GUAM COASTAL MANAGEMENT PROGRAM

FEDERAL CONSISTENCY FORM APPLICATION:

HONG KONG-GUAM CABLE LANDING

PITI, GUAM

Prepared for:

RTI Solutions, Inc.
268 Bush Street, #77
San Francisco, CA 94104

Prepared by

DUEÑAS · CAMACHO
& Associates Inc.

Duenas Camacho & Associates
238 E. Marine Corps Drive, Suite 201
Hagatna, Guam 96910

July 2018

DUEÑAS · CAMACHO

Website: www.dcaguam.com
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July 30, 2018

Mr. Carl Dominguez
Director
Bureau of Statistics & Plans
P.O. Box 2950
Hagatna, Guam 96932

Subject: CZMA Federal Consistency Certification for Hong Kong-Guam Submarine Cable Landing, Tepungan, Piti, Guam.

Dear Mr. Dominguez:

RTI Solutions, Inc. is proposing to land the Hong Kong-Guam submarine cable system on Guam and has an agreement with GTA to utilize one of the six conduits that GTA previously installed offshore and in Lot 262, Tepungan, Piti in 2017. GTA installed the conduit raceway to receive submarine fiber-optic cables, including the Southeast Asia-U.S. (SEA-US) telecommunication system linking Asia with Guam, Hawaii and California. The proposed Hong Kong-Guam cable landing is an extension of the SEA-US cable system.

For this activity, RTI Solutions, Inc. is seeking a Department of the Army permit for work in waters of the United States, and is providing its Coastal Zone Management Act Consistency Certification to the Bureau of Statistics and Plans, in accordance with the Guam Coastal Management Act of 1972 (P.L. 92-583). The proposed Hong Kong-Guam cable is needed to increase capacity and interconnectivity in this region of the western Pacific.

The project will land a single cable through one of the conduits in the GTA raceway, and pull the cable to shore where it will be spliced to land cables at a beach manhole located above the high tide line. The excavator to pull the cable to shore will be equipped with on-board spill response equipment for work near marine environments. These include absorbent pads and booms to be deployed in case of accidental oil leaks. No heavy equipment will be operated in marine waters. Similarly, the cable ship will have on-board spill response equipment to deploy in accordance with the vessel's spill response plan. The Environmental Protection Plan (EPP) developed for the project describes the EPP measures that would be implemented to control discharges and manage spills from heavy equipment operating at the site. Construction would be performed in accordance with specified best management practices (BMPs) to control erosion and minimize sedimentation.

On behalf of RTI Solutions, Inc. we certify that the proposed activity complies with the enforceable policies of Guam's approved coastal management program and will be conducted in a manner consistent with such program. A consistency assessment package is enclosed that discusses each of the 16 enforceable policies with findings that the proposed action and its effects are consistent with these policies. Please contact me at 477-7991 if you need additional information.

Sincerely,

Devin Keogh

Enclosure: CZM Application Package

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EXHIBITS

APPENDICES

GUAM COASTAL MANAGEMENT PROGRAM
ASSESSMENT FORMAT

DATE OF APPLICATION: July 2018
NAME OF APPLICANT: RTI Solutions, Inc. (RTI)

CONTACT PERSON: Chris Brungardt
ADDRESS: 268 Bush Street #77, San Francisco, CA 94104

TELEPHONE NUMBER: (916) 949-9141 (RTI) **CELL NO:**
E-MAIL ADDRESS: chris.brungardt@rticable.com
FAX NUMBER: ______________
TITLE OF PROPOSED PROJECT: GUAM-HONG KONG CABLE SYSTEM PITI, GUAM

COMPLETE THE FOLLOWING PAGES

FOR BUREAU OF STATISTICS & PLANS ONLY

DATE APPLICATION RECEIVED: ______________

ORCM NOTIFIED: ______________ **LIC. AGENCY NOTIFIED:** ______________

APPLICANT NOTIFIED: ______________ **PUBLIC NOTICE GIVEN:** ______________

PROJECT LOCATION: ______________

OTHER AGENCY REVIEW REQUESTED: ______________

DETERMINATION:

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

ORCM NOTIFIED: ______________ **LIC. AGENCY NOTIFIED:** ______________

APPLICANT NOTIFIED: ______________

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

DATE REVIEW COMPLETED: ______________

FEDERAL CONSISTENCY
SUPPLEMENTAL INFORMATION FORM

DATE: July 2018

PROJECT TITLE/DESCRIPTION: GUAM-HONG KONG CABLE LANDING

LOCATION: Lot 262, Santos Memorial Park, and Tepungan Channel and reef flat.

OTHER APPLICABLE AREA(S) AFFECTED, IF APPROPRIATE:

EST. START DATE: March 2019 **EST. DURATION:** 1 MONTH

TELEPHONE NUMBER: (916) 949-9141 **CONTACT:** Chris Brungardt

APPLICANT

NAME & TITLE Chris Brungardt, Senior Vice President of Regulatory Compliance

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A/C ( )

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CATEGORY OF APPLICATION (check one only):

( ) **I. Federal Activity**

(√) **II. Permit or License**

( ) **III. Grants & Assistance**

TYPE OF STATEMENT (check one only):

(√) **Consistency**

( ) **General Consistency (Category I only)**

( ) **Negative Determination (Category I only)**

( ) **Non-consistency (Category I only)**

APPROVING FEDERAL AGENCY (Categories II and III only):

AGENCY U.S. Army Corps of Engineers

CONTACT PERSON Ms. Karen Urelius

TELEPHONE DURING BUSINESS HOURS

A/C ( ) 671-339-2108

A/C ( ) ______

FEDERAL AUTHORITY FOR ACTIVITY

TITLE OF LAW Clean Water Act , Rivers and Harbors Act of 1889

SECTION Section 404 of CWA, Section 10 of Rivers & Harbors Act

OTHER TERRITORIAL APPROVALS REQUIRED

Agency	Type Of Approval	Date Of Application	Status
Guam Department of Agriculture	Piti Marine Preserve Permit	July 2018	Pending
U.S. Army Corps of Engineers	Nationwide Permit 6	July 2018	Pending
Guam EPA	401 Water Quality Cert.	July 2018	Pending
Guam Seashore Reserve Permit	Seashore Protection Comm.	July 2018	Pending

PROJECT DESCRIPTION

The purpose and scope of the project is to land a single submarine fiber-optic cable (Hong Kong-Guam Cable) into one of GTA's three remaining unoccupied conduits in Piti, Guam. The fiber-optic cable will be landed in Piti Bay and pulled through one of the conduits to shore where it will be spliced to land cables in the beach manhole located above the high tide line within Pedro Santos Memorial Park. The Hong Kong-Guam (HK-G) cable would be landed in March 2019. The landing would proceed as follows:

Cable Landing

1) Prior to the arrival of the cable ship, the cable route will be marked using floats tied to weights. Floats will be placed in approximately 30 m intervals. These positions will be located using a handheld GPS receiver.

2) The cable ship would position itself at the mouth of the Tepungan Channel with its stern facing shoreward and would be powered by its own thrusters to avoid anchoring on live corals. The cable ship will be positioned in an area where water depth is greater than 60 feet to avoid inadvertent coral damage from the ship's positioning thrusters. A single 1.61 in. (4.1 cm) diameter fiber-optic cable would be paid out from the stern of the cable ship into the channel.

3) Floats will be attached to the cable as its paid out and it will be floated into the channel. Support vessels, such as small to medium sized boats, pontoons, and personal watercraft (Jet Skis or similar watercraft), will position the cable along the correct alignment over the seabed, using the previously installed floats to guide placement. In order to maintain cable alignment, support vessels would anchor only where no corals are present.

4) The cable would be floated inland towards the seaward end of one of the previously installed 4 in. (10.1 cm) diameter ductile iron conduits located at the GTA bulkhead. At the seaward terminus of the conduit, the cable will be attached to a winch cable and pulled shoreward through the conduit by a winch truck located in Santos Memorial Park and into the beach manhole (BMH), where the cable will be spliced to GTA's terrestrial cable system.

5) After the cable is pulled through the BMH and proper cable alignment is verified, divers will cut the floats, starting at the bulkhead and proceeding seaward, and lay the cable in place on the seabed. If the cable needs to be repositioned, a stopper on the cable ship will be used to create slack on the cable and allow divers and support vessels to maneuver the cable into place. As the floats are cut, a support vessel will collect the floats and return them to the cable ship.

6) The cable ship would proceed to lay the cable beyond the 3 nautical mile limit from shore, transitioning from double-armored to single-armored cable at around the 328 ft. (100 m) water depth.

7) A post-landing survey will be conducted to inspect the cable route and confirm the cable is positioned along the correct alignment.

8) If the post-landing survey does not reveal any discrepancies, then 6.1 in. (15.5 cm) cast-iron articulated pipe armor protectors (also called N-pipe, split-pipe, or AP), in 21.7 in. (55.1 cm) sections, would be placed around the cable. The AP would be installed from the seaward end of the ductile iron conduit (bulkhead location) to an approximate seaward distance of 2,555 ft. (779 m) and a depth of approximately 80 ft. (25 m).

9) Offshore, the portion of cable encased in articulated pipe will be selectively pinned to the substrate with U-bolts at locations where no live corals are present. The cable will be pinned in the channel and at the channel mouth to prevent lateral movement. The U-bolts will be stainless steel with typical dimensions of 14 in. long, 5 in. wide, and 0.5 in. diameter (38 cm long, 12.7 cm wide, and 1.2 cm diameter). After the U-bolts are positioned over the cable, two 1 in. (3 cm) diameter holes for each bolt will be drilled down to approximately 12 in. (30 cm) with a marine-grade hydraulic drill, and the bolts will be inserted and secured in place with a non-toxic marine epoxy. Pins will be installed in approximately 33 ft. (10 m) intervals along the cable's path over the reef crest. Approximately 20 pins will be installed.

10) A final post-landing survey will be conducted to inspect the AP and pin installations, and ensure all ropes, floats and other materials are removed from the marine environment.

SUMMARY OF FILL IN WATERS OF THE U.S.

Material	Area (sq. ft.)	Area (sq. yds.)	Volume (cu. yds.)
Rock and sand from drilling for pins	0.304	0.033	0.011
Marine epoxy	N/A	N/A	0.009
TOTAL EXTENT AND VOLUME	**0.304**	**0.033**	**0.02**

GUAM COASTAL MANAGEMENT PROGRAM
ASSESSMENT FORMAT

DEVELOPMENT POLICIES

1. <u>Shore Area Development</u>

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

Policy: Only those uses shall be located within the Seashore Reserve which:

--- enhance, are compatible with or do not generally detract from the surrounding coastal area's aesthetic and environmental quality and beach accessibility; or

--- can demonstrate dependence on such a location and the lack of feasible alternative sites.

Discussion: Consistent. The proposed activity involves landing a single submarine fiber-optic cable into a beach manhole above the mean high water in Santos Park. By its nature, the activity is necessarily within the Seashore Reserve; however, it would not detract from the surrounding area's aesthetic and environmental quality and beach accessibility. The cable would be landed into a previously installed buried conduit raceway and beach manhole; therefore, no new excavation is needed within the Seashore Reserve to support the activity. After the cable is installed, it will be encased in cast-iron articulated pipe (AP) and selectively pinned to the seabed in approximately 20 locations to prevent lateral movement of the cable. Over time, corals would likely establish on the cable (as has been observed on other cables around Guam) and it would blend more naturally into the surrounding substrate.

RTI investigated other sites to determine their feasibility. The existing AT&T cable landing sites at Gun Beach and Tanguisson are not available to RTI. Likewise, the existing TyCom/Tata Communications cable landing sites at Tepungan and Agat are not available to RTI. Therefore, RTI considered utilizing one of the three previously installed and unused conduits within the GTA Conduit Raceway.

No other sites at Tepungan were considered since the cable will be landed into previously installed conduits and will be utilizing GTA's bulkhead, beach manhole, cable conduits, and cable landing station (CLS). This project does not propose to install new conduits.

2. <u>Urban Development</u>

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

Policy: Commercial, multi-family, industrial and resort-hotel zone uses and uses requiring high levels of support facilities shall be concentrated within urban districts as outlined on the Land Use Districting Map.

Discussion: Not applicable.

3. Rural Development

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

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

Discussion: Not applicable.

4. Major Facility Siting

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

Policy: In evaluating the consistency of proposed major facilities with the goals, policies, and standards of the Comprehensive Development and Coastal Management Plans, the Territory shall recognize the national interest in the siting of such facilities including those associated with electric power production and transmission, petroleum refining and transmission, port and air installations, solid waste disposal, sewage treatment, and major reservoir sites.

Discussion: Not applicable.

5. Hazardous Areas

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

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

Discussion: The project site is not considered as hazardous lands in terms of air installations, crash and sound zones, and major fault lines.

Floodplains

Executive Order 11988 (Floodplain Management) requires all federal agencies to evaluate the likely effects of their actions located in floodplains. Federal agencies shall reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities, including providing federally undertaken, financed, or assisted construction and improvements.

The Federal Emergency Management Agency (FEMA) Flood Rate Insurance Maps designates the nearshore areas of the Piti site as Special Flood Hazard Area with base flood elevations of 10 and 11 feet, and as Flood Zone VE. Zone VE encompasses areas of the coastal flood zone with a velocity hazard (wave action) (FEMA, 2007). The project involves landing of a single submarine fiber-optic cable, and therefore, is a site specific land use. After landing and installation, the cable would not affect other flood areas or cause backwater effects, nor be affected by this designation.

6. Housing

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

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

Discussion: Not applicable.

7. Transportation

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

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

Discussion: Not applicable.

8. Erosion and Siltation

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

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

Discussion: The site is not a mapped erosion-prone area (slopes of 15% or greater); however, the shoreline along the Santos Park is prone to erosion from wave activity. The project would utilize GTA's previously installed conduit raceway and therefore disturbance of the shore and reef flat would be minimal. No earthmoving activities along the shoreline or below the high tide line are proposed.

RESOURCE POLICIES

1. Air Quality

Intent: To control activities to insure good air quality.

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

Discussion: Consistent. The cable landing activities will implement best management practices, if necessary, in accordance with an Environmental Protected Plan (Exhibit B, EPP), and with the implementation of these measures, the project is expected to comply with Guam's air quality standards. Temporary impacts to air quality will originate from exhaust emissions from the cable ship, support vessels and other terrestrial vehicles. These would be short-term emissions, as the landing itself would take one day, followed by minor activities to armor and pin the cable in the water.

2. Water Quality

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

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

Discussion: Consistent. The Tepungan site was originally selected in part for the degraded condition of the reef flat, which is negatively affected by terrigenous deposits from the Masso River and an unnamed intermittent stream. Freshwater inundation affecting salinity on the shallow reef flat also contributes as a condition affecting coral growth.

The cable landing, AP installation, and pinning activities have the potential to temporarily increase turbidity on the Tepungan reef flat and reef crest, as well as within the channel. The cable landing will have minimal increases in turbidity as the cable is laid on the seabed and will dissipate quickly. Equipment used in the marine environment, such as generators and power tools, will use vegetable oil or food-grade glycol instead of traditional hydraulic fluids. During cable pinning activities, turbidity will be temporarily increased as holes are drilled into the substrate. Turbidity increases will be minimal, about 0.0075 cu ft (0.0560 US gal) per hole drilled, or 0.2995 cu ft (2.2408 US gal) total. Minimal excavation is proposed for the installation of a single Ocean Ground Bed Electrode within Santos Park, above the mean high water mark and outside of the Guam Seashore Reserve. BMPs such as silt fencing would be used during all earth moving activities as described in the Environmental Protection Plan to prevent sediment runoff from entering the marine environment. All contours would be restored to their original elevation and grade after construction is completed.

3. Fragile Areas

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

Policy: Development in the following types of fragile areas shall be regulated to protect their unique character.

--- historical and archaeological sites

--- wildlife habitats

--- pristine marine and terrestrial communities

--- limestone forests

--- mangrove stands and other wetlands

Discussion: Consistent.

Historic and archaeological sites. There would be no adverse effect on historic or archaeological sites. No documented resources listed or eligible for listing on the National or Guam Registers of Historic Sites occur within the project area, and none were encountered during previous archaeological tests or during past construction activities at Santos Park, including the archaeological monitoring of the GTA conduit raceway in 2017. The 2017 monitoring followed the Monitoring and Discovery Plan prepared by Micronesian Archaeological Research Services (MARS). Archaeological monitoring will be performed by a qualified archaeologist during construction of the new Ocean Ground Bed in the Park, if required by the State Historic Preservation Officer (SHPO).

Wildlife Habitat. The project would not disturb any of the scrub forest along the intermittent stream in the eastern sector of the park, and the project would not result in the loss of wetlands or waters of the United States. Very few trees occur within the raceway corridor in the Park, which is mostly a maintained lawn or gravel base course. Vegetation will be preserved where possible since it plays an integral role in controlling erosion along the shoreline. While common fauna, such as sinks and sparrows would be temporarily displaced by cable landing activities, these species are anticipated to return after the landing and subsequent AP installation and pinning activities cease. There would be no long-term impacts on terrestrial biological resources, as the operation of the cable within the buried cable raceway is generally considered benign.

The project area supports habitat for a variety of algae, corals, macroinvertebrates, crustaceans, mollusks, and fish species. There is no designated or proposed critical habitat in the vicinity of the cable landing site. Based on information from the National Marine Fisheries Service (NMFS), the project area is within the essential fish habitat (EFH) designation for Guam.

As of 2014, NOAA has listed 15 Indo-Pacific coral species as threatened under the Endangered Species Act (ESA) of 1973, of which three species occur in Guam waters: *Acropora globiceps*, *Acropora retusa*, and *Seriatopora aculeata*. *A. globiceps* is known to occur within Piti Bay (Personal communication, Valerie Brown, NMFS); Kerr and Burdick (2016); Burdick (2018)). The cable landing route was surveyed in April 2018 and three *A. globiceps* colonies were observed within the vicinity of the proposed cable route. These colonies are generally small and would be easily avoidable as they are not located in the direct path of the proposed cable route or in locations where inadvertent contact or impacts would be likely. Additional pre-landing surveys will be performed to confirm there are no other colonies in the path of the bundled cables. Impacts to known *A. globiceps* colonies will be avoided by conspicuously marking the colonies and the final route prior to the cable landing. Divers and workers in the marine environment will attend a briefing on the presence or ESA-listed species and all necessary BMPs in place. Best management practices would be implemented throughout the course of in-water work to minimize impacts to the marine environment. These include the NMFS Protected Resources Division's BMPs, which are recommended for general in- and near-water work including boat and diver operations to reduce potential adverse effects on protected marine species.

The threatened green and endangered hawksbill sea turtles are listed under the ESA, and small populations are known to forage around Guam. Seagrass beds, such as those in Piti Bay, are located close to shore and provide foraging habitat for green sea turtles. In order to avoid any potential impacts to sensitive species such as migratory birds, and other marine species, biological monitoring will be performed prior to commencing and during daily construction activities. If any protected species are observed in the vicinity of the work site, Department of Agriculture would be contacted and work would not commence until the species voluntarily leaves the area. Work would occur outside of coral spawning periods in July and August.

Pristine marine and terrestrial communities and limestone forest. The project corridor does not fall within pristine marine or terrestrial communities, nor do they contain limestone forest communities (Moore, 1977; Stojkovich, 1977; Bureau of Planning, 1982; U.S. Forest Service, 2005).

Piti Bay was designated as a marine protected area within the Piti Bomb Holes Marine Preserve in 1997 by the Government of Guam via Public Law 24-21, and is currently managed by the Division of Aquatic and Wildlife Resources (DAWR), Guam Department of Agriculture. The project will secure a permit from DAWR for activities in the Piti Bomb Holes MPA.

Mangroves and other wetlands. The proposed action would not be located within mangroves, wetlands or seagrass beds, based on marine surveys and benthic habitat mapping (Kerr and Burdick, 2016; Burdick, 2005) (Figure 4, Exhibit A).

4. Living Marine Resources

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

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

Discussion: Consistent. In order to avoid any potential impacts to sensitive species and other marine species, marine monitoring will be performed prior to and during the cable landing, AP installation and pinning activities, in accordance with NOAA's best management practices. Construction would be suspended until the animal voluntarily leaves the area. There are no federally listed corals within the direct path of the landing corridor. All known listed coral species present near the landing corridor are avoidable, and all will be pre-marked using conspicuous materials prior to the cable landing.

During the shore landing of the cable, care will be taken to avoid laying the 1.6-inch (41 mm) diameter cables on large coral colonies during the alignment process, especially at the mouth of Tepungan Channel. The cable ship will be held in place at the mouth of the channel by its own thrusters and would not anchor in areas of live corals. The cable ship will remain in sufficiently deep water to avoid inadvertently damaging coral with its thrusters. Prior to landing the cable, divers will mark the pre-approved route with least impact to corals, and where the cable would be exposed to the least impact from physical terrain. As the cable is paid out from the cable ship, the cables will have floats attached, and they will be floated towards the conduits at the bulkhead. The floats will be cut and the cables laid in place by divers. If the cable needs to be repositioned, a stopper would be used to provide slack on the cable and allow manipulation of the cable before its final placement over the substrate. Likewise, the installation of the split pipes around the fiber-optic cables for 779 m (2,555 ft), and selected pinning of the cables to the substrate at intervals at the channel mouth, will be conducted in such a manner as to minimize damage to live corals along the cable route. A post-construction and cable-laying inspection will be conducted to confirm these measures have been carried out. The implementation of these and other best management practices would minimize impacts to the existing marine life in Guam's coastal waters.

5. Visual Quality

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

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

Discussion: Consistent. There would some temporary effects on aesthetics of the reef flat and park during the construction period, but the project would not permanently obstruct or degrade natural scenic views. The cable will utilize the previously installed GTA cable raceway, which is buried within the reef flat and the Park, and will not contribute to any visually objectionable uses.

6. Recreational Areas

Intent: To encourage environmentally compatible development.

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

Discussion: Consistent. The project would involve temporary activities in marine waters and would not have a significant effect on the use of these waters for recreation. Vessels operating in the vicinity of the cable ship would be temporarily diverted to nearby areas during the brief cable landing events.

7. Public Access

Intent: To ensure the right of public access.

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

Discussion: Consistent. The offshore activities would temporarily restrict access on the section of reef flat in the work zone for during the cable landing, AP installation, and pinning activities to ensure public safety. Similarly, vessels would be advised via a Coast Guard Notice to Mariners not to approach the area during the cable landing while the cable ship is offshore.

Public access to Santos Park would be limited during construction and cable landing activities for safety reasons. During construction, this project is expected to have a temporary impact on the traffic patterns along Route 1 (Marine Corps Drive) and potentially Route 11 (Cabras Highway) as materials and equipment are moved in and out of the Park. An encroachment permit would be required to safely accommodate construction access to the Park from Route 1. The permit would include a site specific traffic control plan that will be prepared and submitted to the Department of Public Works and Port Authority of Guam for review and approval. The traffic control plan would be implemented with appropriate lights and/or signage to safely divert motorists and facilitate the movement of vehicles during these construction periods. Construction is scheduled to occur during daylight hours. Motorists would be inconvenienced and may opt to travel on alternate routes or at alternate times of day.

8. Agricultural Lands

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

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

Discussion: Not applicable. None of the soils in the project site are identified as having major components that meet the soil requirements for prime farmland when irrigated (Young, 1988).

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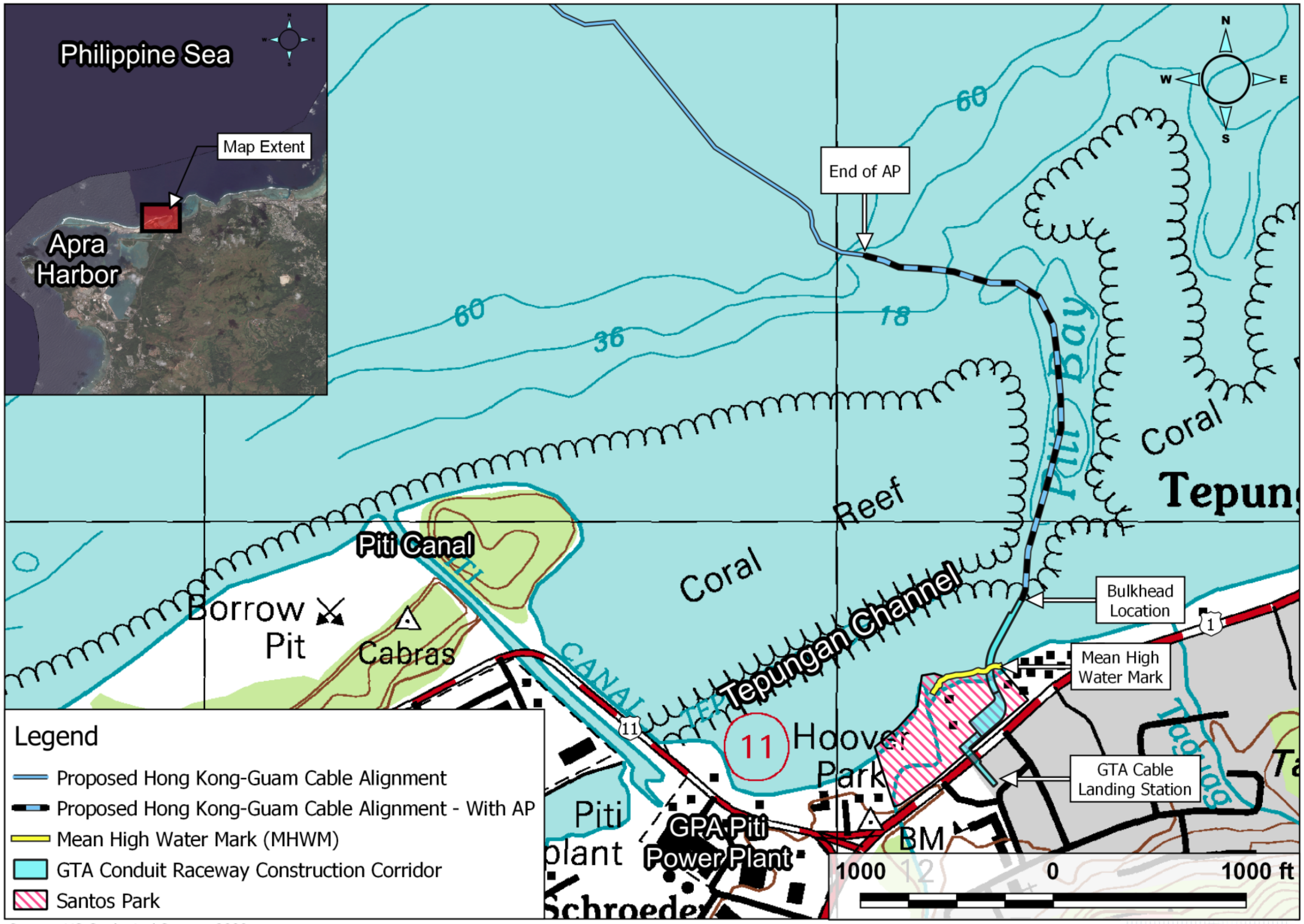
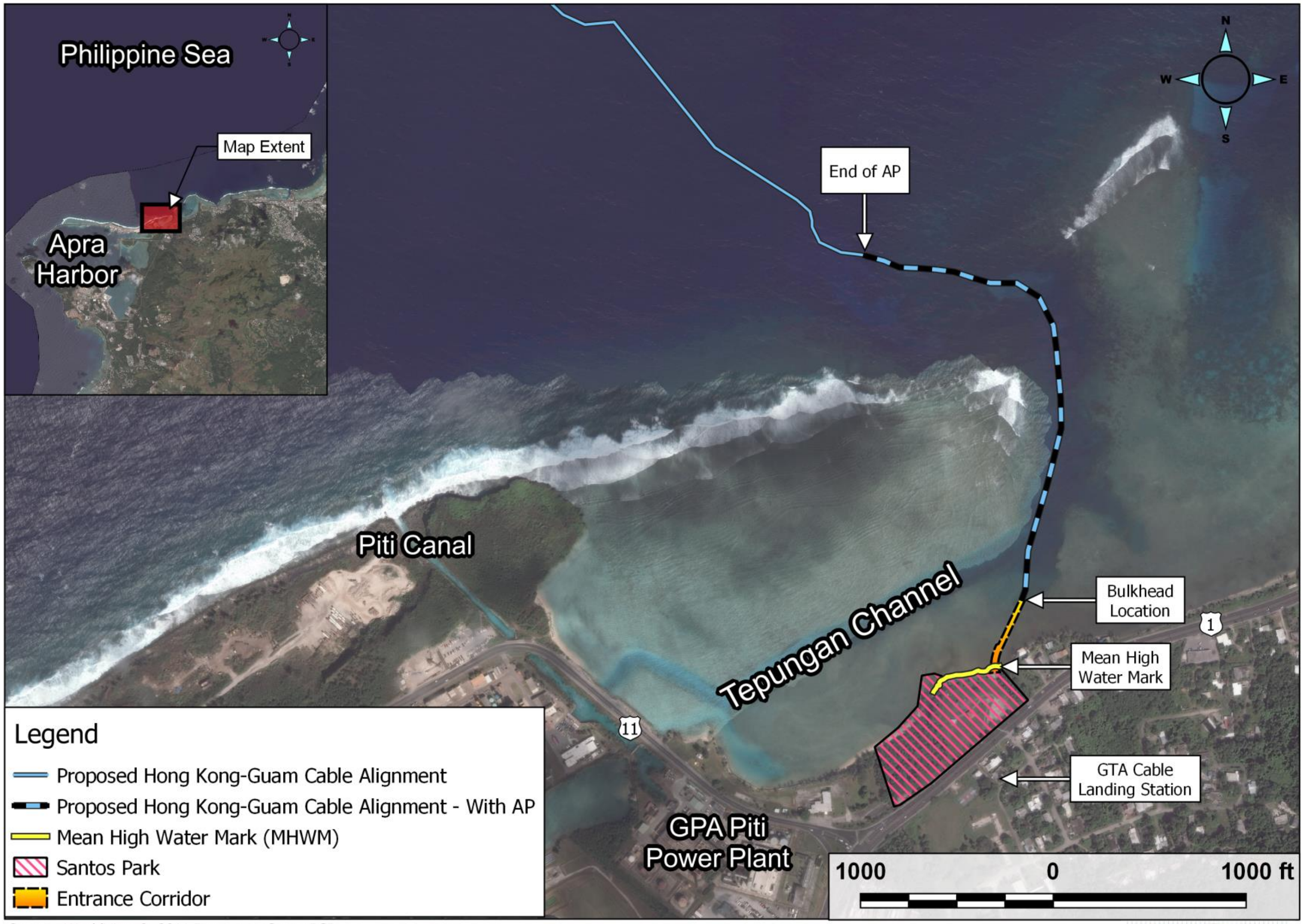
EXHIBIT A. FIGURES
FROM FEDERAL CONSISTENCY APPLICATION

1. **Site location map of GTA cable raceway and HK-G cable landing site, Piti, Guam.**
2. **Aerial View of GTA cable raceway and HK-G cable landing site, Piti, Guam.**
3. **Flood hazard map at the project site, Santos Park, Piti.**
4. **Benthic habitat map of project site, Tepungan, Piti, Guam**



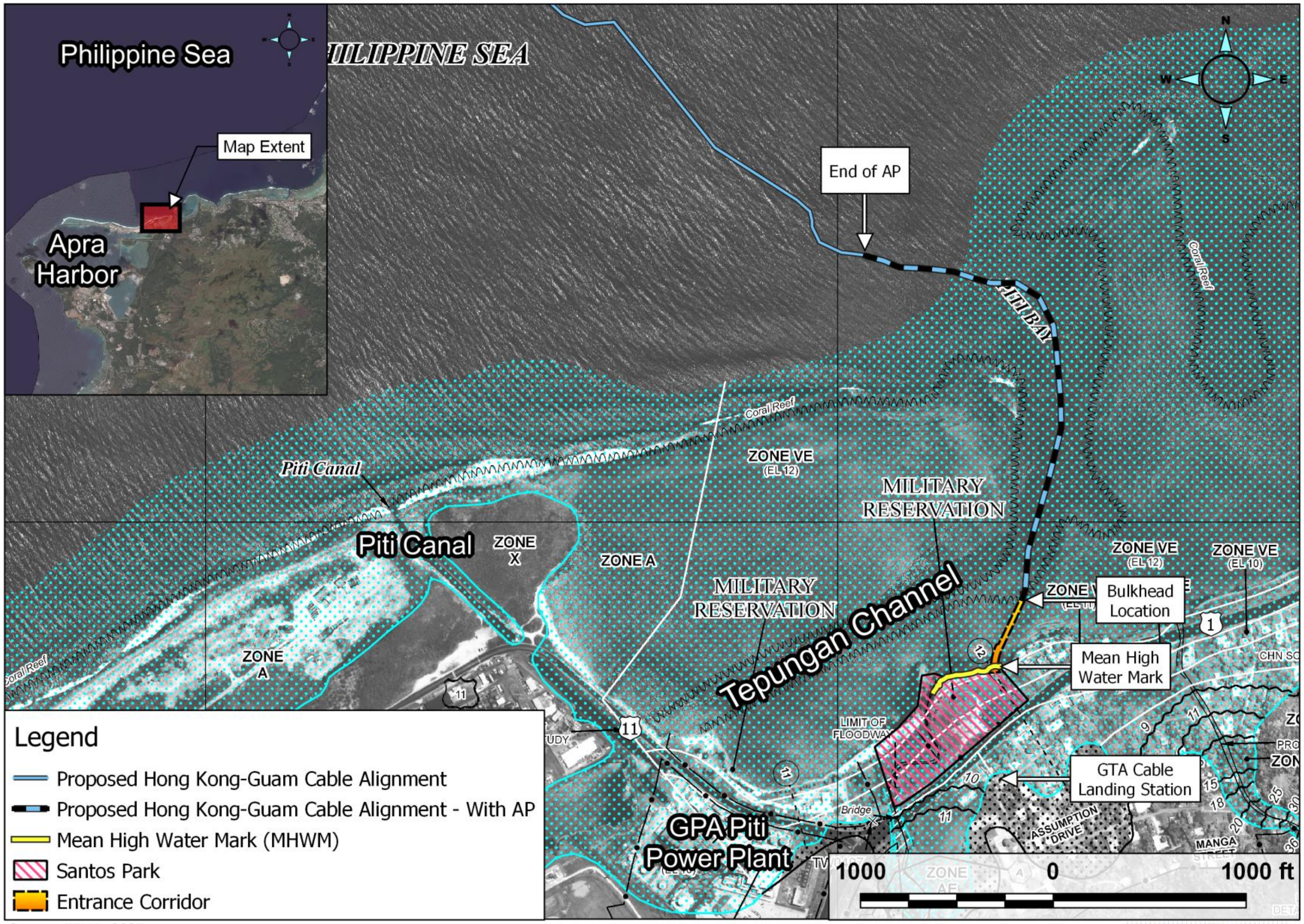
Source: US Geological Survey, 2000

Figure 1. Site location map of GTA cable raceway and HK-G cable landing site, Piti, Guam.



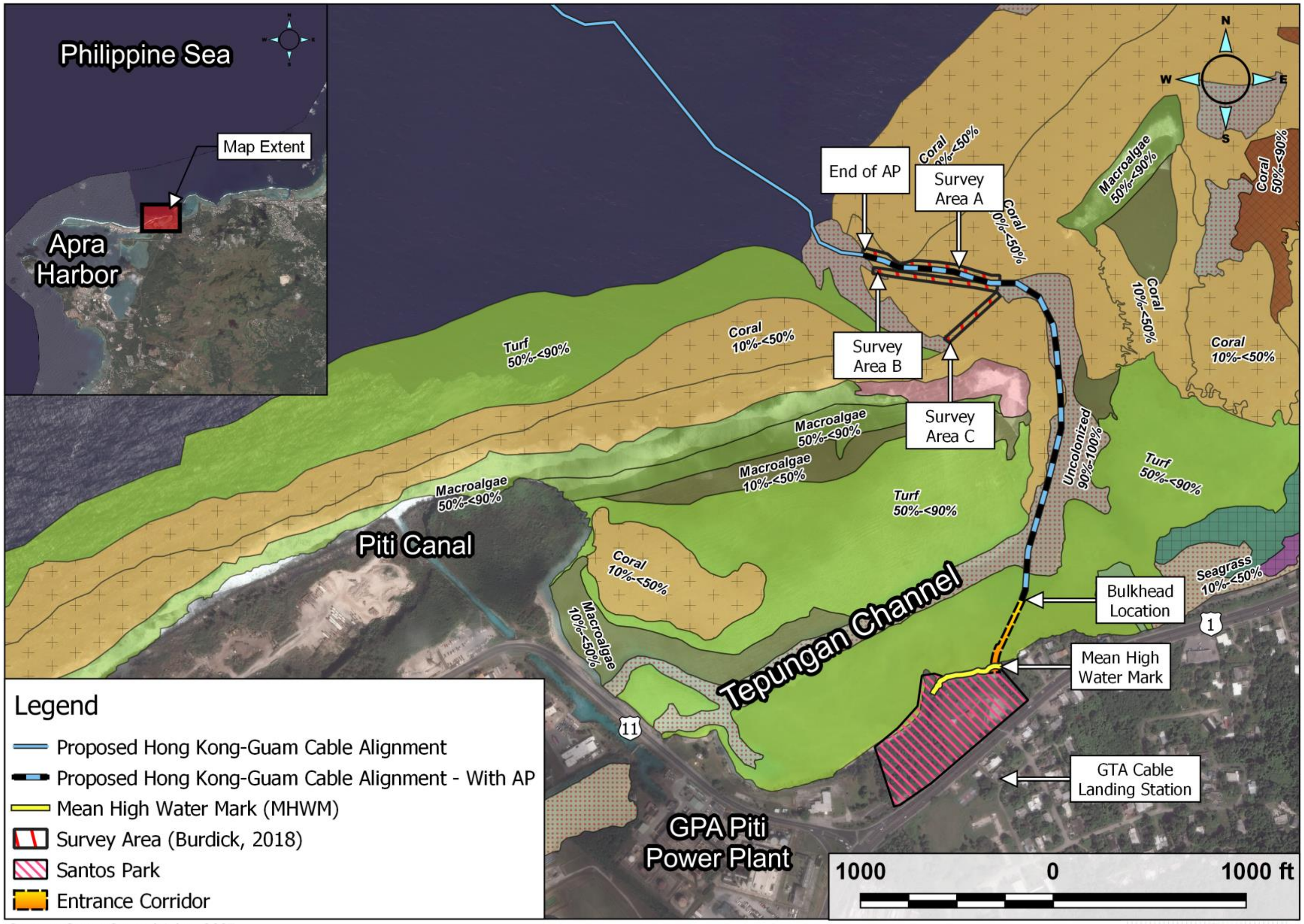
Source: WorldView 2, 2011 Imagery - Guam BSP

Figure 2. Aerial View of GTA cable raceway and HK-G cable landing site, Piti, Guam.



Source: FEMA, 2007

Figure 3. Flood hazard map at the project site, Santos Park, Piti.



Source: Guam Coastal Atlas, 2005

Figure 4. Benthic habitat map of project site, Tepungan, Piti, Guam

EXHIBIT B

ENVIRONMENTAL PROTECTION PLAN:

HONG KONG-GUAM SUBMARINE CABLE LANDING
PITI, GUAM

Prepared for:

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July 2018

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EXHIBITS

1 Purpose

The objective of this Environmental Protection Plan (EPP) is to establish general environmental protection procedures for the marine contractors to follow during the landing of a single submarine fiber-optic cable for the Hong Kong-Guam (HK-G) Cable System. The EPP will ensure compliance with laws and regulations of the U.S. Environmental Protection Agency and the Guam Environmental Protection Agency (Guam EPA), and with permit conditions mandated by the U.S. Army Corps of Engineers and applicable Government of Guam agencies.

2 Project Information

2.1 Project Location

The Hong Kong-Guam cable would link Guam to Hong Kong and is part of the larger SEA-US (Southeast Asia-U.S.) cable system installed in 2017.

Guam is an unincorporated U.S. territory and the largest and southernmost island in the Mariana Islands archipelago. The cable landing and beach manhole are located in the eastern portion of Pedro G. Santos Memorial Park (Lot 262), an approximately 6-acre parcel located in the Municipality of Piti, just east of Apra Harbor on the western coast of Guam. The Marine portion of the project site is located in the Tepungan Channel and Tepungan reef flat offshore from Santos Park. The cable will be landed into GTA's previously installed cable bulkhead and conduit raceway where it will proceed shoreward towards the Beach Manhole (BMH) located above the mean high water mark within Santos Park. From the BMH, the cable will continue to follow the terrestrial portion of the cable conduit raceway south, terminating at GTA's Cable Landing Station (CLS) on the southern side of Marine Corps Drive (Route 1).

2.2 Project Description

This project proposes to land a single submarine fiber-optic cable into one of GTA's three remaining conduits in Piti, Guam. The fiber-optic cable will be landed through one of the conduits and pulled to shore where it will be spliced to land cables at a GTA BMH that is located outside of the Guam Seashore Reserve and above the mean high water mark. The Hong Kong-Guam cable will be landed in March 2019. The cable will be directly laid on the seabed, articulated (split-pipe) armor protectors will be installed, and the cable will be selectively pinned to the seabed in approximately 20 locations where no live corals exist. The landing of a new cable system linking Hong Kong with Guam will be located in waters of the United States. This cable landing is the subject of this EPP.

2.2.1 Cable Landing and Shoreside Work

The work on site will be overseen by NEC and local contractors who will perform the landing and dive work. The Hong Kong-Guam cable will be landed in March 2019 and would proceed as follows:

1. Prior to the arrival of the cable ship, the cable route will be marked using floats tied to weights. Floats will be placed in approximately 30 m intervals. These positions will be located using a handheld GPS receiver.
2. The cable ship would position itself at the mouth of the Tepungan Channel with its stern facing shoreward and would be powered by its own thrusters to avoid anchoring on live corals. The cable ship will be positioned in an area where water depth is greater than 60 feet to avoid inadvertent coral damage from the ship's positioning thrusters. A single 1.61 in. (4.1 cm) diameter fiber-optic cable would be paid out from the stern of the cable ship into the channel.
3. Floats will be attached to the cable as its paid out and it will be floated into the channel. Support vessels, such as small to medium sized boats, pontoons, and personal watercraft (Jet Skis or similar watercraft), will position the cable along the correct alignment over the seabed, using the previously installed floats to guide placement. In order to maintain cable alignment, support vessels would anchor only where no corals are present.
4. The cable would be floated inland towards the seaward end of one of the previously installed 4 in. (10.1 cm) diameter ductile iron conduits located at the GTA bulkhead. At the seaward terminus of the conduit, the cable will be attached to a winch cable and pulled shoreward through the conduit by a winch truck located in Santos Memorial Park and into the beach manhole (BMH), where the cable will be spliced to GTA's terrestrial cable system.
5. After the cable is pulled through the BMH and proper cable alignment is verified, divers will cut the floats, starting at the bulkhead and proceeding seaward, and lay the cable in place on the seabed. If the cable needs to be repositioned, a stopper on the cable ship will be used to create slack on the cable and allow divers and support vessels to maneuver the cable into place. As the floats are cut, a support vessel will collect the floats and return them to the cable ship.
6. The cable ship would proceed to lay the cable beyond the 3 nautical mile limit from shore, transitioning from double-armored to single-armored cable at around the 656 ft. (200 m) water depth.
7. A post-landing survey will be conducted to inspect the cable route and confirm the cable is positioned along the correct alignment.
8. If the post-landing survey does not reveal any discrepancies, 6.1 in. (15.5 cm) diameter cast-iron articulated pipe (AP) armor protectors (also called N-pipe or split-pipe), in 21.7 in. (55.1 cm) sections, would be placed around the cable from the end of the ductile iron conduit (bulkhead) to an approximate seaward distance of 2,600 ft. (800 m) and a depth of approximately 80 ft. (25 m).
9. Offshore, the cable (covered by articulated pipe) will be selectively pinned to the substrate with U-bolts at locations where no live corals are present in the channel and at

the channel mouth to prevent lateral movement of the cable. The U-bolts will be stainless steel with typical dimensions of 14 in. long, 5 in. wide, and 0.5 in. diameter (38 cm long, 12.7 cm wide, and 1.2 cm diameter). After the U-bolts are positioned over the cable, two 1 in. (3 cm) diameter holes for each bolt will be drilled down to approximately 12 in. (30 cm) with a marine-grade hydraulic drill, and the bolts will be inserted and secured in place with a non-toxic marine epoxy. Pins will be installed at approximately 33 ft. (10 m) intervals along the cable's path over the reef crest. A total of 20 pins will be installed.

10. A final post-landing survey will be conducted to inspect the AP and pin installations, and ensure all ropes, floats and other materials are removed from the marine environment.

2.2.2 Terrestrial Construction

Since the proposed cable system will utilize previously installed underground infrastructure (e.g., terrestrial conduit raceway), earthmoving activities would be minimal and limited to the installation of one additional Ocean Ground Bed (OGB) to be constructed within Santos Park. The OGB would be located near the conduit raceway and BMH and would comprise four 15 ft deep by 8 in wide holes. An auger would be used to dig the holes within the park above the mean high water mark. Construction is expected to last 2 days.

2.2.3 Construction Equipment

The equipment used in the seaward portions of the project would be minimal. Support vessels such as boats, personal watercraft, and barges or pontoons would be used to pull the cable from the cable ship to the bulkhead and to ensure proper alignment before divers begin cutting the floats and laying the cable on the seabed. Support vessels will enter the Piti Bay Marine Preserve in one of two ways: large boats will depart from Apra Harbor or the Hagåtña Boat Basin and enter via the Tepungan Channel mouth, while smaller vessels or personal watercraft could be launched from Santos Memorial Park. An "entrance corridor" will be defined within a previously disturbed portion of the Tepungan Reef Flat. The corridor will be over the previously installed conduit raceway to minimize the potential for damage to coral and marine life. Support vessels will be trailered into the water via Santos Park and would be manually moved (walked or floated) to the end of the cable raceway (bulkhead) where sufficient water depth allows for powered movement. As the floats on the cable are cut, a support vessel will collect the floats and return them to the cable ship.

A winch-truck will be used to pull the cable through the conduit from the bulkhead to the beach manhole. The winch-truck will be located within Santos Park above the MHW mark and outside of the Guam Seashore Reserve. Support vessels, such as small boats and pontoons, are required for articulated pipe installation and pinning activities. Hydraulic tools would be used during pinning activities. A small generator and air compressor would be positioned on a barge and towed by a small boat to the pinning location near the Tepungan Channel mouth. An auger would be used to drill holes for the OGB installation.

3 Protection of Natural and Cultural Resources

3.1 Air Pollution

Particulates and exhaust gases (hydrocarbons and carbon monoxide) will be the primary potential sources of air quality degradation during construction. The Contractor shall be required to keep construction activities under surveillance, management, and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the Contractor shall be in accordance with Public Health Standards and Federal Emission and Performance Laws and Standards. Ambient Air Quality standards set by the Guam EPA shall be maintained for all construction operations and activities.

Air quality can be considered Fair at the project site, since it falls within the 3.5-kilometer radius of the Cabras and Piti Power Plants, which is designated as a non-attainment area for sulfur dioxide by Guam EPA under the National Ambient Air Quality Standards (NAAQS) that covers a 3.5-kilometer (km) (2.2-mile) radius from the respective facility. The NAAQS are U.S. EPA standards for six criteria air pollutants: carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter, and ozone (O3). A non-attainment designation indicates a certain air region has not met the NAAQS based on ambient air quality monitoring data. Power plants and motor vehicles are sources of sulfur dioxide when they burn sulfur-containing fuels, especially diesel.

Guam Power Authority is charged with controlling the potential impacts of pollutants by switching fuel type consumed by the power plants depending on the wind direction. Under normal conditions, high sulfur content fuel is burned when winds carry the emissions away from the island and over the ocean; low sulfur fuel is used when winds carry emissions inland. Since winds rarely blow from the southwest, the Tepungan site is relatively free from the emissions of the power plants. Vehicular traffic from Route 1 to the south is a minor mobile emissions source.

3.1.1 Particulates

Dust particles, aerosols and gaseous by-products from all construction activities shall be controlled at all times including weekends, holidays, and hours when work is not in progress.

3.1.2 Smoke

There shall be no burning of solid or liquid wastes at the site during cable landing activities. After all work is completed, there shall be no incineration of wastes.

3.1.3 Motor Vehicle Emissions

All emissions from motorized machinery shall be controlled to stay within Federal and Guam EPA and limits at all times. No gasoline-powered vehicle or machine shall be operated which emits visible smoke. No diesel powered vehicle or machine shall be operated which emits visible smoke for a period of more than five consecutive seconds. All machinery shall be kept in good repair.

3.1.4 Generator and Hydraulic Equipment

The Contractor would use a low-noise portable generator on board the dive boat in order to power the hydraulic power tools necessary to perform the post-landing pinning of the cable. These hydraulic tools would include a drill and drivers. The Contractor will assure that the generator is properly permitted through GEPA. As a rule of thumb, if the portable generator is larger than 25kW, then the Contractor must apply for an air emissions permit. All hydraulic equipment will use vegetable oil or food-grade glycol instead of traditional hydraulic fluid.

3.2 Noise Control

All vehicles and equipment will be fitted with proper noise-suppression and emission control devices as required by OSHA and U.S. EPA Standards. Motorized equipment shall be fitted with functioning mufflers, engine enclosures, and engine vibration isolators that are periodically inspected and properly maintained. Crews will avoid idling their equipment engines unnecessarily, and will minimize impulsive noise generation. Speed limits will be observed within the work zone and roadways, and particularly while traveling through residential neighborhoods.

During construction, there would be short-term impacts to noise levels from the operation of heavy equipment vehicles. These standard vehicles and equipment would operate within OSHA guidelines, and construction workers would wear appropriate ear protectors.

The nearest sensitive receptors are a single-family residence and apartment building to the east of Pedro Santos Memorial Park, and a single-family residence to the south; these would be temporarily inconvenienced by the noise generation caused during the cable landing activities. Best management practices and working within reasonable hours, however, would minimize noise impacts to occupied residential areas adjacent to the project. After the construction phase is completed, the buried communications system would not contribute significantly to the ambient noise of the area.

3.3 Biological Resources

3.3.1 Terrestrial Resources

The vegetation within the Santos Park project area was investigated by biologists from Dueñas, Camacho & Associates, Inc. during field visits in August and September 2015 and again in July 2018. Pedestrian surveys were conducted to characterize the existing vegetation community and identify any species of concern that may require special consideration. Three communities were identified within and adjacent to the project area: Urban Built-up and Open Clearing; Strand; and Scrub Forest. No listed plant species were observed.

No trees will need to be removed for the cable landing, as there are no trees between the beach manhole and the shoreline and bulkhead. Impacts to strand vegetation such as beach morning glory (*Ipomoea pes-caprae)* and various grasses may occur. After the ocean ground bed installation and cable landing have been completed, the ground cover at the site will be restored to its original state.

Migratory birds may visit the project site during construction activities. These species are protected under the Migratory Bird Treaty Act (MBTA). Daily pre-construction surveys for migratory birds will be conducted by a biological monitor. If migratory birds are present, work will not begin until the migratory birds have voluntarily left the site.

3.3.2 Marine Resources

The in-water portion of the project site is located in the Piti Marine Preserve, a Marine Protected Area (MPA) administered by Guam Department of Agriculture, and all in-water work is subject to the MPA permit conditions for the proposed activity.

Prior to the cable landing, the "entrance corridor" for support vessels (i.e., jet skis) will be identified and marked. This corridor will be follow the original construction corridor for the installation of the GTA marine raceway on the reef flat. Support vessels will be allowed to use only this corridor for access between the shore and the channel. In advance of the landing, the corridor will be surveyed to identify macro-invertebrates in the water (i.e., sea cucumbers, star fish, sea stars, etc.). These macro-invertebrates, if present within the corridor limits, will be removed from the vicinity to a nearby and suitable area.

3.3.3 Sensitive, Threatened, and Endangered Species

Napoleon wrasse and bumphead parrotfish are occasionally seen near the proposed landing site, but were not seen during the marine surveys in 2015 and 2018; other species of parrotfish and wrasses were observed in the deeper and steeper portions of the site, indicating the suitability for these two species (Kerr and Burdick, 2016). Sea turtles were observed during marine surveys of the Guam project area in both 2015 and 2018, and appear to frequent the mouth of Tepungan Channel (Kerr and Burdick, 2016). Although the landing beach is not a nesting site for sea turtles, green sea turtles actively forage in the waters of Piti Bay (Kerr and Burdick, 2016). Spinner dolphins are known to occur in the Piti Bay MPA and are listed under the Marine Mammal Protection Act.

Effective October 10, 2014, 20 species of corals were listed as threatened under the U.S. Endangered Species Act (79 FR 53851). Three of these coral species are known to occur in Guam's waters: *Acropora globiceps*, *Acropora retusa*, and *Seriatopora aculeata*. Three individual *Acropora globiceps* colonies occur along or in the vicinity of the cable route at the mouth of Tepungan Bay and will not be disturbed or impacted. These colonies will be conspicuously marked underwater by a DCA biologist using rope and floats to prevent inadvertent damage or impacts.

If any protected species are observed in the vicinity of the work site, Guam Department of Agriculture Division of Aquatic & Wildlife Resources (DAWR) would be contacted (Telephone: 735-0294/0289) and work would not commence or resume until the species voluntarily leaves the area. Best management practices would be implemented throughout the course of in-water work to minimize impacts to the marine environment.

Prior to landing the cables, divers will mark the route with least impact to corals, and where the cable would be exposed to the least impact from physical terrain. During the cable landing, care will be taken to avoid laying the cable on large coral colonies during the alignment and laying process. The cable ship will not anchor, and will be positioned using its own thrusters. As the cable is paid out from the cable ship, it will have floats attached in approximately 2-3 m intervals to keep the cable near the surface. The floats will be cut and the cables gently laid in place by divers once the cable is pulled through the bulkhead and proper cable alignment is verified by divers. If the cable needs to be repositioned, a stopper would be used to provide slack on the cable and allow manipulation of the cable before its final placement over the substrate. Likewise, the installation of the split pipes around the fiber-optic cable, and selective pinning of the cable to the substrate at intervals, will be conducted in such a manner as to minimize damage to live corals along the cable route. A post-construction and cable-laying inspection will be conducted to confirm these measures have been carried out.

BMPs, such as silt fencing, would be used during earth moving activities within the park to prevent surface runoff of sediments onto the Tepungan Reef Flat.

3.3.4 USFWS Conservation Measures

The U.S. Fish and Wildlife Service has identified the following conservation measures that will be implemented to ensure the project does not jeopardize the continued existence of federally-listed species protected under the U.S. Endangered Species Act (ESA).

- The operators of the cable ship and any attendant vessels or dive and support boats would be advised to remain alert to the potential presence of protected marine animals (e.g., dolphins, corals and sea turtles) and to avoid them while operating at the project site and while traveling to and from the site.
- Fauna monitoring will be performed during all active work and cable laying activities for hawksbill and green sea turtles, which are listed as endangered. If listed species are present, work will not begin or resume until these species have voluntarily left the site.

- The Contractor shall minimize habitat loss and degradation as much as possible and avoid to the extent practicable the ensnarement or entanglement of aquatic species by floats that are needed to lay down and maneuver the cable. Such devices shall be removed promptly from the water when their presence is no longer necessary.

3.3.5 NMFS Best Management Practices

As a general guideline for the contractor, fauna monitoring will be performed during all in-water work for hawksbill and green sea turtles, which are listed as endangered and, respectively, any other protected marine species that may enter the construction area. If listed species are present, work will not begin until these species have voluntarily left the site. The work would be performed in compliance with the following National Marine Fisheries Service (NMFS) best management practices (BMPs):

1. The project manager shall designate an appropriate number of competent observers to survey the areas adjacent to the proposed action for ESA-listed marine species.

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

3. All work shall be postponed or halted when ESA-listed marine species are within 50 yards of the proposed work, and shall only begin/resume after the animals have voluntarily departed the area. If ESA-listed marine species are noticed within 50 yards after work has already begun, that work may continue only if, in the best judgment of the project supervisor, that there is no way for the activity to adversely affect the animal(s). For example; divers performing surveys or underwater work would likely be permissible, whereas operation of heavy equipment is likely not.

4. Special attention will be given to verify that no ESA-listed marine animals are in the area where equipment or material is expected to contact the substrate before that equipment/material may enter the water.

5. All objects will be lowered to the bottom (or installed) in a controlled manner. This can include the use of buoyancy controls such as lift bags, or floats, or other equipment that affect positive control over the rate of descent.

6. In-water tethers, as well as mooring lines for vessels and marker buoys shall be kept to the minimum lengths necessary, and shall remain deployed only as long as needed to properly accomplish the required task. Once work is complete, all ropes, floats, and other foreign materials will be removed from the marine environment.

7. When piloting vessels, vessel operators shall alter course to remain at least 100 yards from whales, and at least 50 yards from other marine mammals and sea turtles.

8. Reduce vessel speed to 10 knots or less when piloting vessels at or within the ranges described above from marine mammals and sea turtles. Operators shall be particularly vigilant to watch for turtles at or near the surface in areas of known or suspected turtle activity, and if practicable, reduce vessel speed to 5 knots or less.

9. If despite efforts to maintain the distances and speeds described above, a marine mammal or turtle approaches the vessel, put the engine in neutral until the animal is at least 50 feet away, and then slowly move away to the prescribed distance.

10. Marine mammals and sea turtles shall not be encircled or trapped between multiple vessels or between vessels and the shore.

11. Do not attempt to feed, touch, or otherwise intentionally interact with any ESA-listed marine species.

3.3.6 Water Resources, Essential Fish Habitat and Critical Habitat

Given that the proposed cable landing activities have the potential to impact receiving waters, the marine contractor(s) shall take care in the protection of these water resources and avoid impacts to areas that may be considered Essential Fish Habitat (EFH). Essential fish habitat (EFH) is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA § 3(10)). The waters of Piti Bay and Tepungan Channel are within the EFH designated for Guam.

There is a potential for fuel and hydraulic fluid to leak from vehicles during the proposed activities. These risks would be minimized by daily inspections of the vehicles and hoses prior to starting the job each day, adhering to emergency response plans, and the use of materials to contain and clean up accidental spills. Hydraulic equipment and tools used for the installation of AP and cable pins will use vegetable oil or food-grade glycol instead of traditional hydraulic fluids.

Offshore, the direct laying of the cable on hard substrate would generate minimal turbidity; however, pinning of the cable and associated drilling would increase turbidity temporarily. The anticipated drilling discharge volume would be approximately 2.2408 US gallons (0.0111 yd^3 or 0.0085 m^3) of rock and sand material. however, the location of the pinning activities is an area of high wave energy, and any suspended material would rapidly disperse. In-water work could potentially result in the incidental and unintentional discharge of marine-grade epoxy used for the pinning activities. This possibility, however, is very unlikely since the contractor would use a manual epoxy gun with a nozzle to direct the epoxy cleanly into the pre-drilled hole.

Unless otherwise specified in the Department of the Army permit or 401 Water Quality Certification permit, the Contractor shall conduct visual monitoring of the water body daily.

Visual monitoring shall also be performed after a rain event. The visual inspections shall focus on discharges to the water body from the construction area on shore. Corrective actions will be taken immediately should discharges be observed.

Similarly, if construction debris is observed in the water body, it will be immediately removed manually by construction personnel in a manner that causes the least disturbance practicable. The Contractor will cease construction activity in the vicinity until the source of the debris has been identified, and corrective measures have been installed to prevent any future incidents.

In November 2004, the USFWS designated critical habitat for three endangered Mariana Island species on Guam: the Mariana fruit bat, Mariana crow, and Guam Micronesian kingfisher (69 FR 62943). The habitat totals 376 acres, all within the U.S. Fish and Wildlife Service's 771-acre Ritidian unit of the Guam National Wildlife Refuge. Neither the Tepungan Channel nor the Piti site are included as critical habitat.

3.3.7 Invasive Species

The Contractor shall implement regular training for its employees to educate them on the pathways for invasive species introduction and the control measures that will prevent their introduction. Washing and decontamination of equipment and tools shall take place off-site to the maximum extent practicable. This is a control measure intended to prevent the inadvertent introduction of non-native invasive species from the job site into other areas. If washing is determined to be necessary, a designated bermed wash area shall be used to contain all wash water and prevent its contact with marine or surface water bodies.

The fragile ecosystems of Guam are vulnerable to invasive species originating from Asia and the U.S. In order to avoid inadvertent introduction of invasive species, the proposed interdiction measures will be implemented during all proposed activities. The plan will address non-target species, i.e., species that are undesirable and pose an invasive species risk, and therefore, require detection and elimination from the construction material shipment process from Port to job site. These non-target species include, but are not limited to, the Coconut Rhinoceros Beetle (CRB), Little Fire Ant (LFA), and Brown Treesnake (BTS). Rats are an existing problem on the islands for native birds and tree snails.

Potential BTS and non-target introduction pathways would be the focus of the plan. All cargo for the Hong Kong-Guam Cable System project would be shipped through Guam ports and will be subject to inspection. Once materials arrive at the job site, the interdiction plan would rely on the Contractor’s employee awareness of invasive species. If a sighting occurs, rapid response by the employee involves immediate capture and destruction of the non-target species, followed by re-inspection of the construction materials for other non-targets, and reporting of the incident.

3.4 Archaeological Resources

Micronesian Archaeological Research Services, Inc. (MARS) prepared an Archaeological Monitoring, Identification, Evaluation, and Data Recovery Plan for the now-completed GTA cable raceway in Lot 262 (Santos Park). Previous archaeological testing in the eastern sector of the Park found no significant historic properties and there are no historic resources listed on either the Guam Register of Historic Places (GRHP) or the National Register of Historic Places (NRHP) in Santos Park or its vicinity. MARS performed archaeological monitoring during construction of the GTA terrestrial raceway in Santos Park in 2017 and did not find any intact cultural or historic properties.

Archaeological monitoring will be performed during the excavation of the HK-G cable ocean ground bed (OGB), if it is determined to be required by the State Historic Preservation Officer (SHPO). Prior to the start of construction, the Contractor must get the services of an Archeological Team to perform archaeological monitoring of the area in accordance with the approved Archaeological Monitoring, Identification, Evaluation, and Data Recovery Plan. Whenever any material of apparent Archaeological or Historical significance is found during clearing, grubbing, grading, excavation, or by other means, all work in the area of the find will cease. Work can continue in other areas of the project site per Archaeologist's approval. The Contractor will immediately notify the Historic Resources Office, of the Historical Preservation Office (HPO) in the Guam Department of Parks and Recreation. The telephone numbers are 475-6290 or 475-6291. If such a discovery is made on a weekend, holiday or after regular working hours, the HPO will be notified as soon as possible (next working day) and work will not resume without approval of the HPO.

4 Erosion and Sediment Control Measures

4.1 Temporary Erosion and Sedimentation Control Measures

This EPP provides the general conditions and requirements which will be employed before and during all proposed cable landing activities for this project. This includes all phases of work, mobilization, and demobilization. The Guam Soil Erosion and Sedimentation Control Manual published by the Guam Environmental Protection Agency in 1986, and the *CNMI and Guam Stormwater Management Manual* (Horsely Witten Group, Inc., 2006) are hereby adopted as reference specifications for the implementation of erosion and sedimentation control measures on this project.

The previously installed seaward duct at the bulkhead in the Tepungan Channel is already available to accept the cable. The shore work would be minimal since the cable would only need to be pulled from shore via the existing beach manhole in Santos Memorial Park. Earthmoving activities for an additional ocean ground bed would involve the temporary disturbance of soils within Santos Memorial Park. The work is expected to be completed within 2 days and would be entirely on land above the mean high water mark inland of the beach manhole.

The following temporary ESC measures and procedures, as derived from the Guam EPA Manual, will be employed during construction to control erosion and prevent the occurrence of drainage and sedimentation problems.

1. Site grading and excavation will be accomplished only during suitable weather conditions. Site grading operations will be undertaken during periods of expected low rainfall.

2. Silt screen fence(s) will be placed on low points or toe/top of embankments to prevent sediment from exiting the project site or work area.

3. Should erosion of exposed haul roads be observed, mulching or placement of leafy vegetation such as palm fronds or other acceptable methods will be performed to arrest the erosion process.

4. Diversion ditches and/or dikes will be provided as required to divert sheet flow runoff from critical areas.

5. Any disturbed area not paved or off the roadway, immediately following completion of work, shall be sodded or seeded and mulched with vegetative cover appropriate for the soil type. The EPP drawing constitutes the Erosion Control Plan for this project. The Guam Soil Erosion and Sedimentation Control Manual published by the Guam Environmental Protection Agency in 1986 and subsequent Amendment, is hereby adopted as a reference specification for the implementation of erosion and sedimentation control measures on this project.

4.1.1 Maintenance Procedures

The Contractor must inspect each of these sediment control measures daily to assure performance and effectiveness. At a minimum, the Contractor must:

- Visually inspect the stockpiling area daily and prevent the stockpile from overtopping the silt fence. The silt fence would be inspected several times daily for rips and tears; work would resume once the issue has been resolved.
- In inclement weather the stockpiled material shall be returned to the excavation area, the silt fence would be removed and the site would be secured.

These temporary sediment/ESC maintenance measures are listed and a daily checklist is attached to this EPP (Table 1).

4.2 Permanent Erosion and Sedimentation Control Measures

Permanent ESC measures are assured by the restoration of the project site.

5 Control of Waste

5.1 Solid Waste

Since earthmoving activities are anticipated to be minimal for the installation of the ocean ground bed and cable landing, the generation of solid waste would also be minimal. Solid waste consists of rubbish, soils, debris, plant material, and other discarded soil materials resulting from land clearing and grubbing activities. The material shall be placed such that it will not pose a hazard to personnel. No debris shall be allowed to encroach beyond the property boundaries or beyond the limits of construction within the property. The burning of solid waste is not permitted.

If there is any excess material from the excavation of the ocean ground bed, the Contractor will haul the debris to an approved hardfill site, e.g. the Northern Hardfill in Yigo. The Contractor shall identify pathways for the introduction of invasive species and implement control measures to prevent such introductions.

5.2 Sanitary Waste

Sanitary waste consists of domestic sanitary sewage and garbage such as refuse and scraps resulting from the preparation and consumption of food. Garbage material will be stored in closed containers that cannot be opened by stray animals. All breaks and meals shall be taken at a designated area of the job site. The Contractor will police the area and maintain a litter-free eating area to minimize the attraction of pests. Rubbish containers shall be promptly emptied at the end of each work day and cleaned to remove food residues. The Contractor shall follow a Litter Control and Prevention Program to control sanitary waste and minimize the introduction and movement of pests to and from the job site.

The Contractor shall be required to provide portable, temporary toilet facilities in sufficient numbers to accommodate all construction personnel until such a time as permanent facilities are available. These portable toilets shall be a type approved by Guam EPA. They shall be secluded from public observation, emptied periodically in a manner acceptable to Guam Waterworks Authority (GWA), and maintained at all times without nuisance. Upon completion of the work, they shall be removed from the premises.

5.3 Petroleum Products

These materials shall primarily consist of the diesel oil, gasoline, hydraulic fluid, lubricating oil, and grease which is used by machinery and equipment during construction. The Contractor shall not allow any petroleum products to enter, by any means, the near shore or ground waters. The Contractor shall identify pathways for release of petroleum products and implement control measures to prevent such incidental releases.

The Contractor shall use the following guidelines to ensure that there is no pollution caused by petroleum products:

5.3.1 Gasoline

There shall be no fixed storage of large quantities of gasoline, i.e., volumes over 600 gallons. If a tanker truck is used, fueling of machinery shall be done in a safe manner. Containers shall be covered at all times and smoking precautions shall be strictly followed.

5.3.2 Hydraulic Fluid, Diesel, Lubricating Oil, and Grease

Any storage of these substances shall be in an approved storage container. The storage area shall be lined with an impervious membrane and surrounded by a barrier or wall of sufficient height to insure that any spillage will be contained. Any accidental spillage shall be immediately cleaned up. This storage area shall be secured by a chain link fence or other suitable deterrent.

5.3.3 Oily Wastes

Oily wastes include used motor oil, gear oil, and hydraulic fluid. All oily wastes shall be stored in sealed 55-gallon steel drums away from the shoreline and in a secured area. Drums of used oil shall be disposed of at a licensed facility in accordance with the standards of Guam EPA. Oil-soaked sand, oily rags, oil filters, etc. shall be stored in sealed containers and disposed of promptly.

5.3.4 Maintenance and Lubrication

Shop areas shall be on a plastic-lined impervious surface. Any machinery soaking in any solvent/petroleum product shall not be left unattended or uncovered. Any paints, solvents, etc. shall be stored in covered containers. All drums and containers must be properly labeled. Empty or partially full or damaged drums shall be removed from the site promptly.

5.4 Hazardous Waste

It is unlikely that large quantities of hazardous wastes will be generated during construction of this project. Small quantities of battery electrolytes, epoxy, and other similar hazards shall be disposed of off-site in a manner consistent with Guam EPA regulations.

Oil and hazardous material spills which may be large enough to violate federal and/or local regulations will be handled and cleaned-up in accordance with prevailing standards established by government regulations.

6 Pest Control

The Contractor is required to discourage the breeding or attraction of pests on the job site. There shall be no open containers of stagnant water, which will act as a breeding area for mosquitoes. Food or other organic matter shall not be left in the open to attract flies, rats or stray animals. The Contractor shall maintain a clean job site, keep rubbish bins firmly closed, and promptly empty rubbish bins at the end of the workday. The Contractor shall minimize the introduction and movement of pests to and from the job site.

7 Public Safety

The cable ship will be mobilized off-shore in waters at a depth of 60 ft (18 m) or more. The cable ship will maintain a safe minimum water depth under the hull and similar safe distance from the reef so that the safety of the crew and personnel onboard is maintained at all times and corals are not damaged. NEC will develop additional Quality, Health and Safety and Environmental (QHSE) plans and procedures to be applied in conjunction with their general work methodology. Additionally, site safety fences and warning signs that read "Construction Area - Keep Out" will be placed on the outside face of the security fence on all sides at the access and egress to the beach working areas. The perimeter fence and signage will be inspected and maintained for the duration of construction.

8 Motorized Equipment

All equipment shall be kept in a good state of repair. Equipment shall be muffled and meet OSHA noise regulations. Operators shall be trained to operate equipment in a safe and lawful manner. Equipment exhaust shall meet Guam EPA air quality standards. Equipment shall not leak oil or fuel onto the ground.

9 Typhoon Contingency Plan

The Contractor is responsible for assuring that unnecessary environmental damage does not occur during periods of extreme bad weather. The Contractor shall be responsible for the security and safety of the construction work and site when warnings of winds of gale force (34 knots or more) are issued. Satisfactory day-to-day cleanup of the jobsite in accordance with other provisions of this EPP is essential in order to be properly prepared for inclement weather conditions.

With the onset of the wet season, there may be a seasonal increase of typhoons affecting the island. Weather predictions for this year state that the El Niño conditions may turn into a La Niña condition, which is anticipated to generate fewer than usual typhoons for this time of year.

The cable ship will only be mobilized to the site with the knowledge of a suitable weather window, which extends at least 24 hours beyond the expected duration of the cable landing operation. In the case of inclement weather whilst the cable ship is on site, the crew will respond in accordance with any notices /guidelines / instructions issued by the US Coast and secure the site and remove the silt curtains.

9.1 Condition of Readiness (COR) 4 (Normal Conditions)

The regular provisions of the EPP are essential in order to be properly prepared for inclement weather conditions. It is especially important that the jobsite be kept free of accumulations of debris and materials loosely scattered about.

9.2 Condition of Readiness (COR) 3 (48-Hour Warning)

The Contractor shall commence all securing operations necessary for a storm. If the condition is set during holidays or weekends, the securing operations shall proceed regardless.

9.3 Condition of Readiness (COR) 2 (24-Hour Warning)

The Contractor shall cease routine activities to allow maximum securing effort. Any fuel drums, paint, or other potentially dangerous materials shall be secured.

9.4 Post-Storm Requirements

Cleanup after typhoons and/or tropical storms shall proceed immediately as conditions permit. Of special importance is the rapid cleanup of storm debris and material with the potential for damage to ground waters.

10 Removal of Construction Structures

All temporary construction structures shall be removed, and all temporary facilities such as roadways, silt fences, etc. shall be obliterated and shaped to original condition, or to such condition as specified by the contract specifications.

11 Traffic Control

This project is expected to have a temporary impact on access to Santos Park. Except for periodic visits by maintenance personnel, the project would not generate any regular traffic after installation of the cable system is completed. Construction and installation of the cable, including AP installation and pinning, is estimated to take approximately 30 days. Public access to the shoreline and offshore waters along the cable landing route would be restricted during this period for safety reasons. Similarly, vessels would be advised via a Coast Guard Notice to Mariners not to approach the area during the cable landing while the cable ship is offshore.

During construction, there would be a temporary impact on the traffic patterns along the nearby highway as materials and equipment are moved in and out of the park grounds. An encroachment permit would be required to safely accommodate construction access to the park. The permit would include a site specific traffic control plan that would be implemented with appropriate lights and/or signage to safely divert motorists and facilitate the movement of vehicles during these construction periods. Construction is scheduled to occur during daylight hours. Motorists would be inconvenienced and may opt to travel on alternate routes or at alternate times of day.

12 Emergency Spill Response Plan

Its purpose is to prevent or reduce the discharge of pollutants to the ocean water resulting from accidental spills of petroleum products or other contaminants from construction equipments.

The following procedures will be followed when implementing an emergency spill response and cleanup plan:

1. Key personnel will receive formal training or knowledgeable in plan execution. Additionally, all workers will have basic knowledge of spill control procedures.

2. A summary of the plan will be posted at each worksite location, identifying the spill cleanup coordinators, location of cleanup equipment, and phone numbers of regulatory agencies to be contacted in case of a spill.
3. In case of a spill, the Contractor will notify the following agencies;

	Agency	Tel. Number(s)
I.	U.S. Coast Guard	355-4910
II.	Guam EPA	300-4751/52/53
III.	Emergency	911
IV.	Piti Fire Department	472-8139

4. Containment and cleanup of spills will begin immediately following a discovery of a spill.
5. The Contractor will have absorbent pads and oil booms readily available at the worksite.
6. The Contractor will maintain an inventory of appropriate cleanup materials at the worksite and have them readily available.

The clean-up of accidental release of petroleum products will be the responsibility of the Contractor.

TABLE 1. CHECKLIST OF BMPS MAINTENANCE, INSPECTION AND REPAIR

BEST MANAGEMENT PRACTICE	INSPECTION FREQUENCY	MAINTENANCE/REPAIR PROGRAM
TEMPORARY SEDIMENT CONTROL BMPS		
Silt Fence	Inspect silt fence at least weekly and when rain is forecasted Inspect silt fence following rainfall/ typhoon events	Repair or replace uncut, torn, or weathered fabric Remove damaged silt fence Sediment shall be removed when accumulation reaches 1/3 of silt fence height Holes and depressions caused by the removal of the temporary silt fence shall be backfilled
Sandbag Barrier	Inspect plastic cover /erosion control before and after each rainfall /typhoon event Inspect sandbag barriers weekly	Reshape or replace sandbags as needed Sediment shall be removed when accumulation reaches 1/3 of sand barrier height Remove sandbags when no longer needed. Clean, re-grade, and stabilize the area if necessary
TEMPORARY SOIL STABILIZATION BMPS		
Plastic Covers/Erosion Control Blankets	Inspect plastic cover or erosion control before and after each rainfall /typhoon event Inspect sandbag barriers weekly	Replace torn or weathered plastic covers /erosion control blankets
Earth Dikes /Drainage Swales	Inspect earth dikes /drainage swales before and after	Remove debris and sediment as needed
Stabilize Construction /Exit	Inspect silt fence following rainfall/ typhoon events	Dump trucks hauling material from the construction site shall be covered with tarpaulin. Truck tires shall be cleaned if clogged with soil which will track.

CHECKLIST OF BMPS MAINTENANCE, INSPECTION AND REPAIR (continued)

BEST MANAGEMENT PRACTICE	INSPECTION FREQUENCY	MAINTENANCE/REPAIR PROGRAM
TRACKING CONTROL BMPS		
Vehicle and Equipment Refueling	Inspect fueling areas and storage tanks (if any) on a regular basis	Clean up spills and properly dispose of contaminated soil and cleanup materials immediately
Vehicle and Equipment Maintenance	Inspect daily	Repair or replace any damaged / leaking hoses, gaskets, fittings
WASTE MANAGEMENT AND MATERIAL POLLUTION CONTROL BMPS		
Stockpile Management	Inspect daily	Repair or replace any deteriorated perimeter control and top covers as needed
Solid Waste Management	Inspect daily	Repair or replace deteriorated dumpsters or other forms of solid waste containers Empty dumpsters to avoid overstuffing
Hazardous Waste Management	Inspect routinely	Keep hazardous waste storage areas (if any) clean and well organized Clean up hazardous spills in conformance with the applicable Material Safety Data Sheet (MSDS)
Sanitary /Septic Waste Management	Inspect weekly	Clean up on a regular basis to provide clean, odor /pest free temporary sanitary facilities

End of EPP

Appendix A
United States Army Corps of Engineers Permit Application

DEPARTMENT OF THE ARMY PERMIT APPLICATION:

HONG KONG-GUAM CABLE SYSTEM

PITI, GUAM

Prepared for:

RTI Solutions, Inc.
268 Bush Street, #77
San Francisco, CA 94104

Prepared by:

Dueñas, Camacho, & Associates Inc.
238 E. Marine Corps Drive, Ste. 201
Hagåtña, Guam 96910

July 2018

Website: www.dcaguam.com
Email: dca@dcaguam.com

DUEÑAS · CAMACHO

July 31, 2018

Karen Urelius
US Army Corps of Engineers
Honolulu District
Guam Regulatory Field Office
Apra Harbor Naval Complex
PSC 455 Box 188
FPO, AP 96540-1088 Guam
(671) 339-2108

Subject: Department of the Army Permit Application for Landing of Hong Kong-Guam Cable System, DA File No. POH-2017-187.

Dear Ms. Urelius:

RTI Solutions, Inc. is proposing to land the Hong Kong-Guam submarine cable system on Guam, and has an agreement with GTA Teleguam to utilize one of the six conduits that GTA previously installed offshore and in Lot 262, Tepungan, Piti in 2017. GTA installed the conduit raceway to receive submarine fiber-optic cables, including the Southeast Asia-U.S. (SEA-US) telecommunication system linking Asia with Guam, Hawaii and California. The proposed Hong Kong-Guam cable landing is an extension of the SEA-US cable system.

The single fiber-optic cable will be landed through one of the existing conduits at its seaward opening in the existing bulkhead on the Tepungan reef flat. The cable will be pulled through the buried conduit to shore, where it will be spliced to land cables in the existing buried beach manhole located above the mean high water (MHW) mark within Santos Park. The cable would be laid directly on the seabed starting from the bulkhead proceeding seaward. Once the cable is verified to be in the correct and intended alignment, divers will install articulated pipe (AP) around the cable to a seaward distance of 779 m (2,555 ft), around the 25 m (82 ft) depth contour. After AP installation is complete, the AP-encased cable will be selectively pinned to the seabed in 20 locations where no live coral exists. From the bulkhead, the cable would be laid directly over the substrate in shallow and deep waters out to 3 nautical miles (nm) and beyond to Hong Kong. The information presented below describes measures for minimizing impacts to waters of the U.S. (WOUS) and coral reef habitat.

The impact of the cable-laying activity would be related to the footprint of the cable crossing over hardbottom substrate containing coral reef habitat. The cable footprint varies depending on the type of cable and whether articulated pipe protection would be used over that section of cable. Three types of cable would be used for the single Hong Kong-Guam Cable:

- double-armored (DA) cable with a 4.1 cm (1.61 inch) diameter;
- single-armored (SA) cable with a 2.8 cm (1.10 inch) diameter; and
- light-weight shielded (LWS) cable with a 2.7 cm (1.06 inch) diameter.

Only DA and SA cable types would be used within the three (3) nautical mile jurisdiction. The more resilient DA cable would be laid from shore out to the approximately 200 m (656 ft) depth where the cable type would then transition from DA cable to SA cable. The cable would transition from SA cable to LWS cable at the 1500 m (4,921 ft) depth contour.

Articulated pipe (15.1 cm or 6.1 inch diameter) would be placed over the DA cable from the bulkhead to a seaward distance of 779 m (2,555 ft) and pinned to the seabed at 20 locations onto hard substrate where there are no live corals. The U-bolt pins will be stainless steel with typical dimensions of 14 in. long, 5 in. wide, and 0.5 in. diameter (38 cm long, 12.7 cm wide, and 1.2 cm diameter). The DA cable would be fed into a previously installed, buried 4.1-inch diameter ductile iron conduit from the end of the bulkhead for a shoreward distance of 114 m (375 ft) to the MHW mark. The cable would be pulled through the conduit raceway, which extends above the MHW mark inland to a beach manhole.

The cable would traverse a total of 22,141 ft (6.7 km) of substrate from the MHW mark to 3 nm, inclusive of 714 ft (218 m) of shallow hardbottom and 1,842 ft (561 m) of shallow softbottom substrate (Table 1).

TABLE 1. Cable Footprint Estimates From MHW Mark to 3 Nautical Miles

Cable Type	Footprint Width	Length	Total Footprint Area	Shallow Hardbottom Crossing	Shallow Hardbottom Crossing Area	Deep Crossing	Deep Crossing Area	Shallow Soft Bottom Crossing	Shallow Soft Bottom Crossing Area
	ft	ft	sq ft	ft	sq ft	ft	sq ft	ft	sq ft
AP	0.50	2,555.44	1,277.72	713.37	356.69	0.00	0.00	1,842.07	921.04
DA	0.13	1634.30	219.27	0.00	0.00	1634.30	219.27	0.00	0.00
Pinned	0.005	0.10	0.30	0.10	0.30	0.00	0.00	0.00	0.00
SA	0.10	17,951.40	1,884.66	0.00	0.00	17,951.40	1,884.66	0.00	0.00
Totals		22,141.24	3,381.96	713.47	356.99	19,585.70	2,103.93	1,842.07	921.04

AP = articulated pipe-encased DA cable; DA = double-armored cable; Pinned = U-bolt pin over AP-encased cable; SA = single-armored cable. Table excludes 375 ft-long buried conduit section below MHW mark.

The DA cable with articulated pipe would have a disturbance footprint of approximately 0.50 ft or 6 inches (0.15 m) wide and would be laid over 218 m (714 ft) of shallow hardbottom substrate. The holes drilled in the hardbottom substrate would cover approximately 0.304 sq ft (0.0283 sq m). The combined

ENGINEERING * PLANNING * SURVEYING * ENVIRONMENTAL SERVICES * GEOGRAPHIC INFORMATION SYSTEM * CONSTRUCTION MANAGEMENT
GUAM P.O. Box 8900, Tamuning, Guam 96931 / 238 E. Marine Corps Drive, Suite 201 Diamond Plaza, Hagatña, GU 96910 / Tel: (671) 477-7991 / Fax: (671) 479-6315
SAIPAN Caller Box PPP, Suite 164, Saipan, MP 96950 / Chalan Pale Arnold, Ada's Building South Garapan, Saipan 96950 / Tel: (670) 234-9017 / Fax: (670) 234-3842

total footprint of DA cables, articulated pipe, and 20 pins would occupy approximately 357 sq. ft or 0.008 acres over shallow hardbottom substrate supporting coral reef areas with up to approximately 25% coral cover. This is the estimated permanent impact area over hardbottom substrate supporting coral reef habitat from the cable-laying activity.

During the landing of the cable, the direct impact to water quality in WOUS over shallow hardbottom would be temporary, lasting approximately 15 to 30 days. Turbidity would be temporarily increased in the immediate vicinity of the cable as the cable is laid, articulated pipe (split pipe) is installed around the cable, and pins are installed at intervals to immobilize the cable. The impact to coral habitat in WOUS over shallow hardbottom would be permanent as the cable is a structure that will be in place for its approximately 25-year life span. Coral cover is approximately 2 to 25 percent in the shallow hardbottom, based on 2018 marine surveys.

The Hong Kong-Guam cable would cross a total of 1,842 feet (561 m) of shallow softbottom substrate of mostly sand. During the landing of the cable, the impact to water quality in WOUS over shallow sand bottom would be temporary, lasting approximately 15 to 30 days. Turbidity would be temporarily increased in the immediate vicinity of the cable as the cable is laid and articulated pipe (split pipe) is installed around the cable. The cable would not be pinned on softbottom substrate. The impact to coral habitat in WOUS over shallow softbottom would be permanent as the cable would be in place over its 25-year life span. Coral density is approximately 0.2 to 0.9 percent in the shallow sand bottom, based on 2015 marine surveys.

- Direct but temporary impacts from cable landing.
  There is the possibility that divers would make inadvertent contact with the seabed during the cable landing, AP installation, and pinning activities. All divers working in the marine environment would be briefed on the presence of fragile coral colonies and best management practices on how to avoid impacts to marine resources. During the AP installation, divers may stage the AP segments next to the cable on the seabed. Staging will be conducted in such a way that no corals are impacted by manually placing the AP segments on areas where no live corals exist.

- Direct and permanent impacts from cable-laying portions.
  The total footprint of DA cable, articulated pipe, and 20 pins would occupy approximately 357.9 sq. ft or 0.008 acres over shallow hardbottom substrate supporting coral reef areas with up to approximately 25% coral cover. This is the estimated permanent impact area over hardbottom substrate supporting coral reef habitat from the cable-laying activity. While corals will be avoided to the maximum extent practicable through pre-marking of the landing route, where corals are not avoidable, they would be impacted by the weight of the cable and articulated pipe placed over or adjacent to the coral colony. There would be localized damage to coral tissue by this activity; however, based on observations of other existing cables on the seabed and depending on the species involved, it is anticipated there is a good likelihood that the coral would eventually recover and grow around the cable.

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The impacts to coral habitat will be minimized by identifying corals impacted by the cable, and relocating them into suitable recipient sites. A Coral Transplant and Monitoring Plan is enclosed in the application package detailing the proposed relocation of corals.

The remaining cable-laying portions cross over deep hardbottom substrate at greater than 80 ft depth where coral cover is anticipated to be lower. The cable in these deeper areas would have smaller (4.1 cm or 1.61 inch or less) footprints because no articulated pipe or pins would be used.

- Indirect and temporary impacts from cable-laying portions.
  A total of 20 pins will be installed over the articulated pipe in areas of hard substrate where no living coral is present to prevent the cables' lateral movement. A 3 cm diameter hole for each side of the U-bolt pin will be drilled down to 30 cm with a hydraulic drill, and the bolts will be inserted and secured in place with a non-toxic marine epoxy. The sediment generated from this activity is anticipated to be very small, approximately 0.056 gallon per hole, or a total of 2.24 gallons (0.011 cu yds) for all 40 holes. There would be a direct and permanent impact to the rock substrate from the drilling activity, and an indirect and temporary impact from the release of minor amounts of sediment for each hole drilled. It is anticipated that this sediment would quickly disperse into the water column and have an insignificant effect on live corals, if any, in the vicinity.

- Direct but temporary impacts within work corridor where the trucks will be tracking back and forth.
  An entrance and exit corridor will be defined using floats over the existing conduit raceway to allow for small support vessels and pedestrian traffic to enter and exit the marine environment. This portion of the Tepungan reef flat is a previously disturbed and largely uncolonized area of consolidated hardbottom and unconsolidated sand, rubble, and boulders. Prior to the landing, conspicuous marine organisms would be removed from within the corridor and placed a safe distance beyond the work zone. Support vessels would be manually moved or walked over the reef flat and within the corridor to the bulkhead, where they would proceed seaward under their own power. This entrance corridor would remain in use for the entirety of the project, including AP and pin installations. A Boat Exclusion Zone will be defined for sensitive areas for the Tepungan reef flat where other coral mitigation sites from past cable landings are present.

On behalf of RTI Solutions, Inc., we are submitting the enclosed Department of the Army Permit Application to the U.S. Army Corps of Engineers for the proposed activity. Please contact me at 477-7991 if you need additional information.

Respectfully,

Claudine Camacho

Claudine Camacho
Environmental Services Division

Enclosures: Department of the Army Permit Application Package

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U.S. Army Corps of Engineers (USACE)

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

33 CFR 325. The proponent agency is CECW-CO-R.

Form Approved - OMB No. 0710-0003 Expires: 01-08-2018

PRIVACY ACT STATEMENT

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME

First - Chris Middle - Last - Brungardt

Company - RTI Solutions Inc.

E-mail Address - chris.brungardt@rticable.com

8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required)

First - Claudine Middle - Last - Camacho

Company - Duenas, Camacho and Associates Inc.

E-mail Address - cmcamacho@dcaguam.com

6. APPLICANT'S ADDRESS:

Address- 268 Bush Street, #77

City - San Francisco State - CA Zip - 94104 Country - USA

9. AGENT'S ADDRESS:

Address- 238 East Marine Corps Drive Suite 201

City - Hagatna State - GU Zip - 96910 Country - USA

7. APPLICANT'S PHONE NOs. w/AREA CODE

a. Residence b. Business +1.916.949.9141 c. Fax

10. AGENTS PHONE NOs. w/AREA CODE

a. Residence b. Business +1.671.477.7991 c. Fax +1.671.479.6315

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Duenas, Camacho & Assoc. Inc. to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

Chris Brungardt Digitally signed by Chris Brungardt Date: 2018.07.28 13:18:39 -07'00' 2018-07-27

SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)

Hong Kong-Guam Cable System

13. NAME OF WATERBODY, IF KNOWN (if applicable)

Piti Bay

14. PROJECT STREET ADDRESS (if applicable)

Address 330 N. Marine Corps Drive

City - Piti State- GU Zip- 96915

15. LOCATION OF PROJECT

Latitude: °N 13°27.883'N Longitude: °W 144°41.583'E

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)

State Tax Parcel ID M09 L262 Municipality Piti

Section - Township - Tepungan Range -

17. DIRECTIONS TO THE SITE

Drive to Pedro M. Santos Memorial Park on Route 1 (Marine Corps Drive). Project site is offshore on reef flat and in Tepungan Channel in Piti Bay.

18. Nature of Activity (Description of project, include all features)

The fiber optic cable will be landed through one of the existing conduits at its seaward opening in the existing bulkhead where it will be pulled through the buried conduit to shore. the cable would be laid directly on the seabed extending from the end of the conduit raceway seaward past the 3-nm limit. The cable would be encased in cast-iron articulate pipe (AP) starting from the bulkhead to a seaward distance of 779 m. The cable would be selectively pinned to the seabed on hardbottom substrate where no live corals exist.

An ocean ground bed (OGB) will be installed inland of the existing beach manhole in Santos Park to receive the landed cable. The OGB will be installed above the mean high water mark.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

The purpose and scope of the project is to land a single submarine fiber optic cable (Hong Kong-Guam Cable) into one of GTA's three remaining unoccupied 4-inch diameter ductile iron conduits in Piti Bay, Guam, and connect it to existing terrestrial infrastructure on shore. The cable is needed to provide increased capacity and interconnectivity to this region of the western Pacific.

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

In order to prevent lateral movement of the cable at the channel mouth and reef crest, the cable will be selectively pinned in 20 locations on hardbottom substrate where no live corals exist. Forty 30 cm deep by 3cm diameter holes would be drilled to accept 20 U-bolt pins. After the pins have been installed, they will be filled with marine-grade epoxy.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
Hardbottom Drilling for pins: 0.0338 yd^3	Marine Epoxy Fill: 0.0091 yd^3	

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres 0.000007

or

Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

Best Management Practices will include a pre-landing survey to conspicuously mark the cable route and any Endangered Species Act (ESA)-listed coral colonies in the vicinity of the cable route. These BMPs will assist the marine contractor in aligning the cable along the proposed route and avoiding all ESA-listed coral colonies in the vicinity. All personnel will attend a briefing on the presence of listed coral colonies and how to avoid impacts to ESA-listed species, turtles, and marine mammals (dolphins). No boats, watercraft, or pedestrians will be allowed to cross the reef flat flat outside of designated entrance and exit corridors. All corals impacted by the cable landing as defined in the Coral Transplant and Monitoring Plan would be relocated to a permanent relocation site within the marine preserve and monitored for 18 months.

24. Is Any Portion of the Work Already Complete? ☐ Yes ☒ No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address- Mayor Jesse L.G. Alig, Piti Mayor's Office, P.O. Box 786

City - Hagatna State - Guam Zip - 96932

b. Address- Joanne M.S. Brown, General Manager Port Authority Guam, 1026 Cabras Highway, Suite 201

City - Piti State - Guam Zip - 96915

c. Address- Tycom Network LLC, P.O. Box 4072

City - Hagatna State - Guam Zip - 96932

d. Address- Florencia Quenga Lewis, P.O. Box 4072

City - Hagatna State - Guam Zip - 96932

e. Address- Celestina Ignacio Cruz, 860 Hawaii Ave.

City - San Diego State - CA Zip - 92154

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
Guam EPA	401 WQC		2018-07-30		
BSP	CZM		2018-07-30		
DAWR	MPA		2018-07-30		

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

Chris Brungardt Digitally signed by Chris Brungardt Date: 2018.07.28 13:19:13 -07'00' — 2018-07-28

SIGNATURE OF APPLICANT — DATE — SIGNATURE OF AGENT — DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Honolulu District

U.S. Army Corps of Engineers

Nationwide Permit Pre-Construction Notification (PCN)

This PCN template integrates requirements of the U.S. Army Corps of Engineers (Corps) Nationwide Permit (NWP) Program with the Honolulu District (POH) NWP Regional Conditions. Boxes 1-10 should be completed to include all information required by NWP General Condition 32. Boxes 11 and 12 (or other sufficient information to show compliance with all NWP General and POH Regional Conditions) is also recommended to be completed for proposed activities seeking verification under the NWP Program. If additional space is needed, please provide as a separate attachment. Please refer to the *Instructions for the Honolulu District Nationwide Permit Pre-Construction Notification (PCN)* (Instructions) for instructions on completing the PCN.

To be completed by the Corps – do not fill-in

Application Number:	Date Received:	Date Complete:

1. Prospective Permittee and Agent Contact Information (see Instructions)

a. Prospective Permittee

First - Chris Middle - Last - Brungardt

Company - RTI Solutions, Inc. Email Address - chris.brungardt@rticable.com

Address - 268 Bush Street, #77 City - San Francisco State/Territory - CA Zip - 94104

Phone (Residence/Mobile) - Phone (Business) - +1.916.949.9141

b. Agent (if applicable)

First - Claudine Middle - Last - Camacho

Company - Duenas, Camacho & Associates, Inc. Email Address - cmcamacho@dcaguam.com

Address - 238 East Marine Corps Drive Suite 201 City - Hagatna State/Territory - GU Zip - 96910

Phone (Residence/Mobile) - Phone (Business) - +1.671.477.7991

c. Statement of Authorization: I hereby authorize Duenas, Camacho & Associates, Inc., to act on my behalf as my agent for the proposed activity. (Optional, see instructions)

Chris Brungardt Digitally signed by Chris Brungardt Date: 2018.07.28 13:14:39 -07'00'
Signature of Applicant

July 28, 2018
Date

2. Name and Location of the Proposed Activity (see Instructions)

☐ The proposed work would involve multiple-single and complete projects. See attachment for the information required in Boxes 2 through 12, as applicable.

a. Project Name or Title:	**b. City, County, Island, State/Territory:**
Hong Kong-Guam Cable Landing	330 N. Marine Corps Drive

c. Name of Impacted Waterbody(ies):
Tepungan Channel, Piti Bay, Philippine Sea

d. Coordinates (in decimal format):
☐ Unknown (please provide other location descriptions below)

Latitude - 13°27.883'N Longitude - 144°41.583'E

e. Other Location Description (optional, see instructions):

f. Directions to the site (optional, see instructions):

Drive to Pedro M. Santos Memorial Park on Route 1 (Marine Corps Drive). Project site is offshore on reef flat and in Tepungan Channel in Piti Bay.

3. Specific NWP(s) you want to use to authorize the proposed activity (see Instructions)

NWP 12

4. Description of the Proposed Activity (see Instructions)

a. Complete description of the Proposed Activity:

A single, 1.61-inch (4.1 cm) diameter fiber-optic cable will be landed in Piti Bay through the Tepungan Channel, and pulled shoreward through one of the existing 4.1-inch diameter conduits previously installed in the Tepungan reef flat. The cable will be pulled through the buried conduit raceway to shore, and into an existing beach manhole inland of the mean high water mark. The cable would be laid directly on the seabed from the seaward end of the conduit raceway (bulkhead location), extending seaward past the 3-nm limit to Hong Kong. The cable would be encased in 6.1-inch (15.5 cm) diameter cast-iron articulated pipe (AP) starting from the bulkhead to a seaward distance of 2,555 ft (779 m), or approximately 82 ft (25 m) water depth. The AP-encased cable would be selectively pinned to the seabed on hardbottom substrate where no live corals exist. The cable would be pinned using stainless steel U-bolts with dimensions of 14 in. long, 5 in. wide, and 0.5 in. diameter (38 cm long, 12.7 cm wide, and 1.2 cm diameter). After the U-bolts are positioned over the cable, two 1 in. (3 cm) diameter holes for each bolt will be drilled down to approximately 12 in. (30 cm) with a marine-grade hydraulic drill, and the bolts will be inserted and secured in place with a non-toxic marine epoxy. A total of 20 pins will be installed at approximately 33 ft. (10 m) intervals along the cable's path in the high-energy reef crest zone of the channel.

An ocean ground bed (OGB) will be installed inland of the existing beach manhole in Santos Park to receive the landed cable. The OGB will be installed above the mean high water mark.

b. Purpose of the Proposed Activity:

The purpose and scope of the project is to land a single submarine fiber optic cable (Hong Kong-Guam Cable) into one of GTA's three remaining unoccupied 4-inch diameter ductile iron conduits in Piti Bay, Guam, and connect it to existing terrestrial infrastructure on shore. The cable is needed to provide increased capacity and interconnectivity to this region of the western Pacific.

c. Direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure:

Air quality may be temporarily affected by emissions from the cable ship, support vessels, and terrestrial vehicles (i.e., winch-truck) during landing activities, AP installation, and pinning. All vehicles used in construction shall have properly functioning and maintained air emission controls. Hydraulic equipment used in the marine environment, such as drills required for pinning and AP installation, will use vegetable oil or food-grade glycol instead of traditional hydraulic fluids. During cable pinning activities, turbidity will be temporarily increased as holes are drilled into the substrate (a total area of 0.304 square feet), although turbidity increases will be minimal, about 0.056 gallons per hole drilled, or 2.24 gallons total. Any suspended material would disperse rapidly into the water column given the high wave energy in this zone. Sessile and slow-moving invertebrates would be impacted within the cable landing corridor, while fish and other mobile organisms would be temporarily displaced during landing activities, AP installation, and pinning. Landing activities, such as pedestrian traffic and the mobilization of support vessels across the reef flat, have the potential to disturb sediment on the heavily silted reef flat and suspend it, increasing turbidity, which may potentially affect corals and other marine organisms in the vicinity.

Cable landing activities may result in abrasion or other direct damage to corals and other sessile fauna if care is not taken during the laying and armoring or pinning of the cables to the seabed. The 1.61-inch diameter cable, encased in a 6.1-in. diameter AP, would impact 2,555 ft (779 m) of hardbottom and sand substrate, or 1,277 sq. ft. (118 sq. m). Of this total, the AP-encased cable would impact 713 ft (218 m) or 357 sq. ft. (33 sq. m) of hardbottom area. Coral cover ranged from 2% to 25% based on 2018 benthic surveys of the cable route. Using the maximum percent coral cover (25%) over the entire AP-encased cable hardbottom impact area (357 sq. ft.) would generate an estimated coral impact area of 178 sq. ft. (8.3 sq. m). From the end of the AP encasement seaward to the 3-nautical mile limit, the cable would have a 1.61-in diameter for a linear distance of 1,634.3 ft. and impacting 219.27 sq. ft. of bottom substrate, followed by a smaller 1.25-in diameter cable type for a linear distance of 17, 951.4 ft. impacting 1,884.66 sq. ft. of bottom substrate, with a total impact of approximately 2,103.93 sq. ft. (195 sq. m) of bottom substrate.

d. Description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity:

Best Management Practices will include a pre-landing survey to conspicuously mark the cable route and any Endangered Species Act (ESA)-listed coral colonies in the vicinity of the cable route. These BMPs will assist the marine contractor in aligning the cable along the proposed route and avoiding all ESA-listed coral colonies in the vicinity. All personnel will attend a briefing on the presence of ESA-listed coral colonies and how to avoid impacts to ESA-listed species, turtles, and marine mammals (dolphins). A delineated marine entrance/exit corridor would be established over the previously disturbed conduit raceway construction corridor within the Tepungan reef flat. No boats, watercraft, or pedestrians will be allowed to cross the reef flat flat outside of designated entrance/exit corridor. Macroinvertebrates would be relocated from the corridor to a suitable nearby area prior to landing activities. All corals impacted by the cable landing, as defined in the Coral Transplant and Monitoring Plan, would be relocated to a permanent relocation site within the marine preserve and monitored for 18 months.

e. Any other NWP(s), or Individual Permit(s) used or intended to be used to authorize any part of the proposed activity or any related activity including other separate and distant crossings for linear projects that require Department of the Army authorization:

None.

f. Have sketches been provided containing sufficient detail to show that the activity complies with the terms of the NWP and provide an illustrative description of the proposed activity? ☒ Yes, Attached ☐ No

5. Aquatic Resource Delineation (see Instructions)

a. Has a delineation of aquatic resources(wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams) been conducted in accordance with the current method required by the Corps? ☐ Yes ■ No

If yes, please attach a copy of the delineation

Note: If no, your PCN is not complete. In accordance with General Condition 32, you may request the Corps delineate the special aquatic sites and other waters on the project site, but there may be a delay. In addition, the PCN will not be considered complete until the delineation has either been submitted to or completed by the Corps, as appropriate.

b. If a delineation has been submitted, would you like the Corps to conduct a jurisdictional determination (preliminary or approved)? ☐ Yes ☐ No

If yes, please complete, sign and return the attached *Appendix 1 – Request for Corps Jurisdictional Determination (JD)* sheet or provide a separate attachment with the information identified in Appendix 1.

6. Compensatory Mitigation (see Instructions)

a. Will the proposed activity result in the loss of greater than 1/10-acre of wetlands? ☐ Yes ■ No

If yes, describe how you propose to compensate for the loss of each type of wetland:

Note: For the loss of less than 1/10 acre of wetlands, or if no compensatory mitigation is proposed, the Corps may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in no more than minimal adverse environmental effects.

b. Will the proposed activity result in the loss of streams or other open waters of the U.S.? ☐ Yes ■ No

If yes, provide a description of any proposed compensatory mitigation for the loss of each type of stream or other open water:

Note: If no compensatory mitigation is proposed, the Corps may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in no more than minimal adverse environmental effects.

7. Endangered Species Act (ESA) Compliance (see Instructions)

a. For non-Federal permittees (if Federal permittee, check N/A and skip to 7(d)): ☐ N/A

(1) Is there any Federally-listed endangered or threatened species or designated critical habitat that might be affected or is in the vicinity of the activity? ■ Yes ☐ No ☐ Unknown

(2) Is the activity located in designated critical habitat for Federally-listed endangered or threatened species? ☐ Yes ■ No

If yes to either (1) or (2), include the name(s) of those endangered or threatened species that might be affected by the proposed activity or might utilize the designated critical habitat that might be affected by the proposed activity:

1. Acropora globiceps
2. Chelonia mydas
3. Eretmochelys imbricata
4.
5.
6.
7.
8.
9.
10.

If no to both (1) and (2), proceed to Box 8.

Note: If yes to either (1) or (2), note per General Condition 18(c), you shall not begin work on the activity until notified by the Corps that the requirements of the ESA have been satisfied and that the activity is authorized.

b. For Federal permittees, you must provide documentation demonstrating compliance with ESA as a separate attachment. ☐ Documentation provided, see attached.

8. Historic Properties (see Instructions)

a. For non-Federal permittees (if Federal permittee, check N/A and skip to 7(d)): ☐ N/A

(1) Is there a known historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places that your proposed activity may have the potential to affect? ☐ Yes ■ No

If yes to (1), state which historic property may have the potential to be affected by the proposed activity:

1.
2.
3.
4.
5.
6.

OR

☐ A vicinity map indicating the location of the historic property is enclosed

(2) If no to (1), describe the potential for the proposed work to affect a previously unidentified historic property:

Note: If yes to (1), note per General Condition 20(c), you shall not begin the activity until notified by the Corps that the activity has no potential to cause effects or that consultation under Section 106 of the National Historic Preservation Act (NHPA) has been completed.

b. For Federal permittees, you must provide documentation demonstrating compliance with NHPA in a separate attachment. ☐ Documentation provided, see attached.

9. National Wild and Scenic Rivers (see Instructions)

a. Will the proposed activity occur in a component of the National Wild and Scenic River System or a river officially designated by Congress as a "Study River" for possible inclusion in the system while the river is in an official study status? ☐ Yes, in a component of a National Wild and Scenic River System; ☐ Yes, in a "study" river ■ No

If yes, identify the Wild and Scenic River or the "study river":

Note: Per General Condition 16(b), you shall not begin the NWP activity until notified by the Corps that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status. If you have received written notification from the Federal agency, please attach the correspondence.

10. Section 408 Permissions (see Instructions)

a. Will the proposed activity also require permissions from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a Corps federally authorized Civil Works project? ☐ Yes ■ No

If yes, have you received Section 408 permission to alter, occupy, or use the Corps project? ☐ Yes ☐ No

If yes, please attach the Section 408 permission

Note: If yes, note per General Condition 31, an activity that requires Section 408 permission is not authorized by NWP until the Corps issues the Section 408 permission to alter, occupy, or use the Corps project, and the Corps issues a written NWP verification.

11. Compliance with NWP General Conditions (see Instructions)

Check	General Condition	Rationale for Compliance with General Condition
☑	1. Navigation	Vessels would be advised via a Coast Guard Notice to Mariners not to approach the area during the cable landings while the cable ship is offshore and during AP installation and pinning activities while divers are in the water.
☑	2. Aquatic Life Movements	NMFS BMPs would be implemented, including biomonitoring, during the activity, which will be brief (1 day for cable landing).
☑	3. Spawning Areas	Work would be performed outside of coral spawning periods in July and August, or as identified by NOAA or DAWR, to the maximum extent practicable.
☑	4. Migratory Bird Breeding Areas	Activity is not in a known migratory bird breeding area. Biomonitoring will be implemented during the activity to avoid potential impacts to migratory birds.
☑	5. Shellfish Beds	Activity is not within or near a known area of concentrated shellfish populations.
☑	6. Suitable Material	Only clean, suitable materials will be used for the cable installation and pinning.
☑	7. Water Supply Intakes	Activity is not in proximity of a water supply intake.
☑	8. Adverse Effects from Impoundments	Activity would not create an impoundment of water.
☑	9. Management of Water Flows	The activity would maintain the pre-construction course, condition, capacity and location of open waters.
☑	10. Fills Within 100-Year Floodplains	Activity would not place will in 100-year floodplain, and is consistent with floodplain management requirements.

☑	11. Equipment	Activity would not involve work in wetlands or mudflats with heavy equipment.
☑	12. Soil Erosion and Sediment Controls	Activity would be performed during low tides to the extent practicable. Erosion and sediment controls would be installed for work above MHW.
☑	13. Removal of Temporary Fills	No temporary fills are proposed.
☑	14. Proper Maintenance	The cable would be properly maintained to ensure public safety and in compliance with permit conditions.
☑	15. Single and Complete Project	The Hong Kong-Guam cable landing is a single and complete project.
☑	16. Wild and Scenic Rivers	No wild and scenic rivers are designated on Guam.
☑	17. Tribal Rights	No tribal rights, resources or lands would be affected by the activity.
☑	18. Endangered Species	See Box 7 above.
☑	19. Migratory Bird and Bald and Golden Eagle Permits	Biomonitoring would be performed to avoid effects on migratory birds.
☑	20. Historic Properties	See Box 8 above.
☑	21. Discovery of Previously Unknown Remains and Artifacts	The district engineer will be notified of any discovery of previously unknown remains and artifacts.
☑	22. Designated Critical Resource Waters	Activity would lay the cable in the Marianas Trench Marine National Monument, but would not discharge dredged or fill material.
☑	23. Mitigation	See Boxes 4(d) and 6 above.
☑	24. Safety of Impoundment Structures	Activity would not install impoundment structures.
☑	25. Water Quality	Activity will secure a water quality certification and comply with permit conditions.
☑	26. Coastal Zone Management	Activity will secure a coastal zone management consistency concurrence, and comply with agency requirements.

☑	27. Regional and Case-by-Case Conditions	Activity will comply with regional and case-by-case conditions.
☑	28. Use of Multiple Nationwide Permits	Activity will use a single NWP.
☑	29. Transfer of Nationwide Permit Verifications	Activity will comply with NWP transfer requirements.
☑	30. Compliance Certification	Permittee will provide compliance certification.
☑	31. Activities Affecting Structures or Works Built by the United States	See Box 10 above.
☑	32. Pre-Construction Notification	Activity PCN is provided.

12. Compliance with NWP Regional Conditions (see Instructions)

Check	Regional Condition	Rationale for Compliance with Regional Condition
☑	1. Revoked Permits	Activity does not propose to use any of the 7 revoked NWPs.
☑	2. Limited Use Areas	PCN discloses activity is proposed in Piti Bomb Holes Marine Preserve on Guam and in Marianas Trench National Marine Monument.
☑	3. Acreage Limitation	Activity complies with 0.10-acre threshold for a single project.
☑	4. Stream Channelization and Impoundment Restriction	Activity does not propose stream channelization or impoundment.
☑	5. NWP Verification	Activity will not commence until NWP verification is issued.
☑	6. Pre-Construction Notification	A written PCN is submitted for proposed activity.
☑	7. Additional PCN Information	PCN contains additional required information.
☑	8. Best Management Practices	Applicable best management practices will be implemented for the proposed activity.
☑	9. Bank Stabilization	Bank stabilization is not part of the proposed activity.

Department of the Army Permit Application

SUPPLEMENTAL QUESTIONNAIRE

A complete Department of the Army Permit Application consists of the application form (ENG Form 4345, *http://usace.army.mil/CECW/Documents/cecwo/reg/eng4345a.pdf*), drawings and environmental information necessary to determine a project's probable impact on the public interest (33 CFR Part 325.1 (d)(1) and Part 325.3(a)). Based on our experience, the environmental information necessary to make the public interest determination is often inadequate when only the ENG Form 4345 form is submitted by applicants. Project managers must then request additional information from applicants, resulting in delays in project evaluation. In order to provide more efficient processing of your application, this questionnaire has been developed to supplement the information required in ENG Form 4345 and to simplify your submittal of environmental assessment information.

A. LOCATION (supplement to Blocks 15-16 of ENG Form 4345):
The project site is located in Piti Bay and Lot 262 (Pedro M. Santos Memorial Park) in Piti, Guam. Santos Park is located east of the Guam Power Authority Cabras and Piti Power Plants, and north of the GTA Cable Landing Station (CLS) site in Lot 5NEW-1, Block 2 on the opposite side of Marine Corps Drive (Route 1). See Exhibit A (Project Figures), Figures 1, 2 and 3.

1. **Please provide the Tax Map Key number(s) for the project site**: Not applicable.
2. **Please provide the Latitude and Longitude.** See Table 1 below.

TABLE 1. LATITUDE AND LONGITUDE OF PROJECT FEATURES

Location Along Alignment	Latitude	Longitude
Existing Beach Manhole above MHW	13° 27.895' N	144° 41.591' E
Entry point of cable into seaward duct of GTA raceway / Start of Articulated Pipe (AP)	13° 27.980' N	144° 41.606' E
End of Articulated Pipe (AP) at approximately 25 m (80 ft) water depth (WD)	13° 28.2741'N	144 ° 41.4631'E
Transition from Double-Armored (DA) to Single-Armored (SA) cable (WD 200 m)	13° 28.5101'N	144° 41.1643'E
Transition from SA to Light-weight (LW) cable (WD 1,500 m)	13° 33.0718'N	144° 38.7747'E
Exit 3-nautical mile limit (WD 1,030 m) from shore (6.866 km or 4.266 mi from MHWM to 3NM limit)	13° 30.2895' N	144° 40.3254' E

3. Please provide the watershed in which work is proposed: The project site is in the Asan-Piti watershed, a 7.5 km^2 (2.9 sq. mile) area which encompasses portions of Asan and Piti municipalities, and drains north into the Philippine Sea (Kottermair, 2012). Two freshwater streams flow beneath Marine Corps Drive (Route 1), through Lot 262, and empty into Piti Bay. Masso River passes through the western sector of the property and empties into the bay approximately 61 m (200 ft.) west of the project corridor. The second stream or creek is unnamed and flows intermittently from a culvert below Route 1 through the eastern sector of the property. The shallow stream channel is approximately 0.9 to 1.2 m (3 to 4 ft.) wide and empties into the bay adjacent to the project corridor. See Exhibit A, Figure 4.

<u>B. PROPOSED ACTION</u> (supplement to Block 18 of ENG Form 4345).

1. **Please provide a detailed description of the scope of work, especially those activities that may adversely impact the aquatic environment, including the following pertinent information:**

   a. **Construction method(s) highlighting those methods requiring in-water work**

   The purpose and scope of the project is to land a single submarine fiber-optic cable (Hong-Kong-Guam cable) into one of GTA's three remaining unoccupied 4-inch diameter ductile iron pipes or conduits in Piti, Guam. The fiber-optic cable will be landed through one of the existing conduits at its seaward opening in the existing bulkhead. The cable will be pulled through the buried conduit to shore, where it will be spliced to land cables in the existing buried beach manhole located above the high tide line (HTL) within Santos Park. The landing would proceed as follows:

   1) Prior to the arrival of the cable ship, the cable route will be marked using floats tied to weights. Floats will be placed at approximately 30 m intervals. These positions will be located using a handheld global positioning system (GPS) receiver.

   2) The cable ship would position itself at the mouth of the Tepungan Channel with its stern facing shoreward and would be powered by its own thrusters to avoid anchoring on live corals. The cable ship will be positioned in an area where water depth is greater than 60 feet to avoid inadvertent coral damage from the ship's positioning thrusters. A single 1.61 in. (4.1 cm) diameter fiber-optic cable would be paid out from the stern of the cable ship into the channel.

   3) Floats will be attached to the cable as its paid out and it will be floated into the channel. Support vessels, such as small to medium sized boats, pontoons, and personal watercraft (Jet Skis or similar watercraft), will position the cable along the correct alignment over the seabed, using the previously installed floats to guide placement. In order to maintain cable alignment, support vessels would anchor only where no corals are present.

   4) The cable would be floated inland towards the seaward end of one of the previously installed 4 in. (10.1 cm) diameter ductile iron conduits located at the GTA bulkhead. At the seaward terminus of the conduit, the cable will be attached to a winch cable and pulled shoreward through the conduit by a winch truck located in Santos Memorial Park

and into the beach manhole (BMH), where the cable will be spliced to GTA's terrestrial cable system.

5) After the cable is pulled through the BMH and proper cable alignment is verified, divers will cut the floats, starting at the bulkhead and proceeding seaward, and lay the cable in place on the seabed. If the cable needs to be repositioned, a stopper on the cable ship will be used to create slack on the cable and allow divers and support vessels to maneuver the cable into place. As the floats are cut, a support vessel will collect the floats and return them to the cable ship.

6) The cable ship would proceed to lay the cable beyond the 3-nautical mile Corps jurisdictional limit from shore, transitioning from double-armored to single-armored cable at around the 656 ft. (200 m) water depth.

7) A post-landing survey will be conducted to inspect the cable route and confirm the cable is positioned along the correct alignment.

8) If the post-landing survey does not reveal any discrepancies, 6.1 in. (15.5 cm) cast-iron articulated pipe armor protectors (also called N-pipe, split-pipe, or AP), in 21.7 in. (55.1 cm) sections, would be placed around the cable from the end of the ductile iron conduit (bulkhead) to an approximate seaward distance of 2,555 ft. (779 m) and a depth of approximately 80 ft. (25 m).

9) Offshore, the cable (covered by articulated pipe) will be selectively pinned to the substrate with U-bolts at locations where no live corals are present in the channel and at the channel mouth to prevent lateral movement of the cable. The U-bolts will be stainless steel with typical dimensions of 14 in. long, 5 in. wide, and 0.5 in. diameter (38 cm long, 12.7 cm wide, and 1.2 cm diameter). After the U-bolts are positioned over the cable, two 1 in. (3 cm) diameter holes for each bolt will be drilled down to approximately 12 in. (30 cm) with a marine-grade hydraulic drill, and the bolts will be inserted and secured in place with a non-toxic marine epoxy. Pins will be installed in approximately 33 ft. (10 m) intervals along the cable's path over the reef crest. Approximately 20 pins will be installed.

10) A final post-landing survey will be conducted to inspect the AP and pin installations, and ensure all ropes, floats and other materials are removed from the marine environment.

1. Machinery/equipment necessary to complete construction

The equipment used in the seaward portions of the project would be minimal. Support vessels such as boats, personal watercraft, and barges or pontoons would be used to pull the cable from the cable ship to the bulkhead and to ensure proper alignment before divers begin cutting the floats and laying the cable on the seabed. Support vessels will enter the Piti Bay Marine Preserve in one of two ways: large boats will depart from Apra Harbor or the Hagatña Boat Basin and enter via the Tepungan Channel mouth, while smaller vessels or personal watercraft could be launched from Santos Memorial Park. An "entrance corridor" will be defined within a previously disturbed portion of the Tepungan Reef Flat over the previously installed conduit raceway (Exhibit A, Figure 7) to minimize the potential for damage to coral and marine life. Support vessels will be trailered into the water via Santos Park and would be manually moved (walked or floated out) to the end of the cable raceway (bulkhead) where sufficient water depth allows for powered movement by the vessel.

As the floats on the cable are cut, a support vessel will collect the floats and return them to the cable ship. A winch-truck will be used to pull the cable through the conduit from the bulkhead to the beach manhole. The winch-truck will be located within Santos Park above the MHW mark. Support vessels, such as small boats and pontoons, are required for articulated pipe installation and pinning activities. Hydraulic tools would be used during pinning activities. A small generator and air compressor (to support the tools tools) would be positioned on a barge and towed by a small boat to the pinning location near the Tepungan Channel mouth.

2. **Construction sequence**

The cable landing will take one day to complete. After the cable landing, a post-landing survey will be conducted to verify the cable is positioned correctly along the proposed alignment and is not suspended in any way that could damage the cable. If the cable needs to be repositioned, the contractor will use lift-bags to gently lift the cable off the seabed and use a boat to tow the cable to the intended alignment. Once proper alignment is verified, divers will install articulate pipe around the cable starting from the end of the ductile iron conduits (bulkhead) to an approximate seaward distance of 2,555 ft. (779 m) and water depth of approximately 82 ft (25 m). Once AP installation is complete, divers will selectively pin the cable to the seabed using U-bolts and marine epoxy.

3. **Construction scheduling (begin & end dates)**

The Hong Kong-Guam cable landing will take place at Piti in March 2019. Depending on the weather and tidal conditions, the cable installation is estimated to take 15-30 days to complete, inclusive of the landing, post-landing surveys, and installation of articulated pipes (AP) and U-bolt pins on the cable.

4. **Location of stockpiling of material. (Be advised, stockpiling of materials in waters of the U.S. is discouraged. If unavoidable, stockpiling of materials in waters of the U.S. will require prior authorization from this office as it constitutes a temporary discharge of fill material.)**

No dredging or stockpiling is proposed for this project. The proposed cable will utilize GTA's existing bulkhead and buried conduit raceway on the Tepungan Reef Flat. Since the conduit infrastructure was previously installed in 2017, there will be no need for any new excavation activities below the MHW line for the proposed landing.

5. **Please provide the location of borrow and upland disposal sites for construction materials and any excess materials not utilized to complete the project.**
   No dredging or excavation is proposed for this project, therefore no borrow and upland disposal sites will be utilized.

6. **Please provide a description of Best Management Practices i.e., silt fence/curtain, sheet pile, sandbags, etc., proposed for implementation throughout the project site as a measure to prevent degradation of the aquatic environment. Include a diagram showing placement of BMPs relative to the project site with the Best Management Practices (BMPs).**
   Best Management Practices will include a pre-landing survey to conspicuously mark the cable route and any Endangered Species Act (ESA)-listed coral colonies in the vicinity of the cable route. These BMPs will assist the marine contractor in aligning the cable along the proposed route and avoiding all ESA-listed coral colonies in the vicinity. All personnel onsite will attend a briefing on the presence of ESA coral colonies and how to avoid impacts to ESA-listed species, turtles, and marine mammals (dolphins). No work will occur during coral spawning periods. All equipment and machinery in be checked for proper maintenance to prevent oil or fuel spills in the marine environment. Oil spill kits will accompany all equipment in the marine environment. No boats, watercraft, or pedestrians will be allowed to cross the reef flat outside of designated entrance and exit corridors. This entrance and exit corridor will be established over the existing cable conduit raceway, which is a previously disturbed area of the Tepungan reef flat (Exhibit A, Figure 7). Support vessels and barges will not anchor in areas with live coral and will be restricted to sandy areas only.

<u>C. DISCHARGE OF DREDGED AND/OR FILL MATERIAL</u> (Blocks 20-22 of ENG Form 4345 also pertain to discharges of dredged and/or fill material).

1. **State the source of the dredged or fill material.* Provide type of equipment required.**
   No dredging or excavation is proposed for this project, therefore no borrow and upland disposal sites will be utilized. Minor drilling will be performed to pin the cable on hard substrate. The drilled material would originate from hard substrate on the channel bottom.

   The cable (covered by articulated pipe) will be selectively pinned to the substrate with U-bolts at locations where no live corals are present in the channel and at the channel mouth to prevent lateral movement of the cable. The U-bolts will be stainless steel with typical dimensions of 14 in. long, 5 in. wide, and 0.5 in. diameter (38 cm long, 12.7 cm wide, and 1.2 cm diameter). After the U-bolts are positioned over the cable, two 1 in. (3 cm) diameter holes for each bolt will be drilled down to approximately 12 in. (30 cm) with a marine-grade hydraulic drill, and the bolts will be inserted and secured in place with a non-toxic marine epoxy. Pins will be installed in approximately 33 ft. (10 m) intervals along the cable's path over the reef crest. Approximately 20 pins will be installed.

2. **State the method of discharge. Provide type of equipment/machinery required.**
   No dredging or excavation is proposed for this project, therefore material will be discharged. Minor drilling using a hydraulic drill will be used to drill 40 one-inch (3 cm) diameter holes for installation of 20 U-bolts to pin the cable after AP is installed.

3. **Indicate the location of the discharge within the project site. This is best accomplished through a plan view drawing of the site that shows the footprint of the filled area (discharge). A cross-sectional view with existing and proposed contours (elevations) also provides necessary information on the scope of proposed work.** The cross-sectional view should clearly demarcate either the Mean High Water Mark or the Mean Higher High Water Mark/High Tide Line for tidal waters or the Ordinary High Water Mark for non-tidal waters. Definitions for these limits of jurisdiction are available at** http://gpo.gov/fdsys/pkg/CRF-2011-title33-vol3/pad/CFR-2011-title33-vol3-part328.pdf. **Be advised, the Corps has sole authority to assert jurisdiction over a water body.**
   Exhibit A, Figure 3 depicts the location of the discharge within the project site. The locations and quantities of fill are summarized in Table 2.

TABLE 2. SUMMARY OF FILL IN WATERS OF THE U.S.

Material	**Area (sq. ft.)**	**Area (sq. yds.)**	**Volume (cu. yds.)**
Rock and sand from drilling for 20 pins	0.304	0.033	0.011
Marine epoxy for 40 holes (2 per pin)	N/A	N/A	0.009
TOTAL EXTENT AND VOLUME	**0.304**	**0.033**	**0.02**

4. **What types of structures or facilities would be constructed on the fill area? (Show on drawings their dimensions, layout, etc.)**
   The 1.61 in (4.1 cm) diameter submarine fiber optic cable would be landed onto the seabed starting from the bulkhead and continuing seaward. The cable would be armored with cast iron split pipes (approximately 6 in. diameter by 21 in. long) from its entrance into the ductile iron conduits (bulkhead) to a linear seaward distance of 2,555 ft. (779 m) within Tepungan Channel. At the reef crest, the cables will be pinned to the seabed where no live corals are present, typically at 33 ft. (10 m) intervals to prevent lateral movement from wave energy in this zone. The pins will be stainless steel U-bolts typically 14 in. long, 5 in. wide, and 0.5 in. diameter. Two 1 in. (3 cm) wide, 12 in. (30 cm) deep holes will be drilled on either side of the cable for each side of the U-bolt using a hydraulic drill, and the bolts will be secured in place with a non-toxic marine epoxy.

***Note that Blocks 21 and 22 of ENG Form 4345 require both the volume (usually given in cubic yards) *and* surface area (square feet, acres, etc.) of fill.**
****Please submit any drawings on 8 ½ x 11" paper whenever possible.**

D. DREDGING PROJECTS

1. **Please provide plans showing the dredging footprint within the project site. Include cross-sectional views depicting the existing and proposed contours. Also include a location/vicinity map and plan view (if appropriate) of the area(s) where dredge spoil will be stockpiled, processed, and disposed.**
   Project figures are presented in Exhibit A. No dredging or excavation is proposed for this project in waters of the U.S. The proposed cable will utilize GTA's existing bulkhead and buried conduit raceway on the Tepungan Reef Flat. Since the conduit infrastructure was previously installed in 2017, there will be no need for any new excavation activities below the MHW line for the proposed landing. There will be a need to drill two holes each for 20 U-bolt pins to anchor the cable in areas of high wave energy. The sediment generated from this activity is anticipated to be very small, approximately 0.05 gallon per hole, or a total of 2.24 gallons (0.0004 cu m) for all 20 pins (2 drilled holes per pin, 40 holes total).

2. **What is the type and composition of the material to be dredged?**
   Not Applicable (N/A)

3. **How much time will be required to complete the dredging (construction window)? Will the dredging project be accomplished in phases? If so, please describe. Is maintenance dredging proposed, and, if so, what is the timeframe of the dredging cycle?**
   Not Applicable (N/A)

4. **How much material will be dredged?**
   a. **Volume**: Not Applicable (N/A)
   b. **Surface area:** (N/A)

5. **State what dredging method(s) will be used, and indicate why that method(s) is proposed.**
   No dredging or excavation is proposed for this project.

6. **Where will the dredged material be de-watered?**
   No dredging or excavation is proposed for this project; therefore, no dredged material would be de-watered.

7. **Do you plan to transport dredged material for the purpose of disposing it in the ocean?**
   No dredging or excavation is proposed for this project. There are no plans to dispose of any material at an ocean dump site.

   a. **Where do you plan to dispose of the dredged material?** Not applicable (N/A).
   b. **How much material (volume) will be disposed?** N/A.
   c. **What is the type and composition of the material?** N/A.
   d. **How long do you plan to dispose of the material?** N/A.
   e. **How will you transport the material to the ocean dump site?** N/A.

E. STRUCTURES IN NAVIGABLE WATERS

Be advised that the Corps considers and as such, regulates, some BMPs as structures.

1. **What specific structures will be constructed (type and size) and with what machinery and/or equipment?**
   No structures would be constructed in any navigable waters of the United States. A single 1.61 in. (4.1 cm) diameter fiber-optic communication cable would be landed onto the seabed and into one of GTA's previously constructed cable conduits located in the Tepungan reef flat. In-water machinery and equipment for the cable landing would include the cable ship, support vessels (small-to-medium sized boats, personal watercraft, and barges/pontoons). Equipment for the AP installation and pinning activities would include a hydraulic drill, generator, and various hand-tools.

2. **Is in-water work required? If yes, describe.**
   Yes, in-water work is required to land the cables on the seabed and through the conduits. Once the cable is landed, divers will install 21.7 in. long (55 cm) articulated pipe (AP) around the cable, from the bulkhead to the 82 ft. (25 m) contour. The linear distance of cable to be enclosed in AP is approximately 2,555 ft. (779 m). After AP installation is completed, divers will selectively pin the cables in 20 places to the seabed where no live corals are present.

3. **What will the structures be used for?**
   The subsea fiber-optic cable would provide a direct link from Guam to Hong Kong and would be capable of 100 gigabit per second (Gbps) optical data transmissions. This HK-G Cable is part of the larger SEA-US (Southeast Asia-U.S.) Cable System, providing Guam with increased data transmission capabilities.

4. **Describe support and/or anchoring systems, where appropriate.**
   Articulated (split) pipe (AP) sections (6.1 in. diameter and 21.7 in. long) would be placed around the cables from the end of the ductile iron conduits (bulkhead) to an approximate seaward linear distance of 2,555 ft. (779 m). The cables will be selectively pinned to the seabed with U-bolts in approximately 20 locations where no live corals are present. The combination of the articulate pipe's weight (approximately 13.4 lbs/ft or 20 kg/m) and the 20 pins, will prevent lateral movement of the cable on the reef crest and at the channel mouth.

F. EXISTING ENVIRONMENT

Please submit photos when possible!

Project site photographs are presented in Exhibit E.

1. **PHYSICAL ENVIRONMENT**

a. How would you generally describe the project area and surrounding area?

(1) Level of development:

The 6.5-acre Pedro C. Santos Memorial Park (Lot 262) fronts Guam's major coastal highway, Route 1 (Marine Corps Drive). After several years of closure, Santos Park was the subject of major improvements in 2011 to reduce erosion and sedimentation and serve as an "Eco-Park" to showcase stormwater stewardship (Kottermair, 2012). The Park has a pavilion, a concrete basketball court, a restroom facility, walkway and accessible parking area. In 2012, a raingarden was installed adjacent to the pavilion to receive rooftop runoff and infiltrate it into an area planted with native species (Kottermair, 2012).

Commercial uses are located to the south of the park along the opposite side of Route 1, including the existing GTA Cable Landing Station (CLS), 76/Circle K Gas Station, and Seawalker Tours, and a two-story, multiple-family residence.

(2) Existing land and water use:
The Tepungan Channel and reef flat lies within M-2 (Good) waters and Piti Bomb Holes Preserve, which was established in 1997 and is currently managed by the Division of Aquatic and Wildlife Resources (DAWR) of the Guam Department of Agriculture. Much of the length of the Tepungan Channel, which lies parallel to the shoreline, was widened to 157 feet and deepened from 6 feet to 16 feet between January and April 1973 to accommodate additional cooling water needed for the new Cabras Power Plant that was under construction (Marsh and Gordon, 1972 and 1974). The Power Plant and nearby Commercial Port are industrial uses to the west of Santos Park. Single-family residences and a two-story apartment building (Alig Apartments) are located along the coastline north of Santos Park.

A cable conduit system was installed in 2001 by TyCom Networks (Guam) LLC on the reef flat close to the project site. The six conduits come ashore on Lot 58-1-NEW-1-1NEW, located adjacent and north of Santos Park (see Exhibit A, Figure 9). This parcel contains a marine and terrestrial raceway, an ocean ground bed and a beach manhole. Only one cable has been landed into these conduits and they have otherwise been idle since their installation.

A second cable conduit system was installed in 2017 by GTA Teleguam on the Tepungan reef flat adjacent to and southwest of the TyCom cable conduit system. This cable conduit system would be utilized by the proposed Hong Kong-Guam cable (Exhibit A, Figure 9). The conduits come ashore in Pedro C. Santos Memorial Park (Lot 262). The park contains the buried marine and terrestrial raceway, an ocean ground bed, a beach manhole, and an intermediate manhole. GTA Teleguam and Docomo Pacific landed three cables (SEA-US and ATISA) into three of the six conduits in 2017.

(3) Other general features:

b. What kind of substrate (i.e., rock, rubble, soil, etc.) is found at the project site?

The substrate along the cable route within the Tepungan Channel, channel mouth, and reef crest can be described as two distinct zones; unconsolidated sand and rubble, and consolidated hardbottom with interspersed sand rubble material. The area directly seaward of the conduit raceway seaward terminus is an unconsolidated sand area. Particle sizes are estimated to be between 0.06 and 2 mm in diameter with pebbles and rubble up to 25 cm. The substrate at the channel mouth and reef crest is consolidated hardbottom with pockets of sand and rubble. The hardbottom comprises consolidated sand and coral limestone.

c. What is the range of water levels which occur (during normal tides and during storm or flood periods)?

The average tide level ranges from 1.3 ft. during neap tides and 2.1 ft. during spring tides. Edward K. Noda and Associates, Inc. (1990) calculated storm tidal ranges for the west coast of Guam to be 23.6 ft. high with period of 16 seconds (5-year significant wave) and 46.5 ft. high with period of 22 seconds (100-year significant wave).

d. Describe the water currents and water circulation patterns at the project site.

Marsh & Gordon (1972 and 1974) state that the most important factors affecting movement of water across the Piti reef flats are tidal conditions and surf actions on the reef margin north of the Tepungan Channel. Water circulation on the reef flat is primarily unidirectional during ebbing, and flooding during spring tides with water moving over the northern reef margin and flowing in a southern direction towards the southwestern sector of the Tepungan Channel and reef flat south of the Channel. The water then moves in a northeast direction along the Tepungan Channel and southern reef flat, and veers north towards the mouth of the Tepungan Channel. There is also movement of water during flooding tides into the entrance of the Channel, especially when the surf action on the northern reef margin is reduced.

Huddell et al. (1974) placed a current meter at a depth of 35 feet between 25 February and 2 March 1971, and at a depth of 55 feet between 22 August and 12 September 1971 approximately 200 feet of the northwest tip of Cabras Island. The water currents generally flowed towards the west at a speed up to 0.30 meters per second during February and March 1971, and flowed equally towards the east and west at a slower speed, i.e., up to 0.14 meters per second. Dye studies conducted near shore off the northwest tip of Cabras Island showed movements towards the west during flood tides and general movement towards the east during ebb tides.

e. What is the salinity (salt, brackish, or fresh) of the water at the project site?

The salinity of the marine waters in the Tepungan Channel and reef crest area is saline (salty).

f. What is the quality of the water at the project site? For instance, in Hawaii a stream may be listed as a 303(d) Impaired Water by the State of Hawaii's Department of Health (DOH).

The project site is within the Asan-Piti watershed, a 2.9 square mile area that encompasses the Masso River and Piti and Asan Bays (Kottermair, 2012). Based on freshwater and marine water monitoring programs for various parameters, including sediment loads and bacteria, Kottermair (2012) cites bacterial and turbidity levels as the main water quality concerns in the watershed. Guam Environmental Protection Agency (Guam EPA) has two weekly water sampling stations in the vicinity of the project site, i.e., at the mouth of Masso River (N-16) in Santos Park, and Hoover Park (United Seamen's Service) (N-17). The stations are sampled for *Enterococci* bacteria, which is an indicator of wastewater contamination. If warranted based on the sampling results, Guam EPA will issue an advisory to notify during that specific week's sampling, the bacteria concentration at that beach was above the accepted Guam Water Quality Standard for marine recreational beaches. From 2008 to 2011, the N16 sampling station at Pedro Santos Memorial Park had 42, 28, 47, and 48 advisories issued per year, and the number of days the site was on the advisory ranged from 200 to 337 days per year (Kottermair, 2012). The waters off Santos Park were not listed in the Guam EPA's 2016 list of impaired waters under Section 303(d) of the Clean Water Act (Guam EPA 2016).

The 2001 Revised Guam Water Quality Standards designates the coastal waters in Tepungan Channel and the nearby reef flat as M-2 (good) marine waters (Guam EPA, 2001). Marine water in this category are intended to be of sufficient quality to allow for the propagation and survival of marine organisms, particularly shellfish and other similarly harvested aquatic organisms, corals and other reef-related resources, and whole body contact recreation. Although the waters are designated as M-2 good, the actual quality may be considered compromised by the large amount of silt in the inner section of the reef flat and impaired water designation from the high *Enteroccocus* levels found in nearshore waters. Much of the silt deposited on the reef flat and entering Tepungan Channel originates from the Masso River, with some contributed by the unnamed freshwater stream and direct stormwater runoff from the beachfront properties in the area.

g. Is this area a groundwater recharge area?

No. The Park is not located over an aquifer recharge area, nor is the Masso River or the unnamed creek considered a surface water supply source to the Northern Guam Sole Source Aquifer (U.S. EPA, 2012).

h. What is the history or possibility of contaminants/pollutants in the substrate (soil) at the source of fill material?

LOW. The reef channel and crest are not known to have a history of industrial contaminants/pollutants in the substrate and there are no industrial sources that discharge to this area in the vicinity. The Tepungan Channel is a source of cooling water intake; however, thermal effluent from the power plants is discharged into the Piti Channel area of Apra Harbor to the west.

i. Have there been problems with erosion at or near the project site?

YES. The shoreline along Santos Park has had erosion problems for several years. Wave action, especially during storms events, cuts into the Park leaving a high embankment along the shore and a debris line of vegetation and rubble. The Masso River and unnamed creek at opposite ends of the Park both contribute to the erosion where they discharge into Tepungan Bay.

j. Is the project site located in or near a drainage way or flood plain? If yes, describe.

YES. The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) prepared for Guam designates Santos Park within Coastal Flood Zone VE with velocity hazard (wave action), a Special Flood Hazard Area with base flood elevations of 10 and 11 feet (Exhibit A, Figure 5) (FEMA, 2007, Panel No. 66000167D).

k. What is the quality of the air at the project site? Will the proposed project have an adverse, or insignificant, effect on air quality at the site? Will the impacts to air quality be temporary or permanent?

Air quality can be considered Fair at the project site. The Tepungan site lies within the 3.5-kilometer radius of the Cabras/Piti Power Plants, which is designated as a non-attainment area for sulfur dioxide by Guam EPA. Power plants and motor vehicles are sources of sulfur dioxide when they burn sulfur-containing fuels, especially diesel. Guam Power Authority is charged with controlling the potential impacts of pollutants by switching fuel type consumed by the power plants depending on the wind direction. Under normal conditions, high sulfur content fuel is burned when winds carry the emissions away from the island and over the ocean; low sulfur fuel is used when winds carry emissions inland. Since winds rarely blow from the southwest, the Tepungan site is relatively free from the emissions of the power plants. Vehicular traffic from Route 1 to the south is a minor mobile emissions source. The landing of the single subsea fiber-optic cable would use heavy equipment and marine vessels that are potential mobile sources of sulfur dioxide; however, the impacts would be temporary and insignificant given the short duration of construction and few numbers of vehicles that will be operating at the sites.

l. What are the existing noise levels at the project site? Will the proposed project have an adverse, or insignificant, effect on noise levels at the site? Will the impacts to noise levels be temporary or permanent?

The Park is used infrequently for gatherings; hence, existing noise levels can be considered moderate. The regular stationary noise sources in the vicinity of the Tepungan site are the Power Plants to the west, while motor vehicles on Routes 1 and 11 are a constant mobile noise generator.

2. <u>BIOLOGICAL ENVIRONMENT</u> (attach biological survey reports if available)

a. Biological survey reports from a qualified environmental professional can provide much of the necessary information for evaluating a project's potential to impact aquatic resources. If not available, a general characterization of the plants and animals at the site should be provided.

Terrestrial Vegetation

The vegetation within the Santos Park project area was investigated by biologists from Dueñas, Camacho & Associates, Inc. during field visits in August and September 2015 (DCA, 2016) and again in July 2018. Pedestrian surveys were conducted to characterize the existing vegetation community and identify any species of concern that may require special consideration. Three communities were identified within and adjacent to the project area: Urban Built-up and Open Clearing; Strand; and Scrub Forest.

Scrub Forest. Fosberg (1960) describes scrub forest as a secondary vegetation type that may have once been limestone forest but has since had a long history of human disturbance leading to its present condition. Scrub forest is present along the unnamed seasonal creek in the eastern sector of Santos Park. The vegetation along the creek comprises coconut (*Cocos nucifera*), binalo or Pacific rosewood (*Thespesia populnea*), noni (*Morinda citrifolia*), tangantangan (*Leucaena leucocephala*), half-flower (*Scaevola taccada*), field dodder (*Cuscuta campestris*), and pago (*Talipariti tiliaceum*).

Strand. The beach strand is an assemblage of hardy, usually pantropical species that have adapted to tolerate the harsh conditions by the seashore. The strand community occurs along the northern boundary and coastline of the Park, and primarily consists of low-lying alaihai or beach morning glory vines (*Ipomoea pes-caprae*) interspersed with coconut (*Cocos nucifera*), beach ironwood (*Casuarina equisetifolia*), pago (*Talipariti tiliaceum*), monkey pod (*Albizia saman*), and tangantangan trees (*Leucaena leucocephala)*.

Urban Built Up and Open Clearing. The urban built-up and open clearing community characterizes the developed areas of the Park. The vegetation comprises a manicured lawn with juvenile to mature specimen trees and shrubs, such as coconut (*Cocos nucifera*), plumeria (*Plumeria obtusa*), chi'ute (*Cerbera odollam*), talisai or tropical almond (*Terminalia catappa*), pandanus (Pandanus tectorius), niyoron (*Cordia subcordata*), and da'ok or Alexandrian laurel (*Calophyllum inophyllum*) trees.

Terrestrial and Avian Fauna

General pedestrian surveys were conducted to assess the presence of terrestrial and avian fauna that may exist within the project sites. The surveys were conducted in September 2015 and July 2018 (Table 3). Land survey crews conducting the topographic survey of the project sites in 2015 were interviewed regarding any incidental observations. Visual observations were conducted with the use of 10 x 40 binoculars, in addition to any audible observations.

The search for mollusks focused on the presence of endemic tree snails, namely *Partula radiolata*, which was listed as endangered under the Endangered Species Act by the U.S. Fish and Wildlife Service in 2015. Survey methods included searching the ground within the site for any shell remains, historic or present. The undersides of leaves of broad-leaved species and known snail host plants within the coastal community were also examined.

No mollusks, reptiles, or amphibians were observed during the July 2018 surveys.

TABLE 3. TERRESTRIAL AND AVIAN FAUNA OBSERVED IN THE VICINITY OF THE TEPUNGAN SITE

SPECIES	COMMON NAME	STATUS	ABUNDANCE
REPTILES			
Carlia ailanpalai	Curious skink	I	R
BIRDS			
Passer montanus	Eurasian tree sparrow	I	U
Gallus gallus domesticus	Domestic chicken	I	R
Egretta sacra	Pacific reef-heron	M	R
Key to Status (Guam Department of Agriculture, 1998): I = introduced resident, N = native; E = endemic; M = migratory; V = visitor. Abundance Ratings (all others): Birds (sightings/vocalizations per 8-minute period): R = rare (1 to 2); U = uncommon (3 to 6 per observation); C = common (7 to 10); A = abundant (more than 10). Other fauna (sightings per 1-hr period): R = rare (1-4); U = uncommon (5 to 9); C = common (10 to 19); A = abundant (20 or more).			

Mollusks. No native tree snails of the *Partulidae* family were observed on the few trees in the Tepungan site and vicinity during the 2015 and 2018 pedestrian surveys. These included coconut (*Cocos nucifera*) and binalo or Pacific rosewood (*Thespesia populnea*) trees, which are among the known host plants for native tree snails.

Amphibians. The amphibian fauna of Guam is non-native, and includes naturalized species such as the marine toad (*Rhinella marina* or *Bufo marinus*) and eastern dwarf tree frog (*Littoria fallax*), and recently established species such as the greenhouse frog (*Eleutherodactylus planifostris*) (Christy et al., 2007). No toads or frogs were observed in the vicinity of the Tepungan project site during the 2015 and 2018 pedestrian surveys; however, marine toads are likely to occur in or near the intermittent creek and Masso River.

Reptiles. The introduced curious or four-toed skink (*Carlia ailanpalai*) was the only reptile observed during 2015 pedestrian surveys. Skinks were noted in the leaf litter adjacent to the intermittent stream east of the Park. No skinks or other reptiles were observed during the 2018 pedestrian survey.

Birds. Eurasian tree sparrows (*Passer montanus*) and stray chickens were observed in Santos Park during the 2015 and 2018 pedestrian surveys. Two pacific reef herons (*Egretta sacra*), gray phase, were observed foraging over the Tepungan reef flat, one during the 2015 survey and one during the 2018 survey. The Mariana common moorhen (*Gallinula chloropus guami*) is a federally-listed endangered waterbird species that is found primarily at freshwater wetlands and occasionally in brackish water wetlands. Moorhen were not observed in the intermittent creek during pedestrian surveys. The narrow creek is shallow and does not contain emergent, submergent or floating vegetation, but primarily discharges stormwater from upland areas via a culvert beneath Route 1; therefore, it is not considered preferred moorhen habitat.

Mammals. A stray dog (*Canis lupus familiaris*) strolling through the Park was the only mammal observed during pedestrian surveys at the Tepungan site in 2015. No mammals were observed during the 2018 pedestrian surveys. Stray cats (*Felis catus*) were observed within Santos Park during the 2017 SEA-US and ATISA cable landings. Feral ungulates, such as pigs and deer, are not present or expected in the property given the level of development and regular human presence in the area.

Marine community

Two marine surveys by teams of marine biologists (i.e., Kerr & Burdick (2016) and Burdick (2018)), have been performed within the Tepungan Channel to characterize the habitat along the cable landing routes for the proposed HK-G cable, and for the completed SEA-US and ATISA submarine cable landings. Information from these surveys is presented below for the proposed HK-G cable landing.

Kerr & Burdick (2016) surveyed a corridor along the SEA-US cable route that is parallel to and overlaps the proposed HK-G cable route. The proposed HK-G cable landing route was surveyed in April 2018 along a 10 m wide corridor from the Tepungan Channel mouth shoreward using belt transects and photo transects to assess benthic and coral cover as well as the presence of any ESA-listed coral species (Burdick 2018) (Exhibit C). This survey did not assess fish diversity, sessile organisms, macroinvertebrates, and total coral species diversity since Kerr & Burdick (2016) surveyed the immediately adjacent area in 2015 and collected this data.

Burdick (2018) surveyed a total of 3 potential cable landing routes across the Tepungan reef crest, Survey Areas A, B, and C (Exhibit A, Figures 3 and 6). Survey Area A is the longest and northern most route following the previously installed SEA-US cable system. Survey Area B is located south of Survey Area A and follows the previously installed ATISA cable. Survey Area C was located south of Survey Area B in a previously undisturbed section of the Tepungan reef and was not pursued as a potential landing route due to the high abundance and density of fragile coral colonies.

BENTHIC COVER. Burdick's (2018) benthic cover estimates were derived from the point-count analysis of photographic images captured along a series of 50 meter transects laid end-to-end across the length of the 10 m wide by 301 m long Survey Area A. After a length of transect tape was placed by one diver, another diver obtained an image every one meter along the left side of the tape using a compact point-and-shoot camera placed atop a PVC monopod. Images were imported from the Secure Digital (SD) card into Adobe Lightroom software and a batch white balance adjustment was applied to groups of images with similar white balance characteristics. Benthic cover estimates were generated through an analysis of the photo transect images using Coral Point Count with Excel Extension (CPCe) application. Corals were identified to species when possible, although some taxa, such as massive *Porites*, *Montipora*, and others, often could not be identified to species level using the photo transect images.

Burdick's (2018) survey focused on hardbottom substrate or sandy areas with existing coral colonies within the Tepungan Channel: at the bulkhead; on a large rock outcrop in the sandy bottom channel portion; and in the outer portion of the channel seaward to the reef crest. The survey area could generally be divided into two distinct zones: 1) a deeper (approximately 30-15 m) community characterized by low relief, low coral cover, and high algal cover, and 2) a shallower (approximately 15–5 m) community characterized by moderate-to-high relief, higher coral cover, and lower fleshy macroalgae cover (Burdick 2018).

EFH and CRE-MUS. Essential Fish Habitat (EFH) and Coral Reef Ecosystem Management Unit Species (CRE-MUS) at the site are described by NOAA's National Marine Fisheries Service in their December 19, 2016 consultation letter for the previous SEA-US project:

The marine water column and seafloor in much of the proposed project area are designated as Essential Fish Habitat (EFH) and support various life stages for the management unit species (MUS) identified under the Western Pacific Regional Fishery Management Council's Pelagic and Mariana Archipelago Fishery Ecosystem Plans (FEPs). The MUS and life stages that may be found in these waters include: eggs, larvae, juveniles and adults of Coral Reef Ecosystem MUS (CRE-MUS), Pelagic MUS (P-MUS), Bottomfish (B-MUS), and Crustacean MUS (CMUS).

Part of the HK-G cable would be located within the Piti Bomb Holes Marine Preserve. According to Guam Code Annotated Chapter 63 §63116.1, "The purpose of the marine preserve is to protect, preserve, manage, and conserve aquatic life, habitat, and marine communities and ecosystems, and to ensure the health, welfare and integrity of marine resources for current and future generations by managing, regulating, restricting, or prohibiting activities to include, but not limited to, fishing, development, human uses." The preserve was established by law in 1997 and first enforced in 2001, since that time the reef fish populations have increased.

Burdick (2018) evaluated the shallow (30-5 m) reef areas that would be affected by this project. The reefs in this area have been affected by numerous stressors including sedimentation and coral bleaching. Coral cover on hardbottom substrates was relatively low ranging from 2% in the channel to 25% on the seaward slope (Burdick, 2018). Sixty-eight species of coral were identified by Kerr and Burdick (2016) along this transect including many branching species that are quite susceptible to physical impacts such as cable laying (e.g. species of the genera Acropora, Pavona, Heliopora, Pocillopora, branching Porites, and Psammocora). Video shows that the area is relatively rugose with a number of large massive Porites colonies providing topographic complexity and shelter for CREMUS species. A total of 78 species of fishes in 76 genera and 32 families were observed along the proposed project area including CREMUS species in the families Acanthuridae, Labridae, Lethrinidae, Lutjanidae, Mullidae, and Serranidae. The project area also supports numerous invertebrate species that support CREMUS or are harvested by humans including numerous mollusks and echinoderms.

Outer Channel and Reef Crest Portion. The benthic habitat in the channel was previously mapped as pavement turf (50% to 90% cover) near shore, uncolonized sand (90% to 100% cover) in the channel, and aggregate coral reef (10% to 50% cover) along the seaward slope at the channel mouth (Burdick, 2005) (Exhibit A, Figure 6). Based on the 2018 marine survey, coral cover was moderate, ranging from 2% up to 25% with a mean coral cover of 14% ± 8.0% standard deviation. Benthic cover percentages were analyzed per 50 m transect and are presented in Table 4.

TABLE 4. PERCENT BENTHIC COVER ALONG MARINE SURVEY ROUTE (Burdick, 2018)

Zone Distance Major Structure	**Transect 1** 0 to 50 m	**Transect 2** 50 to 100 m	**Transect 3** 100 to 150 m	**Transect 4** 150 to 200 m	**Transect 5** 200 to 250 m	**Transect 6** 250 to 300 m	**Average Percent Cover**
Hardbottom cover (%)							
Coral	2	9	15	16	25	18	**14.0** ± 8.0
Crustose coralline algae	2	5	13	14	24	22	**13.4** ± 9.0
Fleshy macroalgae	30	21	9	11	24	32	**21.0** ± 17.2
Turf algae	19	27	24	25	13	12	**19.9** ± 6.5
Branching coralline algae	33	23	21	17	10	13	**19.6** ± 10.0
Cyanobacteria	1	3	5	16	1	1	**2.9** ± 2.0
Unconsolidated sediment (%)							
Sand	13	11	13	10	3	3	**8.9** ± 5.5

During the 2015 marine survey, 68 species of hard corals were recorded, including Scleractinian, *Millepora* and *Heliopora* species, with diversity spanning 13 families (Kerr & Burdick, 2016) (Table 5). Since the total species count includes taxa that were identified to genus but not confidently to species level, unidentified conspecifics were conservatively lumped into a single category; therefore, the total number of species may be higher (Kerr and Burdick, 2016).

Rock Outcrop in Sandy Bottom Channel. Coral cover at this site was very low, with a mean of 0.6%. The total coral cover area was estimated to be 1.5 m² out of a total area surveyed of 250 m². All coral impacts could be avoided in this area by pre-marking the cable route during the pre-landing survey.

Bulkhead Area. Burdick (2016) found a total of 20 coral colonies within the vicinity of the bulkhead. These colonies included three massive *Porites* spp. colonies, 16 *Pocillopora damicornis* colonies, and one small *Leptastrea purpurea* colony.

Two of the *Porites* spp. colonies are not affixed to the substrate and could be easily moved to an adjacent sandy area to avoid cable impacts. These colonies could be moved by hand, and handled in such a way that no living tissue would be negatively impacts, then moved to an area directly west of the cable corridor and bulkhead where no future impacts or cable landing activities would occur. Impacts to the massive *Porites* spp. affixed to the substrate could be minimized or avoided by moving the cable or landing the cable away from the colony.

FISH. Kerr & Burdick (2016) recorded 90 species of fish observed within 5 m of the transects, and spanning 25 families (Table 6). The diversity was highest (78 species) along the outer reef slope, which is characterized by a complex topographic relief and variety of bottom types (Kerr and Burdick, 2016). Although this habitat type can harbor a large number of planktivorous fishes, the survey recorded few such species, apparently because of a lack of notable upwelling; instead, the survey primarily found members of Chaetodonidae (butterflyfish) and Acanthuridae (surgeonfish, tangs, and unicornfish) (Kerr and Burdick, 2016).

The survey recorded a few species from the Mullidae (goatfish) and Lethrinidae (emperorfish and breams) families in the central sector (deeper portion with sandy bottom), and an unidentified member of the Blenniidae (blennies) in the southern sector (shoreward intertidal bench). No large schools of food fishes were observed, presumably as a result of past, and potentially current, pressure from spearfishing within the MPA (Kerr and Burdick, 2016).

TABLE 5. CORAL SPECIES OBSERVED DURING MARINE SURVEY (Kerr and Burdick, 2016)

FAMILY/SPECIES	FAMILY/SPECIES	FAMILY/SPECIES
ACROPORIDAE	**EUPHYLLIDAE**	**MILLEPORIDAE**
Acropora abrotanoides	*Euphyllia cf. cristata*	*Millepora platyphylla*
Acropora cf. quelchi	*Euphyllia glabrescens*	**OCULINDAE**
Acropora globiceps	**FUNGIIDAE**	*Galaxaea fasicularis*
Acropora latistella	*Fungia fungites*	**POCILLOPORIDAE**
Acropora microclados	**HELIOPORIDAE**	*Pocillopora damicornis*
Acropora spp.	*Heliopora coerulea*	*Pocillopora meandrina*
Acropora surculosa	**Incertae sedis (formerly**	*Pocillopora setchelli*
Acropora tenuis	**FAVIIDAE)**	*Pocillopora spp.*
Acropora verweyi	*Leptastrea pupurea*	*Pocillopora verrucosa*
Acropora wardii	**LOBOPHYLLIDAE**	*Stylocoeniella armata*
Astreopora listeri	*Lobophyllia* cf. *flabelliformis*	**PORITIDAE**
Astreopora myriophtalma	**MERULINIDAE**	*Goniopora* cf. *tenuidens*
Astreopora randalli	*Astrea curta*	*Porites* cf. *myrmidonensis*
Montipora cf. tuberculosa	*Cyphastrea agassizi*	*Porites deformis*
Montipora grisea	*Cyphastrea* cf. *ocellina*	*Porites lobata*
Montipora hoffmeisteri	*Cyphastrea chalcidicum*	*Porites lutea*
Montipora spp.	*Cyphastrea serailia*	*Porites murrayensis*
Montipora verrucosa	*Dipsastreae favus*	*Porites rus*
AGARICIIDAE	*Dipsastraea matthaii*	*Porites* spp.
Gardineroseris planulata	*Dipsastraea pallida*	**SIDERASTREIDAE**
Pachyseris speciosa	*Dipsastraea* spp.	*Psammocora contigua*
Pavona chiriquiensis	*Favites magnistellata*	*Psammocora haimeana/*
Pavona divaricata	*Goniastrea edwardsi*	*Profundacella*
Pavona duerdeni	*Goniastrea pectinata*	*Psammocora superficiales*
Pavona sp. “contorta”	*Goniastrea retiformis*	
DIPLOASTREIDAE	*Goniastrea stelligera*	
Diploastrea heliopora	*Hynophora microconos*	
	Leptoria phrygia	
	Platygyra daedalea	

Note: “sp.” indicates a species unidentifiable to species level in the field. “cf.” indicates the species may be the one indicated.

TABLE 6. FISH SPECIES OBSERVED DURING MARINE SURVEY (Kerr and Burdick, 2016)

FAMILY/SPECIES	FAMILY/SPECIES	FAMILY/SPECIES
ACANTHURIDAE	**EPHIPIDAE**	**MALACANTHIDAE**
Acanthurus lineatus	*Platax orbicularis*	Malacanthus latovittatus
Acanthurus nigricans	**FISTULARIIDAE**	**MULLIDAE**
Acanthurus olivacerous	*Fistularia commersonii*	*Parupeneus barberinus*
Acanthurus triostegus	**GOBIIDAE**	*Parupeneus multifasciatus*
Ctenochaetus striatus	*Oplopomus oplopomus*	*Parupeneus cyclostomus*
Naso literatus	**HOLOCENTRIDAE**	**NEMIPTERIDAE**
Naso unicornis	*Myripristis berndti*	*Scolopsis lineata*
Naso vlamingii	*Myripristis* sp.	**OSTRACIIDAE**
Zebrasoma scopas	*Neoniphon* sp. cf. *sammara*	*Ostracion cubicus*
APOGONIDAE	**LABRIDAE**	**PINGUIPEDIDAE**
Apogon sp.	*Calotomus carolinus*	*Parapercis clathrata*
BALISTIDAE	*Cheilinus trilobatus*	**POMACANTHIDAE**
Balistapus undulatus	*Chlorurus microrhinos*	*Centropyge flavissima*
Melichthys vidua	*Chlororus sordidus*	**POMACENTRIDAE**
Sufflamen chrysoptera	*Epibulus insidator*	*Abudefduf sexfasciatus*
BLENNIIDAE	Cf. *Coris* sp.	*Abudefduf vaigiensis*
gen. sp.	*Halichoeres hortulanus*	*Amblyglyphidodon curacao*
Meiacanthus atrodorsalis	*Halichoeres trimaculatus*	*Chromis alpha*
CHAETODONTIDAE	*Hemigymnus fasciatus*	*Chromis* sp.
Chaetodon auriga	*Hemigymnus melapterus*	*Chromis ternatensis*
Chaetodon citrinellus	*Labroides dimidiatus*	*Chromis viridis*
Chaetodon lunulatus	*Macropharyngodon melagris*	*Chrysiptera brownriggii*
Chaetodon melannotus	*Oxycheilinus unifasciatus*	*Chrystiptera* sp.
Chaetodon mertensii	*Scarus altipinnis*	*Dascyllus aruanus*
Chaetodon ornatissimus	*Scarus globiceps*	gen. sp.
Chaetodon reticulatus	*Scarus rubroviolaceus*	*Neopomacentrus violascens*
Chaetodon unimaculatus	*Scarus schlegeli*	*Plectroglyphidodon johnstonianus*
Forcipiger flavissimus	*Stethojulis bandanensis*	*Plectroglyphidodon lacrymatus*
Hemitaurichthys polylepis	*Thallassoma lutescens*	*Pomacentrus vaiuli*
Heniochus chrysostomus	*Thallassoma purpureum*	*Stegastes lividus*
Heniochus monoceros	**LETHRINIDAE**	**SERRANDIDAE**
Heniochus varius	*Lethrinus harak*	*Epinephelus* sp.
CIRRHITIDAE	**LUTJANIDAE**	**TETRAODONTIDAE**
Paracirrhites arcatus	*Lutjanus fulvus*	*Arothron melagris*
ELEOTRIDAE	*Macolor macularis*	*Canthigaster solandri*
Ptereleotris heteroptera	*Macolor niger*	**ZANCLIDAE**
	Monotaxis grandoculis	*Zanclus cornutus*

Note: "sp." indicates a species unidentifiable to species level in the field. "cf." indicates the species may be the one indicated.

MOBILE MACROINVERTEBRATES. A total of 35 mobile invertebrate species were recorded during the 2015 surveys, spanning 8 taxonomic Orders or Classes (Table 7). The highest diversity was among members of Echinodermata, which were observed in the following classes: Asteroidea (3 species), Echinoidea (2 species), and Holothuroidea (13 species). The next most common group were the Mollusca, which included the following classes: Bivalvia (1 species) and Gastropoda (13 species). The survey found these as either burrowing, sand-inhabiting predatory members of Conidae (cone shells) or Naticidae (moon shells), or as cryptic but visible members of Cypraeidae (cowries) (Kerr and Burdick, 2016). Many specimens of the tropical oyster *Saccostrea* sp. were observed on the reef flat, and may thrive here because of its tolerance of the freshwater seepage in this area (Kerr and Burdick, 2016).

TABLE 7. CONSPICUOUS INVERTEBRATES OBSERVED DURING MARINE SURVEY (Kerr and Burdick, 2016)

CLASS/ORDER & SPECIES	CLASS/ORDER & SPECIES	CLASS/ORDER & SPECIES
ALCYONACEA	**ECHINOIDEA**	**HOLOTHUROIDEA**
cf. *Clavularia* sp.	*Echinostrephus aciculatus*	*Actinopyga echinites*
Lobophyton sp.	*Metalia dicrana*	*Actinopyga mauritiana*
Sarcophyton sp.	**GASTROPODA**	*Bohadschia argus*
Sinularia sp.	*Conus pulicarius*	*Holothuria atra*
ASTEROIDEA	*Conus* sp.	*Holothuria edulis*
Acanthaster planci	*Cypraea moneta*	*Holothuria whitmaei*
Linckia laevigata	*Cypraea pustulosa*	*Stichopus chloronotus*
Linckia multiora	*Cypraea vitellus*	*Thelenota ananas*
BIVALVIA	gen. sp.	
Saccostrea sp.	*Lambis lambis*	
DECAPODA	*Lambis scorpius*	
Calcinus sp.	*Phyllidia* sp.	
Callianassidae sp.	*Polinices* sp.	
Thalamita sp.	*Strombus gibberulus*	
DEMOSPONGIAE	*Tectus niloticus*	
gen. sp.	*Vasum* sp.	

Note: Conspicuous invertebrates are greater than 5 cm maximal dimension. "sp." indicates a species unidentifiable to species level in the field. "cf." indicates the species may be the one indicated.

Please list any plants and animals found within or near the project area that are listed as threatened or endangered under the Endangered Species Act of 1973. *http://fws.gov/pacificislands/teslist.html*.

In September 2014, the National Marine Fisheries Service (NMFS) listed 15 Indo-Pacific coral species as threatened under the Endangered Species Act (ESA), including the following 3 species confirmed in Guam's waters: *Acropora globiceps*, *Acropora retusa* and *Seriatopora aculeata*. Six *Acropora globiceps* colonies were observed within the vicinity of the proposed HK-G cable landing route during the Burdick's 2018 survey, ranging from 3 to 14 m in separation (Exhibit A, Figure 8).

Green sea turtles (*Chelonia mydas*) and hawksbill sea turtles (*Eretmochelys imbricata*) have an endangered status in Guam's waters. Scalloped hammerhead sharks (*Sphyrna lewini*), which are listed as endangered, have been observed in Guam's waters, although only in Apra Harbor. Giant oceanic manta rays (*Manta birostris*) are listed as threatened, although they have not been observed in any of Guam's waters (NOAA 2016). Dolphins are protected under the Marine Mammal Protection Act. Biological monitoring would be conducted during in-water work to detect the presence of sea turtles and dolphins. DAWR biologists would be contacted and work would cease until any observed animals voluntarily leave the area. Best management practices would be implemented throughout the course of in-water construction to minimize and prevent any adverse impacts to marine organisms. The Contractor will refer to the NMFS Protected Resources Division's BMPS, which are recommended for general in- and near-water work including boat and diver operations to reduce potential adverse effects on protected marine species.

3. **<u>SPECIAL AQUATIC SITES</u> Is the project site located at or adjacent to any of the following areas? (Show on vicinity drawings the extent of the special sites, if they are present, clearly labeling each type.) Are any of these sites proposed for impact as a result of this project?**

Special Aquatic Site:	Dredge Site	Discharge Site	Construction Site
Wetlands (swamps, marshes, bogs)	N/A	N/A	No
Mudflats	N/A	N/A	No
Vegetated Shallows/Seagrass beds	N/A	N/A	No
Coral Reefs	N/A	N/A	Yes
Riffle & Pool Complexes (streams)	N/A	N/A	No

The cable would be landed into the existing GTA bulkhead and cable conduit raceway located on the Tepungan Reef flat. This reef flat receives heavy siltation deposited from the Masso River and an intermittent unnamed creek. The nearest stream is an intermittent rock and rubble bottom creek that drains stormwater from upland areas via a culvert. The reef flat is a shallow low-relief pavement exposed at low tides with a high rate of sedimentation and very low coral cover.

There are no seagrass or other vegetated shallows, riffle or pool complexes, mudflats or wetlands at the dredge, discharge or construction site. Benthic habitat along the cable route comprises turf pavement, uncolonized sand, and aggregate reef dominated by corals, coralline algae, and macroalgae, and supports an array of fish and other pelagic organisms. The cable alignment crosses into the Piti Bomb Holes Marine Preserve and Essential Fish Habitat designated around Guam, but does not cross any designated critical habitat under National Marine Fisheries Service jurisdiction.

4. PUBLIC INTEREST REVIEW

a. What is the existing land use zoning for the site and its vicinity?

The Official Zoning Map of Guam designates Pedro C. Santos Park as “A” Agriculture or Rural Zone and currently accommodates the previously installed GTA cable raceway, beach manhole, intermediate manhole, and ocean ground bed. The adjacent Lot 58-1-NEW-1-1NEW to the east is Zone “C” for Commercial use and accommodates the existing Tata/TyCom teleommunications cable raceway. Other commercially-zoned properties are located to the south and southeast (76/Circle K gas station and Seawalker tours). Multi-family “R-2”-zoned properties further east of the Park support a 2-story apartment. Hoover Park to the west of the Park is a military property with no zone designation under the Government of Guam. The Power Plants to the southwest are industrial land uses. Parcels to the south are “R-1”-zoned parcels supporting single-family residential uses within Piti Village.

b. What is on the land (including dwellings, facilities, etc.) at or near the site?

Santos Park is a village park with one pavilion, a restroom facility, a concrete basketball court, a paved walkway and parking area. Drainage crossings (culverts) are located at the western and eastern ends of the Park to convey the Masso River and an intermittent unnamed creek beneath Marine Corps Drive (Route 1) into the Park. Adjacent and west of Santos Park is Hoover Park, which is now idle but contains structures for a former restaurant and recreational pavilions.

GTA constructed a conduit raceway comprising six underground cable conduits, two communications manholes, and an ocean-ground-bed (OGB) within Santos Park in 2017. The conduit raceway extends seaward onto the Tepungan Reef Flat , terminating at the bulkhead, and inland across Marine Corps Drive (Route 1) , terminating at the GTA Cable Landing Station (CLS).

Active commercial uses are located to the south along the opposite side of Route 1, including the existing GTA substation and cable landing station site, 76/Circle K Gas Station, and Seawalker Tours, and a two-story residence. The Piti/Cabras steam and diesel Power Plants are a prominent land use to the southwest of the Park. Piti Village, comprising mostly single-family residences, a church and Mayor's Office, is situated south of Santos Park across the Route 1 highway.

c. Do any of the following occur at or near the site?

Characteristic	Dredge Site	Discharge (fill) Site	Construction Site
Local fresh water supply	No	No	No
Fishing (recreational, commercial)	No	Yes	Yes
Scenic areas	No	Yes	Yes
Agriculture (small garden plots)	No	No	No

Characteristic	Dredge Site	Discharge (fill) Site	Construction Site
Aquaculture (type)	No	No	No
Historic sites (type)	No	No	No
Other cultural resources (type)	No	No	No
Parks, monuments, preserves, etc.	No	No	Yes
Other (type)	None	None	None

Fishing. The Piti Bomb Hole Marine Preserve is a marine protected area (MPA) managed and enforced by the Department of Agriculture Division of Aquatic and Wildlife Resources (DAWR). DAWR authorizes (by special permit) the fishing for seasonal fish traditionally caught by the local community at certain times of the year: juvenile rabbitfish (mañåhak), juvenile skipjacks (i'e), juvenile goatfish (ti'ao), juvenile fusiliers (achemson), and mackerel (atulai). Boating, jetskiing and other in-water vessel activity is typically suspended during the harvesting of these species. Trolling is also allowed beyond the reef margin for pelagic fish. No other fishing, harvesting, or collecting is allowed in the preserve.

Scenic Areas. The project would not permanently obstruct or degrade natural scenic views since the cable would be positioned along the seabed and the entirety of the cable would remain underwater.

Agriculture and aquaculture. No agriculture or aquaculture operations occur near the site.

Historic sites or other cultural resources. The proposed cable system would utilize GTA's previously installed marine and terrestrial conduit raceway, manholes, and cable landing station. During the construction of this infrastructure, an Archaeological Monitoring and Discovery Plan (AMDP) was prepared and implemented by Micronesian Archaeological Research Services (MARS), who did not discover any historic or cultural properties during the archaeological monitoring of construction activities (MARS, 2017). The proposed HK-G cable and construction area will not deviate from the previously monitored construction corridor. New earthmoving activities are proposed above the MHW to install a new ocean ground bed for the HK-G cable and, connect it by a trench from the ground bed to the existing beach manhole. This activity will be monitored by a qualified archaeologist, if required by the SHPO.

F. ENVIRONMENTAL EFFECTS OF PROPOSED PROJECT

Briefly describe the environmental effects which may be expected as a result of your proposal, referring to the items listed in Section E above. Please don't answer "none", all projects have some effects.

1. **Physical environment (effects on land, water, air, soil, etc.)**
   Air quality may be temporarily affected by emissions from the cable ship, support vessels, and terrestrial vehicles (i.e., winch-truck) during landing activities, AP installation, and

pinning. The project site is located within the sulfur dioxide (SO^2) non-attainment zone surrounding the Cabras and Piti Power Plants. While heavy equipment vehicles and vessels used in the proposed activities are potential mobile sources of sulfur dioxide, the construction period would be about 2-4 weeks and would involve only a few vehicles. Per Guam Air Quality Standards, the contractor will be required to operate and maintain construction vehicles per the applicable regulations governing air pollutant emissions. All vehicles used in construction shall have properly functioning and maintained air emission controls.

Hydraulic equipment used in the marine environment, such as drills required for pinning and AP installation, will use vegetable oil or food-grade glycol instead of traditional hydraulic fluids. During cable pinning activities, turbidity will be temporarily increased as holes are drilled into the substrate, although turbidity increases will be minimal, about 0.056 gallons per hole drilled, or 2.24 gallons total.

2. Biological environment (effects on plants, animals, and habitats)

The project would not disturb any of the scrub forest along the intermittent stream in the eastern sector of the park, and the project would not result in the loss of wetlands or waters of the United States. Cable landing activities would temporarily disturb and displace terrestrial and avian fauna to other areas of the park.

Sessile and slow-moving invertebrates would be impacted within the cable landing corridor, while fish and other mobile organisms would be temporarily displaced during landing activities, AP installation, and pinning. Landing activities, such as pedestrian traffic and the mobilization of support vessels across the reef flat, have the potential to disturb sediment on the heavily silted reef flat and suspend it, increasing turbidity, which may potentially affect corals and other marine organisms in the vicinity. A delineated marine entrance and exit corridor would be established over the previously disturbed conduit raceway construction corridor within the Tepungan reef flat (Exhibit A, Figure 7). Cable landing activities may result in abrasion or other direct damage to corals and other sessile fauna if care is not taken during the laying and armoring or pinning of the cables to the seabed.

3. Special aquatic sites (effects on wetlands, coral reefs, etc.)

The Tepungan reef flat and reef crest will be disturbed during the cable landing, AP installation and pinning of the cable to the seabed. The duration of these activities is approximately usually 15-30 days, although could take longer depending on weather and other limiting factors. There is no designated or proposed critical habitat in the vicinity of the Tepungan site. Based on coordination with Ms. Valerie Brown, National Marine Fisheries Service, green and hawksbill sea turtles are expected to occur within the area, as are spinner dolphins. Green sea turtles (*Chelonia mydas*) and hawksbill sea turtles (*Eretmochelys imbricata*) have an endangered status in Guam's waters. Dolphins are protected under the Marine Mammal Protection Act. Although the park is not a nesting site for sea turtles, green sea turtles apparently forage in the area and were observed at the mouth of the channel during the 2015 marine surveys (Kerr and Burdick, 2016). Bumphead parrotfish and Napoleon wrasse have been occasionally observed in the area, although not during the marine survey (Kerr and Burdick, 2016). The area contains one coral species, *Acropora globiceps*, that has been federally-listed as threatened. A total of 11 colonies were observed during the 2018 marine surveys; of these, 6 colonies are within the vicinity of the proposed cable route; 3 colonies within Survey Area A and 3 within Survey Area B. The proposed cable route, while not being completely enclosed within a single survey area, is closer to Survey Area A than Survey Area B. The 3 observed *A. globiceps* colonies within Survey Area A range from 3 to 10 m separation from the proposed HK-G cable alignment. The three observed *A. globiceps* colonies within Survey Area B range from 9 to 14 m separation from the proposed HK-G cable alignment. No *A. globiceps* colonies will be disturbed or otherwise harmed during the cable landing, AP installation, and pinning activities.

4. **Human use (how existing human activities would be affected)**
The cable landing and subsequent AP installation and pinning activities will be conducted within the Tepungan reef flat, channel, and reef crest. Public access on the reef flat would be restricted during times of active work for safety reasons. Similarly, vessels would be advised via a Coast Guard Notice to Mariners not to approach the area during the cable landings while the cable ship is offshore and during AP installation and pinning activities while divers are in the water. Public access to Santos Park would be limited during cable landing activities for safety reasons. During the cable landings, this project is expected to have a temporary impact on the traffic patterns along Route 1 (Marine Corps Drive) as materials and equipment are moved in and out of the Park.

5. **Historical/Cultural resources. The Corps must evaluate permit applications pursuant to Section 106 of the National Historic Preservation Act. In many cases, the Corps must coordinate its determination of a project's potential to adversely affect historic sites with the local Historic Preservation Officer. The Corps encourages applicants to contact their local Historic Preservation Officer as soon as possible in the project planning process to address any issues relevant to Section 106.**

Micronesian Archaeological Research Services, Inc. (MARS) prepared an Archaeological Monitoring, Identification, Evaluation, and Data Recovery Plan for the previously installed cable raceway in Lot 262 (Santos Park) and Lot 5NEW-1, Block 2 (GTA Cable Landing Station) (Moore, 2016) (Exhibit D). The Area of Potential Effect (APE) covered the cable trench on the reef flat to the beach manhole and ocean ground bed in Santos Park, and the connecting cable trench that leads to the GTA Cable Landing Station south of the Park on the opposite side of Marine Corps Drive.

Previous archaeological testing using six backhoe trenches along Masso River in the west sector of the Park found culturally sterile layers of beach sand, exposed disturbed wet clays and introduced fill (Moore and Amesbury, 2013). In the eastern sector of the Park, 12 backhoe trenches dug for an archaeological testing program found no significant historic properties (Moore and Amesbury, 2009). The APE for this project does not encompass any historic resources listed on either the Guam Register of Historic Places (GRHP) or the National Register of Historic Places (NRHP).

Based on the findings of previous archaeological surveys in the Park and vicinity, the landing activities are not expected to encounter significant historic properties in Santos Park (Moore, 2016). MARS performed archaeological monitoring during the installation of the GTA terrestrial raceway; however, no intact cultural deposit was exposed during the excavations (MARS, 2017).

6. **Indirect impacts (will the project eventually encourage or discourage residential, agricultural, urban, industrial or resort activities?)**
   The project would not encourage or discourage agricultural, urban, industrial or resort activities in the project vicinity. In general, however, the project would support economic growth through greater bandwidth capacity and connectivity between Guam and Hong Kong

7. **Cumulative impacts (Is this project similar in purpose, characteristics, and location compared to previous projects? Will this project lead to or be followed by similar projects? Are there other activities in the area similar to your proposed activity?)**
   Cumulative effects are the combined, incremental effects of development on the environment. The effects of even minor actions may accumulate over time and result in significant impacts on the environment. The cumulative impacts from the proposed action variants were evaluated in conjunction with effects from other local and federal government past, present and reasonably foreseeable future projects. The region of influence for cumulative impacts on these resources is the island of Guam, although the discussion below focuses on the Asan-Piti watershed encompassing the proposed action.

   TyCom Networks Guam LLC installed a cable raceway at Tepungan in 2001 and landed a cable shortly afterwards. There has not been any cable landing activity at the site since then and the five (5) remaining spare conduits are unoccupied. The installation of cable raceway and landing of one cable in Lot 58-1-NEW-1-1NEW and Tepungan reef flat by TyCom is a past action that is relevant for consideration because of its proximity to the proposed action, although the raceway was installed about 16 years ago. TyCom's cable raceway and bulkhead has the capacity for up to 6 fiber-optic subsea cables. Potential future actions could include up to 5 additional cable landings.

   GTA Teleguam installed a cable raceway at Tepungan in April 2017 and landed two cables shortly afterwards. Docomo Pacific landed a third cable (ATISA) into the GTA raceway in May 2017. Three (3) remaining conduits are currently unoccupied, one of which will be utilized by the proposed Hong Kong-Guam cable.

   The proposed HK-G cable landing would have short-term impacts on air, noise and water quality; however, these impacts would be minimized by best management practices. Therefore, there would be no long-term impacts to these resources after the landing is complete. The proposed action would not contribute towards the cumulative impact of sedimentation loading and pollution entering Piti Bay from unsewered land uses and terrigenous sources in the Asan-Piti Watershed (Kottermair, 2012).

The placement of the cable in the channel would have a cumulative impact when combined with the past TyCom and GTA cables and potential future cables that may be landed. The use of pre-marked routes and careful handling and placement of the cable by divers would minimize the effect on corals within the landing corridor. Other cumulative effects would be through the addition of hard substrate that provides support upon which corals and other sessile organisms may settle, such as the existing TyCom cable that has been gradually colonized by corals growing on the split pipe protectors.

Other cumulative effects include the emission of greenhouse gases (GHG) during the landing, AP installation, and pinning phases of the project, which is temporary and short-term. Emissions will originate from the cable ship, support vessels and various vehicles entering and exiting Santos Memorial Park.

The proposed action would have a long-term cumulative positive socioeconomic effect on the local economy through increased telecommunications capacity and interconnectivity in the western Pacific region.

With the implementation of best management practices, the proposed HK-G cable landing, in combination with past, present and reasonably foreseeable future projects will have no significant adverse cumulative impact on air quality, noise, topography and soils, water resources, biological resources, cultural resources, land use, electrical and water utilities, and socioeconomic conditions.

ALTERNATIVES to Activities Conducted in Aquatic Areas

1. **List other sites which may be suitable for this proposal and indicate whether these are or could become available to you. If none, explain why.**
   The project did not consider any alternative landing sites since the cable will utilize the existing GTA cable conduit raceway and therefore must cross the Tepungan reef in order to land in Santos Memorial Park. Three alternative landing routes across the Tepungan reef were considered when choosing the cable alignment. The proposed cable alignment was chosen after careful consideration of the impacts to essential fish habitat (EFH) and potential impacts to any ESA listed coral colonies found along the alignment. The National Marine Fisheries Service (NMFS), Department of Agriculture Division of Aquatic and Wildlife Resources (DAWR), Guam Environmental Protection Agency (GEPA), United States Army Corps of Engineers (USACE), and Bureau of Statistics and Plans (BSP) were consulted regarding the potential alignments of the proposed cable landing. The current proposed cable alignment was ultimately decided to be the least impactful of the three possible cable landing options.

2. **If your project involves the discharge of fill material to convert wetlands or submerged areas to fastland (dry land), list any existing fastland sites which are or could become available to you. If none, clearly explain why.**
   Wetlands and submerged areas would not be converted to fastland under this project. The landing of a single submarine cable is an activity specific to the marine environment; therefore, no fastland sites would be feasible.

3. **List other methods or project designs which would fulfill the basic purpose of your proposal. Which ones are reasonable for you? If none, explain why.**
   No other methods or designs were considered for this project. The proposed cable landing will utilize GTA's previously installed marine and terrestrial conduit raceway, bulkhead, manholes (Beach MH and Intermediate MH), and cable landing station (CLS). The proposed methodology has been implemented recently within the same area (2017) and has proven to be the most effective and least impactful approach.

4. **If your permit application were denied, what other alternatives would you have?**
   If the proposed permit application is denied, the issues which caused the denial will be examined in detail. Additional environmental issues that can be mitigated will be identified and integrated into the environmental protection plan until the regulatory agencies are satisfied. Alternative designs and construction methods suggested by the regulatory agencies would be assessed in detail in terms of overall costs, available technology, and logistics. The no action alternative is unacceptable.

MITIGATION

What can you do to avoid or minimize adverse effects of your proposal on the environment? For instance, a project might be relocated to a non-aquatic site, the footprint of fill or dredging can be minimized to only that which is necessary to achieve project purpose, a project footprint might be moved within a site to avoid aquatic resources, and/or different construction methods could be used.

Physical Environment

The contractor would implement the project's Environmental Protection Plan (EPP) (Exhibit B) for the duration of the cable landing, AP installation, and pinning activities.

Biological Environment

Very few trees occur within the raceway corridor in the Park, which is mostly a maintained lawn or gravel base course. No trees would be removed for this project; however, some vegetation would be removed or disturbed for installation of the ocean ground bed in Santos Park. While common fauna, such as sinks and sparrows would be temporarily displaced by the cable landing activities, these species are anticipated to return after landing activities have ceased. There would be no long-term impacts on terrestrial biological resources, as the operation of the cables within the buried cable raceway is generally considered benign.

A concerted effort was made to minimize effects on benthic habitat from the proposed action. These include the following:

- Conspicuous sessile organisms, such as sea cucumbers and sea stars, would be manually relocated out of the cable landing corridor prior to the cable landing.
- To the maximum extent practicable, branching corals would be avoided by the cable landing, AP installation, and pinning activities. This would be ensured by pre-marking the cable route prior to the cable landing, and adjusting the route as necessary and if possible.
- No work or activity that would increase turbidity and/or sedimentation would be conducted during coral spawning periods.
- Post-Landing Coral Relocation
    - Coral relocation will follow the same methods as previous cable landing projects to ensure consistency and relocation reliability and survivorship.
    - Following the cable landing, AP installation, and pinning activities, corals impacted by the proposed action would be collected and relocated to a suitable relocation site with similar habitat conditions. This redundancy accounts for the estimated failure rate of relocated corals and will offset adversely affected corals that are undocumented due to their location at deeper and unobservable depths. The methods and criteria are defined in the Coral Transplant and Monitoring Plan, Exhibit F.
    - The contractor will consult with NOAA prior to conducting coral relocation activities.
    - The contractor conducting the post-landing coral relocation will look for additional corals of opportunity (fragmented, detached, or broken corals that are not clearly a result of the proposed activities) within a 3 m area of both sides of the landed cable. These corals would be collected and reattached in a suitable relocation site with similar habitat conditions, but would not be monitored long term.
- The 1.61 in. (41 mm) diameter cable will be landed, to the maximum extent practicable, within 2 m (6.5 ft) of the previously installed SEA-US Cable to minimize and consolidate potential impacts to the benthic habitat.
- NMFS will be requested to provide training materials or a presentation to the contractor(s) on techniques to reduce damage to marine resources during the installation of the cable, AP, and pins.
- To the extent possible, divers will work mid-water column to avoid incidental damage to coral colonies. If bottom contact is required, divers will take care to avoid live corals and sessile organisms.
- During the AP installation, it may be necessary to stage the AP segments along the cable route on the seabed due to safety concerns. AP segments would be manually placed on the substrate where no live corals exist.
- Support vessels will only anchor in soft-bottom or sandy areas where no corals are present. If anchoring in hard-bottom areas is required, anchors will be set manually by divers to ensure that no live corals or sessile organisms are adversely impacted.

- A biological monitor will be onsite for all in-water activities and will supervise the pre-landing marking of the cable route.
- Following the conclusion of the proposed activities, the contractor will document the cable landing route through video or photos to ensure that the intended and proposed cable alignment was followed.

Work would be performed during outside of coral spawning periods in July and August, or as identified by NOAA or DAWR. Biological monitoring would be performed during in-water work to detect the presence of listed species, such as sea turtles, dolphins, or migratory birds, which may enter the work site. If any protected species are observed in the vicinity of the work site, Department of Agriculture and USFWS would be contacted and work would not resume until the species voluntarily leaves the area. Additional pre-landing surveys will be performed to confirm there are no other ESA listed coral colonies in the path of the cable. Impacts to known *A. globiceps* (Exhibit A, Figure 8) colonies will be avoided by pre-marking the colony with a buoy and pre-marking the final route prior to the cable landing. Best management practices would be implemented throughout the course of in-water activities to minimize impacts to the marine environment. These include the NMFS Protected Resources Division's BMPs, which are recommended for general in- and near-water work including boat and diver operations to reduce potential adverse effects on protected marine species.

During the shore landing, care will be taken to avoid laying the 1.6 in. (4.1 cm) diameter cable on large coral colonies during the alignment process, especially at the mouth of Tepungan Channel. The cable ship will remain in place at the mouth of the channel by using its own thrusters and would not anchor. The cable ship will remain in an area with sufficient depth to avoid inadvertent damage to the seabed from the ship's thrusters. Prior to landing the cables, divers will mark the route using easily retrievable weights and surface marker buoys. As the cables are paid out from the cable ship, the cables will have floats attached, and will be pulled towards the conduits at the bulkhead by a support vessel. Once proper alignment is verified, the floats will be cut and the cable laid in place by divers. If the cable needs to be repositioned, a stopper would be used to provide slack on the cable and allow manipulation of the cable before its final placement on the substrate. Likewise, the installation of the split pipes around the fiber-optic cables for 779 m , and selected pinning of the cables to the substrate at intervals in the channel and at the channel mouth, will be conducted in such a manner as to minimize damage to live corals along the cable route. A post-construction and cable-laying inspection will be conducted to confirm these measures have been carried out.

<u>Human Use</u>

An encroachment permit would be required to safely accommodate construction access to the Park from Route 1. The permit would include a site specific traffic control plan that will be prepared and submitted by the contractor to the Department of Public Works and Port Authority of Guam for review and approval. The traffic control plan would be implemented with appropriate lights and/or signage to safely divert motorists and facilitate the movement of vehicles during these construction periods. Construction is scheduled to occur during daylight hours. Motorists would be inconvenienced and may opt to travel on alternate routes or at alternate times of day. Prior to the cable landing, a Broadcast Notice to Mariners would be issued through the U.S. Coast Guard to alert vessels of the activity in the area and advise them to maintain a safe distance around the cable ship.

Please see the Honolulu District's Compensatory Mitigation and Monitoring Guidelines on-line on our web site (http://www.poh.usace.army.mil/regulatory.asp), **or contact the Corps office listed below to request a hard copy. Thank you for your cooperation in this manner. If you have any questions, please contact the Corps of Engineers, Regulatory Branch at (808) 438-9258 in Honolulu or at (671) 339-2108 in Guam.**

SUPPLEMENTAL INFORMATION

A. COORDINATION WITH OTHERS

U.S. Federal Government
Ms. Valerie Brown, National Marine Fisheries Service (NMFS)
Ms. Karen Urelius, U.S. Army Corps of Engineers

Government of Guam
Mr. Jay Gutierrez, Division of Aquatic and Wildlife Resources, Dept. of Agriculture
Mr. Tom Flores, Division of Aquatic and Wildlife Resources, Dept. of Agriculture
Mr. Ray Calvo, Guam Environmental Protection Agency
Mr. Francis Damian, Guam Coastal Management Program, Bureau of Statistics & Plans

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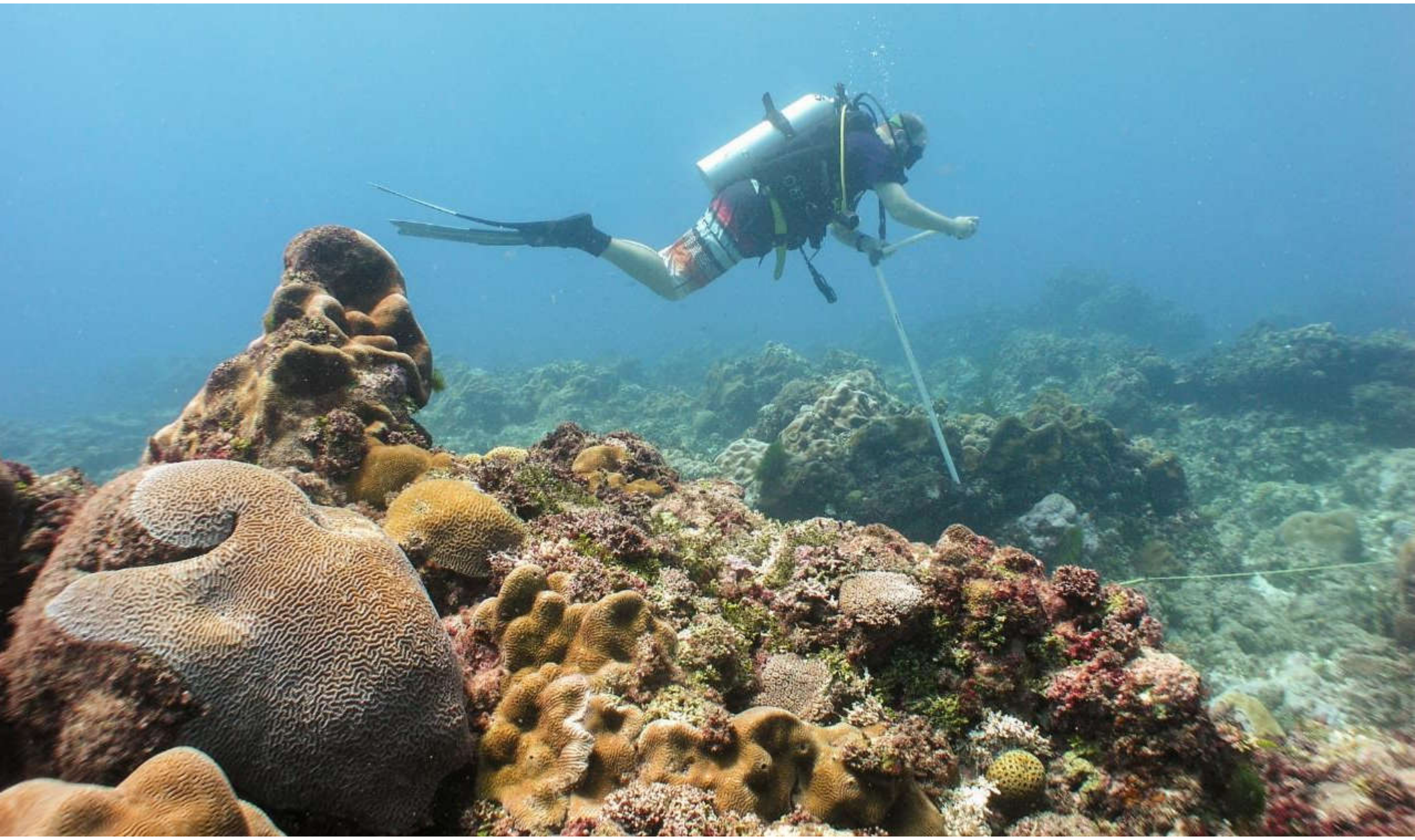
EXHIBIT C

Benthic cover and ESA coral surveys for the proposed Hong Kong-Guam, Japan-Guam-Australia North, and Japan-Guam-Australia South cable systems landings in Piti, Guam



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INTRODUCTION

RTI Solutions, Inc. is proposing to land three cable systems, including the Hong Kong-Guam (HK-G) Cable System, the Japan-Guam-Australia North (JGA-N) Cable System and the Japan-Guam-Australia South (JGA-S) Cable System, in Piti Bay, Guam. The cable systems are proposed to land within the Tepungan Channel in the vicinity of two previously landed SEA-US (Southeast Asia-United States) cables (East and West segments) from Davao, Philippines, and from Hawaii. The new cables would enter a marine raceway of individual ducts and concrete bulkhead previously installed in the Tepungan reef flat by GTA TeleGuam. The ducts continue shoreward onto a beach manhole installed in Pedro Santos Memorial Park, Piti, Guam. Two other cables, the Tata and ATISA cables, are also present in the channel. The ATISA cable is the third cable in the GTA bulkhead, while the Tata cable utilizes its own bulkhead located a short distance to the northwest of the GTA bulkhead. In order to adequately assess the potential impacts to corals and other reef benthos within the proposed landing areas, and to obtain information required to avoid and minimize these impacts, Duenas, Camacho & Associates, Inc. (DCA) contracted the author to conduct a survey of benthic cover and a survey of Endangered Species Act (ESA)-listed corals within 10 meter-wide corridors extending across the length of three proposed landing locations along the seaward slope and at a small area of hardbottom inside the Tepungan Channel. In addition, all corals were censused in an area located immediately seaward of the bulkhead that receives the cables on the edge of the Tepungan reef flat. This report provides the results of the surveys and includes recommendations to assist with the permitting requirements for the proposed cable repair project.

Scope of work

The scope of work for the surveys included the following:

- A census of all colonies representing ESA-listed species within a 10-meter belt transect centered on each of the proposed cable system landing areas (Sites A, B, C, and D)
- An assessment of benthic cover for the designated length of the proposed landing areas (Sites A, B, C, and D)
- A census of all coral colonies within the area immediately seaward of the bulkhead on the Tepungan reef flat

METHODS

Site description

PitiBay is northwest-facing embayment on the central-western coast of Guam that extends approximately 2.5 km between Cabras Island on its western boundary and Asan Point on its eastern boundary (Figures 1 & 2). The western portion of the bay is intersected by the Tepungan Channel, which extends approximately 400 m from the reef margin shoreward, and then turns westward and runs parallel to shore towards the Cabras Power Plant. The western, shoreward portion of the channel that runs parallel to shore was dredged in the early 1930s to facilitate the shipment of coal from Cabras Island to the Hagåtña power plant (Moore and Amesbury, 2009).

The Masso and Taguag rivers, as well as an unnamed ephemeral stream, discharge onto the reef flat adjacent to Tepungan Channel (Figure 2). Deposits of terrestrial-derived sediments can be observed on the reef flat near the river mouths, and within the portion of Tepungan Channel where the natural channel intersects with the dredged portion that extends westward to the power plant. The heavy deposition of terrestrial-derived sediment appears to be limited to areas not directly affected by near constant water movement within the channel; bioclastic, primarily calcium carbonate sediments dominate the channel floor across the majority of the channel. The dredged portion of the channel hosts a significant number of small *Acropora* cf. *pulchra* thickets, ranging in size from less than one square meter to more than five square meters. These thickets appear to be particularly robust to thermal/irradiative stress, as they have exhibited little or no signs of bleaching in during known periods of moderate-to-severe coral bleaching-associated mortality. The relatively deep (compared to staghorn corals on the shallow reef flat) location of these thickets, and the sometimes-turbid water that is in near-constant water movement in the channel, may mitigate the effects of the thermal/irradiative stress events. Also located within the channel are three 25 m^2 plots designated as coral mitigation sites for impacts associated with the landing of the SEA-US and ATISA cables. Two GTA coral relocation sites are located on the reef flat adjacent to the channel, and coral relocation sites associated with the SEA-US and ATISA cable landing projects are located on the seaward slope near the mouth of the channel (Figure 3)

Piti Bay is an important site for marine tourism and recreation, with hundreds of divers, snorkelers, and other marine recreators visiting the bay on a daily basis. The entirety of the bay falls within the Piti Bomb Holes Marine Preserve, one of five Marine Preserves established by Public Law 24-21 in 1997 and managed by the Guam Department of Agriculture's Division of Aquatic and Wildlife Resources. Fishing within the preserve is prohibited, except for limited seasonal fishing activities that require a special permit. Public Law 28-107, which was passed in 2006, expanded the purpose of the preserves and prohibits certain non-fishing activities, such as development, construction, drilling, and trenching, which could damage coral reef habitat. Special permission must be obtained through the Guam Department of Agriculture's Division of Aquatic and Wildlife Resources to conduct these activities within the preserve boundaries.

The areas surveyed in this study occur in or near Tepungan Channel and include sites A–E as depicted in Figures 3 and 4. Site A extends approximately 300 meters from a depth of 30 m (~100 ft) to the transition between the hardbottom substrate of the seaward slope and the beginning of the sandy bottom of the Tepungan Channel; this site runs parallel to, and immediately adjacent to, the northernmost existing cable. In contrast to sites B and C, the seaward-most end of the survey area did not begin at the transition of softbottom and hardbottom; the extent of the hardbottom community at depths greater than approximately 40 m could not be determined in situ. Site B extends 190 meters from a depth of approximately 23 m (~75 ft) to the same area where site A ended, and runs parallel with, and immediately adjacent to, the northernmost existing cable. Site C extends 146 meters from a depth of approximately 20 m (~65 ft) to the same area where sites A and B ended; this site did not occur in close proximity to any existing cables, except near the shoreward end of the site where it converged with the other sites at the transition between the hardbottom of the seaward slope and the sandy bottom of the Tepungan Channel. In contrast to sites A and B, which along their deeper portion extend upwards along a relatively gentle slope, the deep end of Site C rises steeply from a sand flat at a depth of approximately 22 m (72 ft) to a depth of approximately 15 m (50 ft) before transitioning to a gentler slope (Figure 22). Site D is a small (~400 m^2) area of hardbottom in the center of Tepungan Channel, located at 13.4692°N and 144.694°E at a depth of approximately 10 m (33 ft). Site E is a shallow (~2.5-4 m depth), gently-sloping area of silt/sand extending from the bulkhead seaward approximately 25 m to where it transitioned to a steeper soft-bottom slope along the edge of the channel.

General survey approach

Benthic cover and ESA corals surveys were carried out by the author on SCUBA on April 8, 15, and 22, 2018. Technical assistance was provided by Jordan Gault, a student in the Marine Biology graduate program at the University of Guam, and Devin Keogh, a biologist employed by DCA. Piti Bay was accessed from a boat operated by Gen-X Sports. The specific survey sites were located using a Garmin GPSMAP 78S hand-held GPS receiver and coordinates provided by DCA.

Benthic cover surveys

Benthic cover estimates were derived from the point-count analysis of images captured along a series of 50 meter transects laid end-to-end across the length of each survey site. For Site A the benthic photo transects were placed approximately 5 m to the north of the northernmost existing cable, and thus represented the center of a 10 m-wide belt extending along the north side of the cable. For Site B the transects were placed approximately 5 m to the south of the southernmost existing cable. Because an existing cable was not present at Site C, surface floats tied to two-pound weights were deployed at a series of regularly-spaced coordinates provided by DCA that represented the center of Site C. Brightly-colored flagging tape was placed on each line at a height of approximately 3 meters above the substrate in order to assist the diver placing the transect tape in keeping the transects in line with the center of the site as proposed. In order to account for uncertainty regarding the placement of the proposed cables across Site D two short transects were placed at the site, including a 16 m transect placed approximately 5 m to the east of the SEA-US cable and a 9 m transect placed approximately 5 m to the west of the ATISA cable. These short transects were sufficient to traverse the length of the hardbottom substrate occurring at either side of the two existing cables. While the placement of the 9 m transect was determined in reference to the ATISA and SEA-US cables, the older Tata cable was observed within a few meters to the west, at the base of the relatively steep channel slope. A benthic cover survey was not carried out at Site E because the majority of the limited number of coral colonies observed at the site occurred attached to small rocks scattered across a silt/sand substrate, and could be comprehensively censused rather than relying on an estimate of benthic cover.

After a length of transect tape was placed by one diver, another diver obtained an image every one meter along the left side of the tape using a compact point-and-shoot camera placed atop a PVC monopod. Images were imported from the Secure Digital (SD) card into Adobe Lightroom software and a batch white balance adjustment was applied to groups of images with similar white balance characteristics. Images were then exported and renamed.

Benthic cover estimates were generated through an analysis of the photo transect images using the Coral Point Count with Excel Extension (CPCe) application. A total of 16 points were overlaid on each image using a random-stratified approach, whereby a single point was randomly placed within each cell of a four by four grid placed over the image. The benthic feature falling under each point was identified. Corals were identified to species when possible, although some taxa, such as massive *Porites*, *Montipora*, and others, often could not be identified to species level using the photo transect images. Fleshy macroalgae were identified to genus when possible, although the resolution of the images limited the identification of many macroalgae taxa. When identification to genus was not possible, fleshy macroalgae were identified as "fleshy macroalgae –erect" or "fleshy macroalgae –adherent". Other benthic features were classified using broad biological cover types, including turf algae, crustose coralline algae, branching coralline algae (articulated and non-articulated), cyanobacteria, chrysophytes, zooxanthids and corallimorpharians, and sponges (erect and encrusting). Three additional non-biological benthic classes, including "sand on hard substrate", "sand", and "rubble" were also utilized. "Sand on hard substrate" was used when a point fell on a thin layer of sand covering hardbottom habitat (e.g., aggregate reef and pavement), while the "sand" class was used when the point fell on unconsolidated sediment that appeared to be more than a few cm thick and which was dominated by sand- and silt-sized particles. The class "rubble" was used when a point fell on unconsolidated rubble, predominately comprised of highly eroded coral skeleton fragments. The "rubble" designation was used even if a point fell on turf algae, macroalgae, or crustose coralline algae colonizing the rubble, and "sand" was used when fleshy macroalgae (e.g, unattached *Padina* spp.) covered the sand. However, in recognition of the importance of assessing the potential impacts to corals by activities associated with the proposed cable landings, if the point fell on a coral colony growing on a piece of rubble, the coral taxa was attributed to the point.

10-meter belt transect for ESA-listed corals

All colonies of ESA-listed coral species were censused within a 10-meter-wide belt transect centered on the transect tape used for the benthic photo transects at sites A–D. The location of each colony was recorded using a GPS receiver placed on a float towed by the diver conducting the ESA corals survey. Instead of having a technician at the surface manually marking waypoints above each colony identified by the diver conducting the survey at depth, the location of each colony was obtained by recording a GPS track throughout the duration of a dive (with a point recorded every 15 seconds), taking images of each colony, and using the software application, Robogeo, to interpolate the location of each image using the image's time of capture and the time of the two nearest GPS track points. It should be noted that while an effort was made to position the GPS/float directly above each colony before images are taken, the greater the depth of a colony the more difficult it was to align the GPS/float above the colony due to currents and wind—and thus the less accurate the coordinates are likely to be.

Site E coral census

All coral colonies were censused within a belt approximately three meters wide, beginning at the cable bulkhead at the edge of the reef flat and extending approximately 25 m across a gently-sloping area of silt/sand to where it transitions to a steeper, soft-bottom slope along the edge of the channel. The narrower survey belt width was used at Site E because of the limited possible range of lateral movement that the proposed cables would have so close to the duct/bulkhead. The census involved the counting and identification of all coral colonies within the site. Colony sizes were not measured, but reasonable estimates could be obtained from photographs taken of each of the colonies or exact measurements could be made during a return visit to the site upon request. An effort was also made to assess whether or not each colony was attached to hardbottom substrate, and thus whether or not a colony could be easily moved should its location coincide with the cable placement.

RESULTS AND DISCUSSION

Benthic cover

A total of 662 benthic photo transect images were analyzed to the lowest possible taxonomic classification. The benthic cover data generated from this analysis were used to characterize the benthic community at each survey site and to make comparisons among the sites. Mean percent cover values for broad benthic categories (e.g., hard coral, crustose coralline algae, etc.) at each site are provided in Table A and can be visualized in Figure 20. Percent cover values are provided for each transect in Table B. The estimated areal extent of hard coral for each site, which was calculated by multiplying the percent hard coral cover values for each transect and summing the areas for all transects within a site are presented in Table C. A summary of the benthic communities at each site based on the benthic cover data and personal observations are provided below.

Site A

Site A can be broadly divided into two distinct benthic communities, with a deeper (~30−15 m) community characterized by low relief, low coral cover, and high algal cover (Figure 5), and a shallower (~15−5 m) community characterized by moderate-to-high relief, higher coral cover, and lower algal cover (Figure 7). The composition of these benthic communities can be interpreted from the transect-level data presented in Table B, but are best visualized in Figures 21−26, which show the change in major cover types across the length of each site using cover values binned into five-meter segments. While hardbottom habitat was observed extending below the 100 foot-depth contour (where the survey began), the benthic community of this deeper area appeared to be the same or similar to the low-relief, low-coral cover community observed in the first two transects of Site A. Mean coral cover across the entire site was the lowest among Sites A–C, at 14% ± 8% SD (Table A), and ranged from 2% for the deepest 50 m-long transect to 25% along Transect 5. The relatively low coral cover extended across the deepest two transects (1 and 2) and increased to a peak at the shallowest transect (5) before decreasing somewhat as the final, most shoreward transect (6) descended to the transition between the hardbottom of the seaward slope and the sandy bottom of Tepungan Channel (Table B, Figure 21a). While mean coral cover was quite low at the deeper end of the site, several large colonies or clusters of colonies of the coral, *Diploastrea heliopora*, were observed (Figure 6). The *Diploastrea* colonies detected by the photo transect survey produced spikes in coral cover in Transect 2 (Figure 21a), resulting in a greater mean coral cover value for Transect 2 compared to that of Transect 1 (Table A). The estimated total area of coral cover in Site A was approximately 423 m^2 out of a total of 3010 m^2 (Table C).

The mean cover of crustose coralline algae, which are calcium carbonate-producing red algae known to facilitate coral recruitment, across Site A was similar to that of coral (13%) (Table A) and ranged from 2% on the deepest transect (1) to 24 % on the shallowest transect (5)(Table B). Also similar to that observed with coral cover was the significant increase in crustose coralline algae cover with decreasing depth (Figure 22a). The cover of branching coralline algae, which was primarily comprised of *Halimeda* spp., was moderately high across the site (~20%) (Table A), ranging from 10–13% in the two shallowest transects (5 and 6) to 33% on the deepest transect (1) (Table B). Branching coralline algae cover declined significantly with decreasing depth (Figure 23a). Fleshy macroalgae cover, which was primarily comprised of erect red algae, such as *Galaxaura* sp., and the more diminutive green algae, *Caulerpa filicoides*, in the deeper assemblage and of an unidentified species of adherent, lightly calcified red algae in the shallower assemblage, was also moderately high across the site, with a mean of 21% (Table A) and ranging from around 10% in the center two transects (3 and 4) to about 30% in the deepest (1) and shallowest (6) transects (Table B). The cover of fleshy macroalgae decreased at mid-depths but increased again with increasing cover of adherent forms in shallower depths (Figure 24a). The mean cover of turf algae, which can range from a thin, nearly imperceptible veneer of algal growth on otherwise bare substrate to a conspicuous mat often comprised of a mix of algae taxa, was moderately high (~20%) across the site (Table A), ranging from around 12% in the shallowest two transects (5 and 6) to 25% in one of the center transects (4). Turf algae cover did not exhibit any significant trends across the length of the site, but average cover appeared to be somewhat higher at mid-depths (Figure 25a). The mean cover of both cyanobacteria and soft coral was low for Site A (3% and <1%, respectively) (Tables A and B).

Site B

As with Site A, Site B can be broadly divided into two distinct benthic communities, with a deeper (~20–15 m) community characterized by moderate-to-high relief, relatively low coral cover, and relatively low algal cover (Figure 9), and a shallower (~15–5 m) community characterized by moderate-to-high relief, higher coral cover, and higher fleshy macroalgae cover primarily comprised of adherent forms (Figure 10). Mean coral cover at Site B was 16% ± 7.6% SD (Table A) and ranged from 10% for the deepest two transects (1 and 2) to a peak of 24% for Transect 3 (Table B). Coral cover along transects 1 and 2 in Site B was comparable to transects 2 and 3 from Site A; Transect 1 from Site A began at a greater depth and is characterized by very low coral cover and low topographical relief. Also similar to Site A, several large colonies or clusters of colonies of the coral, *Diploastrea heliopora*, were observed in the deeper extent of Site B (Figure 8). The *Diploastrea* colonies detected by the photo transect survey produced spikes in coral cover in Transect 1 (Figure 21b). The estimated total area of coral cover in Site B was approximately 306 m^2 out of a total of 1900 m^2 (Table C).

The mean cover of crustose coralline algae across Site B was relatively high (21%) (Table A) and ranged from 15% on the deepest two transects (1 and 2) to 25−27% on the shallowest two transects (3 and 4) (Table B). The trend of increasing cover of crustose coralline algae with decreased depth can be visualized in Figure 22b. The cover of branching coralline algae, which was primarily comprised of *Halimeda* spp., was moderate across the site (~15%) (Table A), ranging from 11% in the shallowest transect (4) to 21% on Transect 2 (Table B). Branching coralline algae cover did not exhibit any significant trends across the length of the site, but average cover appeared to be somewhat higher at mid-depths (Figure 23b). Fleshy macroalgae cover, which was primarily comprised of *Dichotomaria marginata* in the deeper assemblage and adherent, lightly calcified red algae in the shallower assemblage, was also low-to-moderate across the site, with a mean of ~12% (Table A) and ranging from 8−9% in the two deepest transects (1 and 2) to about 14−16% in the two shallowest transects (3 and 4) (Table B). The cover of fleshy macroalgae exhibited no major trends across the site, although on average it was somewhat higher at mid-depths (Figure 24b). The mean cover of turf algae was moderately high (~22%) across the site (Table A), ranging from around 18% on one of the shallow transects (3) to 23−24% for the other three transects (1, 2 and 4) (Table B). Turf algae cover did not exhibit any significant trend across the length of the site, but cover exhibited a great degree of variability, with several peaks and dips in cover. The cover of both cyanobacteria and soft coral was low across the site (4% and <1, respectively) (Table A).

Site C

Site C can also be broadly divided into two distinct benthic communities, with a deeper (~20−15 m) community characterized by moderate relief, relatively low coral cover, and higher cyanobacteria cover (Figure 14), and a shallower (~15−5 m) community characterized by moderate relief, higher coral cover, and low cyanobacteria cover (Figure 15). Mean coral cover at Site C was the highest of the survey sites, at 18% ± 9.2 SD (Table A) and ranged from 9 % along the deepest transect (1) to 27% on one of the shallow transects (2). When binned into five-meter segments, a peak around the 95-100 m segment (end of Transect 2) is apparent. The decrease in cover between this peak and the shoreward end of Site C may be driven in part by a reduction in the cover of the brain coral, *Leptoria phrygia*, which is dominant in the shallower portion of the site. *Leptoria* prefers habitats that experience a moderate degree of wave exposure; the reduction in *Leptoria* cover, then, may be driven by a reduction in wave exposure near the mouth of the channel, but could also be related to a decline in water quality associated with the channel. The estimated total area of coral cover in Site C was approximately 265 m^2 out of a total of 1450 m^2 (Table C).

The mean cover of crustose coralline algae across Site C was moderately high (~18%) (Table A) and ranged from 14% on the mid-depth transect (2) to 20% on the deepest transect (1) (Table B). When visualized using data binned into five-meter segments, no discernible trend can be observed in crustose coralline algae cover across the length of the site (Figure 22c). The cover of branching coralline algae, which was primarily comprised of *Halimeda* spp., was moderately high across the site (~19%) (Table A), ranging from 14% in the deepest transect (1) to 26% on the mid-depth transect (2)(Table B). The increase in branching coralline algae cover at mid-depths can be observed with the finer-scale visualization of cover across the length of Site C, but a high degree of variability can also be observed, with several peaks and dips in cover values (Figure 23c). Fleshy macroalgae cover, which was primarily comprised of *Dichotomaria marginata* in the deeper assemblage and adherent, lightly calcified red algae in the shallower assemblage, was moderately high across the site, with a mean of ~20% (Table A) and ranging from 17−18% in the two deepest transects (1 and 2) to 25% in the shallowest transect (3) (Table B). Although there was a high degree of variability in fleshy macroalgae cover across the length of the site, cover was lower at mid-depths in comparison to the deep end of the transect and with a sharp increase in cover in the segments closest to Tepungan Channel (Figure 24c). This peak may be related to the decline in coral cover in this area and possibly explained by the preference for the adherent fleshy macroalgae forms with less wave exposure and a greater tolerance for reduced water quality. The mean cover of turf algae was moderate (~17%) across the site (Table A), ranging from 11% on Transect 2 to 22% for the deepest transect (1). Turf algae cover did not exhibit any significant trend across the length of the site, but cover exhibited a great degree of variability, with several peaks and dips in cover (Figure 25c). The cover of cyanobacteria was moderate (13%) on the deepest transect (1) but dropped to 2% for the two shallowest transects (2 and 3) (Table B). The cover of soft coral was low across the site (<1%) (Table A).

Site D

Coral cover at Site D was very low, with a mean of 0.6% (Table A). Coral cover was < 2% for Transect 1 (east of the existing cables) and 0% for Transect 2 (west of the existing cables) (Table B). The total areal extent of coral cover within Site D was estimated to be 1.5 m^2 out of a total 250 m^2 of hardbottom that was surveyed (Table 3). Few corals were observed within the site, although some notable colonies, such as a 20 cm diameter *Pocillopora meandrina* colony, were observed (Figure 19). A thin growth of turfing algae comprised nearly half of the benthic cover at Site D, while fleshy macroalgae, such as the erect red algae *Asparagopsis* and one or more unidentified adherent red algae taxa, and branching coralline algae (primarily *Halimeda* spp.) also comprised approximately one quarter of the benthic community. Sand, including both relatively deep sand deposits and thin layers of sand on hardbottom, also comprised a notable portion (~19%) of the benthic cover.

Coral community structure

Although a survey was not carried out to specifically characterize the coral community in a great degree of detail, the data generated from the benthic photo transect surveys can provide a relative—if not comprehensive—measure of diversity, as well as allow general comparisons of coral communities across sites and indications of shifts in coral community structure along the length of each site. A summary of these data, along with observations made in situ, are provided below.

Site A

The coral community at Site A was predominately comprised of encrusting, mounding, and boulder-shaped corals, such *Porites* spp. and the brain coral, *Leptoria phrygia* (Figure 27). As noted above, large *Diploastrea heliopora* colonies are present in Site A, with particularly large colonies or groups of large colonies occurring at depths between approximately 15 and 25 m. While relatively few in number, these colonies comprised a significant amount of the coral cover detected by the benthic photo transect survey in the deepest 100 m stretch of Site A. Other corals detected by the photo transect survey or observed in situ along this deeper portion include small *Favia favus* and massive *Porites* spp. colonies. The cover and diversity of corals increased with decreasing depth, eventually transitioning from the relatively low cover, *Porites* spp.-dominated community to a community with relatively high cover dominated by *Leptoria phrygia*. Few colonies of branching species, such as *Acropora* spp. or *Pocillopora* spp., or encrusting *Montipora* spp. were observed in Site A. Skeletons of dead branching corals, including some that died recently, were observed. While these branching corals may not have been a dominant component of this reef area in the past, they were likely more numerous in previous decades and have declined primarily as a result of predation by the crown-of-thorns sea star, *Acanthaster planci*, and, more recently, by several moderate-to-severe thermal stress (coral bleaching) events.

Site B

The coral community in Site B was overwhelmingly dominated by the encrusting-to-mounding coral, *Leptoria phrygia*, with a smaller proportion of *Porites* than Site A (Figure 28). As with Site A, Site B can be roughly divided into two distinct coral communities: a massive *Porites* spp.-dominated deeper portion, which extends upslope from 23 m (~75 ft) to approximately 10 m (32 ft), and then transitions to a shallower platform dominated primarily by *Leptoria phrygia*. Also similar to Site A, few living colonies of branching species were observed in Site B, but skeletons of dead branching corals, including some that died recently, were observed.

Site C

The coral community at Site C was also dominated by *Leptoria phrygia*, but there were notable contributions to coral cover by other taxa, such as *Galaxea fascicularis*, *Porites rus* (plate and pillar coral), and the brain coral, *Platygyra daedalea* (Figure 29). The transect (Transect 2) with the highest coral cover (27%) occurred at this site. Also of note is that a significant portion of this site had extensive cover of a coral, *Galaxea fascicularis*, that was only observed occasionally at the other sites (Figure 16). This coral species forms colonies with delicate skeletal structures in comparison to the mounting and boulder-like corals that comprise the majority of the other sites (and the deeper portion of Site C as well). While the percent cover of this species was not especially high when averaged across the entire site, there were smaller (but still sizeable) portions of the site that approached 25% cover, and possibly as high as 50% or more. Although the benthic photo transect in Site C did not cross any large *Diploastrea* colonies, as it did in sites A and B, there were large colonies in the vicinity of the site. Of particular note was an unusually large colony (~5 m diameter) that occurred along the steep slope several meters to the north of the Site C (Transect 1) (Figure 13).

ESA-listed corals within 10-meter belt transect

Of the 16 Indo-Pacific coral species recently listed by the National Oceanic and Atmospheric Administration (NOAA) as Threatened or Endangered in 2014, only three are officially recognized as occurring in Guam's waters, including *Acropora globiceps*, *Acropora retusa*, and *Seriatopora aculeata*. However, recent examination of a collected specimen by Dr. Doug Fenner, an independent contractor currently assisting the NOAA Protected Resources Division with the implementation of ESA protections of listed Pacific Ocean species, resulted in the identification of another ESA-listed species, *Acropora* *speciosa*, from Guam's waters. *Acropora retusa*, *A. speciosa*, and *Seriatopora aculeata* are rare in Guam's waters, but *Acropora globiceps* is a relatively common inhabitant of Guam's seaward slopes and was expected to occur within the survey sites. Indeed, the survey for ESA listed corals resulted in the identification of several colonies consistent with the current interpretation of *Acropora globiceps* in the Mariana Islands, including three colonies in Site A, three in Site B, and five in Site C (Figs. 31–37). The coordinates for these colonies are provided in Table D and their locations presented in Figure 30. It should be noted that most of the colonies tentatively identified as *A. globiceps* were small (< 10 cm) and were difficult to confidently discern from the very similar-looking *Acropora* cf. *humilis*. Larger colonies of these two species are usually fairly easy to distinguish from each other, with the exception of the occasional intermediate form that shares features of both and cannot be reliably identified as one species or the other. In recognition of the challenge in discerning *A. globiceps* and *A*. cf. *humilis*, images and location information were obtained for colonies of both species. Only images of those colonies that are more consistent with the current understanding of *A. globiceps* in the Mariana Islands, and those colonies that appear to be intermediate in form, are included in Figures 31–37. NOAA will likely consider these intermediate forms *A. globiceps*, and thus subject to the same protections as the more typical representatives of the species. The images and location information for the *A.*cf. *humilis* colonies can be provided upon request. No *A. retusa*, *A. speciosa*, or *S. aculeata* colonies were observed during any of the surveys.

Site E coral census

A total of 20 coral colonies were observed within Site E, including three massive (i.e., boulder-shaped) *Porites* colonies (likely *P. lutea*), 16 *Pocillopora damicornis* colonies, a small *Leptastrea purpurea* colony. The *Porites* colonies include a relatively large (~75 cm diameter) colony located approximately 2.5 m seaward of the duct and two smaller (~25–30 cm diameter) colonies approximately 15 m and 20 m from the duct, respectively (Figure 38). The large *Porites* colony appears to be firmly attached to hardbottom substrate located beneath the silt/sand substrate, while the smaller *Porites* colonies do not appear to be attached to hardbottom and instead are resting on the softbottom substrate (Figures 38 and 39). The *Pocillopora damicornis* colonies range in size from approximately 10 to 20 cm in diameter; all of these colonies appear to be attached to loose rocks resting on the softbottom substrate (Figure 38). The single *Leptastrea purpurea* colony was growing on a small rock. Additional small *Leptastrea purpurea* may be present in the site, but were not be readily observed while snorkeling.

Additional observations

Two green sea turtles, *Chelonia mydas*, were observed while diving near the deep ends of sites A (4/15/18) and C (4/22/18). At least one, but possibly two or more, green sea turtles were observed at the surface from the boat while inside Tepungan Channel on 4/15/18. Green sea turtles are listed as Endangered under the Endangered Species Act. A pod of spinner dolphins, *Stenella longirostris*, comprised of an estimated 10−15 individuals, was observed on multiple occasions across the three field days. It is not clear if the same pod was observed each day, but it was evident that at least one pod frequents the area in and around the Tepungan Channel. On two of the field days a dolphin-watching tour boat was observed in the vicinity of the dolphins, and could be seen following the animals into the Tepungan Channel. The spinner dolphin is protected under the Marine Mammal Protection Act.

CONCLUSIONS AND RECOMMENDATIONS

Survey sites A, B and C were all primarily dominated by hardbottom habitat and hosted broadly similar benthic communities, with moderate-to-high reef complexity (i.e., relief), low-to-moderate coral cover, and moderate-to-high algal cover. The low relief, very low coral cover, high algal cover benthic community observed along the deepest two transects (1 and 2) of Site A is an exception, and is best explained by the greater depths at which these transects occurred in comparison to the deepest depths surveyed in sites B and C. Coral cover was more variable within a given site than across sites; as a result of this variability inter-site differences in mean coral cover were not statistically significant. The coral communities that occur within each of these sites are also broadly similar and exhibit similar shifts in community composition with depth. The coral communities along approximately the 20−10 m depth range of all of the sites were comprised primarily of massive *Porites* species, with some contribution by other taxa such as *Diploastrea heliopora* and *Favia* spp., while the coral communities along approximately the 10-5 m depth range were primarily dominated by *Leptoria phrygia*, with some contributions from other taxa such as *Porites* spp., *Favia* spp., and *Platygyra* spp. These coral taxa form encrusting, mounding, and boulder-shaped colonies; very few branching colonies (e.g., *Acropora* spp. and *Pocillopora* spp.) were observed within any of the survey areas.

Despite the broad similarity of the benthic communities at sites A, B, and C there are key differences that should be noted. While mean coral cover was generally similar across these sites, the different lengths of these sites resulted in significant differences in the estimated total area occupied by living coral. Approximately ~423 m^2 of coral was estimated to occur along the ~300 m length of Site A, while the shorter sites B (190 m) and C (146 m) were estimated to contain approximately 305 m^2 and 265 m^2 of coral cover, respectively. This simple calculation of total coral area, while informative, should also be considered along with information regarding the types of coral—particularly those more vulnerable to physical damage—present at each site. For example, while few branching colonies were observed at any of the sites, the presence of extensive aggregations of the coral, *Galaxea fascicularis*, along a substantial part of Site C should be considered. As mentioned above, in seaward slope habitats this species forms primarily encrusting colonies with delicate skeletal features that are highly susceptible to damage. *Galaxea fascicularis* is an abundant species in Guam's waters and colonies often occur in aggregations, but the area of reef covered by the numerous aggregations of this species in Site C is the most extensive the author has encountered on Guam.

Impacts to the hardbottom community at Site D should be very minimal, as coral cover detected by the photo transect survey was very low and unavoidable impacts to the dominant benthic organisms (e.g, turf algae, fleshy macroalgae, and *Halimeda* spp.) would likely be temporary.

Observations of the seaward slope benthic community in the vicinity of the SEA-US and ATISA cables, which were installed in 2017, suggest that impacts associated with the installation of the cable were minimal. The minimal degree of impact appears to be related to the limited contact between the cable and living coral colonies, and the limited susceptibility to physical damage of the predominately encrusting, mounding, and boulder-shaped (i.e., non-branching) corals. The SEA-US and ATISA cables are relatively rigid, which results in the cable making contact with raised substrate at relatively few points where the reef topography is relatively complex (i.e., moderate-to-high relief). Contact with the substrate is more extensive across relatively flat reef areas. In places where the cable was observed in contact with corals, the area of contact was generally small—especially for rounded corals atop of which the cable rested (Figure 41). The area of coral tissue immediately below the cable is expected to be dead; there may also be some health impacts related to shading caused by the cable, but this can vary greatly depending on the size of the shaded area relative to the coral and the amount of reflected light that can reach the tissue below the cable.

While impacts associated with the installation of the cables are expected to be minimal, there is still the potential for injury to occur to corals and other benthic organisms. There is also the potential for impacts to corals within a narrow corridor along the cables as a result of diver interactions with the nearby substrate during the installation of articulated piping used to protect the cables and saddle clamps intended to secure the cables to the substrate, or in other in-water activities that require divers to be in close proximity to the seafloor. The following recommendations are intended to aid in maximizing the degree to which impacts to corals can be avoided, minimize the risk of unintended impacts, and mitigate impacts that cannot be avoided.

Avoiding and minimizing risk to corals during placement of proposed cables

Care should be taken to avoid any of the few branching colonies in the selected landing area. Branching corals, especially *Acropora* spp., have experienced catastrophic levels of mortality as a result of predation by the crown-of-thorns sea star and, more recently, by moderate-to-severe coral bleaching events. The populations of many *Acropora* species, even if they are not currently protected under the Endangered Species Act, should be considered vulnerable, and steps should be taken to avoid any impacts to these species. Care should also be taken to avoid *Porites rus* colonies, which can be found in the area. This species forms colonies that range from tiered plates at greater depths and colonies with pillars or columns arising from plates at moderate depths. Both of these growth forms are relatively fragile and are susceptible to physical damage. If Site C is selected, it is recommended that an attempt be made to carefully place the cable in areas with few *Galaxea* colonies. Also pertinent, should Site C be selected, is the presence of the exceptionally large *Diploastrea heliopora* colony in the vicinity of the site as mentioned above. This five-meter-wide colony occurs to the north of the section of steep slope across which Site C extends. This colony would not be impacted if the cable is laid within the boundaries of Site C as proposed, but its close proximity to Site C should be noted and care taken to avoid it. While colonies of this species seem relatively robust to physical damage, this partially plating form is likely less robust than the massive (i.e., boulder-shaped) colonies and could break or sustain significant tissue damage if a cable is placed across it. Although coral cover in Site D was very low, measures should be taken to avoid injury to a single moderately-sized (~20 cm diameter) branching coral, *Pocillopora meandrina*, that was observed within the site.

Avoiding and minimizing risk of injury to corals in close proximity to the cable

Coral colonies occurring in close proximity to (but not directly under) the final resting place of the cable and articulated piping are at risk for injury resulting from activities associated with the cable and articulated piping placement, including breakage and tissue damage from divers and by tools, equipment, and materials placed on the seafloor. The risk of injury to these corals can be minimized by informing the working divers to avoid contact with coral colonies and to avoid placing tools, equipment, and materials on or immediately next to coral colonies.

Avoiding risk of injury to ESA-listed corals

With the locations of the relatively few *Acropora globiceps* colonies found within the survey sites now known, efforts can be made to avoid any impacts to these colonies during the cable installation process.

To avoid impact during placement of the cable the location of each *A. globiceps* colony along the site selected for landing can be marked using a surface float and line attached to a small weight that can be lowered to an area of bare substrate in the vicinity of the colony. Flagging tape or a brightly colored sub-surface float could also be placed on the substrate near the colony so that its exact location can be visually determined by workers in the water. It is not recommended that these colonies be moved outside the selected landing site unless their injury as a result of the cable installation process is unavoidable. The mostly young *A. globiceps* colonies observed in the survey areas have extensive encrusting bases and short branches arising from the base in a digitate (finger-like) form; attempts to remove them from the substrate would very likely result in the colonies breaking into several pieces. Even if large colonies can be removed without significantly damaging the colony, the risk of injury during the movement of the colony and its attachment to the substrate would likely be higher than the risk to injury if left in-place. It is also recommended that any divers participating in the cable installation process are familiarized with the location of the *Acropora globiceps* colonies, and that at least one diver that can discriminate this species from similar-looking species be present during the in-water work.

Avoiding or minimizing risk of injury to corals in Site E

Impacts to most corals within Site E can be avoided by moving the colonies to nearby softbottom substrate that would not be disturbed during the placement of the cables. The possible exception is the large *Porites* colony located near the bulkhead; this colony appears to be attached to hardbottom substrate and would be difficult to detach, translocate, and re-attach without causing injury to the colony. The cable that would occupy the westernmost bulkhead port could possibly be installed in such a way that this large *Porites* colony is avoided, but it depends on how much the cable can bend in such close proximity to the bulkhead. If the other two smaller *Porites* colonies are moved, it is recommended that the colony be handled from the portion of the colony currently in contact with the silt/sand. This portion of the colony will have little or no living tissue.

REFERENCES

Moore, D. R. and J. R. Amesbury. 2009. Archaeological testing at Santos Memorial Park – Piti, Guam. Micronesian Archaeological Research Services (MARS), Guam.

Table A. Mean benthic percent cover values (± standard deviation), including hardbottom and unconsolidated sediment cover types, for Sites A (n=6 transects), B (n=4 transects), and C (n=3 transects), and D (n=2 transects). Benthic cover values for some benthic classes used in the image analysis, such as sponges, zoanthids/corallimorphs, and other invertebrates, are not presented because of their rarity (< 0.5% cover) and lack of significance to the present study; as a result of the exclusion of these values, the sums of the percentages do not equal 100%.

	A		B		C		D	
Hardbottom cover								
Coral	**14.0**	± 8.0	**16.1**	± 7.6	**18.1**	± 9.2	**0.6**	± 0.8
Crustose cor. algae	13.4	± 9.0	20.6	± 6.4	17.7	± 3.0	7.4	± 3.6
Fleshy macroalgae	21.0	± 17.2	11.9	± 10.2	20.0	± 12.3	16.3	± 2.5
Turf algae	19.9	± 6.5	21.7	± 2.6	16.8	± 5.6	46.5	± 2.9
Branching cor. algae	19.6	± 10.0	15.3	± 6.9	19.2	± 7.2	9.1	± 1.2
Cyanobacteria	2.9	± 2.0	4.0	± 2.4	5.7	± 6.2	0.3	± 0.5
Soft coral	0.1	± 0.1	0.1	± 0.1	0.2	± 0.2	0.0	± 0.0
Unconsol. sediment								
Sand	8.9	± 5.5	10.3	± 10.0	2.3	± 1.3	19.2	± 13.3

Table B. Mean benthic percent cover values, including hardbottom and unconsolidated sediment cover types, for individual transects at sites A–D. For sites A, B, and C, Transect 1 is the deepest, most seaward transect. Benthic cover values for some benthic classes used in the image analysis, such as soft corals, sponges, zoanthids/corallimorphs, and other invertebrates, are not presented because of their rarity (< 1% cover) and lack of significance to the present study; as a result of the exclusion of these values, the sums of the percentages do not equal 100%.

	Transect														
	Site A						**Site B**				**Site C**			**SiteD**	
	1	2	3	4	5	6	1	2	3	4	1	2	3	1	2
Hardbottom cover															
Coral	2	9	15	16	25	18	10	10	24	22	9	27	18	1	0
Crustose cor. algae	2	5	13	14	24	22	15	15	25	27	20	14	18	10	5
Fleshy macroalgae	30	21	9	11	24	32	8	9	16	14	17	18	25	18	15
Turf algae	19	27	24	25	13	12	23	24	18	22	22	11	17	49	44
Branching cor. algae	33	23	21	17	10	13	16	21	14	11	14	26	17	10	8
Cyanobacteria	1	3	5	6	1	1	6	6	2	2	13	2	2	0	1
Unconsol. sediment															
Sand	13	11	13	10	3	3	22	15	2	2	4	1	2	12	26

Table C. Length (m), site area (m^2), mean coral cover (%), and estimated coral area (m^2) for each site. Percent coral cover was estimated from point count analysis of benthic photo transect images. Estimated coral area was calculated for each survey site by multiplying the site area by the percent coral cover for that site.

	Length (m)	Site area (m^2)	Coral cover (%)	Est. coral area (m^2)
Site A	301	3010	14.0	422.8
Site B	190	1900	16.1	305.7
Site C	146	1450	18.1	264.8
Site D	25	250	0.6	1.5

Table D. Coordinates for the putative *Acropora globiceps* colonies observed in Sites A, B, and C. Coordinates are provided in decimal degrees (WGS 1984 datum).

Colony	Latitude	Longitude
A1	13.471103	144.691823
A2	13.471133	144.692104
A3	13.471062	144.692118
B1	13.470945	144.692217
B2	13.470912	144.692281
B3	13.470887	144.692317
C1	13.470395	144.692766
C2	13.470407	144.692793
C3	13.47042	144.692794
C4	13.470469	144.69278
C5	13.470589	144.692929

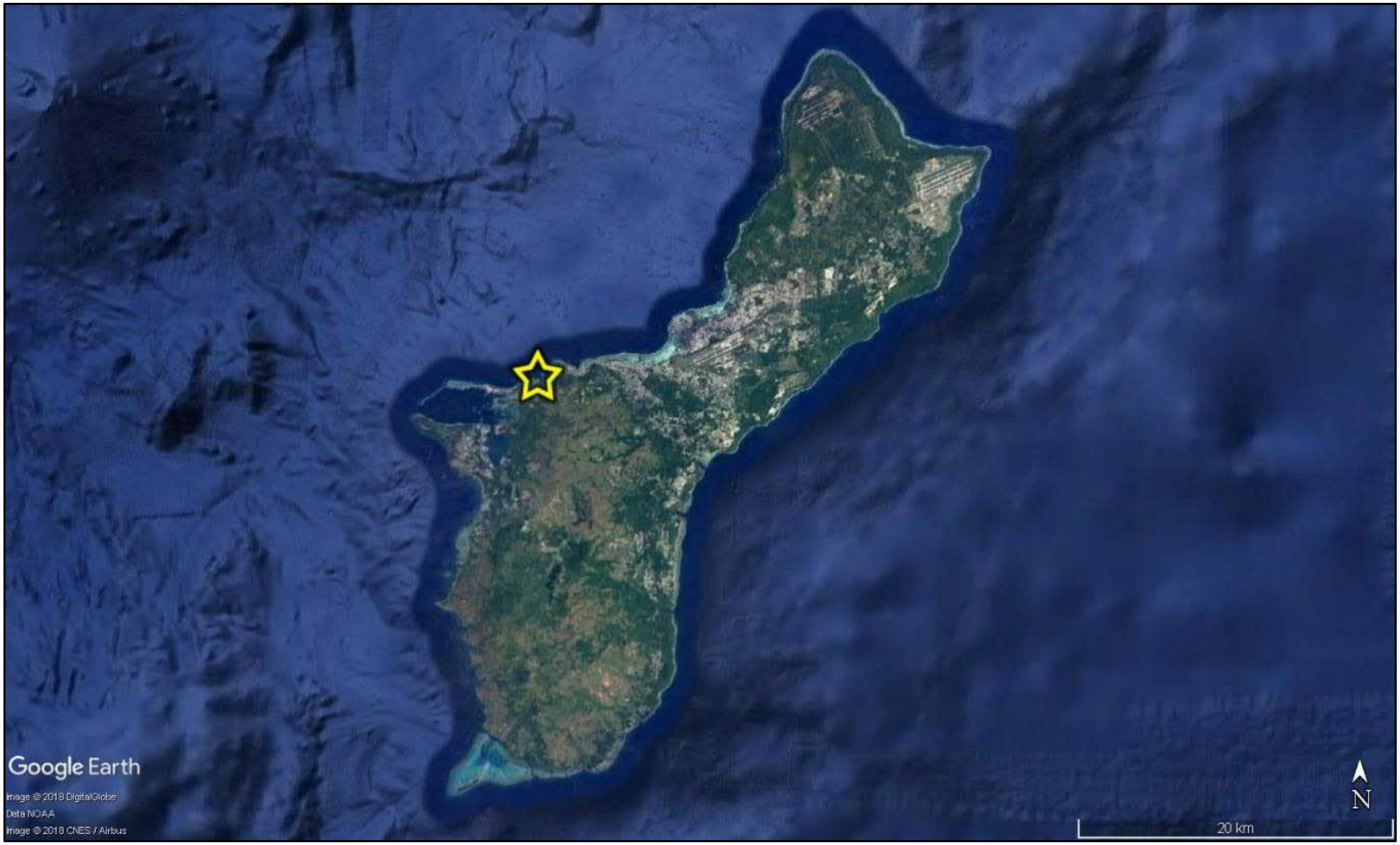

Figure 1. Map of Guam depicting the location of Piti Bay.

Figure 2. Map depicting the general location of the survey areas in Piti Bay.

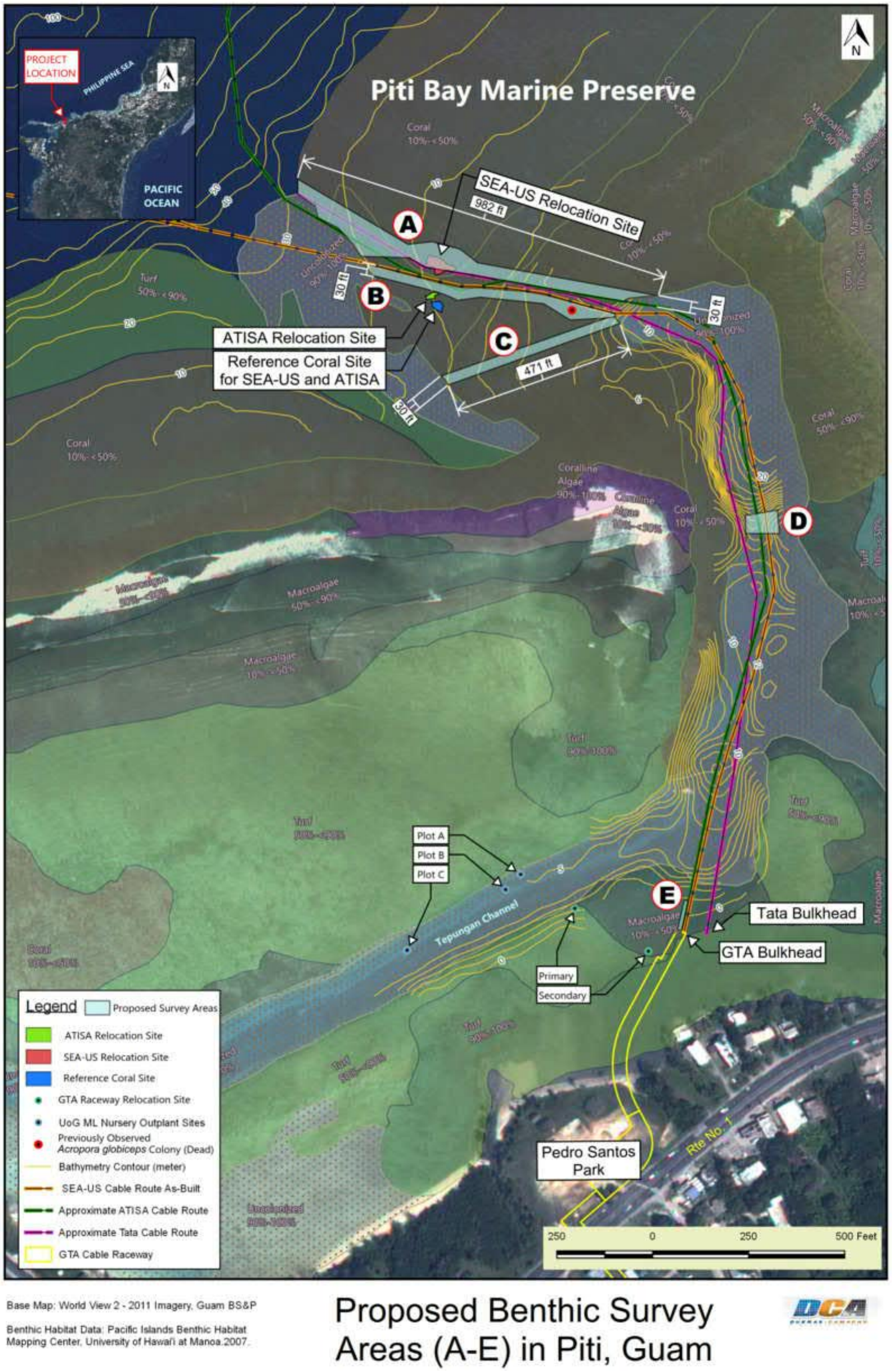

Figure 3. Map depicting survey Sites A–E and the approximate locations of the existing cables. Map produced by Duenas, Camacho, and Associates, Inc.

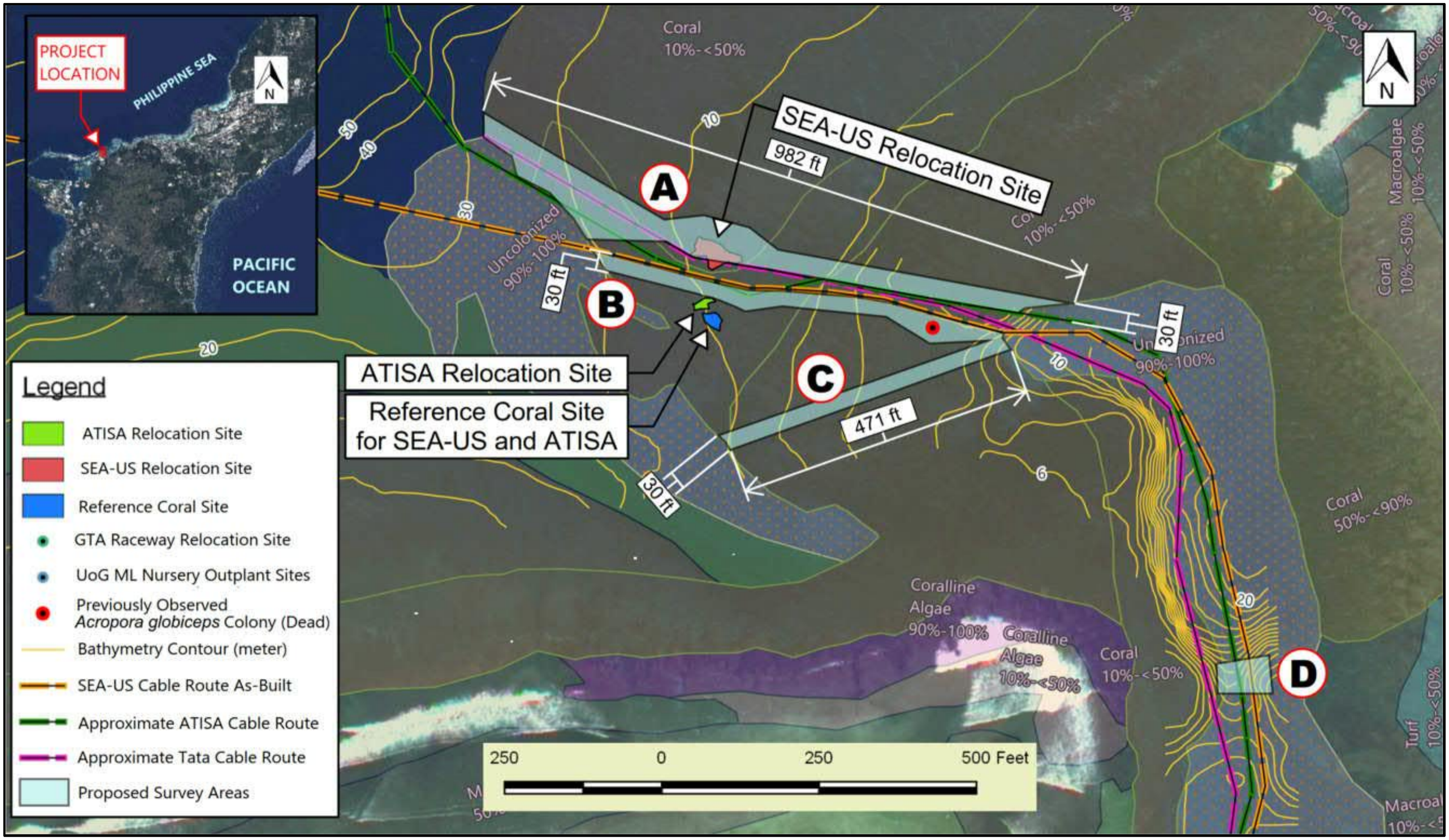

Figure 4. A detail of the map in Figure 3 depicting survey sites A–D and the approximate locations of the existing cables. Modified from a map produced by Duenas, Camacho, and Associates, Inc.

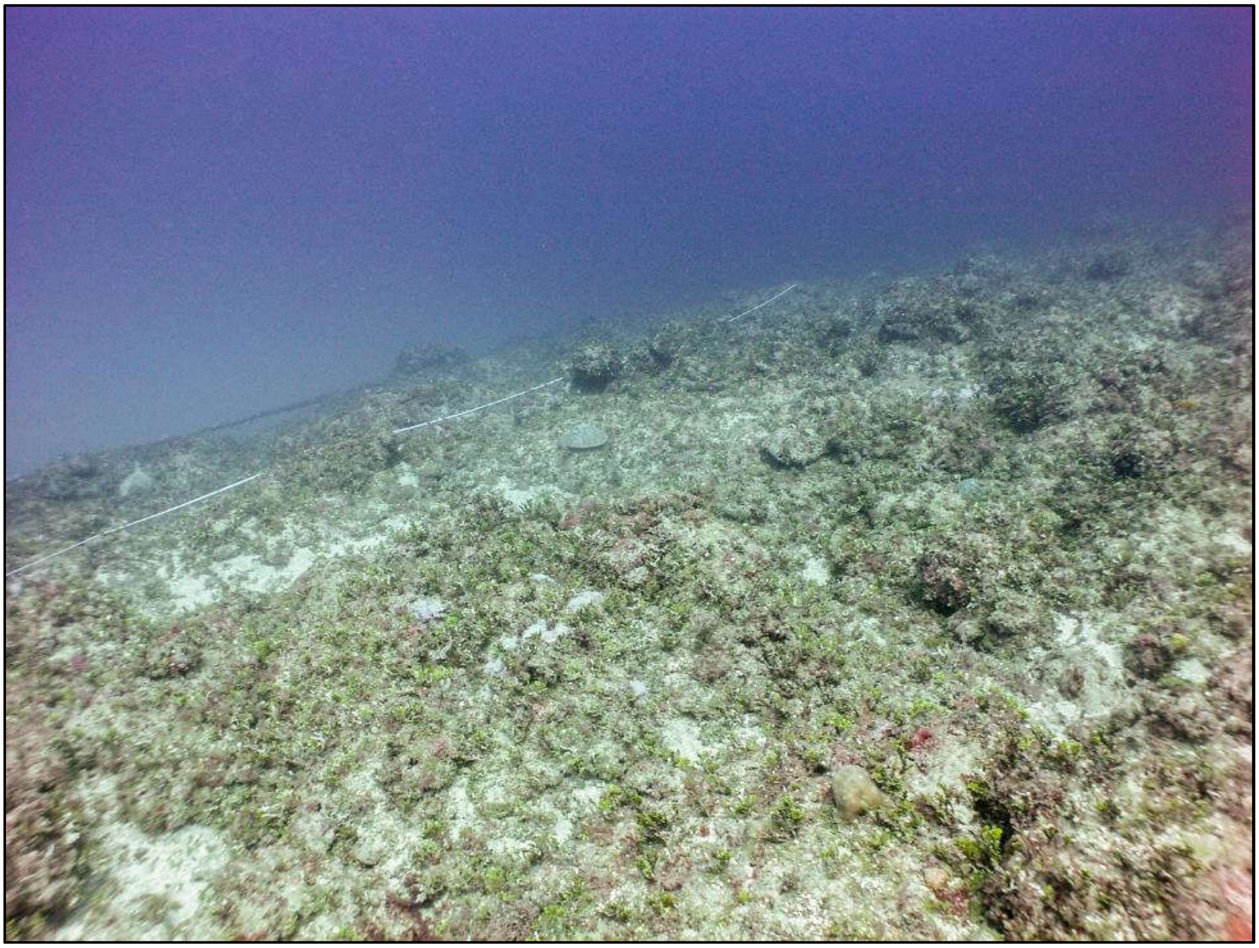

Figure 5. A low-relief, low coral cover, high algal cover benthic community representative of that observed at Site A between depths of approximately 30.5 m (100 ft) and 18 m (60 ft). The Tata cable (without articulated pipe) can be seen in the upper-left quadrant of the image, beyond the white transect tape.

Figure 6. Large colonies of the coral, *Diploastrea heliopora*, within the deeper portion of Site A. While coral cover along the deeper half of Site A was generally low, several large *D. heliopora* colonies were observed in this area, including the aggregation of colonies pictured here. The above colonies occur within the center of Site A (Transect 2). The Tata cable with articulated pipe can be observed immediately to the right (southwest) of the colonies.

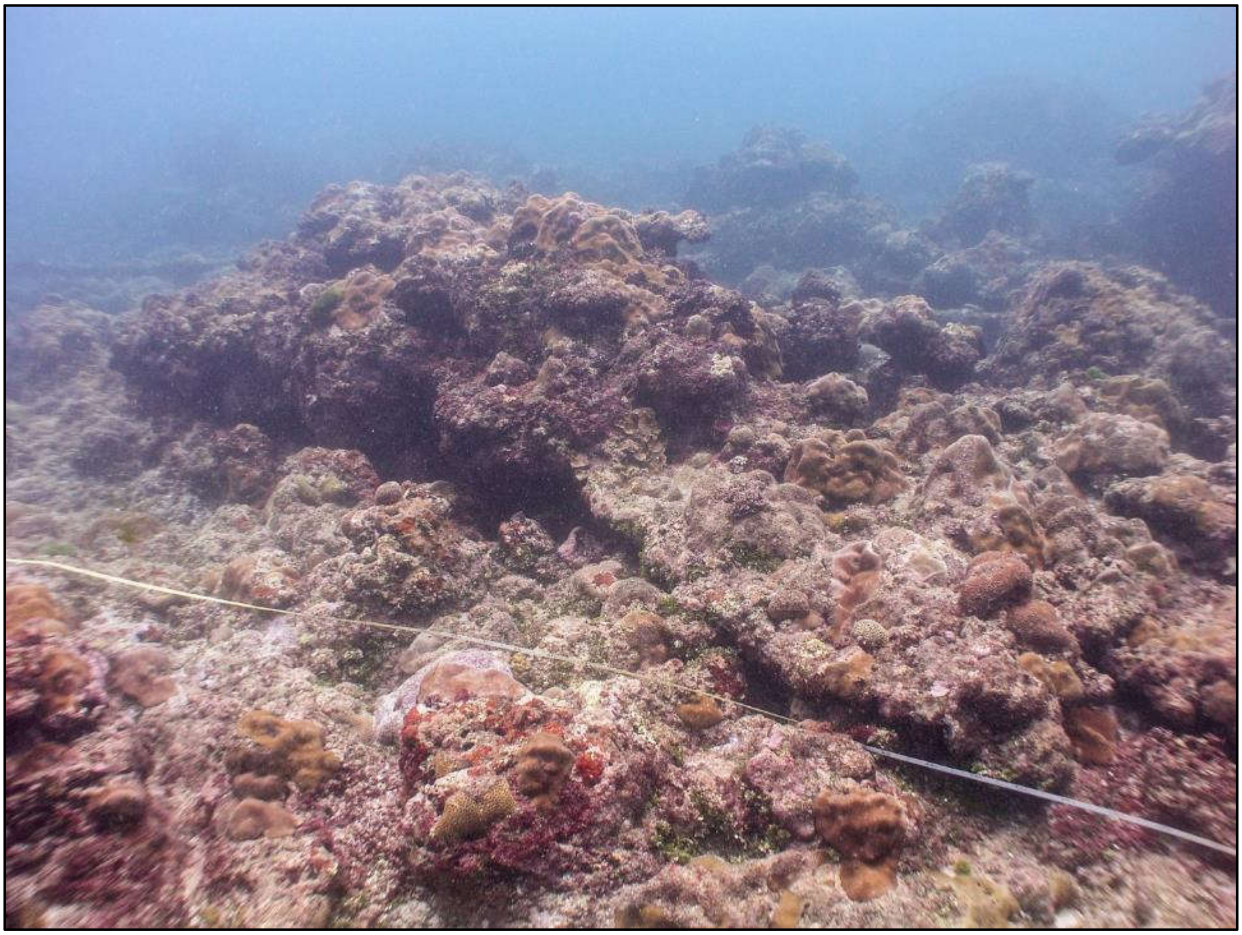

Figure 7. A relatively high-relief benthic community representative of that observed in the shallower (< 18 m depth) half of Site A. This benthic community exhibits higher coral cover and lower macroalgal cover than the deeper portion of Site A.

Figure 8. *Diploastrea heliopora* colonies within the deeper portion of Site B. Similar to the pattern observed at Site A, coral cover was lower in the deeper portion of Site B compared to the shallower portion. However, also similar to what was observed at Site A, several large *D. heliopora* colonies (pictured above) occurred within the deeper portion of Site B. The red circle marks the shoreward-leading transition on the Tata cable (at 28.7 m depth) from bare cable to articulated pipe.

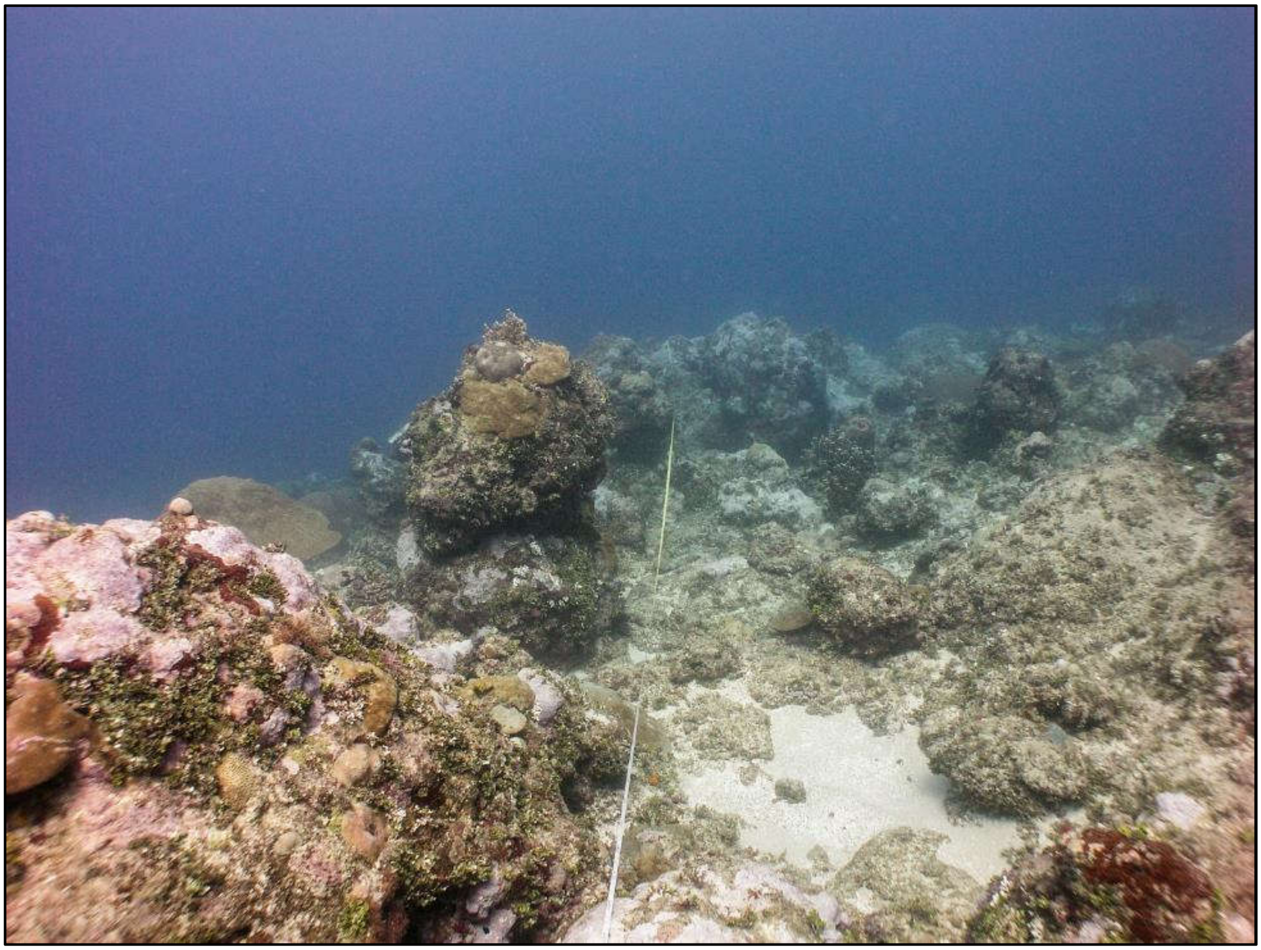

Figure 9. A moderate-to-high relief, *Porites*-dominated benthic community in the deeper portion of Site B.

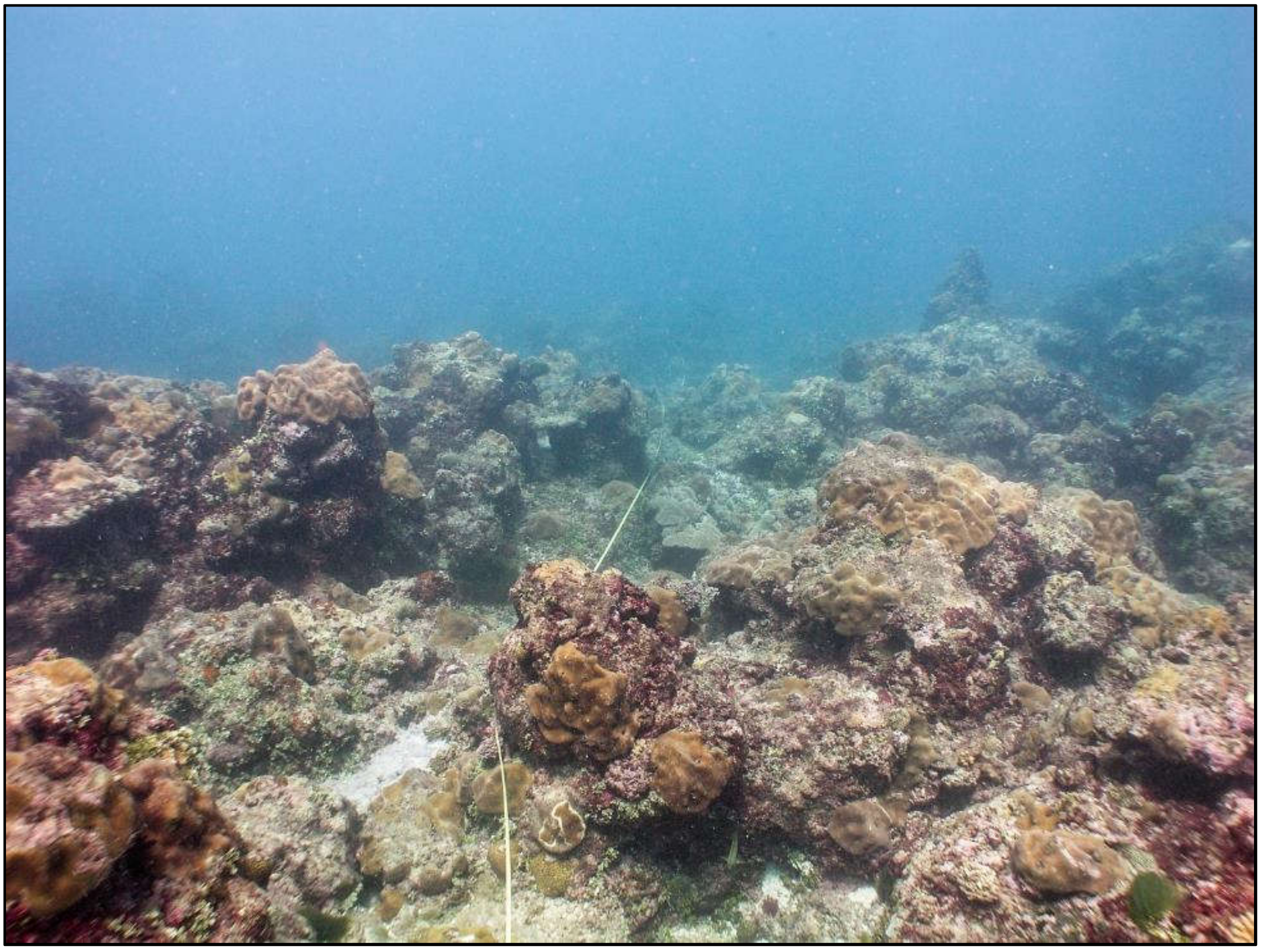

Figure 10. A moderate-to-high-relief benthic community comprised predominately by the brain coral, *Leptoria phrygia*, in the shallower portion of Site B.

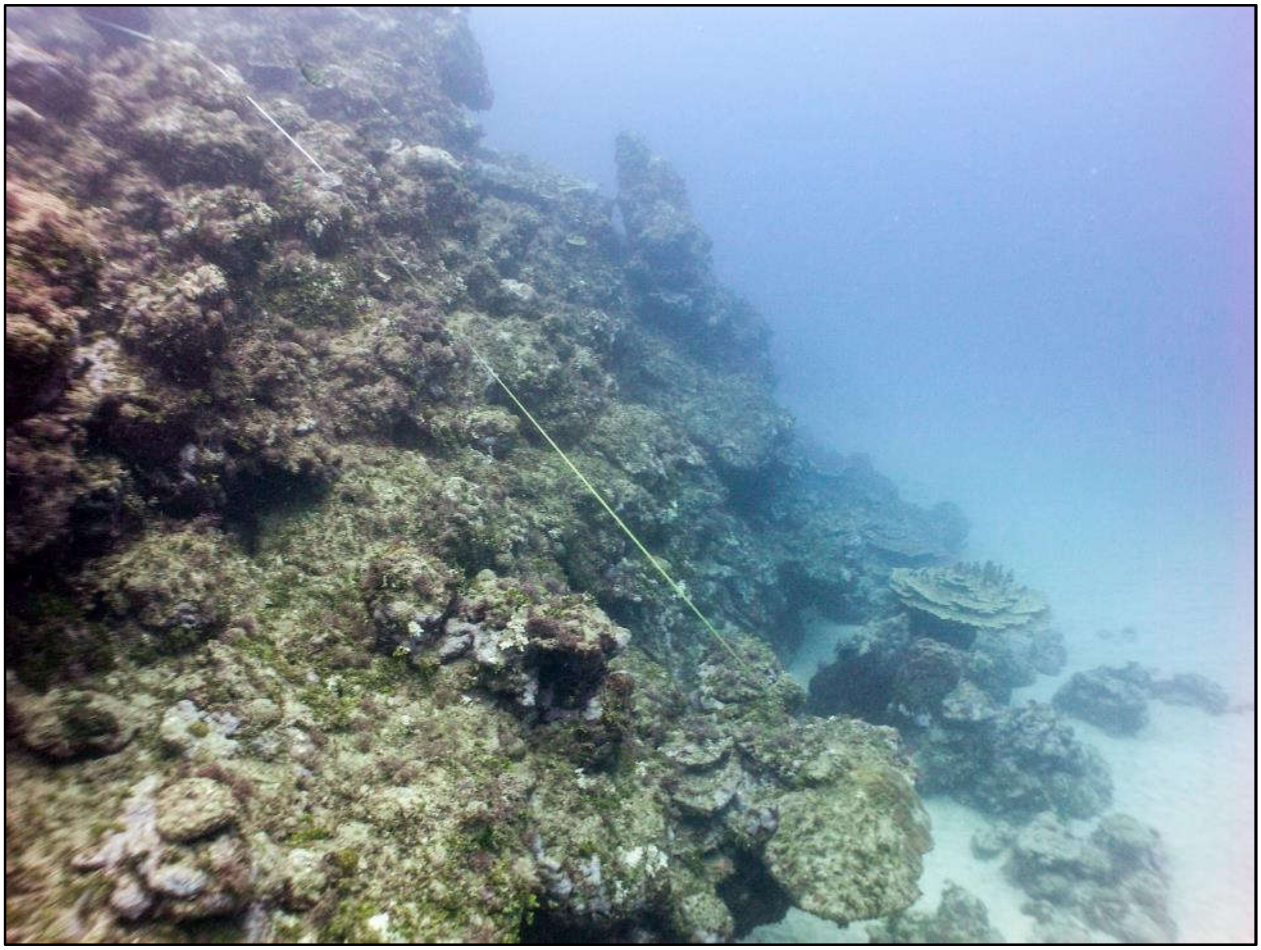

Figure 11. A steep slope at deep end of Site C. The steep hardbottom slope rises from a sand flat at a depth of approximately 22 m (72 ft) to a depth of approximately 15 m (50 ft).

Figure 12. A plate-and-pillar coral, *Porites rus*, along the base of the steep slope of Site C pictured in Figure 11. While coral cover is relatively low along the steep slope of Site C some notable coral colonies, such as the *P. rus* colony pictured above, are present along the slope. Colonies such as this one are relatively fragile and would be highly susceptible to physical damage if care is not taken to avoid them.

Figure 13. An exceptionally large *Diploastrea heliopora* colony in the vicinity of the section of steep slope across which Site C extends. This colony would not be impacted if the cable is laid within the boundaries of Site C as proposed, but its close proximity to Site C should be noted and care taken to avoid it. While colonies of this species seem relatively robust to physical damage, this partially plating form is less robust than the massive (i.e., boulder-shaped) colonies and could break or sustain significant tissue damage if a cable is placed across it.

Figure 14. A moderate-to-high relief, relatively low coral cover benthic community primarily dominated by massive *Porites* spp. in Site C. The community depicted here is representative of the portion of Site C between the steep slope pictured in Figs 11–13 and the shallower, shoreward portion of the site pictured in Figure 15.

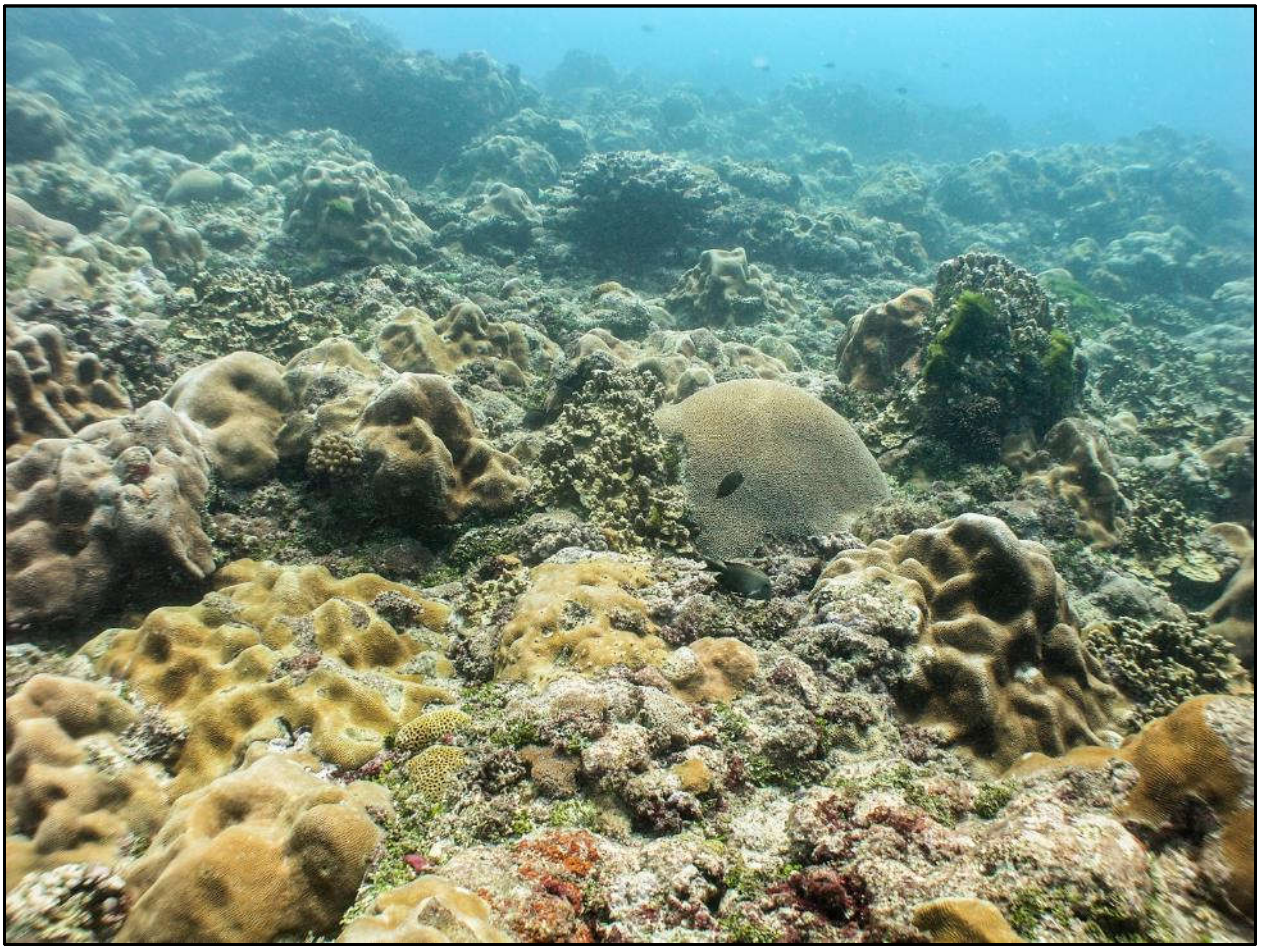

Figure 15. A moderate relief, relatively high coral cover benthic community dominated by the brain coral, *Leptoria phrygia*. This benthic community is representative of the shallower, shoreward-most portion of Site C.

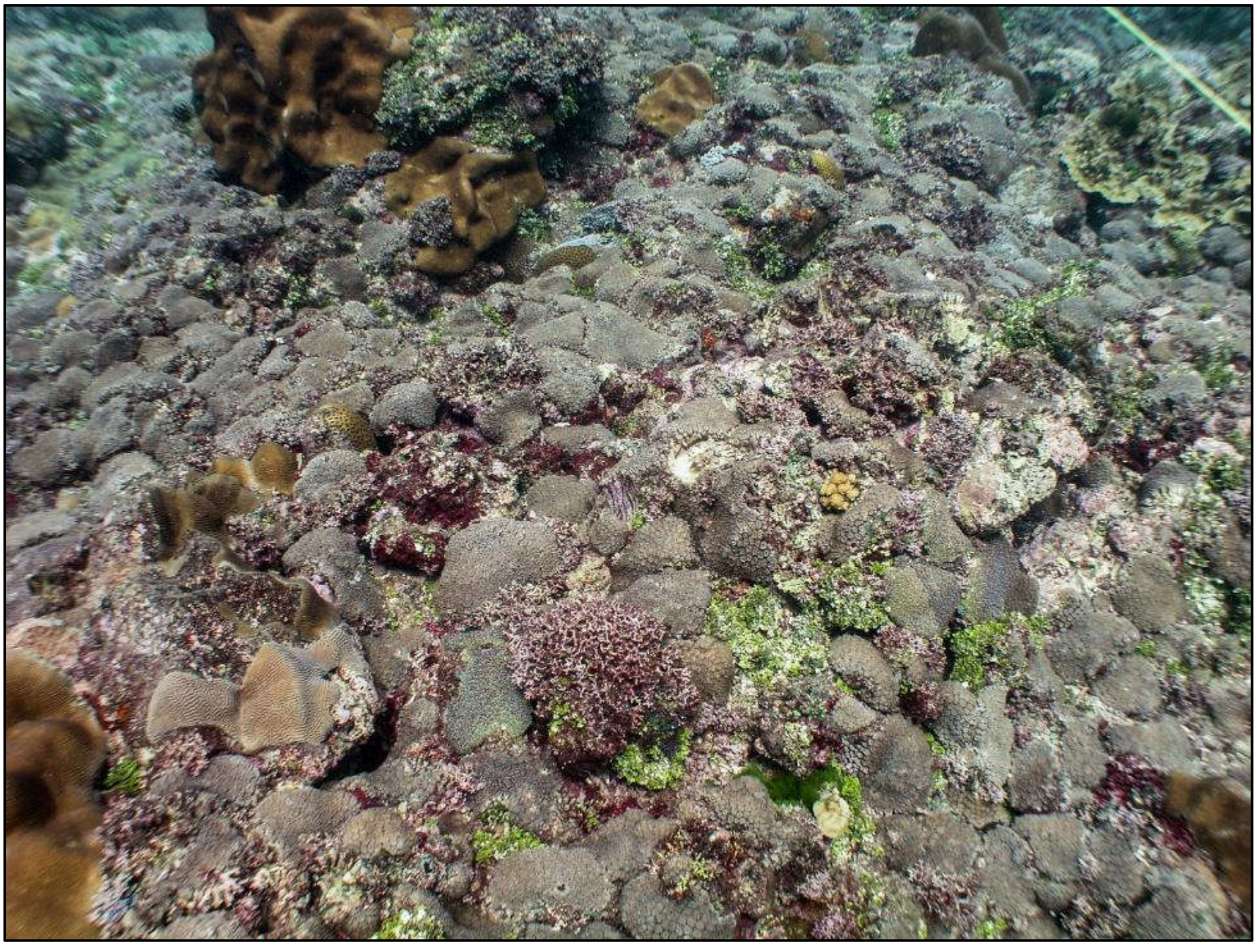

Figure 16. Unusually dense and extensive cover of *Galaxea fascicularis* colonies in the shallower portion of Site C. While these encrusting colonies do not form branches, they have delicate skeletal features that are highly susceptible to physical damage.

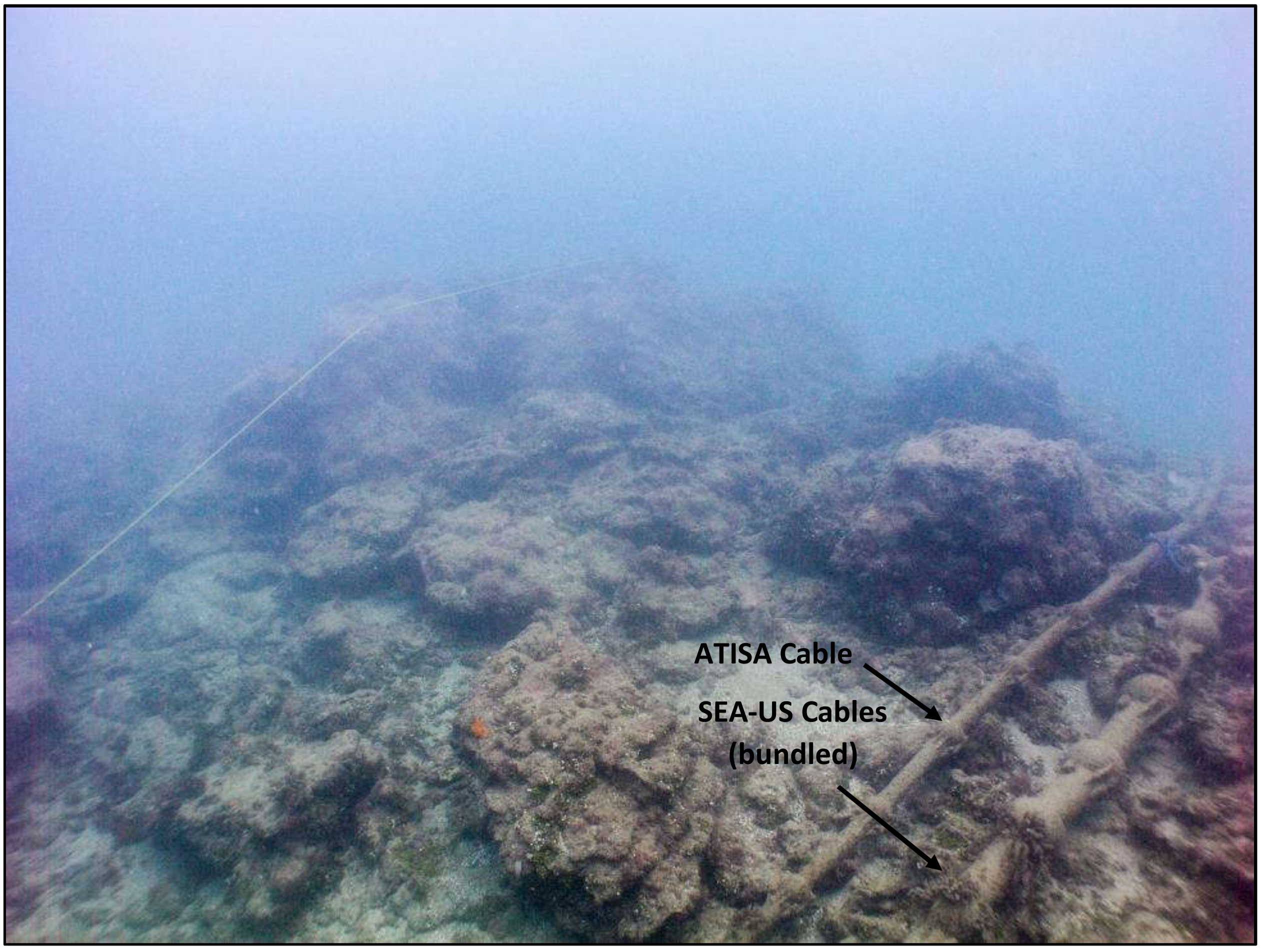

Figure 17. The patch of raised, moderate-relief hardbottom near the center of Tepungan Channel. Few coral colonies were observed in the vicinity of Site D, and total coral cover was very low (<2%). The existing SEA-US and ATISA cables can be seen in the lower right and the transect tape of Transect 1 (the easternmost transect) in the upper left.

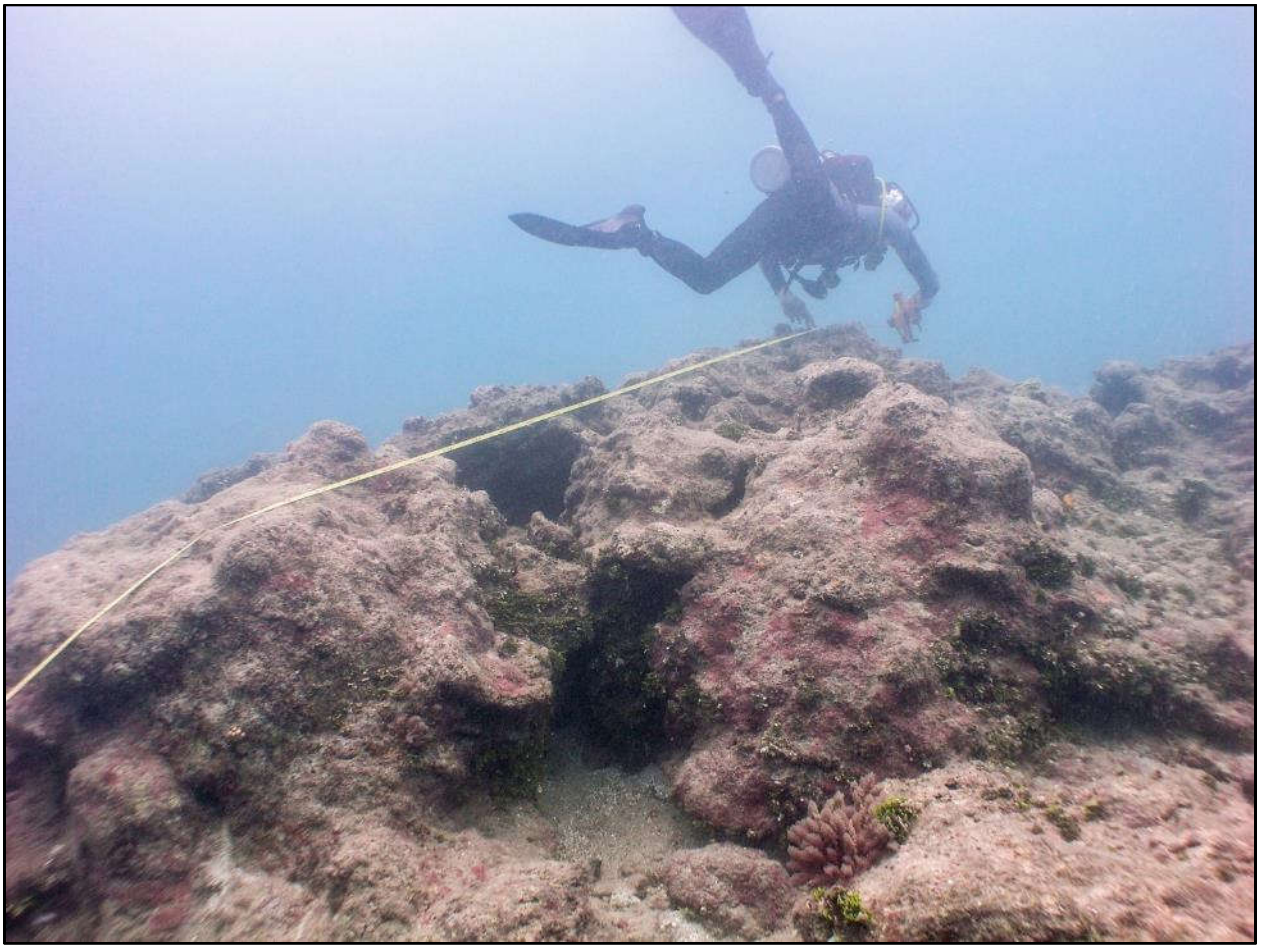

Figure 18. A closer view of the hardbottom benthos of Site D.

Figure 19. A colony of the branching coral, *Pocillopora meandrina*, observed within Site D. While coral cover was very low at Site D, a few notable coral colonies, such as this *P. meandrina* colony, were observed within the site. Care should be taken to avoid physical damage to these fragile branching colonies.

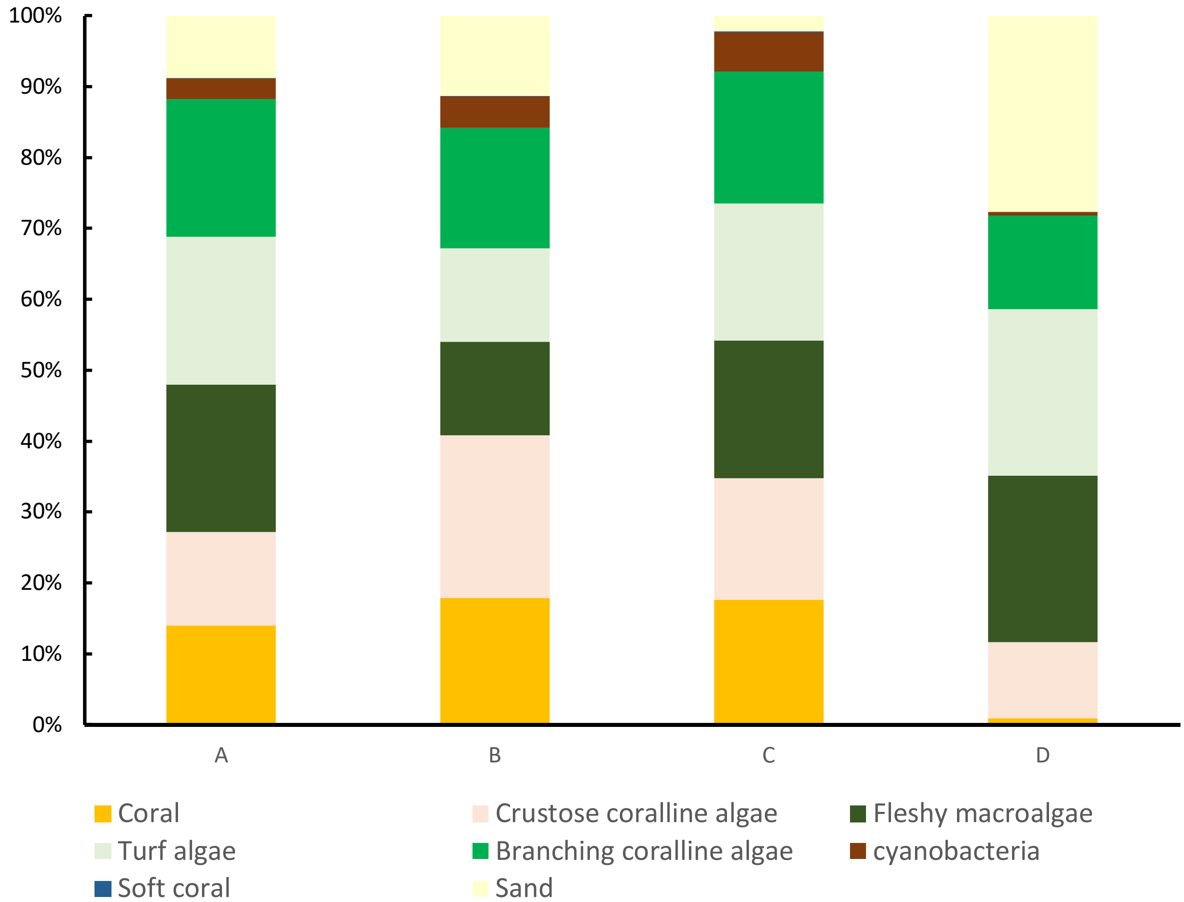

Figure 20. Mean percent cover for major benthic cover types at Sites A–D.

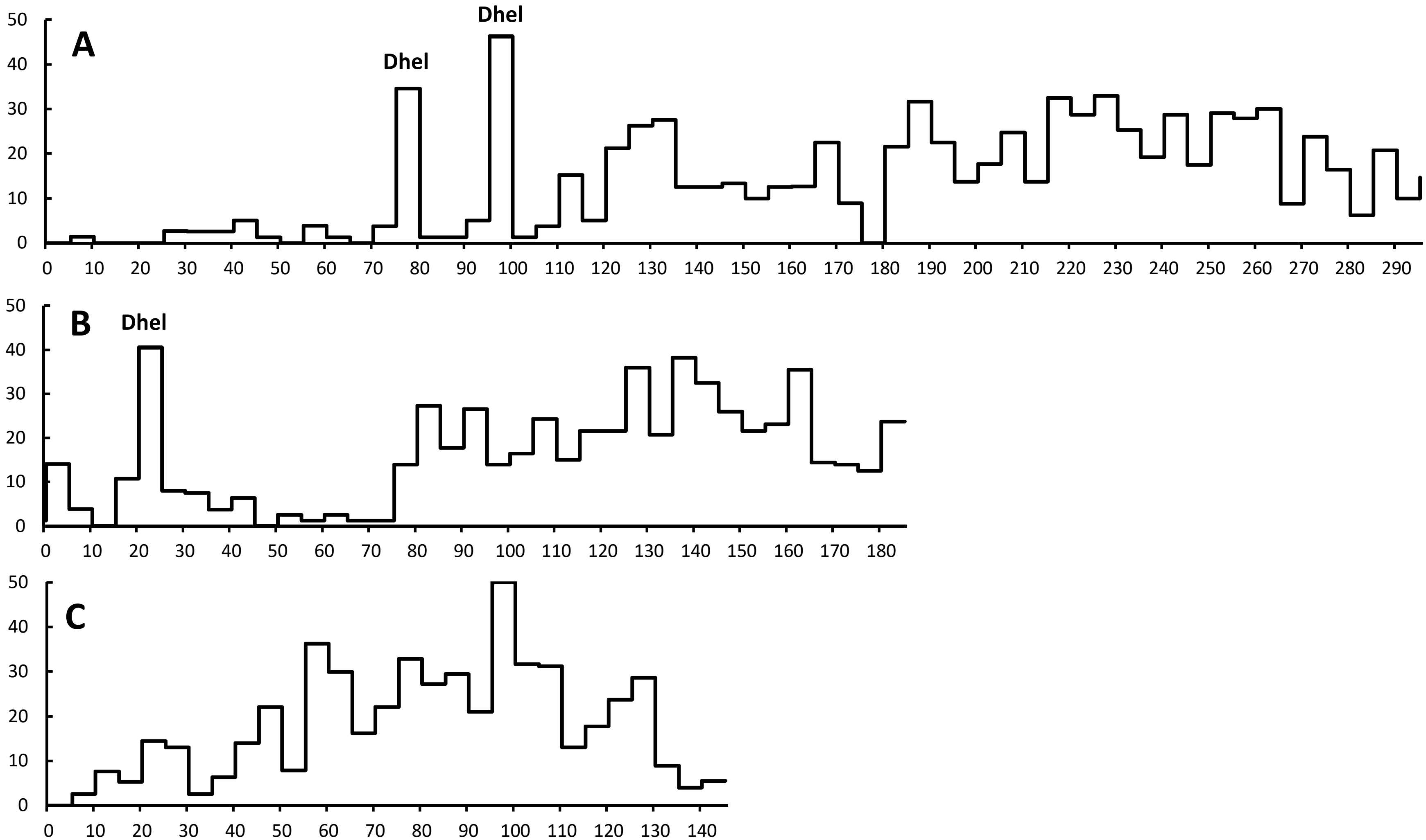

Figure 21. Percent cover (y-axis) of hard corals, including scleractinian corals, *Millepora* spp., and *Heliopora coerulea,* across the length in meters (x-axis) of Sites A, B, and C. Percent cover values were derived from point count analysis of benthic photo transect images, and represent mean percent cover for five-meter bins (= five benthic photo transect images). The zero-meter mark corresponds to the deepest, most seaward end of each site and the final value for each site corresponds to the location at which each site transitions from the hardbottom of the seaward slope to the sandy bottom of the Tepungan Channel. "Dhel" indicates 5-m sections within which the transect crossed over large *Diploastrea heliopora* colonies.

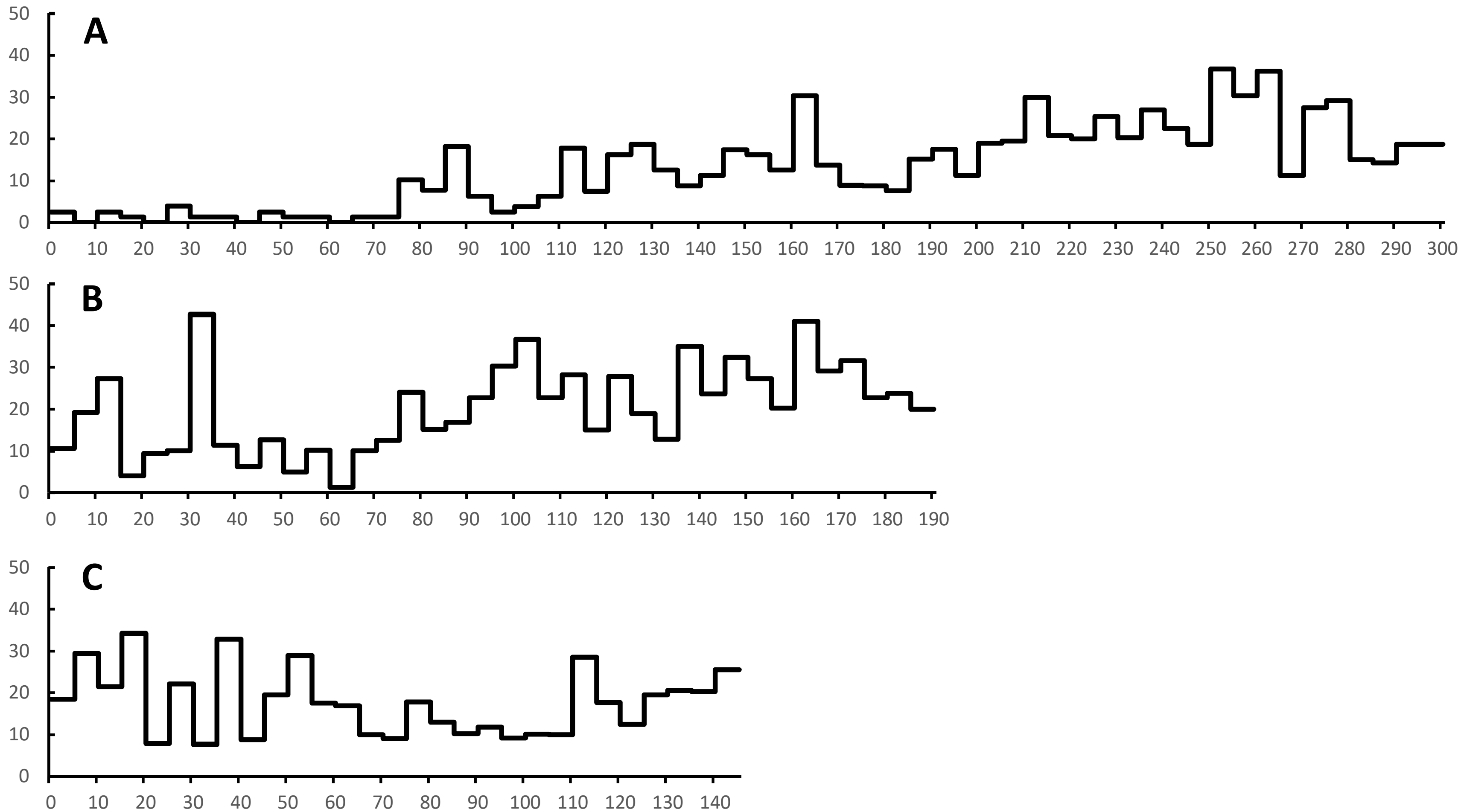

Figure 22. Percent cover (y-axis) of crustose coralline algae across the length in meters (x-axis) of Sites A, B, and C. Percent cover values were derived from point count analysis of benthic photo transect images and represent mean percent cover for five-meter bins (= five benthic photo transect images). The zero-meter mark corresponds to the deepest, most seaward end of each site and the final value for each site corresponds to the location at which each site transitions from the hardbottom of the seaward slope to the sandy bottom of the Tepungan Channel.

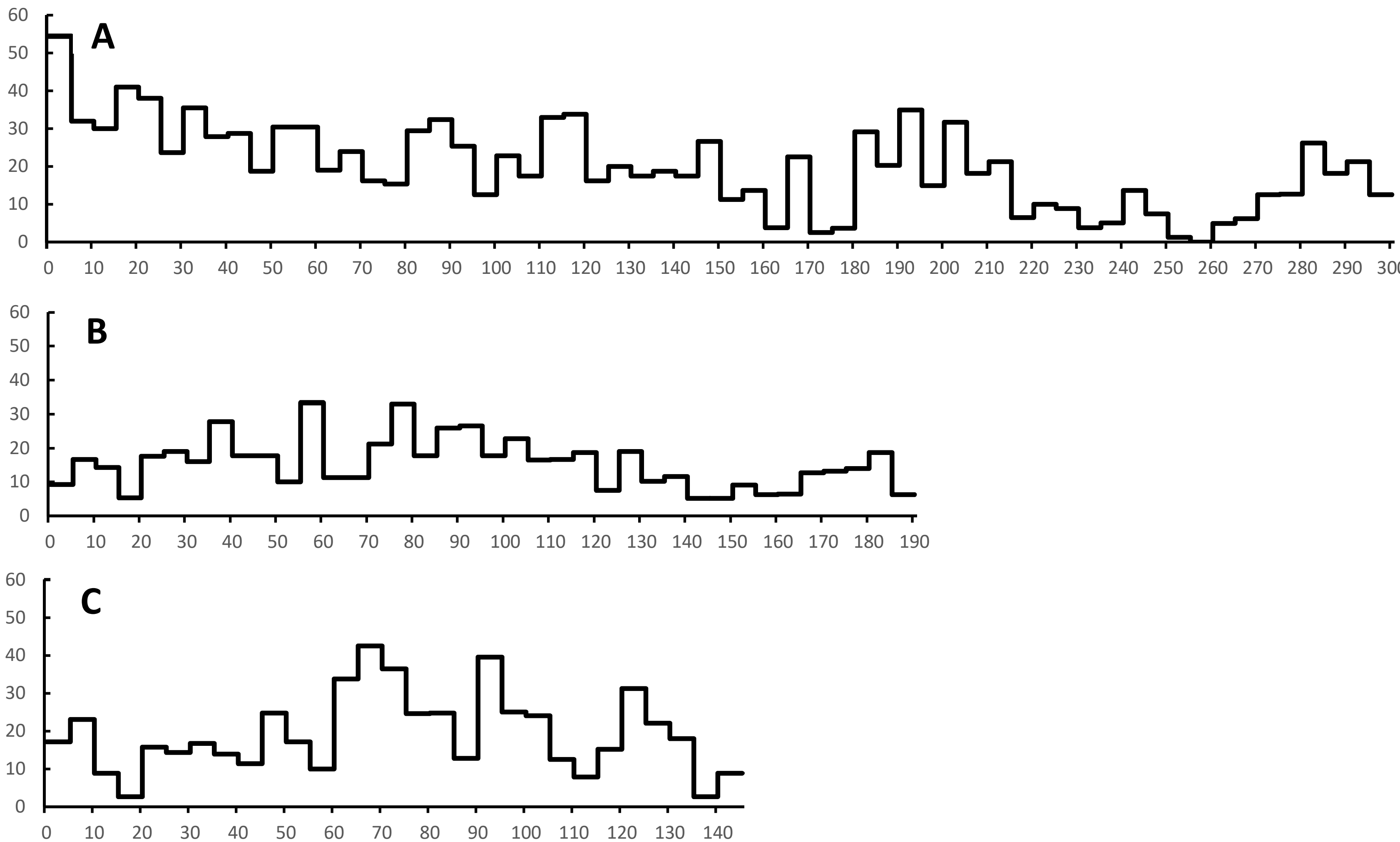

Figure 23. Percent cover (y-axis) of branching coralline algae (primarily *Halimeda* spp.) across the length in meters (x-axis) of Sites A, B, and C. Percent cover values were derived from point count analysis of benthic photo transect images and represent mean percent cover for five-meter bins (= five benthic photo transect images). The zero-meter mark corresponds to the deepest, most seaward end of each site and the final value for each site corresponds to the location at which each site transitions from the hardbottom of the seaward slope to the sandy bottom of the Tepungan Channel.

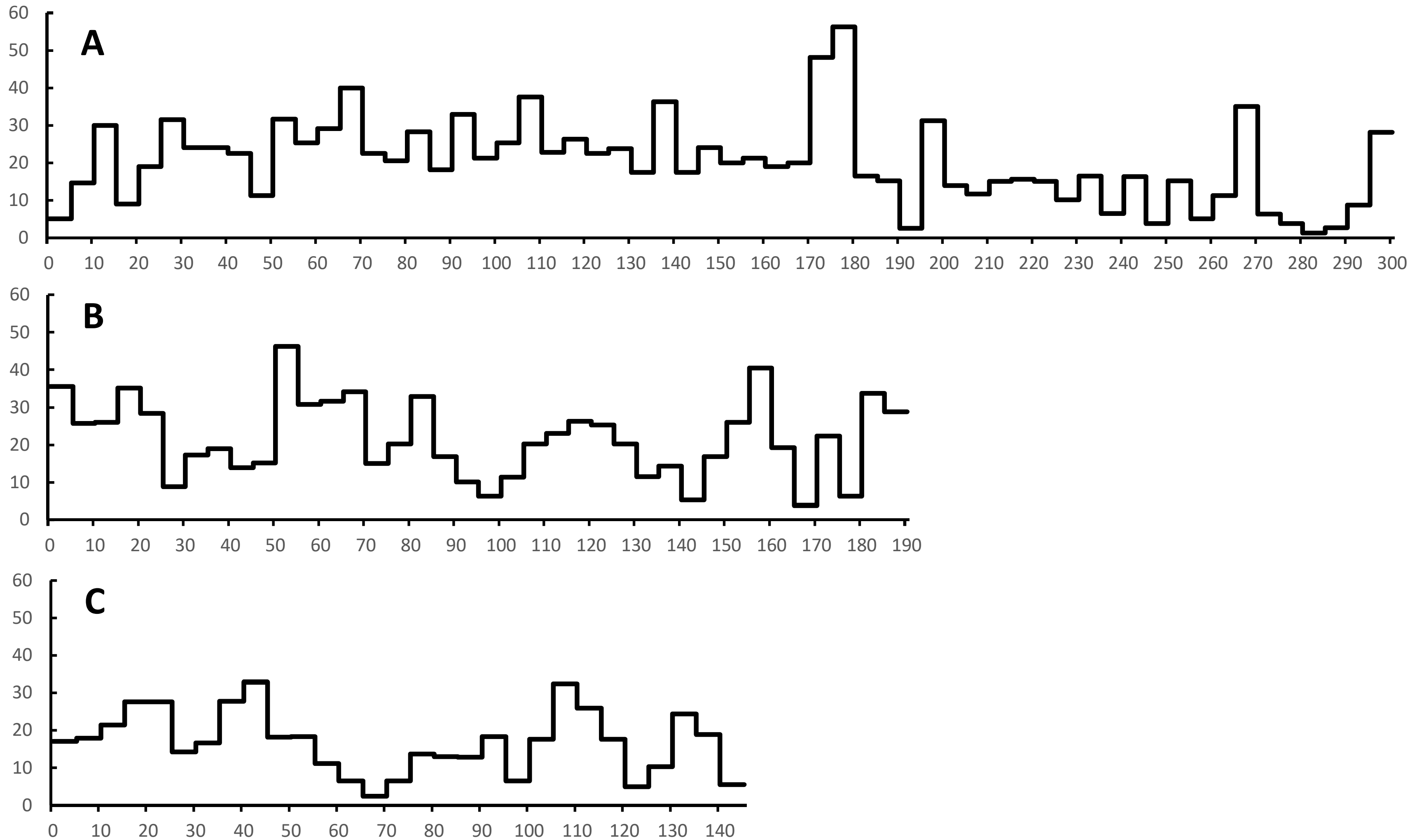

Figure 24. Percent cover (y-axis) of turf algae across the length in meters (x-axis) of Sites A, B, and C. Percent cover values were derived from point count analysis of benthic photo transect images and represent mean percent cover for five-meter bins (= five benthic photo transect images). The zero-meter mark corresponds to the deepest, most seaward end of each site and the final value for each site corresponds to the location at which each site transitions from the hardbottom of the seaward slope to the sandy bottom of the Tepungan Channel.

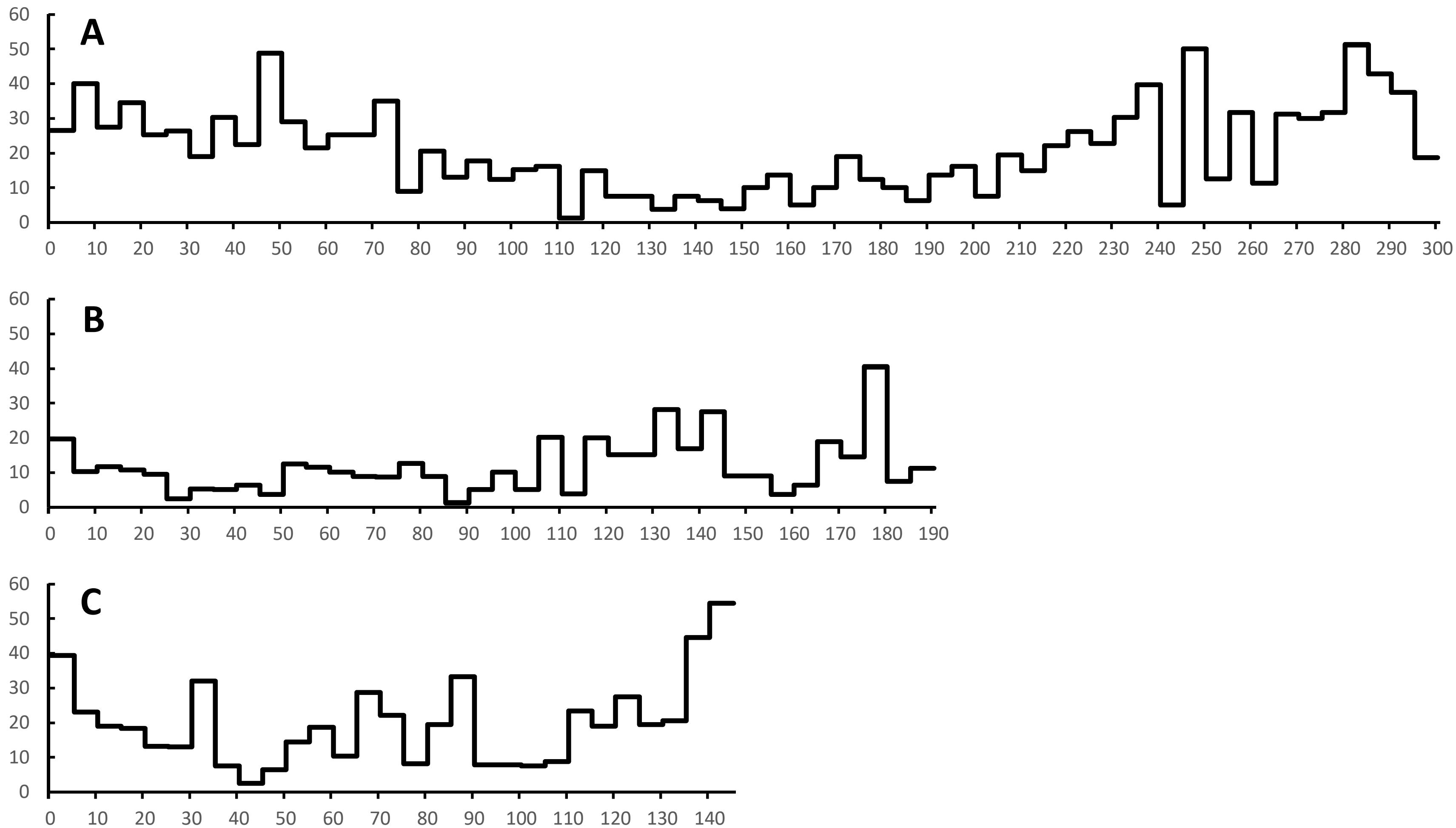

Figure 25. Percent cover (y-axis) of fleshy macroalgae algae (including erect and adherent forms) across the length in meters (x-axis) of Sites A, B, and C. Percent cover values were derived from point count analysis of benthic photo transect images and represent mean percent cover for five-meter bins (= five benthic photo transect images). The zero-meter mark corresponds to the deepest, most seaward end of each site and the final value for each site corresponds to the location at which each site transitions from the hardbottom of the seaward slope to the sandy bottom of the Tepungan Channel.

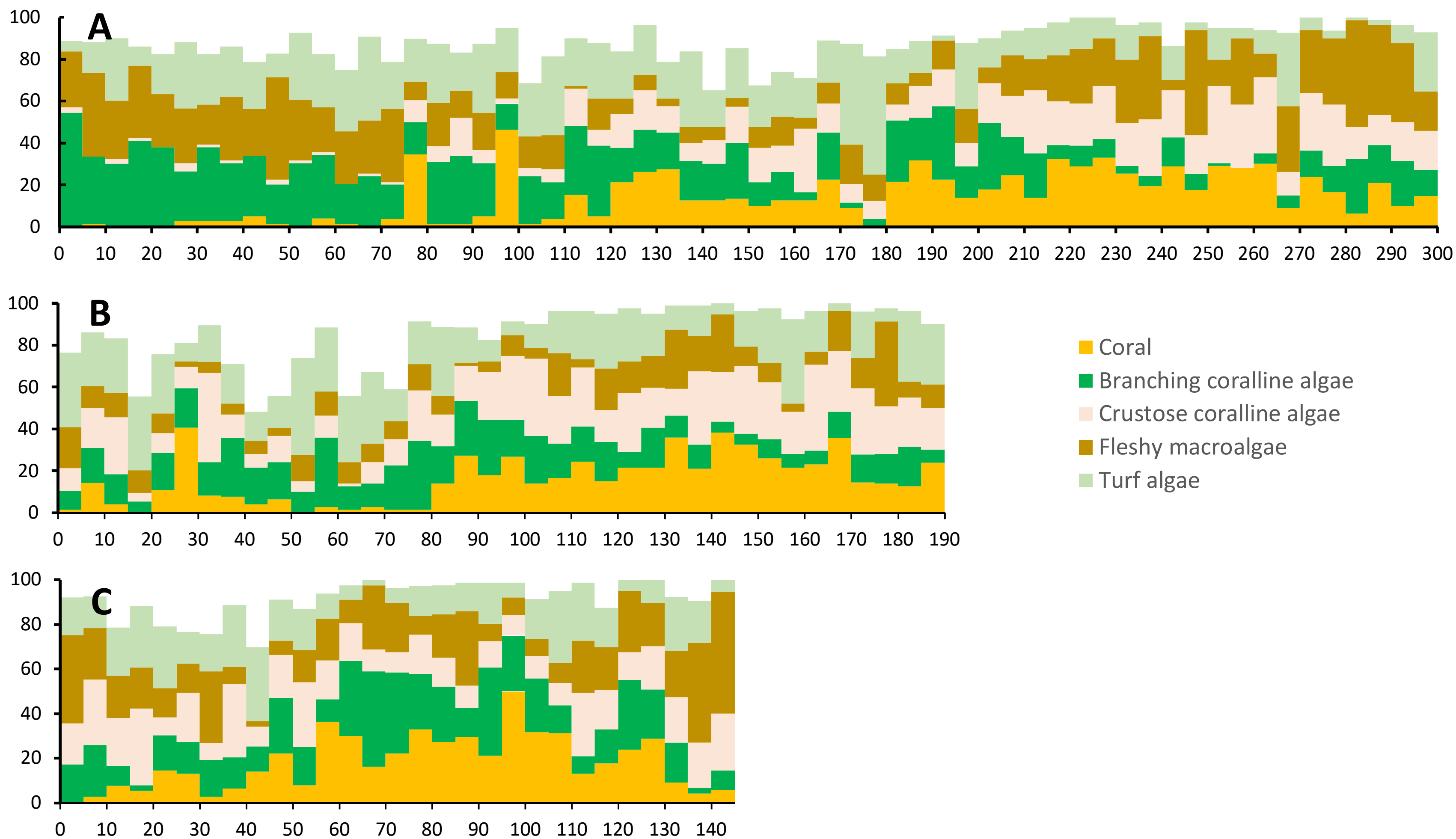

Figure 26. Percent cover (y-axis) of hard coral, branching coralline algae (primarily *Halimeda* spp.), crustose coralline algae, fleshy macroalgae algae (including erect and adherent forms), and turf algae across the length in meters (x-axis) of Sites A, B, and C. Percent cover values were derived from point count analysis of benthic photo transect image, and represent mean percent cover for five-meter bins (= five benthic photo transect images). The zero-meter mark corresponds to the deepest, most seaward end of each site and the final value for each site corresponds to the location at which each site transitions from the hardbottom of the seaward slope to the sandy bottom of the Tepungan Channel.

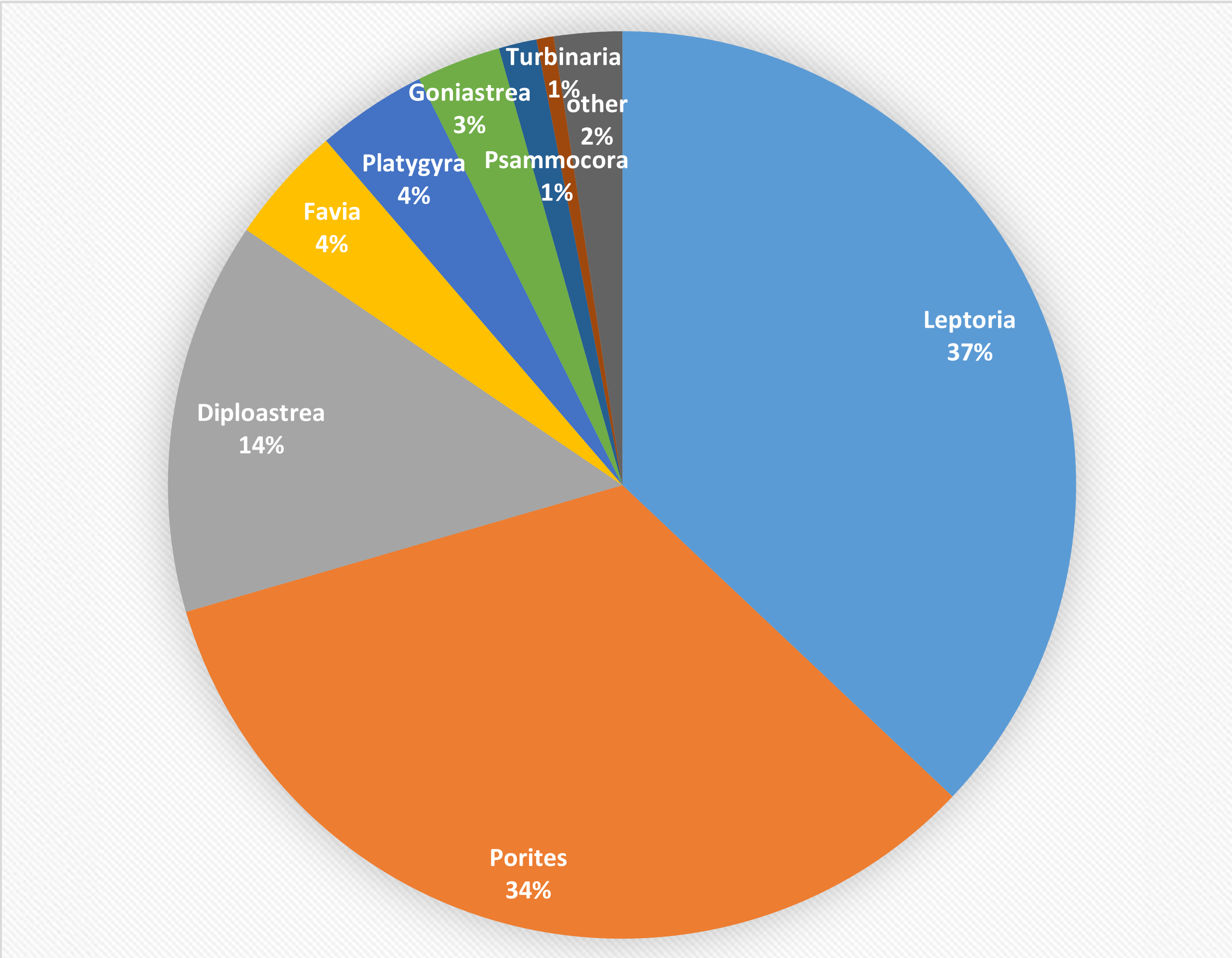

Figure 27. Relative abundance of genera comprising the hard coral community within Site A. Values represent the percentage contributions to the total percent cover of hard coral.

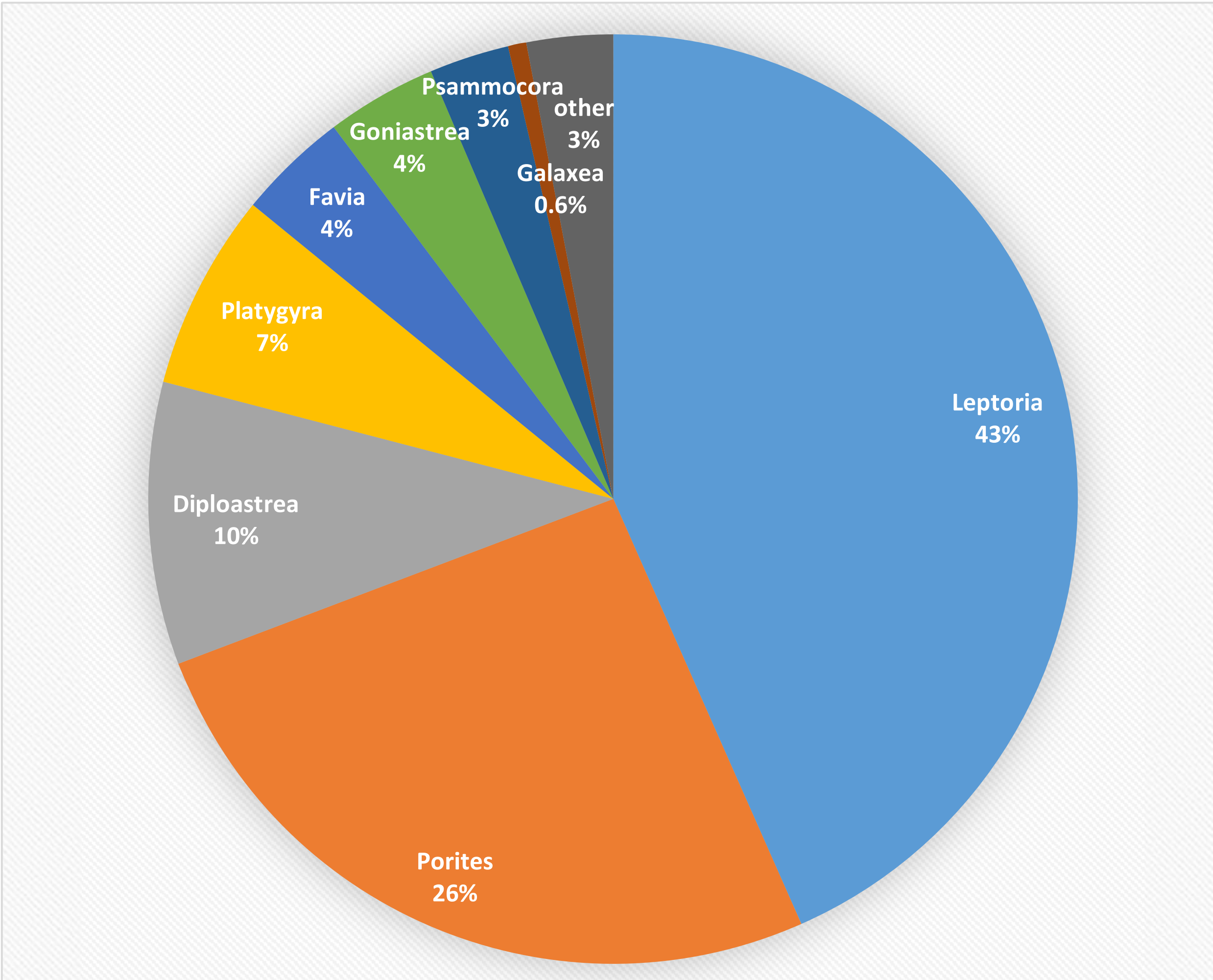

Figure 28. Relative abundance of genera comprising the hard coral community within Site B. Values represent the percentage contributions to the total percent cover of hard coral.

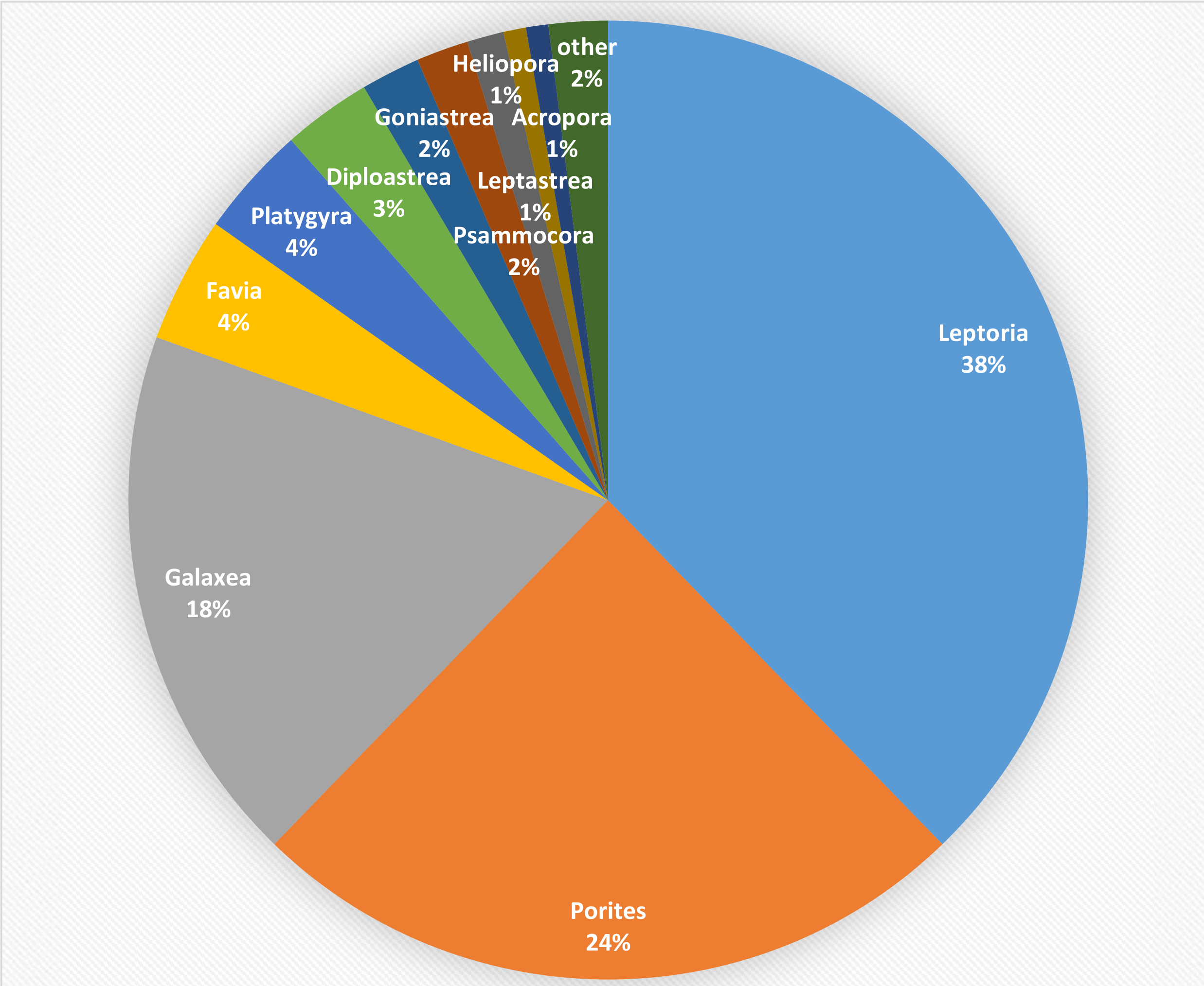

Figure 29. Relative abundance of genera comprising the hard coral community within Site C. Values represent the percentage contributions to the total percent cover of hard coral.

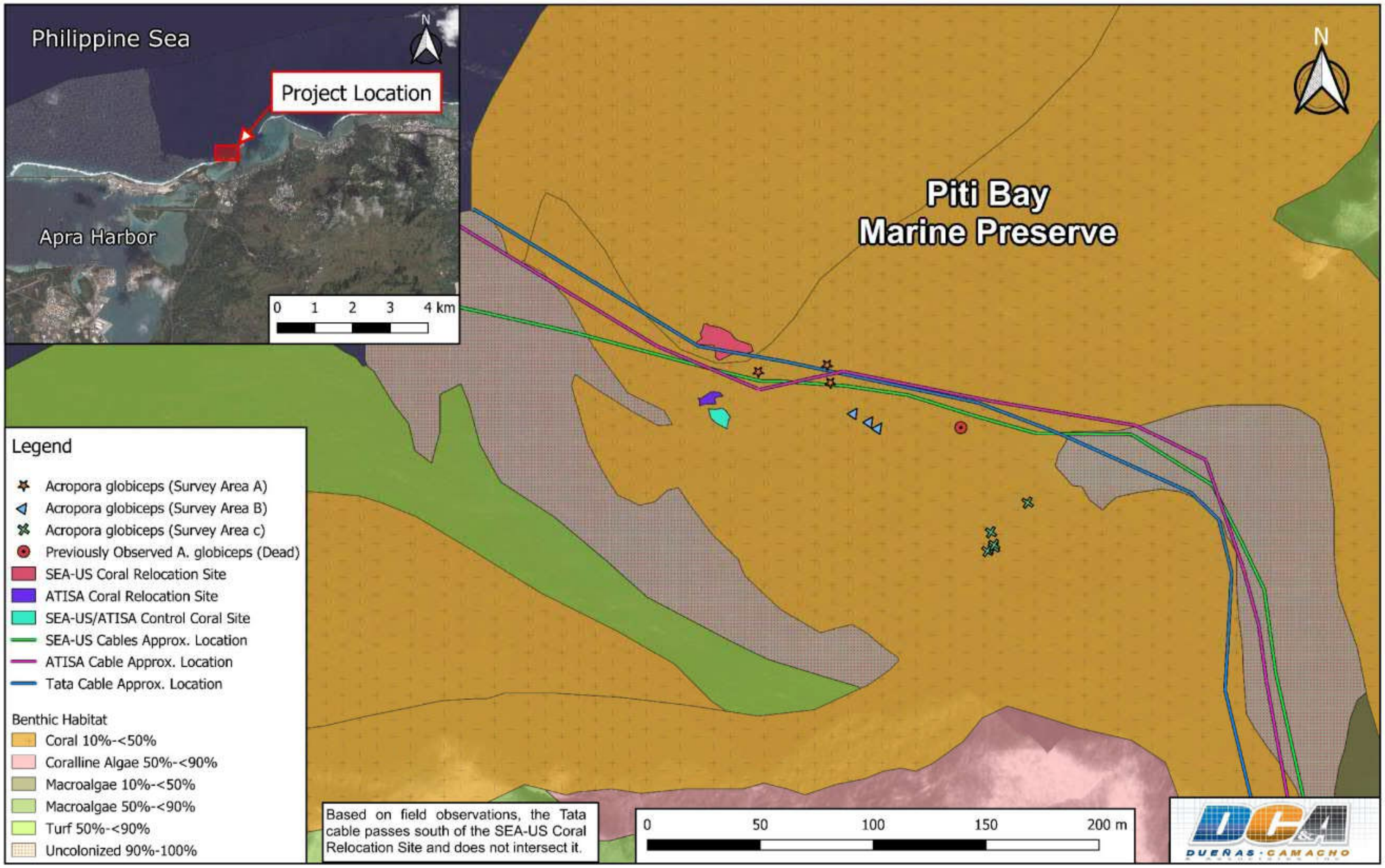

Figure 30. Location of colonies tentatively identified as *Acropora globiceps* at Sites A, B, and C in relation to the existing cables and coral relocation sites. Coordinates for each colony are provided in Table D. Map produced by Duenas, Camacho, and Associates, Inc.

Figure 31. Colonies A1 (top) and A2 (bottom) tentatively identified as the ESA-listed coral species, *Acropora globiceps*, that were observed in Site A. Young colonies such as these are difficult to discern from the very similar *Acropora* cf. *humilis*.

Figure 32. Colony A3 in Site A, tentatively identified as the ESA-listed coral species, *Acropora globiceps*. This colony is slightly larger and possesses more branches than the colonies pictured in Figure 31, and thus characters that distinguish *Acropora globiceps* from *A*. cf. *humilis*, such as the terete branches with even lengths, are more readily visible. Still, the high degree of similarity between small colonies of *A. globiceps* and *A*. cf. *humilis*, and the general lack of understanding of the relationship between these two species, make even this identification tentative.

Figure 33. Colonies B1 (top) and B2 (bottom) in Site B, tentatively identified as the ESA-listed coral species, *Acropora globiceps*. Young colonies such as these are difficult to discern from the very similar *Acropora* cf. *humilis*, but the terete branches of relatively even length suggest that these colonies may be *A. globiceps*.

Figure 34. Colony B3 in Site B, tentatively identified as the ESA-listed coral species, *Acropora globiceps*. Young colonies such as these are difficult to discern from the very similar *Acropora* cf. *humilis*, but the terete branches of relatively even length suggest that these colonies may be *A. globiceps*.

Figure 35. Colonies C1 (top) and C2 (bottom) in Site C, tentatively identified as the ESA-listed coral species, *Acropora globiceps*. Young colonies such as these are difficult to discern from the very similar *Acropora* cf. *humilis*, but the terete branches of relatively even length suggest that these colonies may be *A. globiceps*.

Figure 36. Colonies C3 (top) and C4 (bottom) in Site B, tentatively identified as the ESA-listed coral species, *Acropora globiceps*. With its terete branches of relatively even length colony C3 can be more confidently identified as *A. globiceps*. The form of colony C4 appears to be somewhat intermediate between *A. globiceps* and *A.* cf. *humilis*, as it exhibits some tapered branches that diverge more widely than colonies currently considered typical of Marianas form of *A. globiceps*.

Figure 37. Colony C5 in Site C, tentatively identified as the ESA-listed coral species, *Acropora globiceps*. This relatively large, well-developed colony exhibits the short, terete branches of even length that are characteristic of what is currently considered the Marianas form of *A. globiceps*. Also visible in this colony are the branch clusters typical of this species.

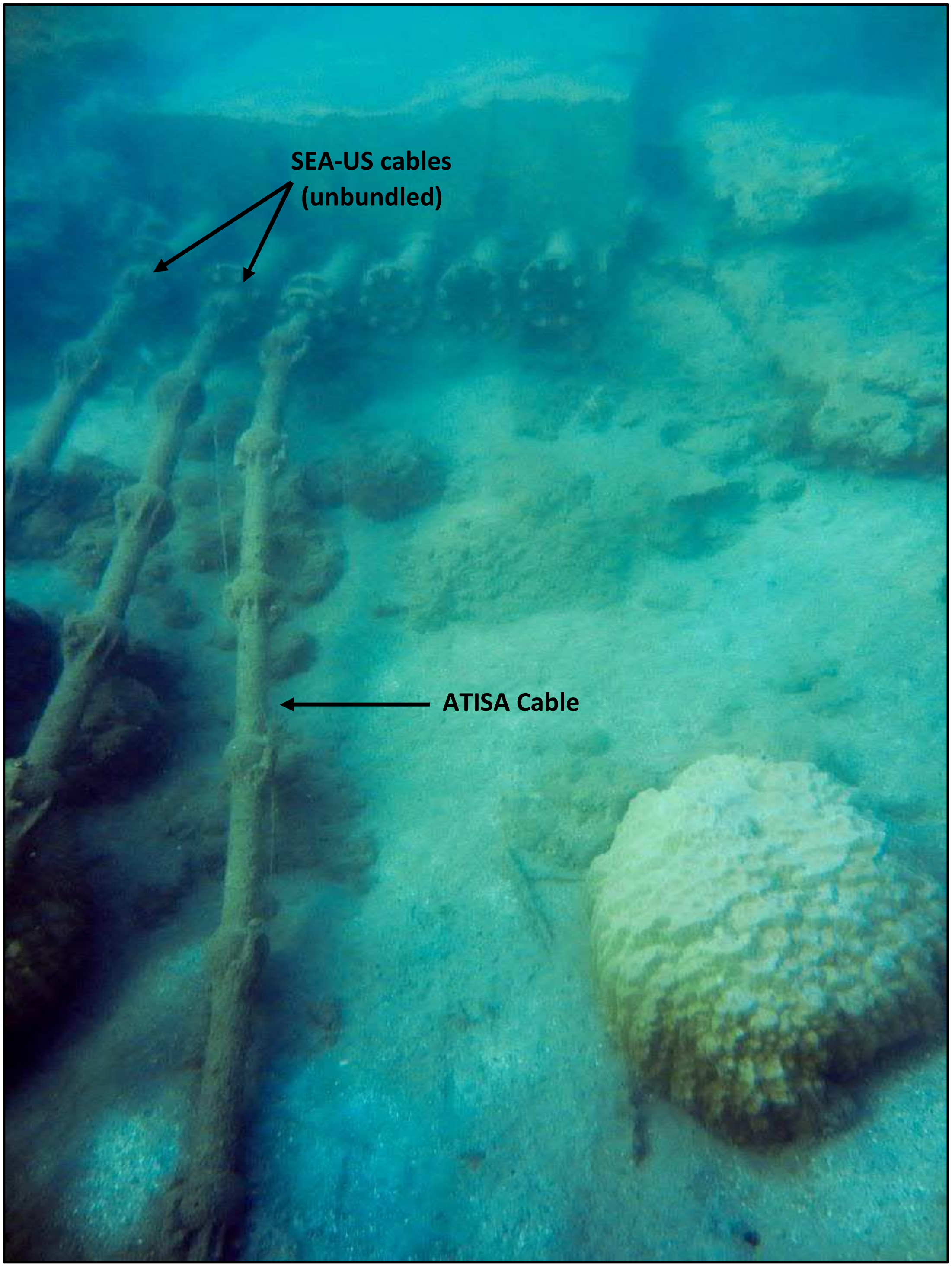

Figure 38. A *Porites* colony (~75 cm diameter) at Site E located approximately 2.5 m seaward of the bulkhead to which the proposed cables will connect. The colony appears to be attached to hardbottom substrate and would be difficult to move without potentially damaging the colony.

Figure 39. A *Porites* colony and a group of *Pocillopora damicornis* colonies (top) located approximately 10 m seaward from the bulkhead at Site E. Two additional *P. damicornis* colonies (bottom) within the path of the proposed cables. The colonies in both of these images could be moved to nearby softbottom substrate to avoid damage during the placement of the cables. The silty/sandy substrate with scattered rock and rubble pictured here is prevalent in the vicinity of the bulkhead.

Figure 40. A third massive *Porites* colony located approximately 20 m seaward of the bulkhead, also resting on the unconsolidated substrate in Site E.

Figure 41. The ATISA Cable resting on the surface of a large *Diploastrea heliopora* colony. The small area of dead tissue may be an area of the colony where the cable had previously rested.

EXHIBIT D

Micronesian Archaeological Research Services

March 15, 2016

RECEIVED
MAR 15 2016
11:00a
GUAM HISTORIC RESOURCES DIV.

Mr. John Mark Joseph, Archaeologist
Guam Historic Resources Division
Dept. of Parks and Recreation
490 Chalan Palasyo
Agana Heights, Guam 96910

RE: Guam Telephone Authority's (GTA) Proposed Cable Landing Project in Piti, Guam, Lots 262 and 5NEW-1 Block 2.

Dear Mr. Joseph,

On behalf of our client, Duenas, Camacho, and Associates, Inc. (DCA), Micronesian Archaeological Research Services (MARS) submits the attached **Archaeological Monitoring, Identification, Evaluation, and Data Recovery Plan** for GTA's proposed Cable Landing Project in Piti, Guam for your review and approval.

If you have any questions, please let us know.

Sincerely,

Darlene Moore

Darlene Moore, Archaeologist

CC:Duenas, Camacho and Associates, Inc.

A Guam Non-Profit Corporation
P.O. Box 22303 ▫ GMF, Guam 96921
Tel: (671) 734-1129 ▫ Fax: (671) 734-1132 ▫ Email: [redacted]

ARCHAEOLOGICAL MONITORING, IDENTIFICATION, EVALUATION, AND DATA RECOVERY PLAN FOR THE GUAM TELEPHONE AUTHORITY CABLE SYSTEM LOT 262 AND LOT 5NEW-1 BLOCK 2 PITI, GUAM

Prepared by

Darlene R. Moore

Micronesian Archaeological Research Services, Inc.

Prepared for

Duenas, Camacho and Associates, Inc.

March 15, 2016

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Introduction

Duenas, Camacho and Associates, Inc. (DCA) contracted Micronesian Archaeological Research Services, Inc. (MARS) to provide archaeological services for the Guam Telephone Authority (GTA) Cable System, involving conduit installation and the Southeast Asia-United States (SEA-US) cable landing at Pedro M. Santos Memorial Park (Lot 262) in Piti, Guam (Figs. 1-4). The area of potential effect (APE) includes an offshore and beach-side landing site, a trench across the Park and across (or under) Marine Corps Drive (Route 1). South of Marine Corps Drive, the cable trench will connect the landed cable to the improved GTA Substation (Lot 5NEW-1 Block 2). The locations for the subsurface disturbances related to the Cable System and connecting trenches are shown in Figure 4. The cable trench dimensions are approximately 1,110 ft long, 6 ft wide and approximately 3 ft to 5 ft deep. The proposed trench measures approximately 380 ft long and 3 ft deep offshore from mean high water to a new bulkhead at the Tepungan Channel margin, and approximately 180 ft long and 3ft deep from the mean high water to a new beach manhole. The proposed trench measures approximately 550 ft from the beach manhole to a new cable vault at the GTA Substation on the opposite side of Marine Corps Drive. The marine cable will terminate at a new beach manhole measuring approximately 15 ft long by 9 ft wide and 9 ft deep. Three ocean ground electrode beds will be installed to ground the cables. Each bed is 5.5 ft wide, 55 ft long, and 15 ft deep, and the beds are spaced 10 ft apart. The APE is 36 ft wide to encompass the new 6-foot wide cable trench, and widens in the vicinity of the beach manhole and ocean ground electrodes, and staging area (southwest of the electrodes). The marine cable will transition to a land cable at the beach manhole. Conduits to convey the land cable will be installed from the beach manhole to a new intermediate manhole that will be installed in the Park directly across from the GTA Substation. Conduits will be installed from the intermediate manhole to the Substation, and terminate at a new cable vault outside the Substation. The excavation will be 4 to 5 ft deep as it crosses Route 1 (Marine Corps Drive). The cable vault will have the same dimensions as the beach manhole (15 ft. long by 9 ft. wide by 9 ft. deep).

The proposed project includes the following parts:

Part 1 is the cable trench and conduit installation offshore from Santos Memorial Park.

Part 2 is the connecting cable trench and conduit installation onshore in Santos Memorial Park, and across Marine Corps Drive to the GTA Substation on Lot 5NEW-1 Block 2, south of Marine Corps Drive. This includes installation of a beach manhole and ocean ground beds.

Part 3 is the beach cable landing at Santos Memorial Park through the installed conduits.

Project Background

Archaeological investigations related to the proposed improvements to the GTA Substation (Lot 5NEW-1 Block 2, Piti) were completed for RIM Architects in June, 2015 by the archaeological consulting firm SEARCH. Prior to implementing a subsurface testing program on the GTA property, SEARCH submitted to Guam Historic Resources Division (GHRD) a comprehensive Research Design that includes an extensive review of the historic and archaeological history of the Piti vicinity (DeFant 2015). Because the GTA Research Design also pertains to the cable landing and connecting trenches, the detailed historical information contained in that document will not be repeated here.

Once GHRD approved the SEARCH Research Design, the archaeologists supervised the excavation of six backhoe trenches situated within the proposed footprint for the new building on the GTA Substation property (DeFant and Leon Guerrero 2015) (Fig. 5). Significant cultural deposits were not identified in the trenches, which were dug to depths of 1.4 m below ground surface. Exposed soils consisted of coral gravel fill over loamy clay and sand containing cinder blocks, metal cables, rebar, miscellaneous metal pieces, PVC pipe filled with concrete, aluminum soda cans, plastic bottle, plastic bucket lid and a section of a wooden pole.

In 2012 Garcia and Associates (GANDA) monitored the excavation of four backhoe excavations in Piti for GTA (Craft 2012). Trenches 1 and 2 were located in the right-of-way on the inland side of Marine Corps Drive just southwest of its junction with Route 11 (Cabras Island Rd.). Trenches 3 and 4 were located in the right-of-way on the inland side of Marine Corps Drive just south of the Route 11 junction. The depth of the trenches varied from .65 to 1.60 m. All four trenches exposed layers of construction fill and/or disturbed soils. No significant cultural deposits were identified.

MARS completed an archaeological testing program at Santos Memorial Park for Duenas Camacho and Associates, Inc. in 2009 (Moore and Amesbury 2009). Twelve backhoe trenches were excavated. No significant historic properties were identified. Five of the trenches dug during this testing project were located on the east side of the Park, in or near the path of the proposed cable landing and trenching (Fig. 6). These five trenches ranged in length from 3.0 to 5.5 m, width from .75 to 1.0 m, and depth from 1.20 to 2.0 m. Generally, the five trenches exposed limestone fill over moist, sandy clay. Thickness of the fill ranged from .65 to 1.20 m. In BT 4, the clay layer beneath the fill was very moist and contained abundant decaying plant parts which suggests that portions of the Park formerly were a low lying area that supported water tolerant plants, such as mangroves. In BT 5, closest to the shoreline, the water table was reached at a depth of 1.75 m.

Other archaeological projects completed in the vicinity of the project area also encountered introduced fill material overlying disturbed clays (see details below). The subsurface soils in the vicinity of the project area suggest that portions of the area were wet, probably prone to flooding, and possibly provided a habitat for mangroves, and or gardens. On the other hand, cultural deposits and features dating to the Latte Period and the Spanish Period have been identified at the east end of Piti, near the place name Tepungan (Workman and Haun 1992).

The Area of Potential Effect (APE) for the proposed Cable System project does not encompass any historic resources listed on either the Guam Register (GRHP) or the National Register of Historic Places (NRHP). In processing the Department of the Army Permit application, the US Army Corps would engage in National Historic Preservation Act (NHPA) Section 7 consultation. This Archaeological Monitoring, Identification, Evaluation, and Data Recovery Plan would support the Corps' anticipated finding of "No Adverse Effect" for the Cable Landing project. Guam Historic Resources Division (GHRD) is anticipated to concur with that finding once an approved **Archaeological Monitoring, Identification, Evaluation, and Data Recovery Plan** is in place. GHRD requires that the Plan address the entire project.

Based on MARS' conversations with GHRD former employee and archaeologist, Rich Olmo, prior to his departure from GHRD and considering that an extensive background review prepared by SEARCH for the Piti vicinity was previously approved by GHRD, the Plan for the Cable Landing project will describe the archaeological investigations (including archaeological monitoring, analysis, and reporting) that will occur during and after construction of the proposed project.

Because the privately funded Cable Landing project requires a permit from the U.S. Army Corps of Engineers, the archaeological research for this project will comply with the Federal regulatory mandate, including the amended National Historic Preservation Act of 1966 (especially Section 106), the National Environmental Policy Act, Executive Order 11593, the Archaeological and Historic Conservation Act of 1974, the Housing and Community Development Act of 1974, and the Archaeological Resources Protection Act of 1979. The Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation will be followed during the project.

The Guam regulatory mandate for the proposed undertaking includes Public Law 20-151 and 21-104. Public Law 20-151 requires that the project area historic properties be professionally assessed in order to fulfill GHRD permitting conditions. Under Public Law 12-126 agencies, such as GTA, must conduct their undertakings so as to maximize the protection of territorial cultural resources.

Environmental Background

Young (1988) describes the soils in Santos Memorial Park and Lot 5NEW-1 Block 2 as consisting of the Urban land Ustorthents complex. Urban land consists of areas covered by buildings, roads, and parking lots. Some of these areas have a base of crushed coral and some rest directly on limestone. Areas of Urban land are impermeable to water and runoff is rapid. Ustorthents is quarried fill material. Commonly the fill is crushed coral gravel. Included in this unit are small areas of Shioya soils along the shoreline. Shioya soils are made up of water-deposited coral sands derived from the reef. Currently, the eroding edge of the shoreline at Santos Memorial Park has a vertical drop of 50-80 cm to the narrow beach, which is underwater during periods of high tide. No significant cultural material was seen on the beach.

The previous trenching on Santos Memorial Park (Moore and Amesbury 2009) and on the GTA Substation property (DeFant and Leon Guerrero 2015) found that much of the area had been previously filled. The fill material overlays moist sandy clay. No intact cultural deposits have been noted in the clay.

Previous Archaeological Background

Recent archaeological projects completed in Piti include DeFant and Leon Guerrero (2015); Moore and Amesbury (2013); Moore (2013); Craft (2012); DeFant and Moore (2012); DeFant (2011); Vernon and O'Day (2009); Moore and Steffy (2008); Hunter-Anderson (2002); and Workman and Haun (1992). The results of most of these projects are described in the Research

Design prepared for the GTA Substation project (DeFant 2015). Those included in the DeFant document are not repeated here. Those not included in the DeFant document are included here.

In 2013, MARS did archaeological testing and monitoring of the Masso River Embankment Restoration Project in Santos Memorial Park (Moore and Amesbury 2013). Six backhoe trenches were dug on the west side of the park. Three trenches were located adjacent to the south side of the river and three were located adjacent to the north side of the river. The trenches on the river's north side exposed culturally sterile layers of beach sand, while the trenches on the river's south side exposed disturbed wet clays and introduced fill. A few glass and historic ceramic fragments were recovered from the clay below the fill in Trench 3 on the south side of the river. Two historic ceramic sherds were recovered from the trenches north of the river, along with a possible hammerstone and a slingstone (which was picked up on the beach).

In 2013, MARS monitored backhoe excavations for a new electrical conduit for the renovation of the Day Buy Day grocery store (the former New J Market) located on the inland side of Marine Corps Drive in Piti, east of the project area. The 1.0 m deep trench was situated under the paved parking lot in front of the building. Below about .75 m of introduced fill was a wet sandy clay. Three pieces of coal were noted in the clay.

In 2009, GANDA completed an archaeological investigation at the 76/Circle K Guam location (former Piti Mobile Station) in Piti (Vernon and O'Day 2009). This project area is located a short distance east of the GTA Substation and southeast of Santos Memorial Park (see Fig. 3). The 3 m deep excavation for a French Drain exposed about 1.0 m of fill over a previously disturbed, saturated sandy clay. The project lacked historically significant resources. Materials encountered in the excavation included metal and PVC pipes, wire, and rough cut lumber with galvanized nails and mortise-and-tenon joints. The authors proposed that these were the remains of an old wooden structure of some sort. The GHRD office suggests that the timbers could represent a section of cord road, built to cross the wet clay in Piti (Mr. JM Joseph, Territorial Archaeologist, pers. comm. 2015).

In 2008, MARS completed a survey of *Hotnun Sanhiyong,* Guam's Outside Ovens for the Guam Historic Preservation Office (Moore and Steffy 2008). Two ovens were documented in Piti; the Fejeran Oven and the Quan Oven. Both were built by former Piti resident, Jose Cruz Fejeran. The Quan Oven is listed on Guam's Historic Property Inventory, GHPI Data Form 66-03-2276, the Fejeran Oven was too recent to be placed on the list. The Quan oven was located in the corner, west of J.C. Tuncap Street and north of J.C. Santos Street (see Fig. 3). Associated with the Quan oven was a raised barbecue grill and a separate, above ground water tank or fish pond. Recent construction on this property may have destroyed one or more of these features.

In 2001, MARS monitored the cable landing site situated on Lot 58-1-New-1-1New, Piti (Hunter-Anderson 2002:34). This landing site is situated along the Piti shoreline just east of the proposed GTA landing site (see Fig. 3). A drainage ditch separates the two sites. The beach manhole excavation measured 13 ft by 19 ft by 11 ft deep. A 15 cm thick layer of crushed coral gravel had been spread on ground surface prior to the excavation. Below the gravel to a depth of 1.0 m was a dark brown sticky clay, from 1.0 m to 1.7 m below ground surface was an orangebrown sticky clay, from 1.7 m to 2.13 m was a dark gray/green muck, and from 2.13 m to 3.35 m was a whitish gray sand with numerous coral heads, staghorn coral and marine shells. Groundwater was observed at a depth of 2.13 m. The muck layer was thought to represent a former mangrove habitat, but due to the unstable excavation walls, no sample was taken. No intact cultural deposits were observed in the manhole or in the four feet wide, four feet deep trench that was located south of the manhole. However, the excavation for the manhole exposed some Latte Period pottery sherds, modern glass bottles and ordnance from WWII. The ordnance was turned over to the appropriate authorities.

Beginning in 1990 and intermittently continuing until 1993 MARS monitored mechanical excavations related to the reconstruction of Marine Corps Drive from Route 8 to Route 11 (Cabras Island Road) (Wells et al. 1995). No intact cultural deposits were identified in the Piti Highway corridor, located on the seaward side of the road.

Archaeological Expectations for the Project Area

Based on the findings of the previous archaeological projects completed in the vicinity of the project area, the landing and connecting trench are not expected to encounter significant historic properties in Santos Memorial Park. However, it is possible that the connecting trench will encounter buried intact cultural deposits on the seaward side of Lot 5NEW-1 Block 2, between the GTA Substation Building and Marine Corps Drive. This portion of the project area has not been previously investigated. Additionally, it is possible that remnants of the old Spanish Road through this part of Piti may be encountered in the connecting trench.

It is likely that the excavations related to the cable landing and connection trenching will encounter ordnance and discarded materials related to WWII. DeFant (2015) noted that a monitoring project in Piti in 1992 (Workman, Brown, and Haun 1992) encountered a "cache of rifle and small artillery ammunition in a buried earthen bunker…" In association were idler wheels from a tank, mess kits, and bipods for infantry rifles." The location of this accumulation of WWII debris was given as across Route 1 from the coastal portion of the GTA Substation property, Lot 5NEW-1 Block 2.

A gleyed deposit containing decaying wood and roots may be encountered in the excavations. An analysis of this organic material could provide information about the types of vegetation that were growing in the area, prior to the clearing and infilling that has taken place.

Methods and Procedures

The purpose of the Archaeological Monitoring, Identification, Evaluation, and Data Recovery Plan is to ensure that historic resources in the project area are identified and appropriately treated prior to their being lost from the archaeological record. The plan describes the steps to be taken when assessing historic significance.

The main criteria for determining the significance of archaeological materials are the federal government's guidelines for nomination to the National Register of Historic Places, especially Criteria A and D. Criterion A states that a site is significant if it is associated with events important to broad patterns of our prehistory or history. This would include WWII. Criterion D states that a site is significant if it has yielded or has the potential to yield important information about the prehistoric or historic record of a place or people. This would include, for example, data pertaining to prehistoric settlement, subsistence, social organization, land use, or religion, including mortuary practices.

The report style and content guidelines spelled out in the March 18, 2014 GHRD Basic Reporting Requirement will be followed.

The construction excavations related to the landing and the trench connecting the cable to the substation will be monitored by qualified archaeologists. The objective of the monitoring is to identify and evaluate potentially significant historic resources prior to their destruction and to notify DCA and GTA upon discovery of significant properties. The archaeological monitor will carry out an appropriate level of site recordation (including plan mapping, stratigraphic profiles, written descriptions and photographs). Diagnostic/museum quality artifacts, necessary to document and evaluate identified deposits or features, will be collected. Samples will be taken. Site coordinates will be located with sub-meter accuracy and site boundaries plotted on current USGS maps. Each site will have a permanent datum point established. Guam Historic Properties Inventory data forms will be updated or completed.

If the archaeologists determine that significant remains have been identified and data recovery procedures beyond what can be accomplished during the time allotted can be performed, MARS will make recommendations regarding preservation or further treatment to DCA and GTA. Any additional archaeological work may not require preparation of a new research design, but a change work order may be necessary to cover expenses for additional data recovery, if needed.

Anticipated cultural materials include both prehistoric and historic items. Diagnostic items in disturbed soils may be collected. If intact cultural deposits are encountered the archaeologists will collect individual items and quantitative samples and place them in appropriately labeled collection bags. A field catalog will be maintained. Hand excavated soils will be screened through a 1/8 inch mesh if possible. Charred material from intact features, such as earth-ovens or hearths will be collected for radiocarbon processing. Appropriate soil samples for further study will be taken during hand excavations and/or from the walls of the trenches. All recovered materials will be taken to MARS' facility on Guam for processing and analyses.

The ceramics, artifacts, and non-human faunal remains will be analyzed on Guam. The traditional ceramics will be subjected to an attribute analysis that records information about temper content, surface treatment, rim type, wall and rim thickness. The pottery data set can be compared with pottery collections from other Guam sites to see how similar or different they are. That information may provide insight as to how the people were organized on the island. Marine shells will be sorted to the lowest possible taxon (family, genus, or species), counted and weighed. The marine shell data set can be compared with other collections from similar time periods to look at differences in shell habitats and/or collection strategies. Stone and shell tools and other artifacts will be described and photographed. The tools provide information about the range of activities that were carried out at the site.

Charred materials will be sent to off-island laboratories for radiocarbon dating. If deposits of decayed wood are encountered, samples will be taken and sent to off-island laboratories for identification. Soil samples may be submitted to off-island laboratories for pollen and phytolith analyses. The results of such specialized studies can provide information about past environmental conditionals in this part of Guam. Knowledge of past environmental conditions is important for accurate archaeological interpretations, such as land utilization.

If human remains are encountered, GTA and DCA will consult with GHRD to determine the appropriate measures to be taken. If they are to be removed, the costs of recovery, analysis, and reburial will be negotiated (see Burial Treatment Plan below).

Research Questions and Approaches

Archaeological inquiry is guided by both broad and site-specific research questions arising from a review of the pertinent literature and from the archaeologist's prior field experience. A major question for all projects is **When and how was the project area utilized?** Descriptions of the archaeological features and items identified during the survey will help to answer this question.

There is a growing body of archaeological evidence for prehistoric rice on Guam, but as yet little is known about where it was grown. Rice is known to have been planted in Piti in historic times. **Was rice grown in the project area?**

What was the Masso River shoreline like before dredged reef rubble was introduced to the site? If the trenching encounters soil deposits that contain decaying roots or plant material, samples will be taken and sent off-island for identification and possible radiocarbon dating.

The road through Piti linking the historic village of Sumay with Hagatna is known to have been built during Spanish times, but little is known about road construction techniques utilized in the 1700s and 1800s. If old road beds are encountered along the trench corridor, photos and GPS coordinates will be taken, profiles will be drawn, and samples taken as appropriate.

Interpretation and Dissemination of Information

MARS will prepare draft and final reports which present the methods employed, the results of the monitoring activities, an assessment of the research questions, and recommendations regarding further work, based on the significance of the findings. Government of Guam site inventory forms will be completed or updated for sites identified in the project area. Two copies of the final technical report and an electronic versions will be submitted to GHRD. Copies of the final report will be available to DCA and GTA.

Personnel

MARS staff are familiar with Guam archaeology and are qualified to perform the inventory survey, to perform laboratory analyses of recovered cultural material, to select samples for radiocarbon dating, and to send them to off-island specialists for processing. All archaeological work and personnel will conform to the Secretary of the Interior's historic preservation standards and guidelines.

Work Schedule

MARS will work closely with DCA and the construction contractors to monitor the mechanical excavations. Laboratory work including cleaning, sorting, counting, weighing, and describing the items will be initiated once the monitoring tasks have been completed. It is expected that these studies will be completed within three months after field work is finished.

Curation and Disposition of Recovered Material

MARS will store the cultural material recovered from the project area until the various analyses have been completed and the final report accepted. Once these requirements are met, the cultural material and copies of field records, photographs, and the report will be turned over to the Guam Museum.

Burial Treatment Plan

Burials are to be treated in accordance with Executive Order 89-24 and with the GHRD's General Guidelines for Archaeological Burials as amended March 2010. The guidelines specify that when human bones are found at an archaeological site, they are to be left undisturbed if possible. This requirement sometimes results in the redesign of a project.

Data recovery in a burial area entails the systematic exposure of the human remains in their archaeological context. This is accomplished by hand excavation of burial features and associated cultural deposits. Because prehistoric burials on Guam usually are located within former residential areas, the associated cultural deposits often include hearths, earth-ovens, pits, post holes, as well as various artifacts and other culturally generated materials, especially marine shell middens.

Burials will be hand excavated using small wooden picks and small to medium brushes. After the skeletal remains have been exposed, photographs will be taken and scaled plan maps drawn. If necessary, additional plan maps will be drawn during exhumation to document the locations of previously obscured bones and artifacts. Burial register forms will be completed for each burial. Burial orientation will be determine by sighting along the long axis of the vertebral column, from the cervical vertebrae to the sacrum. Burial position will be categorized as extended, semi-flexed, flexed, and tightly flexed.

The analysis of the skeletal material will be completed on Guam by a qualified osteologist. In the laboratory, the skeletal remains will be allowed to air dry and will be cleaned with small brushes. Reconstruction of post-mortem breaks will be carried out only where readily apparent "joins" are available and where the resulting measurement is significant for comparative purposes. Such reconstruction will be accomplished using water-soluble glue. The remains will be measured in accordance with standard osteological techniques. Gender will be assessed for adults. Age at death will be estimated for each individual. Dental and skeletal remains will be examined for pathology and anomalies. Estimates of the minimum number of individuals (MNI) represented by human remains will be based on spatial and anatomical distribution of bones from burial and nonburial contexts. The results of these investigations will be compiled into a descriptive analysis of the remains and will be incorporated into the Final Technical Report that MARS prepares for the project.

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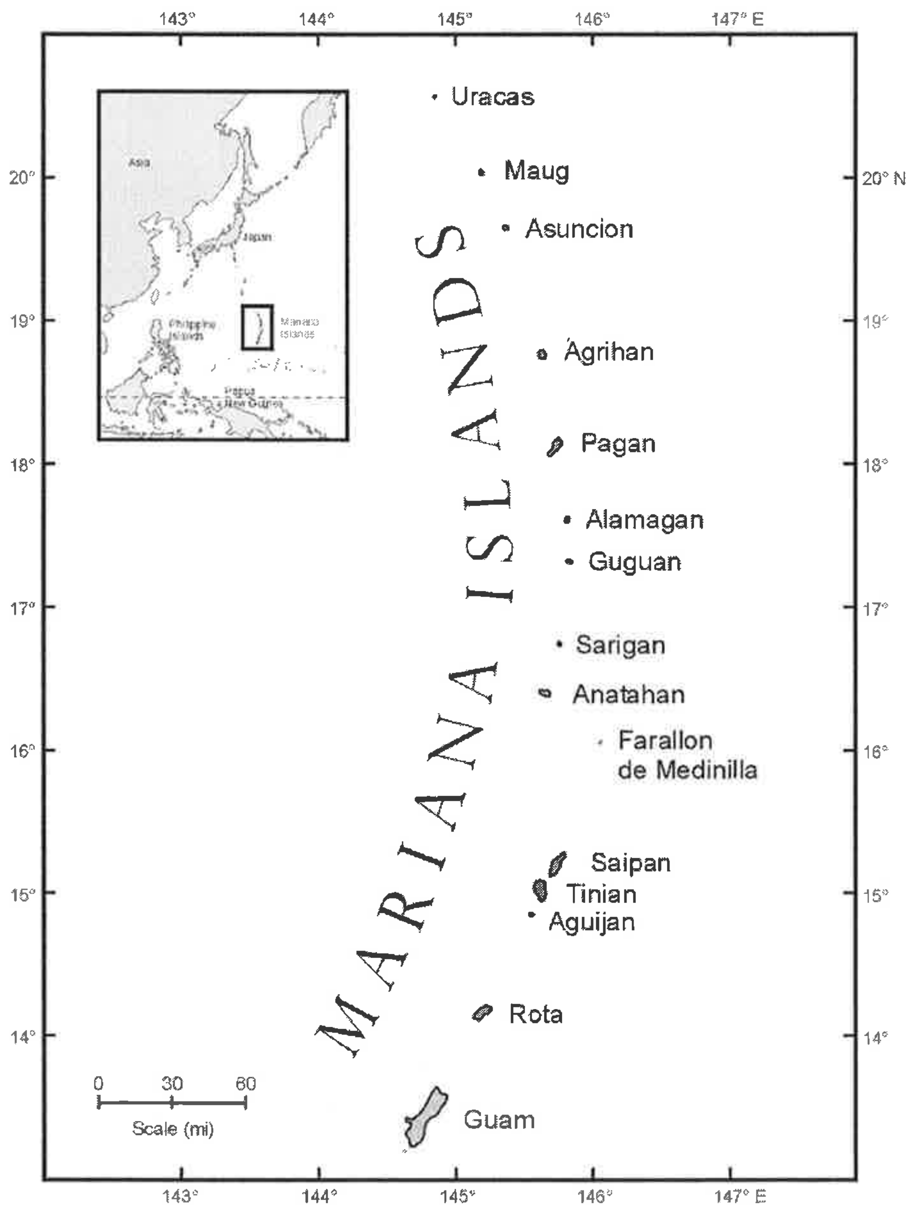

Figure 1. Map of the Mariana Islands, showing Guam. Inset shows the Mariana Islands in the Western Pacific. Courtesy of Barry Smith, University of Guam Marine Laboratory.

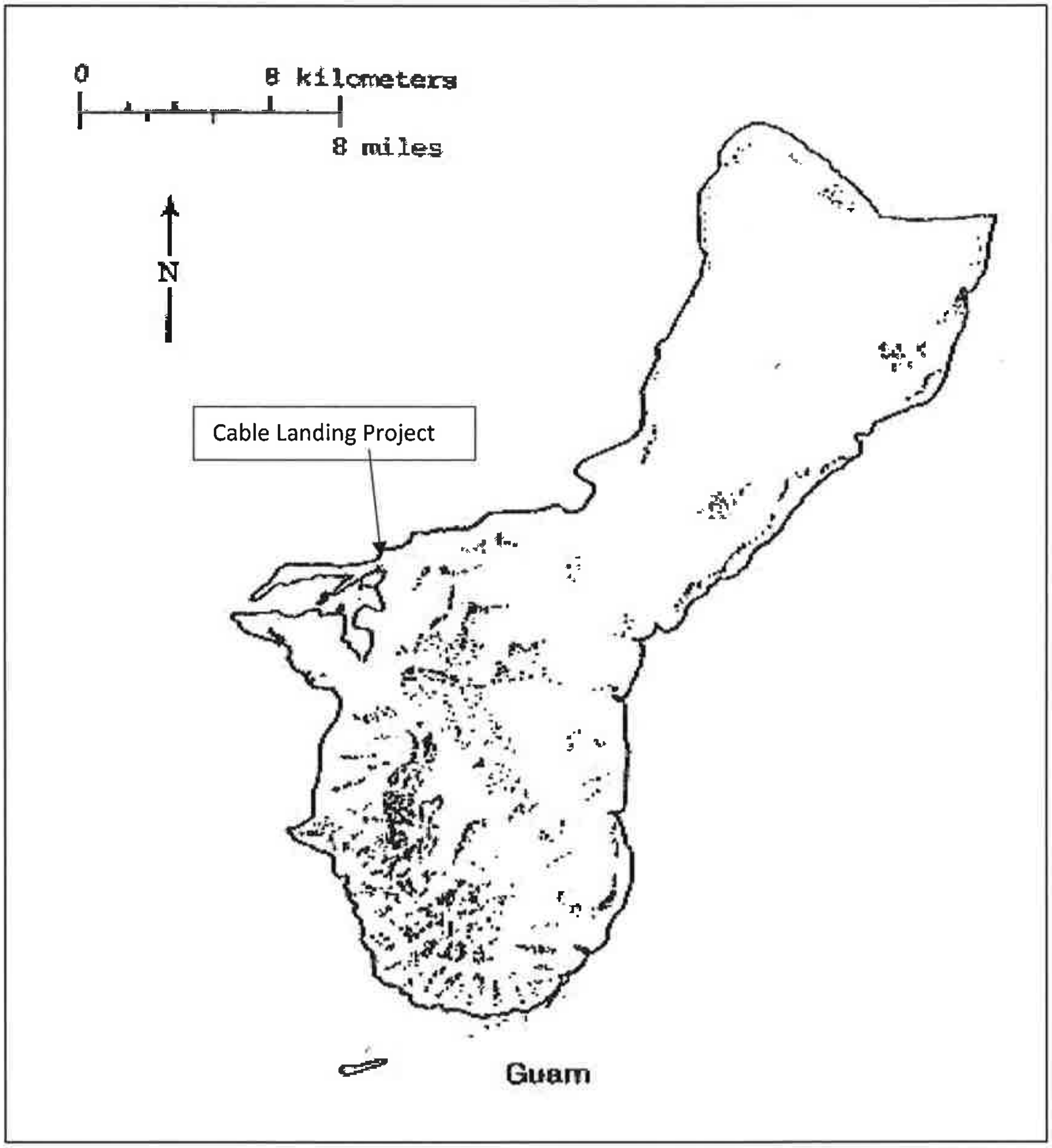

Figure 2. Map of Guam showing the location of the GTA Cable Landing project in Piti.

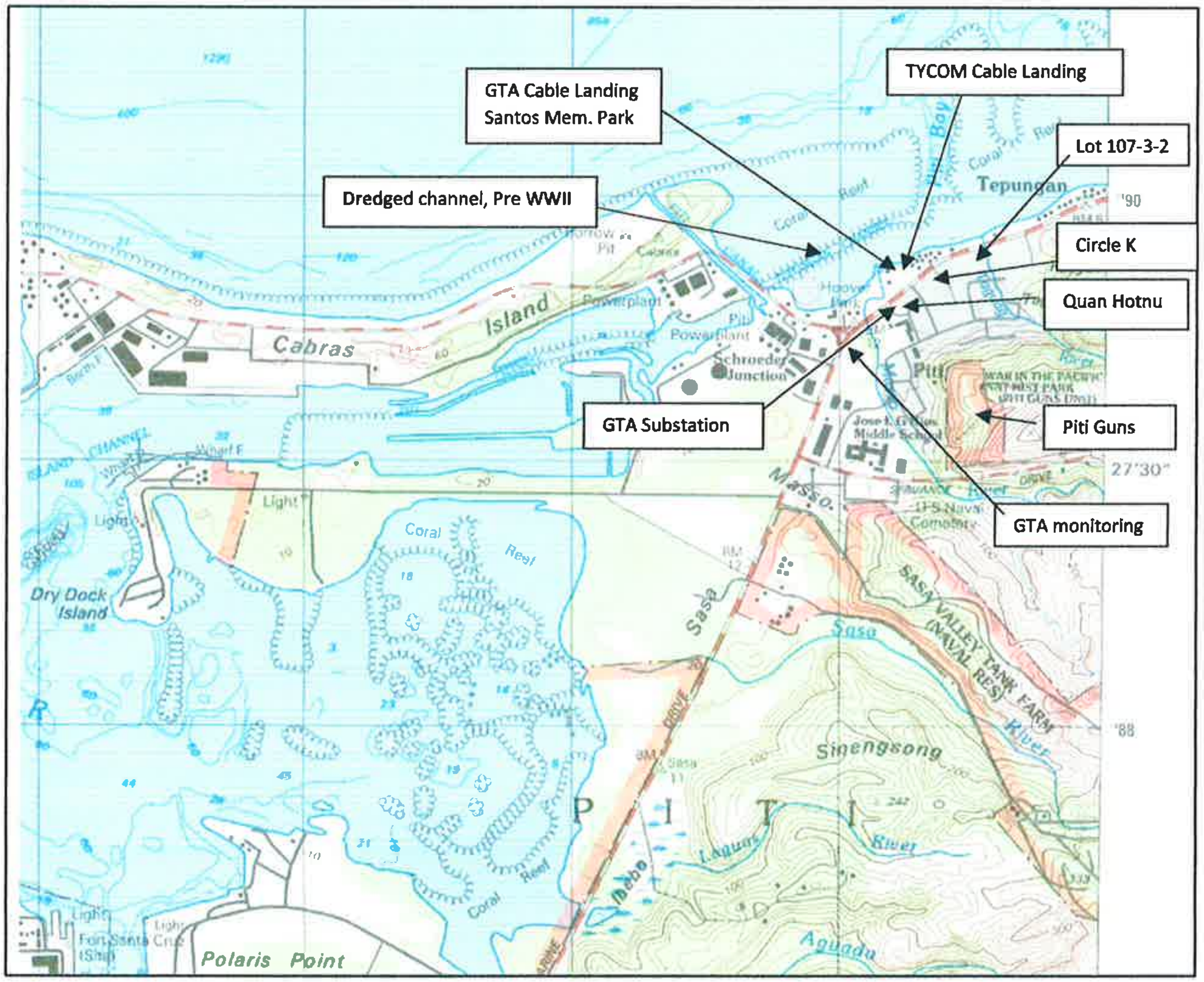

Figure 3. Section of the Apra Harbor Quadrangular Map (2000) showing the location of the GTA Cable Landing at Santos Memorial Park, the GTA Substation, and other sites or archaeological projects completed in the nearby vicinity. Historic sites on Guam's inventory are the Quan Hotnu (66-03-2276) and the Piti Guns (66-03-1046). The other projects did not encounter significant historic properties.

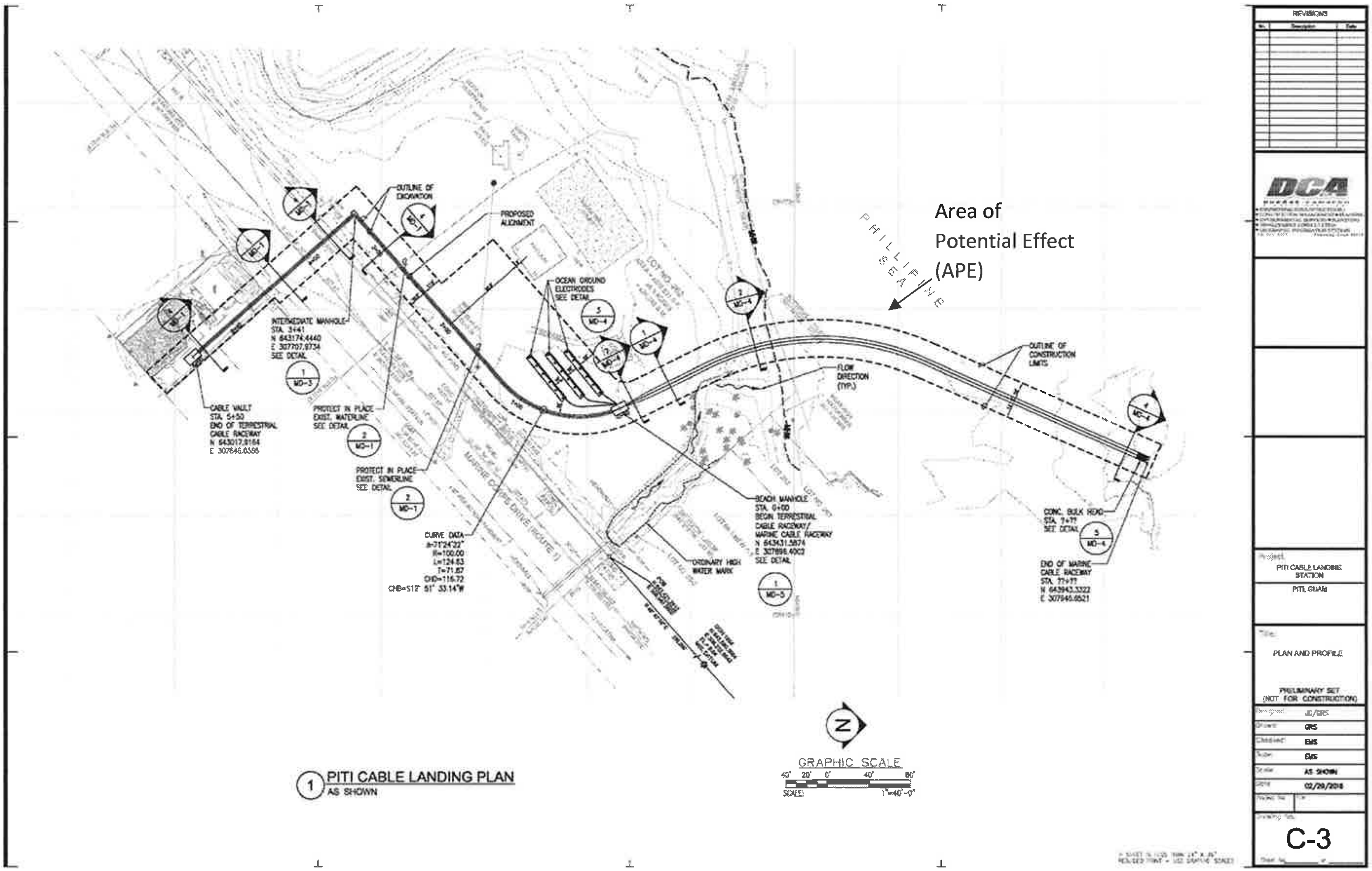

Figure 4. Plan view of the project area.

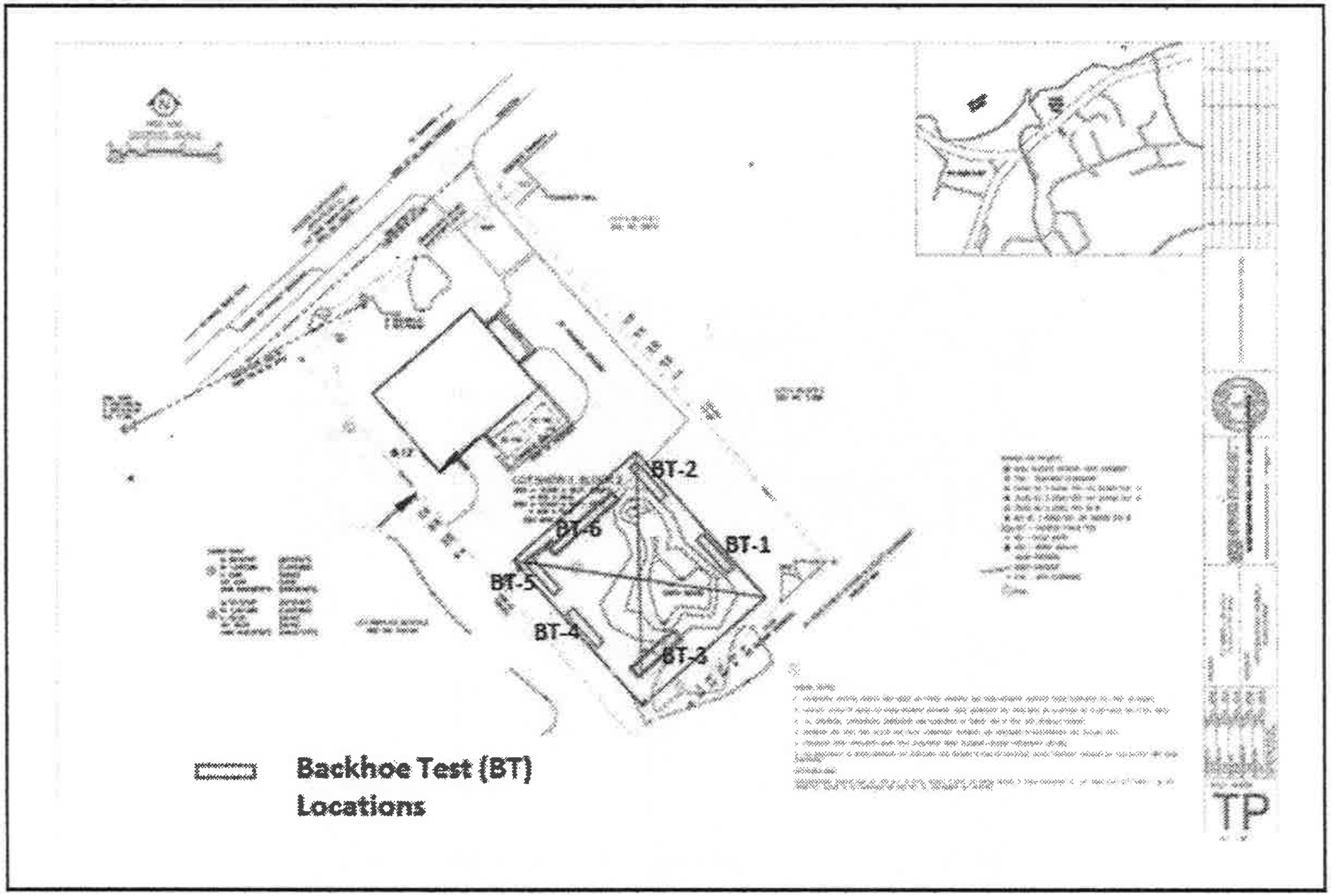

Figure 5. Plan view of the backhoe testing completed by SEARCH in 2014 at the GTA cable station (adapted from DeFant and Leon Guerrero 2014).

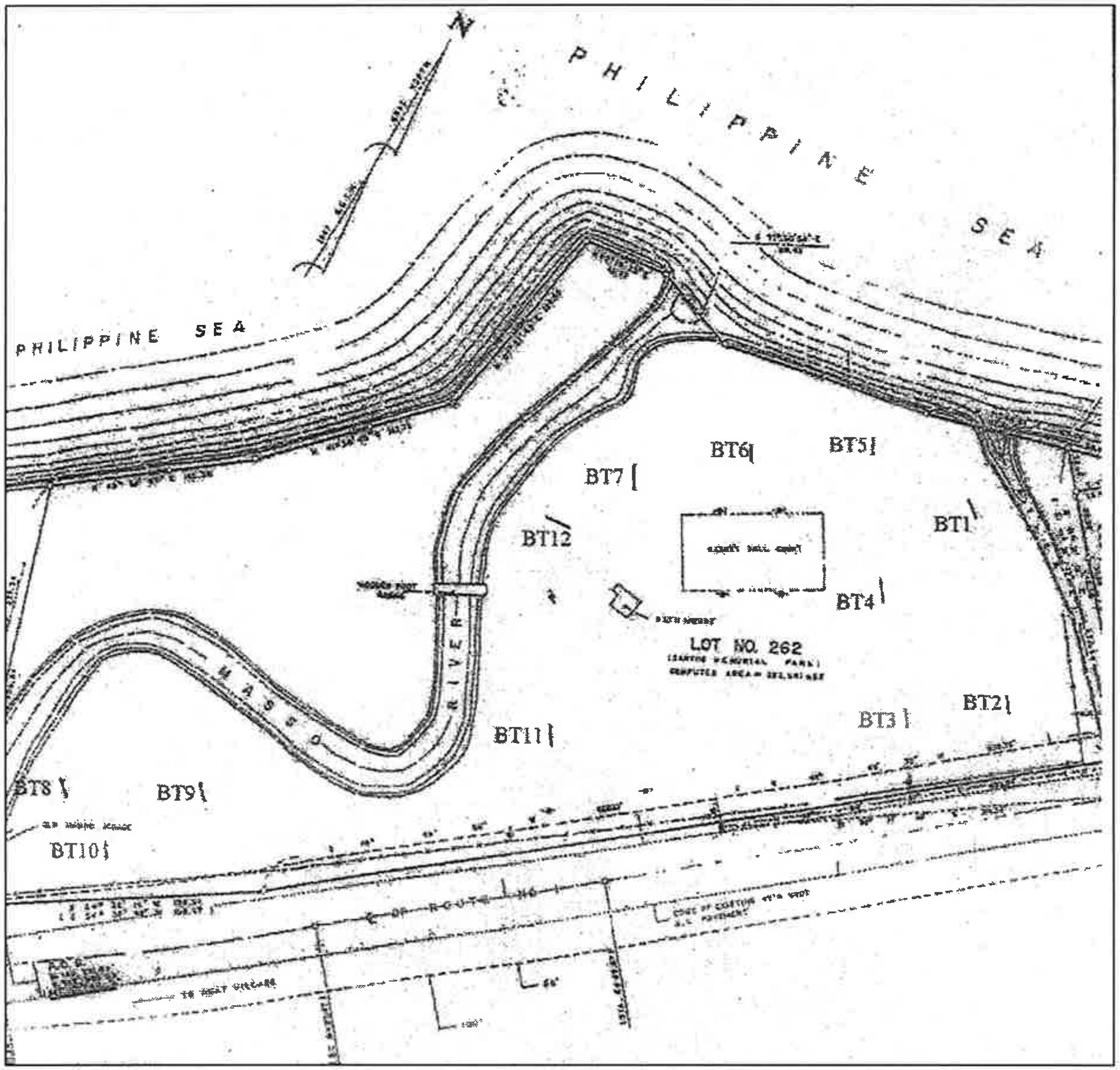

Figure 6. Plan of Santos Memorial Park showing the location of backhoe testing in 2009 (after Moore and Amesbury 2009).

EXHIBIT E

SITE PHOTOS

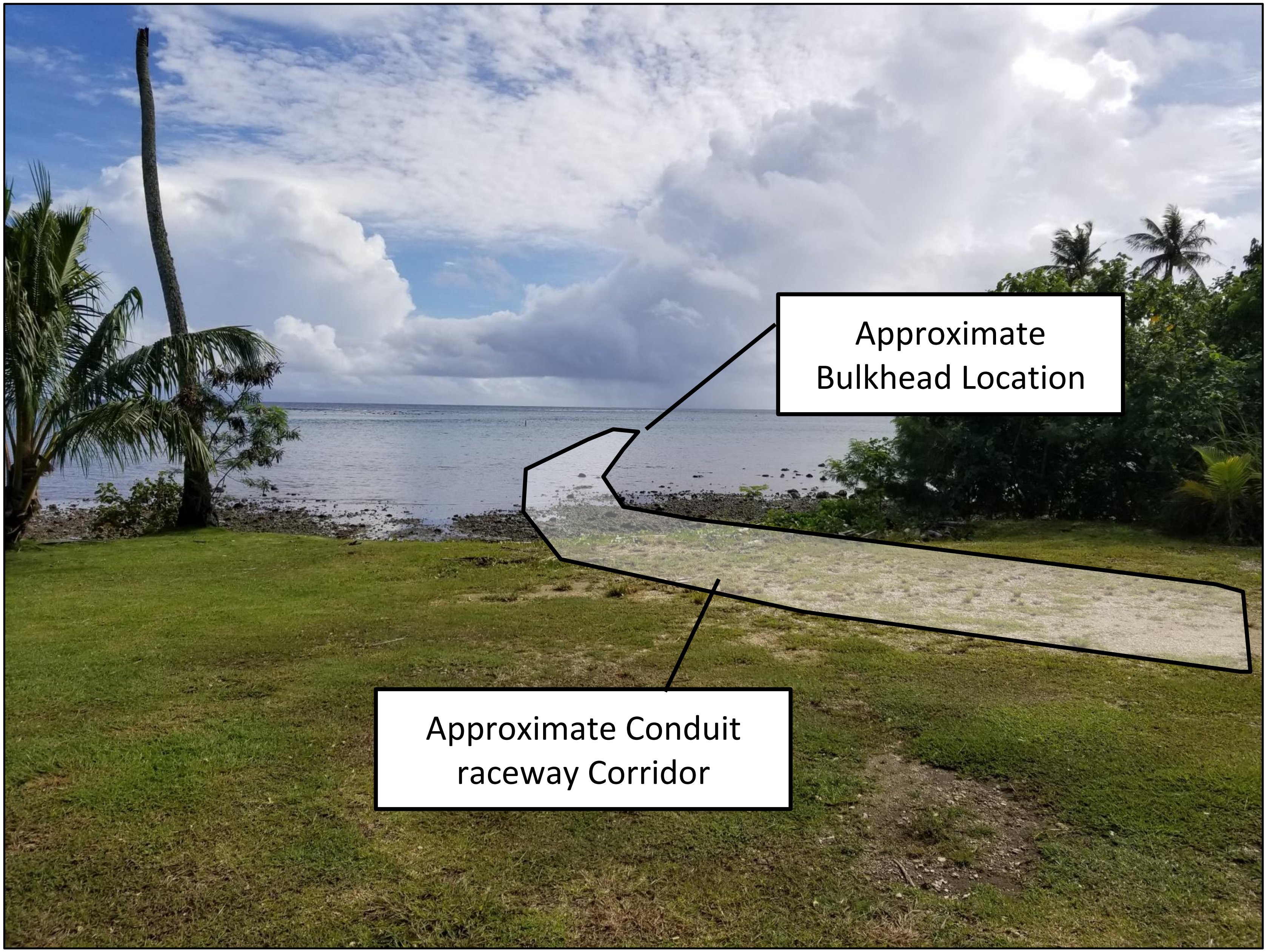

Photo 1. Approximate location of the previously installed conduit raceway corridor and Tepungan Reef Flat, facing north.

Photo 2. GTA Beach Manhole installed in 2017 located within Santos Park, facing north.

Photo 3. GTA conduit raceway construction corridor. The entrance corridor to allow for small support vessels and pedestrian access would be located entirely within this corridor and would have a smaller area.

Photo 4. Cable pin installed on the ATISA Cable in 2017. The same hardware and methods would be used for the HK-G Cable pin installation.

Photo 5. OGB location within Santos Park, facing southwest.

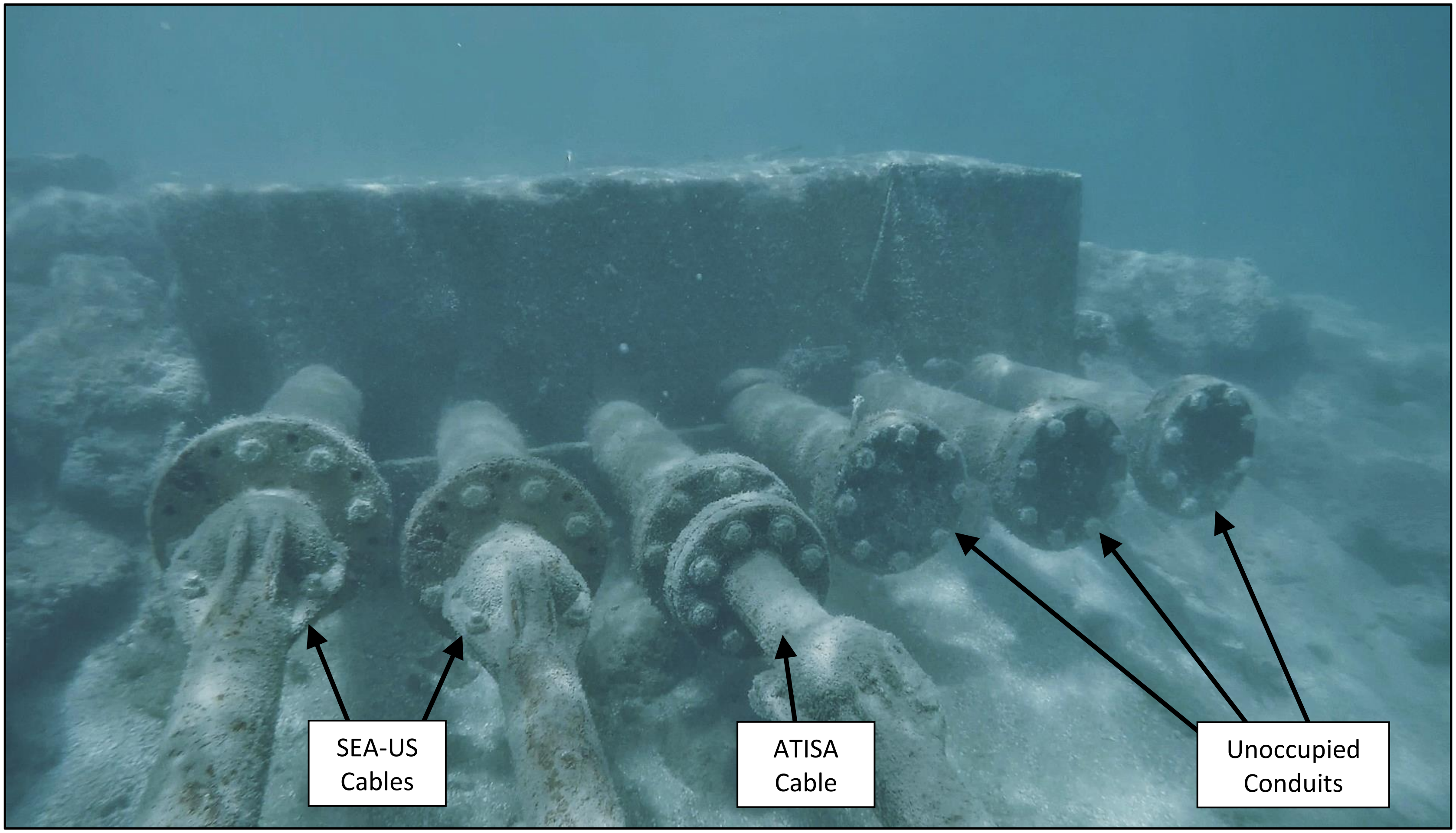

Photo 6. Bulkhead with two SEA-US Cables, ATISA cable, and three unused conduits, facing south.

EXHIBIT F

Coral Transplant and Monitoring Plan for the Hong Kong-Guam Cable Landing Piti, Guam

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July 2018

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1 INTRODUCTION

The purpose and scope of the project is to land a single submarine fiber-optic cable (Hong-Kong-Guam cable) into one of GTA's three remaining unoccupied 4-inch diameter ductile iron pipes or conduits in Piti, Guam.

1.1 Objectives of Mitigation Plan

The overall objective of this plan is to mitigate for the loss of ecological functions and services resulting from the direct impacts to coral reef habitat from the landing of the submarine cable in waters of the U.S., in accordance with the U.S. Army Corps of Engineers mitigation policies as well as the Memorandum of Agreement between the U.S. Environmental Protection Agency and the Department of the Army (Clean Water Act Section 404).

1.2 Description of Proposed Action

The fiber-optic cable will be landed through one of the existing conduits at its seaward opening in the existing bulkhead. The cable will be pulled through the buried conduit to shore, where it will be spliced to land cables in the existing buried beach manhole located above the high tide line (HTL) within Santos Park. The cable would be laid directly on the seabed starting from the bulkhead proceeding seaward. Once the cable is verified to be in the correct and intended alignment, divers will install articulate pipe (AP) around the cable to a seaward distance of 779 m, around the 25 m (82 ft) contour. Once the AP installation is complete, the cable will be selectively pinned to the seabed in 20 locations where no live coral exists.

1.3 Description of Impacts

The impact of the cable-laying activity would be related to the footprint of the cable crossing over hardbottom substrate containing coral reef habitat. The cable footprint varies depending on the type of cable and whether articulated pipe protection would be used over that section of cable. Three types of cable would be used within the three (3) nautical mile jurisdiction:

- double-armored (DA) cable with a 4.1 cm (1.61 inch) diameter;
- single-armored (SA) cable with a 2.8 cm (1.10 inch) diameter; and
- light-weight shielded (LWS) cable with a 2.7 cm (1.06 inch) diameter.

DA cable would be laid from shore out to the approximately 200 m (656 ft) depth where the cable type would then transition from DA cable to SA cable. The cable would transition from SA cable to LWS cable at the 1500 m (4,921 ft) depth contour.

Articulated pipe (15.1 cm or 6.1 inch diameter) would be placed over the DA cable to a seaward distance of 779 m (2,555 ft) and pinned to the seabed at 20 locations onto hard substrate where there are no live corals. The U-bolt pins will be stainless steel with typical dimensions of 14 in.

long, 5 in. wide, and 0.5 in. diameter (38 cm long, 12.7 cm wide, and 1.2 cm diameter). The DA cables would be protected by articulated pipe sections from the end of the bulkhead for a seaward distance of 779 m (2,555 ft).

The DA cable with articulated pipe would have a disturbance footprint of approximately 0.5 ft or 6 inches (0.15 m) wide and would be laid over 218 m (715 ft) of shallow hardbottom substrate supporting coral reef areas with up to approximately 25% coral cover. The holes drilled in the hardbottom substrate would cover approximately 0.304 sq ft (0.0283 sq m). The combined total footprint of DA cables, articulated pipe, and 20 clamps would occupy approximately 357.9 sq. ft or 0.008 acres over shallow hardbottom substrate supporting coral reef areas with up to approximately 25% coral cover. This is the estimated permanent impact area over hardbottom substrate supporting coral reef habitat from the cable-laying activity.

While corals will be avoided to the maximum extent practicable through pre-marking of the landing route, where corals are not avoidable, they would be impacted by the weight of the cable and articulated pipe placed over or adjacent to the coral colony. There would be localized damage to coral tissue by this activity; however, based on observations of other existing cables on the seabed and depending on the species involved, it is anticipated there is a good likelihood that the coral would eventually recover and grow around the cable.

- <u>Direct but temporary impacts from cable landing</u>.
  There is the possibility that divers would make inadvertent contact with the seabed during the cable landing, AP installation, and pinning activities. All divers working in the marine environment would be briefed on the presence of fragile coral colonies and best management practices on how to avoid impacts to marine resources. During the AP installation, divers may stage the AP segments next to the cable on the seabed. Staging will be conducted in such a way that no corals are impacted by manually placing the AP segments on areas where no live corals exist.

- <u>Direct and permanent impacts from cable-laying portions.</u>
  The total footprint of DA cable, articulated pipe, and 20 pins would occupy approximately 357.9 sq. ft or 0.008 acres over shallow hardbottom substrate supporting coral reef areas with up to approximately 25% coral cover. This is the estimated permanent impact area over hardbottom substrate supporting coral reef habitat from the cable-laying activity.

  The remaining cable-laying portions cross over deep hardbottom substrate at greater than 80 ft depth where coral cover is anticipated to be lower. The cable in these deeper areas would have smaller (4.1 cm or 1.61 inch) footprints because no articulated pipe or pins would be used, and only the bare cable would be laid in place.

- <u>Indirect and temporary impacts from cable-laying portions.</u>
  A total of 20 pins will be installed over the articulated pipe in areas of hard substrate where no living coral is present to prevent the cables' lateral movement. A 3 cm diameter hole for each side of the U-bolt pin will be drilled down to 30 cm with a hydraulic drill, and the bolts will be inserted and secured in place with a non-toxic marine epoxy. The sediment generated from this activity is anticipated to be very small, approximately 0.056 gallon per hole, or a

total of 2.24 gallons (0.011 cu yds) for all 40 holes. There would be a direct and permanent impact to the rock substrate from the drilling activity, and an indirect and temporary impact from the release of minor amounts of sediment for each hole drilled. It is anticipated that this sediment would quickly disperse into the water column and have an insignificant effect on live corals, if any, in the vicinity.

- <u>Direct but temporary impacts within reef flat corridor where the support vessels and personnel will be tracking back and forth.</u>
  An entrance and exit corridor will be defined using floats over the existing conduit raceway to allow for small support vessels and pedestrian traffic to enter and exit the marine environment. This portion of the Tepungan reef flat is a previously disturbed and largely uncolonized area of consolidated hardbottom and unconsolidated sand, rubble, and boulders. Support vessels would be manually moved or walked over the reef flat and within the corridor to the bulkhead, where they would proceed seaward under their own power. This entrance corridor would remain in use for the entirety of the project, including AP and pin installations. A Boat Exclusion Zone will be defined for sensitive areas for the Tepungan reef flat where other coral mitigation sites from past cable landings are present (Figure 5).

1.4 Avoidance and Minimization Measures

The project incorporates the following measures to avoid or minimize impacts to waters of the U.S. and coral reef resources.

1. Conspicuous mobile invertebrates, such as sea cucumbers and sea stars, would be manually relocated out of the entrance corridor at the start of each day prior to all activities.
2. During the shore landing of the cable, care will be taken to avoid laying the 1.6-inch (41 mm) diameter cable on large coral colonies during the alignment process, especially at the mouth of Tepungan Channel. The cable ship will be held in place at the mouth of the channel by its own thrusters and would not anchor in areas of live corals. Prior to landing the cables, divers will mark the route with least impact to corals, and where the cable would be exposed to the least impact from physical terrain.
3. The installation of the articulated pipes around the fiber-optic cable and selected pinning of the cable to the substrate at intervals in the channel and at the channel mouth will be conducted in such a manner as to minimize damage to live corals along the cable route.
4. Pinning activities would be performed outside of coral spawning periods (typically in July and August) of any given year.
5. Best Management Practices (BMPs) will include silt fencing in uplands to confine work for the installation of the ocean ground bed, located inland of the beach manhole in the Park.
6. An “Entrance Corridor” would be defined within the Tepungan reef flat over GTA’s previously installed cable conduit raceway. Support vessels and pedestrian traffic would only be allowed to enter and exit the marine environment through this corridor. This area was chosen due to its low coral cover and recent construction disturbance.
7. Two “Boat Exclusion Zones” would be defined in the areas directly east and west of the entrance corridor in the Tepungan reef flat. No vessels or pedestrian traffic would be allowed to enter these areas in order to protect fragile marine resources and existing coral mitigation and relocation sites.

8. Articulated split pipe (AP) would be manually staged in the marine environment in areas where no live coral exist.
9. All divers and personnel working in the marine environment would be briefed on the presence of fragile and ESA-listed coral species, as well as the possibility of marine mammals and sea turtles.

1.5 Description of Impact Area

Guam is an unincorporated U.S. territory and the largest and southernmost island in the Mariana Islands archipelago. The project site is in the eastern portion of Pedro G. Santos Memorial Park (Lot 262), an approximately 6.5-acre parcel located in the Municipality of Piti, just east of Apra Harbor on the western coast of Guam (Figure 1). The HK-G cable will utilize an existing cable raceway was constructed in 2017 in Lot 262 (terrestrial portion) and on the reef flat (marine portion) offshore from the Park in navigable waters of the U.S. Santos Park is located east of the Guam Power Authority Cabras and Piti Power Plants, and north of the GTA Cable Station site in Lot 5NEW-1, Block 2.

The Tepungan Channel and reef flat lies within M-2 (Good) waters according to the Guam Water Quality Standards (Guam EPA, 2001). The area is also within Piti Bomb Holes Preserve, which was established in 1997 and is currently managed by the Division of Aquatic and Wildlife Resources (DAWR) of the Guam Department of Agriculture. Much of the length of the Tepungan Channel, which lies parallel to the shoreline, was widened to 157 feet and deepened from 6 feet to 16 feet between January and April 1973 to accommodate additional cooling water needed for the new Cabras Power Plant that was under construction (Marsh and Gordon, 1972 and 1974). The Power Plant and nearby Commercial Port are industrial uses to the west of Santos Park. Single-family residences and a two-story apartment building (Alig Apartments) are located along the coastline north of Santos Park. A cable conduit system was installed in 2001 by TyCom Networks (Guam) LLC on the reef flat close to the project site. The conduits come ashore on Lot 58-1-NEW-1-1NEW, located adjacent and north of Santos Park. This parcel contains the marine and terrestrial raceway, an ocean ground bed and a beach manhole. Only one cable has been landed into these conduits and they have otherwise been idle since their installation.

The Hong Kong-Guam cable would be landed into the existing cable raceway and bulkhead within the Tepungan reef flat. This section of the reef flat receives heavy siltation deposited from the Masso River and an intermittent unnamed creek to the east of Santos Park. The nearest stream is an intermittent rock and rubble bottom creek that drains stormwater from upland areas via a culvert. The reef flat is a shallow low-relief pavement exposed at low tides with a high rate of sedimentation and very low coral cover. There are no seagrass or other vegetated shallows, riffle or pool complexes, mudflats or wetlands at the cable landing site. The cable alignment crosses into the Piti Bomb Holes Marine Preserve and Essential Fish Habitat designated around Guam, but does not cross any designated critical habitat under National Marine Fisheries Service jurisdiction.

1.5.1 Endangered Species

There is no designated or proposed critical habitat in the vicinity of the Tepungan site. Based on coordination with Ms. Valerie Brown, National Marine Fisheries Service, green and hawksbill sea turtles are expected to occur within the area, as are spinner dolphins. Green sea turtles (*Chelonia mydas*) and hawksbill sea turtles (*Eretmochelys imbricata*) have an endangered status in Guam's waters. Scalloped hammerhead sharks (*Sphyrna lewini*), which are listed as endangered, have been observed in Guam's waters, although only in Apra Harbor. Giant oceanic manta rays (*Manta birostris*) are listed as threatened, although they have not been observed in any of Guam's waters (NOAA 2016). Dolphins are protected under the Marine Mammal Protection Act. Although the park is not a nesting site for sea turtles, green sea turtles apparently forage in the area and were observed at the mouth of the channel during the marine survey (Kerr and Burdick, 2016). Bumphead parrotfish and Napoleon wrasse have been occasionally observed in the area, although not during the marine survey (Kerr and Burdick, 2016).

Effective October 10, 2014, 20 species of corals were listed as threatened under the U.S. Endangered Species Act (ESA) (79 FR 53851). Three of these listed corals occur within Guam's waters: *Acropora globiceps*, *Acropora retusa*, and *Seriatopora aculeata*. A total of 11 colonies were observed during the 2018 marine surveys; of these, 6 colonies are within the vicinity of the proposed cable route – 3 colonies within Survey Area A, and 3 within Survey Area B (Burdick, 2018) (Figure 6). The proposed cable route, while not being completely enclosed within a single survey area, is closer to Survey Area A than Survey Area B. The 3 observed *A. globiceps* colonies within Survey Area A range from 3 to 10 m separation from the proposed HK-G cable alignment. The three observed *A. globiceps* colonies within Survey Area B range from 9 to 14 m in linear separation from the proposed HK-G cable alignment. No *A. globiceps* colonies will be disturbed or otherwise harmed during the cable landing, AP installation, and pinning activities.

1.5.2 EFH and CRE-MUS

Essential Fish Habitat (EFH) and Coral Reef Ecosystem Management Unit Species (CRE-MUS) at the site are described by NOAA's National Marine Fisheries Service in their December 19, 2016 consultation letter for the previous SEA-US project:

The marine water column and seafloor in much of the proposed project area are designated as Essential Fish Habitat (EFH) and support various life stages for the management unit species (MUS) identified under the Western Pacific Regional Fishery Management Council's Pelagic and Mariana Archipelago Fishery Ecosystem Plans (FEPs). The MUS and life stages that may be found in these waters include: eggs, larvae, juveniles and adults of Coral Reef Ecosystem MUS (CRE-MUS), Pelagic MUS (P-MUS), Bottomfish (B-MUS), and Crustacean MUS (CMUS).

Part of this project would be located within the Piti Bomb Holes Marine Preserve. According to Guam Code Annotated Chapter 63 §63116.1, "The purpose of the marine preserve is to protect, preserve, manage, and conserve aquatic life, habitat, and marine communities and ecosystems, and to ensure the health, welfare and integrity of marine resources for current and future generations by managing, regulating, restricting, or prohibiting activities to include, but not limited to, fishing, development, human uses." The preserve was established by law in 1997 and first enforced in 2001, since that time the reef fish populations have increased.

Burdick (2018) evaluated the shallow reef areas that would be affected by this project. The reefs in this area have been affected by numerous stressors including sedimentation and coral bleaching. Coral cover on hardbottom substrates was relatively low ranging from 2% in the channel to 25% on the seaward slope. Sixty-eight species of coral were identified by Kerr and Burdick (2016) along this transect including many branching species that are quite susceptible to physical impacts such as cable laying (e.g. species of the genera *Acropora*, *Pavona*, *Heliopora*, *Pocillopora*, branching *Porites*, and *Psammocora).* Video shows that the area is relatively rugose with a number of large massive *Porites* colonies providing topographic complexity and shelter for CREMUS species. A total of 78 species of fishes in 76 genera and 32 families were observed along the proposed project area including CREMUS species in the families *Acanthuridae, Labridae, Lethrinidae, Lutjanidae, Mullidae,* and *Serranidae.* The project area also supports numerous invertebrate species that support CREMUS or are harvested by humans including numerous mollusks and echinoderms.

2 MITIGATION GOALS AND OBJECTIVES

2.1 Functions to be Lost at Impact Area

The landing of the HK-G submarine cable is anticipated to result in the loss of ecological functions and services associated with coral reef habitat from the following impacts:

- Direct long-term physical impacts and temporary physical impacts and water quality impairments, including an increase in turbidity and sedimentation, during the project.

- Adverse effects to EFH and MUS because there will likely be permanent loss, or long-term damage to, coral colonies/coral reef living on hardbottom substrate in the project area.

This mitigation plan is prepared to offset adverse effects to EFH (i.e., benthic/bottom habitat and substrate) and MUS resources (i.e., coral colonies/coral reefs that are CRE-MUS) and their ecosystem function due to the laying of the cable, AP installation and pinning activities.

2.2 Functions to be Gained at Mitigation Area

The main goal of this mitigation plan is to compensate for the loss of ecological functions and services of a total of 0.008 acres (357.91 sq. ft.) of shallow hardbottom. The coral cover over these areas ranges from 2% to 25% (Burdick, 2018). Based on the upper limit of coral cover, the cable could affect an estimated total area of impacted coral resources of 89.47 sq. ft. (total hardbottom footprint multiplied by the maximum coral cover percentage). A post-landing survey would evaluate those corals affected by the cable landing activities, e.g., by shading or abrading, and then relocate those corals to an area with similar habitat conditions.

The relocation of reef-building hard coral colonies to the mitigation area would increase the amount of EFH and habitat for CRE-MUS at that site. There would be a gain of ecological functions and corresponding goods and services derived from this increase in habitat. Generally, as associated with coral reefs, these are anticipated to include a gain in structure and shelter or habitat for organisms (which provide refugia for fish and other marine organisms); increased uptake and recycling of nutrients (which provide treatment of waste products); and additional reef structure (which provide for coastal stabilization against the effects of storm surge).

2.3 Location

The impact areas are shown on Figure 3.

2.4 Methods for Quantifying Aquatic Resources

Burdick's (2018) benthic cover estimates were derived from the point-count analysis of photographic images captured along a series of 50 meter transects laid end-to-end across the length of the 10 m wide by 301 m long Survey Area A (Figure 3). After a length of transect tape was placed by one diver, another diver obtained an image every one meter along the left side of the tape using a compact point-and-shoot camera placed atop a PVC monopod. Images were imported from the Secure Digital (SD) card into Adobe Lightroom software and a batch white balance adjustment was applied to groups of images with similar white balance characteristics. Benthic cover estimates were generated through an analysis of the photo transect images using Coral Point Count with Excel Extension (CPCe) application. Corals were identified to species when possible, although some taxa, such as massive *Porites*, *Montipora*, and others, often could not be identified to species level using the photo transect images.

Burdick's (2018) survey focused on hardbottom substrate or sandy areas with existing coral colonies within the Tepungan Channel: at the bulkhead; on a large rock outcrop in the sandy bottom channel portion; and in the outer portion of the channel seaward to the reef crest. The survey area could generally be divided into two distinct zones: 1) a deeper (approximately 30-15 m) community characterized by low relief, low coral cover, and high algal cover, and 2) a shallower (approximately 15–5 m) community characterized by moderate-to-high relief, higher coral cover, and lower fleshy macroalgae cover (Burdick 2018).

2.5 Existing hydrology

The project site is in the Asan-Piti watershed, which encompasses portions of Asan and Piti municipalities, and drains north into the Philippine Sea (Kottermair, 2012). Two freshwater streams flow beneath Marine Corps Drive (Route 1), through Lot 262, and empty into Piti Bay. Masso River passes through the western sector of the property and empties into the bay approximately 200 feet west of the project corridor. The second stream or creek is unnamed and flows intermittently from a culvert below Route 1 through the eastern sector of the property (Photo 3-1). The shallow stream channel is approximately 3 to 4 feet wide and empties into the bay adjacent to the project corridor.

The project corridor is a part of a shallow, intertidal reef flat with a depth of about 1 m (3.2 ft) at high tide and low surface relief interrupted by occasional pools. The reef margin drops to about 2 m as it transitions into Tepungan Channel, which ranges from approximately 200 to 500 ft wide and up to approximately 75 ft deep. The average tide level ranges from 1.3 ft. during neap tides and 2.1 ft. during spring tides. Edward K. Noda and Associates, Inc. (1990) calculated storm tidal ranges for the west coast of Guam to be 23.6 ft. high with period of 16 seconds (5-year significant wave) and 46.5 ft. high with period of 22 seconds (100-year significant wave). Marsh & Gordon (1972 and 1974) state that the most important factors affecting movement of water across the Piti reef flats are tidal conditions and surf actions on the reef margin north of the Tepungan Channel. Water circulation on the reef flat is primarily unidirectional during ebbing, and flooding during spring tides with water moving over the northern reef margin and flowing in a southern direction towards the southwestern sector of the Tepungan Channel and reef flat south of the Channel. The water then moves in a northeast direction along the Tepungan Channel and southern reef flat, and veers north towards the mouth of the Tepungan Channel. There is also movement of water during flooding tides into the entrance of the Channel, especially when the surf action on the northern reef margin is reduced.

2.6 Existing benthic cover

The benthic habitat in the channel was previously mapped as pavement turf (50% to 90% cover) near shore, uncolonized sand (90% to 100% cover) in the channel, and aggregate coral reef (10% to 50% cover) along the seaward slope at the channel mouth (Burdick, 2005) (Figure 3). Based on the 2018 marine survey, coral cover was moderate, ranging from 2% up to 25% with a mean coral cover of 14% ± 8.0% standard deviation. Benthic cover percentages for Survey Area A were analyzed per 50 m transect and are presented in Table 1.

Table 1. Percent Benthic Cover Along Marine Survey Route

Major Structure	Zone/Distance						Average Percent Cover
	Transect 1 0 to 50 m	Transect 2 50 to 100 m	Transect 3 100 to 150 m	Transect 4 150 to 200 m	Transect 5 200 to 250 m	Transect 6 250 to 300 m	
Hardbottom cover (%)							
Coral	2	9	15	16	25	18	**14.0** ± 8.0
Crustose coralline algae	2	5	13	14	24	22	**13.4** ± 9.0
Fleshy macroalgae	30	21	9	11	24	32	**21.0** ± 17.2
Turf algae	19	27	24	25	13	12	**19.9** ± 6.5
Branching coralline algae	33	23	21	17	10	13	**19.6** ± 10.0
Cyanobacteria	1	3	5	16	1	1	**2.9** ± 2.0
Unconsolidated sediment (%)							
Sand	13	11	13	10	3	3	**8.9** ± 5.5

The 2015 marine survey recorded 68 species of hard corals, including Scleractinian, *Millepora* and *Heliopora* species, with diversity spanning 13 families (Table 1). Since the total species count includes taxa that were identified to genus but not confidently to species level, unidentified conspecifics were conservatively lumped into a single category; therefore, the total number of species may be higher (Kerr and Burdick, 2016).

The additional survey of the shallow, intertidal reef flat recorded seven species of hard scleractinian corals, all of which are common species that are found in similar environments around Guam and the tropical western Pacific (Kerr and Burdick 2016). Of these, *Pocillopora damicornis* (cauliflower coral) and *Leptastrea purpurea* (crust coral) dominated the survey area, nearly always as widely scattered, very small and young colonies, often of fingernail-size proportions. As observed by Kerr and Burdick (2016), the shallow depth and high rate of sedimentation appears to have resulted in very low coral cover. The remaining corals were occurred at much lower densities of between 1 and 7 colonies per 100 sq. m: *Acropora* cf. *pulchra*, *Goniastrea retiformis*, *Leptoria phrygia*, *Pocillopora* cf. *verrucosa*, and *Porites* sp(p). (Kerr and Burdick 2016).

Table 2. Coral Species in Impact Area (Kerr and Burdick, 2016)

FAMILY/SPECIES	FAMILY/SPECIES	FAMILY/SPECIES
ACROPORIDAE	**EUPHYLLIDAE**	**MILLEPORIDAE**
Acropora abrotanoides	*Euphyllia cf. cristata*	*Millepora platyphylla*
Acropora cf. quelchi	*Euphyllia glabrescens*	**OCULINDAE**
Acropora globiceps	**FUNGIIDAE**	*Galaxaea fasicularis*
Acropora latistella	*Fungia fungites*	**POCILLOPORIDAE**
Acropora microclados	**HELIOPORIDAE**	*Pocillopora damicornis*
Acropora spp.	*Heliopora coerulea*	*Pocillopora meandrina*
Acropora surculosa	**Incertae sedis (formerly**	*Pocillopora setchelli*
Acropora tenuis	**FAVIIDAE)**	*Pocillopora spp.*
Acropora verweyi	*Leptastrea pupurea*	*Pocillopora verrucosa*
Acropora wardii	**LOBOPHYLLIDAE**	*Stylocoeniella armata*
Astreopora listeri	*Lobophyllia* cf. *flabelliformis*	**PORITIDAE**
Astreopora myriophtalma	**MERULINIDAE**	*Goniopora* cf. *tenuidens*
Astreopora randalli	*Astrea curta*	*Porites* cf. *myrmidonensis*
Montipora cf. tuberculosa	*Cyphastrea agassizi*	*Porites deformis*
Montipora grisea	*Cyphastrea* cf. *ocellina*	*Porites lobata*
Montipora hoffmeisteri	*Cyphastrea chalcidicum*	*Porites lutea*
Montipora spp.	*Cyphastrea serailia*	*Porites murrayensis*
Montipora verrucosa	*Dipsastreae favus*	*Porites rus*
AGARICIIDAE	*Dipsastraea matthaii*	*Porites* spp.
Gardineroseris planulata	*Dipsastraea pallida*	**SIDERASTREIDAE**
Pachyseris speciosa	*Dipsastraea* spp.	*Psammocora contigua*
Pavona chiriquiensis	*Favites magnistellata*	*Psammocora haimeana/*
Pavona divaricata	*Goniastrea edwardsi*	*Profundacella*
Pavona duerdeni	*Goniastrea pectinata*	*Psammocora superficiales*
Pavona sp. "contorta"	*Goniastrea retiformis*	
DIPLOASTREIDAE	*Goniastrea stelligera*	
Diploastrea heliopora	*Hynophora microconos*	
	Leptoria phrygia	
	Platygyra daedalea	

Note: "sp." indicates a species unidentifiable to species level in the field. "cf." indicates the species may be the one indicated.

2.7 Existing substrate

The hardbottom channel impact area comprises 357.91 sq. ft. of consolidated hardbottom substrate, while the remaining impact area in the channel comprises approximately 920.27 sq. ft. of softbottom or sandy substrate.

2.8 Existing wildlife usage

2.8.1 Fish

The Kerr and Burdick (2016) survey recorded 90 species of fish observed within 5 m of the transects, and spanning 25 families (Table 2). The diversity was highest (78 species) along the outer reef slope, which is characterized by a complex topographic relief and variety of bottom types (Kerr and Burdick, 2016). Although this habitat type can harbor a large number of planktivorous fishes, the survey recorded few such species, apparently because of a lack of notable upwelling; instead, the survey primarily found members of Chaetodonidae (butterflyfish) and Acanthuridae (surgeonfish, tangs, and unicornfish) (Kerr and Burdick, 2016).

The survey recorded a few species from the Mullidae (goatfish) and Lethrinidae (emperorfish and breams) families in the central sector (deeper portion with sandy bottom), and an unidentified member of the Blenniidae (blennies) in the southern sector (shoreward intertidal bench). No large schools of food fishes were observed, presumably as a result of past, and potentially current, pressure from spearfishing within the MPA (Kerr and Burdick, 2016).

Table 3. Fish Species in Impact Area (Kerr and Burdick, 2016)

FAMILY/SPECIES	FAMILY/SPECIES	FAMILY/SPECIES
ACANTHURIDAE	**EPHIPIDAE**	**MALACANTHIDAE**
Acanthurus lineatus	*Platax orbicularis*	Malacanthus latovittatus
Acanthurus nigricans	**FISTULARIIDAE**	**MULLIDAE**
Acanthurus olivacerous	*Fistularia commersonii*	*Parupeneus barberinus*
Acanthurus triostegus	**GOBIIDAE**	*Parupeneus multifasciatus*
Ctenochaetus striatus	*Oplopomus oplopomus*	*Parupeneus cyclostomus*
Naso literatus	**HOLOCENTRIDAE**	**NEMIPTERIDAE**
Naso unicornis	*Myripristis berndti*	*Scolopsis lineata*
Naso vlamingii	*Myripristis* sp.	**OSTRACIIDAE**
Zebrasoma scopas	*Neoniphon* sp. cf. *sammara*	*Ostracion cubicus*
APOGONIDAE	**LABRIDAE**	**PINGUIPEDIDAE**
Apogon sp.	*Calotomus carolinus*	*Parapercis clathrata*
BALISTIDAE	*Cheilinus trilobatus*	**POMACANTHIDAE**
Balistapus undulatus	*Chlorurus microrhinos*	*Centropyge flavissima*
Melichthys vidua	*Chlororus sordidus*	**POMACENTRIDAE**
Sufflamen chrysoptera	*Epibulus insidator*	*Abudefduf sexfasciatus*
BLENNIIDAE	Cf. *Coris* sp.	*Abudefduf vaigiensis*
gen. sp.	*Halichoeres hortulanus*	*Amblyglyphidodon curacao*
Meiacanthus atrodorsalis	*Halichoeres trimaculatus*	*Chromis alpha*
CHAETODONTIDAE	*Hemigymnus fasciatus*	*Chromis* sp.
Chaetodon auriga	*Hemigymnus melapterus*	*Chromis ternatensis*
Chaetodon citrinellus	*Labroides dimidiatus*	*Chromis viridis*
Chaetodon lunulatus	*Macropharyngodon*	*Chrysiptera brownriggii*
Chaetodon melannotus	*melagris*	*Chrystiptera* sp.
Chaetodon mertensii	*Oxycheilinus unifasciatus*	*Dascyllus aruanus*
Chaetodon ornatissimus	*Scarus altipinnis*	gen. sp.
Chaetodon reticulatus	*Scarus globiceps*	*Neopomacentrus violascens*
Chaetodon unimaculatus	*Scarus rubroviolaceus*	*Plectroglyphidodon*
Forcipiger flavissimus	*Scarus schlegeli*	*johnstonianus*
Hemitaurichthys polylepis	*Stethojulis bandanensis*	*Plectroglyphidodon lacrymatus*
Heniochus chrysostomus	*Thallassoma lutescens*	*Pomacentrus vaiuli*
Heniochus monoceros	*Thallassoma purpureum*	*Stegastes lividus*
Heniochus varius	**LETHRINIDAE**	**SERRANDIDAE**
CIRRHITIDAE	*Lethrinus harak*	*Epinephelus* sp.
Paracirrhites arcatus	**LUTJANIDAE**	**TETRAODONTIDAE**
ELEOTRIDAE	*Lutjanus fulvus*	*Arothron melagris*
Ptereleotris heteroptera	*Macolor macularis*	*Canthigaster solandri*
	Macolor niger	**ZANCLIDAE**
	Monotaxis grandoculis	*Zanclus cornutus*

Note: “sp.” indicates a species unidentifiable to species level in the field. “cf.” indicates the species may be the one indicated.

2.8.2 Mobile Macroinvertebrates

A total of 35 mobile invertebrate species were recorded during the survey, spanning 8 taxonomic Orders or Classes (Table 4). The highest diversity was among members of Echinodermata, which were observed in the following classes: Asteroidea (3 species), Echinoidea (2 species), and Holothuroidea (13 species). The next most common group were the Mollusca, which included the following classes: Bivalvia (1 species) and Gastropoda (13 species). The survey found these as either burrowing, sand-inhabiting predatory members of Conidae (cone shells) or Naticidae (moon shells), or as cryptic but visible members of Cypraeidae (cowries) (Kerr and Burdick, 2016). Many specimens of the tropical oyster *Saccostrea* sp. were observed on the reef flat, and may thrive here because of its tolerance of the freshwater seepage in this area (Kerr and Burdick, 2016).

Table 4. Conspicuous Invertebrates in Impact Area (Kerr and Burdick, 2016)

CLASS/ORDER & SPECIES	CLASS/ORDER & SPECIES	CLASS/ORDER & SPECIES
ALCYONACEA	**ECHINOIDEA**	**HOLOTHUROIDEA**
cf. *Clavularia* sp.	*Echinostrephus aciculatus*	*Actinopyga echinites*
Lobophyton sp.	*Metalia dicrana*	*Actinopyga mauritiana*
Sarcophyton sp.	**GASTROPODA**	*Bohadschia argus*
Sinularia sp.	*Conus pulicarius*	*Holothuria atra*
ASTEROIDEA	*Conus* sp.	*Holothuria edulis*
Acanthaster planci	*Cypraea moneta*	*Holothuria whitmaei*
Linckia laevigata	*Cypraea pustulosa*	*Stichopus chloronotus*
Linckia multiora	*Cypraea vitellus*	*Thelenota ananas*
BIVALVIA	gen. sp.	
Saccostrea sp.	*Lambis lambis*	
DECAPODA	*Lambis scorpius*	
Calcinus sp.	*Phyllidia* sp.	
Callianassidae sp.	*Polinices* sp.	
Thalamita sp.	*Strombus gibberulus*	
DEMOSPONGIAE	*Tectus niloticus*	
gen. sp.	*Vasum* sp.	

Note: Conspicuous invertebrates are greater than 5 cm maximal dimension. "sp." indicates a species unidentifiable to species level in the field. "cf." indicates the species may be the one indicated.

2.9 Historic and Current Land Use

The impact areas are historically used for recreation and fishing activities. The Tepungan Channel is am intake channel supplying cooling water for the nearby Guam Power Authority power plants. The impact areas are currently within the Piti Bomb Hole Marine Protected Area.

2.10 Current owners

The Government of Guam asserts authority and jurisdiction over the submerged lands of the project site.

3 Relocation Site Selection and Justification

Potential reattachment areas will be identified based on site-specific information; coral reattachment sites will be selected based on relative proximity, open substrate availability, and similarity to original attachment site, including water depth, substrate type, and presence of healthy corals. Specific reattachment sites will be selected outside of the cable corridor but at a corresponding depth with similar water movement (CSA, 2017).

4 Mitigation Work Plan

4.1 Work Plan and Schedule

There is no need for any heavy construction equipment for the mitigation at any of the coral relocation sites. The coral relocation is projected to occur within 20 days after the completion of the cable landing, AP installation, and pinning activities, weather permitting. During the post-cable landing surveys, detached, broken, abraded, shaded, or dislodged corals will be identified and salvaged for repair or relocation. Selection of corals for relocation will be dependent on coral morphology and size (e.g., smaller than 50 cm). This relocation of stony corals will salvage individual specimens and maintain the ecological services they provide to the habitat.

In addition to relocating corals directly impacted by the cable landing, the marine contractor would look for additional corals of opportunity (fragmented, detached, or broken corals that are not clearly a result of the cable landing, AP installation, or pinning activities) within a 3 m area of either side of the cable landing route. These corals would be relocated and reattached along with and using the same methods as corals impacted by the cable landing activities, but would not be monitored long term. This redundancy accounts for the estimated failure rate of relocated corals and will offset adversely affected corals that are undocumented due to their location at deeper and unobservable depths.

4.2 Transplant Methodology

During the relocation process, colonies will be removed by chipping the living portion of the colony from the point of attachment or by removing a portion of the substrate along with the attached organism(s). Selected colonies would be removed by divers using a hammer and masonry chisel. Each colony will be transported underwater to a stable maintenance tray, where it can be temporarily cached in situ pending transport to the relocation site, away from potential impacts of installation activities (CSA, 2017).

Reattachment and relocation of biological specimens is proposed within water depths 0 to 30 m (0 to 98 ft), which are considered to be within safe diving limits. It is not practical to conduct reattachment in deeper waters due to the limited bottom time that would be required in order remain within safe diving no-decompression limits (CSA, 2017).

Selection of corals to be relocated/reattached after cable installation will be determined using four impact categories:

1. cable is shading organism;
2. cable is abrading organism;
3. cable formerly abraded organism but no longer abrading; and
4. cable has dislocated organism.

Following selection of reattachment locations and prior to attaching the corals, reattachment surfaces will be prepared by removing any loose sediment and surficial biota (i.e., algae and fouling organisms). A concrete mixture of approximately one-part Portland cement to one-part sand will be prepared for reattaching corals. Concrete is a much more reliable bonding agent than marine epoxy and is accepted by coral regulatory agencies and research institutes (e.g., National Oceanic and Atmospheric Administration, National Coral Reef Institute, and Florida Marine Research Institute) (National Coral Reef Institute, 2004). Prepared concrete placed in a plastic bucket will be lowered from the vessel to near bottom with lift lines and transported by divers to attachment locations. Alternatively, the concrete can placed in 1-gal heavy duty plastic bags for transport to attachment sites. Proper preparation and application of cement during underwater operations minimizes any sedimentation of cement residue on biota. The concrete is prepared with a minimal amount of water yielding a very dry and “stiff” mixture, which strictly reduces the plume during deployment of the concrete in plastic buckets and during subsequent handling (CSA, 2017).

Sufficient amounts of concrete will be placed directly on the pre-cleaned substrate, and organisms to be reattached will be pressed firmly into the concrete mixture until stable and secure. Masonry nails hammered into the substrate can be used in the attachment process to help determine structural integrity at the reattachment location and reinforce the bonding matrix. Masonry nails should be used in the reattachment of relatively large specimens. Reattached specimens will be intermittently checked during reattachment operations to ensure their stability, address the aesthetic quality of the reattachment matrix, and dissipate cement residue that may have settled on adjacent biota (CSA, 2017). No collateral damage to biological resources has been documented from properly conducted restoration where diver application of concrete has been used for coral reattachment (Franklin et. al., 2005; Schittone et. al., 2006).

Monitored coral colonies will include the experimental group of up to 100 reattached corals and a reference group of up to 30 corals that will be selected based on the degree of stability within the habitat, health, and location relative to the relocation site. The selected biota will be marked with a unique numeric identification tag and mapped relative to an on-site reference benchmark.

Masonry nails will be used to affix the tags to the substrate directly adjacent to reattached and selected reference corals. To make the distinction between groups visually obvious, the experimental group will be marked with different colored tags than the reference group. Selected corals will be mapped by determining the distance and bearing (compass heading) relative to a geo-referenced benchmark. Depending on the spatial distribution of the monitored coral, multiple station markers may be required for mapping. Identification tags will be positioned relative to the coral to ensure the tag will be visible in photographic images collected as part of the monitoring program. Mapping data will be entered into ArcGIS to produce a scaled map of the reattached and reference coral colonies (CSA, 2017). Selected corals will be monitored for health and survivorship for an 18-month duration.

5 Monitoring Plan

Monitoring will occur over an 18-month period, which will include the following monitoring events and reports:

1. Baseline Monitoring Event and report immediately following the coral relocation
2. 6-month monitoring event and report
3. 18-month monitoring event and report.

The monitoring program will include written and photographic records of the coral's condition. The following information will be collected during each monitoring event: species, diameter, survivorship, percent colony mortality in cases of partial survival, cause of mortality, if discernible (including abrasion, detachment, fracture/breakage, bleaching, disease, predation, competitive overgrowth, and silt smothering); and any other observations of scientific interest. Direct observations concerning attachment status and relative health of reattached organisms will be made by an experienced scientist at each of the monitoring sites. Relative health of reattached organisms will be based primarily on assessment of color (e.g., normal, pale, or bleached), tissue condition (e.g., degree of accretion/regression, or presence of disease), interspecific events (e.g., clionid intrusion), and algal overgrowth (CSA, 2017).

Comparisons will be made between experimental (i.e., relocated) and reference corals in order to assess the success of relocation efforts. Coral monitoring will be conducted at 6 months post-relocation, and 18 months post-relocation (from the date of final relocation). An 18-month duration is adequate to determine survivorship and relative success of coral relocation. Typically after 6 months, properly relocated corals have acclimated to the potential effects of being displaced, transported, and reattached and will be responding similarly to the reference corals to environmental conditions at the relocation site(s) (CSA, 2017).

A brief written monitoring report will be submitted to the Guam Department of Agriculture Division of Aquatic and Wildlife Resources, the U.S. Army Corps of Engineers and the Guam Environmental Protection Agency, and National Marine Fisheries Service after each census. The content of the monitoring reports will include sufficient information to document that the performance criteria have or have not been met.

6 Performance Standards

The following criteria will be used to determine or measure the success or failure of the mitigation and the need for maintenance activities.

- Relocated corals established will have greater than 75% survivorship after 6 months and 50% after 18 months, relative to a reference group of resident corals representative of those established as described in Section 4.2.

These performance standards will be used to verify that the project has attained the target functions mentioned in Section 2.2. The presence of established coral colonies will demonstrate the mitigation site has provided coral habitat and ecological functions similar to the impact area.

7 Site Protection and Maintenance

7.1.1 Parties Responsible

RTI Solutions Inc. will be responsible for completing the mitigation for the cable landing project in Piti, Guam.

7.1.2 Long-term legal protection instrument

The mitigation site is located entirely within an established Marine Protected Area (MPA) and submerged lands under the jurisdiction of the Government of Guam. It is not likely that the mitigation site would change ownership because of the terms and conditions of the MPA established under Guam law.

7.1.3 Maintenance plan and Schedule

RTI Solutions Inc. will be responsible for the regular maintenance of the mitigation sites. Maintenance will be scheduled in conjunction with the monitoring, or more frequently as determined by a coral reef ecologist and RTI Solutions Inc., based on the findings during monitoring visits.

8 Adaptive Management Plan

If any of the performance criteria are not met for all or a portion of the mitigation project, RTI Solutions Inc. or its agent shall prepare an analysis of the cause(s) therefore and, if deemed necessary by the Corps, propose remedial actions for Corps approval. The remedial action will be completed as directed by the Corps.

The coral outplanting will be considered a success if 75% of the corals survive to six months and successfully remain affixed to the substrate. Mortality rate of >50% at 18 months (barring a bleaching event or storm) would be considered high mortality. In the event 50% survival relative to the reference group isn't achieved after 18 months, contingency mitigation will be negotiated with regulatory agencies.

Potential challenges include preventing invasive species from becoming established, and addressing elevated sea surface temperature that result in coral bleaching events. Storms also present a challenge if they dislodge the fragments or result in abrasion or breakage of the colony. A possible strategy to address invasive species is to schedule periodic maintenance of the mitigation site by a contractor, who will manually remove undesirable, nuisance species. Elevated sea surface temperatures are difficult to address. Replanting of the site may be necessary once regular temperature patterns resume.

9 Financial Assurances

RTI Solutions Inc. would be responsible for the mitigation of the reef flat and channel sites impacted by the construction of the cable raceway and landing of the submarine cables. The project would be privately funded by RTI Solutions Inc. Upon completion of construction, RTI Solutions Inc. would also be responsible for performing regular maintenance and monitoring of the mitigation sites. Should the monitoring identify issues that require remedial measures, implementation of those measures would be the responsibility of RTI Solutions Inc.. The overall responsibility for project success is with RTI Solutions Inc.. Contact information for RTI Solutions Inc.is presented below:

RTI Solutions Inc.
268 Bush Street, #77
San Francisco, CA 94104

10 References

Burdick, D. 2005. Guam Coastal Atlas. U.S. Department of the Interior and National Oceanic and Atmospheric Administration. 149 pp.

Burdick, D. 2018. Benthic cover and ESA coral surveys for the proposed Hong Kong-Guam, Japan-Guam-Australia North, and Japan-Guam-Australia South cable systems landings in Piti, Guam. 67 pp.

CSA Ocean Sciences Inc. 2017. ATISA Guam-CNMI Cable System Coral Impact Minimization Plan. 30pp

Guam Environmental Protection Agency. 2001. Guam Water Quality Standards. Government of Guam.126 pp.

Kerr, A.M. and D.R. Burdick. 2016. Marine Biological Survey for the Guam Telephone Authority Proposed Cable Landings, Piti, Guam. Prepared for Duenas, Camacho & Associates, Inc. June 2016.

Marsh, J.A., Jr., and G.D. Gordon. 1972. A Marine Environmental Survey of Piti Bay and Piti Channel, Guam. Prepared for Guam Power Authority. Univ. of Guam Marine Lab., Tech. Rept. No. 3, 28 pp.

Marsh, J.A., Jr., and G.D. Gordon. 1974. Marine Environmental Effects of Dredging and Power Plant Construction in Piti Bay and Piti Channel, Guam. Prepared for Guam Power Authority. Univ. of Guam Marine Lab., Tech. Rept. No. 8, 56 pp.

National Coral Reef Institute. 2004. Hollywood Ocean Outfall Stony Coral Transplantation Monitoring Final Monitoring Event. Draft Report. Nova Southeastern Oceanographic Center, Dania Beach, Florida. 14 pp.

National Oceanic and Atmospheric Administration. 2016. Endangered Species Act Status Review Report: Giant Manta Ray (Manta birostris) and Reef Manta Ray (Manta alfredi). 127 pp.

Table 5. Monitoring Intervals for Coral Mitigation

Monitoring Event	Baseline	6-Month	18-Month
Schedule	Immediately Following and within 20 days of the completion of all proposed cable landing, AP installation, and pinning activities	6-Months after Baseline Monitoring Event	12 Months after 6-month monitoring Event
Monitoring Report	Baseline Monitoring Report	6-Month Monitoring Report	18-Month Monitoring Report
Performance Criteria	N/A	75% Survivorship relative to Control Group	50% Survivorship Relative to Control Group

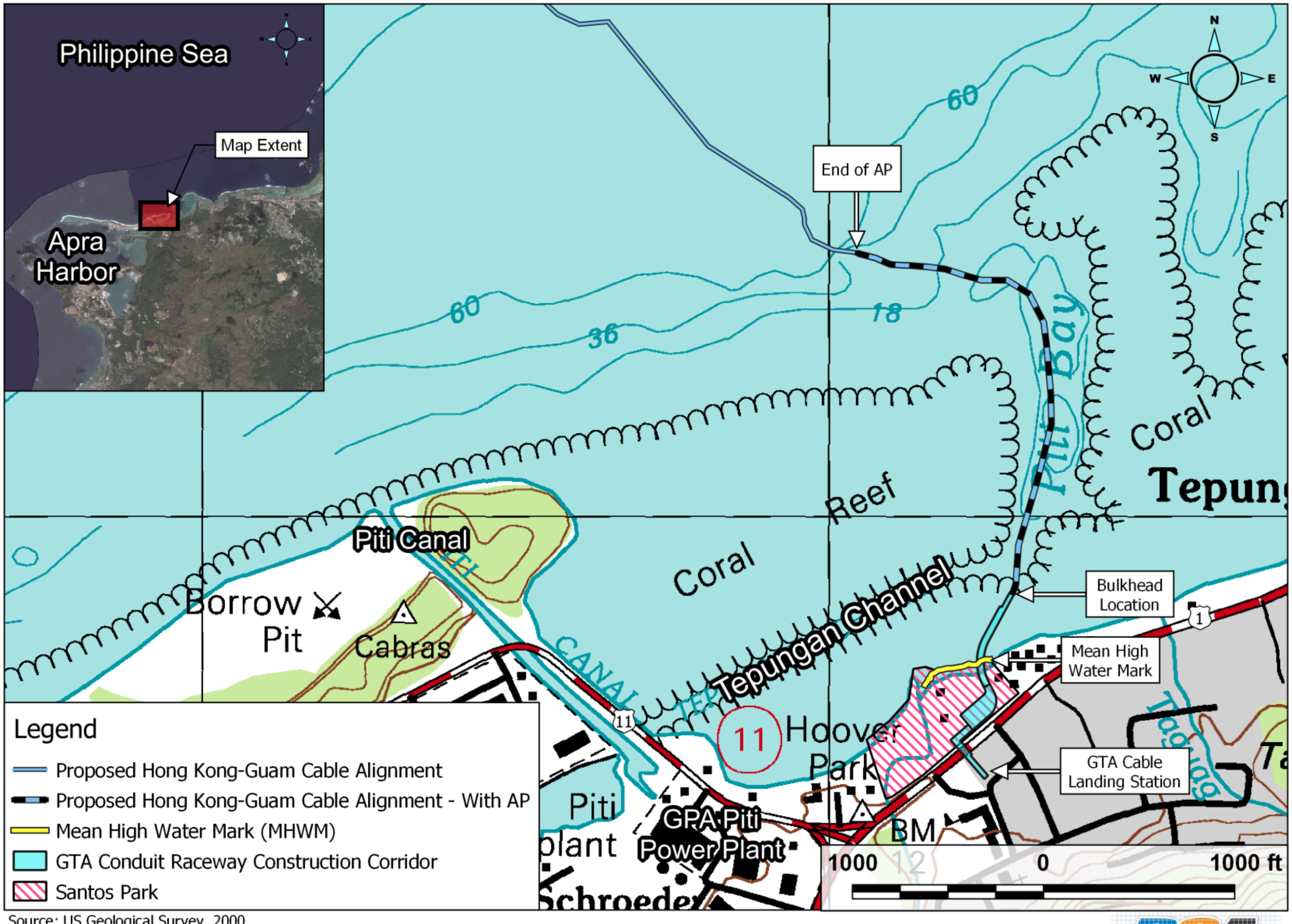


Figure 1. Site location map of the HK-G Cable in Piti, Guam.

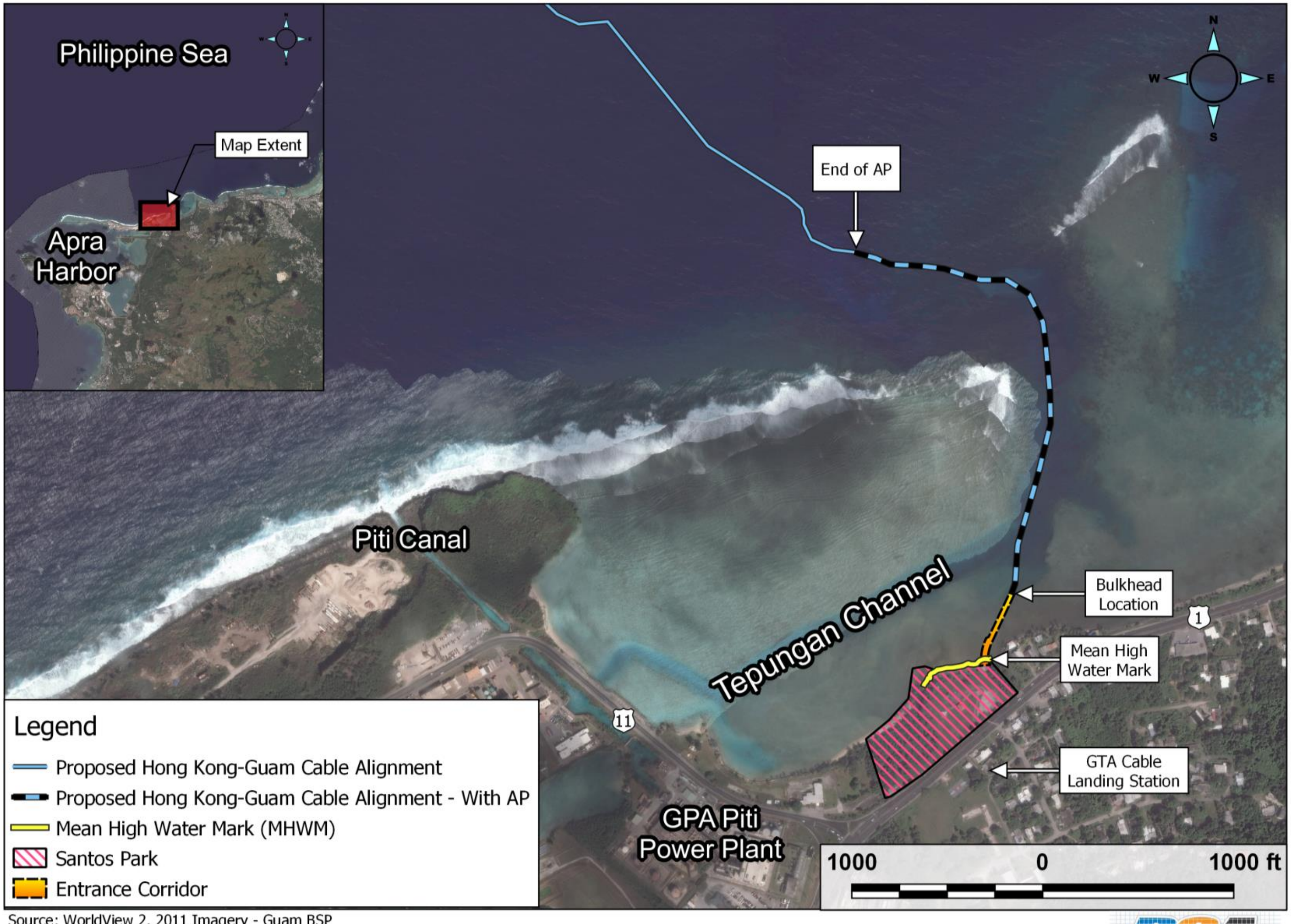


Figure 2. Aerial view of the HK-G Cable in Piti, Guam

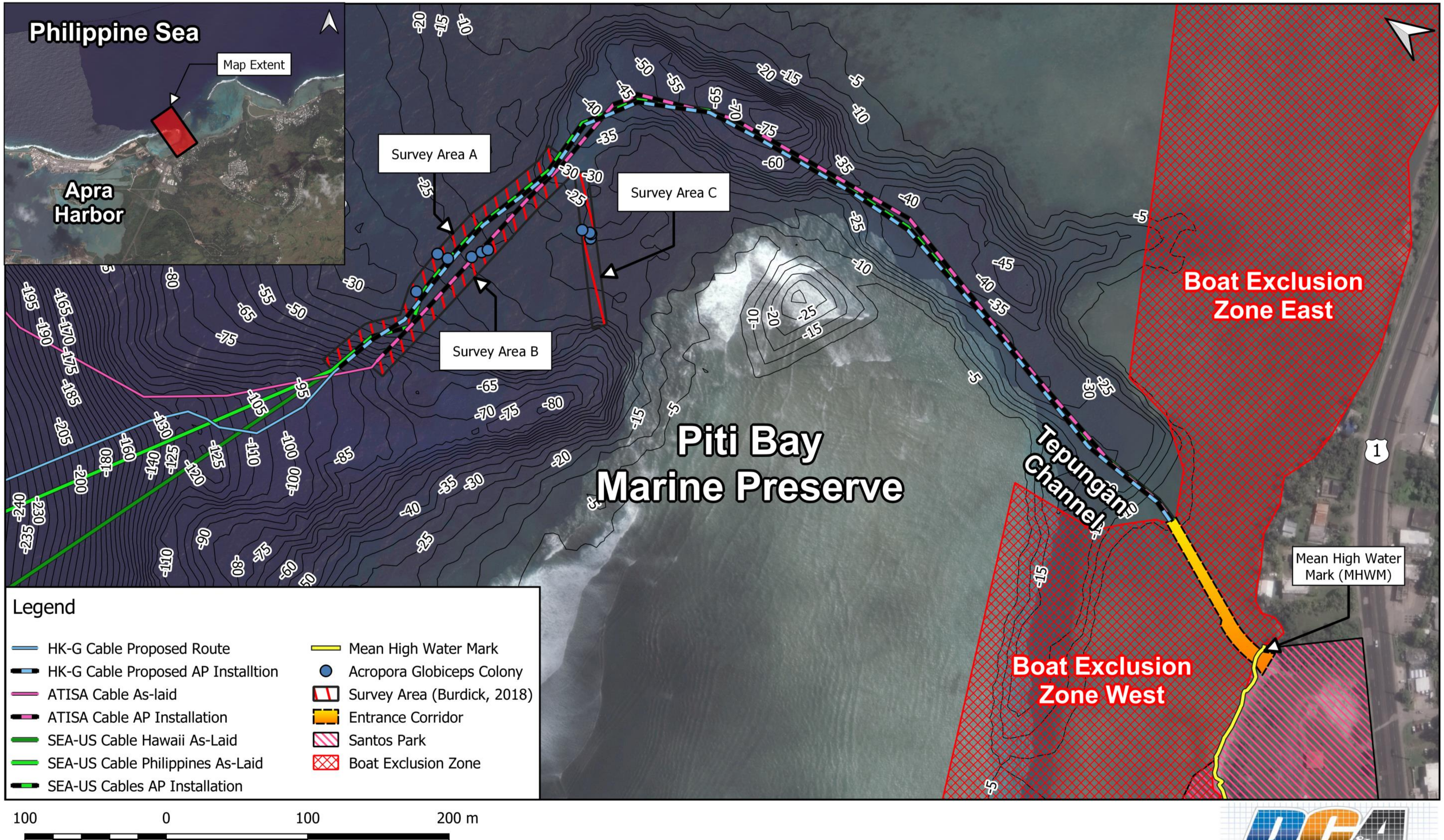


Figure 3. Detailed site location map of the HK-G Cable in Piti, Guam

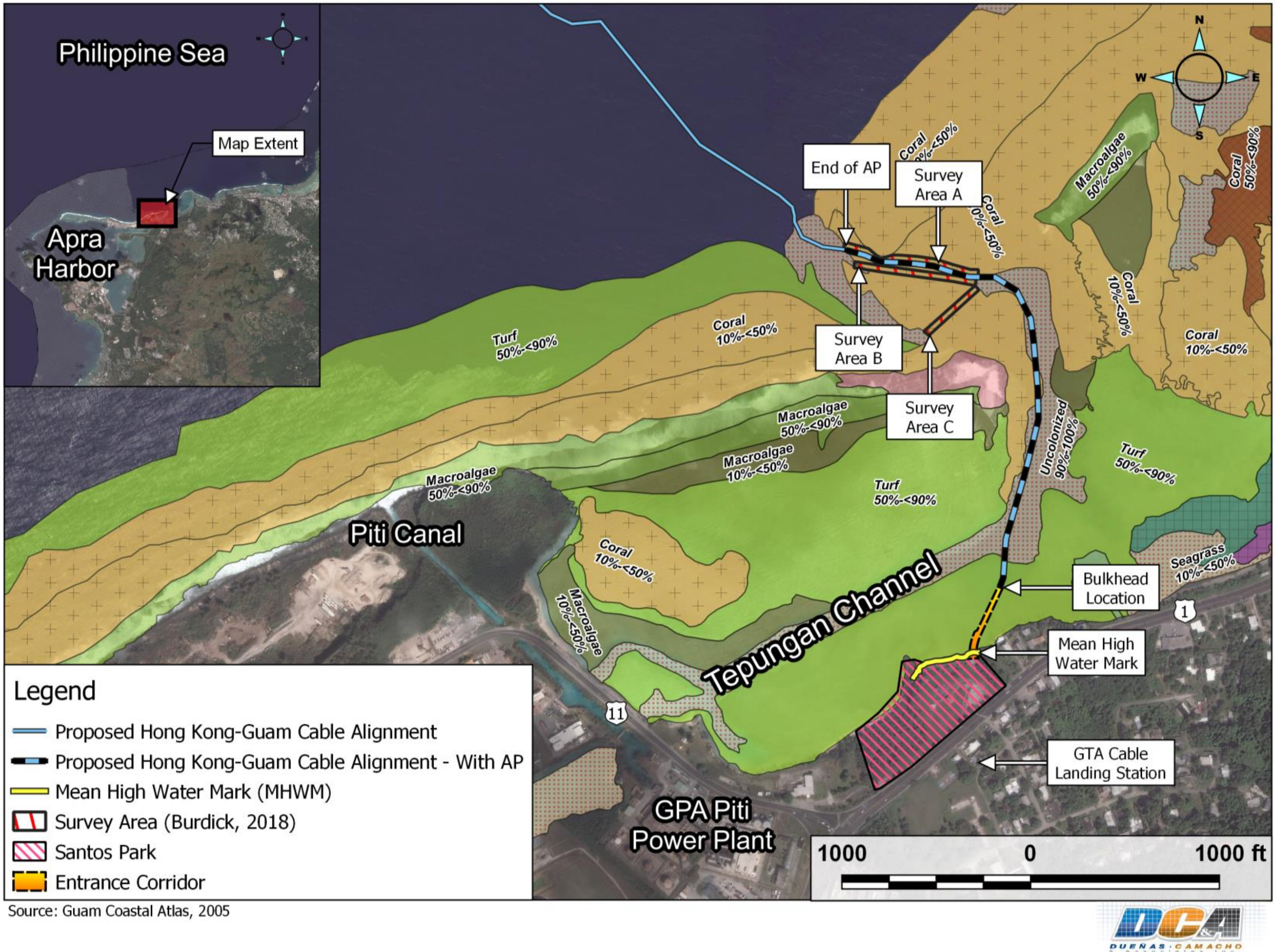


Figure 4. Benthic Habitat map of the HK-G Cable in Piti, Guam.

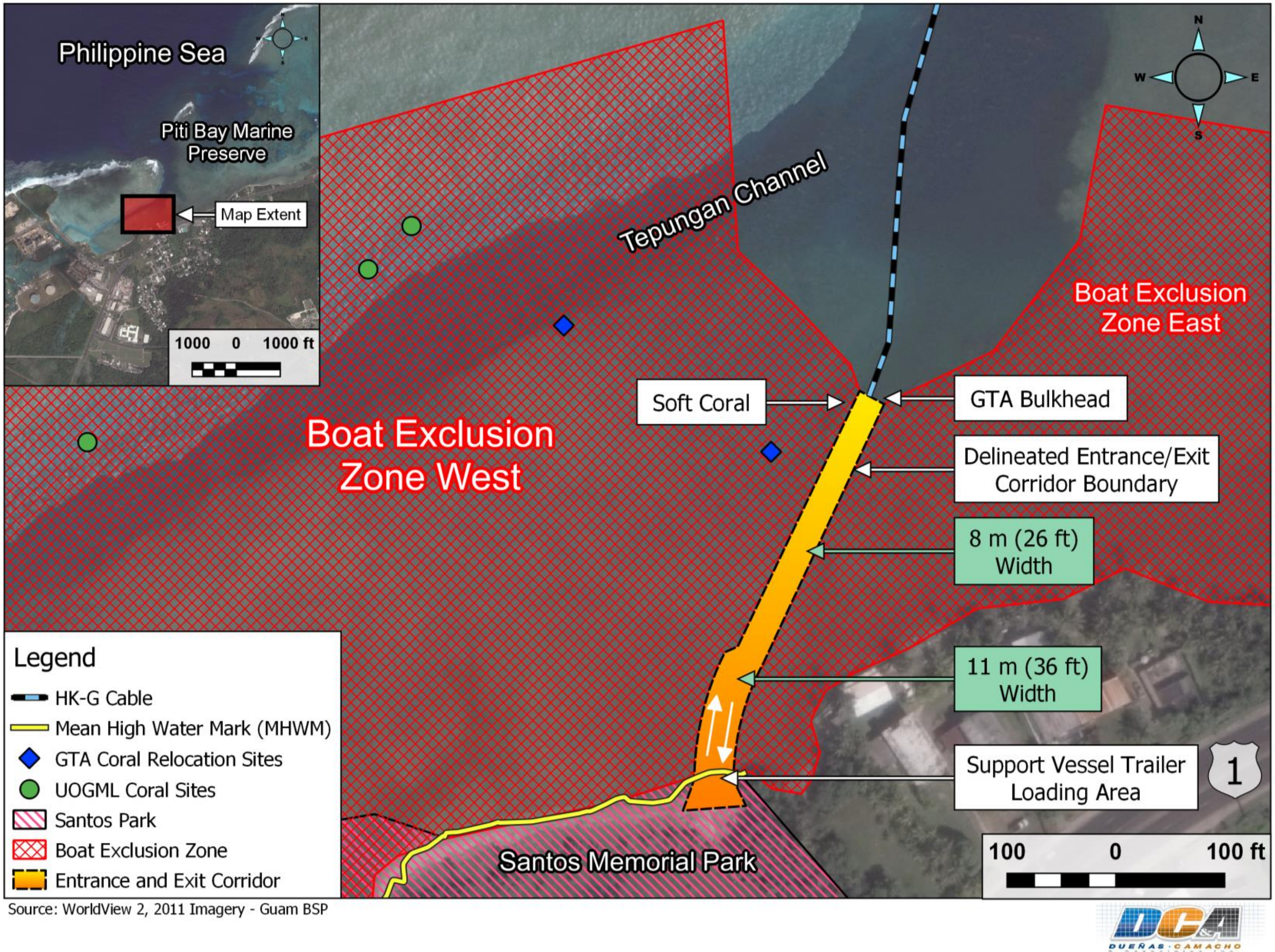


Figure 5. Entrance Corridor Map.

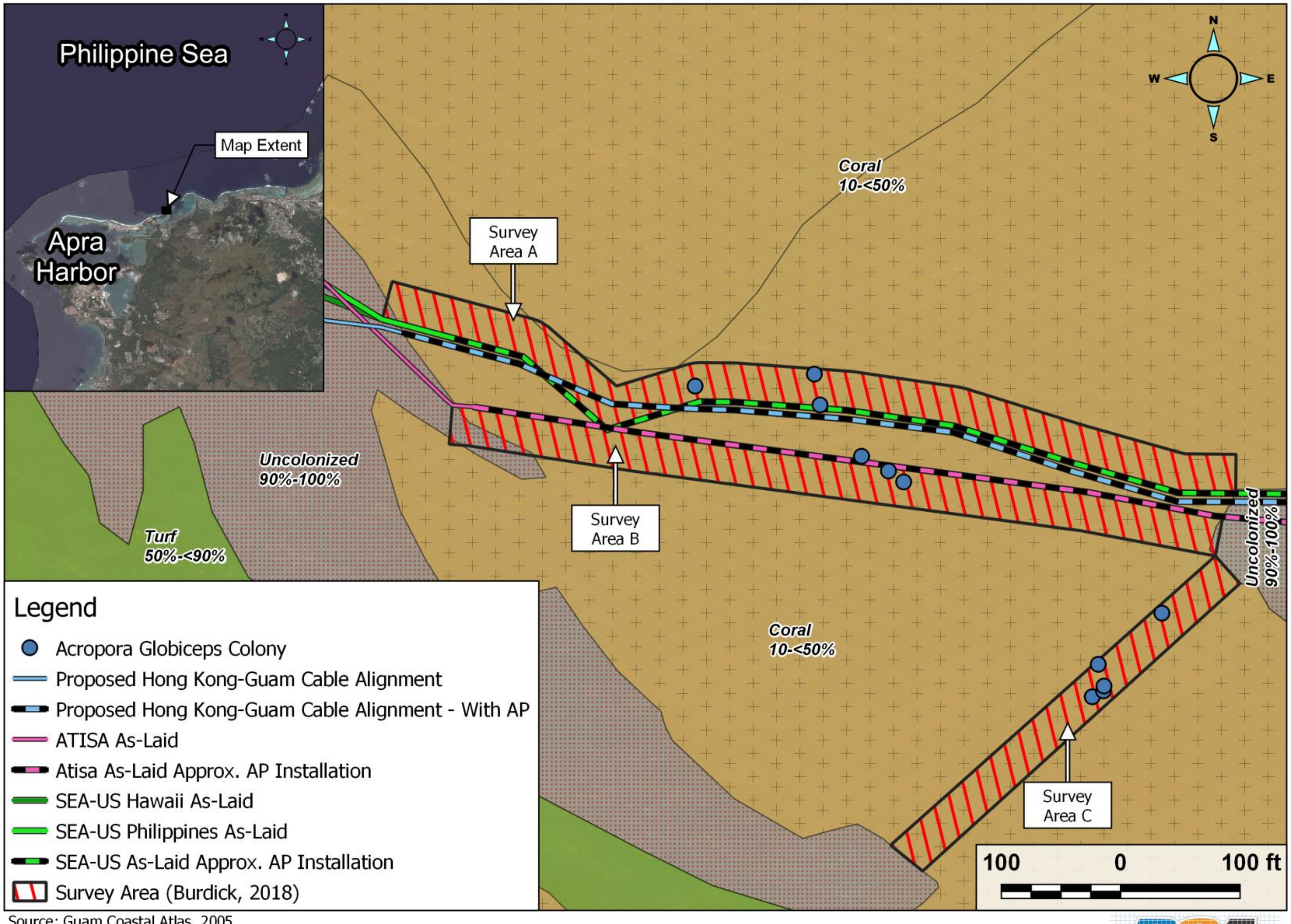
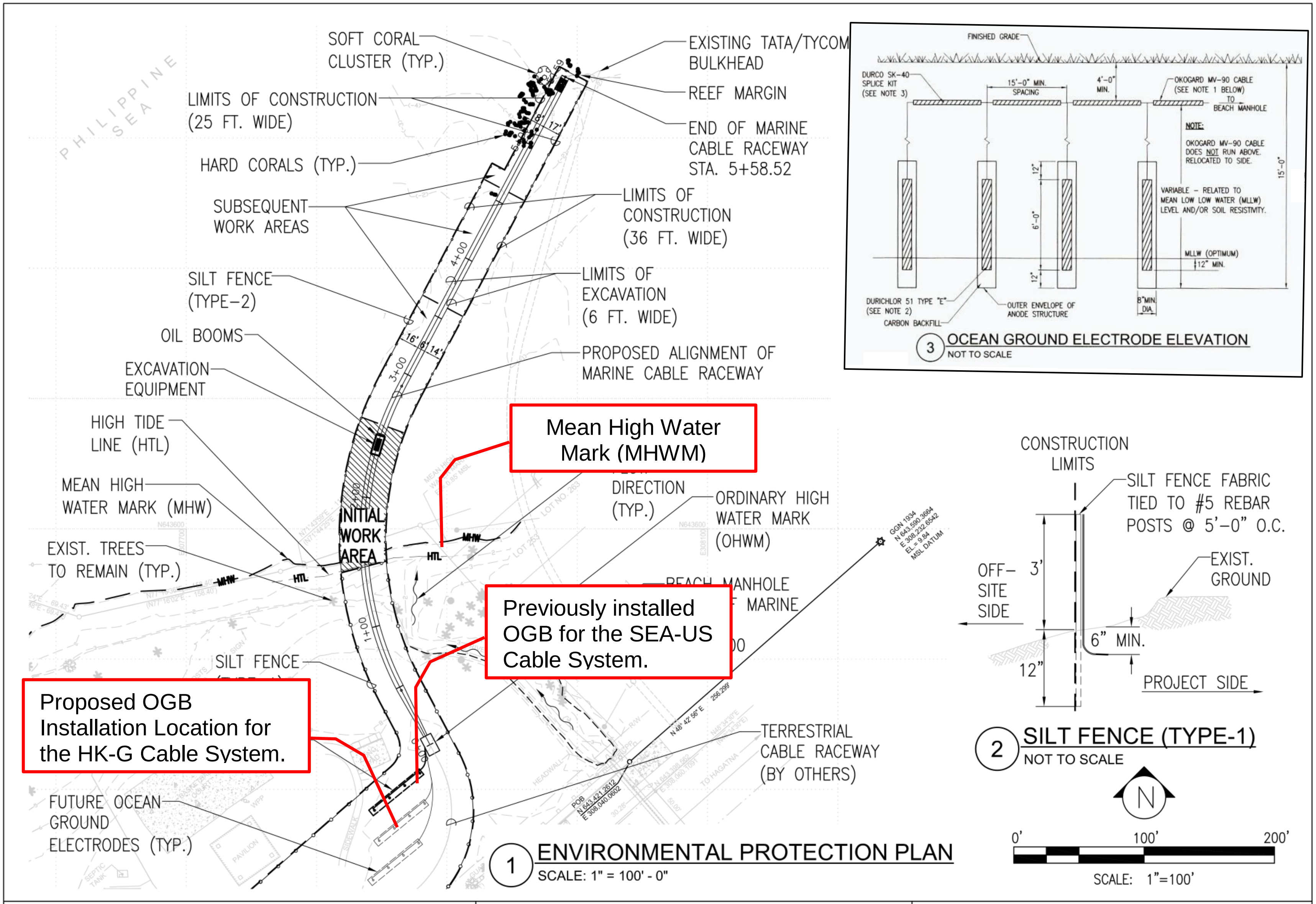


Figure 6. Location of *Acropora globiceps* colonies and marine survey areas.



Environmental Protection Plan Datum: Mean lower low water	POH-2016 GTA 624 North Marine Corps Drive Tamuning, GU 96913	GTA Cable Raceway Route 1, Piti, Guam Sheet 6 of 6 June 2016

Figure 7. OGB Installation Location.

Appendix B

Guam EPA 401 Water Quality Certification Application

401 WATER QUALITY CERTIFICATION APPLICATION:

HONG KONG-GUAM SUBMARINE CABLE LANDING

Prepared for:

RTI Solutions, Inc.
268 Bush Street, #77
San Francisco, CA 94104

Prepared by

Duenas Camacho & Associates
238 E. Marine Corps Drive, Suite 201
Hagatna, Guam 96910

July 2018

Website: www.dcaguam.com
Email: dca@dcaguam.com

July 30, 2018

Mr. Walter Leon Guerrero
Administrator
Guam Environmental Protection Agency
P.O. Box 22439
GMF - Barrigada, Guam 96921

Subject: Guam 401 Water Quality Certification for Hong Kong-Guam Submarine Cable Landing, Tepungan, Piti, Guam.

Dear Mr. Leon Guerrero:

RTI Solutions, Inc. is proposing to land the Hong Kong-Guam submarine cable system on Guam and has an agreement with GTA to utilize one of the six conduits that GTA previously installed offshore and in Lot 262, Tepungan, Piti in 2017. GTA installed the conduit raceway to receive submarine fiber-optic cables, including the Southeast Asia-U.S. (SEA-US) telecommunication system linking Asia with Guam, Hawaii and California. The proposed Hong Kong-Guam cable landing is an extension of the SEA-US cable system.

For this activity, RTI Solutions, Inc. is seeking a Department of the Army permit for work in waters of the United States, and is providing its 401 Water Quality Certification to Guam EPA, in accordance with the Guam Water Quality Standards and Clean Water Act. The proposed Hong Kong-Guam cable is needed to increase capacity and interconnectivity in this region of the western Pacific.

The project will land a single fiber-optic marine cable through one of the conduits in the GTA raceway, and pull the cable to shore where it will be spliced to land cables at a beach manhole located above the high tide line. The activities involve landing a submarine fiber-optic cable, and therefore, need to be within marine waters. The excavator to pull the cable to shore will be equipped with on-board spill response equipment for work near marine environments. These include absorbent pads and booms to be deployed in case of accidental oil leaks. No heavy equipment will be operated in marine waters. Similarly, the cable ship will have on-board spill response equipment to deploy in accordance with the vessel's spill response plan. The Environmental Protection Plan (EPP) developed for the project describes the EPP measures that would be implemented to control discharges and manage spills from heavy equipment operating at the site. Construction would be performed in accordance with specified best management practices (BMPs) to control erosion and minimize sedimentation.

We assure Guam EPA that there is reasonable assurance that the cable landing activities will be conducted in such a manner which will not violate basic water quality criteria and the applicable water quality standards. A 401 WQC application package is enclosed for your review. Please contact me at 477-7991 if you need additional information.

Sincerely,

Claudine Camacho

Enclosure: 401 WQC Application Package

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GUAM ENVIRONMENTAL PROTECTION AGENCY
SECTION 401 WATER QUALITY CERTIFICATION
APPLICATION (401C)

Revised 07/98

FOR OFFICIAL USE ONLY

Prepared By: ___________________________ Application No. __________________
Title: _________________________________ Date Received: __________________
Date Prepared: _________________________

DISCHARGES FROM DREDGED MATERIAL OR
FILL IN WETLANDS AND OTHER INLAND SURFACE WATERS

Instructions:

1) Activities covered by this application request form include wetland dredging, filling, construction of bridges, walkways, culverts and other structures in wetlands, streams, or rivers, mitigation/creation projects, restoration activities, utility trenching and pole placements, and other similar activities in wetlands.
2) When addressing the following items, be sure to answer all questions. If the item is not applicable or the response is none, indicate as much as provide a brief explanation why. If there are incomplete items the application will be returned.
3) When references are made to supporting documents, studies, previous permit actions or other information, they must be identified by document name and date. All pertinent references used to support this application request must be provided.
4) The applicant should use this form; however, a similar format may be used and must include each question (item) found in this form.
5) If additional space is required, use extra sheets or the back of this form. This form is available on diskette.

Applicant Information

1. **a. Applicant Name & Address:**

Chris Brungardt
RTI Solutions, Inc.
268 Bush Street, #77
San Francisco, CA 94104

b. Agent/Representative Name & Address:

Dueñas, Camacho, & Associates, Inc. (DCA)
238 Marine Corps Drive, Suite 201
Hagåtña, Guam 96910

2. **Project Name:** Hong Kong-Guam Submarine Cable Landing

Location: The Hong Kong-Guam (HK-G) cable landing is proposed at Pedro Santos Memorial Park and offshore in Tepungan Channel, Piti, Guam. Guam is an unincorporated U.S. territory and the largest and southernmost island in the Mariana Islands archipelago. The HK-G landing and beach manhole are located in the eastern portion of the Park in Lot 262, an approximately 6-acre parcel located in the Municipality of Piti, just east of Apra Harbor on the western coast of Guam. The marine portion of the project site is located in the Tepungan Channel offshore from the Park. From the beach manhole, the cable will follow easements and rights-of-way south along Route 1 (Marine Corps Drive) to the existing GTA Cable Landing Station on the south side of Route 1 opposite the Park.

The project site is along the western coastline of Guam, and within the Asan-Piti watershed, a 2.9 square mile area that encompasses the Masso River and Piti and Asan Bays (Kottermair, 2012). See site location and vicinity maps (Exhibit A).

3. **Associated Federal Permits or File Nos.**

A Department of the Army Permit (Appendix A) and Guam Coastal Management Program Federal Consistency Statement (Appendix B) are other associated permit requirements filed concurrently with this 401 Water Quality Certification.

4. **Provide a copy of the Guam Wetland Development Permit for this project or a statement from the Department of Land Management as to the reasons why a permit was otherwise not required.**

The proposed action involves landing a cable in a previously laid conduit within the GTA raceway, and therefore, will not require a new wetland or Seashore Clearance application approval from the Guam Land Use/Seashore Protection Commission.

5. **If this project is mitigation (restoration, enhancement, or creation), explain how existing wetland functions/uses will be improved or maintained. What benefits will result from this project with regard to existing wetland functions (especially water quality)?**

The project is not a mitigation activity. The project would temporarily disturb waters of the U.S. in order to land a cable in Piti, Guam. This project does not require any trenching in the ocean as GTA's raceway was previously installed in 2017, and is available to receive the cable. Minimal work will be required in offshore waters to pull the new cable through the existing conduit to the shoreline.

On land, the landing would use the GTA beach manhole that was constructed in the Park as part of GTA's cable raceway system. The HK-G cable landing will require an Ocean Ground Bed (OGB) adjacent to the GTA beach manhole in the park. Both the OGB and beach manhole are inland of the mean high water (MHW) mark and located outside the Seashore Reserve. Some excavated material would originate from the installation of this OGB and anodes. Upon completion of the OGB, the finish grade would be restored; hence, there would be no change in elevation after construction. The OGB construction work would be entirely on uplands and above the MHW mark.

6) **Are there any special environmental protection requirements identified at this time?**

Yes. The project would not disturb any of the scrub forest along the intermittent stream in the eastern sector of the park, and the project would not result in the loss of wetlands or waters of the United States. No trees would be removed by the proposed landing activity, and none occur within the raceway corridor in the Park, which is mostly a maintained lawn or gravel base course. Vegetation will be preserved where possible since it plays an integral role in controlling erosion along the shoreline. While common fauna, such as sinks and sparrows would be temporarily displaced by cable landing activities, these species are anticipated to return after the landing activities cease. There would be no long-term impacts on terrestrial biological resources, as the operation of the cable within the buried cable raceway is generally considered benign.

The project area supports habitat for a variety of algae, corals, macroinvertebrates, crustaceans, mollusks, and fish species. There is no designated or proposed critical habitat in the vicinity of the cable landing site. Based on information from the National Marine Fisheries Service (NMFS), the project area is within the essential fish habitat (EFH) designation for Guam. As of 2014, NOAA has listed 15 Indo-Pacific coral species as threatened under the Endangered Species Act (ESA) of 1973, of which three species occur in Guam waters: *Acropora globiceps, Acropora retusa*, and *Seriatopora aculeata*. Three *A. globiceps* colonies were observed within the vicinity of the proposed route Hong Kong-Guam cable landing route during marine biological surveys in April 2018 (Burdick, 2018). These colonies are generally small and would be easily avoidable as they are not located in the direct path of the proposed cable route or in locations where inadvertent contact or impacts would be likely. Best Management Practices will include a pre-landing survey to conspicuously mark the cable route and any ESA-listed coral colonies in the vicinity of the cable route. These BMPs will assist the marine contractor in aligning the cable along the proposed route and avoiding all ESA-listed coral colonies in the vicinity.

The threatened green (*Chelonia mydas*) and endangered hawksbill (*Eretmochelys imbricata*) sea turtles are listed under the ESA, and small populations are known to forage around Guam. Seagrass beds, such as those in Piti Bay, are located close to shore and provide foraging habitat for green sea turtles. In order to avoid any potential impacts to sensitive species such as migratory birds, and other marine species, biological monitoring will be performed prior to commencing and during daily construction activities. If any protected species are observed in the vicinity of the work site, Department of Agriculture would be contacted and work would not commence until the species voluntarily leaves the area. Work would occur outside of coral spawning periods in July and August.

Best management practices (BMPs) would be implemented throughout the course of in-water work to minimize impacts to the marine environment. These include the National Marine Fisheries Service (NMFS) Protected Resources Division's BMPs, which are recommended for general in- and near-water work including boat and diver operations to reduce potential adverse effects on protected marine species.

All personnel onsite (especially divers and workers in the marine environment) will attend a briefing on the presence of ESA coral colonies and how to avoid impacts to ESA-listed species, turtles, and marine mammals (dolphins). No work will occur during coral spawning periods. All equipment and machinery will be checked for proper maintenance to prevent oil or fuel spills in the marine environment. The excavator to pull the cable to shore will be equipped with on-board spill response equipment for work near marine environments. These include absorbent pads and booms to be deployed in case of accidental oil leaks. No boats, watercraft, or pedestrians will be allowed to cross the reef flat outside of designated entrance and exit corridors. This entrance and exit corridor will be established over the existing cable conduit raceway, which is a previously disturbed area of the Tepungan reef flat. Support vessels and barges will not anchor in areas with live coral and will be restricted to sandy areas only.

The cable landing activities would only be mobilized during fair weather conditions. If work has already started and inclement weather arrives, the contractor would secure the site onshore by returning the fill to the OGB area and removing the silt fence.

Project Description

7. Describe the structure(s) and/or activity, and proposed dredging, discharge or fill required in wetlands, streams, or rivers. Include an accurate description of the physical, biological, chemical and any other characteristics of the dredging, discharge, or fill and the location(s) where such activities will occur in Guam Waters or wetlands.

a. description of the structure(s) or activity (provide a facility/project site plan): The purpose and scope of the project is to land a single submarine fiber-optic cable (Hong-Kong-Guam cable) into one of GTA's three remaining unoccupied 4-inch diameter ductile iron pipes or conduits in Piti, Guam. The fiber-optic cable will be landed through one of the existing conduits at its seaward opening in the existing bulkhead. The cable will be pulled through the buried conduit to shore, where it will be spliced to land cables in the existing buried beach manhole located above the MHW mark within Santos Park (Exhibit A). The landing would proceed as follows:

1) Prior to the arrival of the cable ship, the cable route will be marked using floats tied to weights. Floats will be placed at approximately 30 m intervals. These positions will be located using a handheld global positioning system (GPS) receiver.

2) The cable ship would position itself at the mouth of the Tepungan Channel with its stern facing shoreward and would be powered by its own thrusters to avoid anchoring on live corals. The cable ship will be positioned in an area where water depth is greater than 60 feet to avoid inadvertent coral damage from the ship's positioning thrusters. A single 1.61 in. (4.1 cm) diameter fiber-optic cable would be paid out from the stern of the cable ship into the channel.

3) Floats will be attached to the cable as its paid out and it will be floated into the channel. Support vessels, such as small to medium sized boats, pontoons, and personal watercraft (Jet Skis or similar watercraft), will position the cable along the correct alignment over the seabed, using the previously installed floats to guide placement. In order to maintain cable alignment, support vessels would anchor only where no corals are present.

4) The cable would be floated inland towards the seaward end of one of the previously installed 4 in. (10.1 cm) diameter ductile iron conduits located at the GTA bulkhead. At the seaward terminus of the conduit, the cable will be attached to a winch cable and pulled shoreward through the conduit by a winch truck located in Santos Memorial Park and into the beach manhole (BMH), where the cable will be spliced to GTA's terrestrial cable system.

5) After the cable is pulled through the BMH and proper cable alignment is verified, divers will cut the floats, starting at the bulkhead and proceeding seaward, and lay the cable in place on the seabed. If the cable needs to be repositioned, a stopper on the cable ship will be used to create slack on the cable and allow divers and support vessels to maneuver the cable into place. As the floats are cut, a support vessel will collect the floats and return them to the cable ship.

6) The cable ship would proceed to lay the cable beyond the 3-nautical mile Corps jurisdictional limit from shore, transitioning from double-armored to single-armored cable at around the 656 ft. (200 m) water depth.

7) A post-landing survey will be conducted to inspect the cable route and confirm the cable is positioned along the correct alignment.

8) If the post-landing survey does not reveal any discrepancies, 6.1 in. (15.5 cm) cast-iron articulated pipe (AP) armor protectors (also called N-pipe or split-pipe), in 21.7 in. (55.1 cm) sections, would be placed around the cable from the end of the ductile iron conduit (bulkhead) to an approximate seaward distance of 2,555 ft. (779 m) and a depth of approximately 80 ft. (25 m).

9) Offshore, the cable (encased in articulated pipe) will be selectively pinned to the substrate with U-bolts at locations where no live corals are present in the channel and at the channel mouth to prevent lateral movement of the cable. The U-bolts will be stainless steel with typical dimensions of 14 in. long, 5 in. wide, and 0.5 in. diameter (38 cm long, 12.7 cm wide, and 1.2 cm diameter). After the U-bolts are positioned over the cable, two 1 in. (3 cm) diameter holes for each bolt will be drilled down to approximately 12 in. (30 cm) with a marine-grade hydraulic drill, and the bolts will be inserted and secured in place with a non-toxic marine epoxy. Pins will be installed in approximately 33 ft. (10 m) intervals along the cable's path over the reef crest. Approximately 20 pins will be installed.

10) A final post-landing survey will be conducted to inspect the AP and pin installations, and ensure all ropes, floats and other materials are removed from the marine environment.

b. description of the construction actions, methodology, and operation of the project:

The equipment used in the seaward portions of the project would be minimal. Support vessels such as boats, personal watercraft, and barges or pontoons would be used to pull the cable from the cable ship to the bulkhead and to ensure proper alignment before divers begin cutting the floats and laying the cable on the seabed. Support vessels will enter the Piti Bay Marine Preserve in one of two ways: large boats will depart from Apra Harbor or the Hagatña Boat Basin and enter via the Tepungan Channel mouth, while smaller vessels or personal watercraft could be launched from Santos Memorial Park. An "entrance corridor" will be defined within a previously disturbed portion of the Tepungan Reef Flat over the previously installed conduit raceway to minimize the potential for damage to coral and marine life. Support vessels will be trailered into the water via Santos Park and would be manually moved (walked or floated out) to the end of the cable raceway (bulkhead) where sufficient water depth allows for powered movement by the vessel.

As the floats on the cable are cut, a support vessel will collect the floats and return them to the cable ship. A winch-truck will be used to pull the cable through the conduit from the bulkhead to the beach manhole. The winch-truck will be located within Santos Park above the MHW mark. Support vessels, such as small boats and pontoons, are required for articulated pipe installation and pinning activities. Hydraulic tools would be used during pinning activities. A small generator and air compressor (to support the tools tools) would be positioned on a barge and towed by a small boat to the pinning location near the Tepungan Channel mouth.

The work would proceed in sections starting at the offshore area and terminating at the beach manhole. All in-water work will be carried out during calm weather conditions and outside of coral spawning periods. No dredging or excavation is proposed for this project, therefore no borrow and upland disposal sites will be utilized. No in-water stockpiling would be performed.

c. description of physical, biological, chemical, quantity and other characteristics of dredge material, discharge or fill:

The cable (encased in articulated pipe or AP) will be selectively pinned to the substrate with U-bolts at locations where no live corals are present. The U-bolts will be stainless steel with typical dimensions of 14 in. long, 5 in. wide, and 0.5 in. diameter (38 cm long, 12.7 cm wide, and 1.2 cm diameter). After the U-bolts are positioned over the cable, two 1 in. (3 cm) diameter holes for each bolt will be drilled down to approximately 12 in. (30 cm) with a marine-grade hydraulic drill. Minor sediment would be generated from the drilling of a pair of holes for each U-bolt pin. The drilled material would originate from hard substrate on the channel bottom. The material would be very small quantities of rock particles that would quickly dissipate in the high energy zone of the channel. A similarly small amount of non-toxic marine epoxy would be used to help keep the pin in place. The sediment generated from this activity is anticipated to be very small, approximately 0.05 gallon per hole, or a total of 2.24 gallons (0.0004 cu m) for all 20 pins (2 drilled holes per pin, 40 holes total).

d. location(s) at which such activities will occur in Guam Waters (Note: Provide in site plan):

The selective pinning of the AP-encased cable would occur in the high energy zone of the Tepungan Channel in the channel and at the channel mouth to prevent lateral movement of the cable. Pins will be installed at approximately 33 ft. (10 m) intervals along the cable's path, at 20 locations where the substrate is suitable and no live coral is present.

8. **Describe any alternative(s) considered for the project and the reasons for not selecting those alternatives. Would any of the alternatives pose fewer or less intense environmental impact(s) or consequences?**

The project did not consider any alternative landing sites since the cable will utilize the existing GTA cable conduit raceway and therefore must cross the Tepungan reef in order to land in Santos Memorial Park. Three alternative landing routes across the Tepungan reef were considered when choosing the cable alignment. The proposed cable alignment was chosen after careful consideration of the impacts to essential fish habitat (EFH) and potential impacts to any ESA listed coral colonies found along the alignment. The National Marine Fisheries Service (NMFS), Department of Agriculture Division of Aquatic and Wildlife Resources (DAWR), Guam Environmental Protection Agency (GEPA), United States Army Corps of Engineers (USACE), and Bureau of Statistics and Plans (BSP) were consulted regarding the potential alignments of the proposed cable landing. The current proposed cable alignment was ultimately decided to be the least impactful of the three possible cable landing options.

<u>Water Quality Maintenance and Treatment</u>

9. **Provide a description of the function(s) and operation of all equipment, measures, or activities employed to treat material being removed or placed in wetlands. Specify the degree or level of treatment or control expected to be attained.**

    a. **describe the function(s) of equipment, protection measures or facility employed to control or treat dredge or fill material:**

There will be no dredging below the mean high water (MHW) mark; on land all heavy equipment would be positioned in the Park outside of any wetland or water body. A small amount of non-toxic marine epoxy would be injected into the two holes at each U-bolt pin location (20 pins total). The epoxy will be used to help keep the pin in place. No excess material is anticipated to be released since the epoxy gun will be manually operated, with a nozzle to cleanly inject the material into each hole.

An Environmental Protection Plan (Exhibit B) is included with this permit application. The excavator to pull the cable to shore will be equipped with on-board spill response equipment for work near marine environments. These include absorbent pads and booms to be deployed in case of accidental oil leaks. No heavy equipment will be operated in marine waters. Similarly, the cable ship will have on-board spill response equipment to deploy in accordance with the vessel's spill response plan.

b. specify the degree or level of control, protection, or treatment expected:

Since only minor amounts of discharge are involved for the installation of the U-bolt pins, and these small amounts would not significantly impact water quality, no additional control measures are necessary.

10. Provide the date(s) on which the activity and/or discharge will begin and end (estimate if necessary), and the dates on which discharge or fill will take place (attach a project or construction schedule if available).

a. date(s) on which the activity will begin and end:

The landing is scheduled for March 2019.

b. date(s) on which discharges will take place:

The landing is scheduled for March 2018. The placement of articulated pipe and pins will be completed within about 10-15 days following the landing, depending on tidal conditions and weather.

Water Quality Monitoring

11. Provide a description and location(s) (plan) of the measures being used or proposed to monitor water quality and characteristics of the discharge and the operation of equipment or facilities employed in the treatment, protection and/or control of wastes, erosion sedimentation, or effluent.

a. describe the methods to be used to monitor water quality:

A Water Quality Monitoring Plan is not submitted with this permit application, as any foreseeable impacts to the water quality in connection with the cable landing have been anticipated and addressed.

An increase in water turbidity is not anticipated in connection with the project activity, since the cable would be inserted into one of the three remaining unoccupied ductile iron conduits that will were previously installed in the Tepungan reef flat by GTA, and minor discharges from the pinning would not significantly impact water quality. Because of this, visual monitoring should be sufficient.

Additionally, best management practices, such as having the cable ship hold itself in place at the mouth of the channel by its own thrusters instead of anchoring in areas of live corals and having divers carefully float the cable into place would be implemented throughout the course of in-water work to minimize impacts to the environment.

Visual monitoring would be the method of detection during in-water activities to monitor whether there are any water quality issues such as accidental oil leaks in equipment, for instance. Work would immediately cease upon visual detection of any issue, e.g., oil sheen, and would commence only upon successful correction of the problem. Heavy equipment on the beach will have spill response materials on board the vehicle.

The Contractor is responsible for maintaining the BMPs and for ensuring continuity in communication between work personnel if crew shifts change during the work day. Incoming crews will be advised of water quality issues that have come up in the previous crew's shift.

b. describe measures employed to monitor characteristics of the discharge:

N/A.

c. describe the operation of equipment to be used:

N/A.

12. Identify the individual(s) responsible for monitoring plan development, implementation and monitoring:

It is anticipated that DCA's biologist would be assigned as the biological monitor for this project.

<u>Water Classification, Assurances and Beneficial Uses</u>

13. Describe the classification of the affected Guam waters and associated recreational uses, if any, at the discharge location(s) and state whether the basic water quality criteria and the applicable water quality standards will be met.

a. describe the classification and recreational uses of Guam's water at site of discharge:

The project site is within the Asan-Piti watershed, a 2.9 square mile area that encompasses the Masso River and Piti and Asan Bays (Kottermair, 2012). The site is within the Piti Bomb Hole Marine Preserve. The Piti Bomb Hole Marine Preserve is a marine protected area (MPA) managed and enforced by the Department of Agriculture Division of Aquatic and Wildlife Resources (DAWR). DAWR authorizes (by special permit) the fishing for seasonal fish traditionally caught by the local community at certain times of the year: juvenile rabbitfish (mañåhak), juvenile skipjacks (i'e), juvenile goatfish (ti'ao), juvenile fusiliers (achemson), and mackerel (atulai). Boating, jetskiing and other in-water vessel activity is typically suspended during the harvesting of these species. Trolling is also allowed beyond the reef margin for pelagic fish. No other fishing, harvesting, or collecting is allowed in the preserve.

Based on freshwater and marine water monitoring programs for various parameters, including sediment loads and bacteria, Kottermair (2012) cites bacterial and turbidity levels as the main water quality concerns in the watershed. Guam Environmental Protection Agency (Guam EPA) has two weekly water sampling stations in the vicinity of the project site, i.e., at the mouth of Masso River (N-16) in Santos Park, and Hoover Park (United Seamen's Service) (N-17). The stations are sampled for Enterococci bacteria, which is an indicator of wastewater contamination. If warranted based on the sampling results, Guam EPA will issue an advisory to notify during that specific week's sampling, the bacteria concentration at that beach was above the accepted Guam Water Quality Standard for marine recreational beaches. From 2008 to 2011, the N16 sampling station at Pedro Santos Memorial Park had 42, 28, 47, and 48 advisories issued per year, and the number of days the site was on the advisory ranged from 200 to 337 days per year (Kottermair, 2012). The waters off Santos Park were not listed in the Guam EPA's 2016 list of impaired waters under Section 303(d) of the Clean Water Act (Guam EPA 2016).

The 2001 Revised Guam Water Quality Standards designates the coastal waters in Tepungan Channel and the nearby reef flat as M-2 (good) marine waters. Marine waters in this category are intended to be of sufficient quality to allow for the propagation and survival of marine organisms, particularly shellfish and other similarly harvested aquatic organisms, corals and other reef-related resources, and whole body contact recreation. Although the waters are designated as M-2 (good), the actual quality may be considered compromised by the large amount of silt in the inner section of the reef flat and high *Enterococcus* levels found in nearshore waters. Much of the silt deposited on the reef flat and entering Tepungan Channel originates from the Masso River, with some contributed by the unnamed freshwater stream.

b. state whether the basic water quality criteria and applicable water quality standards will or are expected to be met (if criteria and standards will be met complete item 'c' below):

Basic water quality criteria and applicable water quality standards as stipulated in the 2001 Guam Water Quality Standards are expected to be met throughout the proposed cable landing activities. No increase in turbidity above the basic water quality criterion of 1.0 NTU (nephelometric turbidity unit) over ambient conditions is expected to take place in connection with the project. The Contractor is expected to properly implement and maintain standard BMPs and protection measures.

c. provide a signed assurance statement by the applicant that, "There is reasonable assurance that the activity will be conducted in such a manner which will not violate applicable water quality standards.":

The proposed project and the associated construction methodology represent the most feasible method of accomplishing the objectives while minimizing the potential environmental impacts. This is based on the observations of similar cable landings in 2017 that used the same methodology. A signed statement that there is reasonable assurance that the proposed activity will be conducted in such a manner which will not violate applicable water quality standards is contained in the cover letter of this application.

Supporting Documentation

14. Check and submit all applicable supporting plans and documents as identified below as attachments (*the Agency may require additional documentation prior to Section 401 issuance or as a condition of issuance which may include any of the following*):

a) __ Construction Drawing/Plans
b) __ Wetland Delineation Map
c) __ Specifications
d) _X_ Coral Survey
e) _X_ Environmental Protection Plan
f) __ Water Quality Monitoring Plan
g) __ Environmental Impact Assessment/Statement
h) __ Mitigation/restoration plans

Comments on the status of above documents: See the appropriate exhibits.

15. Explain any irregularities, recent disturbances (natural or anthropogenic), unique features and/or expected cumulative effects that may influence water quality conditions adjacent to or within the project site:

As mentioned previously, much of the silt deposited on the reef flat and entering Tepungan Channel originates from the Masso River, with some contributed by the unnamed freshwater stream.

Piti Bay within the Piti Bomb Holes Marine Preserve was declared a marine protected area or no-take area for marine organisms in 1997 by the Government of Guam and is currently managed by the Division of Aquatic and Wildlife Resources (DAWR) of the Guam Department of Agriculture (NOAA 2009). The designation offers some protection to resources that enhances water quality in the Bay.

References Cited

Burdick, D. 2018. Benthic cover and ESA coral surveys for the proposed Hong Kong-Guam, Japan-Guam-Australia North, and Japan-Guam-Australia South cable systems landings in Piti, Guam. 67 pp.

Guam Environmental Protection Agency (GEPA). 2001. Guam Water Quality Standards, 2001 Revision. 60 pp. + Appendix A-H.

Guam Environmental Protection Agency (GEPA). 2016. Guam Section 303(d) List of Impaired Waters.

Kerr, A.M. and Burdick, D.R. 2016. Marine Biological Survey for the Guam Telephone Authority Proposed Cable Landings, Piti, Guam. Prepared for Duenas, Camacho & Associates, Inc. June 2016.

Kottermair, Maria. 2012. Piti-Asan Watershed Management Plan. Water and Environmental Research Institute of the Western Pacific, Univ. of Guam. Tech. Rept. No. 138. 110 pp.

National Oceanic and Atmospheric Administration. 2009. Coral Reef Habitat Assessment for the U.S. Marine Protected Areas: U.S. Territory of Guam: 7 pp.