of Cumulative Impacts

The approach taken in the analysis of cumulative impacts follows the objectives of NEPA and CEQ regulations and guidance. In accordance with 40 CFR 1508.1(i), agencies shall consider effects from the proposed action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in time or farther removed in distance from the proposed action or alternatives.

4.2 Scope of Cumulative Impacts Analysis

The scope of the cumulative impacts analysis involves both the geographic extent of the effects and the time frame in which the effects could be expected to occur. For this EA, the study area delimits the geographic extent of the cumulative impacts analysis. In general, the study area will include those areas previously identified in Chapter 3 for the respective resource areas. The time frame for cumulative impacts centers on the timing of the Proposed Action.

Another factor influencing the scope of cumulative impacts analysis involves identifying other actions to consider. Beyond determining that the geographic scope and time frame for the actions interrelate to the Proposed Action, the analysis employs the measure of “reasonably foreseeable” to include or exclude other actions. For the purposes of this analysis, public documents prepared by federal, state, and local government agencies form the primary sources of information regarding reasonably foreseeable actions. Documents used to identify other actions include notices of intent for EISs and EAs, management plans, land use plans, and other planning related studies.

4.3 Past, Present, and Reasonably Foreseeable Actions

This section will focus on past, present, and reasonably foreseeable future projects at and near the Proposed Action locale. In determining which projects to include in the cumulative impacts analysis, a preliminary determination was made regarding the past, present, or reasonably foreseeable action. Specifically, it was determined if a relationship exists such that the affected resource areas of the Proposed Action (included in this EA) might interact with the affected resource area of a past, present, or reasonably foreseeable action. If no such potential relationship exists, the project was not carried forward into the cumulative impacts analysis. In accordance with CEQ guidance, these actions considered but excluded from further cumulative effects analysis are not catalogued here as the intent is to focus the analysis on the meaningful actions relevant to informed decision-making. Projects included in this cumulative impacts analysis are listed in Table 4-1.

Table 4-1 Cumulative Action Evaluation Cumulative Impact Analysis

Action	*Level of NEPA Analysis Completed*
Alpha and Bravo Wharf Improvements	Environmental Assessment (EA)/Finding of No Significant Impact (FONSI)
Apra Harbor Wharf Improvements (Uniform & Tango, MILCON P-204)	FEIS/ROD
Inner Apra Harbor Maintenance Dredging	EA/FONSI
Kilo Wharf Extension	FEIS/ROD
Ocean Dredged Material Disposal Site Offshore of Guam	FEIS/ROD
Polaris Point Beach Restoration	Record of Categorical Exclusion (CATEX)
Polaris Point Seawall Repair	CATEX
X-Ray Wharf Improvements – North Berth (MILCON P-518)	EA/FONSI
MILCON P-661 Navy-Commercial Tie-In Hardening	EA/FONSI
Underwater Electromagnetic Measurement System (UEMMS) (RM18-1828)	EA/FONSI
X-Ray Wharf Improvements – South Berth (MILCON P-519)	EA/FONSI
Mariana Islands Training and Testing (Regional)	NEPA EIS/Overseas EIS
Glass Breakwater Repairs	EA
Polaris Point Rock Revetment	CATEX
Sumay Marina Entrance - EOD Point	CATEX
Sumay Marina MWR Docks	CATEX
Sumay Marina Entrance - Sumay Point	CATEX
Lima, Mike, November Wharf Repair and Modernization	EA/FONSI
MILCON P-676 Polaris Point Pier	TBD
Oscar, Papa, Quebec, and Romeo Wharves Maintenance Dredging	TBD
Port Authority of Guam (PAG) Modernization Program	EA/FONSI
Repair Finger Pier	TBD
Repair Oscar, Papa, and Quebec Wharves	TBD
P-835 (formerly P1103U) Lima Wharf and Inner Apra Harbor Dredge EA	EA
Guam and Commonwealth of the Northern Mariana Islands (CNMI) Military Relocation	FEIS/ROD

The following analysis of cumulative impacts is organized by resource area in the same order presented in Chapter 3. Only the resource areas that have the potential to have cumulative impacts resulting from the incremental effects of Alternative 1 are addressed. The Proposed Action is not anticipated to have incremental impacts in the following resource areas that would overlap temporally or spatially in a way

that would be cumulatively significant with those of the past, present, and reasonably foreseeable actions identified in Section 4.3: cultural resources, public health and safety, and climate change and greenhouse gases. Therefore, these environmental resource areas are not analyzed in detail in this section. Where feasible, the cumulative impacts were assessed using quantifiable data; however, for many of the resources included for analysis, quantifiable data is not available and a qualitative analysis was undertaken. In addition, where an analysis of potential environmental effects for future actions has not been completed, assumptions were made regarding cumulative impacts related to this EA where possible. The analytical methodology presented in Chapter 3, which was used to determine potential impacts to the various resources analyzed in this document, was also used to determine cumulative impacts.

The analyses show that, when considered with relevant past, present, and reasonably foreseeable projects, the incremental effects of Alternative 1 would not contribute to cumulative impacts on pertinent resource areas. Because it would not contribute any incremental effects, the No Action Alternative would not result in cumulative impacts on the relevant resource areas during construction.

4.3.1 Air Quality

4.3.1.1 Description of Geographic Study Area

The ROI for air quality includes the SO_2 nonattainment area as described in Section 3.1.

4.3.1.2 Relevant Past, Present, and Future Actions

Past projects have been completed and associated construction period air quality emissions would have dispersed. All present and reasonably foreseeable actions may interact with the Proposed Action's air quality impacts if their construction occurs concurrently with that of the Proposed Action.

Projects currently under construction may interact with the Proposed Action's air quality impacts if construction of the Proposed Action occurs concurrently with any of the projects. The future Glass Breakwater Repairs project, Polaris Point Rock Revetment, and Sumay Marina projects are scheduled to begin no earlier than mid-2025 and would not overlap with the Proposed Action of this EA.

4.3.1.3 Cumulative Impact Analysis

Cumulative air quality impacts from past, present, and future actions within the ROI would be less than significant because, as described in Section 3.1, transport of air emissions to public areas would be infrequent and when they occur, air pollutant concentrations are expected to be low.

The Proposed Action construction period is anticipated to late 2024 or early 2025. The construction periods for projects listed in Table 4-1 are unlikely to overlap with the Proposed Action's construction period. Cumulative air quality impacts within the ROI would be less than significant because impacts from the proposed action are expected to be low and would not overlap with impacts from past, present and foreseeable actions.

4.3.2 Water Resources

4.3.2.1 Description of Geographic Study Area

The ROI for water resources includes the Outer Apra Harbor water column in the vicinity of the Glass Breakwater.

4.3.2.2 Relevant Past, Present, and Future Actions

Past projects have been completed and marine water quality has presumably returned to background levels. Ongoing Mariana Islands Training and Testing activities in Outer and Inner Apra Harbor have a limited potential area of impact (i.e., small zones immediately adjacent to the explosive charge), are generally widely dispersed in space and time, and were determined to result in changes to water quality below applicable standards, regulations, and guidelines. Relevant Marine Corps relocation projects are future projects that may interact with the Proposed Action's water quality impacts if implemented during its construction period.

4.3.2.3 Cumulative Impact Analysis

Cumulative water resources impacts from past, present, and future actions within the ROI would be less than significant because water quality effects of past actions would not overlap temporally or spatially with the Proposed Action's temporary construction period water quality impacts. In addition, the Proposed Action's construction period water quality impacts would be avoided or minimized through the use of BMPs. Therefore, implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts within the ROI.

4.3.3 Biological Resources

4.3.3.1 Description of Geographic Study Area

The ROI for water resources includes the Outer Apra Harbor water column in the vicinity of the Glass Breakwater.

4.3.3.2 Relevant Past, Present, and Future Actions

None of the past or present actions are within the biological resources ROI for the Proposed Action. Further maintenance repairs are planned for the Glass Breakwater that have the potential to impact biological resource. Work would include preparation of subgrade, placement of bedding rocks, fabrication and installation of concrete armor units. In-water work would be required and cannot be limited to above water limitations. Temporary piles may need to be placed in the Outer Apra Harbor in portions of the sandy ocean bottom.

4.3.3.3 Cumulative Impact Analysis

Cumulative biological resource impacts from past, present, and future actions within the ROI would be less than significant. All Proposed Action's construction (and operational) period biological impacts would be avoided, minimized, and/or mitigated through the use of BMPs. Consultation with NMFS would be conducted as appropriate. Therefore, implementation of the Proposed Action combined with the past, present, and reasonably foreseeable future projects, would not result in significant impacts within the ROI.

5 Other Considerations Required by NEPA

5.1 Consistency with Other Federal, State, and Local Laws, Plans, Policies, and Regulations

In accordance with 40 Code of Federal Regulations (CFR) section 1502.16(a)(5), analysis of environmental consequences shall include discussion of possible conflicts between the Proposed Action and the objectives of federal, regional, state and local land use plans, policies, and controls. Table 5-1 identifies the principal federal and state laws and regulations that are applicable to the Proposed Action, and describes briefly how compliance with these laws and regulations would be accomplished.

Table 5-1 Principal Federal and State Laws Applicable to the Proposed Action

Federal, State, Local, and Regional Land Use Plans, Policies, and Controls	*Status of Compliance*
National Environmental Policy Act (NEPA); CEQ NEPA implementing regulations; Navy procedures for Implementing NEPA	Complies; EA and FONSI anticipated
Clean Air Act	Complies; Exempt from General Conformity (see Appendix A)
Clean Water Act	Section 401 Water Quality Certification waiver to be obtained; National Pollutant Discharge Elimination System permit not required
Rivers and Harbors Act	Section 10 Rivers and Harbors Act permit to be obtained
Coastal Zone Management Act	CZMA consultation completed (see Appendix D)
National Historic Preservation Act	Section 106 consultation completed (see Appendix C)
Endangered Species Act	Section 7 consultation completed (see Appendix B)
Magnuson-Stevens Fishery Conservation and Management Reauthorization Act	EFH consultation completed (see Appendix B)
Marine Mammal Protection Act	Taking of marine mammals under the MMPA is unlikely
Executive Order 12088, Federal Compliance with Pollution Control Standards	BMPs, avoidance and minimization measures would address pollution control
Executive Order 12114, Environmental Effects Abroad of Major Federal Actions (Department of Navy implementing regulation 32 CFR part 287)	No significant effects
Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations	No significant effects
Executive Order 13089, Coral Reef Protection	BMPs, avoidance and minimization measures would address coral reef protection issues
EO 14008, Tackling Climate Crisis at Home and Abroad	No significant effects

5.2 Irreversible or Irretrievable Commitments of Resources

Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of non-renewable resources such as metal and fuel, and natural or cultural resources. These resources are irretrievable in that they would be used for this project when they could have been used for other purposes. Human labor is also considered an irretrievable resource. Another impact that falls under this category is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment.

Implementation of the Proposed Action would involve human labor; the consumption of fuel, oil, and lubricants for construction vehicles. Implementing the Proposed Action would not result in significant irreversible or irretrievable commitment of resources. Furthermore, a combination of avoidance and minimization would offset the initial natural resource losses.

5.3 Unavoidable Adverse Impacts

This EA has determined that the alternatives considered would not result in any significant impacts. Implementing the alternatives would result in the following unavoidable environmental impacts:

- Short-term air quality during the construction period

5.4 Relationship between Short-Term Use of the Environment and Long-Term Productivity

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This refers to the possibility that choosing one development site reduces future flexibility in pursuing other options, or that using a parcel of land or other resources often eliminates the possibility of other uses at that site.

In the short-term, effects to the human environment with implementation of the Proposed Action would primarily relate to the construction activity itself. Air quality and noise would be impacted in the short-term.

In the long-term, the needed emergency repairs to the Guam Glass Breakwater would safeguard the shore facilities and infrastructure within the harbor from severe wave action during typhoons and other heavy weather events. Military and commercial vessel would be able to safely and effectively pass through the marine navigations channels, thus continuing to support and provide vital services to the island of Guam. Without the emergency repairs, there is a risk of the breakwater breaching, which would have significant impacts on Navy operational capabilities. The degraded condition of the breakwater, exacerbated by normal wave action, storms, and typhoons, heightens the likelihood of breach. Continued exposure to even normal wave action not only increase the risk of breach, but also poses a risk of potential environmental damage to ESA - listed coral and ESA-candidate clam species located in the submerged areas of the structure. The repair of the breakwater would not significantly impact the long-term natural resource productivity of the area. Because of the planned avoidance and minimization measures, the Proposed Action would not result in any impacts that would significantly reduce environmental productivity or permanently narrow the range of beneficial uses of the environment.

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Appendix A

Record of Non-Applicability for Clean Air Act Conformity and Air Quality Methodology and Calculations

Record of Non-Applicability for Clean Air Act Conformity
Glass Breakwater Emergency Breach Repairs
Naval Base Guam, Apra Harbor, Guam

The Proposed Action falls under the Record of Non-Applicability (RONA) category and is documented with this RONA.

Proposed Action

Action Proponent: Commanding Officer, Naval Base Guam

Locations: Naval Base Guam, Apra Harbor, Guam

Proposed Action Name: Glass Breakwater Emergency Breach Repairs

Proposed Action and Emission Summary:

The Proposed Action entails restoring areas of the Glass Breakwater identified as severely eroded and susceptible to imminent breaching due to normal wave action. Priority repairs will occur on the ocean-side of the breakwater, where significant "armor" rocks, safeguarding the breakwater's inner core, have displaced or been washed away into the ocean. Consequently, the inner core is vulnerable to accelerated degradation from continuous wave and storm activity. Repair activities will involve temporarily relocate intact armor stone from neighboring breakwater crest areas, repositioning them on the failed areas to minimize crest road loss. Implementation of future maintenance repairs will be performed in the spring/summer of 2025 and addressed through separate environmental analysis.

The purpose of the Proposed Action is to expedite and conduct critical repairs to failed and failing sections of the breakwaters' armor rock slope protection. This is crucial to prevent a breach of the breakwater, thereby safeguarding the harbor, shoreline, and vital Navy/Port of Guam infrastructure that is essential to sustain ongoing military and local sustainment missions. The need for the Proposed Action is underscored by the imminent risk of breaching, which would have significant impacts on mission readiness and operational capabilities. The degraded condition of the breakwater, exacerbated by normal wave action, storms, and typhoons, heightens the likelihood of breach. Continued exposure to even normal wave action stressors not only increase the risk of breach, but also poses potential environmental damage to ESA listed coral and ESA candidate clam species located in the submerged areas of the structure.

On May 24, 2023, Super Typhoon Mawar passed north of Guam, bringing destructive winds and swells that severely damaged sections of the Glass Breakwater. The storm's impact caused significant erosion and displacement of the protective "armor" rock on the Western Point-Ocean Side, compromising the breakwater's integrity. The breakwater is essential in order to shelter and protect U.S. Navy vessels, as well as commercial and local government ships, that use Apra Harbor. The breakwater also safeguards the shore facilities and infrastructure within the harbor from severe wave action during typhoons and other heavy weather events. The recent damage has underscored the urgent need for repairs to maintain the harbor's functionality and prevent further degradation, which could lead to increased damage and higher future repair costs. The Glass Breakwater is vital to the Navy's mission because without it, Apra Harbor would be open to severe wave action that accompanies typhoons and other heavy weather events originating from the Philippine Sea. Wave heights of 25 to 30 feet have been recorded during previous super typhoons that occur in seven to 15 years intervals. The worsening

condition of the breakwater affects the position of the existing United States Coast Guard (USCG) navigational aid tower. The navigational aid tower is the only physical means to guide all incoming vessels into the mouth of the outer Apra Harbor.

Assessments conducted in February 2024 revealed that one-third of the breakwater has lost more than 20% of its armor stone, while the remaining two-thirds have experienced a loss of 5-10%, classifying the breakwater as failed according to the U.S. Army Corps of Engineers (USACE) Coastal Engineering Manual (CEM 2008). Furthermore, a recent visual inspection conducted on May 9, 2024, showed an increased rate of degradation from normal wave action. If left unaddressed, this deterioration is likely to result in a breach, posing significant risks to military and commercial ships, facilities, operations, and the overall logistical use of Apra Harbor. In the event of even a partial breach, the maintenance road at the top of the breakwater crest would become impassable, leading to exponential increases in repair costs and time. The acceleration of breakwater failure underscores the urgent need for repair.

Estimated Emissions for Proposed Action

Project Year	Sulfur Dioxide (ton per year)
2024	0.0015
2025	0.0068

Affected Air Basin: Piti-Cabras, Guam

Date RONA Prepared: August 22, 2024

RONA Prepared By: Naval Facilities Engineering Systems Command, Marianas

Proposed Action Exemption

The Proposed Action is exempt from the Clean Air Act General Conformity Rule because the Proposed Action's projected emissions are below the applicable *de minimis* threshold.

Attainment Area Status and Emissions Evaluations Conclusions

The project area at Naval Base Guam Apra Harbor is located within the Guam Piti-Cabras area, which has been designated nonattainment for sulfur dioxide, unclassified for particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers, and unclassifiable/attainment for carbon monoxide, ozone, nitrogen dioxide, lead, and particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.

RONA Approval:

Signature: MOON.EDWARD.E.1272181507 Digitally signed by MOON.EDWARD.E.1272181507 Date: 2024.08.22 19:37:02 +10'00'

Name/Rank/Date: Edward Moon/GS-13/August 22, 2024

Position: Installation Environmental Program Director

Equipment	Fuel Type	Power (hp)	Operating Hours		No. of Trips	Vehicle Miles Traveled (mi)	
			2024	2025		2024	2025
GOVERNMENT FLEET VEHICLES							
Passenger Truck	Gasoline	200	216	996	1010	360	1660
CONSTRUCTION							
Flat Bed Truck	Diesel	380	216	996	1010	360	1660
100-T Crawler Crane	Diesel	230	432	1992	2	10	10
Air Compressor	Diesel	145	216	996			
Backhoe	Diesel	80	432	1992	202	72	332
Compressor	Diesel	80	216	996			
Dozer	Diesel	285	432	1992	202	72	332
End Dump Truck	Diesel	400	432	1992	1010	360	1660
Excavator	Diesel	148	432	1992	2	360	1660
Forklift Truck	Diesel	78	216	996	1010	72	332
Generator	Diesel	400	432	1992			
Generator	Gasoline	27	432	1992			
Pickup Truck	Diesel	310	216	996	1010	360	1660
Rough Terrain Crane	Diesel	105	432	1992	2	10	10
Skid Steer Loader	Diesel	49	432	1992	2	360	1660
Truck Crane	Diesel	350	216	996	202	72	332
Water Truck	Diesel	150	432	1992	404	360	1660

Equipment	Category	SO_2 Emission Factor			SO_2 Emissions (lb/yr)	
		2024	2025	units	2024	2025
GOVERNMENT FLEET VEHICLES						
Passenger Truck	Passenger Truck - 25 mph[1]	0.003	0.003	g/hr	0.002	0.011
CONSTRUCTION						
Flat Bed Truck	Single Unit Short-Haul Truck - 25 mph[1]	0.01	0.01	g/hr	0.008	0.037
100-T Crawler Crane	Cranes (175 < hp <= 300)[2]	0.37	0.37	g/hr	0.352	1.625
Air Compressor	Air Compressors (100 < hp <= 175)[2]	0.21	0.21	g/hr	0.100	0.461
Backhoe	Tractors/Loaders/Backhoes (75 < hp <= 100)[2]	0.09	0.09	g/hr	0.086	0.395
Compressor	Air Compressors (75 < hp <= 100)[2]	0.15	0.15	g/hr	0.071	0.329
Dozer	Crawler Tractor/Dozers (175 < hp <= 300)[2]	0.5	0.5	g/hr	0.476	2.196
End Dump Truck	Combination Short-Haul Truck - 25 mph[1]	0.02	0.02	g/hr	0.016	0.073
Excavator	Excavators (100 < hp <= 175)[2]	0.29	0.29	g/hr	0.276	1.274
Forklift Truck	Rough Terrain Forklifts (75 < hp <= 100)[2]	0.21	0.21	g/hr	0.100	0.461
Generator (Diesel)	Generator Sets (300 < hp <= 600)[2]	0.74	0.74	g/hr	0.705	3.250
Generator (Gas)	Generator Sets (16 < hp <= 25)[2]	0.09	0.09	g/hr	0.086	0.395
Pickup Truck	Light Commercial Truck	0.04	0.04	g/hr	0.032	0.146
Rough Terrain Crane	Cranes (100 < hp <= 175)[2]	0.23	0.23	g/hr	0.219	1.010
Skid Steer Loader	Skid Steer Loaders (40 < hp <= 50)[2]	0.05	0.05	g/hr	0.048	0.220
Truck Crane	Cranes (300 < hp <= 600)[2]	0.66	0.66	g/hr	0.314	1.449
Water Truck	Single Unit Short-Haul Truck - idle[1]	0.07	0.07	g/hr	0.056	0.256
				Total (lb/yr)	2.947	13.588
				Total (tpy)	0.0015	0.0068

[1] Running (25 mph) Emissions (lb/yr) = Emission Factor (g/mi) x activity (mi/yr)]/(453.59 g/lb);

[2] Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb).

GLASS BREAKWATER EMERGENCY BREACH REPAIRS - Emissions Summary

Year	Emissions (tpy)									
	CO	NOx	PM10	PM2.5	SO2	VOC	CO2	CH4	N2O	CO2e
2024	2.03	0.49	2.41	0.65	0.001	0.08	208	0.01	0.00002	208
2025	9.23	2.04	11.11	2.97	0.007	0.37	970	0.03	0.00010	971

GLASS BREAKWATER EMERGENCY BREACH REPAIRS - CO Emissions

Equipment	Category	CO Emission Factor			CO Emissions (lb/yr)	
		2024	2025	units	2024	2025
GOVERNMENT FLEET VEHICLES						
Passenger Truck	Passenger Truck - idle[1]	8.05	6.61	-	16.18	74.38
	Passenger Truck - 25 mph[1]	3.95	3.63	-		
	Passenger Truck - start[1]	16.44	14.97	-		
ON-ROAD and NONROAD						
100-T Crawler Crane	Cranes (175 < hp <= 300)[2]	15.93	13.47	g/hr	15.17	59.15
Air Compressor	Air Compressors (100 < hp <= 175)[2]	12.12	10.80	g/hr	5.77	23.72
Backhoe	Tractors/Loaders/Backhoes (75 < hp <= 100)[2]	48.00	38.46	g/hr	45.71	168.89
Compressor	Air Compressors (75 < hp <= 100)[2]	20.04	17.60	g/hr	9.54	38.65
Dozer	Crawler Tractor/Dozers (175 < hp <= 300)[2]	18.15	13.12	g/hr	17.29	57.62
End Dump Truck	Combination Short-Haul Truck - idle[1]	16.46	15.27	g/hr	14.98	82.74
	Combination Short-Haul Truck - 25 mph[1]	3.01	2.76	g/mi		
	Combination Short-Haul Truck - start[1]	15.86	15.876	g/start		
Excavator	Excavators (100 < hp <= 175)[2]	11.59	8.84	g/hr	11.04	38.81
Flatbed Truck	Single Unit Short-Haul Truck - idle[1]	12.75	11.71	g/hr	7.45	44.72
	Single Unit Short-Haul Truck - 25 mph[1]	1.69	1.53	g/mi		
	Single Unit Short-Haul Truck - start[1]	7.69	7.640	g/start		
Forklift Truck	Rough Terrain Forklifts (75 < hp <= 100)[2]	40.64	35.24	g/hr	19.35	77.39
Generator	Generator Sets (16 < hp <= 25)[2]	3887.01	3875.42	g/hr	3702.00	17019.40
Generator	Generator Sets (300 < hp <= 600)[2]	131.91	118.09	g/hr	125.63	518.62
Pickup Truck	Light Commercial Truck - idle[1]	11.50	9.99	g/hr	5.48	21.93
Rough Terrain Crane	Cranes (100 < hp <= 175)[2]	12.52	10.74	g/hr	11.93	47.16
Skid Steer Loader	Skid Steer Loaders (40 < hp <= 50)[2]	12.16	10.85	g/hr	11.58	47.64
Truck Crane	Cranes (300 < hp <= 600)[2]	46.34	40.46	g/hr	22.07	88.85
Water Truck	Single Unit Short-Haul Truck - idle[1]	12.75	11.71	g/hr	12.14	51.43
			TOTAL (lb/yr)		4053	18461
			TOTAL (tpy)		2.03	9.23

NOTES:

[1] Onroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; January, Hour 08:00-08:59, Weekdays; Virgin Islands St. Thomas; Rural Unrestricted Access, Off-Network; Non-Extended Idle Processes; Soak Time ≥ 720 minutes; assume all idle when only operating hours available (no VMT data);

Idle Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb);

Running (25 mph) Emissions (lb/yr) = Emission Factor (g/mi) x activity (mi/yr)]/(453.59 g/lb);

Start Emissions (lb/yr) = Emission Factor (g/start) x 2 starts/trips x activity (trips/yr)]/(453.59 g/lb); trips/yr = annual VMT/project total VMT.

[2] Nonroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; Weekdays, All Months; Virgin Islands St. Thomas; All Processes; Maximum Monthly;

Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb).

[3] U.S. EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, Final Report, April 2009;

Emissions (lb/yr) = # equipment x [Emission Factor (Table 3-8, g/kWh) x # engines x load factor (Table 3-3) x activity (hr/yr) x average rated power (kW)]/(453.59 g/lb).

GLASS BREAKWATER EMERGENCY BREACH REPAIRS - NOx Emissions

Equipment	Category	NOx Emission Factor			NOx Emissions (lb/yr)	
		2024	2025	units	2024	2025
GOVERNMENT FLEET VEHICLES						
Passenger Truck	Passenger Truck - idle[1]	0.81	0.66	-	0.87	4.13
	Passenger Truck - 25 mph[1]	0.24	0.20	-		
	Passenger Truck - start[1]	0.86	0.76	-		
ON-ROAD and NONROAD						
100-T Crawler Crane	Cranes (175 < hp <= 300)[2]	68.53	56.36	g/hr	65.27	247.49
Air Compressor	Air Compressors (100 < hp <= 175)[2]	58.31	51.51	g/hr	27.77	113.10
Backhoe	Tractors/Loaders/Backhoes (75 < hp <= 100)[2]	52.41	44.75	g/hr	49.92	196.53
Compressor	Air Compressors (75 < hp <= 100)[2]	60.34	56.16	g/hr	28.74	123.31
Dozer	Crawler Tractor/Dozers (175 < hp <= 300)[2]	54.24	42.09	g/hr	51.66	184.85
End Dump Truck	Combination Short-Haul Truck - idle[1]	47.89	43.81	g/hr	7.25	72.17
	Combination Short-Haul Truck - 25 mph[1]	9.13	8.32	g/mi		
	Combination Short-Haul Truck - start[1]	0.00	0.00	g/start		
Excavator	Excavators (100 < hp <= 175)[2]	35.57	28.23	g/hr	33.88	123.99
Flatbed Truck	Single Unit Short-Haul Truck - idle[1]	27.93	24.95	g/hr	3.63	39.13
	Single Unit Short-Haul Truck - 25 mph[1]	3.65	3.27	g/mi		
	Single Unit Short-Haul Truck - start[1]	0.92	0.93	g/start		
Forklift Truck	Rough Terrain Forklifts (75 < hp <= 100)[2]	84.39	78.34	g/hr	40.19	172.01
Generator	Generator Sets (16 < hp <= 25)[2]	25.18	24.63	g/hr	23.98	108.16
Generator	Generator Sets (300 < hp <= 600)[2]	453.93	411.96	g/hr	432.32	1809.17
Pickup Truck	Light Commercial Truck - idle[1]	19.32	16.87	g/hr	9.20	37.05
Rough Terrain Crane	Cranes (100 < hp <= 175)[2]	63.43	53.89	g/hr	60.41	236.65
Skid Steer Loader	Skid Steer Loaders (40 < hp <= 50)[2]	29.81	29.12	g/hr	28.39	127.89
Truck Crane	Cranes (300 < hp <= 600)[2]	194.42	170.90	g/hr	92.58	375.25
Water Truck	Single Unit Short-Haul Truck - idle[1]	27.93	24.95	g/hr	26.60	109.56
			TOTAL (lb/yr)		983	4080
			TOTAL (tpy)		0.49	2.04

NOTES:

[1] Onroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; January, Hour 08:00-08:59, Weekdays; Virgin Islands St. Thomas; Rural Unrestricted Access, Off-Network; Non-Extended Idle Processes; Soak Time ≥ 720 minutes; assume all idle when only operating hours available (no VMT data);
Idle Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb);
Running (25 mph) Emissions (lb/yr) = Emission Factor (g/mi) x activity (mi/yr)]/(453.59 g/lb);
Start Emissions (lb/yr) = Emission Factor (g/start) x 2 starts/trips x activity (trips/yr)]/(453.59 g/lb); trips/yr = annual VMT/project total VMT.

[2] Nonroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; Weekdays, All Months; Virgin Islands St. Thomas; All Processes; Maximum Monthly;
Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb).

[3] U.S. EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, Final Report, April 2009;
Emissions (lb/yr) = # equipment x [Emission Factor (Table 3-8, g/kWh) x # engines x load factor (Table 3-3) x activity (hr/yr) x average rated power (kW)]/(453.59 g/lb).

GLASS BREAKWATER EMERGENCY BREACH REPAIRS - PM10 Emissions

Equipment	Category	PM10 Emission Factor			PM10 Emissions (lb/yr)	
		2024	2025	units	2024	2025
GOVERNMENT FLEET VEHICLES						
Passenger Truck	Passenger Truck - idle[1]	0.02	0.02	-	0.07	0.35
	Passenger Truck - 25 mph[1]	0.08	0.08	-		
	Passenger Truck - start[1]	0.01	0.01	-		
ON-ROAD and NONROAD						
100-T Crawler Crane	Cranes (175 < hp <= 300)[2]	3.02	2.60	g/hr	2.88	11.43
Air Compressor	Air Compressors (100 < hp <= 175)[2]	2.97	2.66	g/hr	1.42	5.84
Backhoe	Tractors/Loaders/Backhoes (75 < hp <= 100)[2]	8.00	6.30	g/hr	7.62	27.65
Compressor	Air Compressors (75 < hp <= 100)[2]	3.42	3.03	g/hr	1.63	6.66
Dozer	Crawler Tractor/Dozers (175 < hp <= 300)[2]	3.80	2.85	g/hr	3.61	12.52
End Dump Truck	Combination Short-Haul Truck - idle[1]	4.15	3.82	g/hr	0.83	7.22
	Combination Short-Haul Truck - 25 mph[1]	0.98	0.92	g/mi		
	Combination Short-Haul Truck - start[1]	0.06	0.06	g/start		
Excavator	Excavators (100 < hp <= 175)[2]	2.96	2.22	g/hr	2.82	9.77
Flatbed Truck	Single Unit Short-Haul Truck - idle[1]	3.04	2.72	g/hr	0.42	4.39
	Single Unit Short-Haul Truck - 25 mph[1]	0.48	0.45	g/mi		
	Single Unit Short-Haul Truck - start[1]	0.05	0.04	g/start		
Forklift Truck	Rough Terrain Forklifts (75 < hp <= 100)[2]	6.71	5.86	g/hr	3.19	12.87
Generator	Generator Sets (16 < hp <= 25)[2]	1.54	1.53	g/hr	1.46	6.71
Generator	Generator Sets (300 < hp <= 600)[2]	19.96	17.83	g/hr	19.01	78.32
Pickup Truck	Light Commercial Truck - idle[1]	0.92	0.80	g/hr	0.44	1.77
Rough Terrain Crane	Cranes (100 < hp <= 175)[2]	3.11	2.67	g/hr	2.97	11.72
Skid Steer Loader	Skid Steer Loaders (40 < hp <= 50)[2]	1.95	1.73	g/hr	1.86	7.61
Truck Crane	Cranes (300 < hp <= 600)[2]	7.12	6.30	g/hr	3.39	13.83
Water Truck	Single Unit Short-Haul Truck - idle[1]	3.04	2.72	g/hr	2.90	11.95
FUGITIVE DUST						
Backhoe	Bulldozing[4]	2.47	2.47	lb/hr	1067	4920
Dozer	Bulldozing[4]	2.47	2.47	lb/hr	1067	4920.44
End Dump Truck	Material Handling[4]	0.0003	0.0003	lb/ton	0.53	2.46
Excavator	Bulldozing[4]	2.47	2.47	lb/hr	2636	12154
			TOTAL (lb/yr)		4827	22228
			TOTAL (tpy)		2.41	11.11

NOTES:

[1] Onroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; January, Hour 08:00-08:59, Weekdays; Virgin Islands St. Thomas; Rural Unrestricted Access, Off-Network; Non-Extended Idle Processes; Soak Time ≥ 720 minutes; assume all idle when only operating hours available (no VMT data);
Idle Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb);
Running (25 mph) Emissions (lb/yr) = Emission Factor (g/mi) x activity (mi/yr)]/(453.59 g/lb);
Start Emissions (lb/yr) = Emission Factor (g/start) x 2 starts/trips x activity (trips/yr)]/(453.59 g/lb); trips/yr = annual VMT/project total VMT.

[2] Nonroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; Weekdays, All Months; Virgin Islands St. Thomas; All Processes; Maximum Monthly;
Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb).

[3] U.S. EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, Final Report, April 2009;
Emissions (lb/yr) = # equipment x [Emission Factor (Table 3-8, g/kWh) x # engines x load factor (Table 3-3) x activity (hr/yr) x average rated power (kW)]/(453.59 g/lb).

[4] U.S. EPA AP-42 Chapter 13.2.3 Heavy Construction Operations: Bulldozing (Table 11.9-1), material silt content (s) = 23%, moisture content (M) = 10%; Grading (Table 11.9-1), mean vehicle speed (S) = 5 mph; Material Handling (13.2.4, equation 1), k(PM10) = 0.35, k(PM2.5)=0.053, moisture content (M) = 10%, mean wind speed (U) = 10.2 mph.

GLASS BREAKWATER EMERGENCY BREACH REPAIRS - PM2.5 Emissions

Equipment	Category	PM2.5 Emission Factor			PM2.5 Emissions (lb/yr)	
		2024	2025	units	2024	2025
GOVERNMENT FLEET VEHICLES						
Passenger Truck	Passenger Truck - idle[1]	0.02	0.02	-	0.02	0.11
	Passenger Truck - 25 mph[1]	0.01	0.01	-		
	Passenger Truck - start[1]	0.01	0.01	-		
ON-ROAD and NONROAD						
100-T Crawler Crane	Cranes (175 < hp <= 300)[2]	2.93	2.52	g/hr	2.79	11.09
Air Compressor	Air Compressors (100 < hp <= 175)[2]	2.88	2.58	g/hr	1.37	5.66
Backhoe	Tractors/Loaders/Backhoes (75 < hp <= 100)[2]	7.76	6.11	g/hr	7.39	26.83
Compressor	Air Compressors (75 < hp <= 100)[2]	3.32	2.94	g/hr	1.58	6.46
Dozer	Crawler Tractor/Dozers (175 < hp <= 300)[2]	3.68	2.77	g/hr	3.51	12.15
End Dump Truck	Combination Short-Haul Truck - idle[1]	3.81	3.51	g/hr	0.54	5.61
	Combination Short-Haul Truck - 25 mph[1]	0.62	0.57	g/mi		
	Combination Short-Haul Truck - start[1]	0.06	0.05	g/start		
Excavator	Excavators (100 < hp <= 175)[2]	2.87	2.16	g/hr	2.73	9.48
Flatbed Truck	Single Unit Short-Haul Truck - idle[1]	2.80	2.50	g/hr	0.25	3.40
	Single Unit Short-Haul Truck - 25 mph[1]	0.27	0.24	g/mi		
	Single Unit Short-Haul Truck - start[1]	0.04	0.04	g/start		
Forklift Truck	Rough Terrain Forklifts (75 < hp <= 100)[2]	6.51	5.69	g/hr	3.10	12.48
Generator	Generator Sets (16 < hp <= 25)[2]	1.41	1.41	g/hr	1.35	6.17
Generator	Generator Sets (300 < hp <= 600)[2]	19.36	17.30	g/hr	18.44	75.97
Pickup Truck	Light Commercial Truck - idle[1]	0.85	0.74	g/hr	0.40	1.63
Rough Terrain Crane	Cranes (100 < hp <= 175)[2]	3.02	2.59	g/hr	2.88	11.37
Skid Steer Loader	Skid Steer Loaders (40 < hp <= 50)[2]	1.89	1.68	g/hr	1.80	7.38
Truck Crane	Cranes (300 < hp <= 600)[2]	6.91	6.11	g/hr	3.29	13.42
Water Truck	Single Unit Short-Haul Truck - idle[1]	2.80	2.50	g/hr	2.67	11.00
FUGITIVE DUST						
Backhoe	Bulldozing[4]	0.97	0.96872	lb/hr	418	1930
Dozer	Bulldozing[4]	0.97	0.96872	lb/hr	418.49	1929.69
End Dump Truck	Material Handling[4]	0.00004	0.00004	lb/ton	0.08	0.37
Excavator	Bulldozing[4]	0.97	0.97	lb/hr	405	1869.33
			TOTAL (lb/yr)		1297	5949
			TOTAL (tpy)		0.65	2.97

NOTES:

[1] Onroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; January, Hour 08:00-08:59, Weekdays; Virgin Islands St. Thomas; Rural Unrestricted Access, Off-Network; Non-Extended Idle Processes; Soak Time ≥ 720 minutes; assume all idle when only operating hours available (no VMT data);
Idle Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb)
Running (25 mph) Emissions (lb/yr) = Emission Factor (g/mi) x activity (mi/yr)]/(453.59 g/lb)
Start Emissions (lb/yr) = Emission Factor (g/start) x 2 starts/trips x activity (trips/yr)]/(453.59 g/lb); trips/yr = annual VMT/project total VMT

[2] Nonroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; Weekdays, All Months; Virgin Islands St. Thomas; All Processes; Maximum Monthly
Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb)

[3] U.S. EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, Final Report, April 2009;
Emissions (lb/yr) = # equipment x [Emission Factor (Table 3-8, g/kWh) x # engines x load factor (Table 3-3) x activity (hr/yr) x average rated power (kW)]/(453.59 g/lb

[4] U.S. EPA AP-42 Chapter 13.2.3 Heavy Construction Operations: Bulldozing (Table 11.9-1), material silt content (s) = 23%, moisture content (M) = 10%; Grading (Table 11.9-1), mean vehicle speed (S) = 5 mph; Material Handling (13.2.4, equation 1), k(PM10) = 0.35, k(PM2.5)=0.053, moisture content (M) = 10%, mean wind speed (U) = 10.2 mph.

GLASS BREAKWATER EMERGENCY BREACH REPAIRS - VOC Emissions

Equipment	Category	VOC Emission Factor			VOC Emissions (lb/yr)	
		2024	2025	units	2024	2025
GOVERNMENT FLEET VEHICLES						
Passenger Truck	Passenger Truck - idle[1]	1.30	1.16	-	1.45	7.01
	Passenger Truck - 25 mph[1]	0.17	0.15	-		
	Passenger Truck - start[1]	1.65	1.46	-		
ON-ROAD and NONROAD						
100-T Crawler Crane	Cranes (175 < hp <= 300)[2]	4.35	3.66	g/hr	4.14	16.07
Air Compressor	Air Compressors (100 < hp <= 175)[2]	3.41	2.92	g/hr	1.62	6.42
Backhoe	Tractors/Loaders/Backhoes (75 < hp <= 100)[2]	9.10	7.12	g/hr	8.67	31.29
Compressor	Air Compressors (75 < hp <= 100)[2]	2.89	2.44	g/hr	1.38	5.37
Dozer	Crawler Tractor/Dozers (175 < hp <= 300)[2]	3.64	2.87	g/hr	3.47	12.61
End Dump Truck	Combination Short-Haul Truck - idle[1]	7.15	6.48	g/hr	0.44	8.04
	Combination Short-Haul Truck - 25 mph[1]	0.56	0.51	g/mi		
	Combination Short-Haul Truck - start[1]	0.00	0.00	g/start		
Excavator	Excavators (100 < hp <= 175)[2]	1.75	1.35	g/hr	1.66	5.93
Flatbed Truck	Single Unit Short-Haul Truck - idle[1]	6.05	5.36	g/hr	0.46	7.02
	Single Unit Short-Haul Truck - 25 mph[1]	0.53	0.47	g/mi		
	Single Unit Short-Haul Truck - start[1]	0.05	0.05	g/start		
Forklift Truck	Rough Terrain Forklifts (75 < hp <= 100)[2]	3.60	3.02	g/hr	1.71	6.63
Generator	Generator Sets (16 < hp <= 25)[2]	103.57	101.51	g/hr	98.64	445.81
Generator	Generator Sets (300 < hp <= 600)[2]	29.17	26.18	g/hr	27.78	114.96
Pickup Truck	Light Commercial Truck - idle[1]	2.29	1.95	g/hr	1.09	4.28
Rough Terrain Crane	Cranes (100 < hp <= 175)[2]	2.86	2.34	g/hr	2.72	10.29
Skid Steer Loader	Skid Steer Loaders (40 < hp <= 50)[2]	2.97	2.64	g/hr	2.83	11.59
Truck Crane	Cranes (300 < hp <= 600)[2]	9.91	8.70	g/hr	4.72	19.10
Water Truck	Single Unit Short-Haul Truck - idle[1]	6.05	5.36	g/hr	5.76	23.55
			TOTAL (lb/yr)		169	736
			TOTAL (tpy)		0.08	0.37

NOTES:

[1] Onroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; January, Hour 08:00-08:59, Weekdays; Virgin Islands St. Thomas; Rural Unrestricted Access, Off-Network; Non-Extended Idle Processes; Soak Time ≥ 720 minutes; assume all idle when only operating hours available (no VMT data);
Idle Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb);
Running (25 mph) Emissions (lb/yr) = Emission Factor (g/mi) x activity (mi/yr)]/(453.59 g/lb);
Start Emissions (lb/yr) = Emission Factor (g/start) x 2 starts/trips x activity (trips/yr)]/(453.59 g/lb); trips/yr = annual VMT/project total VMT.

[2] Nonroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; Weekdays, All Months; Virgin Islands St. Thomas; All Processes; Maximum Monthly;
Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb).

[3] U.S. EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, Final Report, April 2009;
Emissions (lb/yr) = # equipment x [Emission Factor (Table 3-8, g/kWh) x # engines x load factor (Table 3-3) x activity (hr/yr) x average rated power (kW)]/(453.59 g/lb).

[4] U.S. EPA AP-42 Chapter 4.5 Asphalt Paving Operations; Table 4.5-1, assume medium cure, 45% by volume of diluent in cutback: asphalt density = 140 lb/ft^3.

GLASS BREAKWATER EMERGENCY BREACH REPAIRS - CO2 Emissions

Equipment	Category	CO2 Emission Factor			CO2 Emissions (lb/yr)	
		2024	2025	units	2024	2025
GOVERNMENT FLEET VEHICLES						
Passenger Truck	Passenger Truck - idle[1]	3595	3595	-	516	5804
	Passenger Truck - 25 mph[1]	427	427	-		
	Passenger Truck - start[1]	223	223	-		
ON-ROAD and NONROAD						
100-T Crawler Crane	Cranes (175 < hp <= 300)[2]	54268	54268	g/hr	51685	238325
Air Compressor	Air Compressors (100 < hp <= 175)[2]	29494	29494	g/hr	14045	64764
Backhoe	Tractors/Loaders/Backhoes (75 < hp <= 100)[2]	12720	12720	g/hr	12115	55862
Compressor	Air Compressors (75 < hp <= 100)[2]	21282	21282	g/hr	10134	46731
Dozer	Crawler Tractor/Dozers (175 < hp <= 300)[2]	74582	74582	g/hr	71032	327535
End Dump Truck	Combination Short-Haul Truck - idle[1]	8304	8304	g/hr	1924	16781
	Combination Short-Haul Truck - 25 mph[1]	2110	2110	g/mi		
	Combination Short-Haul Truck - start[1]	314	314	g/start		
Excavator	Excavators (100 < hp <= 175)[2]	43578	43578	g/hr	41504	191380
Flatbed Truck	Single Unit Short-Haul Truck - idle[1]	8136	8136	g/hr	1258	13550
	Single Unit Short-Haul Truck - 25 mph[1]	1293	1293	g/mi		
	Single Unit Short-Haul Truck - start[1]	292	292	g/start		
Forklift Truck	Rough Terrain Forklifts (75 < hp <= 100)[2]	30100	30100	g/hr	14334	66094
Generator	Generator Sets (16 < hp <= 25)[2]	14757	14757	g/hr	14054	64806
Generator	Generator Sets (300 < hp <= 600)[2]	95671	95671	g/hr	91117	420152
Pickup Truck	Light Commercial Truck - idle[1]	5256	5256	g/hr	2503	11541
Rough Terrain Crane	Cranes (100 < hp <= 175)[2]	33150	33150	g/hr	31572	145581
Skid Steer Loader	Skid Steer Loaders (40 < hp <= 50)[2]	6561	6561	g/hr	6248	28812
Truck Crane	Cranes (300 < hp <= 600)[2]	94054	94054	g/hr	44789	206526
Water Truck	Single Unit Short-Haul Truck - idle[1]	8136	8136	g/hr	7748	35728
			TOTAL (lb/yr)		416578	1939971
			TOTAL (tpy)		208	970

NOTES:

[1] Onroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; January, Hour 08:00-08:59, Weekdays; Virgin Islands St. Thomas; Rural Unrestricted Access, Off-Network; Non-Extended Idle Processes; Soak Time ≥ 720 minutes; assume all idle when only operating hours available (no VMT data);
Idle Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb);
Running (25 mph) Emissions (lb/yr) = Emission Factor (g/mi) x activity (mi/yr)]/(453.59 g/lb);
Start Emissions (lb/yr) = Emission Factor (g/start) x 2 starts/trips x activity (trips/yr)]/(453.59 g/lb); trips/yr = annual VMT/project total VMT

[2] Nonroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; Weekdays, All Months; Virgin Islands St. Thomas; All Processes; Maximum Monthly;
Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb).

[3] U.S. EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, Final Report, April 2009;
Emissions (lb/yr) = # equipment x [Emission Factor (Table 3-8, g/kWh) x # engines x load factor (Table 3-3) x activity (hr/yr) x average rated power (kW)]/(453.59 g/lb)

GLASS BREAKWATER EMERGENCY BREACH REPAIRS - CH4 Emissions

Equipment	Category	CH4 Emission Factor			CH4 Emissions (lb/yr)	
		2024	2025	units	2024	2025
GOVERNMENT FLEET VEHICLES						
Passenger Truck	Passenger Truck - idle[1]	0.02	0.02	-	0.06	0.29
	Passenger Truck - 25 mph[1]	0.004	0.004	-		
	Passenger Truck - start[1]	0.07	0.07	-		
ON-ROAD and NONROAD						
100-T Crawler Crane	Cranes (175 < hp <= 300)[2]	0.33	0.33	g/hr	0.31	1.44
Air Compressor	Air Compressors (100 < hp <= 175)[2]	0.23	0.23	g/hr	0.11	0.50
Backhoe	Tractors/Loaders/Backhoes (75 < hp <= 100)[2]	0.22	0.22	g/hr	0.21	0.99
Compressor	Air Compressors (75 < hp <= 100)[2]	0.18	0.18	g/hr	0.08	0.39
Dozer	Crawler Tractor/Dozers (175 < hp <= 300)[2]	0.23	0.23	g/hr	0.22	1.01
End Dump Truck	Combination Short-Haul Truck - idle[1]	0.51	0.51	g/hr	0.04	0.67
	Combination Short-Haul Truck - 25 mph[1]	0.05	0.05	g/mi		
	Combination Short-Haul Truck - start[1]	0.00	0.00	g/start		
Excavator	Excavators (100 < hp <= 175)[2]	0.11	0.11	g/hr	0.11	0.50
Flatbed Truck	Single Unit Short-Haul Truck - idle[1]	0.61	0.61	g/hr	0.07	0.91
	Single Unit Short-Haul Truck - 25 mph[1]	0.06	0.06	g/mi		
	Single Unit Short-Haul Truck - start[1]	0.03	0.03	g/start		
Forklift Truck	Rough Terrain Forklifts (75 < hp <= 100)[2]	0.23	0.23	g/hr	0.11	0.51
Generator	Generator Sets (16 < hp <= 25)[2]	9.16	9.16	g/hr	8.73	40.25
Generator	Generator Sets (300 < hp <= 600)[2]	1.13	1.13	g/hr	1.07	4.94
Pickup Truck	Light Commercial Truck - idle[1]	0.36	0.36	g/hr	0.17	0.80
Rough Terrain Crane	Cranes (100 < hp <= 175)[2]	0.21	0.21	g/hr	0.20	0.91
Skid Steer Loader	Skid Steer Loaders (40 < hp <= 50)[2]	0.19	0.19	g/hr	0.18	0.82
Truck Crane	Cranes (300 < hp <= 600)[2]	0.60	0.60	g/hr	0.29	1.32
Water Truck	Single Unit Short-Haul Truck - idle[1]	0.61	0.61	g/hr	0.58	2.66
			TOTAL (lb/yr)		13	59
			TOTAL (tpy)		0.01	0.03

NOTES:

[1] Onroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; January, Hour 08:00-08:59, Weekdays; Virgin Islands St. Thomas; Rural Unrestricted Access, Off-Network; Non-Extended Idle Processes; Soak Time ≥ 720 minutes; assume all idle when only operating hours available (no VMT data);
Idle Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb);
Running (25 mph) Emissions (lb/yr) = Emission Factor (g/mi) x activity (mi/yr)]/(453.59 g/lb);
Start Emissions (lb/yr) = Emission Factor (g/start) x 2 starts/trips x activity (trips/yr)]/(453.59 g/lb); trips/yr = annual VMT/project total VMT

[2] Nonroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; Weekdays, All Months; Virgin Islands St. Thomas; All Processes; Maximum Monthly;
Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb).

[3] U.S. EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, Final Report, April 2009;
Emissions (lb/yr) = # equipment x [Emission Factor (Table 3-8, g/kWh) x # engines x load factor (Table 3-3) x activity (hr/yr) x average rated power (kW)]/(453.59 g/lb)

GLASS BREAKWATER EMERGENCY BREACH REPAIRS - N2O Emissions

Equipment	Category	N2O Emission Factor			N2O Emissions (lb/yr)	
		2024	2025	units	2024	2025
GOVERNMENT FLEET VEHICLES						
Passenger Truck	Passenger Truck - idle[1]	0.00	0.00	-	0.04	0.16
	Passenger Truck - 25 mph[1]	0.00	0.00	-		
	Passenger Truck - start[1]	0.04	0.04	-		
ON-ROAD and NONROAD						
100-T Crawler Crane	Cranes (175 < hp <= 300)[2]	-	-	-	-	-
Air Compressor	Air Compressors (100 < hp <= 175)[2]	-	-	-	-	-
Backhoe	Tractors/Loaders/Backhoes (75 < hp <= 100)[2]	-	-	-	-	-
Compressor	Air Compressors (75 < hp <= 100)[2]	-	-	-	-	-
Dozer	Crawler Tractor/Dozers (175 < hp <= 300)[2]	-	-	-	-	-
End Dump Truck	Combination Short-Haul Truck - idle[1]	0.00	0.00	g/hr	0.00	0.02
	Combination Short-Haul Truck - 25 mph[1]	0.00	0.00	g/mi		
	Combination Short-Haul Truck - start[1]	0.01	0.01	g/start		
Excavator	Excavators (100 < hp <= 175)[2]	-	-	-	-	-
Flatbed Truck	Single Unit Short-Haul Truck - idle[1]	0.00	0.00	g/hr	0.0040	0.0185
	Single Unit Short-Haul Truck - 25 mph[1]	0.00	0.00	g/mi		
	Single Unit Short-Haul Truck - start[1]	0.01	0.01	g/start		
Forklift Truck	Rough Terrain Forklifts (75 < hp <= 100)[2]	-	-	-	-	-
Generator	Generator Sets (16 < hp <= 25)[2]	-	-	-	-	-
Generator	Generator Sets (300 < hp <= 600)[2]	-	-	-	-	-
Pickup Truck	Light Commercial Truck - idle[1]	0.00	0.00	g/hr	0.00	0.00
Rough Terrain Crane	Cranes (100 < hp <= 175)[2]	-	-	-	-	-
Skid Steer Loader	Skid Steer Loaders (40 < hp <= 50)[2]	-	-	-	-	-
Truck Crane	Cranes (300 < hp <= 600)[2]	-	-	-	-	-
Water Truck	Single Unit Short-Haul Truck - idle[1]	0.00	0.00	g/hr	0.00	0.00
			TOTAL (lb/yr)		0.0	0.2
			TOTAL (tpy)		0.00002	0.0001

NOTES:

[1] Onroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; January, Hour 08:00-08:59, Weekdays; Virgin Islands St. Thomas; Rural Unrestricted Access, Off-Network; Non-Extended Idle Processes; Soak Time ≥ 720 minutes; assume all idle when only operating hours available (no VMT data);
Idle Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb).
Running (25 mph) Emissions (lb/yr) = Emission Factor (g/mi) x activity (mi/yr)]/(453.59 g/lb).
Start Emissions (lb/yr) = Emission Factor (g/start) x 2 starts/trips x activity (trips/yr)]/(453.59 g/lb); trips/yr = annual VMT/project total VMT

[2] Nonroad - U.S. EPA MOtor Vehicle Emission Simulator (MOVES) 2014b; Weekdays, All Months; Virgin Islands St. Thomas; All Processes; Maximum Monthly
Emissions (lb/yr) = [Emission Factor (g/hr) x activity (hr/yr)]/(453.59 g/lb).

[3] U.S. EPA Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories, Final Report, April 2009;
Emissions (lb/yr) = # equipment x [Emission Factor (Table 3-8, g/kWh) x # engines x load factor (Table 3-3) x activity (hr/yr) x average rated power (kW)]/(453.59 g/lb)

Appendix B

Endangered Species Act and Essential Fish Habitat Consultation Documentation

ESA/EFH consultation are in progress with NOAA-NMFS and will be included in the Final EA.

Appendix C

National Historic Preservation Act Section 106 Documentation

DEPARTMENT OF THE NAVY
U.S. NAVAL BASE GUAM
PSC 455 BOX 152
FPO AP 96540-1000

5090
Ser EV/133
27 December, 2023

Patrick Lujan
State Historic Preservation Officer
Department of Parks and Recreation/Guam Historic Resources Division
490 Chalan Palasyo
Agaña Heights, Guam 96910

Dear Mr. Lujan,

Subject: EMERGENCY REPAIRS TO GLASS BREAKWATER, NAVAL BASE GUAM

Naval Base Guam requests your review of our proposed project to conduct emergency repairs to the Glass Breakwater, Naval Base Guam, pursuant to Section 106 of the National Historic Preservation Act (NHPA). This project is similar to repairs undertaken in 2011 with SHPO concurrence (RC 2011-9550) of the Navy's "No Adverse Effect" determination.

We have reviewed the project scope and determined that it is an undertaking as defined in 36 CFR 800.16(y) and the 2008 Programmatic Agreement among the Commander, Navy Region Marianas, the Advisory Council on Historic Preservation, and the Guam Historic Preservation Officer regarding Navy Undertakings on the Island of Guam ("2008 PA"), Section I. This undertaking does not meet the conditions of "Undertakings Requiring No Further Review" (2008 PA Section VII.A), and thus will be reviewed in accordance with the same review process as others under 36 CFR 800.3–800.7, as allowed by Section VII.B.1.

In consideration of the information presented in Enclosure (1) and previous SHPO concurrence for the same type of undertaking in the same area (Enclosure 2), a finding of "No Adverse Effect" is applicable to the proposed project. In accordance with 36 CFR 800.4 (d)(1), if we receive no response from your office within 30 days of receipt of this letter, we will consider our responsibilities under Section 106 fulfilled.

Should you have any questions or require additional information, my point of contact regarding this matter is Mr. Lon Bulgrin at lon.bulgrin.civ@us.navy.mil or 671-339-2093.

Sincerely,

Ed Moon

E. E. Moon
Installation Environmental Program Director
By Direction of the Commanding Officer

Enclosure 1. Section 106 Evaluation: Emergency Repairs to Glass Breakwater, Naval Base Guam
Enclosure 2. SHPO Concurrence for Glass Breakwater Repairs, dated 17 October 2011

National Historic Preservation Act
Section 106 Evaluation
Enclosure 1: Emergency Repairs to Glass Breakwater, Naval Base Guam

Purpose:

Conduct emergency repairs to the breakwater at sections with serious and critical damage. Reinforce the breakwater at sections with poor conditions along Philippine Sea side from the breakwater head to western edge of Luminao Reef (Sta 0+00 to Sta 65+00) (Figure 4).

Statement of Work: Project works include the following:

- Stabilize the breakwater to protect the seaport and northern part of Apra Harbor from damaging waves during calm and severe weather conditions;
- Temporary removal of slope protection;
- Restore approximately 2,988 meters of the armor slope protection with suitable material;
- Strengthen toe foundation;
- Add heavy concrete armor units for wave dissipation and rebuild damaged core;
- Provide geofabric filter material on the repaired slope with riprap bedding overlay;
- Replace armor rock on repaired slope.

Area(s) of Potential Effect (APE):

The APE is determined to be the area encompassed by the proposed project, as depicted in Figures 1 - 4.

Identification of Historic Properties:

- As identified in Aaron (2011); Lauter-Reinman (1997); Mason (2009), the boundary of the project site is in fill lands.
- The project APE is located within the Glass Breakwater that is eligible for inclusion in the National Register of Historic Places, Aaron 2011; Lauter-Reinman 1997; Mason 2009.
- The structure dates between 1941 and 1946, which is greater than 50 years old.

Determination of Effect:

- Project area has been previously disturbed (e.g., original construction and grading).
- Ground disturbance (gate/haul road) will be limited to areas where there are existing structures.
- The breakwater is structurally damaged from previous typhoons, namely Typhoon Mawar. Extensive natural wave battering and erosion has damaged the structure.
- The damaged revetment on the Glass Breakwater poses a public health and safety issue.
- Repairs of the Glass Breakwater are essential to maintain and ensure the structural stability of the structure. Failure to provide these repairs will lead to further damage to the historic property.
- All materials used in the repairs will be similar to the original materials used for the construction of the breakwater.
- The boulders/rip rap will match existing erosion control measures in the area and shall have minimal impact to the visual landscape.

Section 106 Evaluation:

In consideration of the evaluated project information, the Naval Base Guam has determined a finding of **"No Adverse Effect"** for the proposed repair to damages on Glass Breakwater.

Certification
The undersigned certifies that, to the best of my knowledge, information, and belief, formed after reasonable inquiry, the information in this report is true, accurate, complete and is provided as a part of our agency's responsibilities under Section 106 of the National Historic Preservation Act of 1966, as amended.

12/27/2023
Date

Lon Bulgrin, M.A.
Cultural Resources Manager/Archeologist
Naval Base Guam

Reference(s):

Aaron, Jayne
2011 *Regional Cold War History for Department of Defense Installations in Guam and the Northern Mariana Islands*. Department of Defense Legacy Resource Management Program. (Legacy 09-454). Archer, Inc., Annapolis, Maryland. https://www.denix.osd.mil/cr/historic/cold-war/index.html.

Lauter-Reinman, Gloria A.
1997 Final Report. Management Plan for World War II Resources at Navy Installations in Guam. Prepared in Conjunction with Department of Defense Legacy Resource Management Program: #349. Prepared for Department of the Navy, Pacific Division, Naval Facilities Engineering Command, Pearl Harbor, HI. Ogden Environmental and Energy Services Co, Inc., Honolulu, HI

Mason Architects Inc. and Weitze Research (Mason and Weitze)
2009 *Evaluation of Historic Resources at Naval Hospital Guam*. Prepared for NAVFAC Pacific, Pearl Harbor. Mason Architects Inc. and Weitze Research.

Programmatic Agreement among the Commander, Navy Region Marianas, the Advisory Council on Historic Preservation, and the Guam Historic Preservation Officer regarding Navy Undertakings on the Island of Guam, November 2008.

Figure 1. Location of the APE.

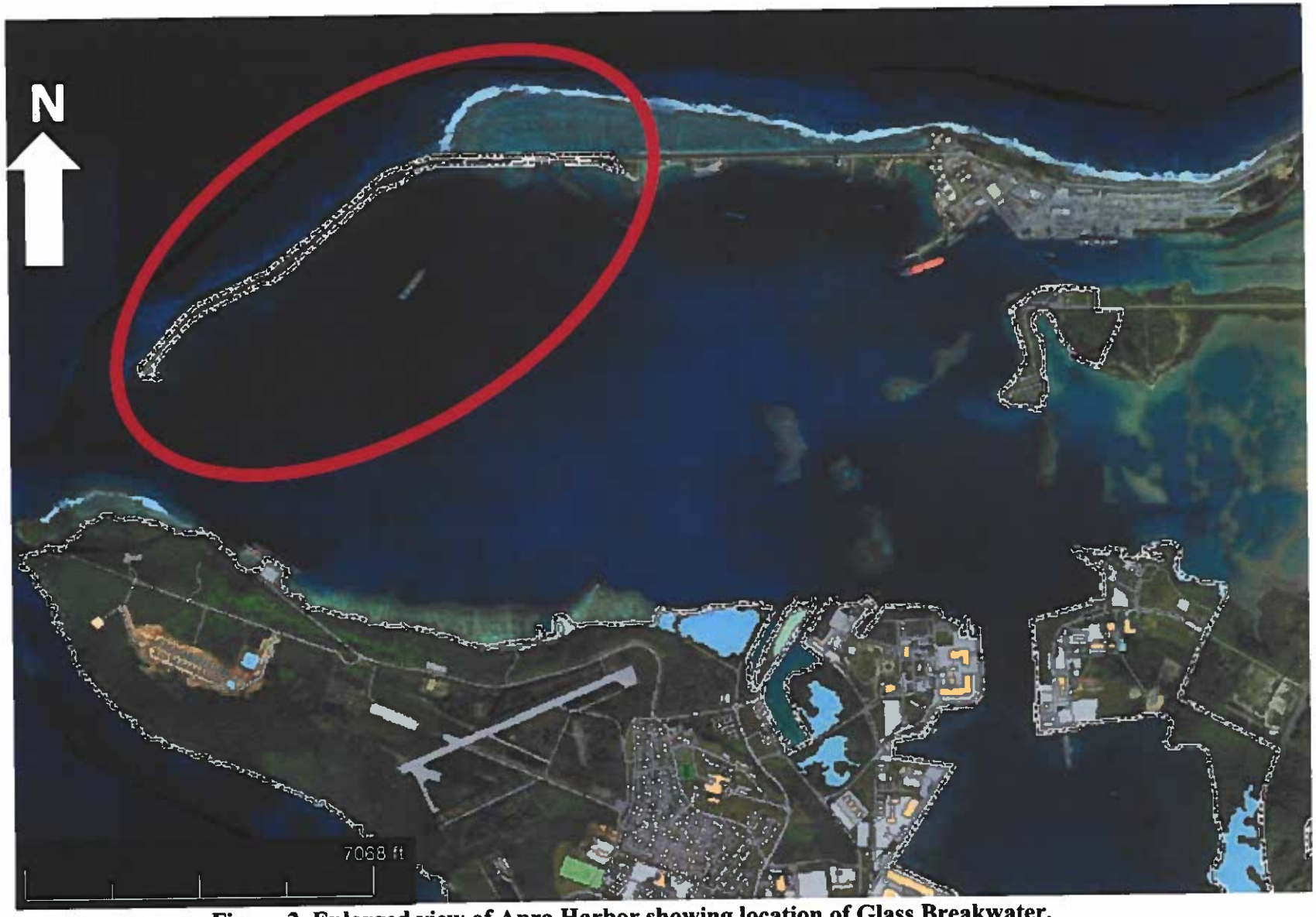

Figure 2. Enlarged view of Apra Harbor showing location of Glass Breakwater.

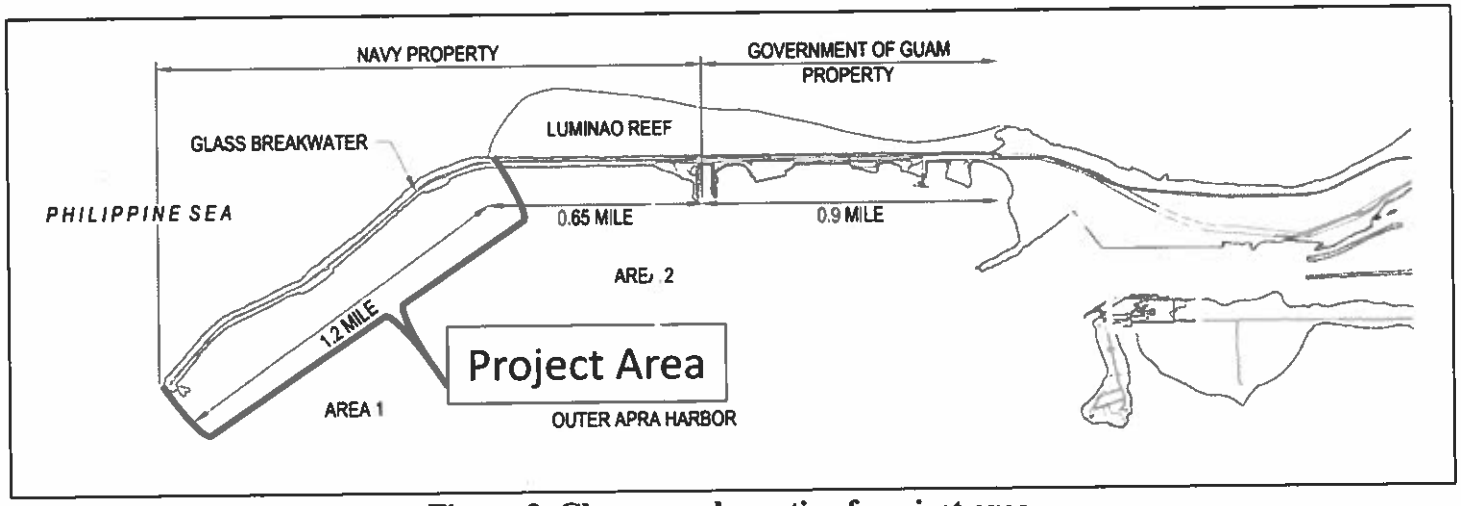

Figure 3. Close-up schematic of project area.

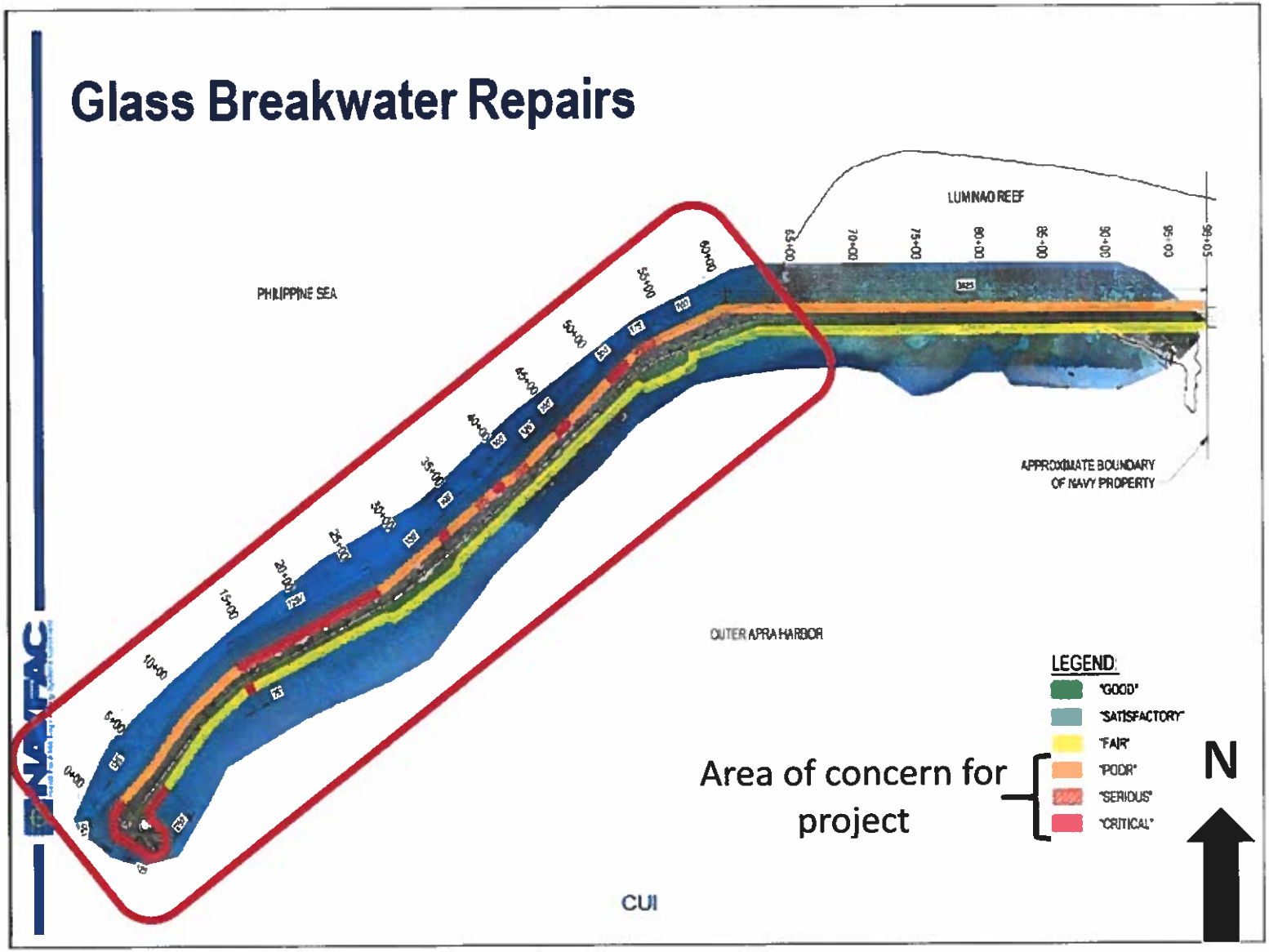

Figure 4. Diagram showing the project location, station numbers, and condition of project area.

Department of Parks and Recreation
Government of Guam
490 Chalan Palasyo
Agana Heights, Guam 96910
Director's Office: (671) 475-6296/7
Facsimile: (671) 477-0997
Parks Division: (671) 475-6288/9
Guam Historic Resources Division: (671) 475-6294/5
Facsimile: (671) 477-2822

Eddie Baza Calvo
Governor

Ray Tenorio
Lt. Governor

Peter S. Calvo
Acting Director

In reply refer to:
RC2011-9550

October 17, 2011

R.M. Rossetti
Department of the Navy
U.S. Naval Base Guam
PSC 455 Box 195
FPO AP 96540-2937

Subject: Section 106 Review
Project: Repair Glass Breakwater, North Shore and Western Point, NBGAH, Piti, Guam

Dear Mr. Rossetti,

We reviewed your request to review subject project and concur with your determination of "No Adverse Effect." However, if inadvertent discovery of historic properties are encountered during the course of the project, please cease all activities, immediately inform our office, and refer to 36 CFR 800.13 Post Review Discoveries.

On a separate note, please properly address Ms. Aguon in future correspondence as State Historic Preservation Officer.

If you have any questions, please contact our office at 475-6294/6295.

Sincerely,

Peter S. Calvo
Acting Director

Lynda Bordallo Aguon
State Historic Preservation Officer

Lourdes A. Leon Guerrero
Governor
Joshua F. Tenorio
Lt. Governor

Department of Parks and Recreation
Dipattamenton Plaset yan Dibuetsion
Government of Guam
Director's Office, Parks and Recreation Divisions
#1 Paseo de Susana, Hagåtña, Guam 96910
P.O. Box 2950, Hagåtña, Guam 96932
(671) 475-6288, Facsimile (671) 477-0997
Guam Historic Resources Division:
490 Chalan Palasyo, Agana Heights, Guam 96910
(671) 475-6294/6355, Facsimile (671) 477-2822

Angel R. Sablan
Acting Director
Warren Pelletier
Deputy Director

February 20, 2024

In reply refer to:
RC 2024-0091

E. E. Moon
Installation Environmental Program Director
Naval Base Guam
PSC 455, Box 152
FPO AP 96540-1000

Subject: Review of: Emergency Repairs to Glass Breakwater, Naval Base Guam

Hafa Adai Mr. Moon,

Thank you for submitting the Emergency Repairs to Glass Breakwater, Naval Base Guam. Per §36 CFR 800 (as amended 5 August 2004) regulations implementing Section 106 of the National Historic Preservation Act (NHPA), Naval Base Guam is seeking the State Historic Preservation Office's (SHPO) comments on the effects the proposed undertaking will have on historic properties.

An email occurred between Logan Myers and Lon E. Bulgrin on 2/15/2023 where Mr. Bulgrin confirmed the APE size to be 354,838 Sqm (87.7 acres). Our office will not accept the "No Adverse Effect" determination without additional information. Our records show four sites within the red breakwater APE box on Page 6 of the submitted document. These sites are *Yosemite 2* GHPI Site No. 66-03-2206 at the southwest, American Tanker GHPI Site No. 66-03-1078 to the southwest, Unnamed Wreck GHPI Site No. 66-03-2191, and Val Bomber GHPI Site No. 66-03-1087 at the northeast. For our office to accept these repairs we need confirmation that these sites will not be impacted by this project. Navy Base Guam needs to submit a map showing these sites and describe how these sites will not be impacted by the repairs. Once we receive this document our office will expedite the review process.

Should you have any questions, please contact Mr. Logan Myers, Archaeologist at (671) 475-6340 or by email: logan.myers@dpr.guam.gov.

Sincerely,

Patrick Q. Lujan
State Historic Preservation Officer

DEPARTMENT OF THE NAVY
U.S. NAVAL BASE GUAM
PSC 455 BOX 152
FPO AP 96540-1000

5090
Ser EV/ N-32
February 26, 2024

Patrick Lujan
State Historic Preservation Officer
Department of Parks and Recreation/Guam Historic Resources Division
490 Chalan Palasyo
Agaña Heights, Guam 96910

Dear Mr. Lujan,

Subject: EMERGENCY REPAIRS TO GLASS BREAKWATER, NAVAL BASE GUAM

This letter is in response to your letter of February 20, 2024 (RC 2024-0091). You expressed concerns over four sites; Yosemite 2 GHPI Site No. 66-03-2206, American Tanker GHPI Site No. 66-03- 1078, Unnamed Wreck GHPI Site No. 66-03-2191, and Val Bomber GHPI Site No. 66-03-1087 that could be potentially impacted by the undertaking based upon the APE.

Lon Bulgrin, the Naval Base Guam Cultural Resources Manager/Archaeologist, met with Logan Myers and John Peterson of your staff this morning to present more detailed design plans for the project and to discuss the project plans in regard to the locations of the sites of concern. There was an agreement that the sites were located outside of the proposed project footprint and that of haul roads and laydown areas. The project design plans are included in Enclosure (1).

In consideration of the information presented in Enclosure (1) and our previous letter of December 27, 2023, a finding of "No Adverse Effect" is applicable to the proposed project. In accordance with 36 CFR 800.4 (d)(1), if we receive no response from your office within 30 days of receipt of this letter, we will consider our responsibilities under Section 106 fulfilled.

Should you have any questions or require additional information, my point of contact regarding this matter is Mr. Lon Bulgrin at lon.bulgrin.civ@us.navy.mil or 671-339-2093.

Sincerely,

E. E. Moon
Installation Environmental Program Director
By Direction of the Commanding Officer

Enclosure 1. FY24 SPECIAL PROJECT Glass Breakwater Emergency Repairs Design Plans.

Lourdes A. Leon Guerrero
Governor
Joshua F. Tenorio
Lt. Governor

Department of Parks and Recreation
Dipattamenton Plaset yan Dibuetsion
Government of Guam
Director's Office, Parks and Recreation Divisions:
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Angel R. Sablan
Acting Director
Warren Pelletier
Deputy Director

February 28, 2024

In reply refer to:
RC 2024-0091

E. E. Moon
Installation Environmental Program Director
Naval Base Guam
PSC 455, Box 152
FPO AP 96540-1000

Subject: Review of: Emergency Repairs to Glass Breakwater, Naval Base Guam

Hafa Adai Mr. Moon,

Thank you for submitting the Emergency Repairs to Glass Breakwater, Naval Base Guam. Per §36 CFR 800 (as amended August 5. 2004) regulations implementing Section 106 of the National Historic Preservation Act (NHPA), Naval Base Guam is seeking the State Historic Preservation Office's (SHPO) comments on the effects the proposed undertaking will have on historic properties.

As stated in the submitted document, a meeting occurred on the 26th of February 2024 between Lon Bulgrin of Naval Base Guam, John Peterson, and Logan Myers. In this meeting, it was agreed that the undertaking was not overlapping the sites of *Yosemite 2* GHPI Site No. 66-03-2206, American Tanker GHPI Site No. 66-03-1078, Unnamed Wreck GHPI Site No. 66-03-2191, and Val Bomber GHPI Site No. 66-03-108. Based on this meeting and the enclosed information, our office agrees with the "No Adverse Effect" determination.

Should you have any questions, please contact Mr. Logan Myers, Archaeologist at (671) 475-6340 or by email: logan.myers@dpr.guam.gov

Sincerely,

Patrick Q. Lujan
State Historic Preservation Officer

Appendix D

Coastal Consistency Determination

DEPARTMENT OF THE NAVY
U.S. NAVAL BASE GUAM
PSC 455 BOX 152
FPO AP 96540-1000

5090
Ser EV/104
August 1, 2024

Ms. Lola Leon Guerrero
Director
Bureau of Statistics and Plans
P.O. Box 2950
Hagatna, Guam 96932

ATTN: Edwin Reyes, Administrator, Guam Coastal Zone Management Program

SUBJECT: NOTIFICATION OF A NEGATIVE DETERMINATION FOR PROJECT: EMERGENCY BREACH REPAIR ADMIRAL GLASS BREAKWATER APRA HARBOR, NAVAL BASE GUAM

Dear Ms. Leon Guerrero:

Naval Base Guam (NBG) proposes to conduct emergency breach repairs on the Admiral Glass Breakwater (GBW) in Apra Harbor, Guam. This letter is to provide Guam Bureau of Statistics and Plans (GBSP) with a Negative Determination finding for this proposed activity in accordance with 15 CFR 930.35. The U.S. Navy has completed an "effects" test and has determined that there will be no net coastal effect to Guam's Coastal Management Zone.

The emergency breakwater repairs are needed due to extensive damage that occurred during Typhoon Mawar in 2023. The project will include resetting of existing armor stone and concrete units that have shifted their position, to temporarily stabilize the GBW until more permanent repairs are carried out in the near future. The emergency repairs of GBW would temporarily restore the breakwater to Army Corps of Engineer breakwater standards and increase the effectiveness of the breakwater in order to continue protecting Apra Harbor and its shorelines. Thus allowing for continued safe use of the area by the public, civil, and federal individuals and organizations.

Best Management Practices (BMPs) will be implemented to ensure that debris and surface runoff does not enter into Guam's coastal waters. The proposed emergency repair project does not involve the discharge of dredged or fill material into the waters of the United States. The construction project has a tentative start date of mid-November 2024, with an estimated projected duration of up to six (6) months.

The enclosed coastal zone consistency assessment package is pursuant to the Coastal Zone Management Act and 15 Code of Federal Regulations (CFR) 930. The subject proposal will comply with the enforceable policies of the Government of Guam's approved coastal zone management program and will be conducted in a manner consistent with such programs.

Should you have any questions, or require additional information, please contact Mr. Jesse Cruz at (671) 339-5314, email: jesse.t.cruz3.civ@us.navy.mil.

Sincerely,

E. E. MOON
Installation Environmental Program Director
By Direction of the Commanding Officer

Enclosure: 1. Guam Coastal Management Program Assessment Package
2. GBW Emergency Breach Repair Project Description

DEPARTMENT OF THE NAVY
U.S. NAVAL BASE GUAM
PSC 455 BOX 152
FPO AP 96540-1000

5090
Ser EV/104
August 1, 2024

Ms. Lola Leon Guerrero
Director
Bureau of Statistics and Plans
P.O. Box 2950
Hagatna, Guam 96932

ATTN: Edwin Reyes, Administrator, Guam Coastal Zone Management Program

SUBJECT: NOTIFICATION OF A NEGATIVE DETERMINATION FOR PROJECT: EMERGENCY BREACH REPAIR ADMIRAL GLASS BREAKWATER APRA HARBOR, NAVAL BASE GUAM

Dear Ms. Leon Guerrero:

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Sincerely,

E. E. MOON
Installation Environmental Program Director
By Direction of the Commanding Officer

Enclosure: 1. Guam Coastal Management Program Assessment Package
2. GBW Emergency Breach Repair Project Description

GUAM COASTAL MANAGEMENT PROGRAM
ASSESSMENT FORMAT

DATE OF APPLICATION: **August 1, 2024**
NAME OF APPLICANT: **U.S. Naval Base Guam**
APPLICANT: **Mr. Edward E. Moon**
Installation Environmental Program Director
Public Works Department
U.S. Naval Base Guam
PSC 455, BOX 152
FPO AP 96540-1000
671-339-4100
Edward.e.moon2.civ@us.navy.mil

TITLE OF PROPOSED PROJECT: **Glass Breakwater Emergency Breach Repair**

COMPLETE FOLLOWING PAGES FOR BUREAU OF STATISTICS AND PLANS ONLY:

DATE APPLICATION RECEIVED: _____

OCRM NOTIFIED: _____ LIC. AGENCY NOTIFIED: _____

APPLICANT NOTIFIED: _____ PUBLIC NOTICE GIVEN: _____

OTHER AGENCY REVIEW REQUESTED:

_____

_____

DETERMINATION:
( ) CONSISTENT ( ) NON-CONSISTENT ( ) FURTHER INFORMATION REQUESTED

OCRM NOTIFIED: _____ LIC. AGENCY NOTIFIED: _____

APPLICANT NOTIFIED: _____

ACTION LOG:
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

DATE REVIEW COMPLETED: _____

DEVELOPMENT POLICIES (DP):

DP 1. Shore Area Development

Intent: To ensure environmental and aesthetic compatibility of shore area land uses.

Policy: Only those uses shall be located within the Seashore Reserve which:
- enhance, are compatible with or do not generally detract from the surrounding coastal area's aesthetic and environmental quality and beach accessibility; or
- can demonstrate dependence on such a location and the lack of feasible alternative sites.

Discussion: **Emergency Breach Repairs to Admiral Glass Breakwater (GBW) would use the same or similar materials to the existing structure and would not appreciably alter the structure visually. Therefore, the project would be compatible and would not detract from the aesthetic or environmental quality. The structure is necessary to provide safe passage into and out of Apra Harbor for military, civil, commercial, and recreational users.**

DP 2. Urban Development

Intent: To cluster high impact uses such that coherent community design, function, infrastructure support and environmental compatibility are assured.

Policy: Commercial, multi-family, industrial and resort-hotel zone uses and uses requiring high levels of support facilities shall be concentrated within appropriate zone as outlined on the Guam Zoning Code.

Discussion: **Not applicable.**

DP 3. Rural Development

Intent: To provide a development pattern compatible with environmental and infrastructure support suitability and which can permit traditional lifestyle patterns to continue to the extent practicable.

Policy: Rural districts shall be designated in which only low density residential and agricultural uses will be acceptable. Minimum lot size for these uses should be one-half acre until adequate infrastructure including functional sewering is provided.

Discussion: **Not applicable.**

DP 4. Major Facility Siting

Intent: To include the national interest in analyzing the siting proposals for major utilities, fuel and transport facilities.

Policy: In evaluating the consistency of proposed major facilities with the goals, policies, and standards of the Comprehensive Development and Coastal Management Plans, Guam

shall recognize the national interest in the siting of such facilities, including those associated with electric power production and transmission, petroleum refining and transmission, port and air installations, solid waste disposal, sewage treatment, and major reservoir sites.

Discussion: **Not applicable.**

DP 5. Hazardous Areas

Intent: Development in hazardous areas will be governed by the degree of hazard and the land use regulations.

Policy: Identified hazardous lands, including flood plains, erosion-prone areas, air installations' crash and sound zones and major fault lines shall be developed only to the extent that such development does not pose unreasonable risks to the health, safety or welfare of the people of Guam, and complies with the land use regulations.

Discussion: **The Proposed Action is consistent with DP 5. GBW emergency breach repairs would enhance the safety of Apra Harbor and comply with land use regulations. The Navy would ensure that the facilities to be constructed would be designed for resiliency with regards to erosion. GBW repairs would not change the local hydrology, soils, or vegetation, or affect shoreline ecological functions.**

DP 6. Housing

Intent: To promote efficient community design placed where the resources can support it.

Policy: The government shall encourage efficient design of residential areas, restrict such development in areas highly susceptible to natural and manmade hazards, and recognize the limitations of the island's resources to support historical patterns of residential development.

Discussion: **Not applicable.**

DP 7. Transportation

Intent: To provide transportation systems while protecting potentially impacted resources.

Policy: Guam shall develop an efficient and safe transportation system, while limiting adverse environmental impacts on primary aquifers, beaches, estuaries, coral reefs and other coastal resources.

Discussion: **The Proposed Action would be consistent with DP 7. GBW is key to the continued function and safety of transportation in and out of Apra Harbor. The proposed emergency breach repairs would restore critical function and enhance safety for federal, civil, commercial, and recreational users.**

DP 8. Erosion and Siltation

Intent: To control development where erosion and siltation damage is likely to occur.

Policy: Development shall be limited in areas of 15% or greater slope by requiring strict compliance with erosion, sedimentation, and land use regulations, as well as other related land use guidelines for such areas.

Discussion: **The Proposed Action is consistent with DP 8. GBW protects the shoreline and harbor entrance from erosion and protect anchorages, helping isolate vessels from marine hazards such as wind-driven waves. The proposed repairs would ensure the continued protection of the shoreline from erosion associated with weather and vessel-generated wave action. The existing facilities and structures would be reused to the extent practicable, and all erosion and sedimentation regulations would be followed.**

RESOURCES POLICIES (RP):

RP 1. Air Quality

Intent: To control activities to ensure good air quality.

Policy: All activities and uses shall comply with all local air pollution regulations and all appropriate Federal air quality standards in order to ensure the maintenance of Guam's relatively high air quality.

Discussion: **The Proposed Action would be consistent with RP 1. Implementation of the Proposed Action would result in temporary air quality impacts from the generation of air pollutants during construction activities. Heavy equipment operation, construction related vehicle traffic (e.g., worker commute trips), and transportation of construction debris would be the primary emissions sources. These sources and emissions would be temporary and intermittent. The Navy would ensure that construction contractors would implement BMPs to minimize impacts to air quality. These may include, but are not limited to:**

- **Using standard dust control measures at the project site (such as watering);**
- **Covering trucks conveying demolition debris;**
- **Removing soil or other debris from streets and roadways;**
- **Minimizing idle time for vehicle and equipment; and**
- **Use of alternate fuels and/or low-sulfur diesel.**

RP 2. Water Quality

Intent: To control activities that may degrade Guam's drinking, recreational, and ecologically sensitive waters.

Policy: Safe drinking water shall be assured, and aquatic recreation sites shall be protected through the regulation of uses and discharges that pose a pollution threat to Guam's waters, particularly in estuaries, reef and aquifer areas.

Discussion: **The Proposed Action would be consistent with RP 2. The project would not involve any in-water work that would permanently degrade Guam's waters. Restoration of the GBW would facilitate the continued safe passage at Apra Harbor, and enhance use by federal, civil, commercial, and recreational users. The construction activities would be short-term in nature and would not have lasting impacts to the water quality in the area. Best management practices would be implemented during construction to minimize pollution and siltation to the extent possible and ensure that there is no runoff into surrounding waters.**

RP 3. Fragile Area

Intent: To protect significant cultural areas, and natural marine and terrestrial wildlife and plant habitats.

Policy: Development in the following types of fragile areas including Guam's Marine Protected Areas (MPA) shall be regulated to protect their unique character.

- historic and archeological sites
- wildlife habitats
- pristine marine and terrestrial communities
- limestone forests
- mangrove stands and other wetlands
- coral reefs

Discussion: **The Proposed Action would be consistent with RP 3. The Navy has conducted a Section 106 consultation with Guam State Historic Preservation Office (SHPO) and made a *No Adverse Effect* determination. The SHPO concurred with our determination on February 28, 2024. If any objects of cultural/archeological significance are identified during restoration activities, work would be ceased immediately and the Naval Base Guam Cultural Resources Manager and Guam State Historic Preservation Office would be notified as soon as possible.**

The Endangered Species Act (ESA) listed coral species *Acropora globiceps* are located 30 to 40 meters offshore of the project area. ESA Section 7 consultations are currently on-going with NOAA to determine the project effects level. The Navy has determined the emergency breach repair project *may affect, but is not likely to adversely affect* the listed species. Currently, there is no critical habitat designated or proposed for *A. globiceps* in the vicinity of the project area.

The Navy has determined that the project *may affect, but is not likely to adversely affect* green turtles, hawksbill turtles, and scalloped hammerhead sharks. Currently, there is no critical habitat designated or proposed for sea turtles or scalloped hammerhead sharks in the vicinity of the project area.

The Proposed Action is not expected to appreciably diminish Essential Fish Habitat (EFH) over the long term. However, temporary adverse effects on EFH

may occur. The Proposed Action may temporarily contribute to the degradation of aquatic habitat resulting from the loss of sessile organisms, including corals and benthic invertebrates as armor stones are placed along the water's edge. Adverse effects will be minimized through minimizing and avoiding in-water work as much as possible. Due to the implementation of appropriate BMPs, the relative quantity and quality of existing EFH within the action area, and the size and scale of anticipated effects, the Proposed Action is not expected to appreciably diminish habitat value over the long term.

RP 4. Living Marine Resources

Intent: To protect marine resources in Guam's waters.

Policy: All living resources within the waters of Guam, particularly fish, shall be protected from over harvesting and, in the case of corals, sea turtles and marine mammals, from any taking whatsoever.

Discussion: **The Proposed Action would be consistent with RP 4. The Proposed Action may affect, but is not likely to adversely affect ESA-listed green turtles, hawksbill turtles, and scalloped hammerhead sharks. BMPs such as monitoring the area for the presence of protected species, avoidance, and cessation of construction when species are present, will help minimize adverse effects.**

RP 5. Visual Quality

Intent: To protect the quality of Guam's natural scenic beauty.

Policy: Preservation and enhancement of, and respect for the island's scenic resource shall be encouraged through increased enforcement of and compliance with sign, litter, zoning, subdivision, building and related land-use laws. Visually objectionable uses shall be located to the maximum extent practicable so as not to degrade significant views from scenic overlooks, highways and trails.

Discussion: **The Proposed Action would be consistent with RP 5. Repairs to GBW would use the same or similar materials to the existing structure, and would not appreciably alter the structure visually. Therefore, the project would be compatible and would not detract from the aesthetic or environmental quality.**

RP6. Recreation Areas

Intent: To encourage environmentally compatible recreational development.

Policy: The Government of Guam shall encourage development of varied types of recreational facilities located and maintained so as to be compatible with the surrounding environment and land uses, adequately serve community centers and urban areas and protect beaches and such passive recreational areas as wildlife, marine conservation and marine protected areas, scenic overlooks, parks, and historical sites.

Developments, activities and uses shall comply with the Guam Recreational Water Use Management Plan (RWUMP).

Discussion: **The Proposed Action would be consistent with RP 6. The proposed project would restore existing structures and ensure continued recreational use consistent with the Guam RWUMP.**

RP 7. Public Access

Intent: To ensure the right of public access.

Policy: The public's right of unrestricted access shall be ensured to all non-federally owned beach areas and all Guam recreation areas, parks, scenic overlooks, designated conservation areas and their public lands. Agreements shall be encouraged with the owners of private and federal property for the provision of releasable access to and use of resources of public nature located on such land.

Discussion: **The Proposed Action would be consistent with RP 7. Public access may be impacted temporarily during the repair activities. However, restoration of GBW will enhance and ensure the long-term safe usage of Apra Harbor for military, civil, commercial, and recreational users.**

RP 8. Agricultural Lands

Intent: To stop urban types of development on agricultural land.

Policy: Critical agricultural land shall be preserved and maintained for agricultural use.

Discussion: **Not applicable.**

FEDERAL CONSISTENCY SUPPLEMENTAL INFORMATION FORM

Date: **August 1, 2024**

Project/Activity Title or Description: **Emergency Breach Repair of the Admiral Glass Breakwater**

Location: **Cabras Island, Piti Guam**

Other applicable area(s) affected, if appropriate:

Est. Start Date: November 2024 Est. Duration: Six months

APPLICANT

Name & Title: **Mr. Edward E. Moon, Installation Environmental Program Director**
Agency/Organization: **Public Works Department U.S. Naval Base Guam**
Address: **U.S. Naval Base Guam, PSC 455, BOX 152, FPO AP 96540-1000**
Telephone No. during business hours:
A/C **(671) 339-4100**
A/C N/A
Fax N/A

E-mail Address: **Edward.e.moon2.civ@us.navy.mil**

AGENT

Name & Title: **Jesse T. Cruz**
Agency/Organization: **Public Works Department U.S. Naval Base Guam**
Address: **U.S. Naval Base Guam, PSC 455, BOX 152, FPO AP 96540-1000**
Telephone No. during business hours:
A/C **(671) 339-5314**
A/C N/A
Fax N/A

E-mail Address: **jesse.t.cruz3.civ@us.navy.mil**

CATEGORY OF APPLICATION (check one only)
(XX) I - Federal Agency Activity
( ) II - Federal Permit or License
( ) III - Federal Grants & Assistance

TYPE OF STATEMENT (check one only)
( ) Consistency
( ) General Consistency (Category I only)
(XX) Negative Determination (Category I only)
( ) Non-Consistency (Category I only)

APPROVING FEDERAL AGENCY (Categories II & III only)

Agency:
Contact Person:
Telephone No. during business hours:
Area Code - Local
Area Code _____ - Govt. Cell

FEDERAL AUTHORITY FOR ACTIVITY

Title of Law:
Section:

OTHER GUAM APPROVALS REQUIRED:

Agency	Type of Approval	Date of Application	Status

ENCLOSURE 2

FEDERAL CONSISTENCY NEGATIVE DETERMINATION

Project Description: Glass Breakwater Emergency Breach Repair

The Admiral Glass Breakwater (GBW), along the outer Apra Harbor, Guam, sustained significant damage resulting from Typhoon Mawar in May 2023 (Figure 1). As a result of this damage, the Navy initiated a Request for Proposal for emergency repairs of the entire GBW in December 2023. On 09 May 2024, another site visit was conducted by Navy engineers who discovered an accelerated degradation of approximately four locations of the breakwater. The armor stones present in these areas, approximately 10 to 15 feet in diameter and weighing approximately 20 to 25 tons, were missing and exposing the GBW core. The armor stones were dislodged, highly unstable and were found moved further down slope and into the water. Emergency mitigation measures to temporarily stabilize the armor stones on these failing slopes was recommended on an accelerated schedule.

There are four locations as of 09 May 2024 that have seriously failed to the extent that the crest road could potentially be breached within the next 12 months. Currently, the crest road width is 35 feet. This width just allows the expected repair equipment to transvers the area and operate. Any additional loss of crest width will delay the repair efforts and expose the GBW to further loss while the crest road is being modified or repaired to allow equipment access. It is possible by the fall of 2024, these eroded areas could grow in size, height, depth, and thickness through typical wave events. If a typhoon occurs, the probability of further failure is very high. In order to repair the breakwater, the crest road must be maintained.

The intent of the emergency breach repair is to temporarily relocate existing intact armor stone from neighboring breakwater crest areas and place them on the failed areas, to minimize crest road loss and protect the breakwater core structure. This emergency repair project will allow time for the Navy to proceed with the original proposed repairs to the GBW.

The proposed construction activities limited to only the emergency breach repair are listed below.

1. Recover unstable armor stones on the slope that are reachable with conventional equipment already available on island.
2. Armor stones out of reach to safely recover with equipment may be carefully maneuvered downslope until they rest at the toe of piled stones.
3. Dress the slopes of the exposed portions of the breakwater core aggregate material and remove any portions of saturated or unstable slopes.
4. If necessary, place geotextile fabric to protect the core (designer determination).
5. Replace the armor stones that were able to be recovered.
6. Relocate armor stones from neighboring portions of the breakwater.
7. Temporarily place recovered armor stones on the failed slopes until the near-future repairs will commence in 2025.

Assumptions & Calculations

In order to estimate the work efforts, the Navy made some assumptions and measurements. Navy engineers identified four primary areas of failure denoted in Figure 2 below. It was assumed a uniform cross section applied and then designers developed a best fit line to estimate the length of hypotenuse on the slope that would require emergency repair. It was further assumed that the emergency repair would extend 130 feet horizontally beyond the center of the crest road which correlates to approximately 10 feet seaward of the High Tide Line. The width of each failure area was measured using Google Earth (recent imagery as of 19 MAR 2024) and the thickness was assumed to be 15 feet thick of armor stone which is 1.5 times the estimated diameter of the stones to be temporarily placed (industry standard practice). Using these assumptions, Navy engineers were able to develop an estimated volume of potentially failed armor stones. It was then calculated how much stone would need to be relocated for the temporary repair; which would need to come from the borrow sections of the GBW. There is currently no on-island source of replacement armor stones.

Navy engineers assumed that the relocated armor stones would be from neighboring crest areas, starting at the breakwater head and move landward, with a dimension of approximately 15 feet thick and 30 feet wide. Only the armor stones at the upper crest would be removed so as to not destabilize the slopes of the adjacent armoring. Assuming only 75% of the failed areas would require temporary breach repair, it was calculated that approximately 1,500 LF of adjacent stones at the crest would be required. This sequential approach reduces the risk of exposing the breakwater to further failure potential

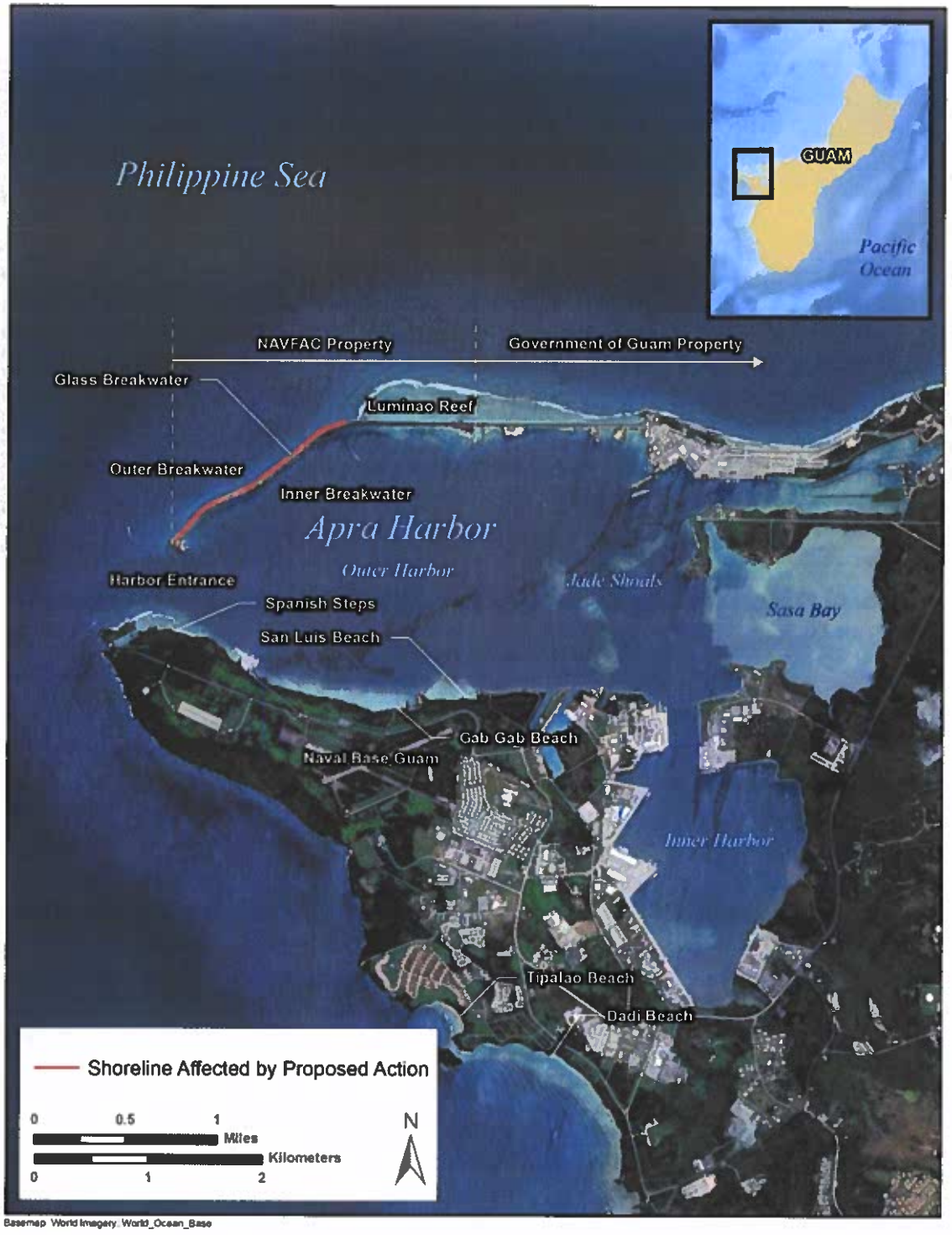


Figure 1. Shoreline of the Glass Breakwater affected by the Proposed Action in Apra Harbor.

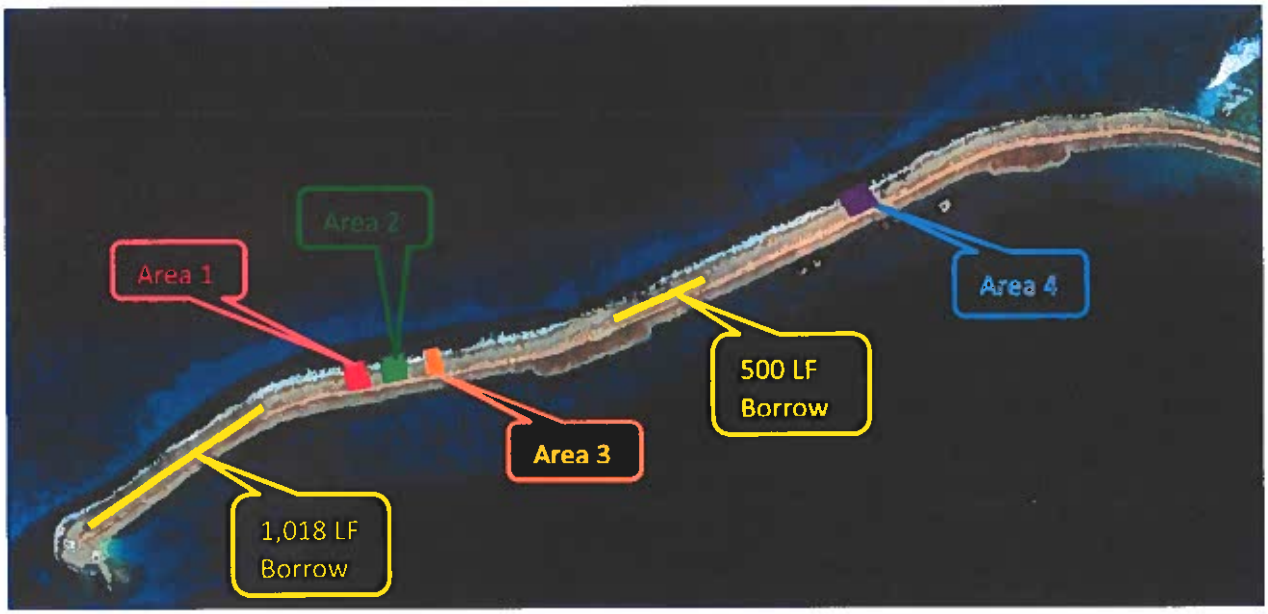
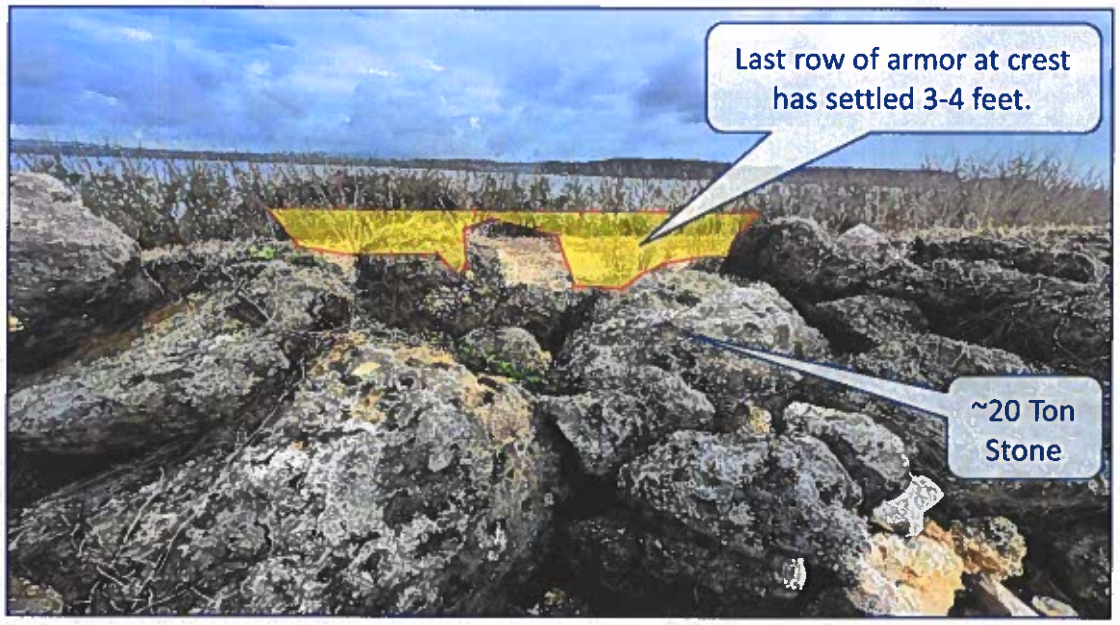


Figure 2. Areas of GBW armor stone failure and Proposed Borrow Areas

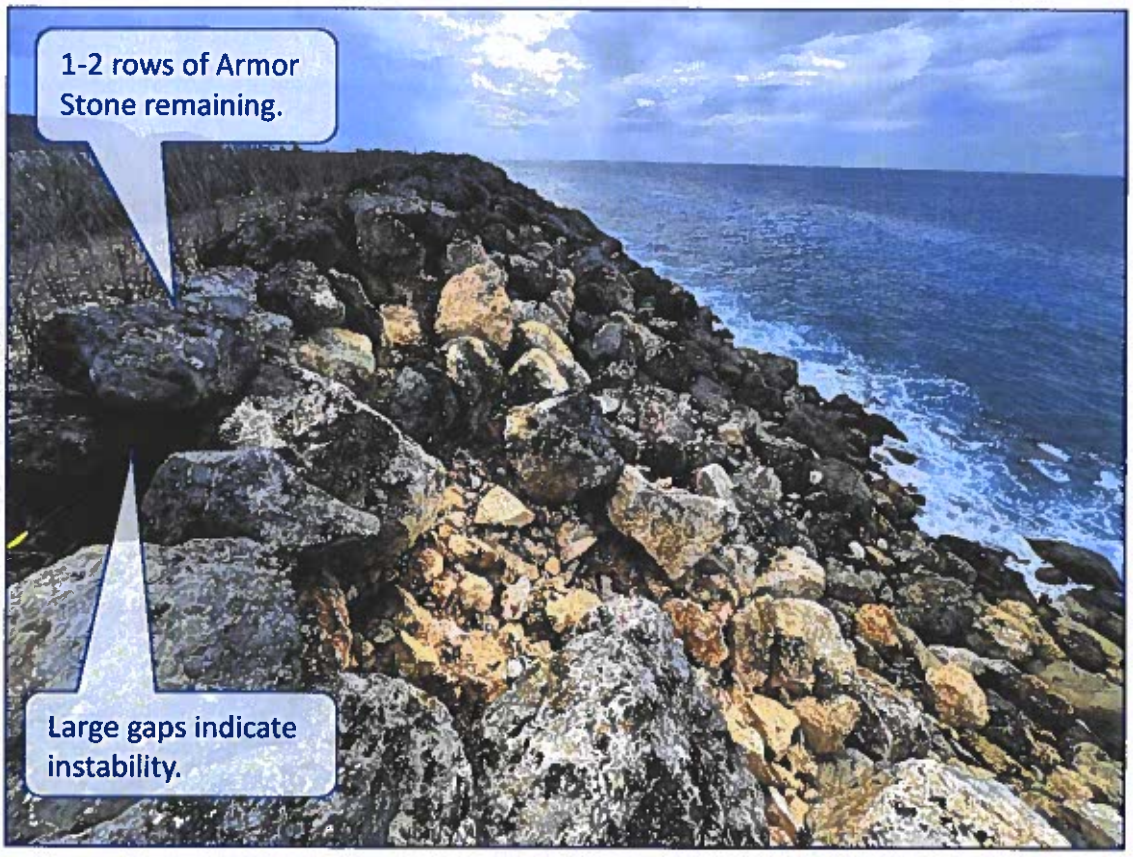
Failure Area	Slope Length (ft)	Width (ft)	Thickness
1	132	115	15
2	132	125	15
3	132	30	15
4	132	150	15
Total Volume (CF)		910,800	
Assumed 75% Repair Volume (CF)		683,100	

	Borrow
Length (ft)	1,518
Width (ft)	30
Height (ft)	15
Volume	683,100

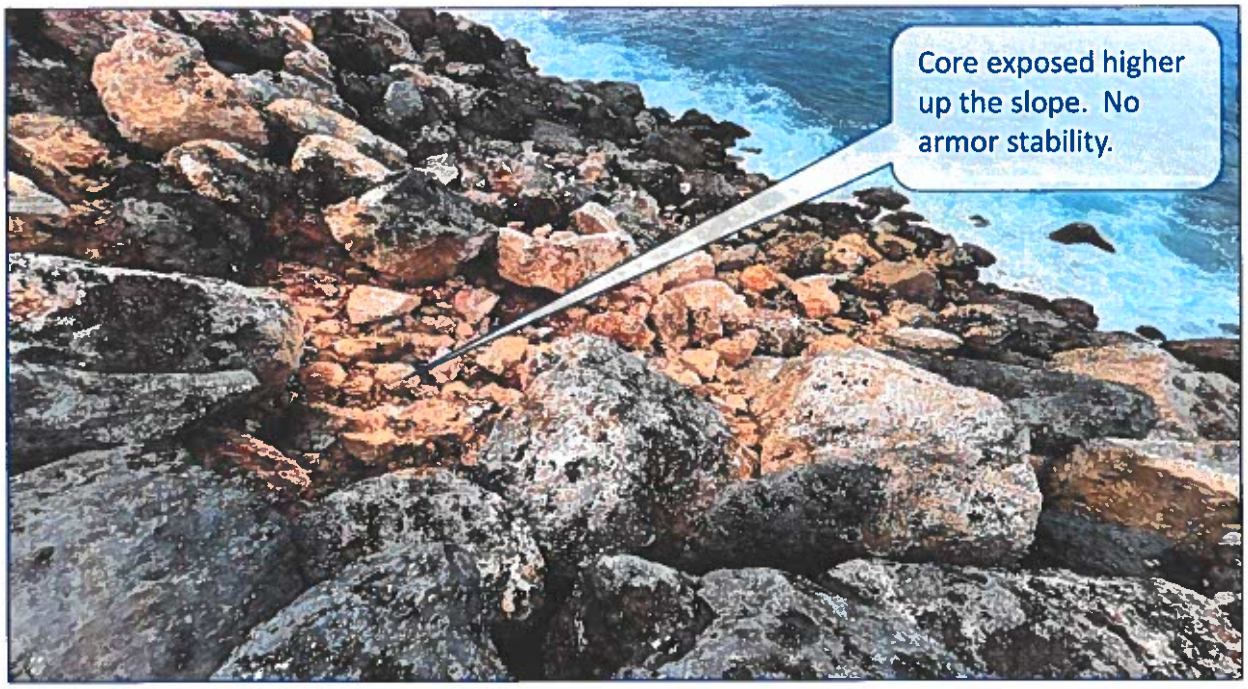
Note: Assumed repair and borrow volumes are equal which verifies sufficient armor stones are available.



Photograph 1. Example of Breakwater Crest Settlement



Photograph 2. Example of Breakwater Armor Stone Loss



Photograph 3. Example of Exposed Core Aggregate

Photograph 4. Example of Debris Spills at Crest Road