Garapan Integrated Watershed Management Plan

Saipan, CNMI

Prepared for the CNMI Division of Coastal Resources Management by the authors under contract for The Nature Conservancy under the cooperative agreement award #NA16NOS4820106from the National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program, U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of NOAA, the NOAA Coral Reef Conservation Program, or the U.S. Department of Commerce.

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The Garapan Integrated Watershed Management Plan builds on previous Conservation Action Plans compiled developed in 2013 and 2015. Much of the information contained in this plan was derived directly from over 40 stakeholders within CNMI government agencies and NGOs who came together in January 2020 to discuss and complete watershed management planning activities for three priority watersheds in CNMI: Garapan, Laolao, and Achugao. Watershed modeling and strategies were provided by Horsley Witten Group and integrated into the plan. Since the workshop, additional review and input was provided to complete this document. The plan reflects a coordinated and collaborative effort to improve or maintain the many benefits the Garapan watershed provides including social, economic, environmental, and cultural.

Approved by:

DPW Director - James A. Ada	7/26/21 Date
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CUC Director - Gary P. Camacho	9/17/2021 Date
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CHCC Chief Executive Officer - Esther L. Muna	9/29/2021 Date

List of Acronyms

AMP	American Memorial Park
APC	Area of Particular Concern
BECQ	CNMI Bureau of Environmental and Coastal Quality
BEH	Bureau of Environmental Health
BMPs	Best Management Practices
CAP	Conservation Action Plan
CID	Community Improvement District
CIP	Capital Improvement Project
CNMI	Commonwealth of the Northern Mariana Islands
CREES	NMC Cooperative Research Extension and Education Service
CSDP	Comprehensive Sustainable Development Plan
CUC	Commonwealth Utilities Corporation
DCRM	CNMI Division of Coastal Resources Management
DEQ	CNMI Division of Environmental Quality
DFW	CNMI Division of Fish and Wildlife
DLNR	CNMI Department of Lands and Natural Resources
DPL	CNMI Department of Public Lands
DPW	CNMI Department of Public Works
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Risk Map
FOGs	Fats, Oils, and Grease
GIS	Geographic Information System
HANMI	Hotel Association of the Northern Mariana Islands
IDDE	Illicit Discharge Detection and Elimination
IWDS	Individual Waste Disposal System
MINA	Micronesia Islands Nature Alliance
MOS	Mayor's Office of Saipan
MS4	Municipal Separate Storm Sewer System
NMC	Northern Marianas College
NMFS	National Marine Fisheries Service
NMHC	Northern Marianas Housing Corporation
NOAA	National Oceanic and Atmospheric Administration
OPD	Office of Planning & Development
PDAC	Planning and Development Advisory Council
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SSG	Smart, Safe Growth
TMDL	Total Maximum Daily Load
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
WMP	Watershed Management Plan
WQS/NPS	Water Quality Surveillance and Non-Point Source
WTM	Watershed Treatment Model
WWG	Watershed Working Group

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Executive Summary

The Garapan watershed is a sub-watershed of the West Takpochao watershed on Saipan. It provides a wide variety of benefits to the people, communities, and the local economy for all of Saipan. Garapan is the main economic hub of the island and entire CNMI with several hotels and tourism activities. More recently a casino was built with the intention of attracting high-end tourism to the island. Garapan is also an important area for Saipan residents, providing residential development, schools, several venues for cookouts and recreation, beaches, the farmers market, bars and restaurants. Saipan's only recreational and commercial marina is located in Garapan. The CNMI's only hospital is also located within the Garapan watershed. In addition to the wide range of recreational activities that the coastal waters off Garapan provide both tourists and residents, they also provide critical mangrove, seagrass, and reef habitat for important marine species. These habitats, in combination with some small areas of inland wetlands and upland forest, also buffer Garapan from storm surges and extreme rain events which are projected to get increase due to climate change. Appendix A provides an detailed watershed characterization updated from past plans.

This integrated watershed plan was developed to consider these key watershed benefits and identify ways to maintain or improve them over the next 5 years. This plan builds off the accomplishments and challenges of two previous conservation action plans (CAPs) developed in 2013 and 2015 as well as updated monitoring data, and existing projects within the watershed. Appendix C provides a detailed list of the accomplishments from these past CAPs. While there were several accomplishments in implementing the CAPs, the majority of objectives and actions were not complete. This was mainly due to two main challenges: 1) a lack of involvement by key agencies throughout implementation, and 2) a lack of monitoring progress. These challenges were exacerbated by the turnover of watershed coordination staff that were responsible for coordinating the CNMI Watershed Working Group (the main forum for coordination of multiple agencies and tracking progress). Approaches taken to develop this plan were aimed at overcoming these challenges to provide the best chance of success during implementation.

From January 21–24, 2020 over 40 stakeholders from CNMI government agencies and NGOs came together to discuss and complete watershed management planning activities for three priority watersheds in CNMI; Garapan, Laolao, and Achugao. During the workshop, participants reviewed required components of watershed management plans to meet EPA standards including identifying watershed benefits, causes of impairments based on monitoring and other local data, and strategies to reduce impairments and pollutant loads. Additional input was provided on financial and technical assistance needed, outreach required to support strategies, implementation schedules, and monitoring and evaluation approaches after the workshop through the Watershed Working Group and meetings with key implementation partners in the plan.

While this plan was not based on extensive field assessment to ID sources and solutions, it builds off the specific sites and solutions identified in the two previous CAPs. There is a recognition that conditions have changed over last 5 years (i.e., Typhoon Yutu impacts, large scale development, and Garapan revitalization efforts), but we consider there to be an adequate monitoring data identifying main impairments and sources as well as a number of projects/initiatives already planned to advance watershed restoration efforts.

The main impairments and sources of threat to the Garapan watershed that were identified were bacterial contamination from human and animal waste; non-bacterial polluted runoff from fats, oils, and grease (FOG); invasive species that threaten critical habitat due to inadequate permitting; native wildlife population decline; and illegal harvest. Causes of these impairments included aging or inadequate infrastructure to prevent flooding

and polluted runoff, improper sewer hook-ups, improper disposal, lack of best management practices integrated into permitting and regulations, a lack of invasive species management, and unclear or inadequate rules and regulations.

To address these impairments and causes, this plan aims to:

1. Improve lagoon water quality through:
    - Improved management to reduce illicit discharge and improper fats, oil, grease (FOG) disposal
    - Upgraded infrastructure to handle stormwater/wastewater loads
    - Green infrastructure to reduce flooding events
    - Reduced and controlled stray animal population
    - Safe, Smart, Growth (SSG) Principles integrated into development permitting and management activities
2. Improve management of Critical Habitat (i.e. wetlands, mangrove, seagrass, reef, forest) through:
    - Invasive species prevention and management
    - Greater compliance and enforcement of natural resource management regulations through clear updated regulations and regulatory framework
3. Foster sustainable and resilient development through:
    - Improved permitting processes based on integrating SSG principles and best available data that considers climate change and natural disaster impacts and risks
    - Inter-agency collaboration and decision-making for permitting
    - Community engagement that fosters environmental stewardship

Through the Horsley Witten Group, a pollutant load model was used to identify key strategies to reduce pollutant loads including remove illicit connection, SSO repair and abatement, structural stormwater BMPs, erosion and sediment control, catch basin cleaning, marina pump outs, redevelopment improvement, and septic system education, repair, upgrade, or retirement.

A combination of the workshop and model outputs were used to develop the objectives and actions defined in this plan. Appendix B provides the full Garapan Watershed Findings and Modeling provided by the Horsley Witten Group.

Introduction

Watershed Benefits

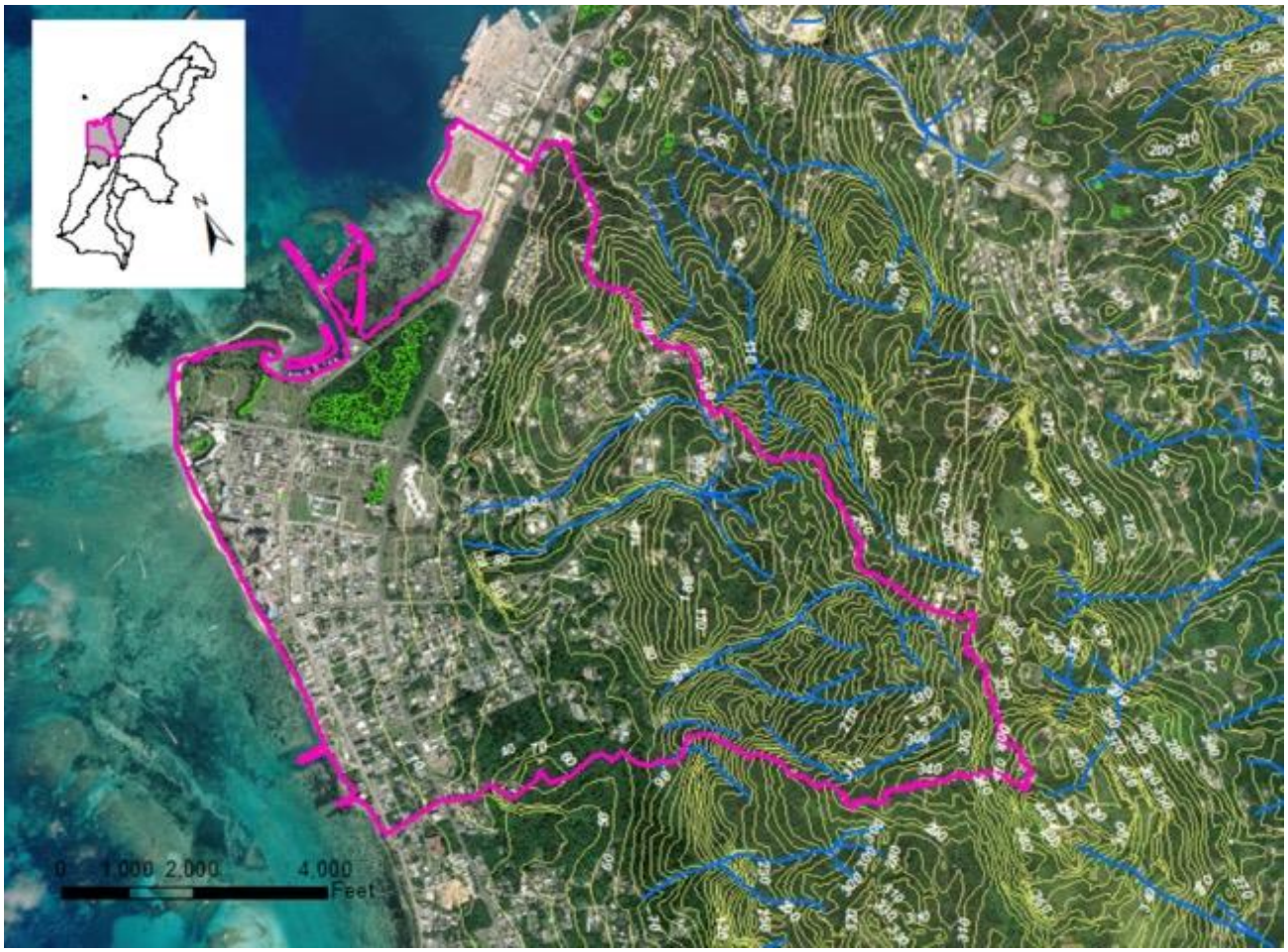


Figure 1: Revised Map of Garapan sub-watershed boundaries (Horsley Witten Group 2020)

Garapan is a sub-watershed of the West Takpochao watershed on Saipan. The Garapan watershed is roughly equivalent to the Central West Takpochao's boundary plus the area around Fishing Base in West Takpochao South for a total of 1,630 acres or 2.55 sq. miles (Fig. 1). This boundary was adjusted by the Bureau of Environmental and Coastal Quality (BECQ) Division of Coastal Resources Management (DCRM) as part of the 2018 Integrated Waters report to exclude the Fishing Base based on drainage mapping. However further discussion at the January 2020 Integrated WMP workshop led to the decision to include Fishing Base in the watershed boundaries due to similarities in management priorities as the rest of downtown Garapan. Additional details regarding watershed classification are included in Appendix A.

Garapan provides a wide variety of benefits to the people, communities, and local economy for all of Saipan. Garapan is the main economic hub of the island and entire CNMI with several hotels and tourism activities such as swimming, several watersports, and shopping along the Paseo. More recently a casino was built with the

intention of attracting high-end tourism to the island. Garapan is also an important area for Saipan residents, providing residential development, schools, several venues for cookouts and recreation, beaches, the farmers market, bars and restaurants. Saipan's only recreational and commercial marina is located in Garapan, providing an important docking facility and boat launch for fishers and boaters. The CNMI's only hospital is located within the Garapan watershed and is therefore another key asset for the entire island population. In addition to the wide range of recreational activities that the coastal waters off Garapan provide both tourists and residents, they also provide critical mangrove, seagrass, and reef habitat for important marine species. These habitats, in combination with some small areas of inland wetlands and upland forest, also buffer Garapan from storm surges and extreme rain events which are projected to get increase due to climate change.

The Integrated WMP Approach

This integrated watershed management plan (WMP) was developed to consider these key watershed benefits and identify ways to maintain or improve them over the next 5 years. This plan builds on the accomplishments and challenges of two previous Conservation Action Plans (CAPs) developed in 2013 and 2015 as well as updated monitoring data and existing projects within the watershed. The CAP tool has been used in the CNMI since 2009 to develop inter-agency plans to address key threats in priority watersheds. While the CAP process provides a foundation for threat identification and objective/strategy development, it does not meet the EPA A-I criteria for an Integrated Watershed Management Plan (IWMP). IWMP's are a requirement for securing implementation funding from EPA and encouraged by some NOAA programs.

The planning process for this management plan started after discussions in 2017 between Commonwealth and federal stakeholders which identified the need to transition all existing Conservation Action Plans to WMP. CNMI has four priority watersheds. The first CAP to be transitioned into an WMP was the Talakaya plan on Rota in 2019. In 2019, updates from CAPs to WMPs for Garapan and Laolao were initiated, and Achugao was identified as a new priority watershed. Given the procedural overlap in developing and updating these three plans, the stakeholder-based planning processes for the three watersheds on Saipan (Garapan, Laolao, and Achugao) were done collaboratively to reduce the time investment needed of agency and organizational stakeholders and improve synergies between plans.

From January 21–24, 2020 over 40 stakeholders from CNMI government agencies and NGO's came together to discuss and complete watershed management planning activities for the three priority watersheds of Garapan, Laolao, and Achugao. The facilitation team was a collaboration of technical partners hired to develop the different watershed plans that consisted of The Nature Conservancy, Sea Change Consulting, Koa Consulting, and Horsley Witten Group. To reduce stakeholder fatigue, utilize different technical skills from each consultant group, and enable discussions that compare and contrast watersheds, planning for all three watersheds was carried out over one week. During the workshop, participants reviewed required components of watershed management plans to meet EPA standards including: identifying watershed benefits, causes of impairments based on monitoring and other data, and strategies to reduce impairments and pollutant loads. The group updated core components (e.g. goals, objectives, actions) of the Garapan and Laolao Bay CAPs to reflect successes, lessons learned, existing efforts, and updated modeling and monitoring results and developed the core components of the Achugao Watershed Management Plan. Additional input was provided on financial and technical assistance needed, outreach required to support strategies, implementation schedules, and monitoring and evaluation approaches after the workshop through the CNMI Watershed Working Group and

meetings with key implementation partners in the plan. The Horsley Witten Group also conducted pollutant load modeling to identify key strategies to reduce pollutant loads. A detailed description of the modelling process and results is found in Appendix B.

Conservation Action Planning Accomplishments and Challenges

The original 2013 CAP and 2015 update had some clear successes in implementation. These success stories were often those objectives and projects that aligned with existing agency projects. Some notable accomplishments from the CAP include:

- Installation of rain garden to reduce stormwater runoff
- New legislation passed to fine littering
- Removal of junk cars
- Cash for Trash Program implemented, and monthly beach clean-ups conducted, and to reduce solid waste and habitat for feral animals
- Infrastructure improvements in Garapan area, including improved drainage near Himawari restaurant and at Garapan Elementary School
- Illicit discharge detection and elimination program began to identify wastewater violations and report to appropriate regulatory agencies
- Grant proposals referenced CAPs to justify priorities and tapped into funding sources
- Leveraged funding through grant applications that referenced the CAP as a local priority
- Climate change components integrated into marine monitoring
- Tour guide certification program now required for all operators and curriculum developed

While there were several accomplishments in implementing the CAP, the majority of objectives and actions were not complete. This was mainly due to two main challenges: 1) a lack of involvement by key agencies throughout implementation, and 2) a lack of monitoring progress. These challenges were exacerbated by the turnover of watershed coordination staff that were responsible for coordinating the CNMI Watershed Working Group (the main forum for coordination of multiple agencies and tracking progress). Planning and implementation of any watershed plan requires multi-agency collaboration and it is unclear if there was true buy-in from all agencies needed to implement the projects. Additionally, the CAP objectives did not always align with existing monitoring efforts making tracking difficult or requiring new monitoring approaches. Finally, some of the indicators did not always reflect progress or outcomes.

This plan update attempts to build off these accomplishments and address these challenges in the development and implementation process.

Existing Monitoring Data and Projects in the Watershed

The WMP workshop included a review of existing monitoring data, reports, and projects that describe the current situation in Garapan. This included presentations by agencies and organizations working on key watershed issues such as an examination of water quality monitoring and modeling, capital improvement projects and infrastructure, and climate change and the environment. This section provides a brief review of these presentations and discussions.

Watershed Coordination and Working Group

CNMI's Bureau of Environmental and Coastal Quality, Department of Coastal Management (BECQ-DCRM) hired a new Watershed Coordinator in November 2019. The Watershed Coordinator is responsible for guiding the Watershed Working Group (WWG). The WWG is a partnership between local and federal government agencies, environmental non-profits and other concerned groups. The group is aimed at collaborating technical expertise and funding to accomplish support watershed initiatives in CNMI. They typically meet every two months to discuss ongoing projects and request review or recommendations on specific issues, including this plan. The WWG was reactivated during the WMP workshop and the first meeting was held in March 2020. The working group provides the framework for ongoing collaboration and review to implement and adapt this plan moving forward.

Water Quality Monitoring Data and Results

CNMI's Bureau of Environmental and Coastal Quality, Division of Environmental Quality (BECQ-DEQ) has a Water Quality Surveillance and Non-Point Source (WQS/NPS) Program that collects and tests marine water samples weekly to monitor the chemical, physical, and microbial quality of near shore waters of popular beaches. Results from the most recent CNMI 305(b) and 303(d) Water Quality Assessment Integrated Report and quantitative Polymerase Chain Reaction/Microbial Source Tracking were used during the WMP process for Garapan to understand the impaired waters and major causes of impairments in the Garapan water quality. This information provided a foundation for the development of objective and action development to address water quality issues. Some of the main results from this monitoring data include:

- Clean Water Act Section 303(d) (Impaired Waters) Listings for Garapan include:
  - Bacteria - Both human and dog fecal bacterial indicators were found widespread throughout the coastal waters of Saipan, and both appear most frequently elevated in the western central shoreline region of Saipan Lagoon.
  - Phosphate
  - Dissolved Oxygen
  - pH
  - Bio-criteria (streams)
  - Mercury (streams)
  - Direct Habitat Alterations (streams)
- Most Impairments in Garapan are caused by:
  - Sanitary Sewer Leaks and Overflow
  - Stormwater Runoff (Urban Environment)
  - Construction Sites

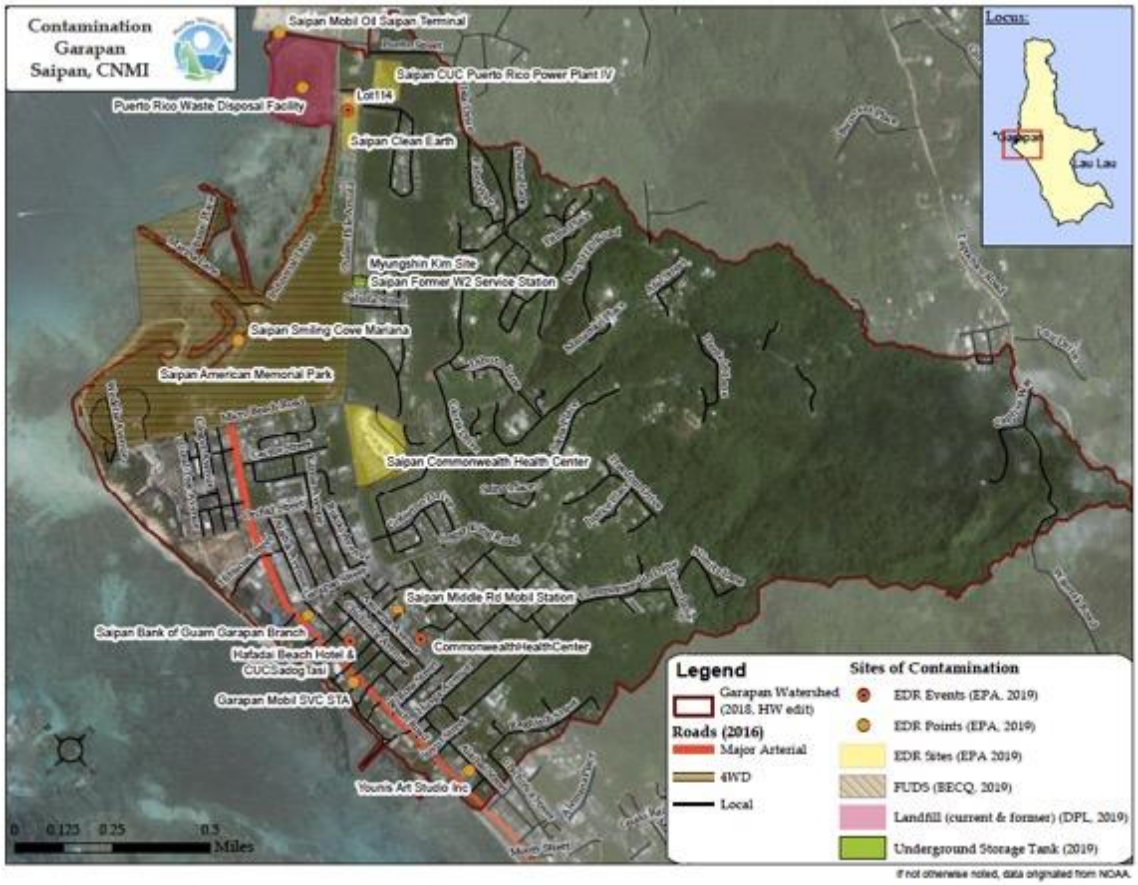


Figure 2: Environmental Data Resources Map of Real or Potential Contamination Sites by EPA (Horsley Witten Group 2020)

Planning, Capital Improvement Projects and Sustainable Infrastructure Development

The "CNMI Planning and Development Act of 2017", Public Law 2020, established the Office of Planning and Development (OPD) whose mission is to "increase the effectiveness of government and private actions, to improve coordination among different agencies and levels of government, and to provide for wise use of resources and future development of the CNMI." OPD is tasked with comprehensive planning and interagency-coordination. To support these mandates, OPD is engaged in several initiatives that relate to watershed planning and implementation in Garapan. These include:

- Establishment of the Planning and Development Advisory Council, and Taskforces to collaborate to compile a Comprehensive Sustainable Development Plan (CSDP). Area-specific watershed management plans should align with the policies and principles as well as relevant goals and objectives of the CSDP, which will incorporate these planning documents by reference;
- Developing and implementing Guidance for Smart, Safe Growth that provides framing principles as well as a "matrix" to support project development and review for future development planning and implementation;
- Supporting area-specific planning through the Garapan Revitalization Taskforce aimed at making key capital improvement projects to transform Garapan into "a world-class beach resort setting that is attractive for visitors and residents". Efforts include:
    - Designating Garapan as a Community Improvement District (CID)

- Focusing on significant stormwater management and flood control improvements including a Hazard Mitigation Garapan Tourist District Drainage and Watershed Improvements Project
- Supporting wetland and coral restoration and capacity enhancement with DLNR and BECQ;
- Supporting a request for updated watershed mapping by the U.S. Army Corps of Engineers; and
- Facilitating updated Flood Insurance Risk Map (FIRM) updates through the Federal Emergency Management Agency in partnership with the CNMI Department of Public Works and BECQ-DCRM.

Climate Change and Environment

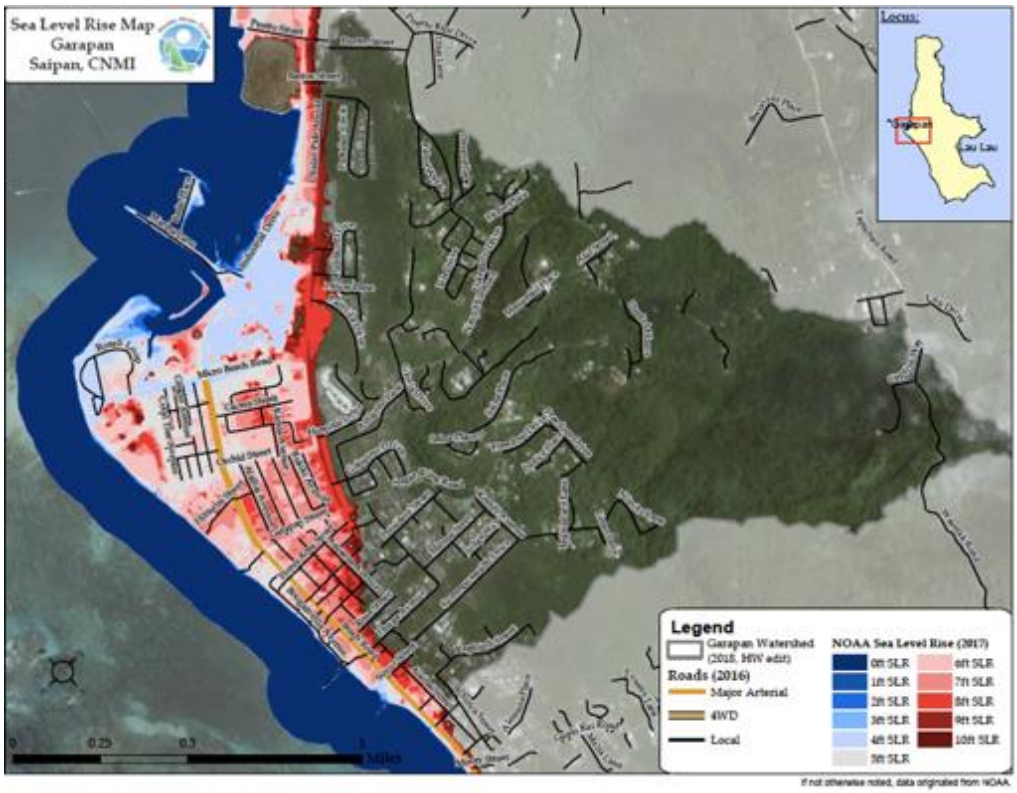


Figure 3: Map of Garapan with Sea-Level Rise projections (Horsley Witten Group 2020)

In 2014 the Saipan Climate Change Vulnerability Assessment was completed to identify the social, physical, and natural features on Saipan that are most susceptible to the impacts of climate change. Based on this assessment, Garapan was found to be one of the most vulnerable areas to sea level rise and inland flooding. The shoreline and beaches along with reefs, seagrass, and mangroves in this area are natures defenses against the impacts of natural hazards such as typhoons and storm surge. They significantly reduce wave energy along the shoreline providing further protections to buildings and infrastructure on shore. Additionally, wetlands and marshes provide protection from inland flooding by absorbing large amounts of stormwater runoff and filtering water before it enters into adjacent nearshore habitats.

Garapan's shoreline and beaches are unstable in some areas showing episodic events of erosion, and without accretion in certain areas. Specifically, the DCRM Shoreline Monitoring Program shows that the Hyatt and Fiesta shorelines are hotspots of erosion, having not receive any accretion for most transects. Further erosion could

jeopardize people who rely on that shoreline, especially the Marine Sports Operators who are stationed just several feet away from the berm. Given the economic importance of beaches to tourism and local recreation, hardening should be avoided where possible and more green infrastructure considered. Rainfall is projected to be less frequent but more intense signifying the need to increase the capacity of stormwater runoff management measures to be able to handle future runoff loads.

Reefs are also highly vulnerable in the lagoon to impacts from runoff and land-based sources of pollution, the effects of climate change, and other threats and stressors. An economic valuation of CNMI's coral reefs and seagrass habitats published in 2019 concluded that these resources generate an annual value of $114.8 million to the CNMI economy (ERG 2019). To protect these valuable resources that provide protection from climate change impacts, restoration of native plant and animal species should be considered for restoration and adaptation. This includes restoration of seagrass and protection of areas for mangroves to retreat with sea level rise, to provide habitat for juvenile hammerheads and the endangered Mariana moorhen. The CNMI long term monitoring program studies how reef communities change over time in response to natural environmental fluctuations as well as those caused by people. This information can be used to better understand and manage the impacts of land-based pollution. More information on marine monitoring can be found at: https://dcrm.gov.mp/our-programs/marine-monitoring-program/

Community Engagement

Several community engagement efforts have been carried out in Garapan to encourage environmentally responsible behaviors among tourists, businesses, and local residents. These include:

- **Choose to Reuse Campaign**- MINA launched an island-wide campaign to discourage the use of plastic bags at the point-of-entry to the point-of-sales. One of MINA's partners include Joeten Hafa Adai, the largest grocery store located within the Garapan Watershed promotes the use of reusable bags, boxes, and restricts the distribution of single-use plastic bags once a week also known as Taya Plastic Tuesdays.
- **Adopt-a-Bin Program**- MINA installed public recycling and mixed waste bins around the island including two in Garapan.
- **Tasi Watch**- In the Chamorro language, I mattan I tasi means the face of the sea, this program facilitates stewardship of this vast resource. MINA's volunteers in the Ranger program are young adults, recent high school graduates, and/or NMC students. These community rangers serve as the "eyes and ears" in the communities for natural resource regulatory agencies. Tasi Watch exercises their rights as citizens by providing written statements or testimonies as a witness to environmental violations and reports these to appropriate jurisdictional agencies. Common environmental violations in the Garapan Watershed include improper disposal of oils, illegal dumping, and illicit discharge.
- **Garapan Clean Water Campaign Initiative** – This program was led by DCRM with assistance by MINA's Tasi Watch community rangers and aimed at protecting wetlands, ocean, and communities from water pollution. The initiative included the Ocean Friendly Campaign which partnered with local businesses to commit to environmental practices and promote eco-friendly products. The initiative also included storm drain marking to discourage illegal dumping in drains that can threaten water resources and create human health risks.

As of this 2020 update, the Garapan Revitalization Taskforce is working to update the Garapan Revitalization Plan. This effort includes the proposed creation of a "Community Improvement District" which aims to establish

a funding mechanism to support improvements for the Garapan Core area which will include infrastructure and beautification projects. Composed of representatives from the private sector, agencies, and the community at large, the Garapan Revitalization Taskforce will be providing opportunities for additional engagement and project implementation support in the years ahead.

Downtown Garapan Photo credit: Junji Takasago

Vision

The Garapan watershed is the CNMI's "Hafa Adai" and "Tirow" to the world. Garapan is the convergence of our economic, natural and cultural resources. It provides our community with safe and healthy resources to engage in and share with our visitors. It is thriving and resilient to the impacts of climate change through smart, safe, development and actions from ridge-to-reef.

Key Threats/Issues

Causes of Watershed Impairments

Threat/Driver of Change: Bacterial Contamination

- Illicit connections of sewer to storm drains (both intentional and accidental).
- Failure or lack of individual waste disposal system (IWDS) or lack of connection to sewer system.
- Aging/ill-maintained/overworked wastewater infrastructure.

- Problems with waste treatment plant, problems with drainage outfall and treatment plant outfall.
- Lack of adequate (or open/functioning) public restroom facilities. Inadequate facilities for the construction workers. People defecating on the beach/in the bushes due to homelessness.
- Animal waste from stray and loose animal population is due to a lack of vets available to spay/neuter animals and a high cost for residents to fix pets. Some of the root causes identified for feral animal populations were a lack of regular spay/neuter clinics due to high costs to implement them; a lack of effective animal control services; diverse cultural beliefs that limit interest in spay/neuter practices; and a lack of active pick up of cats.

Threat/Driver of Change: Non-Bacterial Polluted Runoff

- Aging/ill-maintained/overworked stormwater infrastructure.
- Clogging due to improper use of drains (trash, FOG, etc), IandI (inflow and infiltration).
- High amounts of impermeable surfaces, lack of runoff mitigation measures.
- Insufficient inter-agency coordination, spot zoning and permitting.

Threat/Driver of Change: Native Wildlife Population Decline

- Native wildlife (e.g. birds, lizards) is threatened through habitat loss/fragmentation and direct predation from feral animals (e.g. dogs, cats). Some of the root causes identified for feral animal populations were a lack of regular spay/neuter clinics due to high costs to implement them; a lack of effective animal control services; diverse cultural beliefs that limit interest in spay/neuter practices; and a lack of active pick up of cats.

Threat/Driver of Change: Invasive Species

- There are both existing invasive species and potential (future) invasive species that threaten critical habitat and water quality. Existing invasives occur from historical introductions and disturbances (e.g. fires, storms) that create opportunities for invasive species to spread. Potential introductions are of particular concern through the port and at the marina where small boats arrive. Detection of these introduce species is challenging as there is a lack of inspections and a lack of adequate training of quarantine officers.

Threat/Driver of Change: Illegal Harvest

- Illegal harvest includes any violation of DFW regulations. There was not perceived to be a significant level of harvest in the terrestrial environment in Garapan so the focus of strategies is on the marine area. Garapan contains key landing areas utilized my many fishers. Some of the root causes for illegal harvest include lack of awareness of rules by both residents and tourists, compounded by the fact that many regulations themselves are confusing or conflicting (e.g. moratoriums are not clear to residents). There is also very little fear of enforcement because there is typically a lack of follow through when violations occur due to a disconnect between enforcement action and the legal system. This is due to lack of clarity in the regulations and a lack of dedicated legal counsel for natural resource agencies. The CNMI Wildlife Action Plan also highlights the threat of unregulated harvest of land crabs *Cardisoma carnifex* which are most abundant in Garapan and Achugao, and harvested in the mangroves.

Goals, Strategies, Objectives, Actions

10 Year Goals

By 2030, Garapan will have:

1. Improved lagoon water quality through:
    - Improved management to reduce illicit discharge and improper FOG disposal
    - Upgraded infrastructure to handle loads

- Reduced stormwater runoff
- Green infrastructure to reduce flooding events
- Reduced and controlled stray animal population
- Safe, Smart, Growth Principles integrated into development permitting and management activities

2. Improved management of Critical Habitat (i.e. wetlands, mangrove, seagrass, reef, forest) through:
    - Invasive species prevention and management
    - Greater compliance and enforcement of natural resource management regulations through clear updated regulations and regulatory framework
    - Restoration of degraded native habitats and science-based management
3. More sustainable and resilient development through:
    - Improved permitting processes based on integrating Smart, Safe Growth principles and best available data that considers climate change and natural disaster impacts and risks
    - Inter-agency collaboration and decision-making for permitting
    - Community engagement that fosters environmental stewardship

5-Year SMART Objectives and Actions to Achieve Load Reductions

The following list of objectives and actions were identified as priorities for the next five years toward achieving the 10-year goals of the plan.

Objective/Activity	Funding Required	Partners and Technical Assistance Required
Objective One: By 2025 20 Green Infrastructure or stormwater mitigation projects have been implemented through a pilot program that provides funding and technical assistance to homeowners or businesses		
Activity 1.1 Identify funding sources and develop plan for funding/technical support mechanism. Develop and submit grant applications (ongoing)	$110,000—220,000, depending on the scale of the projects	**Lead**: Watershed Coordinator, BECQ/DEQ Water Quality **Partners:** DLNR Forestry Garapan Revitalization Taskforce and CID – OPD NRCS MINA HANMI
Activity 1.2 Implement a funding and support mechanism, through MOU, program establishment, etc.		
Activity 1.3 Identify priority neighborhoods, projects/recipients, receive applications from interested homeowners and businesses • Disseminate info to communities through community meetings • Provide application/proposal technical support		
Activity 1.4 Projects approved and implemented. • Goal: 20 green infrastructure and/or stormwater projects by 2025 • Provide funding/technical support for ongoing maintenance and community outreach		
Activity 1.5 Identify more funding, expand program to include all of Garapan watershed		

Objective/Activity	Funding Required	Partners and Technical Assistance Required
Objective Two: By the end of 2025 three sustainable designed public restroom facilities will be open, maintained, and available for public use during regular daytime hours. Three existing facilities identified: • AMP bathrooms • Either Smiling Cove or Peace Park • And one new one at or near Fishing Base		
Activity 2.1 Work with Legislative champions to gain support for funding to develop new bathroom at Fishing Base	$500,000	**Lead:** Parks & Rec OPD-Garapan Revitalization Plan OPD – Nat Res. Task Force **Partners:** CUC, DEQ
Activity 2.2 Collaborate with Parks & Re and DFW to assess reasons behind closures and lack of maintenance. Identify someone in Parks & Rec to take lead on project. Develop plan of action for Objective implementation.		
Activity 2.3 Construction of new bathrooms with supporting maintenance MOU or agreement.		
Objective Three: By the end of 2025 high priority individual waste disposal systems (IWDS) have been identified and 10% of inspected sites repaired.		
Activity 3.1 CUC has completed a full inventory of the entire watershed to identify where additional sewer connections can or should be made and identified high priority areas for sewer expansion.	$300,000	**Lead:** DEQ **Partners:** CUC Wastewater, NMHC, OPD Built Environment Taskforce **Outreach:** BEH, CUC
Activity 3.2 Septic system education program implemented to at least 8% of homeowners to encourage repair, upgrade, or retirement (connection to sewer) with the majority showing willingness to repair.		

Objective/Activity	Funding Required	Partners and Technical Assistance Required
Activity 3.3 An implementation plan is developed to address highest priority IWDS including funding mechanism assessment to support connections for low-income land/homeowners	$300,000	
Activity 3.4 10% of inspected sites found lacking improvements are repaired		
Objective Four: By the end of 2025 illicit discharge has been detected and removed in at least 30% of the watershed area through the implementation of an inspection program for Illicit Discharge Detection and Elimination (IDDE).		
Activity 4.1: An IDDE program has been established and institutionalized by DPW, as required by MS4 and includes process for collaboration with enforcement authority (DEQ) and outreach support (MINA) to eliminate IDDE.	$250,000 per year	**Lead MS4:** DPW **Lead Enforcement:** DEQ, BEH **Partners:** DEQ DCRM CUC MINA BEH OPD Built Environment Task Force EPA Region 9
Activity 4.2 Update DPW and CUC infrastructure maps identifying illicit discharges, sanitary and storm		
Activity 4.3: Work with DEQ to assess, enforce, and eliminate illicit discharge in at least 30% of the watershed area.		
Objective Five: By the end of 2025, Fats, Oils, and Grease (FOGs) disposal program is established and implemented.		
Activity 5.1: Hire a FOGs Manager at CUC, as required by CUC Stipulated Order.	$250,000 per year	**Lead:** CUC **Partners:** BECQ DPW OPD Built Environment Task Force **Outreach program:** collaboration
Activity 5.2: Design CUC FOGs program: • Establish and Execute a FOG control plan • Work with BEH and CNMI government to create an enforcement action plan to ensure FOG compliance • Work with DPW on best practices on disposal of FOG		

Activity 5.3: Implement CUC FOGs program: • Set up community collection sites to allow for FOG collection • Conduct regular inspections of sewer sheds (for FOG concerns) and grease traps throughout the island. • Integrate FOGs into waste management feasibility study and comprehensive plan		between BEH, CUC, and BECQ EPA Region 9 **Lead Enforcement:** BEH
Activity 5.4: Implement a FOGs outreach program to disseminate information to both residential and commercial entities about BMPs for FOGs disposal and about consequences of inappropriate FOGs disposal.		
Objective Six: By 2025 a minimum of two affordable spay neuter clinic events are completed in Garapan and to include stray animals		
Activity 61 Source and contract a veterinary team	$25,000 per clinic	**Lead:** Mayor's Office **Partners and Tech Assistance:** Off Island Veterinary Team for clinic Saipan Cares for Animals
Activity 6.2 Advertise clinics on tv, radio, newpaper. Target Garapan residents with mailed flyers		
Activity 6.3 Active round up of stray animals to be spay/neutered		
Activity 6.3 Implement Clinics and collect fees		
Objective Seven: By 2025 DFW hunting, fishing, and research permit regulations have been reviewed and updated with legal guidance		
Activity 7.1 Identify non-sportfish funding source to cover time for DFW staff to review and provide input to existing regulation	$100,000 Total	**Lead:** DFW **Partners and Tech Assistance:** DFW Fish biologists, NOAA, fishers – identify gaps and challenges with regs; ; OPD Natural Resources Taskforce
Activity 7.2 Conduct 3–5 key informant interviews and interagency surveys to provide input on conflicts and challenges to users with existing regulation		
Activity 7.3 Convene small workshop of in house DFW experts and relevant external partners to identify conflicts and challenges with existing regulations		

Activity 7.4 Contract legal support (e.g. legal fellow) to review and update regulations based on internal DFW review and stakeholder support		Legal support (e.g. fellow) to update regs based on existing gaps and challenges
Activity 7.5 Follow DFW protocols to update regulations		
Objective Eight: By 2025. guidance on BMPs for invasive species/vegetation developed and integrated into agency specific permitting and enforcement processes		
Activity 8.1 Conduct preliminary revegetation and succession study	$50,000	**Lead:** DCRM, DLNR Invasive Species Coordinator **Partners and Tech Assistance:** MOS, DLNR, DPW, DFW (enforcement), OPD Natural Resources Task Force CREES – expertise on invasive species management approaches
Activity 8.2 Establish invasive species working group to pool expertise and develop guidance.		
Activity 8.3 Contract signed and implemented to review guidance and determine how to integrate into various agency permitting processes		
Activity 8.4 Guidelines integrated into various permitting requirements through adoption of regulations and policies		
Activity 8.5 Training for enforcement officers on BMP guidance and what to look for		
Activity 8.6 Outreach materials developed to simplify guidance and shared with developers on which BMPs are required		
Objective Nine: By 2025, DCRM will update NMIAC 15-20 (jetski regulations) to encompass all marine sports operations.		
Activity 9.1 Conduct internal review of current 15-20 regulations.	$50,000 Total	**Lead:** DCRM **Partners and Tech Assistance:** DCRM Board USCG DPS Boating Safety DPL DFW
Activity 9.2 Conduct inter-agency review with partner agencies and DCRM Board, including DFW, DPS Boating Safety, DPL, and USCG.		
Activity 9.3 Conduct stakeholder review and feedback, including but not limited to:		

• Holding a MSO forum workshop • Soliciting public comments.		Marine Sports Operators Tour Operators HANMI
Activity 9.4 Incorporate stakeholder and community feedback into new revised regulations with guidance from legal counsel.		
Activity 9.5 Approval by DCRM Board and promulgated into CNMI code.		
Objective Ten: By end of 2025 all development projects incorporate Smart, Safe growth (SSG) principles through the application of the SSG Project Review Matrix.		
Activity 10.1 Develop an CNMI implementation framework for CNMI's Smart, Safe Growth Guidance through incorporation of principles into the Comprehensive Sustainable Development Plan Plan and related planning documents as well as through the application of SSG Project Review Matrix in CNMI project scoping and prioritization processes (ex. CIP, CEDS, HM etc.)	$350,000	**Lead**: OPD **Partners:** Planning and Development Advisory Council (PDAC), Regulatory Partners, Developers and Consultants
Activity 10.2 Conduct at least three SSG trainings for regulators as well as project developers and consultants with supporting materials posted online at www.opd.gov.mp/		
Objective Eleven: By 2023, major siting permitting decisions include the Zoning Board		
Activity 11.1 Work with DCRM Director, Permit Manger, Governor's Office, and Attorney Generals Office and Zoning Administrator to conduct feasibility analysis to determine the best approach for how to integrate Zoning onto the DCRM Review Board	$60,000	**Lead**: DCRM and OPD **Partners:** Zoning, DCRM Board, OPD
Activity 11.2 Implement feasibility analysis recommendations		

Activity 11.3 Capacity building workshop for Zoning and DCRM Board as well as other relevant project development and regulatory partners on SSG Principles and ideas on how to further incorporate them into the permitting process.		
Objective Twelve: By 2025, a Central portal for public spatial data is established and used for planning, permitting, and decision-making.		
Activity 12.1 • Formal establishment of CNMI GIS Working Group • Hire a GIS coordinator at OPD • Identify who will house/maintain central database (with emphasis on data security)	$65,000	**Lead:** DCRM GIS specialist, GIS Specialist **Partners:** OPD(?) GIS Specialist; GIS Working Group
Activity 12.2 • Provide GIS trainings on: GIS portal, GIS software, protocol, familiarity with GIS WG and CNMI geospatial tools		
Activity 12.3 • All agencies have access to a centralized GIS database with non-protected data also made accessible to the general public		
Activity 12.4 • Incorporate GIS data into planning, permitting, and decision-making		
Objective 13: By 2025 the Garapan Revitalization Taskforce and Watershed Working Group have an action plan based on the Horsley Witton Model (Appendix B) to manage at least 50 acres (of drainage area) to address stormwater impacts through new structural stormwater BMPs including a 10% average reduction in impervious cover and in turf by 2030 turf		
Activity 13.1 By 2022 develop a Stormwater Management Plan for Garapan watershed that identifies and prioritizes high priority stormwater BMPs that provide the most bang for the buck. These may include sites identified in the HW Model**: • Additional Rain tanks and Cisterns installed (10 acres) • Constructed Wetland at Navy Hill (134 acres) • Bioretention - (10 acres) • Green Roof – (10 acres)	$200,000	**Lead:** OPD -Garapan Revitalization Task Force **Partners:** DPW CUC, BECQ, private partners

• Redevelopment improvement of impervious surface (30acres) • Semi-annual catch basin cleanings (50 acres) • Sugar King Hill road stabilization, runoff attenuation, and treatment		
Activity 13.2 Implement top priority stormwater BMPs in Garapan with implemented action plan components covering at least 25 acres by 2025 and aiming for 50 acres by 2030	Unknown, depending on identified BMPs. Likely millions of dollars.	
** Retrofits = These include practices such as biorentetion, cisterns, and green roofs. These would be specific projects done on public lands (or as subsidized demonstrations with willing landowners) Redevelopment. These would occur when a hotel or commercial parcel for apply for redevelopment and more environmental standards to kick in to reduce the overall site impervious cover or lawn area to something more sustainable. The model includes an average reduction of 10% of the existing impervious cover on site. For example, if there were 10 parking spaces, they would only have 9 as part of redevelopment or add a landscape island for the other 1 space. It should not to be interpreted as 10% imperivous cover reduction for the watershed. Rather 10% reduction in the existing paved area over 30 acres of redevelopment parcels.		

Education and Outreach

Education and Outreach Plan					
Target Audience	**Which objective/ strategy will this outreach support?**	**Key Messages**	**Outreach Strategy (what approach will be used to communicate with target audience)**	**Outreach Materials Needed**	**Who will Lead and Track Progress?**
Garapan homeowners, business owners	1, 3	Cumulative effect of storm and sewer overflow, importance and proper care of IWDS Role of incentives available to implement BMPs	Update stormwater manual Tasi-Watch Rangers	Updated stormwater manual	BECQ lead MINA support
Homeowners, restaurant owners, business owners	5	Cumulative impact of FOGs on WQ, etc. How and where to properly dispose of FOGs	Social marketing campaign through Healthy Ocean campaign Tasi-Watch rangers	Determined through social marketing campaign (e.g. signage, prompts, incentives, etc.)	BEH, BECQ, and CUC collaboration MINA support
Garapan residents with pets	6	Dogs are one of the leading causes of red flags at beaches posing a health risk to families and tourists There are approximately # stray dogs due to lack of spay/neutering Be sure your pets are spayed/neutered during the Garapan animal clinics	Door to door in neighborhoods	Pamphlets Information about Clinic	Mayor's Office Saipan Cares for Animals support

Developers	2, 4, 10, 11	Updated permitting requirements including: • BMPs required to prevent invasive species • SSG Principles How to navigate the permitting process Implementing SSG results in "win/win" outcomes	Stakeholder meetings/training for developers	Updated stormwater manual Pamphlet with invasive species BMPs SSG Matrix Flow chart of permitting process	DCRM lead OPD
Hunters/ Fishers	7	Updated Fishing regulations	One on one discussions by enforcement officers to share DFW regulations	Pamphlet and signage in key spots with new regulations	DFW Enforcement
Zoning and DCRM Board	11, 12	What are SSG Principles Incorporating SSG Principles early into project scoping for better economic and environmental outcomes How to make permit decisions using SSG tool GIS decision-making tools	Training for Zoning and DCRM Boards	SSG Principles checklist/ Matrix GIS tool	OPD lead SSG DCRM support for GIS tool
DCRM and DFW Enforcement Officers and Inspectors	7,8,9 10	Updated regulations (simple fact sheet/ one pager), and permitting requirements including: • BMPs required to prevent invasive species • SSG Principles • Updated fisheries regulations	Training Sessions for Enforcement Officers	Simple fact sheet/ one pager with regulations numbers and basic content Permitting BMPs SSG Principles checklist	OPD and DCRM – lead SSG training DFW – lead invasive and fisheries

CNMI Policy Makers - Executive and Legislative Branches	13	Impacts of stormwater on lagoon water quality (and tourism) Role and need for BMPs Priority Stormwater BMPs that provide the most bang for the buck	Summary of Garapan Stormwater Plan	PPT presentation One on One consultations One-pager with BMP needs and budgets	OPD and Garapan Revitalization Task Force

Monitoring and Evaluation Plan

This section provides a description of CNMI's water quality monitoring program and a table of progress and outcome indicators that will be used to track progress of this plan. The table includes details on who and how projects will track progress over the life of the plan implementation. It also includes who and how objectives will be measured to track outcomes of the plan's efforts. This includes tracking water quality to understand progress in improving water quality targets. The DCRM Watershed Coordinator will be responsible for tracking overall progress and outcomes of this plan through the Watershed Working Group and direct communications with the various plan partners who are leading different objectives/actions.

CNMI Water Quality Surveillance and Non-Point Source (WQS/NPS) Program

Figure 4: Map of water quality monitoring sites in the Garapan sub-watershed (Horsley Witten Group, 2020)

CNMI's Bureau of Environmental and Coastal Quality has a Water Quality Surveillance and Non-Point Source (WQS/NPS) Program that collects and tests marine water samples weekly by WQS/NPS to monitor the chemical, physical, and microbial quality of near shore waters if popular beaches. *Enterococci* is the fecal indicator used to assess the presence of human or animal waste and when level exceed CNMI's waters quality standards, sites are "red flagged" to indicate a health risk associated with recreating in the waters. This data is combined with other marine monitoring data on the reef and benthic habitat and provided to US EPA, Congress, and the general public in the biennial CNMI 305(b) and 303(d) Water Quality Assessment Integrated Report. A preliminary draft of the 2020 report was submitted to EPA region 9 on April 20, 2020 for review and preliminary approval, upon

which time the report will be released to solicit general public comments. The final updated report is expected to be released in late 2020. If tested waters do not meet the standards set for their designated uses ("fishable and swimmable") they are put on the US EPA 303(d) list of impaired waters. This requires managers to set a and work toward a Total Maximum Daily Load (TMDL) to identify the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards work towards their restoration. Information from these monitoring efforts was used during the WMP process for Garapan to understand the status and threats of the Garapan water quality.

The following table provides monitoring indicators for each objective and activity and who will track progress. This plan will be carried out through several different governmental offices, and non-governmental organizations who have their own internal reporting protocols. Therefore, the Watershed Working Group meetings will provide a venue for various leads to provide updates on progress and indicators in this monitoring plan.

Objective/Activity	**Date of Completion**	**Indicator of Progress/ Outcome**	**Who will Lead and Track Progress?**
Objective One: By 2025 20 Green Infrastructure or stormwater mitigation projects have been implemented through a pilot program that provides funding and technical assistance to homeowners or businesses	2025	# of homes/business with projects completed; watershed area of project contributions	DCRM Watershed Coordinator, BECQ/DEQ Water Quality and DPW
Activity 1.1 Identify funding sources and develop plan for funding/technical support mechanism. Develop and submit grant applications (ongoing)	June 2021	Feasibility study # of grant applications submitted	DCRM Watershed Coordinator
Activity 1.2 Implement a funding and support mechanism, through MOU, program establishment, etc.	June 2022	Program is set, ready to receive applications	DCRM Watershed Coordinator
Activity 1.3 Identify priority neighborhoods, projects/recipients, receive applications from interested homeowners and businesses • Disseminate info to communities through community meetings • Provide application/proposal technical support	June 2023	# of applications received and approved	DCRM Watershed Coordinator

Activity 1.4 Projects approved and implemented. • Goal: 20 green infrastructure and/or stormwater projects by 2025 • Provide funding/technical support for ongoing maintenance and community outreach	Dec 2024	# of homes/businesses with GI projects implemented	DCRM Watershed Coordinator, BECQ/DEQ Water Quality and DPW
Activity 1.5 Identify more funding, expand program to include all of Garapan watershed	Dec 2024	Opportunities for future funding and project implementation	DCRM Watershed Coordinator
Objective Two: By the end of 2025 three sustainable designed public restroom facilities will be open, maintained, and available for public use during regular daytime hours. Three existing facilities identified: • AMP bathrooms • Either Smiling Cove or Peace Park • And one new one at or near Fishing Base	2025	# of public restrooms open, maintained, and available to public during regular hours	Parks & Rec; OPD-Garapan Revitalization Plan OPD – Nat Res. Task Force
Activity 2.1 Work with Legislative champions to gain support for funding to develop new bathroom at Fishing Base	Jan 2021	# of Senators signed on to advocate for new bathroom	Parks & Rec OPD, and Legislature
Activity 2.2 Collaborate with Parks & Rec and DFW to assess reasons behind closures and lack of maintenance. Identify someone in Parks & Rec to take lead on project. Develop plan of action for Objective implementation.	June 2021	Plan of action for Smiling Cove or Peace Park facilities	Parks & Rec OPD
Activity 2.3 Construction of new bathrooms with supporting maintenance MOU or agreement.	Dec 2024	Contracts signed for construction of new bathrooms Bathroom maintenance MOU or agreement executed to support sustainability objectives	AMP for 1 Parks & Rec OPD for 3

Objective Three: By the end of 2025 a high priority individual waste disposal systems (IWDS) have been identified and 10% of inspected sites repaired.	2025	# of high priority IWDS identified % high priority inspected sites repaired	DEQ
Activity 3.1 CUC has completed a full inventory of the entire watershed to identify where additional sewer connections can or should be made and identified high priority areas for sewer expansion.	Dec 2021	Baseline inventory complete	DEQ
Activity 3.2 Septic system education program implemented to at least 8% of homeowners to encourage repair, upgrade, or retirement (connection to sewer) with the majority showing willingness to repair.	June 2023	% of population where outreach has been implanted % % surveyed population willing to upgrade/connect	DEQ and MINA
Activity 3.3 An implementation plan is developed to address highest priority IWDS including funding mechanism assessment to support connections for low-income land/homeowners	June 2022	Implementation plan developed	DEQ
Activity 3.4 10% of inspected sites found lacking improvements are repaired	Dec 2024	% of inspected sites repaired	
Objective Four: By the end of 2025 illicit discharge has been detected and removed in at least 30% of the watershed area through the implementation of an inspection program for Illicit Discharge Detection and Elimination (IDDE).	2025	% of watershed where illicit discharge has been removed/eliminated	DPW
Activity 4.1: An IDDE program has been established and institutionalized by DPW, as required by MS4 and includes process for collaboration with enforcement authority (DEQ) and outreach support (MINA) to eliminate IDDE.	Jan 2022	MOU signed and finalized for MS4 implementation.	DPW
Activity 4.2 Update DPW and CUC infrastructure maps identifying illicit discharges, sanitary and storm	Jan 2024	Maps updated to show illicit discharges	DPW

Activity 4.3: Work with DEQ to assess, enforce, and eliminate illicit discharge in at least 30% of the watershed area.	Dec 2024	% area enforced by DEQ	DEQ, BEH
Objective Five: By the end of 2025, Fats, Oils, and Grease (FOGs) disposal program is established and implemented.	2025	# of FOG collection sites regularly maintained	CUC
Activity 5.1: Hire a FOGs Manager at CUC, as required by CUC Stipulated Order.	June 2021	FOGs Manager position filled and supporting control plan development	CUC
Activity 5.2: Design CUC FOGs program: • Establish and Execute a FOG control plan • Work with BEH and CNMI government to create an enforcement action plan to ensure FOG compliance • Work with DPW on best practices on disposal of FOG	June 2022	FOG Control Plan developed including enforcement plan and BMP's # FOGs-specific training(s) or meetings held	CUC BEH – for enforcement plan
Activity 5.3: Implement CUC FOGs program: • Set up community collection sites to allow for FOG collection • Conduct regular inspections of sewer sheds (for FOG concerns) and grease traps throughout the island. • Integrate FOGs into waste management feasibility study and comprehensive plan	June 2022—Dec 2024	# of collection sites regularly maintained # of inspections FOGs integrated in to waste management comprehensive plan	CUC DPW Built Environment Taskforce
Activity 5.4: Implement a FOGs outreach program to disseminate information to both residential and commercial entities about BMPs for FOGs disposal and about consequences of inappropriate FOGs disposal.	June 2022—Dec 2024	# of educational materials distributed	BEH, BECQ, and CUC
Objective Six: By 2025 a minimum of two affordable spay neuter clinic events are completed in Garapan and to include stray animals	2025	Clinics implemented	Mayor's Office

Activity 61 Source and contract a veterinary team	6 months before clinics	Contract in place	Mayor's Office
Activity 6.2 Advertise clinics on tv, radio, newpaper. Target Garapan residents with mailed flyers	Within 1 month of clinics	# of Newspaper ads, tv, Radio spots % coverage of residents that flyers were sent	Mayor's Office
Activity 6.3 Active round up of stray animals to be spay/neutered	Within one week of clinic	# of animals collected	Mayor's Office
Activity 6.4 Implement Clinics and collect fees	1st by 2022 2nd by 2024	# of pets spayed/neutered # of strays spayed/neutered	Mayor's Office
Objective Seven: By 2025 DFW hunting, fishing, and research permit regulations have been reviewed and updated with legal guidance	2025	Hunting and fishing regulations updated and adopted by DFW	DFW
Activity 7.1 Identify non-sportfish funding source to cover time for DFW staff to review and provide input to existing regulations	June 2021	Funding identified for regulation review workshop Dedicated legal support requested and provided	DFW
Activity 7.2 Conduct 3–5 key informant interviews and interagency surveys to provide input on conflicts and challenges to users with existing regulation	Dec 2021	# of key informants interviewed	DFW
Activity 7.3 Convene small workshop of in house DFW experts and relevant external partners to identify conflicts and challenges with existing regulations	June 2022	Workshop implemented	DFW
Activity 7.4	June 2023	Contract secured	DFW

Contract legal support (e.g. legal fellow) to review and update regulations based on internal DFW review and stakeholder support			
Activity 7.5 Follow DFW protocols to update regulations	Dec 2024	Regulations updated	DFW
Objective Eight: By 2025, guidance on BMPs for invasive species/vegetation developed and integrated into agency specific permitting and enforcement processes	2025	Inter-agency permitting process updated to include BMPs for invasive species management	DCRM DLNR Invasive Species Coordinator
Activity 8.1 Conduct preliminary revegetation and succession study	Dec 2021	Saipan Study complete	DCRM Coral Fellow
Activity 8.2 Establish invasive species working group to pool expertise and develop guidance.	June 2022	Guidance on BMPs developed	DCRM Coral Fellow / DLNR Invasive Species Coordinator
Activity 8.3 Contract signed and implemented to review guidance and determine how to integrate into various agency permitting processes	June 2023	Contract signed for legal guidance	DCRM
Activity 8.4 Guidelines integrated into various permitting requirements through adoption of regulations and policies	June 2024	BMP guidance integrated into permitting review through inclusion of SSG and other policies in major siting and APC assessment forms	DCRM
Activity 8.5 Training for enforcement officers on BMP guidance and what to look for	Dec 2024	% of total enforcement officers trained on BMPs	DCRM, DLNR Invasive Species Coordinator
Activity 8.6 Outreach materials developed to simplify guidance and shared with developers on which BMPs are required	Dec 2024	% of active developers who received outreach materials	DCRM, DLNR Invasive Species Coordinator
Objective Nine:	2024		DCRM

By 2024, DCRM will update NMIAC 15-20 (jetski regulations) to encompass all marine sports operations.		NMIAC 15-20 updated and adopted by DCRM	
Activity 9.1 Conduct internal review of current 15-20 regulations.	By March 2021	Internal Review document complete	DCRM
Activity 9.2 Conduct inter-agency review with partner agencies and DCRM Board, including DFW, DPS Boating Safety, DPL, and USCG.	By end of 2021	Inter-agency Review document complete # of partners/agencies involved	DCRM
Activity 9.3 Conduct stakeholder review and feedback, including but not limited to: • Holding a MSO forum workshop • Soliciting public comments.	By the end of 2021	# of stakeholder input sessions Stakeholder review document complete	DCRM
Activity 9.5 Incorporate stakeholder and community feedback into new revised regulations with guidance from legal counsel.	By the end of 2022	Regulations updated to reflect reviews	DCRM/ Legal Council
Activity 9.6 Approval by DCRM Board and promulgated into CNMI code.	By end of 2023	Regulations promulgated	DCRM Board
Objective Ten: By end of 2025 all development projects incorporate Smart, Safe growth (SSG) principles through the application of the SSG Project Review Matrix.	Dec 2024	All development projects incorporate smart, safe growth	OPD
Activity 10.1 Develop an CNMI implementation framework for CNMI's Smart, Safe Growth Guidance through incorporation of principles into the Comprehensive Sustainable Development Plan and related planning documents as well as through the application of SSG Project Review Matrix in CNMI project scoping and prioritization processes (ex. CIP, CEDS, HM etc.)	Jan 2023	# of planning documents that SSG implementation framework is incorporated SSG Project Review Matrix integrated into project scoping and prioritization process	OPD

Activity 10.2 Conduct at least three SSG trainings for regulators as well as project developers and consultants with supporting materials posted online at www.opd.gov.mp/	Dec 2023	# trainings complete # of developers and consultants trained on SSG principles	OPD
Objective Eleven: By 2023, major siting permitting decisions include the Zoning Board	2023	All major site permitting includes zoning	DCRM
Activity 11.1 Work with DCRM Director, Permit Manger, Governor's Office, and Attorney Generals Office and Zoning Administrator to conduct feasibility analysis to determine the best approach for how to integrate Zoning onto the DCRM Review Board	2021	Feasibility analysis conducted	DCRM
Activity 11.2 Implement feasibility analysis recommendations	2022	Zoning integrated into DCRM Review Board	DCRM
Activity 11.3 Implement feasibility analysis recommendations Capacity building workshop for Zoning and DCRM Board as well as other relevant project development and regulatory partners on SSG Principles and ideas on how to further incorporate them into the permitting process.	2023	Zoning Board trained on SSG principles	DCRM
Objective Twelve: By 2025, a Central portal for public spatial data is established and used for planning, permitting, and decision-making.	Dec 2024	All relevant planning and permitting decisions made with GIS data support	DCRM GIS specialist GIS Working Group

Activity 12.1 • Formal establishment of CNMI GIS Working Group • Hire a GIS coordinator at OPD • Identify who will house/maintain central database (with emphasis on data security)	June 2021	GIS Working Group formalized (MOU, regular meetings, etc.) GIS Coordinator hired # of GIS WG members Database secured	DCRM GIS specialist
Activity 12.2 • Provide GIS trainings on: GIS portal, GIS software, protocol, familiarity with GIS WG and CNMI geospatial tools	June 2021–Dec 2023	# of trainings # of GIS staff participants	DCRM GIS specialist
Activity 12.3 • All agencies have access to a centralized GIS database with non-protected data also made accessible to the general public	Dec 2023	# of agencies accessing database # of data sets in portal	DCRM GIS specialist
Activity 12.4 • Incorporate GIS data into planning, permitting, and decision-making	Dec 2024	Process for GIS use in one stop permitting formalized # planning and permitting decision made with GIS	DCRM planning and permitting
Objective 13: By 2025 the Garapan Revitalization Taskforce and Watershed Working Group have an action plan based on the Horsley Witton Model (Appendix B) to manage at least 50 acres (of drainage area) to address stormwater impacts through new structural stormwater BMPs including a 10% average reduction in impervious cover and in turf by 2030 turf	2030	# acres managed to address SW % reduction in impervious cover and turf	OPD and Garapan Revitalization Task Force
Activity 13.1 By 2022 develop a Stormwater Management Plan for Garapan watershed that identifies and prioritizes high priority stormwater BMPs that provide the most bang for the buck. These may include sites identified in the HW Model: • Additional Rain tanks and Cisterns installed (10 acres) • Constructed Wetland at Navy Hill (134 acres)	Dec 2021	Plan developed # of priority BMPs identified	OPD and Garapan Revitalization Taskforce supported by Watershed Working Group, Built Environment,

• Bioretention - (10 acres) • Green Roof – (10 acres) • Redevelopment improvement of impervious surface (30acres) • Semi-annual catch basin cleanings (50 acres) • Sugar King Hill road stabilization, runoff attenuation, and treatment			and Natural Resource Taskforces
Activity 13.2 Implement top priority stormwater BMPs in Garapan with implemented action plan components covering at least 25 acres by 2025 and aiming for 50 acres by 2030	Dec 2030	# of priority BMPs implemented	OPD and Garapan Revitalization Taskforce supported by Watershed Working Group, Built Environment, and Natural Resource Taskforces

Appendix A: Watershed Characterization

Garapan is a sub-watershed of the West Takpochao watershed is located on the island of Saipan, one of fourteen islands within the 466-mile long archipelago that comprises the US Commonwealth of the Northern Mariana Islands (CNMI) in the western Pacific. The Mariana Islands are located approximately 1,500 miles from Tokyo, about 3 ½ hours by air. Saipan is located at 15^{o} 10'51 N and 145^{o} 45'21 E. The island is 5.6 miles by 12 miles at its widest parts and covers 44.55 square miles. The highest point is Mount Takpochao which climbs to 1,560 feet in the approximate center of the island. Nearly 90% of the CNMI's population is based on Saipan, with 2010 census figures recording 48,000 people on the island (US Census Bureau, 2010).

The Division of Environmental Quality (DEQ) and the Division of Coastal Resource Management (DCRM), both under the Bureau of Environmental and Coastal Quality (BECQ), and the Department of Lands and Natural Resources (DLNR) Division of Fish and Wildlife (DFW) and Forestry (under the Division of Agriculture), as well as the Office of Planning and Development (OPD), a coordinating agency, are situated within the CNMI Office of the Governor. These agencies are partners in managing the natural resources of the CNMI. DEQ was created through Public Law 3-23 to protect the right of each person to a clean and healthful environment. The Commonwealth Environmental Protection Act defines DEQ's purpose, jurisdiction and authorization to issue regulations and implement programs to protect the air, land and water of the Commonwealth. DCRM was established with the implementation of Public Law 3-47 within the Office of the Governor to promote the conservation and wise development of coastal resources. Under CNMI law, DCRM has regulatory jurisdiction over coastal lands of the Commonwealth. DLNR was established by Public Law 1-8 "to be responsible for the protection and enhancement of the natural resources of the islands." DFW was created by Public Law 2-51 which was later revised by Public Law 10-57 with the purpose to conserve fish, game and wildlife and to protect endangered and threatened species. CNMI Forestry was created by Public Law 1-8 and repealed and reenacted by Public Law 10-57 with the duty to promote and develop an agricultural program related to plants. Through research, monitoring, regulation, enforcement, planning and management, these agencies seek to ensure the long-term survival and sustainability of the CNMI's natural resources. Public Law 20-20 established OPD to assist in interagency planning and ensure consistency in planning programs and projects with CNMI's Comprehensive Sustainable Development Plan (publication pending), which provides "short and long-range guidance for the economic, infrastructure, and physical development of the CNMI … to enhance the quality of the environment and preserve the CMNI's natural beauty and historical heritage".

The Mayor's Office of Saipan (MOS) has various duties that are complimentary to the duties of the agencies under the Office of the Governor. Duties such as providing road clearing or improvement services, assisting with land clearing or earth-moving activities for village cultural events, licensing domestic animals and providing public recreation programs are enabled by Public Law 1-4, amended by PL4-11, PL 4-23, PL 6-5, PL7-33 and PL11-44. The MOS has jurisdiction for these and other duties related

to environmental conservation and natural resources.

In order to own land in the CNMI, individuals must prove they are at least a quarter Northern Marianas descent. Land leases rather are available to other corporations or individuals that do not have this status. All lands in the CNMI fall into one of two categories: private lands or public lands. Private lands are all lands that are alienable by the titleholder. Public lands are those that were transferred into the public domain upon the creation of the Commonwealth. Public lands are freely alienable by the Commonwealth and managed by the Department of Public Lands (DPL). Public lands include government acquired lands that have been purchased by the government for public purposes, the use of which is controlled by deed restriction. DPL has the authority to dispose public lands, including the issuing of village homestead and agricultural homestead permits on lots and the subsequent transfer of these lands to private ownership.

Until 2014, the CNMI was the only US territory that did not have title to its submerged lands from the coastline out to three nautical miles. In 2014, President Obama signed into law a bill authorizing the conveyance of the CNMI's submerged lands around nine of the CNMI's islands to the CNMI government. This agreement withheld the transfer of the submerged lands around the military leases on the northern two-thirds of Tinian and the island of Farallon de Medinilla (No'os) as well as the submerged lands around the three Island Units of the Marianas Trench Marine National Monument (the northern islands of Uracas (-— aka Farallon de Pajaros —, Maug, and Asuncion) until the US and CNMI governments could agree on how to coordinate management. A Memorandum of Agreement (MOA) was signed between the CNMI and US governments in 2016 establishing the terms and conditions for the coordination of management of the submerged lands around the three northern islands in the Marianas Trench Monument to the CNMI, and the transfer of the submerged lands around these three islands was subsequently finalized (https://www.fws.gov/uploadedFiles/Region_1/NWRS/Zone_1/Marianas_Trench_Marine_National_Monument/Sections/News/News_Items/3%20MOA.pdf).

Project Scope

The West Takpochao watershed is situated in the western central area of Saipan, from the north-south spine of Mt. Takpochao out to the west coast of the island (Figures 4,5). The northern boundary is Lower Base east to Capitol Hill, and the southern boundary is near Quartermaster Road east to Gualo Rai, according to USGS survey lines that were established several decades ago (USDA NRCS 2003). The West Takpochao watershed, which covers 6.62 square miles (17.14 km^2), contains the villages of Chalan Laulau, I Liyang, Gualo Rai, As Falipe, Takpochao, Garapan, China Town, Fananganam, Maturana Hill, Chalan Galaide, American Memorial Park, As Palacios, Navy Hill, As Rabagau, Puerto Rico, Lower Base, Sadog Tasi and Capitol Hill. This Watershed Management Plan addresses natural resource concerns for the West Takpochao Central sub-watershed, also referred to as the Garapan sub-watershed, which is 2.2 square miles (5.71 km^2) and covers the Falipe, As Falipe and Fanaganam Lichan drainage areas from Fishing Base north to Smiling Cove, and from the Mt. Takpochao ridgeline west to the coastline. This sub-watershed is listed as a high priority watershed because it contains the urban center of Garapan, center of economic, tourism, and community activities on Saipan (US Census Bureau 2010).

Figure 4: Map of Saipan watersheds (created by DEQ). The intersection of the boundaries in the center of the island is Mt. Takpochao, the highest point on Saipan.

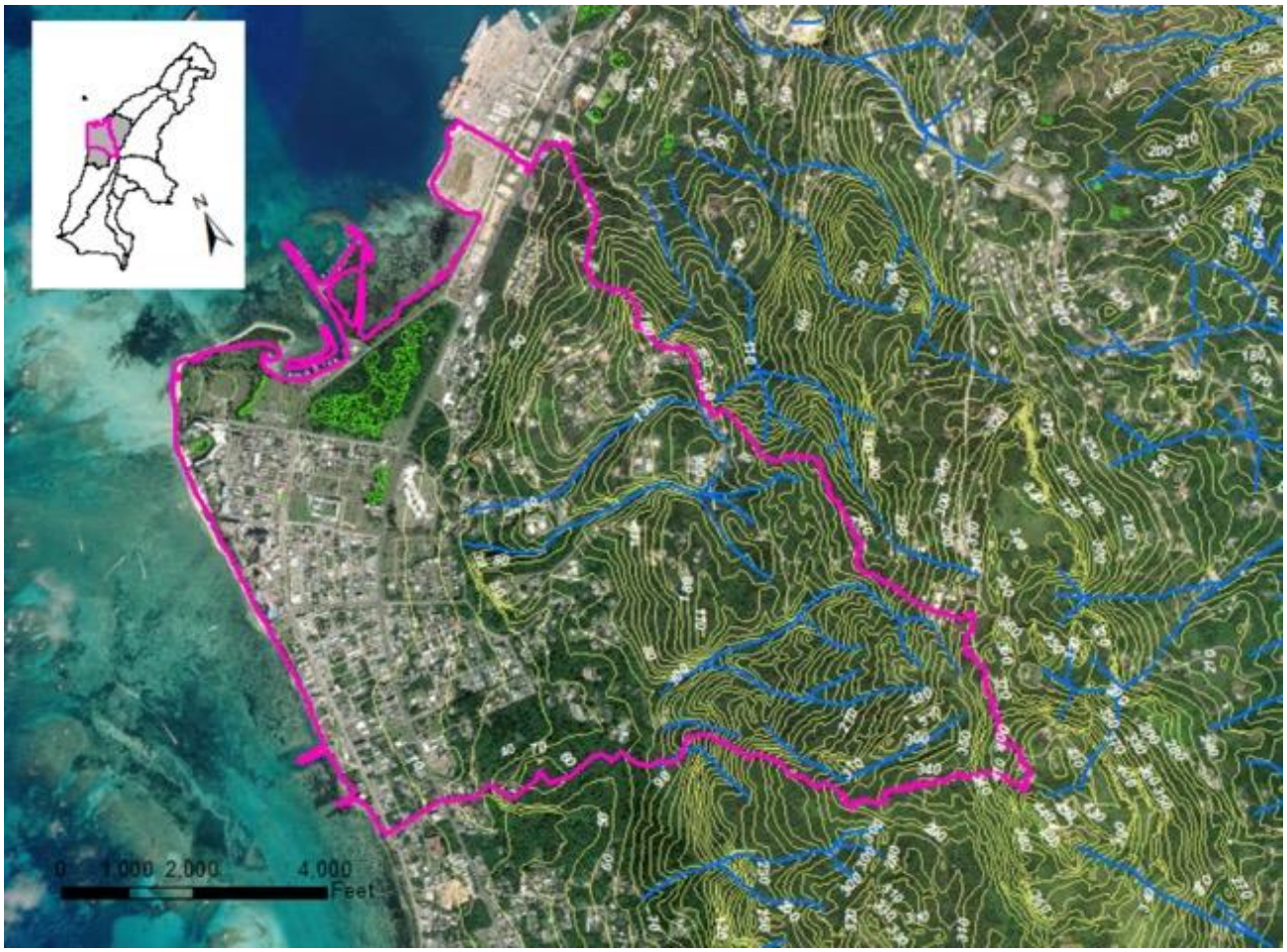


Figure 5: Revised Map of Garapan sub-watershed boundaries (Horsley Witten Group, 2020)

Physical Features

US Geological Survey (USGS) maps indicate that the western coastal portion of the watershed has 0–5% slopes and consists of urban lands, loamy sand or gravelly soils and muck in the remaining wetland and mangrove areas. Moving inland, slopes increase to 5–15% and soils are gravelly, clay, clay-loam or rock outcrops. Proceeding east and further uphill, slopes increase to 15–30% and become dominated by rock and clay-loam.

As can be observed from casual examinations of the watershed, development within the area is heaviest in the lowland coastal areas and sparser continuing uphill towards the divide. Upland areas are scattered with family compounds, apartment buildings, and small farms with piggeries, livestock or crops. The lowland area consists of the downtown area of Garapan, including many businesses, houses and apartments, roads and parking infrastructure, and public institutions such as Garapan Elementary School, the Northern Marianas Housing Corporation, and the Commonwealth Healthcare Center — the island's only hospital. As such, approximately 34% of the West Takpochao watershed is classified as either "impervious surface" or "open space developed" according to 2016 land cover data. A variety of

ephemeral and intermittent streams flow from the top of the watershed during the rainy season and can cause flash floods and dramatic fluctuations in water level. In the lowland areas, most of the surface water is aggregated into drainage ditches and channeled above, and underground out to the ocean.

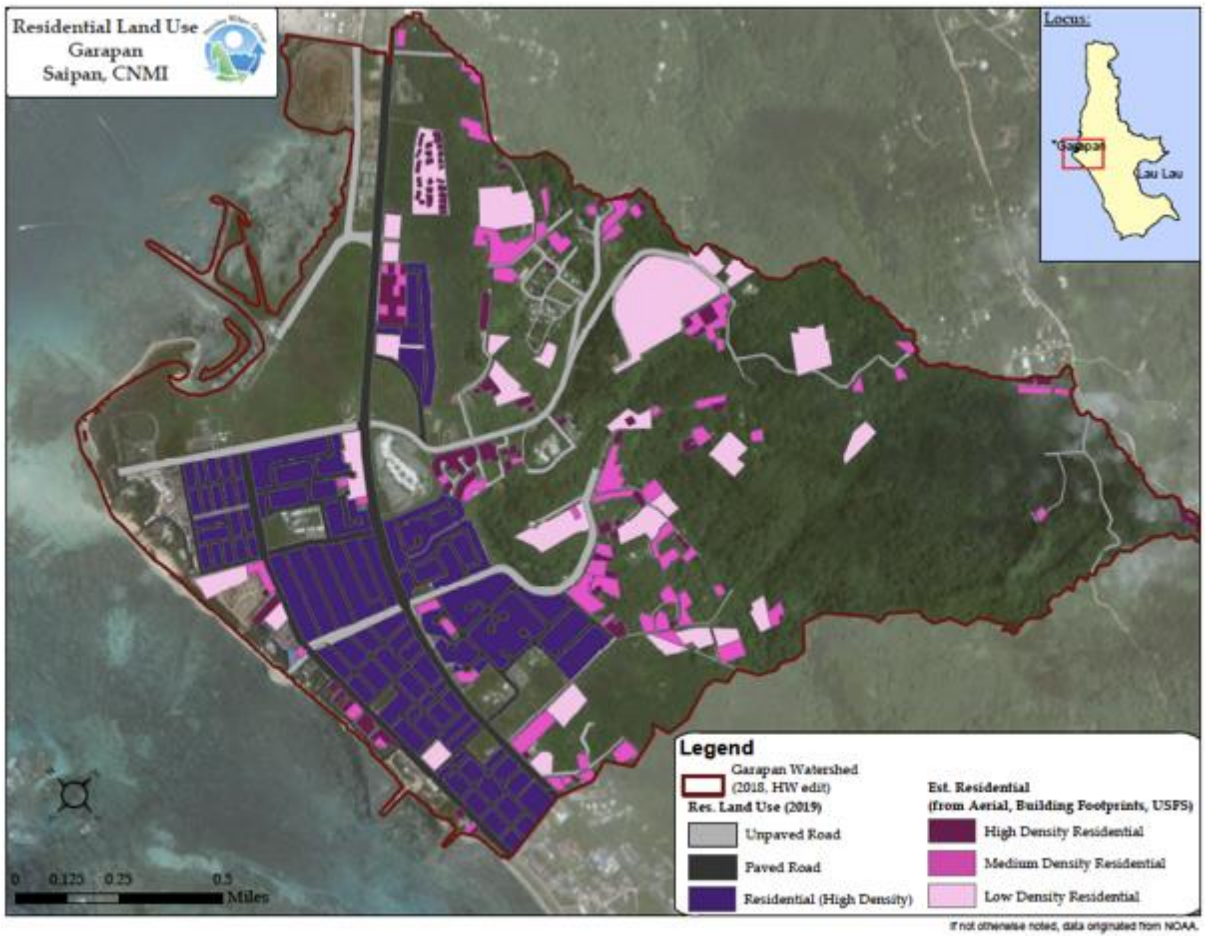


Figure 6: Map of residential land use in Garapan (Horsley Witten Group, 2020)

The CNMI has three groundwater management zones, all of which are represented in the Garapan sub-watershed area. There are currently two Commonwealth Utilities Corporation (CUC) water tanks and approximately thirty-nine drinking water wells that have access to the groundwater at any given time. Several hotels and other businesses operate nine reverse osmosis (R/O) injection wells in the watershed, used for discharging high salinity brine underground after desalination to produce improved drinking water. A groundwater spring discharges within American Memorial Park on the northwestern corner of the watershed.

Middle Road (Chalan Pale Arnold) and Beach Road are the primary roads within the West Takpochao watershed, while major secondary roads cut through Navy Hill and Chinatown into Lower Base. A variety of small paved and unpaved streets connect to individual neighborhoods. Other important infrastructure includes five CUC sewage lift stations in the sub-watershed, where the entire lowland area is connected to

the Sadog Tasi Wastewater Treatment Plant by underground pipes. The Sadog Tasi Wastewater Treatment Plant outfall pipe discharges treated wastewater into the lagoon in the West Takpochao North sub-watershed.

At the northern end of the Garapan sub-watershed in Lower Base lies the former Puerto Rico Dumpsite, now Governor Eloy S. Inos Peace Park. The Puerto Rico Dumpsite on the island of Saipan, CNMI was a military, industrial, and municipal solid waste dumping ground since 1953. For this period of time the dumpsite posed an ongoing environmental and public health threat to Saipan's communities due to contaminant discharge and leaching into the nearby lagoon, periodic open fires, and airborne debris/marine debris resulting from tropical cyclones. Efforts to close and remediate the area began in the early 2000s, and the dump was officially closed in February 2003. In 2015 the Department of Interior – Office of Insular affairs initiated a $29 million remediation of the site into a public park. The park was completed in March 2017 and occupies about 19.5 acres, with a height of 80 feet. Despite the dumpsite closure and conversion to a public open space, leaching and discharge of contaminants remain a major concern. Both groundwater and the lagoon are still contaminated from chemicals leaching out of the dump (Denton et al. 2009).

The Division of Environmental Quality is responsible for regulating and mitigating a variety of point and nonpoint sources of pollution. The West Takpochao watershed has several diesel air stacks permitted by DEQ's Clean Air Program, as well as approximately twenty-six permitted above and underground diesel and fuel storage tanks. The water quality surveillance laboratory at DEQ monitors beaches (weekly), reef flats and sea grass sites (annually) in the lagoon.

The beaches of Garapan constitute one of Saipan's most valuable resources. Most of the shoreline of the West Takpochao Central sub-watershed is characterized by sandy, gently sloping beaches that serve as a transition zone between terrestrial and marine ecosystems and a focal point of recreation and economic viability. These beaches enjoy protection from the Saipan lagoon and fringing reefs which prevent significant wave damage and buffer storm surges and tsunami action from the Philippine Sea. A comprehensive shoreline assessment report completed in 2018 compared aerial images from 1999, 2005, 2011, and 2016 and noted that the shoreline extending from the southern boundary of the West Takpochao Central sub-watershed area (Fishing Base) to the drainage outlet just south of Fiesta Hotel and Resort have experienced relative stability over the past two decades (USACE 2004). In contrast, the north and northeast extent of Garapan's shoreline is very dynamic. The section that presently includes the beachfronts of Fiesta and Hyatt Resorts and American Memorial Park has been subject to significant change on decadal, annual and semi-annual timescales (Sea Engineering, 2018; USACE 2004, Yuknavage and Palmer 2010, Krüger et al. 2010, Greene and Skeele 2014). DCRM assessed shoreline data from 2003 through 2011 and confirmed previously identified trends of beach loss along the western shore of American Memorial Park along with significant accretion to the northeast of the park (Greene and Skeele, 2014). Although coastlines should be expected to shift over time, significant erosion or accretion could greatly affect natural and cultural resources within the watershed area.

Biological Features

The terrestrial watershed area is dominated by mixed introduced forests, and urban vegetated and urban built-up lands (Figure 7). Native limestone forests segments, named for their unique ancient karst/coral substrate with little soil and little water retention, exist within mixed introduced forested areas in the upper watershed. Although these areas are geographically small, they are significant because they contribute to native plant and animal diversity and habitat. These segments have historical and cultural significance for local communities and traditional medicine as well.

Plants that make up this forest type include *Premna obtusifolia, Aglaia mariannensis* (mapunyao)*, Elaeocarpus joga* (yoga), *Barringtonia* spp. (fishkill), *Pandanus* spp. (kafu), *Pisonia grandis*, *Trema orientalis*, and *Hibiscus tiliaceus* (beach hibiscus). DFW bird surveys have identified 21 bird species within the West Takpochao Central sub-watershed forest and fringe habitats, which is on par with diversity within other sub-watersheds and within Saipan as a whole.

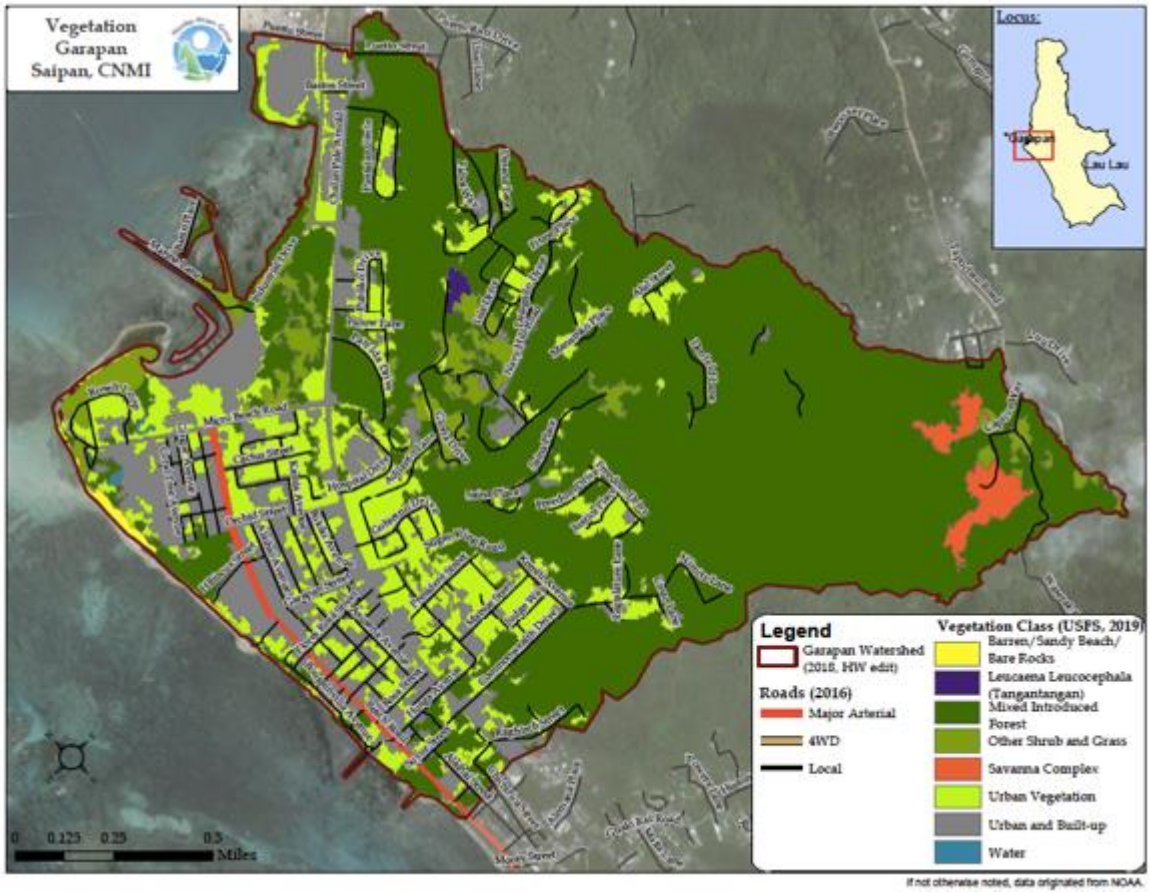


Figure 7: Garapan Vegetation Map (Horsley Witten Group 2020)

There is a small but important secondary forest, wetland and mangrove area consisting of thirty-five acres (14.14 ha) in the American Memorial Park, the National Park Service's only unit on Saipan. The mangrove tree species *Bruguiera gymnorrhiza* persists in this area. This is the largest and most intact section of

mangroves on Saipan (Williams et al. 2007) and was well-studied by National Park Service contractors in the 2000s. Under the Puerto Rico Dumpsite closure plan, mitigation measures for the removal of wetlands during the conversion of the dump into the Inos Peace Park included the planting and continuous monitoring of 200 mangrove seedlings in the Park's natural and constructed riparian wetlands, however, high mortality has been observed in many of these transplants. AMP wetlands also include a constructed wetland created in 1997—1998 along a drainage leading into Smiling Cove Marina to filter urban runoff; this wetland is utilized by the endangered Mariana common moorhen (*Gallinula chloropus guami*). The mangrove forests and wetlands are home to fourteen bird species: the bridled white-eye (*Zosterops conspicillatus*), collared kingfisher (*Halcyon chloris*), eurasian tree sparrow (*Passer montanus*), golden white-eye (*Cleptonis marchei*), Mariana fruit-dove (*Ptilinous roseicapilla*), Micronesian honeyeater (*Myzomela rubratra*), Micronesian starling (*Aplonis opaca*), nightingale reed warbler (*Acrocephalus luscinia*), Pacific reef heron (*Egretta sacra*), Philippine turtle dove (*Streptopelia bitorquata*), common sandpiper (*Actitis hypoleucos*), ruddy turnstone (*Arenari interpres*), rufous fantail (*Rhipidura rufifrons*), white tern (*Gygas alba*), white-throated ground dove (*Gallicolumba xanthonura*), and yellow bittern (*Ixobrychus sinensis*) (Williams et al. 2007), Many of these species also populate the native limestone and tangantangan (*Leucaena leucocephala*) forest types. The nightingale reed warbler was listed as federally endangered in 1970.

The native humped tree snail (*Partula gibba*), listed as a candidate species under the Endangered Species Act, has been identified in the wetlands and mangroves (Williams et al. 2007). Five snails of the genus *Liardetia* have been observed in these areas as well (Meneses et al. 2013). Other notable species observed include the curious skink (*Carlia fusca*), the Pacific blue-tailed skink (*Emoia caeruleocauda),* hermit crabs (*Coenobita* spp.), land crabs (*Cardisoma carnifex*), and the guardian butterfly (*Hypolimnas anomala,* Williams et al. 2007). These species are also common in the limestone forest and can inhabit other forest and habitat types as well.

The near-shore marine habitat of the Garapan sub-watershed was extensively mapped in 2016 as part of a lagoon-wide benthic habitat mapping project (Kendall et al. 2017). According to habitat surveys using combinations of field-based observations and remote-sensing techniques, the marine watershed area is dominated by seagrass beds, fringing and patch reefs (Figure 8). The seagrass beds in the watershed area can be divided into three sub-habitats: theThick *Enhalus* zone; the Pleistocene rock – *Gelidiella*/*Halodule* mix; and the *Halodule*/macroalgae mix (Houk and van Woesik 2008). Three seagrass species are found throughout the habitats: *Enhalus acoroides*, *Halodule uninervis* and *Halophila minor*. Macroalgae can also be found in abundance throughout these habitats. Dominant species include *Caulerpa racemosa*, *Acanthophora spicifera*, *Laurencia papilosa*, *Halimeda opuntia* and *Halimeda macroloba*. The seagrass beds provide habitat for a number of fish and invertebrate species. Commonly found fish in the seagrass are *Lethrinus harak* (mafuti), Scaridae (parrotfish) species (palakse), juvenile *Mulloidichthyes flavoliniatus* (tiao), juvenile *Caranx* spp. (I'e') and *Siganus* spp. (sesyon/hiteng/manahak). Macroinvertebrates include sea cucumbers or balate (*Holothuria atra*, *H. hilla*, *Bohadschia argus, Stichopus horrens*, *Synapta maculate*), pillow urchins (*Tripneustes gratilla*), and sea stars (*Linckia laevigata*).). Green sea turtles

(*Chelonia mydas*), listed as a federally threatened species, also use seagrass beds as foraging habitat. Another federally listed sea turtle species, the endangered hawksbill sea turtle (*Eretmochelys imbricate*), has a population in CNMI but has not been observed in the waters around Saipan.

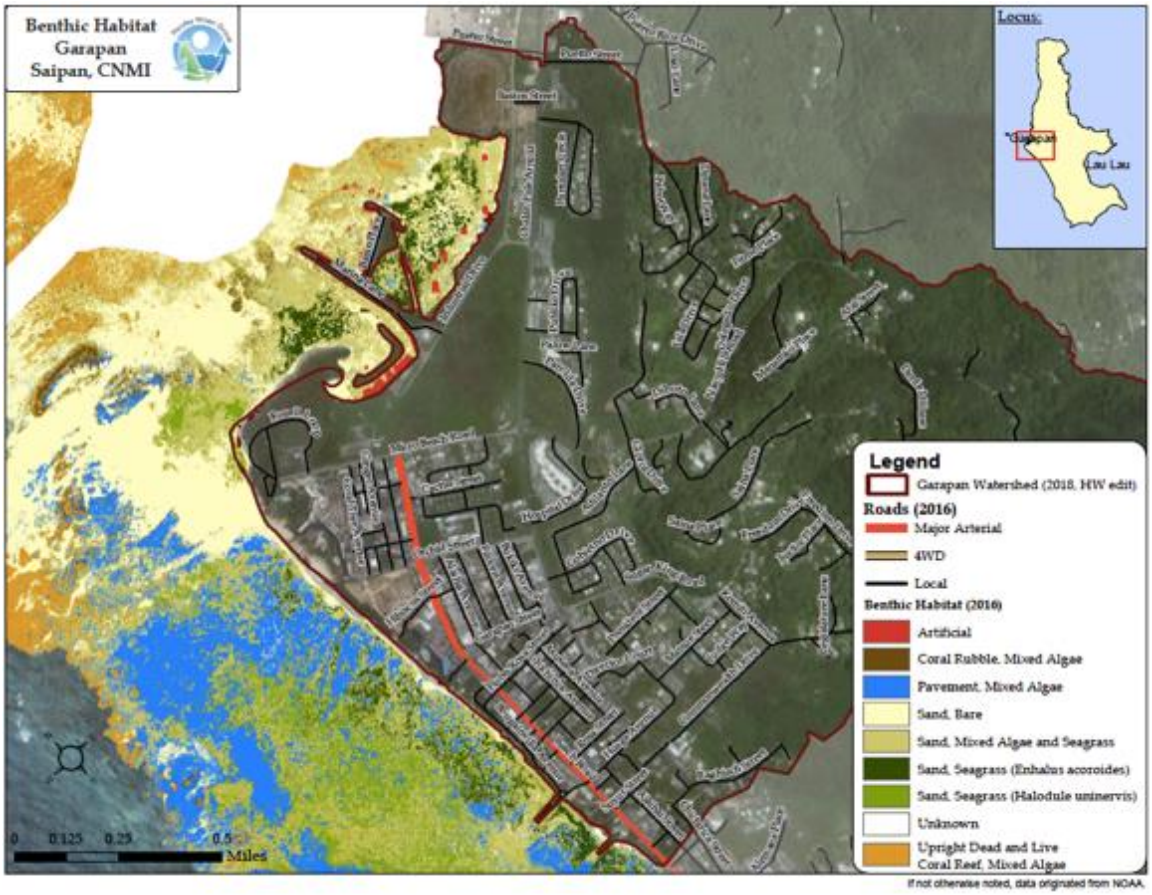


Figure 8: Map of marine benthic habitat off Garapan sub-watershed (Horsley Witten Group 2020)

The lagoon's patch reefs are dominated by massive/encrusting Faviid corals (*Goniastrea* spp., *Favites* spp., *Favia* spp., etc.). A special exception is made for the mid-lagoon staghorn *Acropora* coal species dominated reefs. These reefs are almost exclusively made up of *Acropora aspera* and *A. muricata*. The federally endangered green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) sea turtles use lagoon reefs as foraging and resting habitat. Scalloped hammerhead sharks (*Sphyrna lewini)* are also listed as threatened species under the Endangered Species Act. that occur in the lagoon at different stages of their respective life cycles. Commonly seen fish around these reefs include *Acanthurus lineatus* (hiyok), *Naso lituratus* (hangon), *Chlorurus sordidus* (palakse), *Halichores hortulanus* (chcckerboard wrasse) and an assortment of damselfishes and butterflyfishes. Important invertebrates on the reefs include *Trochus niloticus* (aliling), giant clam *Tridacna* sp. (hima), spider conchs (*Lambis lambis*), and grazing sea urchins (*Echinothrix* sp., *Diadema* sp., and *Echinometra* sp.)

In 2010, NOAA National Marine Fisheries Service (NMFS) proposed the listing of 66 species of corals as threatened or endangered. Twenty-four of those species were identified around Saipan during the 2012 Saipan Reef Resiliency Study, with eleven occurring specifically at sites within or adjacent to the Garapan watershed: *Acanthastrea brevis*, *Acropora aculeus*, *Acropora aspera*, *Acropora paniculata*, *Acropora vaughani*, *Acropora verwey*i, *Millepora tuberose*, *Montipora lobulata*, *Montipora caliculata*, *Pocillopora danae*, and *P. elegans* (Maynard et al., 2012). In 2015, three coral species found in the CNMI were officially listed as threatened under the Endangered Species Act: *Acropora globiceps, Seriatopora aculeata, and Acropora retusa.* Of these three species, only *A. globiceps* is common in nearshore waters; the other two species are rarely encountered in the CNMI.

Cultural and Socio-economic Features

Garapan and the other coastal areas of the West Takpochao watershed have historically been important village and community centers for the local indigenous Chamorro and Carolinian cultures. Numerous "Latte-period" sites have been identified within the study area. Additionally, remnants of Spanish and German occupations are present. The area was also substantially developed during the Japanese period through World War II, and sites of interest include Shinto shrines and the "Sugar King" Railroad as well as bunkers, dock structures, and a lighthouse. These sites are managed along with any structures aged 50 years or more by the Historic Preservation Office.

The villages of the Garapan sub-watershed area currently have the highest population density on island and the highest housing unit densities (US Census Bureau 2010). When the economy and tourism of the Mariana Islands began to build after World War II, Garapan became an important center of commercial development. Today, it is the commercial and population center of the island of Saipan, containing many of the island's large businesses, hotels and tourism industries, including the Imperial Pacific Casino that has been under construction since 2015. The majority of the lowland areas are zoned as commercial (including restaurants, hotels, entertainment, recreational businesses), residential (single-family and apartments) or public (including churches, government services, hospitals, schools, and assembly halls). This sub-watershed also contains Saipan's only hospital, the Commonwealth Healthcare Corporation.

The National Park Service operates the American Memorial Park to commemorate the World War II Battle of Saipan. The Park includes a museum, indoor and outdoor amphitheaters, walking paths as well as memorials and encompasses Smiling Cove Marina. Smiling Cove Marina comprises Inner Cove and Outer Cove Marina, Saipan's only private and commercial marinas (respectively). Outer Cove Marina was severely damaged by Super Typhoon Yutu and was subsequently closed to commercial use in October 2019. Proposals to rebuild this marina could provide opportunities for water quality mitigation measures. Local parks and museums including the Sugar King Railroad Park, Garapan Central Park, and the CNMI Museum also operate in this area. These and other public land and venues (such as the Carolinian Utt or the Fishing Base) provide vibrant community gathering places for events. Annual festivals and events take place in downtown Garapan attracting local families and tourists such as the Taste of the Marianas (May), the Liberation Day Parade (July 4th), and the weekly Night Market (Thursdays). The easily accessible

beaches provide opportunities for fishing, swimming, barbeques and other recreational activities for locals and tourists alike. The lagoon also allows fishing access year-round from the shore, or from boat launches at Fishing Base or Smiling Cove. Furthermore, the presence of fish, seagrass, corals, and calm currents make the lagoon an excellent dive or snorkeling spot for tourism businesses.

The upland areas are zoned as rural, which include residential housing, agricultural activities, and some types of businesses. Population becomes sparser moving up in elevation in the watershed. The very top of the watershed contains the coral/gravel road to the top of Mt. Takpochao, which experiences frequent vehicle traffic from tourists seeking sight-seeing or recreational opportunities. The majority of the upper watershed contains only unpaved roads.

Unfortunately, the high population density and high use of resources throughout the watershed causes various sources of environmental degradation. Land-based sources of pollution that mix into stormwater runoff have damaging effects on lowland areas and the lagoon. Recent shipwrecks and derelict World War II barges, as well as metal and plastic debris from the former Puerto Rico dump, impact marine and terrestrial areas (Starmer 2007). The year-round access by people to west-side beaches has caused local depletion of food fish, and concerns about targeted hunting of some species (such as sea turtles). Additionally, feral species (such as "boonie" or feral dogs and cats) and invasive species (such as vines, rats, mice, non-native fish, and the brown tree snake) that have or could become established and pose a threat to native ecosystems and to human use of natural resources. Freshwater invasive species (e.g. sailfin molleys [*Poecilia latipinna],* tilapia) that have been identified in stormwater drainages in Garapan could pose a threat to fisheries or native ecosystems and species, such as the juvenile milkfish (*Chanos chanos)* and Indo-Pacific tarpon (*Megalops cyprinoides)* that also dwell in these drainages (McKagan et al. 2008).

Climate change may cause additional threats to marine life, beaches and nearshore infrastructure. Because so much of Saipan's infrastructure and population is located close to the water's edge, it may be affected by rising sea and groundwater levels. Ocean acidification due to climate change may affect marine life, and ecosystems which provide coastal protection benefits, while changes in sea and air temperature and weather patterns can impact agriculture and existing livelihoods on Saipan. Recent extreme weather events, specifically Typhoon Soudelor (2015) and Super Typhoon Yutu (2018) have also impacted the Garapan watershed through a significant loss of vegetation and additional shoreline change.

Appendix B: Garapan Watershed Findings and Modeling Memo (Horsley Witten, 2020)

Purpose

The purpose of this memo is to provide you with relevant modeling information for support of the Garapan watershed planning effort.

Background

The Garapan watershed is roughly equivalent to the Central West Takpochao sub-water5shed boundary plus the area around the fishing base in West Takpochao sub-watershed for a total of 1,630 acres or 2.55 sq. miles (Figure 1). It is worth mentioning that this boundary was adjusted by DCRM as part of the 2018 Integrated Waters reporting to exclude the Fishing Base. Without clear mapping of the piped drainage system, it is challenging to make a clear case one way or the other.

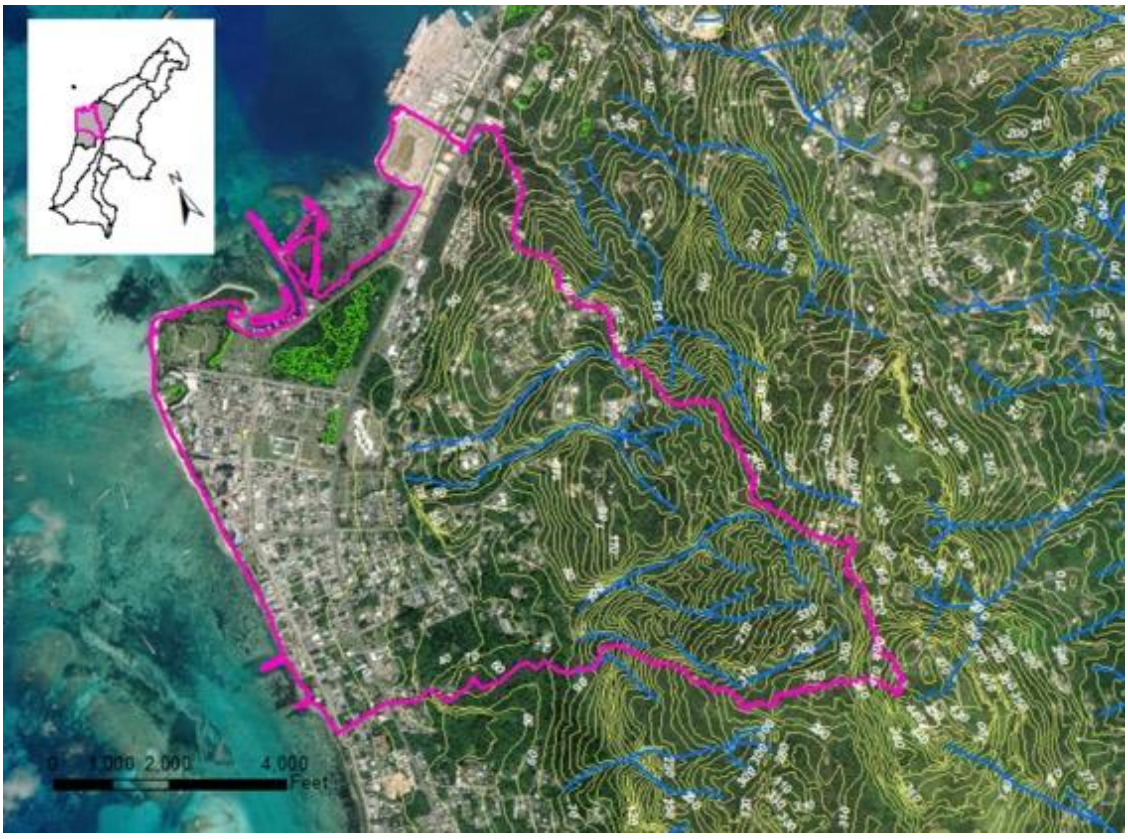


Figure 1. Revised Garapan Watershed Boundary

The Garapan watershed is one of the most urbanized watersheds on Saipan at approximately 30% impervious cover. It encompasses the island's "Tourist District" that includes many hotels; retail, restaurants, and other commercial businesses; the hospital; AMP and Inos Peace Park, as well as extensive multi- and single-family residential development. Most of the lower and mid watershed is serviced by the Sadog Tasi Waste Water Treatment Plant. In the steep, upper portions of the watershed, livestock and

onsite wastewater systems are thought to contribute to watershed pollution. There are only a few stormwater management facilities managing runoff from an estimated 4% of the watershed impervious cover; therefore, it should not be surprising that this watershed is listed as impaired for several parameters in in the 2018 Integrated Waters Report, including nitrates, *Enterococci*, dissolved oxygen (DO), mercury (Hg), and pH (Table 1). In addition, coral and sea grass assemblages ranked poor to fair, and streams have been heavily impacted.

Table 1. 303(d) listing of pollutants of concern from West Takpochao stations (central and south)

Seg ID	Segment Name	Size	Cause Name	Source	Cycle First Listed	Comments
19 B	W. Takpochau (Central)	4.4 miles	pH, Low (490)	Roads, Infrastructure Construction	2018	
				Other Marina/Boating Discharges	2018	
			DO% (205)	Sanitary Sewer Overflows	2008	
				Groundwater loading	2018	New source listed
				Urban Runoff/Storm Sewers	2008	
			Hg in fish (467)	Impervious surface/ Lot Runoff	2010	
19STRB	W. Takpochau (Central) Stream	3.2 miles	Hg in fish (467)	Impervious surface/ Lot Runoff	2010	
			enterococci (215)	Livestock (Grazing or Feeding)	2018	New source listed
				Urban Runoff/Storm sewers	2018	New source listed
				Erosion/Sedimentation	2018	New source listed
19 C	W. Takpochau (South)	1.9 miles	DO% (205)	Sanitary Sewer Overflows	2008	
				on-site treatment systems	2008	
				Urban Runoff/Storm Sewers	2008	
			pH, Low (490)	Roads, Infrastructure Construction	2015	New source listed
				Other Marina/Boating Discharges	2015	New source listed
			nitrates (302)	Urban Runoff/Storm Sewers	2018	New source listed
				on-site treatment systems	2018	New source listed
				Sanitary Sewer Overflows	2018	New source listed

One element of EPA's watershed planning criteria is to estimate watershed loads and load reduction based on the implementation of priority restoration projects. We used a simple spreadsheet loading model — the Watershed Treatment Model (WTM) — to establish current pollutant loads and then to compare how implementation of watershed management actions could potentially reduce those loads. The water quality parameters included in the model are total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS), and fecal coliform bacteria (FC), as well as runoff volume.

The model inputs are based on existing mapping data and our general knowledge of watershed conditions, existing management measures, and potential opportunities for restoration. It should be noted that due to limitations on the scope of this effort, we did not conduct any field assessments to verify pollutant sources, calibrate loads against known water quality data, or confirm restoration potential. We also did not model various scenarios to determine maximum load reduction or the most cost-effective restoration approaches, nor did we include new future land development that might add to existing loads.

Model Results

We ran the WTM one time with one set of future management activities that we believed were feasible. Resulting load reductions of **12% for TN, 13% for TP, 8% for TSS, and almost 30% for bacteria** were predicted by the model. These results were based on implementation of the following management techniques:

1. Illicit discharge detection through investigations within 30% of the service area and removal/elimination of all discovered connections.
2. Repair and abatement of half of the sanitary sewer overflows (SSO) (e.g. pump stations and clogged or broken lines) for (2.5 SSO's assumed within the 18-mile sewer network).
3. New stormwater retrofits (e.g. wetlands, bioretention, cisterns, and green roofs) managing 80% of the water quality volume (first 1.5 inches of rain) for 50 acres of impervious cover in the watershed.
4. Increased effectiveness of the erosion and sediment control inspection program that visits sites weekly and has stringent enforcement (program rating of 75% efficiency).
5. Addition of another marina pump-out station and increased usage.
6. Semi-annual catch basin cleaning (for a combined drainage area of 50 acres).
7. Redevelopment improvements across 30 acres that results in a 10% average reduction in impervious cover and turf.
8. Stabilizing 0.3 miles of eroding stream channel.

Table 2 summarizes existing loads from various watershed sources. Urban stormwater runoff Table 3 quantifies the loads removed by each of the future management practices listed above. Quantification of the numeric annual load, while useful, is highly dependent on specific data inputs, such as runoff concentrations, number of pigs, volume of sewer overflows, etc. We don't recommend putting much stock in these numbers until more refined input data can be obtained and the model compared with findings from the water quality monitoring program. For the purposes of the Garapan watershed update, it is the relative change in value between existing and future conditions, all data input assumptions being equal, that is more relevant. Table 4 summarizes the percent reduction in existing annual load from watershed sources after implementation of the future management actions.

Table 2. Existing Annual Loads and Runoff Volume to Surface Waters in Garapan Watershed

Source	Existing Loads to Surface Waters				
	TN lb/year	TP lb/year	TSS lb/year	FC billion/year	Runoff Volume (acre feet/year)
Urban Land	7,954	1,511	3,093,935	600,257	2,719
Active Construction	29	6	19,431	-	12
SSOs	113	19	754	85,588	-
Channel Erosion	-	-	1,113,020	-	-
Forest	1,486	206	121,362	9,907	195
Rural Land	8	2	218	58	0
Livestock	968	150	-	32,264	-
Illicit Connections	3,405	664	23,333	2,429,910	-
Marinas	54	9	360	40,824	-
Septic Systems	282	47	1,880	785	-
Open Water	6	0	77	-	-
Total Load	**14,306**	**2,615**	**4,374,369**	**3,199,593**	**2,927**

Table 3. Load Reductions Achieved per Future Management Practice

Management Practices*	Annual Load Removed by Practice

	TN (lbs/year)	TP (lbs/year)	TSS (lbs/year)	FC (billion/year)	Runoff Reduction (acre ft/yr)
Lawn Care Education Surface	0	0	0	0	--
Pet Waste Education	0	0	0	0	--
Erosion and Sediment Control	18	4	12,002	0	--
Street Sweeping	0	0	0	0	--
Riparian Buffers	0	0	0	0	0
Catch Basin Cleanouts	46	9	7,687	0	--
Marina Pumpouts	54	9	360	40,824	--
Urban Downsizing	0	0	0	0	0
Redevelopment with Improvements	79	14	22,557	5,719	25
Stormwater Retrofits	309	87	249,965	46,330	31
Stormwater Retrofits-discharge to Ground water	-8	0	0	0	--
Illicit Connection Removal	1,022	199	7,000	728,973	--
SSO Repair/ Abatement	57	9	377	42,794	--
Septic System - Surface	6	1	38	16	--
Septic System - GW	-7	0	0	0	--
Channel Protection	0	0	47,008	0	--
Total Net Reduction	**1,575**	**332**	**346,993**	**864,656**	**56**

*shaded practices were not included in the model runs at this time.

Table 4. % Reductions Achieved with Future Management Practices

Source	Percent Load Removed (%)				
	TN	TP	TSS	FC	Runoff Volume
Urban Land	6%	8%	9%	12%	2%
Active Construction	62%	62%	62%	--	0%
SSOs	90%	90%	90%	90%	--
Channel Erosion	--	--	4%	--	--
Forest	0%	0%	0%	0%	0%
Rural Land	0%	0%	0%	0%	0%
Livestock	0%	0%	--	0%	--
Illicit Connections	30%	30%	30%	30%	--
Marinas	100%	100%	100%	100%	--
Septic Systems	2%	2%	2%	2%	--
Open Water	0%	0%	0%	--	--
Total Load Reduction	**12%**	**13%**	**8%**	**29%**	**2%**

In 2017, a TMDL for bacteria (*Enterococci*) established a 40–67% reduction target range for the nonpoint source bacteria load in the Central West Takpochao watershed during the wet season based on the geometric mean. Ignoring for a moment the differences between *E. coli* and *Fecal Coliform*, the 30% bacteria load reduction predicted in our model run is encouraging and an optimistic indication that the TMDL target may be practically achievable.

Additional load reductions could be achieved in the model by increasing the magnitude or effectiveness of the management measures listed above, or by incorporating additional measures in the model that are currently ignored, such as hooking existing septic systems up to the sewer network, improving livestock

management, managing unpaved roads, or street sweeping among others. Additional modeling effort was beyond the scope of this watershed planning update; however, refinement of data input and comparing various implementation scenarios could be useful as watershed management priorities are better defined.

The rest of this memo summarizes more information on the data inputs and future management assumptions, and next steps.

WTM Inputs and Assumptions

We used a simple pollutant load model to identify the relative contributions of various sources of watershed pollutants. The model was also used to predict the type and extent of watershed restoration effort that could provide the most effective improvement in water quality. Specifically, we could ask, is it feasible to meet bacteria load reduction targets of the TMDL?

The Watershed Treatment Model (WTM) is a public-domain, spreadsheet model used to estimate annual pollutant loads for sediment, nutrients (total nitrogen and total phosphorus), and bacteria, as well as annual stormwater runoff volumes. The model relies principally on the following primary inputs: annual rainfall; drainage area sizing; land use and corresponding standard pollutant loading and runoff coefficients; and soil data, including type and depth to groundwater. In addition, the WTM allows the user to evaluate a host of other secondary sources of pollutants, such as onsite wastewater systems, channel erosion, and livestock, if known.

The WTM also has the capability to evaluate the effects of structural (e.g. stormwater practices, sewer improvements) and non-structural management practices (e.g. efficiency of erosion and sediment control enforcement programs), which makes it a useful watershed planning tool for predicting current and future scenarios. Depending on the quality of input data, the WTM can be used to quickly generate relative comparisons across watersheds, or it can be used to estimate potential loads that can be verified by water quality monitoring data. The model is a GIS-based tool, utilizing available data from sources such as DCRM, CUC, NOAA, NRCS, and others. Field observations on pollutant sources, stream characteristics, and other watershed observations are used to adjust model input variables. Unless otherwise noted, the WTM analysis uses default values derived from US national averages for the primary and secondary sources.

While the WTM can be used to generate qualitative load estimates, it is better used as a planning level tool to compare contributions between different watersheds and to evaluate relative contributions from various sources. As part of this effort, no model calibration or validation was conducted.

Table 5 provides a summary of the significant data input assumptions that were used to generate existing loads. These can be (and should be) adjusted as more information is collected if numerical loads are considered important. Input data is grouped into primary and secondary sources and existing management measures.

Table 5. Input Data Used to Estimate Existing Loads

Input Parameter	Value	Description/Assumptions
PRIMARY SOURCES		
Avg annual rainfall	75 inches	From NOAA Atlas 14.
Watershed Area	1629 acres	Central West Tokpochau drainage basin; modified by consensus during watershed meetings in January 2020 to include Fishing Base
Land Use	See Table 6	DCRM/NOAA provided the most current landuse GIS layer. The existing land use maps underestimated commercial properties and did not

Input Parameter	Value	Description/Assumptions
		effectively distinguish between residential uses. It also underestimated residential development in the upper watershed and overestimated Open Space. HW added additional residential land by inspecting aerial imagery and the USFS Vegetation Classification selecting all parcels with visible buildings or which contained areas classified as urban land. HW reclassified Open Space area using the USFS Vegetation Classification to find more accurate estimates for agricultural land, beach/recreation area and forested area. HW did not adjust for commercial areas or multifamily residential. The land use data contains a transportation class, whose subclasses (primary road, access road, etc.) could clearly be defined as either paved or unpaved road. Unpaved residential driveways were not accounted for at this time. Active construction sites were given a token 5 acres, that was subtracted from Open area category. The land use needs to be corrected before additional modeling occurs.
Impervious Cover	446 acres (~30% of watershed)	Based on the IC coefficients for each land use category. There is a building footprint layer, but no IC layer available. The CCAP data for 2016 may be useful for deriving IC. HW used mostly cloud free 2019 LandSat satellite imagery from USGS to calculate the Normalized Difference Vegetation Index to estimate non-vegetated land cover. The resulting estimate of impervious cover is only an estimate, due to the low resolution (30 meters) and the cloud cover. An analysis of average impervious cover by land use type was not within the scope of this effort. Impervious cover was used to create estimates for average impervious cover for each residential category to refine the WTM.
Pollutant Event Mean Concentrations (EMCs)	See Table 6	EMCs and loading rates from various land uses are typically based on values from the National Stormwater Quality Database (NSQD), which is a summary of stormwater data from over 200 jurisdictions across the US (Pitt et. al., 2003). Land uses with impervious cover are assigned an EMC. Land uses without impervious cover use an assigned loading rate. We have adjusted the default values for sediment using data from the USVI/PR, but they could (and should) be adjusted for CNMI where data is available.
Soils (% of watershed)	58% HSG D soils; 20% HSG C soils; 10% HSG B soils; <9% HSG A	NRCS. The HSGs are used to estimate surface conditions for infiltration potential, with A soils generally having a high permeability rate (e.g., sandy soils) and D soils generally having a low permeability rate (e.g., clay soils).
Depth to Groundwater (% of watershed)	1% <3 ft; 10% 3–5f; 89% >5 ft	NRCS. Shallow depths to groundwater (e.g., <24”) can signify a higher potential for nutrients to enter groundwater, while deeper depths (e.g., > 48”) can provide greater potential for pollutant removal. For the area, nearly all had depths > 5 feet, and only about 1% at depths of < 3 feet.
Stream length	5.9 miles	DCRM/NOAA provided hydrography shapefile. Total length does not include piped sections.
SECONDARY SOURCES		
Sanitary Sewer Overflows (SSO)	17.97miles of sanitary sewer	Most of the watershed is sewered (CUC’s Sadog Tasi sewershed boundaries). Length of sewer lines are from CUC dataset, and include gravitational sewer line, pressurized sewer line and lateral lines. We assume 2.5 sewer overflows per mile (this could be low).

Input Parameter	Value	Description/Assumptions
Onsite Disposal Systems	6% of buildings unsewered; 100% conventional systems; 30% failure rate	77 of 1289 buildings unsewered (from DCRM buildings layer). We assumed all OSDS are conventional design (i.e., not enhanced for nutrient removal). Model default values are used for concentrations and removal efficiencies for OSDS.
Illicit discharges of non-stormwater runoff into the storm drain network or streams	10% of residents and businesses; 70% of commercial illicit discharges are wash water (not sewage)	Not based on any CUC data, just best professional guess. Model default values used for concentrations in sewage and washwater. We assumed 1/3 of the buildings in the watershed were commercial (~425).
Livestock	200 pigs and 400 chickens	Not based on any data. This is probably low by an order of magnitude. It doesn't account for dogs…
Stream Channel Erosion	Low. 25% of total sediment load	Not based on any data. Selected default method 1 in the model that back calculates a % for channel erosion based on total sediment load.
Marinas	75 berths; 365 days year; 50% occupancy	Not based on any data. Used default model values for pollutant load contributions.
EXISTING MANAGEMENT PRACTICES		
Structural stormwater BMPs	See Table 7. We assumed a total 80 impervious acres were being partially managed.	We included several BMPs we were aware of in the model that currently provide some level of stormwater management. There are likely more that BECQ and DPW are aware of. We used default pollutant removal rates for each type of practice, assumed 50% capture rate for target volume (90th percentile storm of 1.5 inch). We estimated the area managed for each in google earth. We assumed maintenance of these practices was low.
Erosion and Sediment Control	50% program efficiency	CNMI has a relatively strong ESC inspection program, although enforcement could be improved. The program efficiency factors could probably be higher.
Catch basin cleaning	Semi-annual cleaning for 10 acre contributing drainage area	We are aware of several catch basin and open channel cleaning activities in downtown Garapan. We made some basic assumptions. This could be refined based on DCRM, DPW, and CUC guidance. There is default removal efficiencies of 8% for nutrient and 13% for TSS assigned to this level of cleaning.
Marina pump outs	1 pump out, 75 berths, and 50% usage	This is not based on any data, rather memory of smiling cove and outer cove marinas. There is better information out there.

Table 6. Assumed Land Use Acres, % Coverage, and Runoff Concentrations

LU Category	Area (Acres)	% Cover		Event Mean Concentrations			
		Impervious	Turf	TN* (mg/l)	TP (mg/l)	TSS (mg/l)	FC (MPN/100 ml)
LDR > 1 ac	100.2	20%	16%	1	0.2	102	20300
MDR .25–1 ac	57.8	40%	12%	1	0.2	102	20300
HDR <.25 ac	211.8	65%	7%	1	0.2	102	20300
Municipal/Institutional	68.9	72%	6%	1.2	0.2	49	20000
Recreational/Beach	126.6	10%	72%	1.2	0.2	49	20000
Commercial	25.8	72%	6%	1.2	0.39	56	20000

Roadway -Paved	98.7	100%	0%	1.2	0.16	36	13700
Roadway - Unpaved	73.5	90%	2%	1.2	0.24	2895	13700
Active Construction	5			1	0.2	680	0
Industrial	35.9	53%	9%	2.2	0.22	81	20000
				Annual Loading Rate			
				(lb/yr)	(lb/yr)	(lb/yr)	(# billion)
Forest/Park or Open	825.6	0%	0%	1.8	0.25	147	12
Ag	1.5	0%	0%	5.3	1.16	147	39
Open Water	0.5	--	--	12.8	0.5	155	--
Total Acres	**1632**	**446**	**139**	--			

*TN values used here are considerably lower than standard concentrations for urban runoff which are generally 2 mg/L or higher for mainland US land uses. Lower values were based on assumption of lack of fertilizer usage in CNMI.

Table 7. Existing BMPs and Pollutant Removal Rates

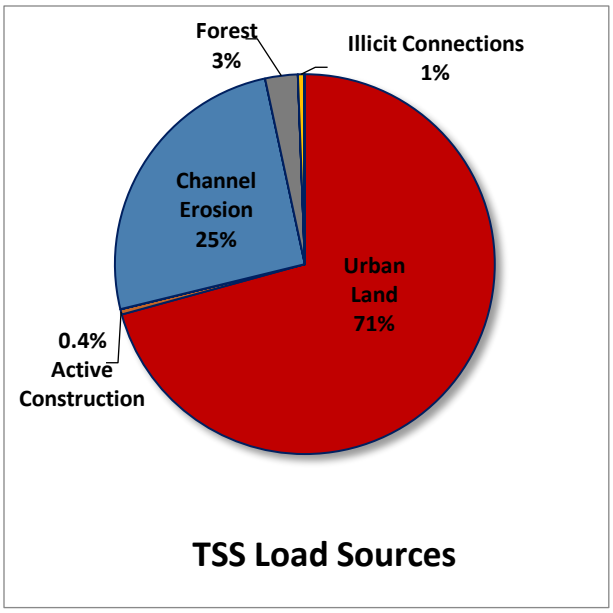
BMP	Drainage Area acres	Impervious acres	Pollutant Removal Efficiencies (% Removal)*			
			TN	TP	TSS	FC
NPS wetland	38	25	25%	50%	75%	80%
hospital grassed swale	50	15	30%	25%	60%	0%
hospital dry extended detention basin	5	5	10%	15%	55%	0%
public housing wetland	10	5	25%	50%	75%	80%
Fishing pier bioretention	1	1	65%	55%	85%	90%
museum rain garden	0.2	0.2	65%	55%	85%	90%
Infiltration (various)	5	5	55%	65%	95%	85%
hotel green roof above Bubba Gump	1	1	45%	45%	80%	0%
rain tanks and cisterns (various)	20	20	40%	40%	40%	0%
Total Acres	**130**	**77**				

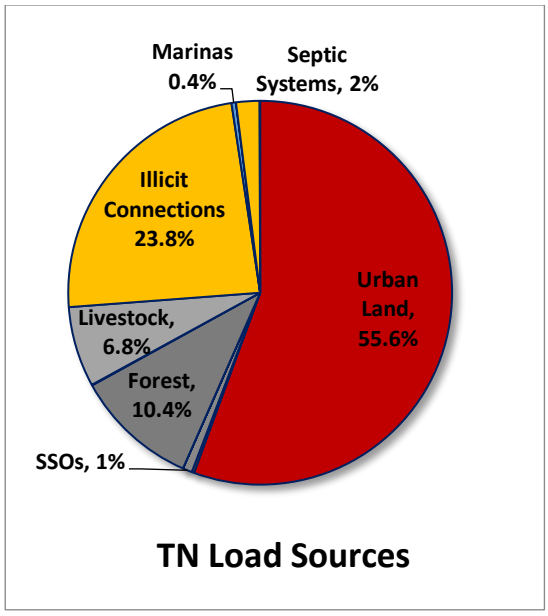
*removal rates should be updated based on the CNMI stormwater management manual

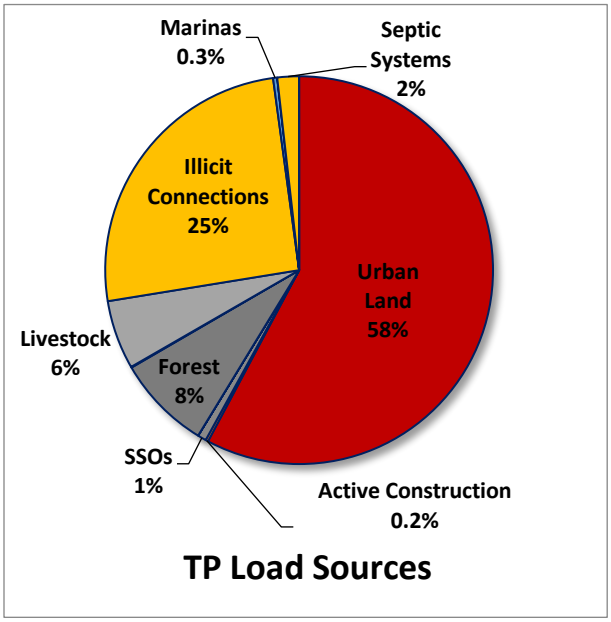
Existing Loads

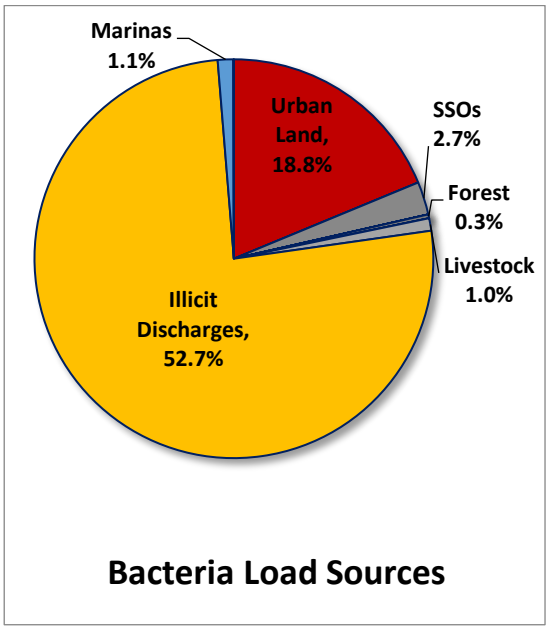
Table 2 summarized annual pollutant loads by watershed sources. Figure 2 below graphically illustrates which of the watershed sources are the biggest contributors to each of the pollutants of concern. For nutrients and TSS, stormwater runoff from urban land uses is the largest source, and therefore, stormwater retrofits and activities that prevent the generation of stormwater and the potential for it to carry contaminants can have a big influence on load reduction. For bacteria, the largest contributor are illicit discharges of wastewater to the drainage system. Efforts to remove illicit connections and reduce bacterial contamination in stormwater runoff will be the most useful.

Figure 2. Allocation of loads by watershed source









Given what we know about the watershed, it is surprising that the model does not show a larger contribution from sewer overflows. Perhaps additional input refinement on the number of SSOs estimated in the watershed and the volumes and concentrations associated with those overflows would change this allocation. Also, the number of active septic systems is probably underestimated as we assume all structures within the watershed boundary are hooked up to the sewer. We know that is not the case, but CUC would have better estimates. Livestock, dogs, and cats are also likely to be larger contributors that are underrepresented in the model. It is not clear if dogs and cats are included in primary land use loads (in which case they should be higher EMCs than currently used) or if they could be treated as livestock in the model (in which case average concentrations would need to be added).

Future Management Measures

What can we do in the Garapan watershed to reduce existing pollutant loads? The WTM includes several structural and non-structural measures that can be used to estimate the benefit of management actions. See Tables 3 and 4 for a list of the practices that were applied in the model run that contributed to the watershed source load reductions of 12% for TN, 13% for TP, 8% for TSS, and almost 30% for bacteria. These results were based on the potential implementation of several types of restoration practices. Table 8 below describes the measures that are in the WTM that can be modeled and shows how they were incorporated in (or excluded from) existing and future model runs. The last column in the table offers suggestions on what could be done to increase performance of these practices.

Table 8. Improving Future Management Options

Input Parameter	Modeled as Existing Management	Modeled as Future Practice	What could do to make it even more effective
Remove Illicit Connection	Not available option	• Illicit discharge detection through investigations within 30% of the service area • removal/elimination of 100% of discovered connections.	• Increase coverage of investigations to 50% or more of the service area • IDDE program may tie to updated MS4 permit
SSO repair and abatement	Not available option	• Repair and abatement of half of the sanitary sewer overflows (SSO) (e.g., pump stations and clogged or broken lines) • Assumes 2.5 SSO within the 18 mile sewer network.	• Assume 100% repair and abatement • Adjust the estimated # of SSOs (this has to be low)
Structural stormwater BMPs	See Table 7. • 80 impervious acres partially managed. • default pollutant removal rates for each practice, • assumed 50% capture rate for target volume (1.5 inch) • low maintenance • would be better if had more data on actual practices out there • BMP inspections and maintenance may tie into new MS4 permit program	• 50 additional acres of impervious cover managed with new stormwater retrofits (see Table 9) • 80% of the water quality volume (first 1.5 inches of rain) • Maintenance not enforced	• Increase total watershed area managed with new retrofits. Need to go out in the field and look for these. • Retrofit existing facilities to higher treatment standards (higher removal efficiencies and fraction of rainfall managed) • much better maintenance
Erosion and Sediment Control	50% program efficiency	75% program efficiency through weekly visits sites weekly and better enforcement	• Increase to 90% program efficiency • Would have better results if a better estimate of active construction acres were made
Catch basin cleaning	• Semi-annual cleaning for 10 acre contributing drainage area • removal efficiencies of 8% for nutrient and 13% for TSS	Semi-annual catch basin cleaning (for a combined drainage area of 50 acres).	• Increase frequency, which leads to increased removal efficiencies of 15% for nutrients and 25% for TSS (or more). • This may tie into requirements of new MS4 permit • Development and adherence to a stormwater management plan (DPW)

Input Parameter	Modeled as Existing Management	Modeled as Future Practice	What could do to make it even more effective
Marina pump outs	1 pump out, 75 berths, and 50% usage	• Add another pump station • up the usage to 75%	Make adjustments based on the actual # of berths and vessels that use pump outs
Channel restoration	Not available option	Stabilizing 0.3 miles of eroding stream channel.	• Increase miles of stream stabilization • Data could be improved through Larry's stream walk findings
Redevelopment improvement	Not available option	• Redevelopment improvements across 30 acres that results in a 10% average reduction in impervious cover and in turf.	• Increase acres of improvement • This could be more reflective of Garapan revitalization efforts • Increase % IC and turf reduction to reflect less effective IC and more native landscaping/canopy cover
Septic System education, repair, upgrade, or retirement	Not available option	• Septic system education program that reaches 8% of population and is 25% effective in changing behaviors • Septic repairs program with 10% of systems inspected and 100% willing to repair • No upgrades or connections to WWTP	• Expand education program • Increase % of systems inspected and repaired, upgraded, or retired (by connecting to WWTP)
Urban downsizing	Not available option	Not included	• Convert unused impervious cover to open space/pervious cover • Estimate acres converted to forest/open from residential, commercial, or other land use category • This could be important as related to Garapan revitalization and SCORP implementation
Riparian Buffers	Not included	Not included	• Include length and width of enhanced vegetated riparian and shoreline buffers • Take credit for enforced buffer protection standards and maintenance
Street sweeping	Not included	Not included	• Provide frequency and acreage of street and parking lot sweeping • Upgrade selected sweeper technology type
Lawn and turf care	Not included	Not included	• lawn care education program • Conversion of lawn to native vegetation • Reduced fertilizer • Soil amendments
Pet waste management	Not included	Not included	Account for proper disposal of pet waste

Table 9. Future stormwater management practices modeled

Stormwater BMP	Drainage Area Managed (Acres)	5 Impervious Cover
Additional Rain tanks and Cisterns installed	10.0	100%
Constructed Wetland at Navy Hill	134.0	20%
Bioretention (various, TBD)	10.0	90%
Green Roof (TBD)	10.0	100%
Total	**164.0**	**34%**

Attached to this memo are summary field sheets documenting a few of the potential retrofit opportunities we saw in the Garapan watershed while we were on island for the pre-COVID week of workshops and watershed assessments in Achugao and Laolao. We recommend conducting a full watershed field assessment to map (or verify) drainage networks and to identify restoration opportunities.

Next Steps

It is important to keep in mind that a model is only as good as the data that goes into it. The purpose of this exercise was to identify the load reduction potential of some identified restoration projects. The WTM offers a lot of flexibility to accommodate better data as it becomes available, but also provides a comprehensive framework that is perfect for big picture watershed planning purposes. The next steps are likely to be:

1. Consider how these model results fit into the priority strategies identified during the watershed workshops and if specific restoration actions in the watershed plan update are adequately reflected here. If there are a few projects that need to be put into the model so their benefits can be quantified, let us know and we can insert them.
2. Review water quality data for the watershed and broadly evaluate how representative you think the model results are at this stage.
3. Refine input variables where assumptions are wrong and data is readily available to correct input, such as primary land use acres, and secondary sources that other agencies have better insight on (e.g. # of SSOs, # of septic systems, boat contributions, concentrations in effluent, livestock estimates).
4. Research and review completed field assessments to better evaluate stream erosion and estimate island appropriate EMCs for runoff.
5. Consider conducting a future buildout analysis (maybe not as critical for Garapan as others).
6. Compare Garapan model results with Achugao and Laolao Bay watersheds.
7. The model estimates load to groundwater from infiltration practices and septic systems but does not include those loads in the total loads to the receiving waters. If more information is known on groundwater discharge for nitrogen into the lagoon, for example, this could be added to the model results.

Attachment A

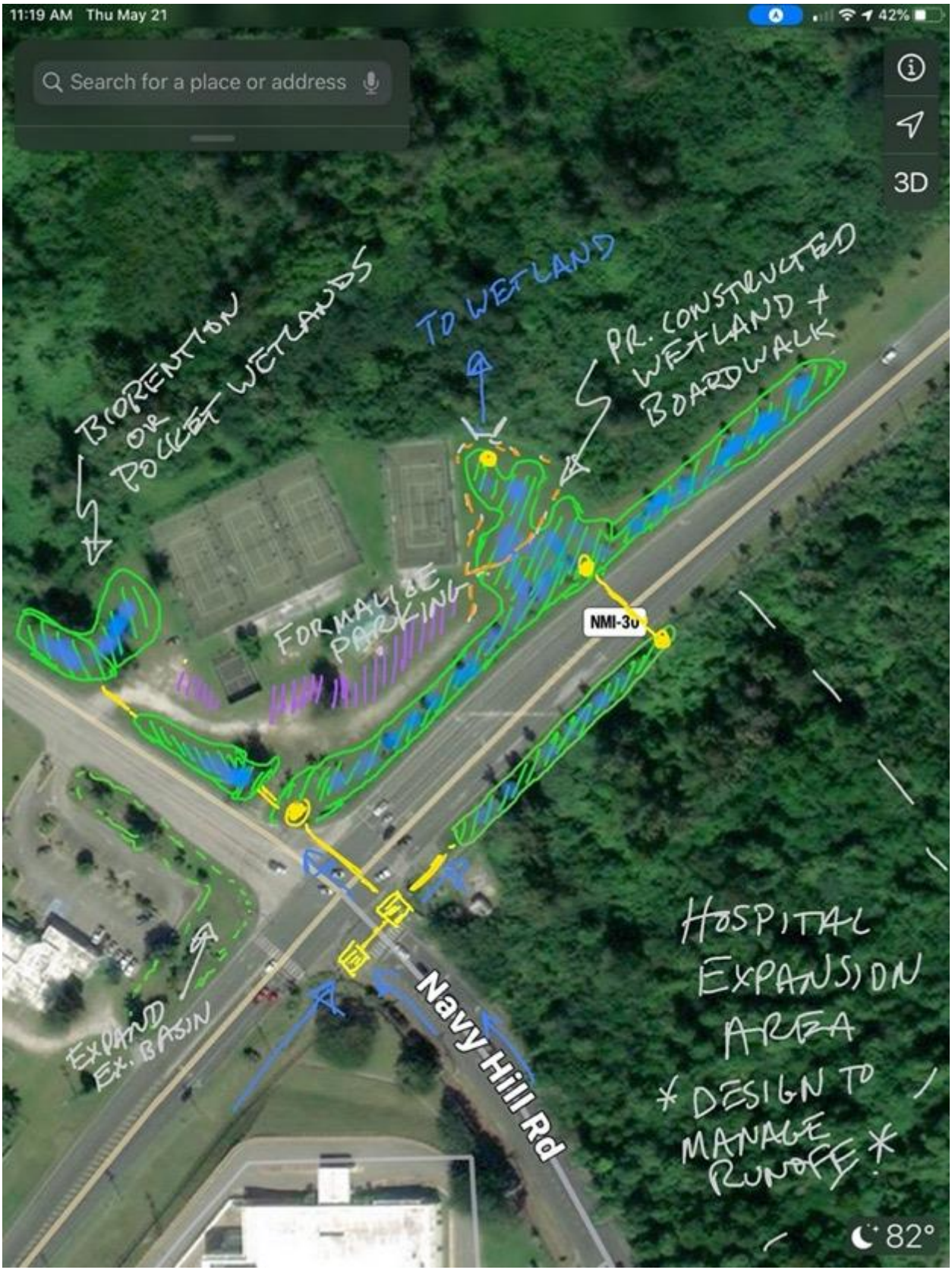
Field Forms

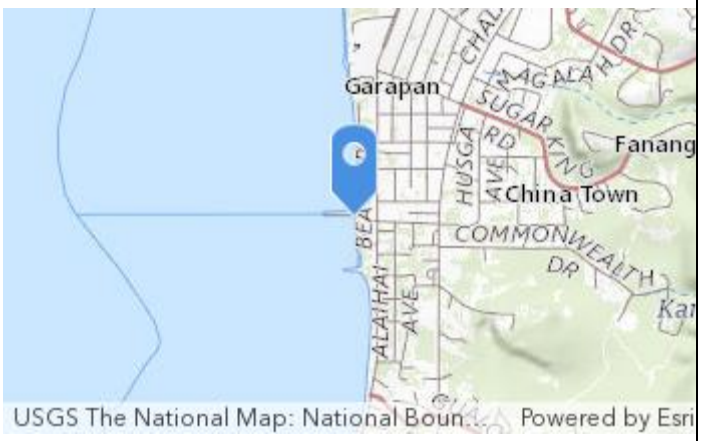
Saipan Watershed Assessment 2020

Site ID: GA-07- Navy Hill Constructed	**Watershed:** Garapan
Crew: AK and BK	**Date/Time:** 01/23/2020 10:26 PM
Project Type: • Stormwater Retrofit, • Stream/Wetland Restoration, • Watershed Education/Signage	
Enforcement Needed: No	
Severity Rating: NA	
Implementation Priority: Love it! (High)	
Descriptions of Existing Conditions: Unmanaged runoff down Navy Hill Rd is collected and discharged directly to the wetland area behind tennis courts and NPS. Currently there is open grassed area between the courts and along the road right-of-way that could be used for stormwater treatment. The open parcel on the corner across from hospital is slated for hospital expansion use, but was recently made into a parking lot for emergency response during the COVID19 pandemic. The exact location of the culvert under Middle Road or the pipe outfalls into the wetland are unknown. Providing treatment of runoff is important to maintaining the ecological functions of the wetland.	
Description of Proposed Opportunity: Install additional inlets and piping on road as needed to convey flows into a constructed wetland complex designed for recreational use and aesthetic benefits in addition to habitat, water quality, and flood control.	
Challenges/Constraints: Land ownership, open space may be used for parking or other events.	

Additional Notes:
See photos and sketch. We estimated a DA of over 134 acres, and assumed 20% impervious cover.


10:55 AM Thu May 21
49%
0.20458 sq miles
Done
Puerto Rico
Industrial Drive
American Memorial Park
Hyatt Regency
Fiesta Resort
Chalan Pale Arnold
As Palacios
Navy Hill
Cactus Street
Hospital Drive
Adilanto Lane
Gloria Drive
Delegado Drive
Navy Hill Road
Magas
Garapan
Fananganan
Saina Place
Maturana Hill
China Town
Sugar King Road
Husga Avenue
Sugar King Park
Commonwealth Drive
Alaihai Street
Gualo Rai Road
As Falipe
16.4 ft


11:19 AM Thu May 21
42%
Search for a place or address
3D
BIORENTION OR POCKET WETLANDS
TO WETLAND
PR. CONSTRUCTED WETLAND + BOARDWALK
FORMALIZE PARKING
NMI-30
EXPAND EX. BASIN
Navy Hill Rd
HOSPITAL EXPANSION AREA
* DESIGN TO MANAGE RUNOFF *
82°

Site ID: GA-06	**Watershed:** Garapan
Crew: AK and BK	**Date/Time:** 01/23/2020 9:43 PM
Project Type: • Drainage Infrastructure/Maintenance/and Repair • Shoreline Stabilization • Watershed Education/Signage	
Enforcement Needed: No	
Severity Rating: 3	
Implementation Priority: It's OK (Med)	

Descriptions of Existing Conditions:
Erosion behind outfall headwall. Could also consider living shoreline along retaining wall and bank stabilization with vegetation and defined public access. This is a high use area. There is a retrofit here! A bioretention facility was install recently to collect runoff from the surrounding parking lot.

Description of Proposed Opportunity:
Need to formalize spillway of bioretention and stabilize where it (and parking lot runoff) discharges at the outfall pipe. Maybe want to consider adding a grass swale along the edge of the parking lot that can take flows into the practice intlet (right now there is puddling). Stable inlets and outlets are very important to the success of the practice. Could also consider planting the bioretention to improve aesthetics. This might be a great location to demo a living shoreline along the retaining wall.

Challenges/Constraints:
Shoreline usage, do boats pull up right here? How would improvements fit within usage context and what behaviors would need to change for success?

Additional Notes:
Highly visible location, great opportunity for community engagement on a variety of watershed practices.


11:15 AM Thu May 21
Search for a place or address
Bougainvi
usga Ave
Husga Ave
Beach Rd
3D
NMI-33
BACKFILL BEHIND OUTFALL & SEAWALL
ADD BERM TO PREVENT EROSION BEHIND
ADD DIRECT FLOW TO
INSTALL REEF BALLS OR PLANTERS AT BASE OF SEAWALL AS LIVING SHORELINE
DEMO
INSTALL VEG. SWALE TO CONVEY FLOWS TO EXISTING RAINGARDEN
Beach Rd
82°

Site ID: GA-03 and GA-01	**Watershed:** Garapan
Crew: BK and ACK	**Date/Time:** 01/23/2020 9:25 PM
Project Type: • Stormwater Retrofit • Drainage Infrastr., Maint. and Repair, • Unpaved Road Stabilization	
Enforcement Needed: No	
Severity Rating: 2–3	
Implementation Priority: It's OK (Med)	

Descriptions of Existing Conditions:
Road runoff drains down road along sugar king hill park to middle road (it's a torrent during rain events). The park is slightly raised above the road in many areas, but there is a wide grass ROW and potential areas where some runoff could possibly be stored. Upper road is unpaved (although sewered) and extends way up to the headwaters. The area around the park is residential, with some commercial spaces (like Golds Gym) and a school (with a new parking lot and infiltration system (??).

Description of Proposed Opportunity:
Edge of road dry swale with broad dips; work on an unpaved road stabilization plan to reduce erosion and maintenance needs of unpaved section; consider providing small, distributed practices throughout the area on private property to break up flows and provide cumulative attenuation and treatment.

Challenges/Constraints:
Directing runoff into the swale. Broad dip day in Toulon to direct water into the swale. Sewer and other utilities I the ROW?. Soils; water table, slopes

Additional Notes: None

Is there room in the ROW for grassed swale or other WQ practice? Can we attenuate any flows in the adjacent park?


Take a closer look at this unpaved road network (it has sewer). What kinds of practices for stabilization can we recommned? At this spot, could we divert flows into a sediment trap?


Look for opportunities throughout the neighborhood to disconnect, store, and treat that might collectively reduce runoff volume onto Middle Road.


Search for a place or address
3D
Chalan Pale Arnold
Husga Ave
Judge Dr
Judge Way
Sugar King Park
Commonwealth Dr
Residential driveway and rooftop disconnection
82°


11:31 AM Thu May 21
40%
0.6893 sq miles
Done
American Memorial Park
Hyatt Regency
Fiesta Resort & Spa
Hafa Adai Beach Hotel
Garapan
Chalan-Pale-Arnold
As Palacios
Navy Hill
Navy Hill Road
Delegado Drive
Hospital Drive
Adilanto Lane
Fananganan
Maturana Hill
China Town
Sugar King Road
Commonwealth Drive
Chalan Galaide
As Rabagau
Marinu Place
Gualo Rai
As Falipe
I Liyang
Middle Road
Beach Road
Orchid Street
Cactus Street
Husga Avenue
Espana Street
Rai Drive
Earhart Drive
Waserak Road
Captive Way
452 m
16.4 ft

Appendix C: Implementation Strategy and Schedule

Implementation Strategy

This document is an interagency plan for addressing the key threats to watershed benefits described in the introduction. The plan was developed through input from the various agencies who have authority to manage different aspects within the watershed as well as non-governmental organization who support a variety of activities within the watershed. Activities that were included were chosen based on their importance in addressing root causes of threats to the watershed in addition to emphasis on project that align with existing agency/organizational priorities. The plan activities will be coordinated through an interagency watershed working group, led by DCRM. However, many of the activities are dependent on the agencies themselves to pursue and implement through their existing programs.

Implementation Schedule

Found at: https://docs.google.com/spreadsheets/d/1dZEqmggB3PvY4KVZyS2NPsBtPPWoMf6jK6JLGdLOZXk/edit?usp=sharing

Appendix D: 2012 – 2015 CAP Accomplishments and Gaps

This document was completed prior to the January 2020 workshop to identify the key accomplishments and gaps in implementing the 2012 and 2015 CAPs. A best effort was made to capture this information from various stakeholders and resource managers. However, many information gaps remain.

Completed Projects from 2012 Garapan CAP

- Garapan storm drain clean-out by BECQ and DPW, initiated in March 2014 and removing over 20,000 gallons of sludge from the drainage canal next to Fiesta Resort and disposal of more than 1000 pounds of trash from open dumping sites in Garapan.
- The Zoning Office, Bureau of Environmental Health (BEH) and BECQ also teamed together to complete trash surveys within the Garapan Core district.
- CUC has completed sewerline repairs in most of downtown Garapan as part of their master plan.
- Numerous education and outreach activities were completed with Garapan Elementary School and other students and communities within the area, including the first stage of the Know Your Watershed Campaign (BECQ), the Environmental Expo (BECQ, American Memorial Park, many partners), and the Choose to Reuse plastic bag campaign (MINA).
- Water quality monitoring is ongoing at beach sites and stormwater drainages, and marine monitoring has been expanded to several new reef sites within the Garapan area.
- The National Park Service has established a new weather station in the watershed at American Memorial Park that provides real time data through the internet.
- In the coming months, partners will also cooperate on the redesign of the Paseo de Marianas (lead by MVA), the Beach Road Revitalization (lead by DPW) and many other monitoring and infrastructure projects and programs.
- The Mayor's Office of Saipan has lead a variety of programs to decrease the stray dog population since 2012, including expanding their kennel facilities in lower base and partnering with veterinarians to provide an inexpensive spay/neuter program for pet owners.
- NMC CREES's Plant Protection Program has been actively propagating integrated pest management programs, bio-control measures for invasive plants and a crop improvement program to encourage farmers to use the best farming strategies and decrease their use of agro-chemicals.
- The Aquaculture and Fishery Development Program at CREES has also promoted projects that reduce the need for artificial fertilizers that have negative impacts on our nearshore environment.
- The natural resource management agencies further participated in the NOAA Coastal Resources Conservation Program's external capacity assessment and enforcement review in 2013, the results of which were unable at the time of this writing.
- The "Climate Change Vulnerability Assessment for the Island of Saipan, CNMI" was completed in January 2014 after stakeholder inventories, community mapping, participatory mapping,

technical assessments, sea level change mapping, and social vulnerability analyses. The three areas with the highest cumulative vulnerability ratings for Saipan were Lower Base, Beach Road (Oleai to Fishing Base) and Garapan. All of these are within the West Takpochao Watershed.

- BECQ resource managers decided to incorporate climate change adaptation strategies explicitly into the Garapan CAP in order to provide the most comprehensive and accurate information regarding priorities and strategies for protecting the watershed.

2015 CAP Progress

Water Quality Related Objectives and Actions

15.A1: By the end of FY2018, water turbidity has been reduced below 2013 ambient levels by 10% on average at all Garapan water quality lagoon monitoring sites - *Good Objective.*
Complete:

- "Install sediment traps, check dams and infiltration basins at the Sugar King Industrial Park and other key locations (as described in the 2005 Winzler & Kelly. Conceptual Stormwater Management Plan for the Garapan II Drainage)" *Sediment traps not installed. Rain garden installed 2012 or 2013.*

In Progress:

- Incorporate stormwater and climate change considerations into the Beach Road Revitalization Plan and other infrastructure plans near Beach Road - *Ongoing. Using "green hardening" instead of "grey hardening".*
- Complete stream inventories to identify pollution sources - *DEQ will do Garapan in 2022-2023. SVAP but this includes more than just turbidity so should be under another objective. WQ/NPS Surveys SVAP*
- Consider allowing variances to permit conditions in exchange for green practices (case-by-case) *– Started/ Are these SEPs? Stormwater treatment?*
- Continue researching, developing and training farmers on techniques for agricultural areas to decrease reliance on agro-chemicals. *Someone is working on it, could use more./ Doesn't relate to turbidity, exchange "decrease reliance on agro-chemicals" with "reducing erosion & sedimentation"*
- Create an interagency working group for unpaved roads and prioritize target roads. *Started/The Mayor's Office and the Department of Public Works continue to improve secondary roads without DCRM's permit or clearance.*
- Design and construct the planned stormwater management improvements (retention ponds, wetlands) for drainages leading into the lagoon to help filter water and moderate runoff during storm events (as described in the Garapan Revitalization plan)- *IPI or Grand Mariana Casino Resort's permit includes conditions to improvement the Garapan Drainage System, Beach Restoration, etc./ Good idea*

- Designate accessible waste collection sites for commercial& household waste, i.e. used oil, chemical and other household contaminants. *Somewhat implemented/ DPW is proposing to construct a convenience refuse collection center in Koblerville (As Gonno) and Kagman area./ Doesn't relate to turbidity,*
- Host landowner workshops to encourage proper land-clearing and land stewardship. *Development workshops only (not local/small landowners)./ Makes sense to reduce turbidity!*
- Increase permeable surfaces in the lower watershed using ponding basins, permeable parking lots, rain gardens and permeable pavement - *Several rain garden projects in San Vicente and at the NMI Museum in Garapan and other schools./ Very expensive*
- Required existing and new building structures proposal to be equipped with centralized with solid waste and effluent containment. i.e., outside centralize trash bin & grease catchment/containment. *"Selectively" implemented./ We can include this as a permit application requirement in order to qualify for a permit fee reduction. Program still needs to be developed and implemented./ Not related to turbidity*

Gap/Not Done as far as we know:

- Add green infrastructure into Qualifying certificate requirements -*as in permitting/ not sure this applies to this objective*
- Apply for EPA stormwater grants - *Not many EPA stormwater grants, maybe remove "EPA", make more general to any grants applicable to stormwater. Make High priority.*
- Clean and maintain all stormwater drainages including improving, cleaning drainages, clearing open ditch areas, ponds and drainages and cut overgrown vegetation
    - *Find funding and have DPW follow the MS4 requirements. There are questions about who is responsible for which drainages, different jurisdictions. We need a map defining areas of responsibility. Why is Zoning a partner? Add MOS. BECQ not responsible but sometimes "nudges" other agencies./Include culverts in this. Add MOS. Who is responsible for what areas? Costs a lot of money!*
- Conduct FOG campaign to teach residents about proper disposal of waste and contaminants and enforce FOG restrictions. *Not related to turbidity*
- Construct permeable sidewalks and beautify high-use areas with native vegetation as needed
- Encourage public and private use of swales and rain gardens to collect and filter stormwater runoff by incorporating stormwater management, green infrastructure, greenspace, and permeable areas (and timelines) into leases (DPL) and permit conditions (other agencies). *Stormwater runoff problems continued. These best practices are included as conditions in all APC and Major Siting permits (swales, filter stormwater runoff, green infrastructure, permeable areas, etc./ Very expensive./ Yes, but don't rely on government for raingarden maintenance.*
- Enforce permits and follow-up on BMP installation in order to address maintenance of existing BMPs. *High priority*
- Establish standard practices for maintenance of public infrastructure

    - *Add MOS. DPW has the MS4. This would be in the MS4 for Garapan manual and have training. Check EPA Stormwater Permit. Primary responsibility is DPW. CUC does sewer maintenance, all others are just partners.*
- Implement stormwater retrofits in the Garapan area to decrease and control stormwater and pollutant loading (as described in the 2010 Winzler & Kelly Garapan Tourist District Storm Water Conceptual Study. *Good idea*
- "Review, reprint and distribute existing resources to encourage "greener" practices (e.g. permeable parking) – *Stormater manual update?/ We can include this as a permit application requirement in order to qualify for a permit fee reduction. Program still needs to be developed and implemented./ Not related directly to turbidity.*
    - DEQ -> contractors and engineers
    - DPW -> material strength and building codes
    - Distribue GTD plan"
- "Expand the grassy swale by Sugar King Road, Garapan Street, and other key locations for use in stormwater treatment and infiltration (as described in the 2005 Winzler & Kelly Conceptual Stormwater Management Plan for the Garapan II Drainage)"
- Continue to evaluate sewer line repair needs and replace leaking or damaged lines at the earliest possible opportunity - *Critical.*
- "Implement stormwater retrofits in the Garapan area to decrease and control stormwater and pollutant loading (as described in the 2010 Winzler & Kelly Garapan Tourist District Storm Water Conceptual Study" - *Funding limited.*

15.F1: By the end of FY2016, all high priority water quality problem areas within the watershed have been identified.

In Progress:

- Implement the Surface Water Quality Assurance Monitoring Plan created for BECQ in 2013 by collecting water and sediment samples at designated stream sites to evaluate possible land-based sources of pollution and to isolate affected watershed segments
- Fill open positions in Water Quality program for data collection and analysis

Gap/Not Done as far as we know:

- Explore relative contributions of agrochemicals, trash burning and other land-based pollution to water quality impairments - *Not possible due to low flow. Implement SVAP instead.*
- Measure volume/velocity of stormwater (explore options with John Riegel/CUC), urgency is high because of climate change predictions of increased rainfall - *Difficult to do with WQ sampling. SVAP will be useful.*
- Work with CUC (and others) to identify rainfall areas for gauges and monitoring equipment - *Instead, update definition of 25, 50, 100 year storm volumes.*
- Continue ongoing monitoring of forest and wetland birds - *How does this relate to the objective?*

15.A2: By the end of FY2018, annual "red flag" occurrences at Garapan-area beach monitoring sites have been reduced by 10% from 2013 levels

In Progress

- Issue notices of violation (NOVs) and citations where appropriate. Ensure proper prosecution and follow-up on all cases - *Yes, but follow-up not happening. NOAA Legal Fellow opportunity.*
- Include animal waste detection methods in IDDE protocol - *Started. Need 3x/yr. FL university partners supplied materials and assistance, but nobody at DEQ working on it.*
- Initiate illicit discharge detection and elimination program to identify wastewater violations within the Garapan area
    - *We know there is faulty sewage infrastructure, still lots of Red Flags, refer to TMDL. Right now it's reactionary, needs to be more programmatic.*
    - *MINA working on it.*
    - *Storm drain maintenance! Ensure all buildings are hooked up to sewer.*
    - *BECQ lacks ability to do this alone, reliant on CUC. CUC has "bigger priorities"*

Gap/Not Done as far as we know:

- Expend CUC sewer connection funds by identifying and reaching out to eligible property-owners - *Property owners don't have the money. Identify federal funds to provide household hookups.*

15.B1: By FY2028, construction of the Saipan Lagoon Aquatic Ecosystem Restoration Project (SLAERP) ponding basins are complete according to Army Corps of Engineers recommendations and specifications

Gap/Not Done as far as we know:

- "Secure funding from partnering agencies and complete planning and construction of basins (as defined in the SLAERP)" - *None (maybe Army Corps?)*

15.B3: By the end of FY2018, engineering alternatives or maintenance options have been examined for all unpaved roads within the Garapan watershed

Gap/Not Done as far as we know:

- Discuss collaboration opportunities with Navy prepositioned ships
- Complete a Stormwater Management Master Plan using existing plans (GTD 2010, Winzler and Kelley, others)

15.E5: By 2018, 50% of farmers in the Garapan watershed have effectively enrolled in the NRCS EQIP program - *Not an achievable objective without farmers having title to their land.*

Complete:

- Share NRCS contact information

Gap/Not Done as far as we know:

- Complete stream inventory and identify EQIP candidates - *How is stream inventory tied to EQIP?*
- Provide assistance to complete the application process

Solid Waste Related Objectives and Actions

15.A3: By the end of FY2020, 30% of trash piles and junk cars have been removed or properly managed as required by zoning and environmental laws
In Progress

- Issue citations and assist residents in removing junk cars and trash piles to reduce feral animal habitat – *this is underway/ no coordinated effort/ more strict enforcement now*
- Pursue legislation that would allow funds from citations to stay at the agencies and support the enforcement programs - *Coral reef violation fine funds going to DFW, no other agencies getting funds.*

Gap/Not Done as far as we know:

- Grant legal authority to the Mayor's Office to assist with issuing Zoning citations
- Increase enforcement actions in cases of trash burning

15.A5: By the end of FY2015, the quantity of public trash bins in tourist areas has doubled and all public trash bins are secured and maintained (never overfull)
In Progress

- Continue surveillance, surveys, reporting and enforcement of trash/litter laws and regulations within the Garapan business district – *On-going*
- Maintain existing bins during high volume periods (weekends) and make sure all bins are lidded and secured to protect from feral animals – *Someone is working on it/ Need island wide trash hauling services*

Gap/Not Done as far as we know:

- Continue and expand MINA Adopt-a-Bin program
- Support and continue MVA and Chamber of Commerce "Cash for Trash" programs
- Promote recycling and pursue a bottle bill
- Encourage businesses and organizations to sponsor public trash bins for high-use areas

15.E2: From 2015-2017, the number of groups participating in MVA's Cash-for-Trash program will increase 10%

In Progress:

- Advertise trash pick-up programs: Cash for Trash, Adopt-a-Beach, BECQ monthly clean-up brigade - *BECQ monthly cleanup on-hold during austerity, but restarted now.*

15.A6: By the end of FY2018, there is a 20% decrease in weight of trash picked-up per participant at BECQ clean-up brigade sites in Garapan compared to 2010-2013 records
Complete:

- Update and introduce new legislation regarding littering fines

In Progress

- Continue litter control officer trainings to increase number of officers patrolling and issuing citations in the watershed area - *Some progress, but issues with process. NOAA Legal Fellow opportunity./ This doesn't seem to change the number of citations. Tackle this a different way.*
- Publicize enforcement numbers for the public to report littering (BECQ and Zoning) - *Available online?*

Gap/Not Done as far as we know:

- Design and conduct a watershed- or island-wide antilitter education and outreach campaign - *Has not worked in the past, don't repeat.*

15.A4: By the end of FY2023, feral cat and dog populations in the Garapan watershed area are effectively controlled (as indicated by no increase in numbers of annual captures or wild population counts)

In Progress

- Identify continual support and resources for spay/neuter programs and pet owner education – *done annually/ Saipan Cares for Animals*

Gap/Not Done as far as we know:

- Control and monitor stray cats to prevent depredation and attacks on native birds and other wildlife
- Provide incentives to the public for capturing and turning in strays - *Could create people holding pets for ransom. / Or breeding, see miner birds in AmSam*

15.A7: By the end of FY2018, all critical habitat areas affected by invasive vines and aquatic plants have been identified and control plans are being implemented

In Progress:

- Create and implement a plan for water hyacinth control and removal in American Memorial Park wetlands - *Will be addressed with NFWF grant (tentative)./ Not as prevelant in "artificial weltand" area. Maybe from brackish water?*
- Remove invasive vines from forest edges and gaps in American Memorial Park mangroves and wetland areas. *Will be addressed with NFWF grant (tentative)/ Still an issue, especially open spaces (created during storms). Occasional removal efforts by park staff.*
- Replant trees (targeting natives) to increase bird habitat in American Memorial Park where invasive vines have killed trees. *Will be addressed with NFWF grant (tentative)/ More trees killed from storms; still working on clearning debris. Replanting plan in the works.*

Gap/Not Done as far as we know:

- Actively remove/reduce presence of invasive plants (scarlet gourd, chain-of-love, devil's gut vine) in critical habitat areas. *Not On-going*
- Identify critical areas where vines are damaging habitat and define higher and lower priorities

15.F3: By FY2018, funding is secured and capacity identified to support long-term ecological monitoring within the watershed

Complete:

- Implement rapid assessment methods for wetlands and mangroves

In Progress:

- Understand types and coverage of forest areas
- Evaluate health of wetlands and mangroves periodically and implement management plans - *NPS does periodic wetlands monitoring.*
- Review wetland and mangrove plans to make them climate smart

Gap/Not Done as far as we know:

- Identify and eliminate gaps in scientific data for fisheries management - *Gaps persist. Limited number of survyes (2 clost to shore, 2 forereef, 2 back reef), all Garapan not covered.*
- Identify and eliminate gaps in scientific data for marine monitoring
- Understand algae preference by herbivorous fish
- Understand watershed impacts on herbivorous fish
- Quantify impacts of various recreational activities on marine resources, including direct contact from boats, snorkelers, divers and swimmers and indirect impacts from beach recreational activities)
- Create monitoring protocols for CRM enforcement related to recreational impacts on marine resources
- Create plans for groundwater monitoring wells related to wetland areas
- Create biosecurity priorities and protocols and begin Biosecurity monitoring

15.F4: By the end of FY2018, effectiveness of current management strategies for herbivorous fish have been maintained and improved

Gap/Not Done as far as we know:

- Assess recruitment of juvenile herbivorous and other fish species (e.g. habitat preference) and consider management options for preferred habitat

Permitting and Enforcement Related Objectives and Actions

15.C3: Percent of all environmental infractions recorded by agencies that are resolved in the local court has increased by 20% each year starting in 2018
In Progress:

- Identify funding and fill post of AAG for environmental resource agencies - *Part-time legal council. NOAA Legal Fellow opportunity.*

Gap/Not Done as far as we know:

- Review hearing process for natural resource agencies, identify and fill gaps, monitor change
- Review natural resource enforcement work-plans to identify improvements, updates and needs (training, funding, personnel), specifically regarding turtle poaching, illegal fishing, directed hunting, littering/dumping, trash burning, land clearing, and wastewater elimination
- Focus agency resources on improving enforcement training, funding and personnel related to turtle poaching, illegal fishing, directed hunting, littering/dumping, trash-burning, land clearing, and wastewater elimination

15.C5: By the end of FY2016, Forestry consultations are included with DLNR/DFW comments in the one-start process permitting process
Gap/Not Done as far as we know:

- Discuss permit requirements and evaluate personnel and capacity to include Forestry consultations in the one-start process with DLNR-DFW
- Determine special permitting options for Areas of Particular Concern (APC) related to highly erodible soils
- Fill-in capacity and personnel gaps at Forestry to assure smooth integration into the one-start process
- **15.C9: By 2017, climate smart adaptation strategies are incorporated into the one start permitting processes (DEQ, CRM, DFW, HPO)**

15.F2: By 2017 the data and results of ongoing climate change work are used to inform regulations in multiple regulatory agencies
Complete:

- Implement climate change-specific components of marine monitoring work - *Protocol includes climate change components (temperature and coral bleaching).*

Gap/Not Done as far as we know:

- Continue to support and participate in the Climate Change Working Group – *CCWG disbanded*
- Integrate NMC into the Climate Change Working Group to contribute to models and datasets and to train communities on climate change concerns/issues - – *CCWG disbanded*

15.C7: By the end of FY2015, rigorous environmental and conservation training is incorporated into MVA's tour guide training program and the program is made mandatory for all tour operators involved in outdoor recreational activities with visitors.
Complete:

- Create curriculum and develop program logistics
- Pass law or regulations to require tour guide certification program for all operators in the CNMI

15.C8: By 2017 Urban greenspace requirements will be incorporated into all DPL leases, as well as all DEQ, CRM, and Zoning permits and regulations, and Qualifying Certificate requirements
In Progress:

- Increase enforcement capacity to prevent and stop spread of invasive species - *Checking at port. Lots of funding/staffing provided. How is this action related to Objective 15.C9*

Gap/Not Done as far as we know:

- "Promote green infrastructure within the watershed (rain garden, permeable parking)
    - • Voluntary
    - • Mandatory: include some % requirement for green infrastructure in regulations, qualifying certificate requirements
    - •Continue to research available funding"
- *Add: Require DPL to regulate agricultural plots. Animals found outside of assigned plots will result in lease ending.*

Outreach and Education Related Objectives and Actions

15.D2: Through 2020, continue to conduct targeted environmental awareness campaigns within the Garapan Watershed

Complete:

- Continue "Think Blue" business stewardship campaign to identify BMPs for businesses and help with implementation - *Different name given to campaign.*

Gap/Not Done as far as we know:

- Implement education and outreach through the permitting process to teach property owners about BMPs
- Continue and expand MINA's Plastic Bag Challenge campaign to decrease plastic bag use – *Legislate Plastic Bag Ban*
- Create nature trail and interpretive signs at American Memorial Park through wetland and mangrove areas – *Still needed*
- Repeat 2003 "Know Your Watershed Campaign" and related activities (tentatively 2014)

15.D5: By the end of FY2018, there are active recycling programs in all public and private schools

Gap/Not Done as far as we know:

- Work with schools, administrators and clubs to initiate programs in all schools using existing models

15.E1: Beginning in FY 2015, there will be no net loss of urban greenspace each year due to protection of green areas and conversion of urban built-up land into vegetated area

Gap/Not Done as far as we know:

- Target community groups to get involved in land integration and native area stewardship: Neighborhood Watch, Village Revitalization, Saipan Municipal Council, Mayor's Office, Homeowner's Associations
- Conduct tree plantings and offer free trees to private, public, commercial groups
- Encourage businesses to sponsor large-scale greenscaping projects