National Park Service
U.S. Department of the Interior

ASAN AND AGAT UNITS MANAGEMENT PLAN AND ENVIRONMENTAL ASSESSMENT

PART 4 of 4 – Appendices

WAR IN THE PACIFIC NATIONAL HISTORICAL PARK

January 2024

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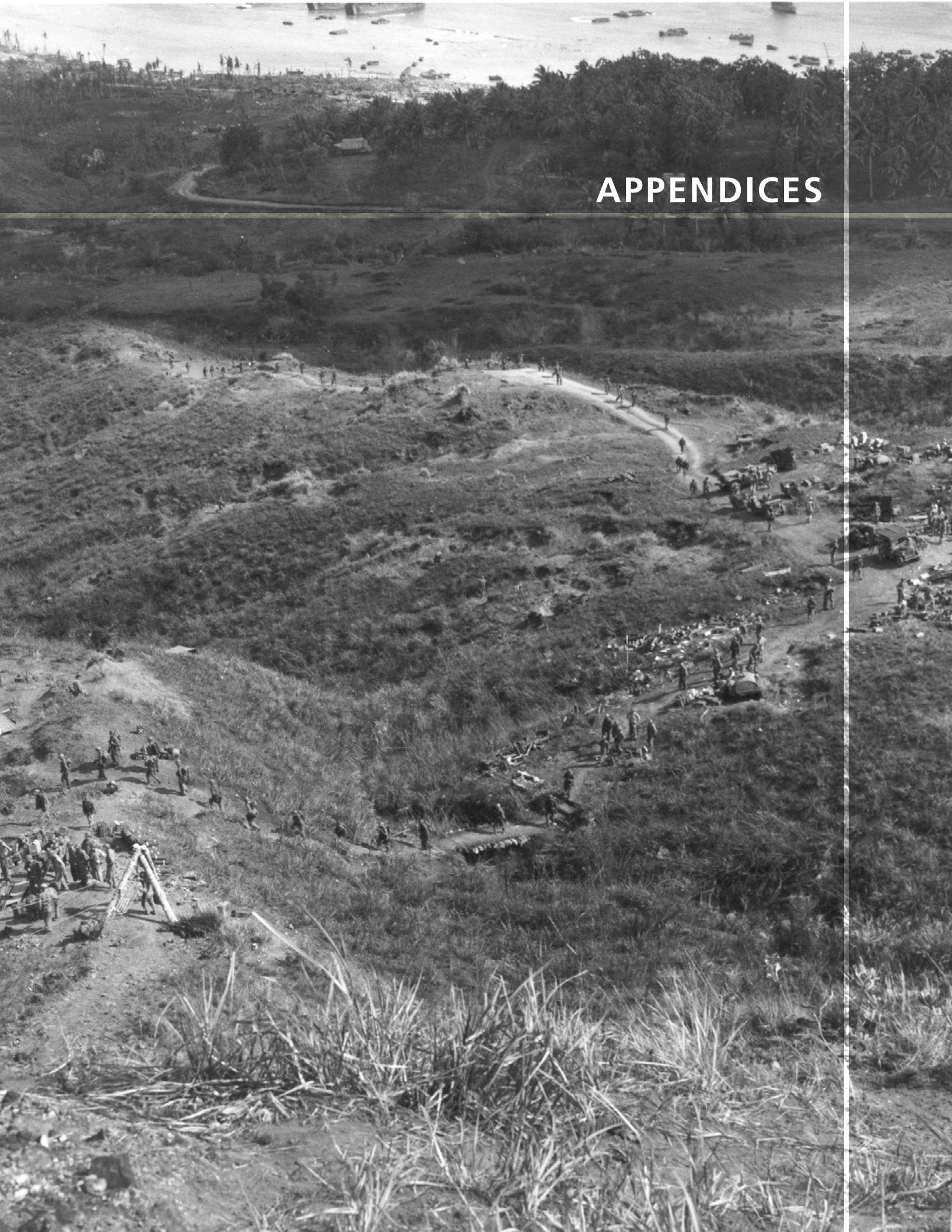


APPENDICES

US reinforcements heading uphill from Asan Beach (through the present-day Asan Inland Unit). Photo: NARA.

APPENDIX A: INDICATORS, THRESHOLDS, AND MANAGEMENT STRATEGIES

INDICATORS AND THRESHOLDS

As described in chapter 2 under Adaptive Management for Visitor Use and Climate Change Impacts, indicators, thresholds, monitoring protocols, and management strategies would be implemented as part of the unit management plan in pursuit of achieving and/or maintaining desired conditions. These are described below and would be applied to potential action alternatives in the plan. Indicators measure conditions that are related to visitor use, and monitoring is conducted to track those conditions over time. Thresholds represent the minimum acceptable condition for each indicator and were established by considering desired conditions, data on existing conditions, relevant research studies, and the professional judgment of staff.

The interdisciplinary planning team considered the central issues driving the need for the plan and developed related indicators that would help identify when the level of impact becomes cause for concern and management action may be needed. Given the direct relationship between climate change and visitor opportunities in the park, the NPS has taken an integrated approach to prioritize which resources and visitor experiences are likely to be the most sensitive to impacts from visitor use and climate change. In addition to the phase-based adaptive management approach described in alternative B, the indicators described below were considered the most critical, given the importance and vulnerability of the resource or visitor experience.

The following indicators have been selected for monitoring at the Asan Beach, Asan Inland, Agat, and Mt. Alifan Units:

- Number of times per year a visitor facility needs to close due to flooding, storm damage, wildfire, or other natural impacts.
- Incidences of human-caused damage to cultural resources.

In identifying high-priority indicators, the park also considered the potential future need for an indicator related to trail and adjacent resource conditions, in view of the proposed trail additions within the inland units. Because alignments for trails have not yet been identified (except the trail to Tony's Falls), trail-specific indicators would need to be developed as part of implementation-level design and planning.

The following pages outline associated thresholds, rationale, monitoring, and management strategies for each indicator. Not all strategies related to the indicators and thresholds would be implemented upon completion of the unit management plan, rather some would be implemented as thresholds are approached or exceeded. At this time, these have all been identified as adaptive management actions. The impact analysis for all strategies would be included as needed in future environmental compliance documents for the applicable future planning effort so that the park could employ actions necessary to achieve desired conditions.

Indicator

Number of times per year a visitor facility needs to close due to flooding, storm damage, wildfire, or other natural impacts.

THRESHOLD[1]

- Parking lots, walkways, and picnic areas: no more than five times per year.
- Restrooms: no more than two times per year.

1 Note that the visitor center isn't included in the list of sites monitored, because it is outside of the planning area. Thresholds for closure of the visitor center due to natural impacts would be lower than for other facilities because the visitor center also houses the park's museum collections.

RATIONALE

Desired conditions for the planning area (see chapter 2) describe facilities that are resilient to climate change and other environmental impacts, as well as accessible and welcoming for visitors. Monitoring of this indicator ensures that the park is continuing to support a high-quality visitor experience within the four units in the context of a dynamic environment. This indicator is highly relevant to the purpose and need of the unit management plan because it integrates visitor use and climate change impacts. It is sensitive to change and would alert managers when action is required.

MONITORING

The park typically receives notifications from staff members or visitors when a facility closes and would compile these closures and their frequency in a logbook that would be evaluated regularly.

ADAPTIVE MANAGEMENT STRATEGIES

- Increase messaging and information about weather impacts and closures using the park's website, social media, radio announcements, and other methods.
- Redirect use to alternative areas of the park where facilities are still open.
- In the long term, remove or relocate facilities to more resilient locations, as described under alternative B (see chapter 2).

Indicator

Incidences of human-caused damage to cultural resources.

THRESHOLD

- Graffiti: no more than two incidents per year.
- Removal of historic objects: no more than one incident per year.

RATIONALE

The park's cultural resources, including historic fortifications and defensive features, all contribute to the World War II battlefield landscape that is identified as a fundamental resource of the park (NPS 2017). Desired conditions for the planning area describe a visitor experience of being immersed in the historic landscape and understanding the significance of the park sites through this power of place. Human-caused damage to National Register-listed historic properties and other cultural resources negatively impacts the experience of all park visitors, in addition to the resources the park is mandated to protect. Monitoring would be prioritized for areas receiving the most visitation but would occur on a rotating schedule for all units in the planning area.

MONITORING

Park maintenance staff are regularly on site in areas receiving visitor traffic and would monitor the condition of historic structures, archeological sites, and tangible artifacts that could be easily accessed. Visitors could also report damage. Incidents would be recorded in a logbook that would be evaluated regularly. In addition, park cultural resources staff conduct annual condition assessments of all the historic fortifications within the units on a rotating schedule, which would provide the opportunity to record any incidences of human-caused damage.

ADAPTIVE MANAGEMENT STRATEGIES

- Incidences of damage will be reported to law enforcement personnel for response, per NPS *Management Policies 2006*.
- If appropriate, law enforcement personnel may close areas of the park, depending on the significance of the damage.
- Graffiti would be removed from historic structures following approved methods.
- Increase messaging and communications about the importance of resource protection, historic preservation, and Leave No Trace principles. This could occur through additional signage, online communications such as the park website and social media, and interpretive programming or other park events.
- Promote regular community volunteer groups and junior ranger programs to instill stewardship and keep "eyes on the park."

APPENDIX B: ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED

The Council on Environmental Quality (CEQ) guidelines for implementing NEPA require federal agencies to analyze all "reasonable" alternatives that substantially meet the purpose and need for the proposed action. Under NEPA, an alternative or alternative element may be eliminated from detailed study for the following reasons:

- Technical or economic infeasibility;
- Inability to meet project objectives or resolve need for the project;
- Duplication of other less environmentally damaging alternatives;
- Conflicts with an up-to-date valid plan, statement of purpose and significance, or other policy; and therefore, would require a major change in that plan or policy to implement; and
- Environmental impacts too great (40 Code of Federal Regulations [CFR] 1504.14(a)).

The planning team considered other potential actions, including those identified through civic engagement, that were determined infeasible and/or not responsive to the purpose and need for action. These actions and the rationale for not carrying them forward for further analysis are summarized below.

NEW VISITOR CENTER WITHIN THE PLANNING AREA

The development of a new visitor center or visitor contact station within the four park units was considered during the unit management planning process. The park's current T. Stell Newman visitor center is leased from the Navy and located in Sånta Rita, approximately 4.5 miles south of the Asan units and 3 miles north of Agat and Mt. Alifan. During civic engagement in August 2022, several members of the public encouraged the NPS to provide a formal visitor contact facility with an onsite ranger within the park units. Many suggested that this be located at the Asan Beach Unit.

The planning team understands the importance of enhancing interpretation and the NPS presence within the park, especially at Asan Beach. However, building a new facility within the coastal zone of Asan Beach would not be feasible or sustainable in the long term due to projected sea level rise and other coastal hazards such as storm surge and typhoons. In addition, the construction of a new building within the cultural landscape of the invasion beach would have an adverse effect on the spatial organization and historic viewsheds of the site, both character-defining features of the Word War II battlefield (NPS 2021). Locations within the other three units of the planning area are similarly constrained by coastal hazards in the case of Agat, or development challenges posed by steep and rugged terrain and lack of public access in the case of the inland units. As with Asan Beach, facility development opportunities in the other three units would also be restricted by the need to preserve character-defining features of the cultural landscape and protect other cultural and natural resources.

Therefore, a new visitor center or visitor contact station within one of the four units was dismissed from further consideration. Instead, alternative B of the UMP proposes a mobile visitor center with a ranger that would be stationed at Asan Beach and the other coastal park sites on a rotating schedule. Together with the small open-air interpretive shelters included in alternative B, the mobile visitor center helps meet the goals of the NPS Visitor Center Futures project, which is reimagining how can parks can deliver essential visitor functions and meet contemporary needs and audiences. If in the future the park needs to revisit the location and/or configuration of the current visitor center, it would be undertaken as a separate project and would evaluate alternative sites within the park or on the island.

INSTALLATION OF A SECURITY GATE AT ASAN BEACH UNIT

Several people requested that the NPS install a security gate at Asan Beach Unit during civic engagement for the plan in August 2022. Those proposing a gate suggested that it be locked at night to prevent illegal activities. The planning team considered incorporating a gate into the site design for Asan Beach Unit but dismissed this idea from further consideration. This is due to the operational challenges faced by the park several years ago when a security gate was installed at Asan Bay Overlook. Additionally, closing the gate at night would reduce current visitor access opportunities. Asan Beach Unit receives heavy visitation before dawn, from recreational visitors exercising before the heat of the day, and after sunset with use from people picnicking as well as exercising.

REPLACEMENT OF BASEBALL FIELD AT ASAN BEACH UNIT

The suggestion to replace the Asan Point baseball field was raised during civic engagement. Replacing the Asan Beach baseball field would not be compatible with the cultural landscape's period of significance, which is 1941 to 1945, marking the beginning and end of World War II in the Pacific. In addition, providing a new baseball field would not respond to the purpose and need for the UMP, nor does it align with the park purpose and significance as articulated in the park's foundation document. Lastly, the Superintendent's Compendium for the park states that the entire park is closed to the playing of sporting activities by teams in organized sports leagues to protect resources, ensure visitor safety, and not impede the peace, tranquility, and commemorative nature of the park. Therefore, this idea was dismissed from further consideration.

FOOD VENDING AND CAMPING OPPORTUNITIES AT ASAN BEACH UNIT

Additional visitor-serving opportunities at Asan Beach were suggested during civic engagement in 2022. In particular, a small number of commenters recommended that the NPS consider allowing food vendors and camping at Asan Beach Unit. Food vending and camping at national parks typically fall under the category of commercial visitor services. NPS *Management Policies 2006* offers guidance to ensure that commercial services are necessary and appropriate, financially viable, and addressed in an approved management plan. According to *Management Policies 2006*, a decision to authorize a park concession will among other factors be based on a determination that the facility or service is consistent with the park's enabling legislation, complementary to a park's mission and visitor service objectives, necessary and appropriate for the public use and enjoyment of the park in which it is located, and is not, and cannot be, provided outside park boundaries.

Food vending and camping fall into a category of commercial service that is not consistent with the purpose of the park as described in the enabling legislation to "commemorate the bravery and sacrifices of those participating in the campaigns of the Pacific Theater of World War II and to conserve and interpret the outstanding natural, scenic, and historic values and objects on the island of Guam." In addition, camping is prohibited in all areas of the park in the Superintendent's Compendium, to protect government equipment, protect the public water supply, and to protect the public from hazards. While the park could potentially host traditional food preparation activities associated with a special event, through a special use permit, food vending would not be consistent with NPS policy. Therefore, these ideas have been dismissed from further consideration.

SEAWALL TO PROTECT COASTAL UNITS

Many of the park's most significant planning challenges relate to threats posed by sea level rise and storm surge. See the Planning Challenges and Opportunities section of chapter 1, as well as appendix E for more detail.

The planning team considered a variety of approaches to protect the coastline of the historically significant invasion beaches, including both "hard" and "soft" engineering solutions for coastal protection. "Hard" infrastructure solutions include engineered structures such as seawalls, levees, and breakwaters. "Soft" solutions rely on natural defenses for protection, such as coral reefs, native strand vegetation along the shoreline, and mangroves at the mouth of river drainages. Although seawalls can be a method to reduce flooding and storm damage, they are costly to construct and can cause increased coastal erosion and other damage to ecosystems, exacerbating coastal hazards in the long term. A seawall constructed along the Asan and Agat invasion beaches would additionally pose an adverse effect to the historic viewsheds along the beaches, which are listed in the National Register of Historic Places (NRHP). As a result, the NPS has instead identified a suite of natural defenses in alternative B to increase resilience to coastal inundation, allowing natural systems to continue unimpeded to the greatest extent possible.

MOVING WORLD WAR II FORTIFICATIONS INLAND

As part of the planning process, the NPS considered relocating the World War II defensive structures that are located along the shoreline in the coastal units of the park. These fortifications are at risk of damage or inundation due to sea level rise, storm surge, and other coastal weathering. As described in the Cultural Resources section of chapter 3, the fortifications were intentionally integrated into the rocky outcroppings on which they were built. Their strategic importance to the Japanese military is still visible in their location at the water's edge, which allowed the defense of the landing beaches and made it possible for the structures to be well-camouflaged. Many of the defenses also consist of natural or modified caves connected to the concrete fortifications.

The relocation of these fortifications would therefore damage their integrity, both through damaging the structures themselves and through changing their location and arrangement along the shoreline, which are character-defining features of the World War II battlefield. This would result in an adverse effect to these historic properties under Section 106 of the National Historic Preservation Act. Instead, the preferred alternative focuses on a rigorous monitoring, stabilization, and documentation program that would prioritize management activities for the defensive structures most at risk. Documentation of structures through the HABS/HAER/HALS program and 3-D virtual modeling would ensure that information about the structures at highest risk of loss would be preserved and that their arrangement along the coast could still be shared with visitors.

COMMEMORATION OF UNMARKED JAPANESE GRAVES IN ASAN INLAND UNIT

During civic engagement, the NPS was encouraged to memorialize unmarked Japanese graves from World War II as part of the planning concepts proposed for the Asan Inland Unit. Currently the location of these graves is unknown, although the park is working closely with the Defense POW/MIA Accounting Agency (DPAA) and the Japan Association for Recovery and Repatriation of War Casualties (JARRWC) to locate and recover Japanese graves and remains within the park. If a mass burial location were to be discovered within the unit, decisions about how best to commemorate the site would need to be determined in collaboration with the Government of Guam, including the Guam State Historic Preservation Office (SHPO), and other park partners. This action is therefore not analyzed as part of the alternatives in the UMP, although it could be compatible with both alternative A and B if discoveries were to occur in the future.

APPENDIX C: IMPACT TOPICS CONSIDERED BUT NOT CARRIED FORWARD FOR DETAILED ANALYSIS

The NPS followed the criteria from the *National Park Service NEPA Handbook* (NPS 2015) to identify issues to analyze in detail in the environmental assessment. In the context of NEPA reviews, "issues" or "environmental issues" can be problems, concerns, conflicts, obstacles, or benefits that would result if the proposed action or alternatives, including the no-action alternative, are implemented (NPS 2015, 50–51). The handbook identifies the following criteria to determine whether an issue should be considered:

As a general rule, issues should be retained for consideration and discussed in detail if:

- the environmental impacts associated with the issue are central to the proposal or of critical importance;
- a detailed analysis of environmental impacts related to the issue is necessary to make a reasoned choice between alternatives;
- the environmental impacts associated with the issue are a big point of contention among the public or other agencies; or
- there are potentially significant impacts to resources associated with the issue (NPS 2015, 51).

Issues retained for analysis are described in Chapter 3: Affected Environment and Environmental Consequences. The following issues were dismissed from further analysis because they would not trigger any of the criteria described above.

WATER QUALITY

Several of the park's streams likely receive pollutants, mainly from non-point-source processes, runoff from agricultural areas, and animals (e.g., wild pigs). They are also exposed to elevated levels of turbidity, especially during storms.

The National Park Service Pacific Islands Inventory and Monitoring Network (I&M) conducts stream surveys in the Asan Inland Unit and coral reef surveys offshore at the Asan Beach and Agat Units. Water quality data is collected using sondes for temperature, conductivity, turbidity, and nutrients. The data suggests that the Saddok Assan and Ñåmu (Asan and Namo Rivers) likely receive pollutants because of their proximity to agricultural, commercial, or residential development; well-traveled highways; and/or their exposure to wildfires that produce debris and expose sediment that can enter streams during storms, thus increasing turbidity. A flood control structure on the Saddok Ñåmu that drains an adjacent wetland likely promotes turbidity within the stream as well. Similarly, stream channelization on both rivers also promotes increased turbidity. Litter and debris are often present in both streams (Donaldson et al., 2017).

The plan would not create any new roads or additional stormwater runoff. Drainage and stormwater infiltration along roads, walkways, and near parking areas would be improved by using pervious surfaces where possible and creating bioswales. These features would have minor long-term beneficial impacts to water quality. Measures listed in appendix D would be implemented to minimize short-term adverse impacts to water quality from site-specific construction of trails, facilities, and other actions listed in chapter 2. The preferred alternative would not result in appreciable impacts to water quality; therefore, water quality is dismissed from further analysis.

WETLANDS

Approximately 6 acres (2 hectares) of freshwater forested/scrub wetlands are located within the lower (northern) portion of the Asan Inland Unit and extend along the Saddok Assan to its mouth in the Asan Beach Unit. Two small freshwater/emergent wetlands

(less than 1 acre [0.4 hectares]) are located within this forested/scrub wetland delineation (USFWS 2023a).

Approximately 3.92 acres (1.59 hectares) of freshwater forested/shrub wetland are located within the Agat Unit, near Apaca Point. This area is within the Namo River floodplain wetland, which is designated by the Guam Coastal Management Program and included within the United Nations Protected Area Program (Donaldson et al. 2017, 57). Although the USFWS National Wetlands Inventory does not identify wetlands in the Mt. Alifan Unit (USFWS 2023b), the park's draft natural resources condition assessment indicates that palustrine forested wetland is found along part of the eastern boundary of the unit, connected to an unnamed stream (Donaldson et al. 2017, 57).

For all coastal units in the plan, naturally occurring wetland areas would be enhanced and expanded to absorb additional overland flows. Native mangrove vegetation would be planted along river outfalls to help protect the shoreline and enhance wetland habitat. These actions would result in long-term beneficial impacts to wetlands.

All associated activities within the footprint of identified wetlands (USFWS 2023a, b) would be required to follow best management practices and mitigation measures outlined in appendix D. Prior to any disturbance to existing wetlands, the park would 1) consult with the NPS Water Resources Division to further investigate and map the extent of the wetlands and conduct necessary wetland compliance, and 2) design facilities that minimize all potential impacts to wetlands, including siting trails, pathways, and other infrastructure to avoid wetland areas. These measures would also apply to any other wetlands identified in the planning area and would minimize potential adverse impacts to wetlands during the implementation of project-specific elements of the plan. The proposed action would therefore have comparatively minor impacts on wetlands within the planning area, and these impacts are expected to be beneficial. As a result, wetlands are dismissed from detailed consideration.

VEGETATION

The vegetation in the planning area is varied in distribution and composed of a complex assortment of plant communities. Plant communities are described in further detail below.

Asan Beach Unit: Vegetation in this unit consists of developed land, mainly lawn with coconut palms (*Cocos nucifera*) maintained as a recreational area, mixed grass-wooded coastal strand, and tangantangan (*Leucaena leucocephala*) semi-natural shrubland. Assan Ridge vegetation includes established limestone forest species and is being managed to restore a limestone forest habitat on the karst substrate.

Asan Inland Unit: The plant communities within this unit are more complex and include mixed savanna-herbaceous woodland, palma brava (*Heterospathe elata*) agat, and tangantangan semi-natural scrubland. There is also some developed land present, belonging to private inholdings within the park boundary.

Agat Unit: Plant communities in this unit include pago (*Hibiscus* spp.) mixed grass and woodland, coastal strand vegetation, and Australian beardgrass (Caucasian bluestem [*Bothriochloa bladhii*]) or Inifuk lawn (pilipiliula [*Chrysopogon aciculatus*]), an invasive weed).

Mt. Alifan Unit: This unit is dominated by mixed savanna herbaceous vegetation, mana (savanna fern [*Dicranopteris linearis*]) herbaceous vegetation, and karriso (wetland reed [*Phragmites* spp.]) herbaceous vegetation.

The UMP would enhance vegetation in the park by proposing revegetation of native strand and riparian vegetation in the coastal units (Asan Beach and Agat) as well as increased protection and enhancement of native plant communities in the inland units (Asan Inland and Mt. Alifan). Ongoing efforts to control invasive plant species would

continue under the no-action and action alternatives. Chapter 3 analyzes in detail the impacts to threatened and endangered plant species and nonnative invasive plant species management, which are of central importance to the proposed action. As a result, vegetation in general is dismissed from further consideration.

NIGHT SKY

Given that the park is located adjacent to several developed communities, light intrusion occurs in all the units of the planning area. This light intrusion affects the night sky. However, the night sky conditions remain good enough for the park to hold stargazing events with the public at the Asan Beach Unit and Asan Bay Overlook in Asan Inland Unit. Most of the visitor use in the park occurs between the early morning and the evening, although the park currently has minimal lighting. The addition of any new lighting associated with the preferred alternative would follow best practices for the installation of lights, as outlined in appendix D. Impacts from lightning on wildlife species, such as endangered sea turtles (haggan betde [*Chelonia mydas*], haggan karai [*Eretmochelys imbricata brissa*]) and the fanihi (Mariana fruit bat [*Pteropus mariannus mariannus*]), are discussed in more detail under the Threatened and Endangered Species section in chapter 3. Night Sky in general is dismissed from further consideration.

PUBLIC HEALTH AND SAFETY

During civic engagement for the unit management plan, several community members expressed concerns about health and safety issues at the park, specifically at Asan Beach. Risks and issues identified include:

- Stray dogs;
- People experiencing homelessness and associated short-term overnight stays;
- Petty crime (breaking into cars, theft of park property);
- Vandalism (destruction of park property, graffiti, etc.);
- Excess harvesting of resources (fish, breadfruit);
- Starting ground fires in the park;
- Public nudity;
- Vehicles not following speed limit signs;
- Illegal dumping of trash, animals, and furniture

Park staff would continue to utilize law enforcement and park ranger presence to address these issues, as staff capacity and resources allow. The proposed action includes provisions to increase public safety through infrastructure improvements, such as increased lighting on walking trails. However, most of these issues are addressed through day-to-day operational activities and would need to be dealt with by park staff, as appropriate. These issues are therefore outside of the purpose and need of the project. Thus, they are dismissed from further analysis.

Another important component of public health and safety at the park is tsunami risk. The National Oceanic and Atmospheric Administration (NOAA) has identified that all of the Asan Beach Unit and parts of the Asan Inland Unit (near the Saddok Matgue) are located within a tsunami hazard zone (NOAA 2023c). Furthermore, the map identifies that all of the Agat Unit is located within the tsunami hazard zone. The plan would not impact public safety risk from a tsunami. All existing exit routes for all locations of the planning area that are located within the tsunami hazard zone would remain open regardless of the plan's implementation. See Appendix E: Floodplain Statement of Findings for additional information about tsunami risk and other coastal hazards.

ENVIRONMENTAL JUSTICE COMMUNITIES

Federal agencies must consider environmental justice in their activities under NEPA, per Executive Order 12898 (February 1994), "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." The executive order directs each federal agency to "make achieving

environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

On November 22, 2022, the CEQ released Version 1.0 of the Climate and Economic Justice Screening Tool (CEJST) to further assist in this analysis. The purpose of the tool is to highlight overburdened and underserved census tracts and to identify those that meet the threshold for at least one category of burden. Disadvantaged communities are census tracts that are either:

- at or above the threshold for one or more environmental, climate, or other burdens, and/or
- at or above the threshold for an associated socioeconomic burden.

In addition, a census tract that is completely surrounded by disadvantaged communities and is at or above the 50th percentile for low income is also considered disadvantaged.

Two communities have been located by the CEQ CEJST map as adjacent to the planning area. Tract # 66010954800 is located south of the Agat Unit. Tract # 66010953500 is located northeast of the Asan units. Both have been identified as experiencing economic burdens. Tract # 66010954800 has been identified as experiencing burden for low-medium income, unemployment, poverty, and percent of high school degrees. Tract # 66010953500 has been identified as experiencing burden for exceeding the threshold for low-median income and percent of high school degrees (CEQ CEJST, 2022b).

Research has shown that access to green space for disadvantaged populations can promote several indicators of well-being and mental health (Wolch et al. 2014). On Guam, according to the Department of Land Management (DLM), Government of Guam, 32 percent of land is owned by the US government (mostly for military purposes), another approximately 50 percent is in private ownership, and another 20 percent is owned by the Government of Guam. Some land is held by local land trusts (DLM 2015).

Asan Beach provides a valuable open space for surrounding communities (DPR 2019). Thus, the park plays an important role in providing recreational opportunities for the community. Specifically, the Asan Beach Unit's grass fields and beach areas, beach access, and paved pathways for walking and running provide recreational opportunities for residents both adjacent to the unit and farther away from the planning area. The proposed project would preserve existing recreational and green space access and/or use within the planning area, as climate change factors, such as sea level rise, threaten existing recreational opportunities and associated facilities and amenities. The plan would not have any direct impacts to the communities identified by the CEQ CEJST, referenced above. Therefore, environmental justice communities are dismissed from further analysis.

APPENDIX D: BEST MANAGEMENT PRACTICES AND MITIGATION MEASURES

Please note: This list is not final, and all site-specific proposals would be subject to further mitigation measures as additional compliance is conducted for implementation-level projects.

The following conservation measures can be adapted for site-specific and project-specific use to minimize the potential for a project to adversely affect cultural and natural resources. As actions in the plan are implemented, the best management practices (BMPs) listed below would be supplemented by additional site-specific BMPs and mitigation measures necessary under individual project review and related compliance.

WATER QUALITY

- During construction, soil erosion would be minimized by limiting the time soil is left exposed and by applying other erosion control measures such as erosion matting, silt fencing, and sedimentation basins in construction areas to reduce erosion, surface scouring, and discharge to water bodies.
- Fueling of land-based vehicles and equipment would take place at least 50 feet (approximately 15 meters) away from the water, preferably over an impervious surface. Fueling of the vessels would be done at approved fueling facilities. Appropriate materials to contain and clean potential spills would be stored at the work site and be readily available.
- An oil spill pollution prevention plan and/or contingencies to avoid and clean up potential spills would be developed for the project. Discharges of chemicals and other fluids dissimilar from seawater would be prevented from entering the water column through the implementation of these strategies.
- Absorbent pads would be stored on the vessel to facilitate the clean-up of accidental petroleum releases.
- All equipment and materials would be examined and rinsed with fresh water prior to use in marine waters to ensure no organisms are being introduced. Any equipment that enters the water would be clean and free of pollutants, including aquatic invasive species.
- All trash would be disposed of on land in dedicated trash receptacles. No trash would be allowed to enter the water.
- Only reef-safe sunscreen would be used by site personnel.

WETLANDS

- The park shall consult with the NPS Water Resources Division to further investigate and map the extent of the wetlands and conduct necessary wetland compliance prior to any wetland disturbance.
- Facilities such as trails and pathways would be sited to avoid wetland areas to the greatest extent possible.
- If a trail crosses a wetland, the trail would be designed to minimize all potential impacts to wetlands, for example certain materials would be used based on recommendations in the wetland statement of findings.

VEGETATION

- The park would monitor areas used by visitors (such as trails) for signs of native vegetation disturbance and use public education, revegetation of disturbed areas with native plants, erosion control measures, and barriers to control potential impacts on plants from erosion or social trails.
- The park would designate river and stream access/crossing points and use barriers and closures to prevent trampling and loss of riparian vegetation.

- Revegetation plans would be developed for disturbed areas and require the use of genetically appropriate native species. Revegetation plans should specify species to be used, seed/plant source, seed/plant mixes, site-specific restoration conditions, soil preparation, erosion control, ongoing maintenance and monitoring requirements, etc.; salvaged vegetation should be used to the extent possible.
- Revegetation efforts would reconstruct the natural spacing, abundance, and diversity of native plant species in the trail corridor to the extent feasible. Monitoring of revegetated areas following construction would be conducted to ensure successful revegetation, maintain plantings, and replace plants that do not survive.
- The park would investigate and/or conduct surveys for rare plants prior to any ground- disturbing activities. To the greatest extent possible, disturbance to rare or unique vegetation would be avoided. See the Threatened and Endangered Species section below for additional detail.

NIGHT SKY/LIGHTING

Any decisions about lighting in the park would be guided by the NPS Sustainable Outdoor Lighting Principles. In addition, the following lighting specifications would be followed for any proposed new lighting:

- *No Lighting at All*: The park would first consider whether a light is truly necessary for the area or structure/facility. In many cases, reflective tape or other reflective surfaces can be used instead. This is a good option for roadways, parking lots, parking garages, and trails where people would have headlamps, flashlights, and cell phones lights.
- *LEDs in Warm Colors*: For areas that need lighting, the park would use energy-efficient LEDs that have a warm color hue, e.g., yellow and amber instead of blue or white. The target color temperature should be 2700k or below (2700 degrees on the Kelvin scale), with 2200k or below for the most sensitive environments. The highest efficiency LEDs are not preferable because they have a large proportion of blue light, which creates more glare and blind spots, has potential health effects, and isn't considered wildlife-friendly.
- *Recessed and Fully Shielded*: Hockey puck-style lights that would be inserted under a soffit or other architectural features where appropriate. The park would avoid globes or diffusers that hang below the light fixture and would use "full cut off" shielding, which allows excess light to be directed downward and not upward.
- *No Upward-Facing Lights*: Outdoor lighting would be designed and installed to be downward-facing (e.g., park signs and flags often have upward-facing lighting that can be easily made to point downward). The park would also avoid lights that are directed laterally.
- *Fixtures that Include or can Accommodate Timers, Motion Detectors, Hue Adapters, and Dimmers*: The park would use these adaptive technologies to increase energy efficiency and substantially reduce impacts to park natural and cultural resources.
- *Lowest Lumens Possible*: Lumens are the unit of measurement used to specify the intensity or brightness of LED bulbs. The number of lumens needed to safely light an area would be minimized, especially outdoors. LEDs are brighter and more energy-efficient than other types of lighting, so a lower-wattage LED could be used for the same level of brightness. Field-adjustable wattage selectors would be used where appropriate to reduce impacts, increase cost savings, and extend product life.
- *Proper Installation*: Lights would be installed with proper angle and height as designed. LED luminaires allow for very specific control of the beam spread. The size of the lighted area would change depending on the height of the fixture or pole, so the beam spread should be accounted for during installation to avoid lighting a greater area than needed. Proper installation and spread

angle would reduce the number of lights needed in general.

- *Minimize Lighting Impacts to Fanihi*: The park would minimize nighttime lighting in forested areas, and direct temporary lighting away from forest habitat. When installing new or replacing existing permanent lights, the park would use downward-facing, full cut-off lens lights (with the lowest lumens necessary). The park would fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use the lights when necessary. The park would install automatic motion sensor switches and controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area. When activities must be conducted in forested areas where bats may be roosting or foraging, the park would use red light-filtered flashlights and headlamps.
- *Minimize Lighting Impacts to Sea Turtles*: Nighttime work would be avoided during the nesting and hatching season, which is year-round. The park would minimize the use of lighting and shield all project-related lights so the light is not visible from the shoreline. If lights can't be fully shielded or if headlights must be used, the light source would be fully enclosed with light-filtering tape or filters to use warmer frequencies (red light). The park would incorporate design measures into the operation of buildings adjacent to the beach to prevent ambient outdoor lighting from reaching the shoreline, such as tinting or using automatic window shades for exterior windows that face the beach and reducing the height of exterior lighting to below 3 feet (approximately 1 meter) and pointed downward or away from the beach. In order to minimize light intensity, the park would use low-pressure sodium 18 watts, 35 watts, and lighting sources that produce light of 580 nanometers or longer. When possible, the park would include timers and motion sensors.

INVASIVE AND NONNATIVE SPECIES MANAGEMENT

- A biosecurity plan would be developed before projects are implemented to avoid introduction or spread of new invasive plant or animal species to or from the site.
- All observations of nonnative species of concern (e.g., rodents, snakes, coconut rhinoceros beetles [*Oryctes rhinoceros*], little fire ants, and predatory flatworms) would be reported to the Guam Department of Agriculture and USFWS.
- Recently disturbed areas (e.g., construction sites) would be surveyed for new priority invasive species. If new invasive species are detected, they would be treated immediately.
- Materials, tools, and machinery would be inspected by a trained biologist for signs of flatworm, rodent, or snake activity, and additional biosecurity risks, such as seeds, prior to use of equipment on the project site.
- Staff, contractors, and volunteers would be trained to inspect for seeds, seed heads, plant material, soil, and mud.
- Each personnel entering the project site would come with clean field clothing and footwear, thoroughly cleaned of all potential seeds or spores. Soles of shoes would be sprayed with a diluted bleach solution and scrubbed with a brush prior to entering the site. Any personnel entering the project site from another project site in the same day, where clothing has been subjected to potential biosecurity risks, would maintain a separate set of clean field clothing to use for the project site.
- To the greatest extent possible, equipment would remain on site for the duration of the project to minimize contamination from other sites.
- Prior to entering an uninfested area, vehicle and equipment undercarriages and tires would be washed.
- The park would refer to an inspection checklist to ensure comprehensive inspection.

- Areas where tools, equipment, and vehicles are stored would be inspected for invasive plants. These facilities would be maintained weed-free.
- Staff, contractors, and volunteers would ensure that rental equipment is free of invasive plant material before accepting it.
- The park would procure appropriate equipment for inspections, such as flashlights, portable lighting if night-time inspections are necessary, and under-vehicle mirrors.
- The park would consider the extent of infestation at worksites. Typically, not all areas are infested to the same degree with the same plants, and this may affect the type and degree of inspection needed.
- A weed-free source for project materials would be used when available, including for erosion control and soil stabilization.
- To prevent the spread of the coconut rhinoceros beetle, green waste or soil would not be transported except to designated waste sites. Designated green waste disposal sites would be managed with coconut rhinoceros beetle traps.
    - If green waste is found to be infested, trapping would be used to prevent them from spreading and damaging palm trees.
    - A gill net with a 1-inch mesh measured knot to knot, made from 0.25-mm nylon monofilament, would be laid over piles of green waste.
- Cleaning areas for tools, equipment, and vehicles would be designated. Tools, equipment, and vehicles should be cleaned in areas that are:
    - Easily accessible for monitoring and control,
    - Located away from waterways,
    - Located away from areas of sensitive habitats or species,
    - Near areas already infested with invasive plants,
    - Contained with silt fences or soil berms, and
    - Paved or have sealed surfaces to avoid re-accumulation of soil and plant material on cleaned vehicles and equipment.
- Soils and plant materials from tools, equipment, and vehicles would be cleaned before entering and leaving the worksite with the following methods:
    - Remove soil, seeds, and plant parts from tools, the undercarriage, tires, sideboards, tailgates, and grills of all vehicles and equipment. Wash tires and under carriage if the travel route is muddy.
    - Cleaning methods are divided into two categories:
        - Cleaning without water:
            - Bristle brushes, brooms, scraper, and other hand tools (to remove heavy accumulation of soil and debris prior to washing with other tools)
            - High-pressure air devices
            - Vacuum cleaner
            - Hand removal
        - Cleaning with water:
            - Wash on a paved surface to avoid creating mud. Contain wastewater and splash to prevent invasive plant parts and seed from spreading through runoff. Berms or silt fences installed along perimeters of work areas can aid in preventing the spread of contaminated materials outside the cleaning area.
            - High-pressure washers (preferably with 2,000 psi): wash once for six minutes or two to three times for three minutes for best results.
            - Portable cleaning station with undercarriage washers and

pressure hoses (useful during maintenance of multiple sites).

- Dispose of propagule-containing water from equipment washing at a waste management facility or incinerator, not at a wastewater treatment plant.

o Clean carpet, rubber, nylon, or plastic materials using:

- A vacuum cleaner
- A variety of brushes with bristles of varying length and texture

- Vehicles would be washed frequently, especially after driving off-road or along roads bordered by a high density of invasive plants, and after traveling under wet conditions.
- Cleaning would be included as part of routine maintenance activities for tools, equipment, and vehicles. This is in addition to regular cleaning on site.

THREATENED AND ENDANGERED SPECIES

Standard Site Procedures to Avoid and/or Minimize Effects to ESA-Listed Species

- The NPS would employ techniques to reduce impacts on fish, wildlife, and plant communities near existing and proposed trails, including visitor education programs and media, restrictions on visitor and NPS activities, and law enforcement patrols.
- A wildlife protection program would be implemented including evaluation of project scheduling (season and/or time of day); monitoring; erosion and sediment control, fencing, or other means to protect sensitive resources; disposing of food-related items or rubbish; salvaging topsoil; and revegetating.
- The project's action area would be delineated, including all areas that may be affected directly or indirectly by the action. The areas of the project footprint would be delineated, and buffers would be mapped around the project footprint that may be affected by various project stressors (such as noise, lighting, human disturbance, dust, vegetation removal, etc.).
- To inform project plans, a qualified biologist would thoroughly survey the various threat zones within the action area to map the locations of all threatened and endangered species and their habitats, including host plant locations. A qualified biologist is an environmental professional with at least a bachelor's degree in biology, ecology, natural resources, environmental science, or similar, with significant experience over multiple years working with ESA-listed species and their habitats in Hawai‘i or the Pacific Islands.
- Prior to site entry for site preparation, demolition and construction, or operations, staff and contractors would be trained about proper avoidance measures for protected species, including any pre-disturbance survey requirements, unique flagging used, prohibitions against unauthorized clearing of vegetation, and biosecurity BMPs.
- Pre-impact surveys for listed species, such as tree snails, would be required over the full action area as close as possible to the start of any site preparation or demolition and construction activities that require vegetation clearing.

Measures Related to Construction of Facilities

- Actions involving the use of heavy equipment such as backhoes and cranes or the placement of materials, such as large stones or concrete shapes, removing debris, clearing vegetation, grading, and dredging have the potential to injure or kill threatened and endangered plants and animals. Potential injuries and their severity will depend on the species proximity and the nature of the injury to the plant or animal. Contractors would refer to the species-specific conservation measures (e.g., buffer distances) in Table D.1 to reduce the potential for direct physical impacts to listed species and

require that the project manager ensure the buffer distances are maintained and that all materials and equipment are operated in a controlled manner.

- Temporary or permanent deployment of items such as fencing, wiring, markers, mooring lines, erosion control matting, guy wires, aerial lines, and buoys pose an entanglement or strike risk to flying and swimming wildlife. To minimize the risk, these structures would be situated well away from areas that may be occupied by species that are vulnerable to strike or entanglement risk, designed to minimize entanglement or strike risk, and removed when not in use.
- Visibility markings would be used on fences and fencing lengths would be minimized. Single-line moorings would be well-maintained with minimal slack in both support and mooring lines, thus preventing loops from forming in the lines. The complete removal of mooring systems and fencing would be required at the end of a project's life, along with inspection and maintenance for permanent or long-term deployments, minimizing the risk of entanglement.
- Erosion control products with biodegradable netting and rectangular-shaped or flexible mesh with adequate openings would be used to prevent entanglement from erosion control matting.
- The project area would be cleaned up at the end of each work shift so that tools, materials, debris, and trash are not left out in a manner that could be a hazard to threatened and endangered species.
- Noise and vibrations from tools and equipment would be kept to a minimum when working in the vicinity of a listed threatened and endangered species.
- Hazmat spill prevention protocols would be employed to prevent equipment spills and discharges from an action area.
- Tarps would be used to contain all paint chips and building debris from exterior surfaces as these can be hazards to listed threatened and endangered species.
- No standing water on tarps or other construction would be allowed as it could be a breeding ground for mosquitoes which can carry Dengue fever, avian malaria, avian flu, and other diseases.
- Loose nails, screws, and fasteners would be prevented from falling on the ground when working on exterior surfaces as they can be a hazard to threatened and endangered species. If they land on the ground, staff would pick them up immediately and dispose of them properly.
- Threatened and endangered plant and animal species are protected by federal law. Workers must obey all park regulations and drivers must obey all traffic laws and watch for animals on or alongside roads or within the project area.

Working in Near-Shore Areas

- Any in-water work would require a qualified biologist on-site to confirm the presence of endangered species (if habitat and seasonal timing of potential for occurrence occur). The biologist would determine steps required prior to in-water work if any such species are identified.
- As practicable, work would be conducted during calm sea states with work stoppages during high surf, winds, and currents.
- Vessel operators would halt or alter course to remain at least 164 feet (approximately 50 m) from ESA-listed marine species. Vessel operators would reduce vessel speed to 10 knots (11.5 mph) or less when piloting vessels in the proximity of marine mammals, and to 5 knots (5.75 mph) or less when piloting vessels in areas of known or suspected turtle activity.
- If approached by an ESA-listed marine species, the vessel operator would put the engine in neutral until the animal is at least 50 feet (approximately 15 m) away, and then slowly move away to 164 feet (approximately 50 m) from the animal.

Table D.1: Buffer Distances for Listed Plants and Butterfly Host Plants

PROPOSED ACTION	BUFFER DISTANCE: HERBS/SHRUBS	BUFFER DISTANCE: TREES
Vegetation removal (hand tools)	1 meter (3 feet)	1 meter (3 feet)
Vegetation removal (mechanical)	1 meter (3 feet), or height of vegetation to be removed, whichever is greater	1 meter (3 feet), or height of vegetation to be removed, whichever is greater
Vegetation removal (heavy equipment)	Two times the width of the equipment, plus the height of the vegetation to be removed	250 meters (820 feet)
Hand application of herbicide	3 meters (10 feet)	Crown diameter
Ground spray of herbicide (e.g., backpack sprayer)	15 meters (50 feet)	76 meters (250 feet)
Ground/soil disturbance (hand tools)	6 meters (20 feet)	Two times crown diameter
Ground/soil disturbance (heavy equipment)	100 meters (328 feet)	250 meters (820 feet)
Surface hardening/ soil compaction (roads/ utilities/buildings)	100 meters (328 feet)	250 meters (820 feet)
Prescribed burns	Prohibited	Prohibited

- All vessels would operate at 'no wake/ idle' speeds while in water depths where the draft of the vessel provides less than a 6-foot (2-meter) clearance. All vessels would follow deep-water routes (e.g., marked channels) whenever possible. If operating in shallow water, all vessels would use a dedicated lookout to assist the pilot with avoiding large coral colonies.
- Anchors, tools, or equipment would not be placed on any organism unless contact with the organism is a necessary component of the project. Anchors would be placed in soft sediment only. Where applicable, divers would check boat anchor deployment and shift anchors to ensure they are not a threat to corals or seagrass.
- Personnel would avoid contact with organisms wherever possible, take measures to avoid kicking the reef with fins, and secure dive and survey equipment in a manner that would prevent that material equipment from being drug across the substrate.

Measures Related to Trail Work

- Surveys by qualified biologists to determine if rare, threatened, or endangered state or federally listed species are present would be conducted before ground disturbance or vegetation clearance to avoid adverse impacts and ensure appropriate locations and design of facilities. The USFWS would be consulted when required for surveys prior to the commencement of construction activities.
- Vegetation clearing would be strictly limited to that which is required for project completion, and indiscriminate clearing would not occur. Development projects would be located in previously developed areas or areas without native vegetation.
- Topsoil would be re-spread in as near to the original location as possible and supplemented with scarification, mulching, seeding, and/or planting with species native to the immediate area. Conserving native topsoil would minimize vegetation impacts and potential compaction and erosion of bare soils. The use of conserved topsoil would help preserve microorganisms and seeds of native plants.
- Construction activities would be scheduled to minimize construction-related impacts on visitation and wildlife behavior (e.g., nesting seasons).
- Care would be taken not to disturb any sensitive wildlife species found nesting, hibernating, foraging, or otherwise living in or immediately nearby the worksites. If nesting or roosting is found, resource management personnel would be consulted, and measures would be identified to avoid impacts. Resource management personnel would be consulted when wildlife would be disturbed by proposed trail construction or maintenance activities.
- If avoidance is infeasible, adverse effects on rare, threatened, and endangered species would be minimized and compensated as appropriate and in consultation with the appropriate resource agencies.
- The park would use temporary or seasonal visitor use restrictions or area closures to protect sensitive wildlife habitat and sensitive wildlife behavior or life stages from trail use.
- Where possible, natural features with obvious high value to wildlife would be preserved.
- If sensitive natural resources are discovered during trail construction, construction would cease, and the area would be surveyed in more detail so that impacts could be avoided or minimized and/or an alternate route established.

Preservation of Natural Features During Construction

For any construction-related work, the contractor would comply with the following work restrictions to preserve natural features:

- Prevent damage to natural surroundings
- Provide temporary barriers to protect existing trees, tree roots, plants, grass areas, and lawns that are directly impacted by construction operations
- Avoid fastening ropes, cables, or guys to existing trees, rock outcrops, or other natural features
- Avoid removing, injuring, or destroying existing trees, tree roots, or plants without approval by the contracting officer or unless it's explicitly required in the contract documents
- Notify the contracting officer immediately for a determination if a tree, tree branch, root, or mass of vegetation is preventing the completion of the work
- Carefully supervise the excavation, grading, filling, equipment movement, and other construction operations near trees and tree branches to prevent damage

Reporting Adverse Effects

- If an ESA-listed species is adversely affected as a result of the project, all work must stop until coordination with the NPS, USFWS, and/or NOAA has been completed.

Measures for All Listed Plants

- Disturbance would be minimized outside of existing developed or otherwise modified areas. When disturbance outside existing developed or modified sites is proposed, a botanical survey of the action area would be conducted for ESA-listed plant species.
- Surveys would be conducted by a botanist with documented experience identifying native plants during an appropriate time period for the potentially occurring protected species, such as during the wettest part of the year.
- A buffer surrounding rare, threatened, or endangered state or federally listed plant species would be imposed that prohibits physical damage to the identified population during construction activities. The park's Resource Management Division would be consulted when determining the appropriate buffer.
- The boundary of the area occupied by ESA-listed plants would be marked with flagging by the surveyor and the buffer distances in Table D.1 would be implemented. Where project actions will occur within these buffer distances, additional consultation with the Service is required.
- Vegetation and soil disturbance due to project activities would be avoided within the buffer distances detailed in Table D.1.
- Where disturbed areas do not need to be maintained as an open area, disturbed areas would be restored using native plants.

Species-Specific Measures

Fanihi (Mariana Fruit Bat [*Pteropus mariannus mariannus*])

- Activity would not occur within 492 feet (150 meters) of a fanihi day roost. Contractors would avoid exposing fanihi day roosts to any sound in excess of 60 decibels.
- To facilitate project design and section 7 consultation, surveys of all forest habitat would be completed within 492 feet (150 meters) of the project site for the presence of any fanihi day roosts, transiting routes, or feeding areas of the fanihi. During the project, the action area would be monitored for the establishment of a day roost. If a day roost is established within 492 feet (150 meters) of project activity, work would be halted, and the park would coordinate with USFWS.
- To reduce fanihi disturbance, construction operations must be conducted during daylight hours and construction activities

would end at least 30 minutes before sunset. In addition, any exterior light fixtures within the project site would be shielded at bulb height with no light shining from above or to the side.

Pulåttat (Mariana Common Moorhen [*Gallinula chloropus guami*])

- For projects occurring within 100 feet (30 meters) of areas where standing water could persist, a biological monitor with experience surveying for pulåttat individuals and nests should conduct surveys prior to project initiation.
- Any documented nests within the project vicinity should be reported to the USFWS and Guam DAWR within 48 hours. The USFWS should be notified immediately prior to project initiation and provided with the results of pre-construction waterbird surveys.
- A 100-foot (30-meter) buffer would be established and maintained around all active nests and/or broods until the chicks/ducklings have fledged. No project activities or habitat alteration should occur within this buffer.
- A biological monitor should be present on the project site during all construction or earth-moving activities to ensure that pulåttat and nests are not adversely impacted.
- If a pulåttat is observed within the project site, or flies into the site while activities are occurring, the biological monitor should halt all activities within 100-foot (30-meter) of the individual(s). Work should not resume until the listed waterbird(s) leave the area on their own accord.

Yåyaguak (Mariana Gray Swiftlet [*Aerodramus vanikorensis bartschi*])

- In areas of known swiftlet presence, a qualified biologist, as defined herein, would survey the action area to map habitat for these species, determine if the action area is occupied by swiftlets, and determine if the action area is within 1,640 feet (500 meters) of a roosting cave.
- Actions that could increase human disturbance or noise within 1,640 ft (500 m) of a limestone cave entrance and within the caves themselves would be avoided.
- Construction of vertical structures that protrude into the forest canopy or above the height of shrub or grass vegetation and use of guy wires (a potential flight hazard to swiftlets) would be avoided.
- Pesticides would not be used within areas of known swiftlet presence.
- Lighting BMPs described above would be followed to minimize impacts from lighting.

Haggan Betde (Green Sea Turtle [*Chelonia mydas*]) and Haggan Karai (Hawksbill Turtle [*Eretmochelys imbricata brissa*])

- If work is to commence in potential sea turtle habitat, daily searches would be conducted by a qualified biologist familiar with sea turtles before work begins. The biologist would conduct a visual survey of the action area to ensure no basking sea turtles are present.
- No vehicle use or modification of the beach or dune environment would be allowed during sea turtle nesting or hatching season (throughout the year on Guam).
- Native shoreline vegetation would not be removed.
- If a basking sea turtle is found within the action area:
    - All mechanical or construction actions within 100 feet (30 meters) would be ceased until the animal voluntarily leaves the action area.
    - All actions between the basking turtle and the ocean would be ceased.
    - Any project-related debris, trash, or equipment would be removed from the beach or dune if not actively being used. Project-related materials would

not be stock-piled in the intertidal zone, reef flats, or stream channels.

- Lighting BMPs described above would be followed to minimize impacts from lighting.

Akaleha' (Tree Snails): Guam Tree Snail (*Partula radiolata*), Humped Tree Snail (*Partula gibba*), Fragile Tree Snail (*Samoana fragilis*)

- Where work must be conducted in shrub or forested areas, proposed project sites would be surveyed for the presence of tree snails. Prior to project implementation, and at a minimum of every three years during project implementation, all areas within 328 feet (100 meters) of any project area where walking or other project activity may occur would be surveyed for tree snails using the standard prioritized search procedure (Fiedler 2019, entire).
- Because tree snails may be downed and moved to new locations by strong winds, project activity that may crush downed tree snails, other than snail survey work, would not be conducted within the 7-day period after typhoon winds in any project site within 328 feet (100 meters) of a tree snail location.
- After any project site within 328 feet (100 meters) of an area occupied by a listed tree snail is affected by typhoon-strength winds, tree snail surveys should be re-done, and buffer protections re-established for new tree snail locations prior to commencing project work.
- Surveys may only be conducted by a qualified biologist experienced in identifying tree snails and their suitable habitat, with specialized training and field experience surveying for threatened or endangered tree snails in the Pacific Islands.
- Vegetation to be removed would be inspected for the presence of federally listed tree snails one week prior and immediately prior to clearing activities. If a snail is observed, work would stop for 72 hours to allow the snail to move out of the area, and no vegetation clearing would be conducted within 33 feet (10 meters) of a snail. Branches, tree limbs, and vines would be removed manually from areas within 33 feet (10 meters) of snail observation, using hand tools and small powered equipment such as brush cutters.
- Buffer areas would be physically cordoned off, with fencing or netting, for the duration of the project activity, to prevent project personnel from entering buffers of 33 feet (10 meters) from the outermost snail detection. Alternate methods such as visually flagging buffer areas may be used in some types of projects including areas where field crew work will be restricted to designated roads and trails, and heavy equipment will not encroach into the buffer.
- To avoid potential adverse effects to listed tree snails, clearing understory and overstory forest vegetation outside existing developed areas would not be allowed. Intact vegetation is important for maintaining microclimates and air movement conditions that allow snails to survive in a given area.
- Vegetation within 200 feet (61 meters) of the known occurrence would not be cut or removed in order to minimize impacts to the tree snails and their habitat.

Ababbang (Mariana Eight-spot Butterfly [*Hypolimnas octocula marianensis*])

- Where vegetation cutting is necessary, a botanical and listed butterfly survey would be conducted within, and extending 100 feet (30 meters) beyond, the proposed disturbance area.
- A qualified biologist with experience surveying for and identifying the butterfly individuals, chrysalis, caterpillars, eggs, and host plants (*Elatostema calcareum*, *Procris pedunculata*, and *Maytenus thompsonii*) should survey the project action area and visibly mark the area occupied by the butterfly or host plant.
- Surveys should be conducted in the wet season along transects to identify the presence of butterflies (any life stage)

or host plants when the likelihood of observation is greatest.

- In the event of an adult butterfly or butterfly host plant (*P. pedunculata*, *E. calcareum*, and *M. thompsonii*) discovery, focused searches would be conducted for five to thirty minutes to locate and identify any life stage of the listed butterflies. The number and life stage of any observation should be recorded, and location documented. The duration of surveys is relative to the size of host plants and number of individual butterflies found.
- All butterfly host plants in and within 33 feet (10 meters) of the vegetation disturbance site should be marked with flagging to exclude personnel from walking within 33 feet (10 meters) of the plant.
- To minimize potential adverse effects to listed butterflies, cutting or removing vegetation within 100 feet (30 meters) of a butterfly host plant would be avoided. Vegetation clearing would be minimized to widths of 33 feet (10 meters) or less. Where vegetation removal does not need to be maintained, cleared areas would be restored using native plants including specific butterfly host plants.

Operations to Minimize Noise and Disturbance to Soundscape

- For any construction-related work, the contractor would minimize noise levels at the project site to protect the soundscape of the park and minimize noise to staff, visitors, neighbors, and habitat.
- Noise-producing work would be performed during less sensitive hours of the day or week or as directed by the contracting officer. Repetitive and/or intermittent, high-level noise would only be permitted during daytime hours. If the contractor exceeds the thresholds in Tables D.2 or D.3, the contractor may be required to stop work, temporarily relocate to a non-sensitive area, or adjust the construction means and methods at no additional expense to the Government.
- The maximum permissible construction equipment noise at 50 feet for construction equipment is listed in Table D.2. Table D.3 lists dB(A) limitations that would exist at 50 feet.

Air Quality

For any construction-related activity, the contractor would minimize the negative impacts to air quality through the following operations:

- Minimize emissions from vehicles or heavy equipment
- Minimize fumes, vapors, or gases from products or packaging
- Minimize particulates and dust from outdoor operations
- Control of moisture during operations that may lead to damage, fumes, or mold
- Ensure vehicles and heavy equipment do not idle when not in use
- Install temporary mechanical ventilation where appropriate
- Ensure tools are equipped with the proper guards or particulate catchment devices
- Ensure particulates and debris are collected and disposed of on a regular basis
- Consider water trucks or temporary irrigation devices for dust control
- Ensure products are properly dried or cured prior to advancing the work
- Ensure materials are stored in a dry location
- Ensure wet/damp materials are not installed or covered

Table D.2: Maximum Permissible Construction Equipment Noise at 50 feet

EARTHMOVING	dB(A)	MATERIALS HANDLING	dB(A)
Front Loaders	75	Concrete Mixers	75
Backhoes	75	Concrete Pumps	75
Dozers	75	Cranes	75
Tractors	75	Derricks Impact	75
Scrapers	80	Pile Drivers	95
Graders	75	Jack Hammers	75
Trucks	75	Rock Drills	80
Pavers, Stationary	80	Pneumatic Tools	80
Pumps	75	Saws	75
Generators	75	Vibrators	75
Compressors	75		

Table D.3: dB(A) Limitations at 50 feet

TIME DURATION OF IMPACT NOISE	dB(A)
More than 12 minutes in any hour	70
More than 3 minutes in any hour	80

CULTURAL RESOURCES

Measures Related to Development and Construction

Because this plan involves phased implementation of actions not yet designed to allow full impact analysis, the National Park Service would pursue phased compliance with the Guam State Historic Preservation Office and other consulting parties in accordance with Section 106 of the National Historic Preservation Act. Phased implementation activities concerning cultural resources would include the following best management practices:

- All construction projects and infrastructure would be designed to avoid known cultural resources and areas with high potential for archeological or ethnographic resources.
- Analysis and documentation under Section 106 of the NHPA would be conducted to avoid and/or minimize adverse effects on archeological resources of new undertakings.
- Before any ground-disturbing action by the National Park Service, pedestrian surveys and/or remote sensing of the areas planned for construction or other ground-disturbing development would be conducted in compliance with Archaeological Resources Protection Act of 1979, as amended, and the National Historic Preservation Act. The survey would help determine the presence or absence of archeological deposits in the footprint of disturbance.
- The contractor, or contractor's designee, would observe all ground-disturbing activities. The park may also have an Archeological Monitor at the jobsite who is authorized to stop work upon discovery of archeological resources.
- Should construction unearth previously undiscovered cultural resources, work would be stopped in the area of discovery or relocated to a non-sensitive area and the contracting officer would be notified immediately. In conducting site testing and documentation, emphasize actions that would avoid further disturbance to the site.
- A qualified archeologist would be contacted to assess the artifacts and/or site. The National Park Service would consult with the Guam State Historic Preservation Office and the Advisory Council on Historic Preservation, as necessary, according to 36 CFR 800.13.
- Any archeological resources discovered during these investigations would be evaluated for significance and potential effects in consultation with the Guam State Historic Preservation Office (SHPO).
- The National Park Service would adjust project locations, designs, and/or construction activities to avoid National Register-eligible archeological resources discovered during preconstruction survey as much as possible.
- If cultural resources or adverse effects to those resources could not be avoided, additional consultation would occur to identify how to resolve concerns and mitigate impacts.
- In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, the NPS would halt work and contact the SHPO to determine the appropriate next steps.
- All crew members and volunteers assisting in construction efforts would be educated about the importance of avoiding impacts on sensitive cultural resources that have been flagged for avoidance.
- The contractor would not disrupt known archeological resources or flagged areas during construction activities.
- If necessary, the contractor would erect temporary barriers around the archeological resource to ensure avoidance.
- All project work relating to historic structures and cultural landscapes would be conducted in accordance with Director's Order 28 and the Secretary of

the Interior's Standards for the Treatment of Historic Properties and Guidelines for the Treatment of Cultural Landscapes, including the standards and guidelines for the treatment of historic properties and cultural landscapes.

- For any trail work, known archeological sites would be monitored to assess and document the effects of natural processes and human activities on the resources.
- The siting of new trails would follow historic circulation routes where possible.
- Archeological resources typically found in the park or at the project site would be discussed at the preconstruction meeting.
- All new facilities would follow the recommendations for new development outlined in the park's draft 2021 cultural landscape report.

Cultural Landscapes

- Cultural landscape inventories and cultural landscape reports would be completed as necessary to inform any alterations to cultural landscapes that may impact contributing features.
- Changes to individual features and resources comprising the cultural landscape would be assessed in the larger setting and environmental context to ensure incremental change does not adversely affect the integrity of the historic districts.
- The condition of the cultural landscape would continue to be monitored and any new or emerging threats or treatment measures necessary for its preservation and protection would be identified.
- Consultation with the Guam SHPO, Indigenous CHamoru Organizations, and other traditionally associated groups would continue. As appropriate, under the National Historic Preservation Act, additional consultation would also occur as implementation-level plans and designs are developed.
- If cultural resources or adverse effects to those resources could not be avoided, additional consultation would occur to identify how to resolve concerns and mitigate impacts.
- Facilities would be designed, located, and rehabilitated using context-sensitive designs to minimize change, visual contrast, and intrusions to historic views and vistas.
- Vegetation would be managed to screen facility or infrastructure intrusions or cleared where encroaching or obstructing historic views.

Ethnographic Resources

- The National Park Service would consult with associated Indigenous CHamoru Organizations to ensure that project actions are conducted in a way that respects the beliefs, traditions, and other cultural values of the people who have ancestral ties to park lands.
- Sensitive, sacred, or traditional use areas would be protected to the greatest extent possible by avoiding areas with ritual features, mitigating adverse impacts to ethnographic resources through resource protection efforts, retaining site confidentiality as appropriate, and continuing to provide tribal access to resources and places of cultural importance.

Historic Structures

- To the extent possible, historic structures under NPS management would be stabilized until a further appropriate preservation treatment can be undertaken.
- Adverse effects on historic properties listed in, determined eligible for listing, or not yet assessed for eligibility to the National Register would be avoided, if possible.
- If adverse effects cannot be avoided, an agreement document would be developed through a consultation process with all interested parties according to Section 106.
- The number of incidents (by complaints, reports to rangers, and ranger observation) of graffiti, ground disturbance, damage to structures, and loss of historic fabric would be tracked to assess resource condition and the level of visitor use impacts on cultural resources.

- HABS/HAER/HALS documentation of historic structures would be pursued, prioritizing those at highest risk of loss.

Archeological Resources

- The park would document and avoid previously unidentified archeological sites and prepare a determination of eligibility for the National Register of Historic Places for potentially eligible sites.
- Known archeological resources would be marked and flagged by the park and left undisturbed and preserved in a stable condition to prevent degradation and loss of research values unless intervention could be justified based on compelling research, interpretation, site protection, or park development needs. Recovered archeological materials and associated records would be treated in accordance with NPS *Management Policies 2006*, NPS Museum Handbook, and 36 CFR Part 79.
- The NPS would employ techniques to reduce potential impacts on archeological resources, including visitor education programs, restrictions on visitor and NPS activities, and law enforcement patrols. The required orientation for all visitors would convey the rules for visitation and protection of resources.
- NPS staff would continue to inform visitors and others of the importance of protecting and not disturbing archeological and historic resources. Visitors would be informed (through NPS educational and interpretive programs and/or interpretive media products, and ranger contacts) of the penalties for illegally collecting artifacts or otherwise causing resource damage.
- The NPS could prohibit travel in certain areas to protect archeological resources.

VISITOR USE AND EXPERIENCE

Trail Development and Construction

- Areas not under construction would remain accessible to visitors as much as is safely possible.
- Staging areas during trail construction would be away from visitor use areas to the extent possible. Parking areas for construction vehicles would be limited to these staging areas, existing roads, and previously disturbed areas.
- A construction zone for installation of any proposed trail system, as well as staging areas and work zones, would be identified and demarcated with construction tape or some similar material prior to any construction activities. The tape would define the zone and confine the activity to the minimum area needed for implementing the project.
- During trail construction, the National Park Service would implement measures to reduce adverse effects of construction on visitor safety and experiences. Measures may include, but are not limited to, noise abatement, visual screening, and directional signs that aid visitors in avoiding construction activities.

Public Safety and Tsunami Hazards

- The NPS would post signs along coastal areas advising about the danger of sneaker waves, undertows, and rip currents and include information about self-rescue techniques.
- The NPS would provide information about tsunami behavior by various means, which may include websites, kiosks, and waysides, to create awareness and reduce the potential risk of injury.
- The NPS would participate in the current tsunami warning system and maintain the evacuation routes, and any other responsibilities the park has outlined with local authorities.
- Overnight facilities would be sited to expedite evacuation or be located outside of the mapped inundation zone.

APPENDIX E: FLOODPLAIN STATEMENT OF FINDINGS

INTRODUCTION

NPS proposed actions that may adversely affect floodplains must comply with Executive Order 11988 and Director's Order #77-2: Floodplain Management, which requires the preparation of a Floodplain Statement of Findings if the action falls within the defined regulatory floodplain. The NPS prepared the Floodplains Statement of Findings for the Asan and Agat Units Management Plan (UMP) to describe proposals in the UMP and to review the UMP in sufficient detail to:

- provide an accurate and complete description of the coastal hazards assumed by implementation of the UMP (without mitigation),
- describe the effects on coastal values associated with the proposed action, and
- provide a thorough description and evaluation of mitigation measures developed to achieve compliance with Executive Orders 13690 (Establishing a Federal Flood Risk Management Standard) and 11988 (Floodplain Management) and the NPS Floodplain Management Guideline (Director's Order 77-2).

Description of the Proposed Action and Flood-Related Elements

The UMP addresses four of the park's seven units. Two of the four units, the Asan Beach and Agat Units, are located within the tsunami evacuation zone for Guam (NOAA 2023c). According to NPS Procedural Manual #77-2: Floodplain Management, the tsunami evacuation zone is considered a coastal high-hazard area (NPS 2002). See figures E.1 and E.2. These two units already experience coastal flooding due to storm surge, which is projected to increase with sea level rise. The units additionally experience overland flooding from storms with intense rainfall. The coastal park units received significant coastal and overland flooding most recently from Typhoon Mawar in May 2023. The UMP proposed action focuses on enhancing the visitor experience within the Asan Beach and Agat Units, while anticipating and providing guidance for how the park will address climate change impacts to resources and facilities.

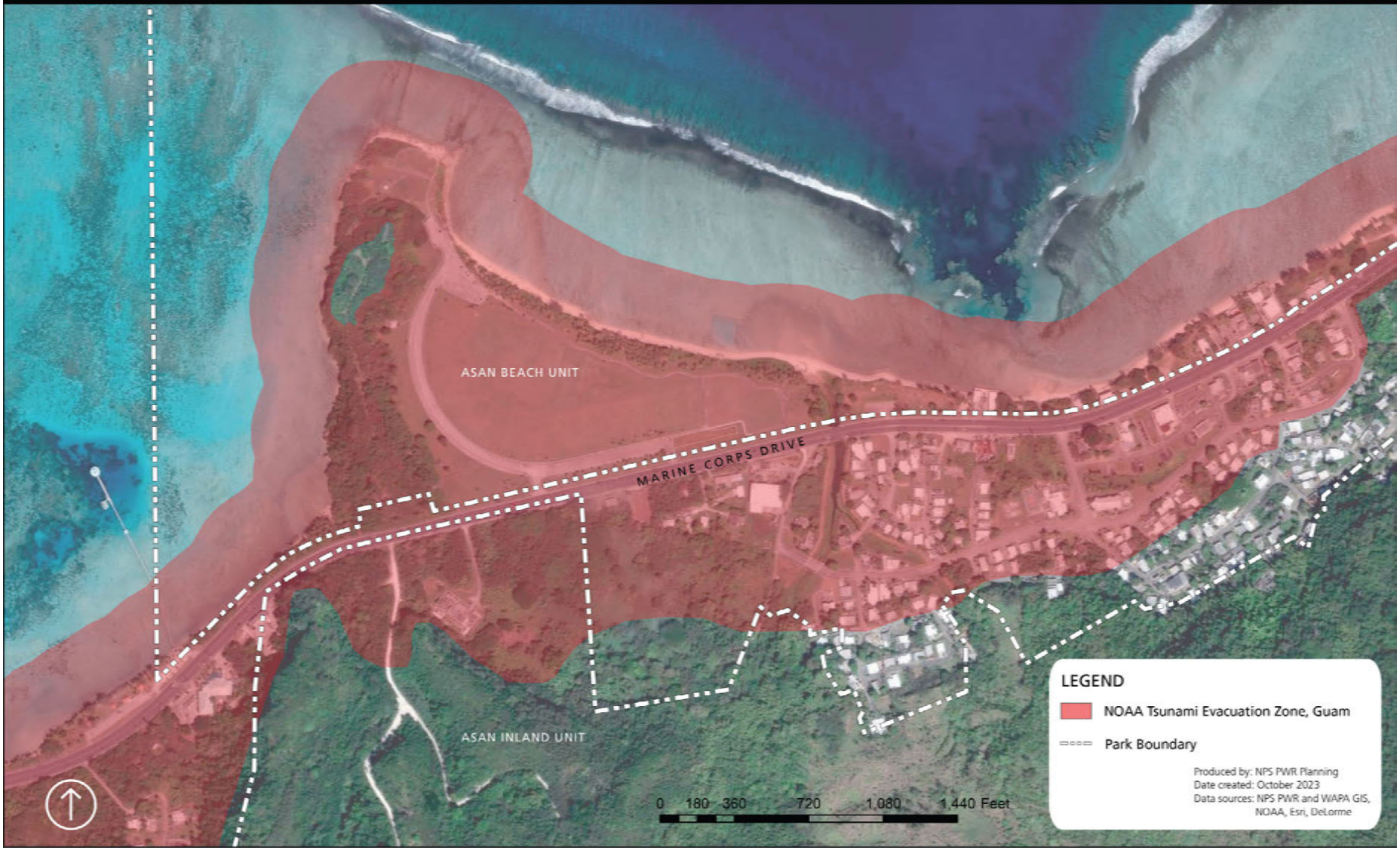
The proposed action identifies a two-phased approach for managed retreat from the shoreline. The two phases are based on two sea level rise scenarios: a 0.8-foot (25-centimeter) rise and a 4.9-foot (150-centimeter) rise, each integrated with storm surge associated with one-year, 20-year, and 100-year storms. These scenarios were informed by a sea level rise and storm surge model provided by the USGS Coastal and Marine Hazards and Resources Program: "Forecasting Storm-Induced Coastal Flooding for 21st-Century Sea Level Rise Scenarios in the Hawaiian, Mariana, and American Samoan Islands" (USGS 2023a). The USGS coastal flooding model relies on a mix of oceanographic, coastal engineering, ecological, and geospatial data and methods to map coastal flooding from waves and storm surge at 108-square-feet (10-square-meter) resolution for the one-year, 20-year, and 100-year storm events. These storm events are each modeled for the current sea level plus six sea level rise scenarios: +0.8, +1.6, +3.3, +4.9, +6.6, +9.8 feet (+25, +50, +100, +150, +200, and +300 centimeters, respectively) (USGS 2023a).[2]

The NPS planning team identified the 4.9-foot (150-centimeter) sea level rise as the worst-case scenario within the UMP's planning horizon of approximately 20 to 30 years.

2 This USGS model is based on metric measurements. The English conversion is only provided for numbers relevant to the planning scenarios, not for every model measurement.

Figure E.1: Asan Beach and Inland Units | Guam Tsunami Evacuation Zone
War in the Pacific National Historical Park | Asan + Agat Units Management Plan

National Park Service
U.S. Department of the Interior



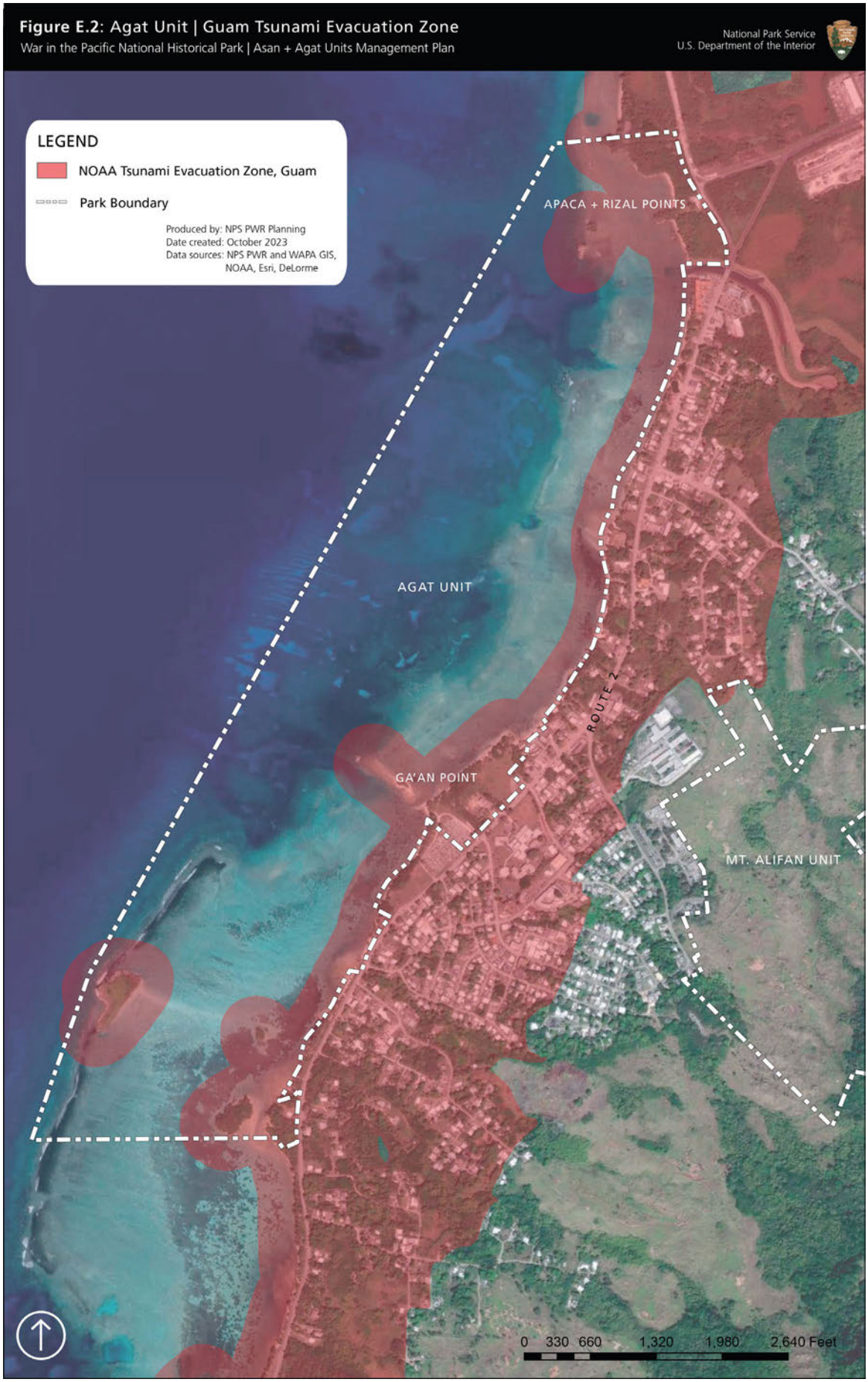


Figure E.2: Agat Unit | Guam Tsunami Evacuation Zone
War in the Pacific National Historical Park | Asan + Agat Units Management Plan
National Park Service
U.S. Department of the Interior
LEGEND
NOAA Tsunami Evacuation Zone, Guam
Park Boundary
Produced by: NPS PWR Planning
Date created: October 2023
Data sources: NPS PWR and WAPA GIS, NOAA, Esri, DeLorme
APACA + RIZAL POINTS
AGAT UNIT
ROUTE 2
GA'AN POINT
MT. ALIFAN UNIT
0 330 660 1,320 1,980 2,640 Feet

Figure E.3: Asan Beach Unit | 0.8-foot (25-centimeter) Sea Level Rise with Three Storm Surge Scenarios
War in the Pacific National Historical Park | Asan + Agat Units Management Plan

National Park Service
U.S. Department of the Interior

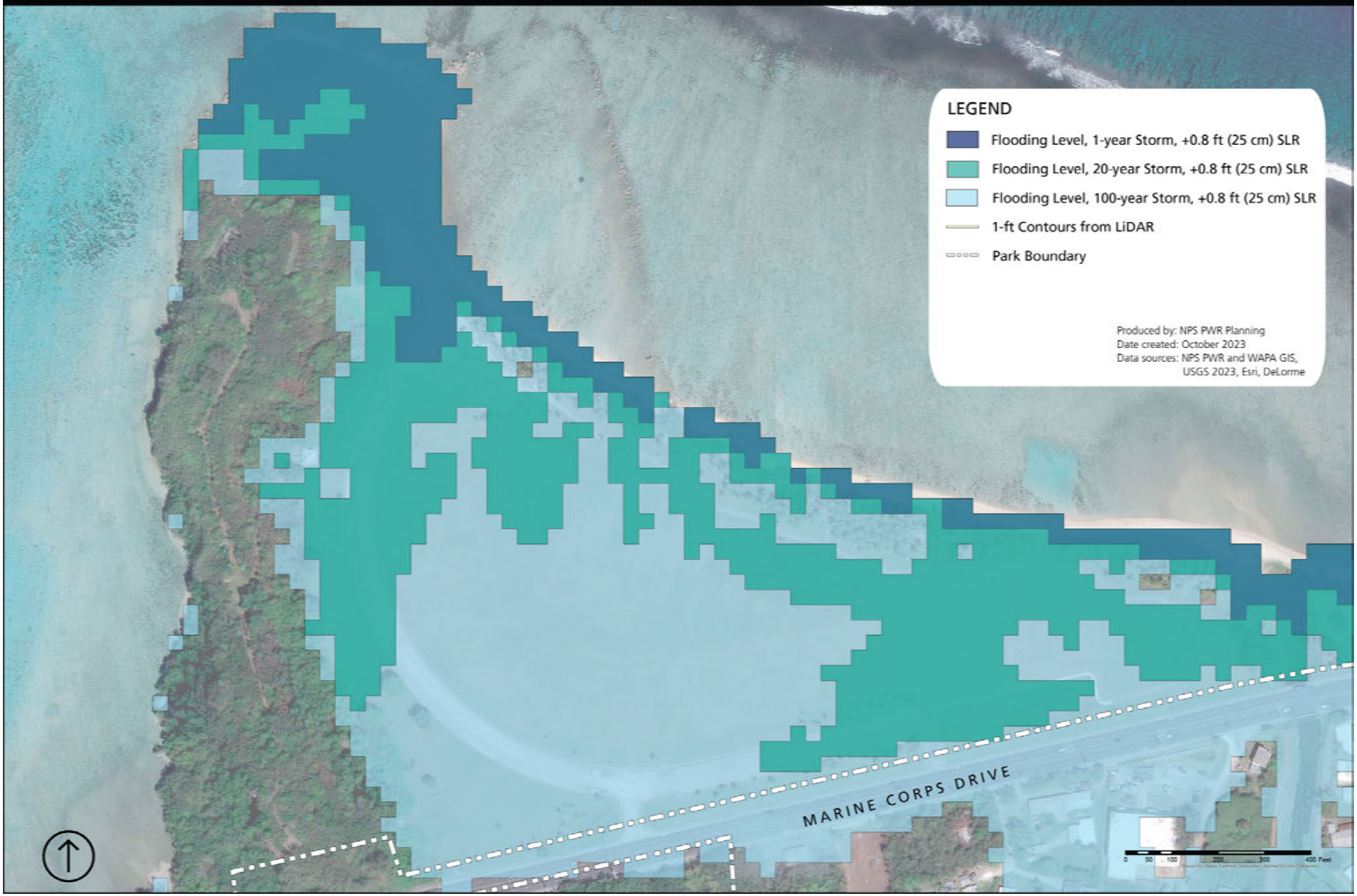


Figure E.4: Asan Beach Unit | 4.9-foot (150-centimeter) Sea Level Rise with Three Storm Surge Scenarios
War in the Pacific National Historical Park | Asan + Agat Units Management Plan

National Park Service
U.S. Department of the Interior

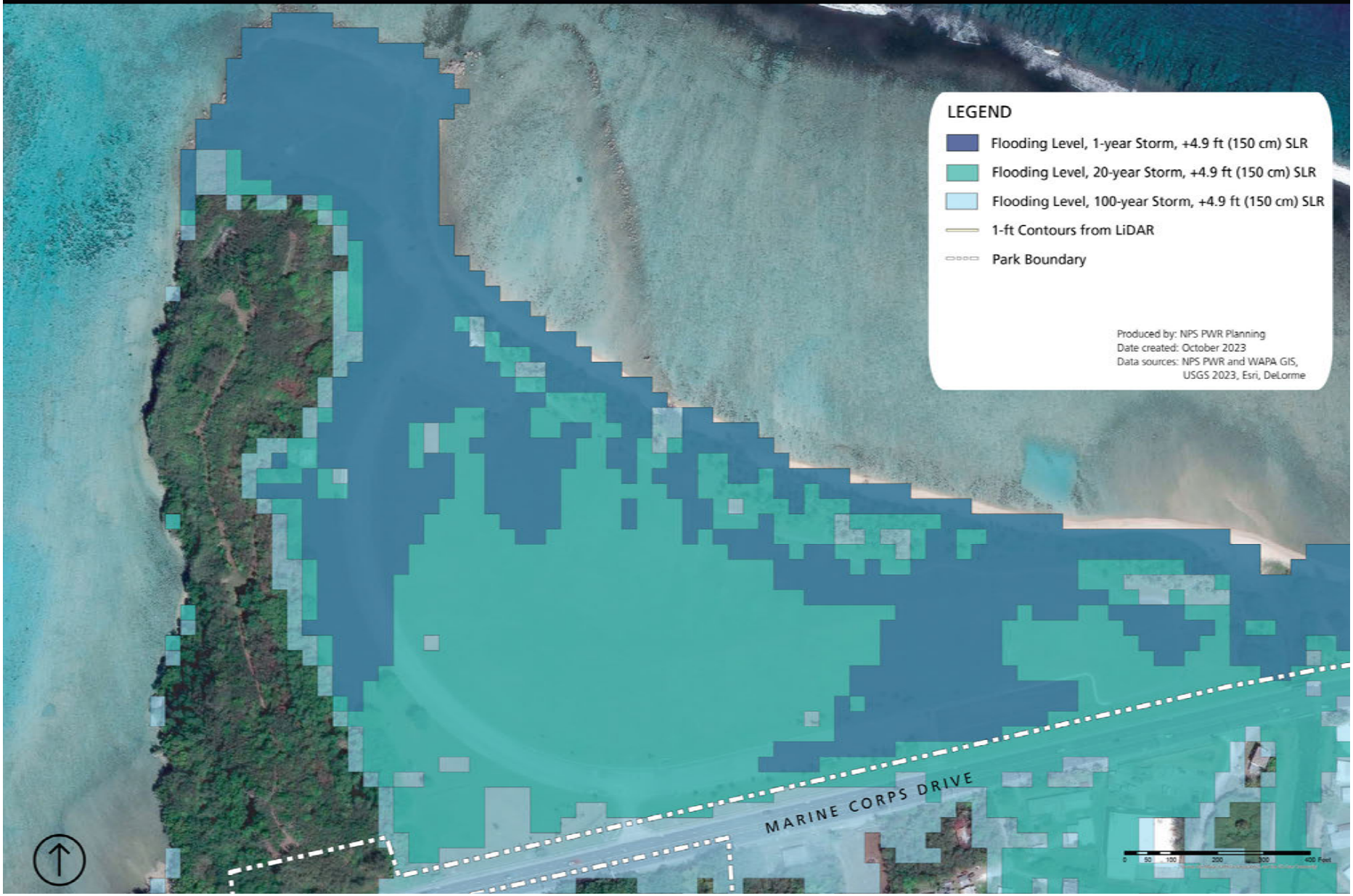


Figure E.5: Apaca and Rizal Points, Agat Unit
0.8-foot (25-centimeter) Sea Level Rise with Three Storm Surge Scenarios
War in the Pacific National Historical Park | Asan + Agat Units Management Plan

National Park Service
U.S. Department of the Interior

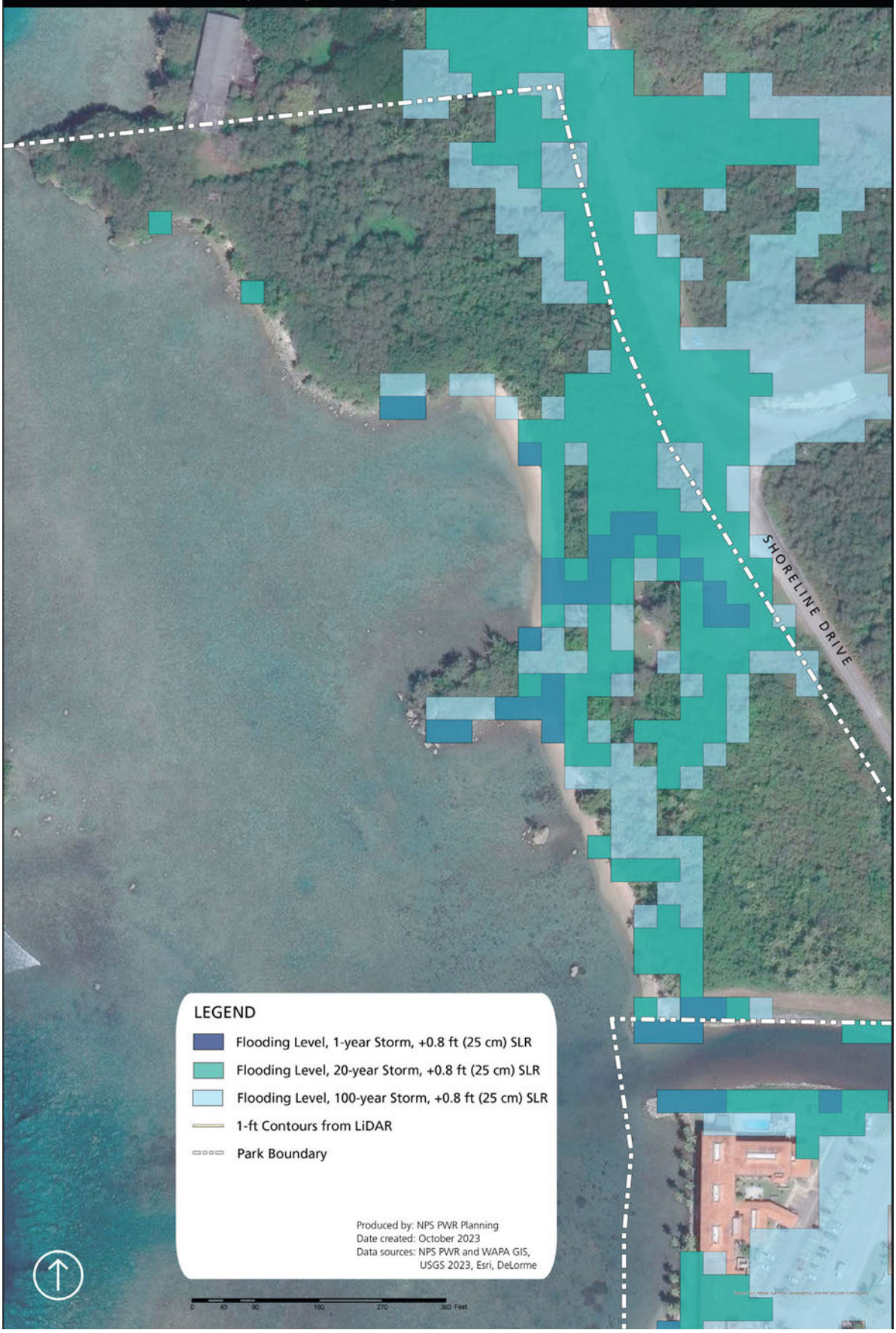


Figure E.6: Apaca and Rizal Points, Agat Unit
4.9-foot (150-centimeter) Sea Level Rise with Three Storm Surge Scenarios
War in the Pacific National Historical Park | Asan + Agat Units Management Plan

National Park Service
U.S. Department of the Interior

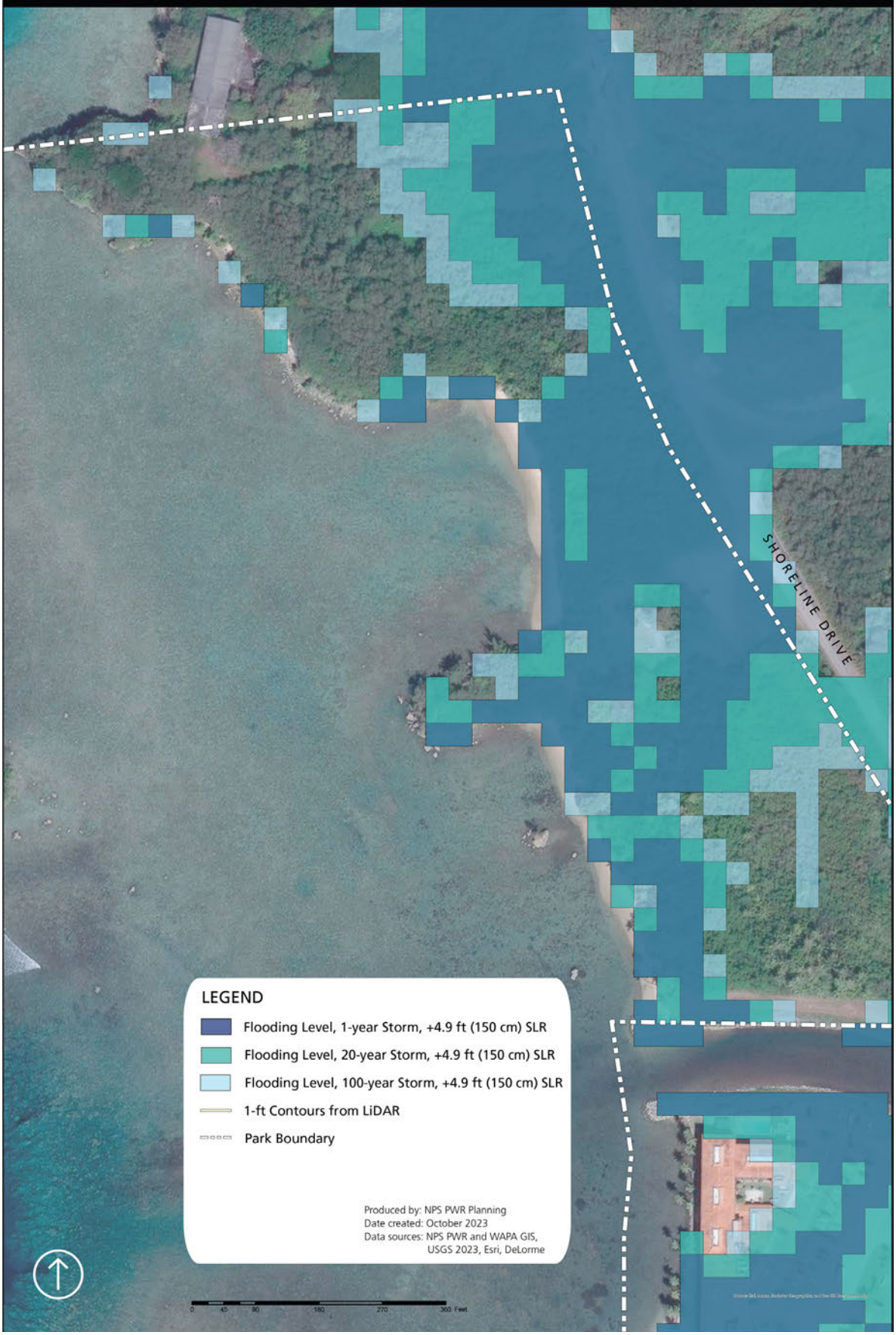


Figure E.7: Ga'an Point, Agat Unit | 0.8-foot (25-centimeter) Sea Level Rise with Three Storm Surge Scenarios

War in the Pacific National Historical Park | Asan + Agat Units Management Plan

National Park Service
U.S. Department of the Interior

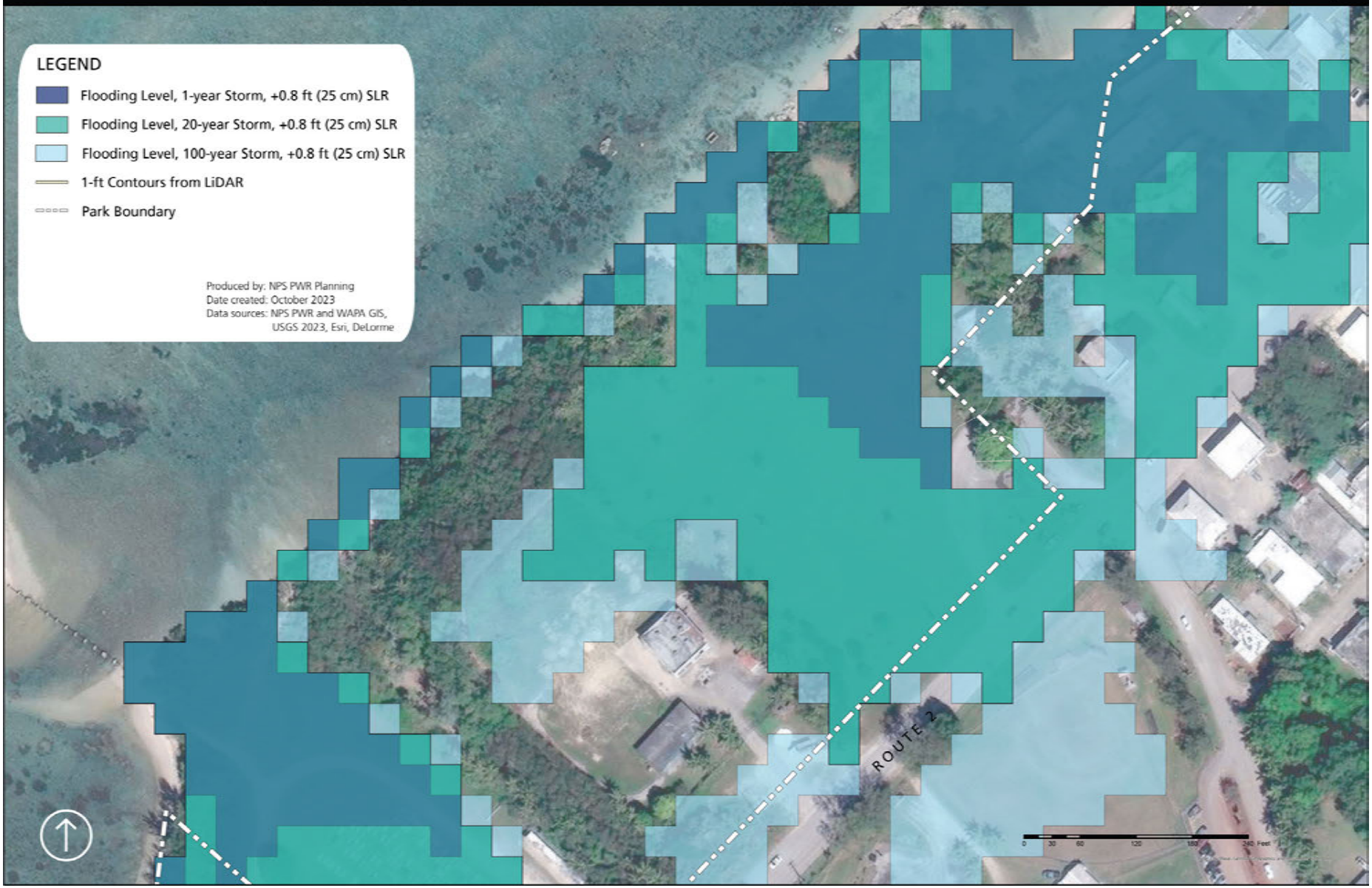
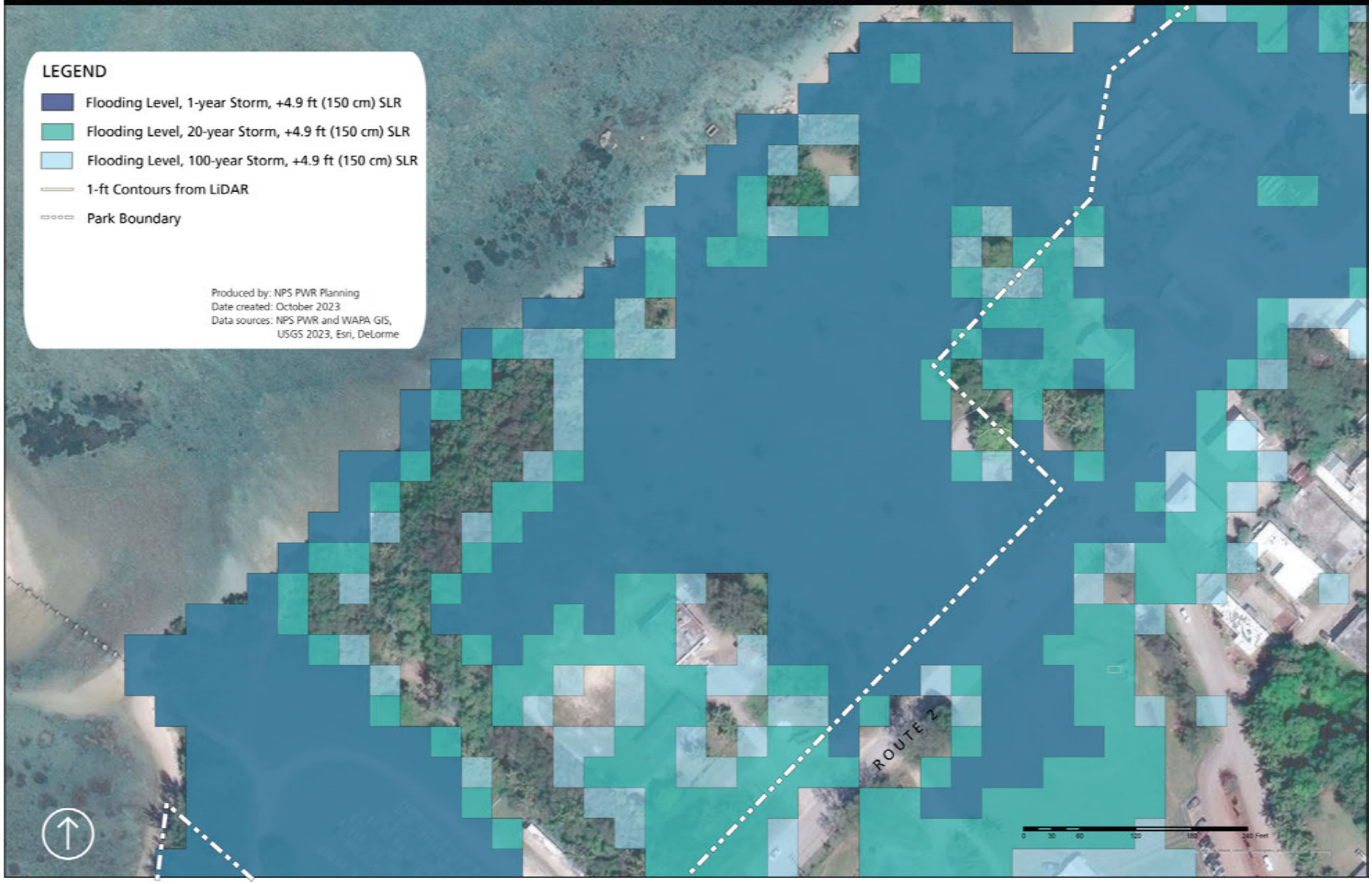


Figure E.8: Ga'an Point, Agat Unit | 4.9-foot (150-centimeter) Sea Level Rise with Three Storm Surge Scenarios
War in the Pacific National Historical Park | Asan + Agat Units Management Plan

National Park Service
U.S. Department of the Interior



As described in Chapter 1: Introduction, this worst-case scenario was identified by the planning team in consultation with the NPS Climate Change Response Program, based on the global range of sea level rise predicted by the 2020 *Climate Change in Guam* report by the Pacific Islands Regional Climate Assessment (PIRCA 2020). While the report projects a global range of sea level rise between 0.5 and 1.2 feet (15.2 and 36.5 centimeters) by 2050, and a range of 1.0 to 4.3 feet (30.5 to 131.1 centimeters) by 2100, it states that sea level rise on Guam is expected to be higher than the global average (PIRCA 2020, 23). Given the uncertainty of global climate models and emerging science suggesting that sea level rise could occur more quickly than predicted, the NPS has identified the more accelerated scenario of 4.9 feet (150 centimeters) as the worst case for planning purposes of this UMP.

However, the NPS recognizes that lesser sea level rise scenarios will still result in increased coastal flooding. For this reason, as noted above, the removal or relocation of facilities is divided into two phases to illustrate the park's plan for managed retreat. Phase 1 corresponds to sea levels between the current level and 0.8 feet (25 centimeters) in sea level rise. Phase 2 is triggered when the 0.8-foot (25-centimeter) sea level is reached or in the event of a catastrophic event/sudden loss (e.g., a storm event). The 0.8-foot (25-centimeter) threshold was also identified in consultation with the NPS Climate Change Response Program. In view of the uncertainty around the projected rate of sea level rise, these phases are defined by sea level rather than according to a specific window of time. See figures E.3–E.8 for illustrations of the two sea level rise phases. Additional detail regarding the transition from phase 1 to phase 2 can be found in Chapter 2: Alternatives.

The first phase of the proposed action removes facilities that are at imminent risk of flooding or loss. The second phase of the proposed action removes facilities that are likely to be at risk in the future due to rising sea levels, increasing storm intensity, and potential reduction in coastal resiliency due to declining coral reefs that functionally serve to attenuate wave energy reaching the shoreline, among other ecosystem services. Small scale facility investments are also proposed in the plan under both phases to shift visitor use to areas that are more resilient to coastal flooding. The addition of bioswales near parking areas and circulation routes and expanded stormwater infiltration capacity are proposed at both coastal units to expand their ability to absorb overland water flows. Phase 1 and 2 actions are illustrated in figures 2.3–2.8 in Chapter 2: Alternatives.

At the Asan Beach Unit, phase 1 actions include removing and re-vegetating a portion of the western paved parking lot closest to the point (sometimes called the "lower parking lot") and the pedestrian walkway along the shoreline around the point. In addition, phase 1 proposes the installation of a new walking path made from pervious materials along the current road and the base of the ridge, which would connect to the Assan Ridge trail system as well as the existing paved shoreline path and would continue to provide direct public beach access. Phase 1 also includes the relocation of the monuments from along the shoreline to higher, more protected ground at the base of Assan Ridge or elsewhere in the park or on the island. The first phase additionally proposes constructing a small open-air shelter for interpretation near the base of Assan Ridge on higher ground.

Phase 2 at Asan Beach involves removing and revegetating the remaining, eastern portion of the lower shoreline parking lot and a portion of the entrance drive that are anticipated to flood regularly. Phase 2 additionally includes removing the current paved shoreline walking path and relocating it further inland using pervious materials, relocating existing shoreline picnic areas further inland, and replacement of the existing restroom with a portable toilet further inland.

In the Agat Unit, phase 1 actions include expanding visitor use to higher ground at Rizal Point, which will be more resilient to sea level rise and coastal flooding in the long term. This would be achieved by constructing a pervious trail (for example using compacted coral) between Apaca and Rizal Points,

providing 4 to 5 new picnic tables along that trail, constructing a small unpaved parking area along Shoreline Drive, and restoring an abandoned driveway to provide an accessible pedestrian path to Rizal Point. Interpretive waysides would also be added at Rizal Point at the overlook area and along the walking path between Rizal and Apaca Points, and an interpretive kiosk would be installed at Rizal Point near the parking area. The abandoned restroom would be replaced by a portable toilet located further inland, also near the parking area.

In phase 2, the parking and picnic areas at Apaca Point would be removed due to projected flooding levels, and the riparian wetland would be expanded to absorb additional stormwater. Visitor use would transition fully to Rizal Point. Additionally, the lower portion of the walking path established between Apaca and Rizal Points could transition to a water-based route.

At Ga'an Point in the Agat Unit, phase 1 actions include removing the restroom that is currently being undermined by the river outfall. The restroom facility would be constructed to better withstand flooding and would likely consist of portable toilets. The restrooms would be relocated to the southwest to more stable and higher ground, though recognizing the USGS modeling still indicates this new location may experience inundation under certain scenarios. Phase 1 actions at Ga'an Point also include reconfiguring the existing parking area to improve its resilience to flooding; constructing an unpaved, compacted pedestrian trail through the site; and providing a few additional picnic tables. Phase 2 actions would include relocating the walking path further inland as needed and relocating the flags and guns to a location further inland. Once water levels rise above 4.9 feet (150 centimeters) or in the event of sudden damage or loss, the NPS would remove the restroom at Ga'an Point and shift formal visitor access opportunities north to Rizal Point.

Site Description

ASAN BEACH UNIT

The Asan Beach Unit (109 land acres [44 hectares], 445 water acres [180 hectares]) stretches from Punta Adilok (Adelup Point) to Punta Assan (Asan Point), and includes Assan Ridge, the landing beaches, and fringing coral reefs. The elevation of the Asan Beach Unit ranges from 0 feet (sea level) to 62 feet (19 meters) at the highest point, along Assan Ridge. This area was where the U.S. 3rd Marine Division came ashore, under heavy fire, to eventually retake Guam from the Japanese on July 21, 1944. It includes several memorials, a network of concealed caves, gun emplacements, and Japanese pillboxes. Past the reefs lie the remains of an American landing craft, called an amtrac, used to transport troops ashore, along with other submerged cultural resources related to WWII. The terrestrial portion of the unit also features developed visitor facilities and parking areas, coconut palms along the shoreline, and a large expanse of lawn. A trail leads along Assan Ridge through an intact remnant of limestone forest, allowing visitors to experience a rich diversity of native, culturally significant plants with views of the invasion beach below. The marine area protects exceptionally diverse aquatic life within the reefs.

Figure E.9: Asan Beach Unit | Current Sea Level with One-Year Storm
War in the Pacific National Historical Park | Asan + Agat Units Management Plan

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Figure E.10: Apaca and Rizal Points, Agat Unit
Current Sea Level with One-Year Storm
War in the Pacific National Historical Park | Asan + Agat Units Management Plan

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Figure E.11: Ga'an Point, Agat Unit | Current Sea Level with One-Year Storm

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Figure E.12: Asan Beach Unit | Typhoon Mawar Inundation and Debris

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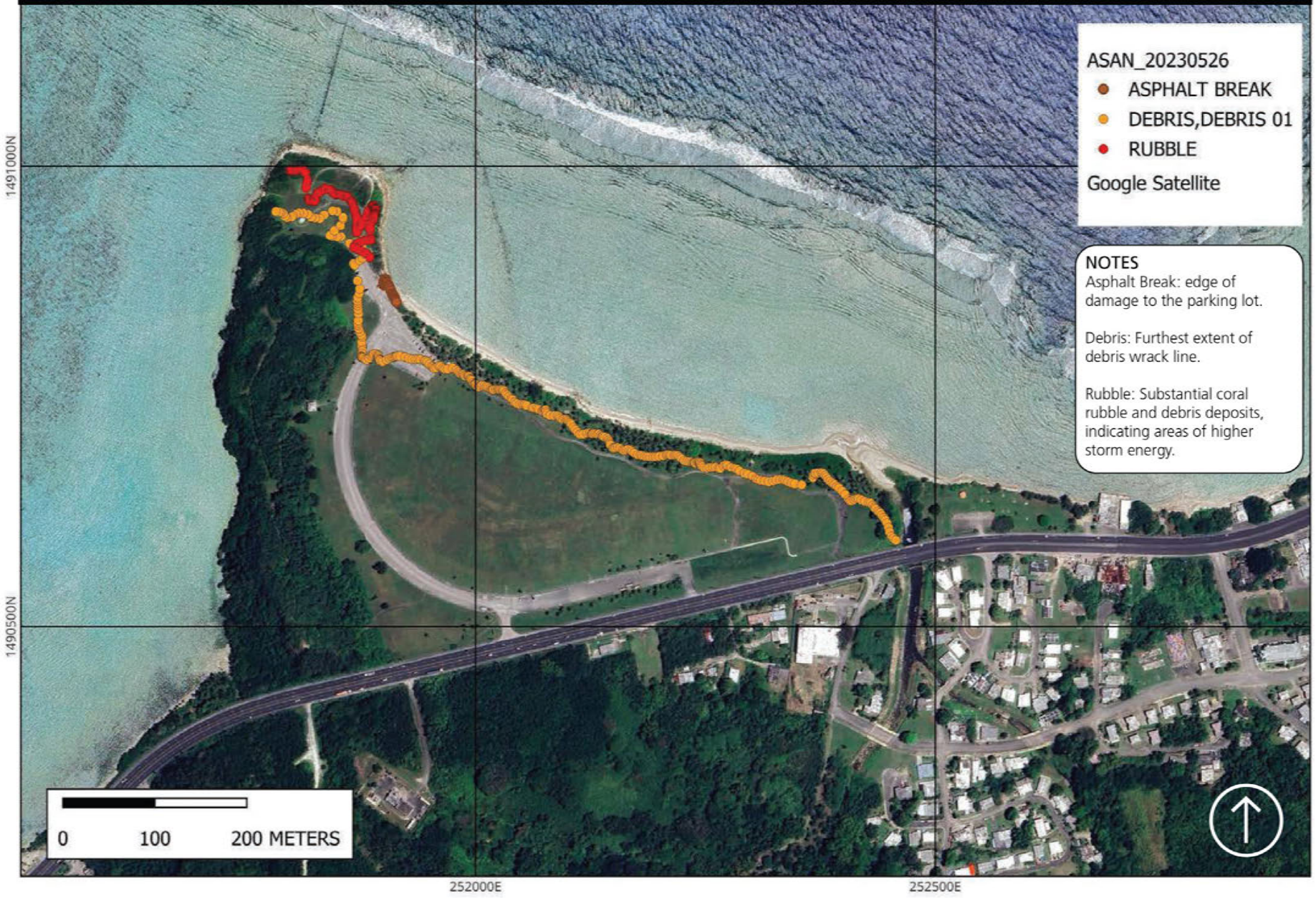

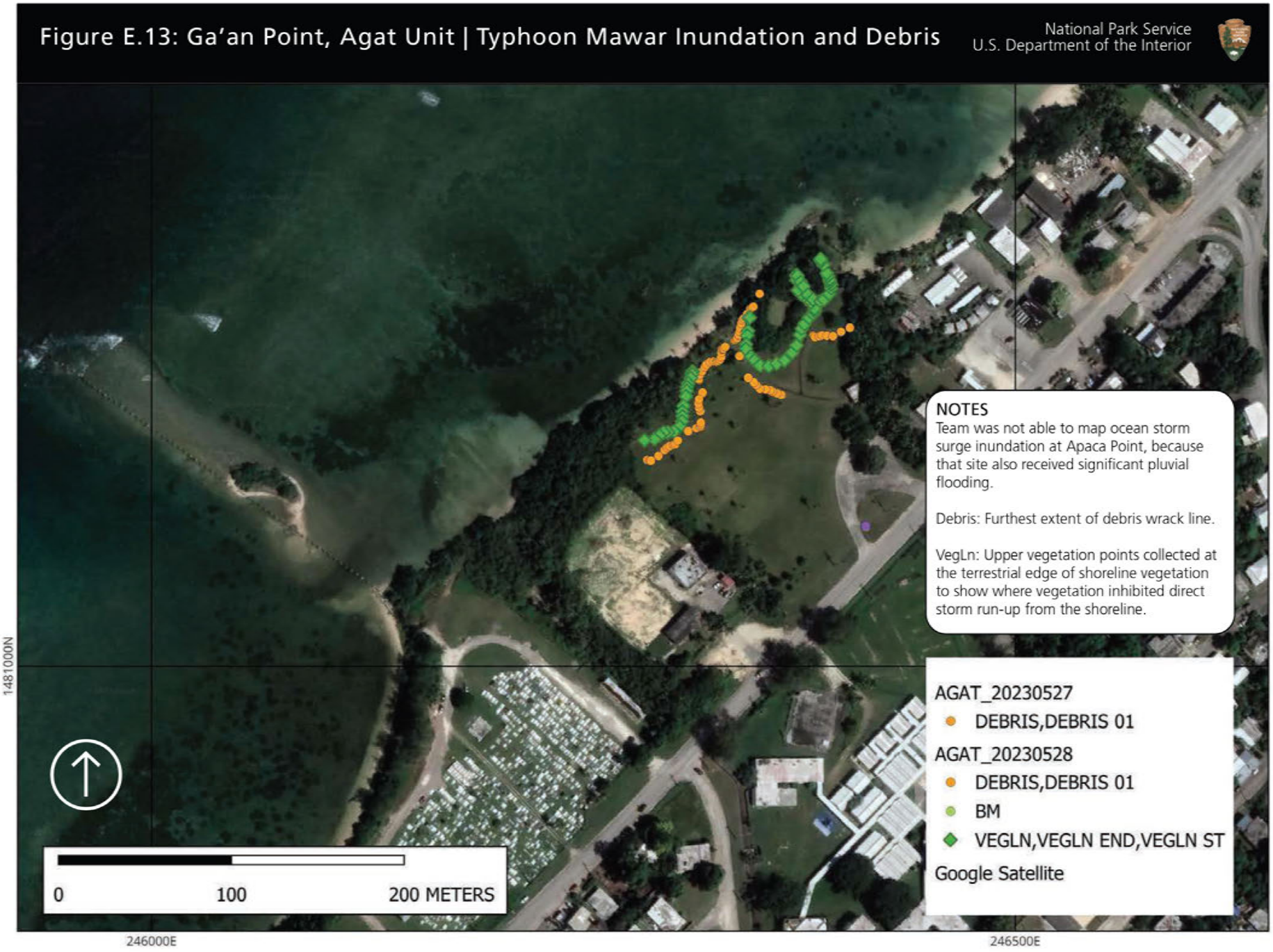
Figure E.13: Ga'an Point, Agat Unit | Typhoon Mawar Inundation and Debris
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NOTES
Team was not able to map ocean storm surge inundation at Apaca Point, because that site also received significant pluvial flooding.
Debris: Furthest extent of debris wrack line.
VegLn: Upper vegetation points collected at the terrestrial edge of shoreline vegetation to show where vegetation inhibited direct storm run-up from the shoreline.
AGAT_20230527
DEBRIS,DEBRIS 01
AGAT_20230528
DEBRIS,DEBRIS 01
BM
VEGLN,VEGLN END,VEGLN ST
Google Satellite
0
100
200 METERS
1481000N
246000E
246500E

AGAT UNIT

The Agat Unit (38 land acres [15 hectares], 557 water acres [225 hectares]) includes Apaca Point, Rizal Point, Ga'an Point, Bangi Point, and Bangngi', Alutom, and Pelagi Islands. Apaca, Rizal, and Ga'an Points are the primary visitor use areas in the unit. The elevation of the Apaca and Rizal Point area ranges from 0 feet (sea level) to 22 feet (7 meters) at Rizal Point, 10 feet (3 meters) at Ga'an Point, and 6 feet (2 meters) at Apaca Point. In this area on July 21, 1944, the U.S. 1st Provisional Marine Brigade followed by the 77th Army Infantry landed under heavy Japanese gunfire and took the southern beachhead. The unit features caves, bunkers, Japanese pillboxes, and a World War II latrine foundation. Ga'an Point was the geographic center of Japanese defense of the Agat beachhead and contains a former Japanese bunker, as well as a U.S. naval coastal defense gun and an antiaircraft machine gun typical of those used in surrounding areas. Another fully intact amtrac is located offshore at Ga'an Point. Apaca Point, at the northernmost end of the unit, has Japanese defensive fortifications from World War II built into its natural ridge. Because of the extensive fortifications, and the difficulty of the ridge's terrain, Apaca Point was avoided during the southern landing of American forces in July of 1944.

Today, the area contains various species of lush mixed grasses as well as woodland and coastal strand vegetation above the high tide line. As with the Asan Unit, the offshore portion of Agat is a rich and diverse fringing coral reef ecosystem and contains an array of WWII-related cultural resources that still remain.

General Nature of Flooding and Associated Floodplain Processes

The coastal units of Asan Beach and Agat receive both coastal and overland, or riverine and pluvial, flooding. The description of floodplain processes below is divided into these two categories, though it is noted that flooding concerns are primarily related to coastal processes.

COASTAL FLOODING AND COASTAL HAZARDS

Sea Level Rise and Storm Surge

The park is already experiencing the impacts of storm surge to coastal facilities, such as parking areas and walkways. The storm surge model provided by the USGS Coastal and Marine Hazards and Resources Program illustrates that even a one-year storm at current sea level results in flooding at the park's coastal units: see figures E.9–E.11 (USGS 2023a). The Punta Assan area at Asan Beach Unit and the eastern area of Ga'an Point are especially susceptible, as illustrated by the impacts of Typhoon Mawar in May 2023: see figures E.12–E.13. The 20- and 100-year storms result in increased flooding to all coastal sites (Asan Beach, Apaca Point, and Ga'an Point).

Projected sea level rise due to climate change will exacerbate flooding from storm surge. In addition, climate change-driven impacts to coral reefs, such as coral reef bleaching, are expected to worsen in the future and could result in reef loss, which could have devastating effects for marine ecosystems and could reduce the natural flooding and storm protection (via wave attenuation) that reefs provide to the shoreline (PIRCA 2020).

Typhoons

Guam is located in the western Pacific Ocean, in an area known as "Typhoon Alley" due to the frequency and intensity of tropical cyclones. The island has been hit by six significant typhoons in the past ten years, including Mawar (2023), Hagibis (2019), Wutip (2019), Yutu (2018), Mangkhut (2018), and Dolphin (2015) (Dobson et al. 2021). Typhoon Mawar in 2023, landing as a category 4 storm, is the most recent severe storm to hit the island, striking with maximum sustained winds of 140 miles (225 kilometers) per hour with peak gusts at 165 miles (266 kilometers) per hour. Typhoons can cause coastal flooding that can result in damage to the reef ecosystem, trees, buildings, roads, and utilities. Climate change projections indicate that while typhoons are expected to decrease in frequency in the future, they are likely to deliver higher wind speeds and increased rainfall (PIRCA 2020).

Typhoons develop over days to weeks and are monitored by the National Weather Service and others. There is sufficient time for officials to warn the public of incoming storms and associated risk, as well as to order evacuation when necessary.

Tsunamis

Tsunamis are a series of waves most commonly caused by large earthquakes below or near the ocean floor on thrust faults associated with subduction zones. Tsunamis can also be caused by undersea landslides. Tsunamis differ from ordinary ocean waves and storm surges in that the entire water column from the sea floor to the ocean surface is displaced, not just the upper few feet of the ocean surface as with ordinary ocean waves. As tsunamis enter shallower coastal waters, the speed of the wave slows down and the height increases. A wave that may be only 3 feet (0.9 meters) high or less in the ocean may climb to more than 60 feet (18 meters) when it hits the coastline.

Tsunamis can cause great loss of life and property damage where they come ashore. The first wave is almost never the largest; successive waves may be spaced tens of minutes apart and continue arriving for many hours. All low-lying areas along the Pacific Coast of the U.S. and in the Pacific Islands are subject to inundation by tsunamis.

Very large earthquakes anywhere around the Pacific Rim may cause a distant source tsunami that could strike the War in the Pacific NHP coastline. The first waves would reach the coastline many hours after the earthquake occurred depending on the distance of the quake from the park. Tsunami Warning Centers will alert local officials, who may order evacuation along the Guam coastline.

The effects of a distant-source tsunami on War in the Pacific NHP may be negligible or severe, depending on the magnitude of the earthquake, the distance of the earthquake from the park units, and the direction of approach. Valley mouths or inlets are more vulnerable than exposed coastlines because the height of the waves may increase as the wave energy becomes concentrated as it moves through a constricted valley/ inlet entrance.

If a large earthquake occurs within the Mariana Islands, this could produce a local source tsunami and the first waves may reach the coast within minutes after the ground-shaking stops. There may be no time for authorities to issue a warning. People on the beach or in low coastal areas would need to move to higher ground as soon as the ground-shaking stops and stay away from low-lying coastal areas until an official "all clear" is broadcast. Locally generated tsunamis constitute the most serious threat because they can strike suddenly, before a tsunami warning system has been activated and sometimes before ground-shaking stops.

Lack of information about how tsunamis behave is widely responsible for loss of human life in many situations. Often the damage from a tsunami is caused not by the water but by large amounts of debris carried in the water. The arrival of a tsunami may be preceded by a withdrawal of water from the coastline. Tsunamis are not breaking waves like those usually seen along a beach, but most often hit the coast as debris-filled turbulent water. Debris entrained in the tsunami strikes whatever is in its path and can cause extensive damage to structures. Strong currents are also a common feature of tsunamis and can cause extensive scour and deposition of debris.

The tsunami evacuation zone for Guam was modeled in 2009 by the National Oceanic and Atmospheric Administration (NOAA) Pacific Marine Environmental Lab. NOAA modeled five bays vulnerable to tsunami damage, including Apra Harbor, Tumon Bay, Pago Bay, Agana Bay, and Inarajan Bay. This was done by developing digital elevation models (DEM) for the bays and testing them against historical data and preliminary worst-case inundation scenarios. Three different magnitude earthquakes (Mw 7.6, 8.8 and 8.9) were modeled on twelve subduction zones with more than 1,200 scenarios to determine the tsunamigenic (tsunami-generating earthquake) source regions. The results were combined with data from tsunami catalogues and geological information to

determine the scenarios that were used in the final inundation study, where the maximum run-up heights, inundation distances, and numerical wave gauge results were computed with the high-resolution DEM grids for the most dangerous Pacific-wide tsunami scenarios (NOAA 2009).

RIVERINE AND PLUVIAL FLOODING

FEMA Flood Insurance Rate Maps (FIRM) for Guam include areas prone to riverine and pluvial flooding and have an effective date of September 28, 2007 (FEMA 2023). In addition to coastal flood hazard zones, the FEMA maps illustrate a 500-year floodplain (area with a 0.2% chance of flooding annually) within the Asan Beach and Asan Inland Units in the vicinity of the Saddok Assan (Asan River), as well as along the Saddok Matgue (Matgue River) primarily in the Asan Inland Unit. The Saddok Assan is additionally identified as a regulatory floodway within the coastal flood hazard zone. The FEMA FIRM maps do not indicate any other pluvial or riverine flooding zones within the four units.

Most overland flooding zones mapped by FEMA are included within the projected flooding zones from the USGS coastal model (USGS 2023a), with the exception of the Saddok Matgue 500-year floodplain. Although coastal and riverine and pluvial flooding are described separately, this is due to the limitations of current models. In reality, coastal and overland flooding will interact in a storm situation to exacerbate the effects of each. Rising groundwater will also likely occur due to sea level rise and would further increase flooding. Anecdotally, park staff have observed pluvial flooding from strong storm systems occur in lower areas of the park that are also projected to flood in the coastal storm surge model. These include the vulnerable parking areas at Asan Beach Unit, the parking and picnic areas at Apaca Point, and the mouth of the drainage at Ga'an Point.

Site-Specific Floodplain Values

Floodplain values for the park's coastal units include natural and cultural resources as well as important community recreation opportunities. In terms of natural resources, the shoreline and coastal plain within the park boundary provide habitats for a rich diversity of marine and terrestrial species, as well as natural flood and erosion control in the form of vegetated and "soft" (i.e., non-armored) shorelines.

Coastal vegetation stabilizes the unconsolidated sediment that primarily comprise these units. Additionally, vegetation, along with the offshore coral reefs, provide valuable ecosystem services and enhance coastal resiliency by dissipating storm surge/wave energy, and thereby reduce the velocity of and potentially extent of flooding. This action can minimize bank and bluff erosion, sand overwash, debris, and overall damage, and may offer more time for visitors to evacuate the area if present during a storm.

For cultural resources, the beach, shoreline vegetation, and level open space created by the coastal plain comprise important contributing features to the park's cultural landscape. These topographical and spatial characteristics help convey the trajectory of the 1944 Battle of Guam and are little changed to this day. These coastal landscapes also protect historic structures and archeological resources from World War II and may include archeological resources from other eras. Ethnographic resources associated with these sites are fishing and marine resources, the gathering of traditionally used plants, and locations associated with CHamoru myths and stories.

From a visitor use and recreation perspective, the park's floodplains offer an important opportunity to access the beach and marine environment. Trails and lawn provide spaces for walking, running, picnicking, events, and quiet contemplation.

JUSTIFICATION FOR USE OF THE FLOODPLAIN

The park's primary visitor use locations are along the coast. These sites were the invasion beaches where US troops first landed to re-take Guam from the Japanese in 1944 and contribute significantly to the reason the park

was established in 1978. The coastal units provide an important place to commemorate the lives lost during the War in the Pacific both on Guam and throughout the entire Pacific Theater. There are no alternative sites outside the coastal high-hazard/tsunami evacuation zone where the invasion beaches can be experienced by visitors. These sites additionally serve a highly valued role as an open space for community recreation for the people of Guam, where such green spaces are comparatively limited.

Current uses within the floodplain are limited to existing day-use facilities that are minimal both in scale and impact to floodplain processes. At both units, these include paved and unpaved walkways and parking areas, picnic tables, and signage. In addition, there are two small restroom facilities (one at Asan Beach Unit and the other at Ga'an Point in the Agat Unit) and six commemorative monuments at Asan. As noted above, the plan's proposed action calls for the removal of facilities that are in the most highly vulnerable areas through a process of managed retreat. Some of these facilities will be relocated further inland within the units to allow continued public access for as long as reasonably possible.

The proposed action identifies opportunities to make targeted minor facility investments. Where possible, these investments will take place in locations that are likely to be more resilient to coastal flooding in the long term, based on the sea level rise and storm surge scenarios illustrated by the USGS model, "Forecasting Storm-Induced Coastal Flooding for 21st-Century Sea Level Rise Scenarios in the Hawaiian, Mariana, and American Samoan Islands" (USGS 2023a).

These higher-resilience locations include the Rizal Point area at the Agat Unit, where an existing ridge is expected to provide protection from coastal inundation, as well as the base of the Assan Ridge within the Asan Beach Unit.

Minor investments will take place in areas that may experience flooding based on the USGS model outputs. These actions are determined to be justified because there are no practicable options outside of the floodplain. The entirety of the Asan and Agat Units are within the tsunami evacuation zone. Additionally, the USGS model outputs indicate that the Asan and Agat Units will experience partial or complete flooding under the most conservative sea level rise (59 inches or 150 centimeters) coupled with three storm (1-, 20-, 100-year) scenarios. The proposed actions support managed retreat by removing current facilities that are at high risk and relocating some of those facilities further inland to reduce potential harm to people and resources. These actions are intended to balance coastal impacts from climate change (e.g., flooding from storms and sea level rise) with providing access to these locations that are recognized to be of significant value to the public.

It should be noted that some facilities are proposed within the modeled flood zone instead of locations outside of it when the impacts/harm to resources are considered to be greater than the potential risk reduction. For example, at the Rizal Point area of the Agat Unit, the proposed parking lot is planned to be located within the floodplain because moving it outside would require substantial clear-cutting of trees and result in additional adverse impacts to natural resources and the cultural landscape.

For all locations, permeable construction materials such as compacted crushed coral and light-footprint approaches such as portable toilets would be utilized to further reduce the impact on floodplain processes. Proposed trail development in the park's inland units of Asan Inland and Mt. Alifan would also serve to relocate visitor access opportunities to alternative sites outside of the coastal high-hazard zone.

For any action, efforts would be taken to minimize activities that could reduce coastal resiliency. For example, vegetation should remain intact (or enhanced) where possible; removing vegetation can destabilize the sediment and increase flooding risk, velocity, and extent. Trails should be constructed a sufficient distance inland from the beach/

bluff-land interface so as not to accelerate erosion and to ensure visitor safety.

DETERMINATION OF ACTION CLASS AND REGULATORY FLOODPLAIN

NPS proposed actions that may adversely affect floodplains must comply with Executive Order 11988 and Director's Order #77-2: Floodplain Management, which requires the preparation of a Floodplain Statement of Findings if the action falls within the defined regulatory floodplain. Actions are grouped into three classes to identify the regulatory floodplain.

The floodplain for class I actions (the location or construction of administration, residential, warehouse, and maintenance buildings, non-excepted parking lots, or other man-made features) is defined as the 100-year floodplain, or base floodplain. This area has a one percent or greater chance of flooding annually. Class II actions are defined as "critical actions" and include schools, hospitals, fuel storage facilities, irreplaceable records, museums, and storage of archeological artifacts. These activities have a regulatory floodplain of 500 years (or locations with a 0.2 percent annual chance of flooding).

Class III actions are any class I and II actions that are located in high-hazard areas, including coastal high-hazard areas and areas subject to flash flooding.

The regulatory floodplain for class III actions is therefore the floodplain associated with the extreme flood, such as the probable maximum flood, which for coastal sites would correspond with the coastal high hazard or tsunami evacuation zone. Because the Asan Beach and Agat Units are located within the tsunami evacuation zone for the island, the actions proposed in the plan for these locations are considered class III actions.

DETERMINATION OF APPLICABILITY OF FEDERAL FLOOD RISK MANAGEMENT STANDARD

Executive Order 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input, was issued in January 2015 to further improve the nation's resilience to floods and to ensure new federal infrastructure will last as long as intended. Executive Order 13690 establishes a more rigorous federal flood risk management standard (FFRMS) that requires federal agencies to choose one of three methods for establishing a higher vertical flood elevation beyond the guidelines provided in Executive Order 11988. These three methods are defined as:

- Climate Informed Science Approach (CISA): The elevation and flood hazard area that result from using the best-available, actionable hydrologic and hydraulic data and methods that integrate current and future changes in flooding based on climate science;
- Freeboard Value Approach (FVA): The elevation and flood hazard area that result from adding an additional 2 feet to the base flood elevation for non-critical actions and by adding an additional 3 feet to the base flood elevation for critical actions; or
- 500-year floodplain: The area subject to flooding by the 0.2% -annual-chance flood (FEMA 2023).

Proposed actions that include federal funding, such as this unit management plan (UMP), are subject to the additional FFRMS. The UMP is following the Climate Informed Science Approach to establish a higher vertical flood elevation. The CISA-identified vertical flood elevation is determined by the USGS model, "Forecasting Storm-Induced Coastal Flooding for 21st-Century Sea Level Rise Scenarios in the Hawaiian, Mariana, and American Samoan Islands" (USGS 2023a).

As described above, these models provide predicted flooding extents for various scenarios that combine storm surge and sea level rise. The scenarios consider one-year, 20-year, and 100-year storm events integrated with 0 feet, 0.8 feet, 1.6 feet, 3.3 feet, 4.9 feet, 6.6 feet, 9.8 feet (0cm, 25cm, 50cm, 100cm, 150cm, 200cm, and 300cm) of sea level rise. For this analysis, the one-year and 100-year storm events with 4.9 feet (150cm) of sea level rise were primarily considered.

In addition to the USGS model outputs, the NOAA Sea Level Rise Viewer was also used to assess predicted future conditions. However, this output reports a "mapping confidence" of "low" for Guam, and professional judgement of NPS Water Resources Division staff from on-site experience determined that the output was underpredicting inundation at the Asan and Agat Units. Therefore, the USGS modelling served as the primary data for analysis, as it was determined to provide more conservative and accurate outputs.

Regardless of information provided by the USGS and NOAA data, all proposed actions are considered class III actions because the Asan Beach and Agat Units are located within the tsunami evacuation zone for the island (refer to figures E.1 and E.2).

DESCRIPTION OF SITE-SPECIFIC FLOOD RISK

As noted above, the proposed action within the Asan Beach and Agat Units falls completely within the regulatory floodplain. The primary flood risk is from coastal flooding associated with sea level rise, storm surge from typhoons, and tsunamis. Advanced notice of incoming storms and tsunamis (with the possible exception of a local source tsunami) allows time for officials to issue public warnings and evacuations, which would reduce or eliminate hazards to human life and safety, as well as park resources.

With regard to time required for flooding to occur, sea level rise occurs gradually over time and poses no imminent risk. Flooding from storms is not instantaneous, providing time for egress from the units in the event they are occupied during a storm event. Flooding from tsunamis poses the greatest risk upon arrival, as these waves tend to be rapidly flowing, debris-filled turbulent waters that would be difficult to avoid.

Conditions of Egress from the Site in the Event of Flooding

The Asan Beach Unit is located adjacent to a major highway on Guam (Marine Corps Drive), which can be easily accessed from the site in the event of sudden inundation. The open character of the unit also makes it possible to move quickly in various directions to escape flooding. Assan Ridge, along the unit's west side, provides higher terrain that could additionally allow visitors to escape threatening storm surge (although it would not be an advisable location to shelter from a tsunami).

Ga'an Point in the Agat Unit is located immediately adjacent to another large highway, Route 2, which runs north-south along the island and connects to routes heading inland. Like Asan Beach Unit, the open character of Ga'an Point allows movement in various directions to escape flooding.

Rizal and Apaca Points in the Agat Unit have egress locations along Shoreline Drive, which leads to Route 2. Vegetation within this area constricts to a certain degree the free movement across the site, although the additional pedestrian walkways and parking in the proposed action will increase the ease of circulation and egress.

DESCRIPTION AND EXPLANATION OF FLOOD MITIGATION PLANS

Mitigation Plans for Flooding and Coastal Hazards

As described above, the plan's proposed action calls for the removal of facilities that are in the most highly vulnerable coastal areas through a process of managed retreat.

Enhanced vegetation along the shoreline and at river mouths, and restoration of previously paved areas with vegetation would contribute to greater long-term resilience to flooding and enhance the sites' floodplain values. The park would increase current coral restoration efforts as well, which would similarly increase protection from coastal flooding in the long term via wave attenuation. The addition of bioswales near parking areas and circulation routes and expanded stormwater infiltration capacity will also mitigate riverine and pluvial flooding.

The limited new facility investments that are proposed are still primarily located within the floodplain, but in more resilient (higher-elevation or further inland) areas. Note that facilities are intended for day-use and do not involve overnight occupation. Facilities would be designed to adapt to, withstand, and/or rapidly recover from a flood event, meeting the intent of the standards and criteria of the National Flood Insurance Program (44 CFR Part 60). These new facilities include relocation of small day-use parking lots, foot trails, picnic tables, restrooms, and new interpretive kiosks. In the event of catastrophic loss or sea levels exceeding the thresholds identified in the proposed action, facilities would not be replaced in-kind. Some visitor amenities, such as shoreline pathways, could transition to water-based routes; whereas other infrastructure may be removed completely, as described above under "Description of the Proposed Action and Flood-Related Elements."

In addition to the measures described above, risk to life and property at War in the Pacific NHP would be further minimized by:

- Posting signs at the beach advising about the danger of tsunamis, storm surge, sneaker waves, undertows, and rip currents;
- Encouraging visitors to adopt a vigilant attitude (keep attention focused on the water rather than turning their back to the ocean) and to describe swimming techniques for escaping undertow and rip currents;
- Providing information about tsunami hazards and evacuation procedures;
- Providing information about storm surge and sea level rise; and
- Continuing to maintain a superintendent-approved All-Hazards Emergency Response Plan, which includes an evacuation plan for tsunamis and other extreme coastal hazards.

TSUNAMI EVACUATION PLAN

Current tsunami evacuation maps for Guam are available online from the Guam Homeland Security Office of Civil Defense website (https://ghs.guam.gov/programs/natural-disasters/tsunamis). The maps illustrate areas that are within the evacuation zone, areas that are within the safe zone, and assembly areas identified for each region.

The assembly area for Asan Beach is the Top o' the Mar parking lot, as identified in the Piti/Asan evacuation map. The assembly areas for Ga'an Point are illustrated in the Agat/Santa Rita evacuation map and include Oceanview Middle School and Southern High School. The assembly area for Apaca and Rizal Points is also Southern High School: while the Navy Exchange/Commissary site is depicted on the Apra Harbor evacuation map, this site is only accessible to military personnel.

The NPS would undertake tsunami warning and evacuation procedures consistent with the directions given by local emergency services agencies and would participate in island-wide exercises to prepare for future tsunami events.

SUMMARY

The NPS concludes that the proposed action would not appreciably increase the impacts of coastal hazards associated with tsunamis, storm surge, or riverine and pluvial flooding at War in the Pacific NHP. Rather, the proposed action is intended to facilitate managed retreat and reduce coastal hazards-related risk to human safety and resources. Coastal hazards and overland flooding are expected to occur within the Asan Beach and Agat Units, but precise timing and magnitude is unpredictable.

The NPS will monitor weather and sea conditions during all seasons and will post additional warnings, increase beach patrols, and/or close access to the coastal units during periods of hazardous conditions.

Distant seismic events capable of generating a tsunami typically allow time for warning and evacuation, which would reduce or eliminate hazards to human life and safety, but local seismic events may limit warning times.

There is no mitigation that can be prescribed for the infrastructure and facilities along the coastline. However, the proposed action would reduce the overall facility footprint within the tsunami evacuation zone and minimize any facility loss that may occur. Additionally, the facility investments are minor in recognition that they are located within the floodplain and are susceptible to varying levels of risks.

While adverse impacts to property, safety, and human life could occur from unpredictable seismic events and storm surge over the long term, there is no practicable way to avoid these impacts and continue to provide public access to the landing beaches, which are a fundamental resource and value of the park and contribute to the natural coastal resiliency of the island. Therefore, the National Park Service finds the proposed action to be acceptable under Executive Order 11988 for the protection of floodplains.

APPENDIX F: NATIONAL-REGISTER LISTED HISTORIC PROPERTIES AND LIST OF HISTORIC STRUCTURES AND ARCHEOLOGICAL RESOURCES

Table F.1: National-Register Listed Historic Properties and Character-Defining Features within the Area of Potential Effects

The table below lists the five historic properties within the planning area that are currently individually listed in the National Register of Historic Places. See figures F.1 and F.2 for a map of these historic properties within the Area of Potential Effects.

HISTORIC PROPERTY	DATE LISTED IN THE NATIONAL REGISTER	CHARACTER-DEFINING FEATURES	ASSESSMENT OF ADVERSE EFFECTS
War in the Pacific National Historical Park (all units)	1978	• Topographical characteristics of the battlefield, including the shoreline, coastal plain, and rugged upland terrain • Natural systems and features including coral reefs, dense vegetation, and river drainages • World War II Japanese fortifications and archeological resources (see list below)	No adverse effect
Memorial Beach Park (Asan Beach Unit)	1974	• Reef, topography, and spatial organization defining the Asan invasion beach during the war • Mouth of the Saddok Assan (Asan River) • Spatial relationship between beach, coastal plain, and upland terrain and influence on the battle	No adverse effect

HISTORIC PROPERTY	DATE LISTED IN THE NATIONAL REGISTER	CHARACTER-DEFINING FEATURES	ASSESSMENT OF ADVERSE EFFECTS
Matgue (Nidual) River Valley Battle Area (Asan Inland Unit)	1975	• Saddok Matgue (Matgue River) mouth and valley • Topographic characteristics of the Saddok Matgue valley and upland terrain • World War II archeological resources (caves; see list below)	No adverse effect
Asan Ridge Battle Area (Asan Inland Unit)	1975	• Topographic characteristics of Assan Ridge, Bundschu Ridge, Chorrito Cliff and relationship to coastal plain below • Saddok Assan • World War II Japanese fortifications and archeological resources (see list below)	No adverse effect
Agat Invasion Beach (Agat Unit)	1975	• Reef, topography, and spatial organization defining the Agat invasion beach during the war • World War II Japanese fortifications and archeological resources (see list below)	No adverse effect
Asan Invasion Beach (Asan Beach Unit)	1979	• Reef, topography, and spatial organization defining the Asan invasion beach during the war • Mouth of the Saddok Assan • Spatial relationship between beach, coastal plain, and upland terrain and influence on the battle • World War II Japanese fortifications and archeological resources (see list below)	No adverse effect

The list of historic structures and archeological resources below was developed based on the park's 2013 and 2003 cultural landscapes inventories, and Protocols for Assessment of Vulnerability of Historic Resources to Climate Change (Peterson et al. 2013).

ASAN BEACH UNIT

Historic Structures

- Asan Japanese Emplacement (Park ID 61, LCS ID 21207)
    - *This pillbox was constructed into the rock cliff at Punta Assan (Asan Point). It is located on the beach side of the ridgeline towards Marine Corps Drive. This reinforced concrete structure has one front wall embrasure and two side firing ports.*
- Asan Japanese Emplacement (Park ID 62, LCS ID 21208)
    - *This pillbox is located on the beach side of Assan ridgeline nearest the road. This pillbox uses a reinforced-concrete roof and a concrete wall faced with rock to enclose a natural crevice in the rock escarpment.*
- Asan Point Japanese Gun Emplacement (Park ID 64, LCS ID 21210)
    - *This pillbox is built into the western rock cliff of Punta Assan. It is the first gun emplacement at the bottom of the stairs leading from the ridgeline, and the further emplacement away from Marine Corps Drive. Built into the rock cliff, this pillbox has concrete walls around the front opening.*
- Asan Gun Base (Park ID 69, ASMIS ID WAPA00083.00)
    - *The feature is a gun base constructed of metal and halfway buried in the soil.*
- Asan Japanese Tunnel (Park ID 106, ASMIS ID WAPA00038.00)
    - *This feature is a 7.5-feet-long by 5-feet-wide by 5-feet-tall manmade cave constructed in a limestone cliff. The site is located on the east side of the Assan ridgeline near Marine Corps Drive.*
- Double Gun Emplacement on Asan Ridge (Park ID 116, LCS ID 56571)
    - *These gun emplacements are located at the top eastern side of the Assan ridgeline; one overlooks Asan Bay and the other overlooks Piti. The two concrete structures are set into the hill.*

Archeological Resources

- Offshore Japanese Pillbox (Park ID 102, ASMIS ID WAPA00045.00)
    - *This feature is a reinforced concrete pillbox that is overturned and is located approximately 40 feet offshore of Asan Beach.*
- Asan Point Stone and Concrete Wall (Park ID 63, other ID TBD)
    - *Coral rock and concrete wall erected by the Japanese for the protection of the crevices which they used for storage or shelter. At the base of the west side of Punta Assan.*
- Camel Rock Ammunition Dump (Park ID TBD, ASMIS ID WAPA00128.00)
    - *The Camel Rock Ammo Dump was identified by Explosive Ordnance Disposal personnel in 1978. It was described as an extensive scatter of ammo ranging in size from .30 caliber to 500 lb. bombs, ranging from 30 to 130 feet in depth.*
- Amphibious Tractor Treads (Park ID TBD, ASMIS ID WAPA00127.00)
    - *Amphibious tractor treads were located during a survey by SRC and park submerged resources team in 1987. Located in 60 feet of water offshore, the remains are likely from LVT-type vehicles.*

Figure F.1: Area of Potential Effects and Historic Properties, Asan Beach + Asan Inland Units

War in the Pacific National Historical Park | Asan + Agat Units Management Plan

National Park Service
U.S. Department of the Interior

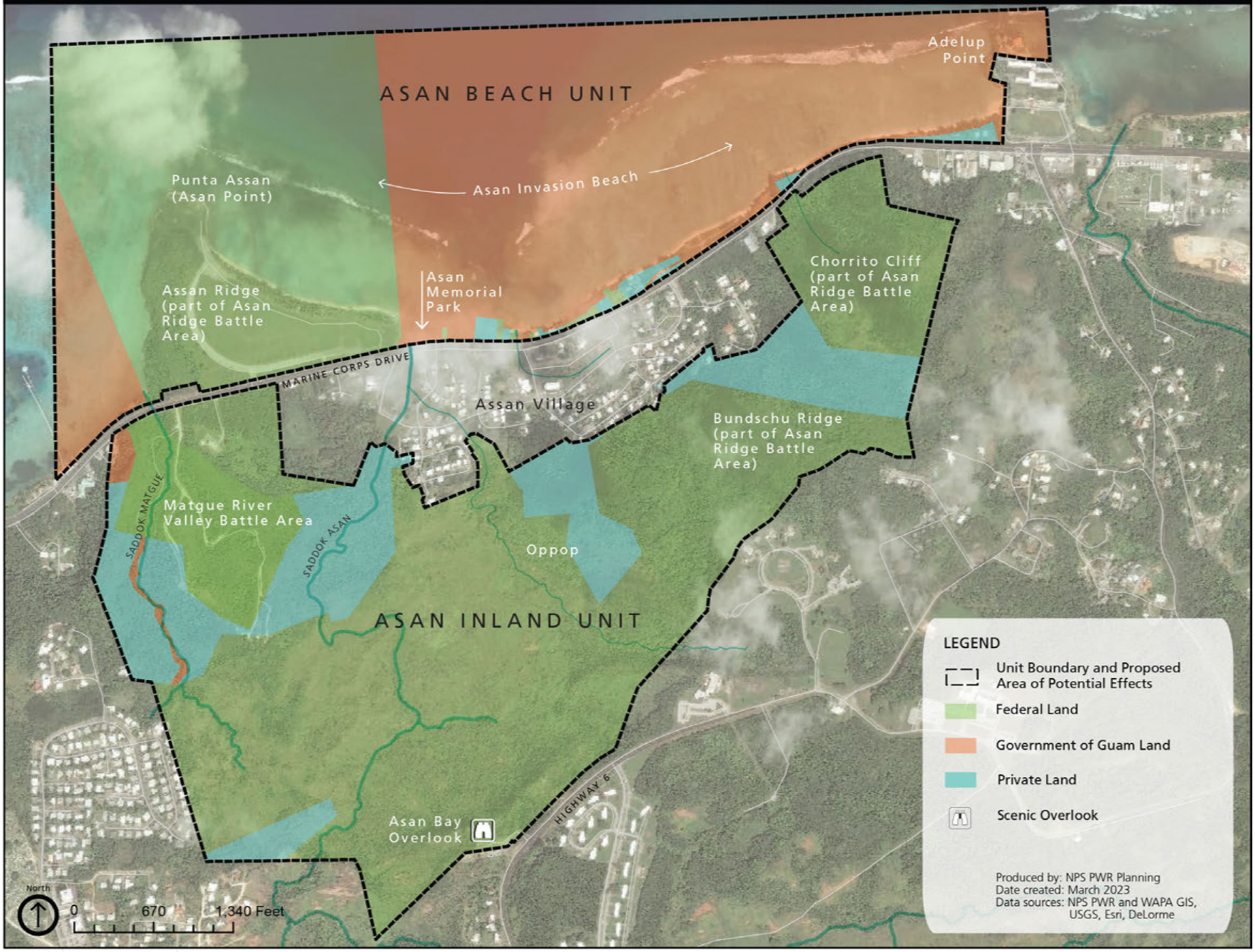
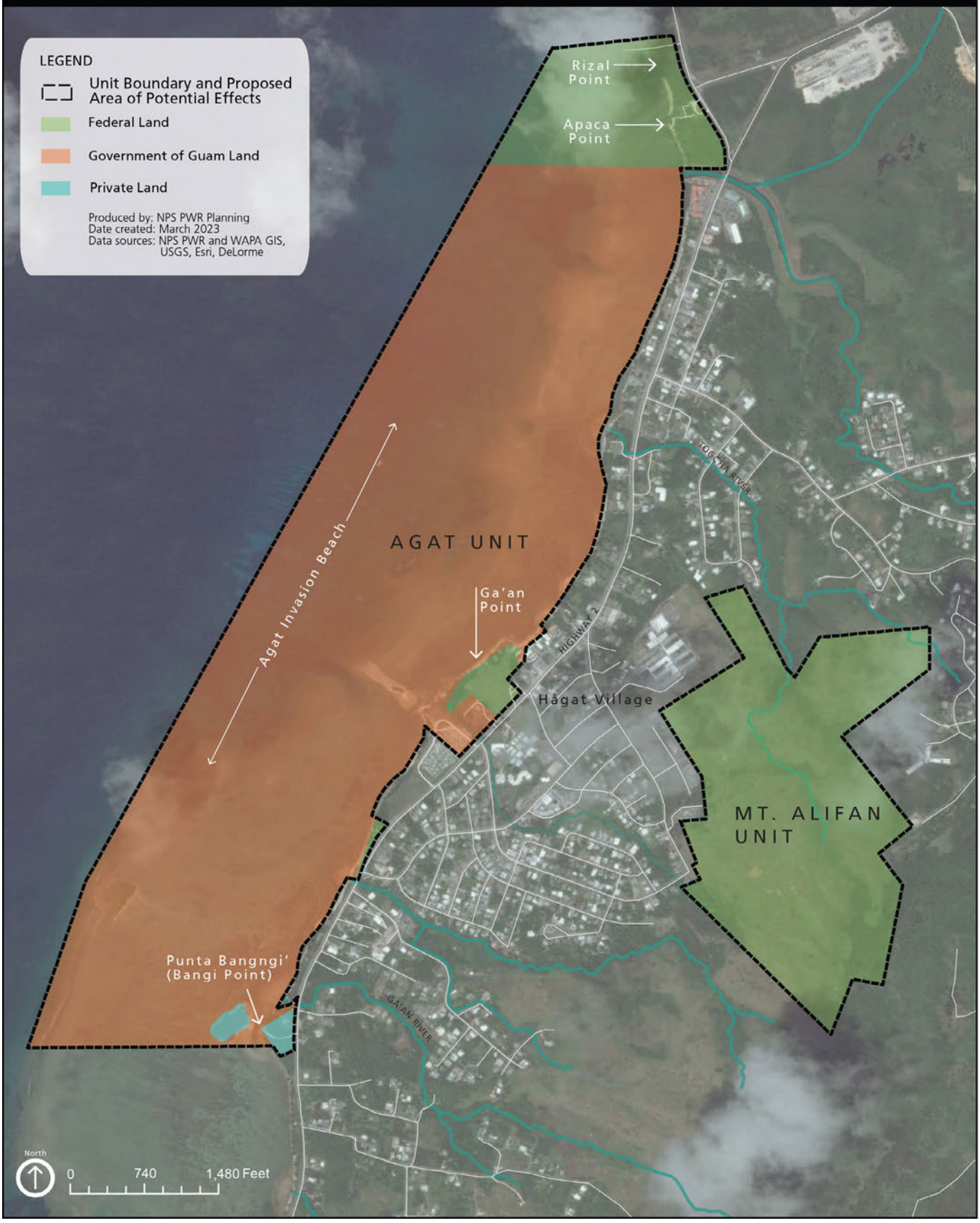


Figure F.2: Area of Potential Effects and Historic Properties, Agat + Mt. Alifan Units
War in the Pacific National Historical Park | Asan + Agat Units Management Plan

National Park Service
U.S. Department of the Interior



ASAN INLAND UNIT

Historic Structures

- Cave (Park ID 88, ASMIS ID WAPA00032.00)
  - *This feature is a 6.2-feet-wide by 4.5-feet-high manmade cave constructed on the west side of the road and dug out of the limestone cliff. The floor of the cave is level and the tunnel is uniform in shape.*
- Cave/Shelter (Park ID 97, ASMIS ID WAPA00035.00)
  - *This cave is 4.2-feet-long by 4.2-feet-wide by 5-feet-high and is dug out of a limestone cliff. The cave entrance faces east and is located directly off of the road.*

Archeological Resources

- Cave (Park ID 89, ASMIS ID WAPA00033.00)
  - *This cave may be a natural cave that was enlarged or is a man-made cave. It is right along the roadside. It is a shallow cave with a wide entry and measures approximately 6-feet-high by 10-feet-wide.*
- Japanese Cave (Park ID 94, ASMIS ID WAPA00034.00)
  - *This cave is 6-feet-wide by 5-feet-high and is dug out of the limestone cliff. The cave is one of a set of three caves high up on the cliff facing Asan Bay. It is located behind the maintenance shop.*
- Post WWII Tank Ruins (Park ID 96, ASMIS ID WAPA00112.00)
  - *This feature includes tank ruins that were constructed of metal. Most of it is buried in the ground and covered by soil and vegetation.*
- Bundschu Ridge Foxholes (Park ID TBD, ASMIS ID TBD)
  - *Company A's position, including foxholes, is located inside the park's Asan Inland Unit boundary.*
- Matgue River Area Cave System (Park ID TBD, ASMIS ID TBD)
  - *There are three caves built into a limestone cliff. The cave openings are approximately three feet wide and tall.*

AGAT UNIT

Historic Structures

- Apaca Point Japanese Bunker with Tunnel (Park ID 1, LCS ID 21190)
  - *This pillbox is located on the southeast corner of Apaca Point with the entrance on the land-ward side leading down an 8-foot tunnel to the pillbox that faces south. It is constructed of reinforced concrete built into a rock outcropping with a rubble-in-concrete exterior for camouflage.*
- Apaca Point Japanese Bunker (Park ID 2, LCS ID 21191)
  - *This pillbox has a reinforced concrete wall and roof constructed in a natural rock crevice at the water's edge.*
- Ga'an Point Japanese Bunker (Park ID 23, LCS ID 21194)
  - *Constructed at Ga'an Point, this large reinforced concrete pillbox has a fire control position or additional pillbox constructed above. The structures are built into a limestone escarpment.*
- Ga'an Point Japanese Bunker (Park ID 24, LCS ID 21195)
  - *This is a large Japanese pillbox constructed of an internal metal frame, with metal foundation posts, and a metal ceiling. The exterior of this structure consists of an outer layer of concrete. This feature is built into the side of a limestone hill or mound.*
- Bangi Point Japanese Pillbox (LCS 10)
  - *This reinforced concrete pillbox is located at the water's edge. The pillbox has two firing embrasures and a rifle slit, and the roof is embedded to act as camouflage.*

Archeological Resources

- Japanese Cave (Park ID 4, ASMIS ID WAPA00003.00)
    - *This cave was either man-made or was a natural cave enlarged to accommodate two to three men. The opening is approximately 4-feet-wide.*
- Rizal Point Japanese Bunker (Park ID 5, ASMIS ID WAPA00019.00/WAPA00122.00)
    - *This bunker is located on southeast corner of Rizal Point, on a rock outcropping in between Rizal Beach and Apaca Point in Agat Unit. This defense structure was built as part of the Japanese coastal defense units. Damaged during naval shelling, concrete sections lie on the beach and against the cliff side. The roof is the only part still intact and is leaning against the rock cliff.*
- Ga'an Point Caves (Park ID 23A, B, C, E; ASMIS ID WAPA00006.001, .002, .003, .005)
    - *There are four limestone caves associated concrete pillboxes at Ga'an Point that provided a field of fire over Agat Beach.*
- Apaca Point Japanese Tunnel (Park ID 103, ASMIS ID WAPA00046.00)
    - *Japanese coastal defense system tunnel connecting two pillboxes together at Apaca Point. The tunnel is enclosed by a concrete and rock roof.*
- Submerged LVT (Park ID 108, ASMIS ID WAPA00100.00)
    - *This site consists of a submerged LVT-4 Amtrac that is located in the water off Agat Beach, which was submerged during the U.S. invasion effort to cross the coral reef.*
- Submerged LVT (Park ID 109, ASMIS ID WAPA00101.00)
    - *This submerged LVT is off the coast of Agat. It is possibly an LVT-1 Amtrac.*
- American Pontoon Barge (Park ID TBD, ASMIS ID WAPA00129.00)
    - *This site was located during a survey of park submerged resources in 1985. It is located south of Ga'an Point in 70 feet of water. The site consists of portions of a barge with hoist or crane assembly used to transfer fuel-oil drums and other supplies to amphibious vehicles.*

MT. ALIFAN UNIT

Historic Structures

- Pillboxes and Connecting Trenches (Park ID 49, LCS ID 56755)
    - *This site is composed of a pillbox complex with trenches that span approximately 130 feet. The two pillboxes that are connected by trenches are made of concrete.*

Archeological Resources

- Bomb Crater (Park ID 11, ASMIS ID WAPA00052.00)
    - *One crater is approximately 42 feet in diameter and 3-feet-deep.*
- Shell Crater (Park ID 14, ASMIS ID WAPA00055.00)
    - *This shell crater is a shallow depression that is completely inundated with vegetation.*
- Radio Tower (Park ID 16, ASMIS ID TBD)
    - *The ruins of a radio tower consist of a bent metal pipe and rebar in a concrete footing.*
- Gun Emplacements (Park ID 18, ASMIS ID WAPA00058.00)
    - *This site includes a gun emplacement and two caves. Cave Shelter 18a is located on a hill and is dug out facing northeast with a large boulder located at the cave entrance. Cave 18b is located on the other side of the hill and faces north. A trench runs north of the caves. A gun emplacement located at the top of the hill.*
- Japanese Gun Emplacements (Park ID 19, ASMIS ID WAPA000124.00)

- *This gun emplacement site consists of a ridge with a mound and depression. Shrapnel and empty cartridges are found around the site.*

- Bomb Crater (Park ID 19a-b, ASMIS WAPA00126.00)
  - *This site consists of a cave and a bomb crater. Feature 019a is a cave shelter dug out of the red dirt mounds at Mt. Alifan. Feature 019b is a crater that measures 19 feet by 16 feet, by 6.5-feet-deep.*
- Anti-Tank Trench and Gun Emplacement (Park ID 35, ASMIS ID WAPA00015.00)
  - *Located along the ridge is a depression with a gun emplacement located approximately 33 feet from an antitank trench. The trench measures approximately 13-feet-long.*
- Foxholes (Park ID 37, ASMIS ID WAPA00068.00)
  - *This site is a collection of foxholes situated on a high ridge above tow ravines (one on either side). Previous surveys revealed that this site had 17 fox holes, but a 2006 six survey was only able to relocate 9 of the 17. Half of these features are inundated by vegetation and are filled with water.*
- Japanese Trenches and Cave (Park ID 38, ASMIS ID WAPA00016.00)
  - *This site consists of a foxhole and trenches with gun remnants. The foxhole is dugout of the side of a dirt clay mound and houses a 4-inch by 4-inch vent that connects with an unknown mound. Above the foxhole is a series of trenches that are inundated by vegetation.*
- Foxholes and Probable Gun Emplacement (Park ID 39, ASMIS WAPA00017.00)
  - *This site consists of a collection of foxholes and trenches. One depression, which appears to be manmade, is located at the base of a mound. There is a trench that runs east to west.*
- Gun Emplacements (Park ID 47, ASMIS ID WAPA00073.00)
  - *This site consists of a network of foxholes and trenches. There are several foxholes in the area as well as a trench that runs north to south for approximately 165 feet. There are three larger dug out areas branching off of this large trench.*
- Cave (Park ID 50, ASMIS ID WAPA00075.00)
  - *This is a man-made tunnel located in a clay hillside. There are entrances on both ends of the tunnel, which connect an upper portion of the hill with a gun emplacement. Both entrances are approximately 3-feet-wide and 6-feet-tall. The tunnel is approximately 26-feet-long. The gun emplacement faces the ridge.*
- Crater (Park ID 51, ASMIS ID WAPA00076.00)
  - *The depression is approximately 5 feet in diameter and is inundated with vegetation.*

APPENDIX G: LIST OF SECTION 106 CONSULTING PARTIES

Preliminary List of Parties Invited to Participate in Section 106 Consultation, July 2022

- Michael J. B. Borja, Director, Guam Department of Land Management
  - CHamoru Land Trust Commission
  - Guam Ancestral Lands Commission
- Hope Cristobal, Guahan Coalition for Peace and Justice
- Helen Grace B. Cuisia, Cultural Officer, Consulate General of the Republic of the Philippines
- Fuetsan Famalao'an
- Jose Garrido, Chairman, Task Force on Free Association—Commission on Decolonization
- Leonard Iriarte, President, Guma'Palu Li'e'; I Fanlalai'an Oral History Project
- Dave Lotz, Historian
- Patrick Lujan, SHPO/Division Supervisor, Guam State Historic Preservation Office
- Rufo Lujan, Ma'gas, Organization of People for Indigenous Rights
- Reid Nelson, Executive Director (Acting), Advisory Council on Historic Preservation
- Debbie Quinata, Maga'haga, Nasion Chamoru
- Joe Quinata, Chief Program Officer, Guam Preservation Trust
- John Salas, Regional Environmental Director, NAVFAC Marianas/Joint Region Marianas
- Frank Schacher, Tribal Chairman, Chamorro Tribe
- Rlene Santos Steffy, Oral Historian
- Speaker Therese M. Terlaje, 36th Guam Legislature
- Trini Torres, Chairperson, Pilong-Mago'haga-I Taotaomona Native Rights
- Melvin Won Pat-Borja, Executive Director, Commission on Decolonization; President, Department of Chamorro Affairs

Additional Groups and Individuals Requesting to Participate as Consulting Parties during Civic Engagement, August–September 2022

- Royce Camacho, Måsu
- Dietrix Jon Ulukoa Duhaylonsod, Adahi I Manaotao-ta Mo'na (AIMM)
- Mana'adahi Coalition, which includes AIMM and Måsu, as well as: Goggue Hila'an, Guahanom, and Hita Litekyan.

List of Parties Invited to Participate in Lujan House Meeting, April 4, 2023

- Dr. David Atienza, Guam Preservation Trust Board of Directors
- Joseph M. Borja, Director, Department of Land Management

- John Burch, Director, Guam Ancestral Lands Commission
- Royce Camacho, Måsu
- Hope Cristobal, Guahan Coalition for Peace and Justice
- Helen Grace B. Cuisia, Cultural Officer, Consulate General of the Republic of the Philippines
- Dietrix Jon Ulukoa Duhaylonsod, Adahi I Manaotao-ta Mo'na (AIMM)
- Pale Eric Forbes, Guam Preservation Trust Board of Directors
- Fuetsan Famalao'an
- Jose Garrido, Chairman, Task Force on Free Association—Commission on Decolonization
- Vince Leon Guerrero, Guam Preservation Trust Board of Directors
- Leonard Iriarte, President, Guma'Palu Li'e'; I Fanlalai'an Oral History Project
- Dave Lotz, Historian and Guam Preservation Trust Board of Directors
- Patrick Lujan, SHPO/Division Supervisor, Guam State Historic Preservation Office
- Michael Blas Makio, Guam Preservation Trust Board of Directors
- Mana'adahi Coalition
- Debbie Quinata, Maga'haga, Nasion Chamoru
- Joe Quinata, Chief Program Officer, Guam Preservation Trust
- Malia Ramirez, Department of Parks and Recreation
- Zina Ruiz, Guam Preservation Trust Board of Directors
- John Salas, Regional Environmental Director, NAVFAC Marianas/Joint Region Marianas
- Dr. Marilyn Salas, Cultural Practitioner
- Frank Schacher, Tribal Chairman, Chamorro Tribe
- Rlene Santos Steffy, Oral Historian
- Alice Taijeron, Director, CHamoru Land Trust Commission
- Speaker Therese M. Terlaje, 37th Guam Legislature
- Trini Torres, Chairperson, Pilong-Mago'haga-I Taotaomona Native Rights
- Christopher Wilson, Program Analyst, Advisory Council on Historic Preservation
- Melvin Won Pat-Borja, Executive Director, Commission on Decolonization; President, Department of Chamorro Affairs

List of Parties Attending the Lujan House Meeting, April 4, 2023

- Antolin Aguilar, Guam Ancestral Lands Commission
- Dr. David Atienza, Professor of Anthropology and Micronesian Studies, University of Guam; Guam Preservation Trust
- Royce Camacho, Måsu
- Helen Grace B. Cuisia, Cultural Officer, Consulate General of the Republic of the Philippines
- Dietrix Jon Ulukoa Duhaylonsod, Adahi I Manaotao-ta Mo'na (AIMM)
- Joe Leon Guerrero, Guam Ancestral Lands Commission

- Dave Lotz, Guam Historic Preservation Board
- Patrick Lujan, Guam State Historic Preservation Officer/Division Supervisor, Guam State Historic Preservation Office
- Speaker Therese M. Terlaje, 37th Guam Legislature
- Joe Quinata, Chief Program Officer, Guam Preservation Trust
- Malia Ramirez, Oral Historian, Guam Department of Parks and Recreation
- Joe Santos, Department of Chamorro Affairs
- Christopher Wilson, Program Analyst, Advisory Council on Historic Preservation

APPENDIX H: LIST OF PREPARERS

War in the Pacific National Historical Park

Barbara Alberti, Superintendent
Tim Clark, Cultural and Natural Resources Manager
Kina-Doreen Lewis, Lead Park Ranger
Charles Wolford, Supervisory Facility Operations Specialist
Rufus Haspalur, Park Guide
Kina-Nicole Lewis, Park Guide
Kelly Carroll, Lead Park Ranger (former)
Theo Chargualaf, Supervisory Facility Operations Specialist (former)
Artak Davtian, Lead Park Ranger (former)
Mike Gawel, Cultural and Natural Resources Manager (former)
Dave Lotz, Cultural Resources Program Manager (former)
Rose Manibusan, Chief of Interpretation (former)
Jim Richardson, Superintendent (former)

National Park Service Pacific West Regional Office (Interior Regions 8, 9, 10, 12)

Betsy Anderson, Landscape Architect, Project Manager
Jean Boscacci, Outdoor Recreation Planner, Project Manager (former)
Martha Crusius, Program Manager, Park Planning & Environmental Compliance
Vida Germano, Cultural Landscapes Program Manager
Scott Henrickson, Civil Engineer
Irina Irvine, Ocean & Coastal Resources Program Manager
Adam Johnson, Cultural Resource Specialist, Pacific Islands
Chris Johnson, Historian, Preservation Partnerships Program
Sarah Killinger, Regional Section 106 Coordinator
Sandy Margriter, GIS Specialist (former)
Allen McCoy, GIS Specialist
Nick Mitrovich, Environmental Protection Specialist
Nina Pulley, Park Planning & Environmental Compliance Fellow (former)
Anna Tamura, Planning Portfolio Manager
Laura Toledo, Park Planning & Environmental Compliance Fellow
John Wooster, Hydrologist

Other NPS Offices

Monique Lafrance Bartley, Marine Ecologist, Water Resources Division
Wylie Carr, Climate Change Planning Specialist, Climate Change Response Program
Susannah Erwin, Hydrologist, Water Resources Division
Marty Hylton, Historic Architect for Climate Change, Climate Change Response Program
Don Wojcik, Program Analyst, Park Planning and Special Studies Division
Jeneva Wright, Archeologist for Climate Change (former), Climate Change Response Program

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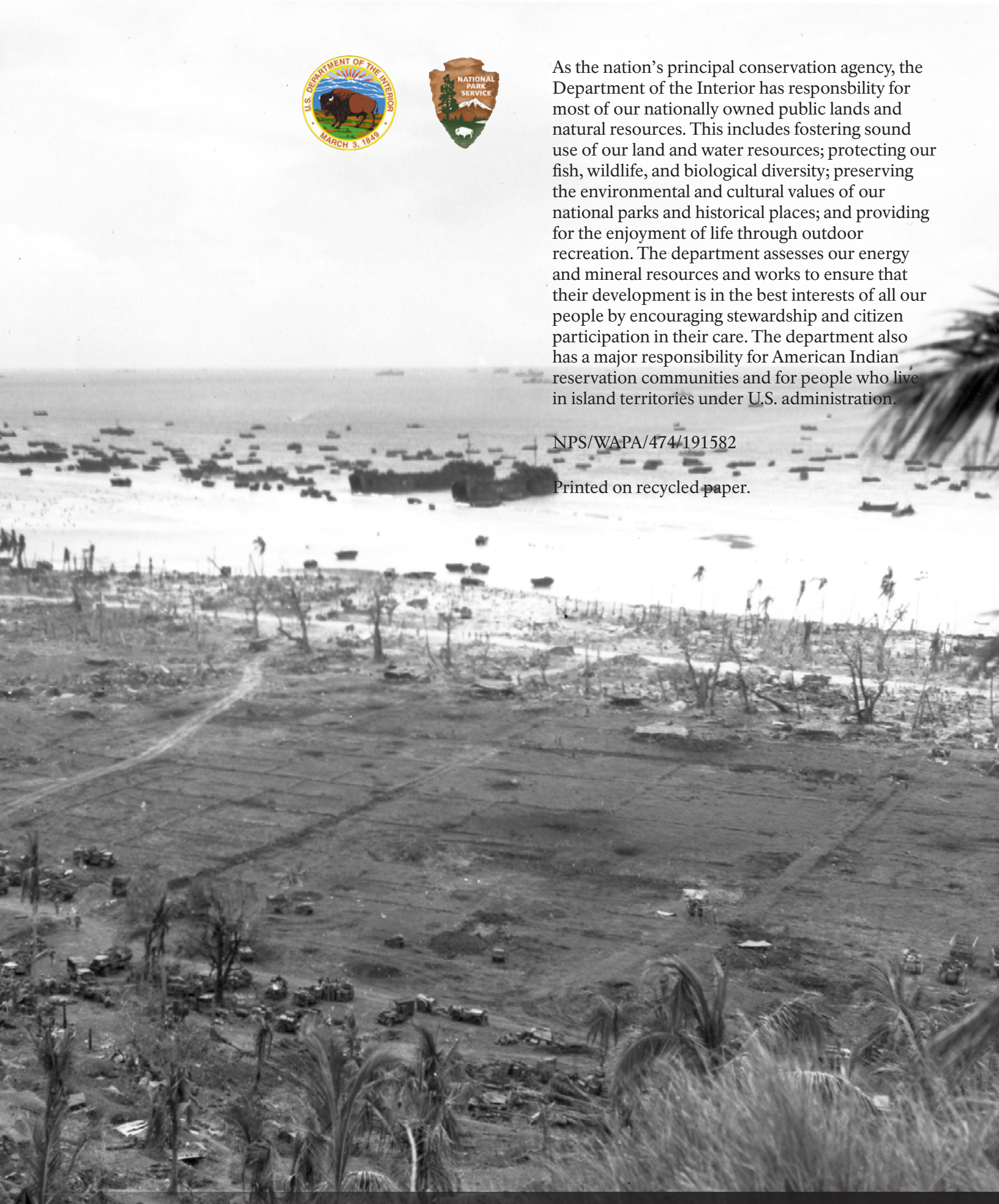

Marines come ashore on the beach at Punta Assan (Asan Point) with boats stopped at the coral reef, July 1944. Photo: NARA.

National Park Service
U.S. Department of the Interior

Prepared by: National Park Service
Interior Regions 8, 9, 10, and 12—Seattle Office
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View of Asan Beach and Asan Inland Units from the water. Photo: NPS.