

# **Grand Anse Marine Protected Area Management Plan, 2016-2020**

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This management plan is a priority for the Fisheries Division  
and support was requested for its development.

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## **Introduction**

The management plan for the proposed Grand Anse Marine Protected Area (GAMPA), is a priority of the Fisheries Division (Government of Grenada). In preparation for the development of this management plan, several public consultations and meetings were held with key stakeholder representatives between May 2015 to January 2016 to identify issues of concern and means of addressing those concerns. A review of available and relevant literature related to the Grand Anse area was also undertaken to get a better understanding of the current management situation and information gaps. The consultations and literature review provided sufficient background information on a range of aspects related to the resources of the area and management issues. These are described in the foregoing sections which precede the management interventions proposed for the site.

## **Resource Description**

### **Name and Location**

The proposed Grand Anse Marine Protected Area is about 1,965 ha (19.7 km<sup>2</sup>) in size and is located along the leeward, southwest coast of Grenada (Figure 1).

The landward boundary of the MPA will be the low water mark starting from the entrance to Port Louis Marina at 12° 02' 45.78"N/61° 45' 02.33"W and ending along the shore at a point south of the airport at 11°59'56.08"N/61°47'16.07"W. The low-water line was selected as the landward limit of the MPA to be consistent with the baseline established under the Territorial Sea and Maritime Boundaries Act (revised 1991) and to minimise jurisdictional overlap with other agencies, especially in the management of the beach at Grand Anse.

The seaward boundary of the MPA will be a straight line from the landward mark at the entrance to Port Louis Marina, due west to a point at 12° 2'52.27"N/61°47'19.10"W, then due southwest to a point at 11°59'56.97"N/ 61°49'15.93"W; then east to the landward boundary south of the airport at 11°59'56.08"N/61°47'16.07"W. Figure 1 illustrates the location of these boundaries.

The seaward boundaries were selected to include critical shallow water habitats as well as deep water habitats; and to ensure that many of the scuba diving sites were included for protection, especially the Bianca C (a 180 m cruise liner which sank in 1961).



**Figure 1.** Proposed boundaries for the Grand Anse Marine Protected Area.

## Habitat Classification

The major benthic habitats are composed of are hard corals, soft corals, seagrass beds, macro algal turfs, sand and rubble. White sandy beaches and bays are found along much the landward boundary.

The 1987 Survey of Coral Reef Near Grand Anse lead by Wayne Hunte of the Bellairs Institute (Barbados) indicated that the community structure of all nearshore reefs within Grand Anse Bay was characteristic of reefs subjected to eutrophication (elevated nutrient) stress.

Species diversity of corals was low and species numbers and abundance of sponges were reduced. Algae was abundant and were beginning to overgrow coral. Sea urchins were also common.

The community structure of nearshore reefs outside the Bay and north of the deep basin as well as that of the most northerly offshore reef were characteristic of reefs exposed to sediment stress. Algal and coral coverage were low, whereas species richness and abundance of sponges were high.

The 2015 survey of the coral reefs off Grand Anse undertaken by Stephen Nimrod of WINDREF (St George's University, Grenada) found that macroalgae and live hard coral were the most abundant benthic substrate types at all the sites surveyed except at one site where turf algae were the most abundant substrate type. With the exception of three of the eight sites surveyed, mean percentage cover of macroalgae was greater than mean percentage cover of live hard coral. Cyanobacteria were recorded at all other sites except at Grand Anse Inshore which had the highest coral cover, highest density of sea urchins and the lowest macroalgae cover. Sea urchins were rare or absent at all the other sites. Figure 1 also shows the resource map of the substrate for much of the GAMPA that was completed in 2015 with data collection done in 2014.

Although the exact sites sampled by Hunt and Nimrod were different, the results indicated that the coral reefs in the Grand Anse area were stressed and the general absence of grazers and abundance of macroalgae at some sites suggest that some action is required to improve the health of the coral reefs.

## Conservation Status

The area proposed as the Grand Anse Marine Protected Area currently has no official conservation status. Currently, about 60% of the proposed GAMPA area falls under the jurisdiction of the Grenada Port Authority (Figure 2). The Port of St George's takes in that area of water enclosed within a line from Point Salines to Point Moliniere. The marine areas used for

fishery is under the jurisdiction of the Fisheries Division and the areas within the Territorial Waters are the responsibility of the Royal Grenada Police Force (Coast Guard), and the government's Maritime Administration under the Grenada Port Authority. These legal jurisdictions offer some degree of protection of the site under existing legislation, however, other than restrictions on anchoring, no tangible protection measures at the site were noted.

### **Access and Context**

The proposed GAMPAs can be accessed at any point from along its boundary. There is currently no restriction to access of the area. The land use along the beaches of the GAMPAs is primarily tourism development including hotels, guest houses, restaurants, SCUBA diving and other water sports operations. Adjacent to the beachfront are domestic dwellings, small businesses and a marina. Due to the heavy use of the beaches in Grand Anse, it is unlikely that areas landward of the low-water line could serve as an effective buffer zone.

## **History and Development**

### **Marine Archaeology**

There are no known archeological sites within the GAMPAs which may influence management activities.

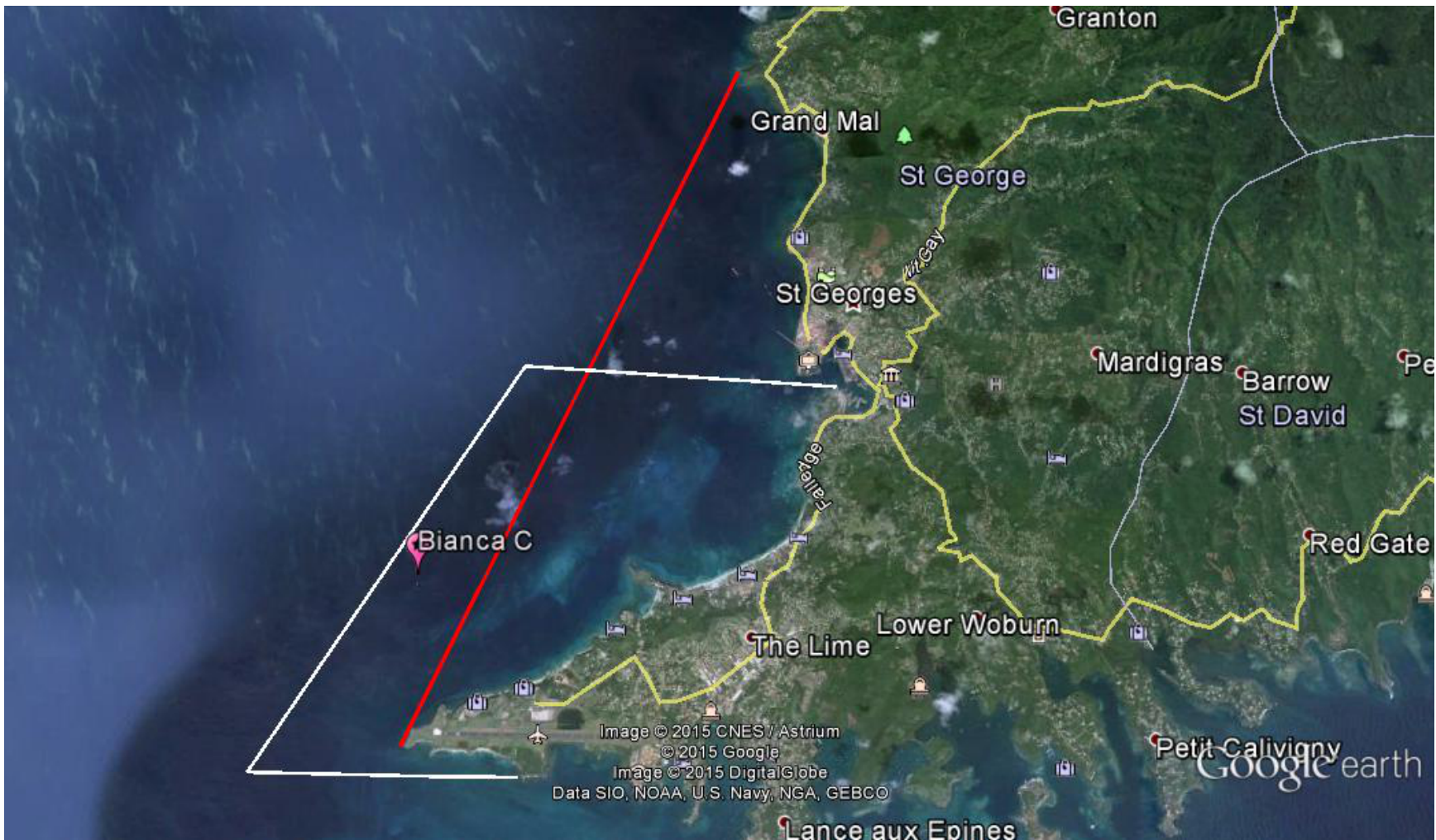
### **Historical Relics**

There are no historically significant relics at the site, however about six ship wrecks, mostly cargo ships, are found within the area and serve as important dive sites. These wrecks include: the Bianca C (cruise liner), Rhum Runner (charter boat), Fiona, Unity Courier, Shakem, and Quarter Wreck (source: Dive Grenada).

### **Impact of Storms and Hurricanes**

The coral reef system has been impacted by hurricanes and tropical storms every decade. In the past 50 years there have been about 2 tropical storms/hurricanes per decade passing within 60 nautical miles of Grenada, with seven such events over the decade 2000-2009 (stormcarib.com), including hurricanes Ivan (Cat. 4, Sep. 2004) and Emily (Cat. 1, Jul. 2005). However, recent dives in the area by the Biologist at the Fisheries Division (July to November 2015), found an abundance of regenerating corals and juvenile fish, but very few adult fish.





**Figure 2.** Proposed boundary of the GAMPA (white lines offshore) and boundary of the Port of St George's (red line).

## Current Human Use and Development

The uses of the marine area is primarily touristic, aquatic recreation, transportation and to a lesser extent subsistence fishing. Along the GAMPA waterfront there are about 20 hotels/ tourist rental accommodations, about 18 restaurants, and six SCUBA diving operations. Behind these facilities there are much more small hotels, apartments, and residential buildings as well as car rental agencies, groceries, restaurants and bars. To the north and adjacent to the GAMPA is the harbour of St George's and the Port Louis Marina. Maritime traffic and pleasure crafts generally pass through much of the northern part of the GAMPA and yachts currently utilise the northeastern portion as an anchorage (Figure 3). Cruise ship passengers arriving at St George's often come to the area via water taxis and disembark at the floating jetty at Palm Beach, near the Coconut Beach Restaurant. The local craft market established on the beachfront is also a major attraction. Navigation fairways (transit channels) to the harbour are aligned in the northern portion of the GAMPA bearing  $068^{\circ} 30'$  and  $132^{\circ} 00'$ . Anchoring is not permitted where vessels may obstruct the line of sight in the fairway ranges.

There are about 14 popular SCUBA diving sites within the proposed GAMPA and numerous shallow coral reef patches that attract snorkelers. Other water sports activities in the area include: sailing, kayaking, powerboat excursions, paddle boarding, windsurfing and kite boarding. The white sandy beaches are used by locals and tourists for passive recreation and swimming, and some sections of the beach can become quite crowded on public holidays and weekends. Passengers from cruise ships can add hundreds of visitors daily on the beach during the peak season. There are currently eight licensed vendors who rent beach chairs to many visitors at Grand Anse and about 121 other licensed vendors providing a range of services at Grand Anse.

Currently a new hotel and villa development is taking place along the beach in the area known as Silver Sands. The existing vegetation has been cleared and the surface of the land is being reshaped to accommodate the construction of infrastructure. Increased runoff and sedimentation of the adjacent reefs are potential negative impacts from this site.

The number of fishermen who use the area is unknown; not all of whom live in the Grand Anse area. At least 20 of them fish regularly using either spear, nets, hand lines and to a lesser extent, fish traps. Rock fishing using hand lines is also popular at Quarantine Point and other areas along the coast with rocky outcrops. The fishing is mostly for subsistence (mainly reef fish, lobster and octopus), but a few fishers do offer their catch for sale at the roadside in Grand Anse. The Fisheries Division does not consider the Grand Anse area as a fish landing site due to its very low volume, so no data is collected at that site (Rennie, pers.com.).



Dive Grenada has started the Grand Anse Reef Regeneration Project a few years ago, using a pyramid design built from cinder block. Twenty-one of these have been deployed close to shore in the sea off the Grand Anse beach, at a depth of about 3 m. The primary objectives of the artificial reef are to: create a positive impact on the marine environment; become an easily accessible focal point for the education of Grenadian school children on the benefits and the needs for conservation of ‘Coral Reefs’ in Grenada; and to become a major new tourist attraction (Saye, 2014).

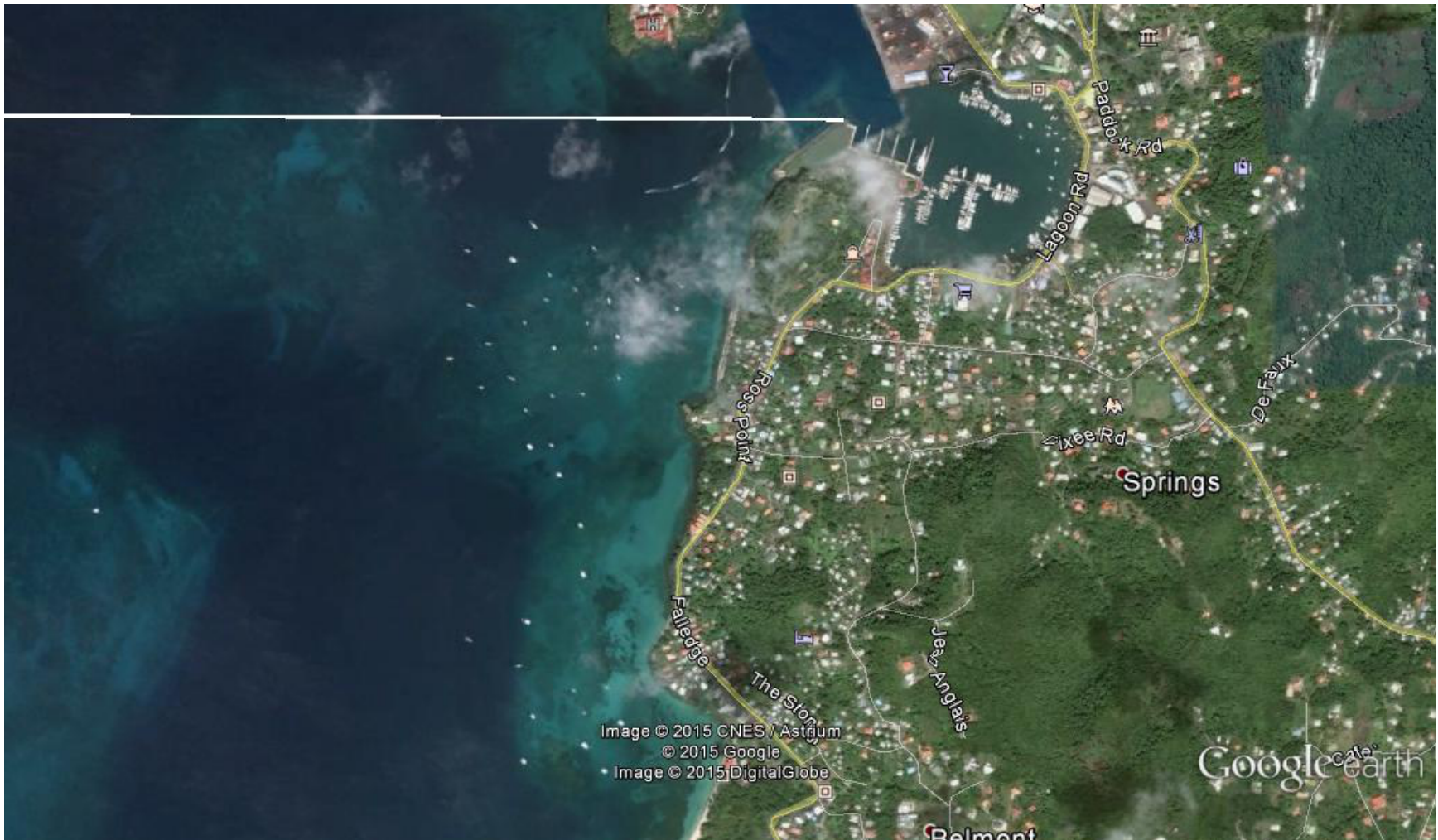
The Nature Conservancy in collaboration with the Government of Grenada initiated a coral nursery project in Grand Anse and Carriacou. The aim of this project is to restore degraded reefs as an adaptation mechanism for coastal communities in the face of climate change. The project will also determine the most resilient coral strains and optimum environmental factors which foster the best coral reef recovery (TNC, 2015). Thirty coral nursery trees were installed in 2015 at Quarantine Reef in Grand Anse, using *Acropora cervicornis* as the key coral species.

#### Economic Importance of Tourism

Expenditure from tourists make a significant contribution to the economy, accounting for about 23-25% of the GDP of Grenada. Based on statistics from the Grenada Tourism Authority, the five-year average visitor expenditure was about EC\$318 million per year. Table 1 below provides a summary of the volume of visitor arrivals. The USA, UK and the Caribbean account for about 50% of the annual visitors.

<b>VISITOR ARRIVAL METHODS</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014 P</b>
Total Stayover Arrivals	110,471	118,295	117,245	117,720	138,316
By Cruise Ship	335,029	309,564	242,757	197,308	235,140
Same Day Visitors	2,448	1,571	2,341	1,729	1,660
<b>TOTAL</b>	<b>447,948</b>	<b>429,430</b>	<b>362,343</b>	<b>316,757</b>	<b>375,116</b>

**Table 1.** Visitor arrivals to Grenada 2010-2014. (P denotes provisional figures)



**Figure 3.** Yachts at anchor (white dots offshore) in northeast portion of the proposed GAMPA (29th October, 2014). St George's Harbour and Port Louis Marina at top centre of satellite image.

A 2013 report on the economic impact of the marine and yachting segment of the Grenada tourism industry estimated that the net economic impact of the sector on GDP was EC\$130,382,053. The direct impact on employment was also estimated at 750 jobs.

Growth in the Tourism sector in 2014 was 30.4%, significantly higher than projected, however this sector was anticipated to expand by 4.8% in 2015. (Ministry of Finance and Energy, 2015). It is unclear how many people are employed in the tourism sector and support services adjacent to the GAMPA, but based on the large number of hotels, restaurants, shops, water sports and tour operators it is likely that several hundred people are permanently employed.

## **Physical and Biotic Features**

### **Bathymetry**

The depth of water outwards from the shoreline ranges from 0-135 m with several shoals scattered across the GAMPA, such as the Annas, Dathan, Patricia, Lloyd and Long Point shoals (British Admiralty Chart, 1993). Three banks of coral reef are prominent, Deverell Patch (in 4-8 m of water), Six Fathoms Bank (in 9-12 m of water) and the Three Fathoms Bank (in 5-7 m of water). Much of the proposed GAMPA is within 40 m depth of water.

### **Tides and Dominant Currents**

The tidal range is 0.61 metre (Grenada Port Authority), with a high tide not usually exceeding 0.4 metre under normal conditions. Dominant currents in the GAMPA seem to be in a southwesterly direction, the strength of which depends on bottom topography, wind forcing, current width and shear.

### **Water Quality**

Very little information is available on the water quality within the GAMPA. A 1987 study undertaken by Hunte found that nitrates and phosphates values at all locations at reefs in the Grand Anse Bay were higher (1.4 to 3.2 microgram/l) than values typical of non-polluted coastal water of the Eastern Caribbean (less than 0.7 microgram/l). Recent, monthly sampling by the National Water and Sewage Authority (NAWASA), does not include nitrates and phosphates (nutrients) and is focused on bathing water quality close to the beach. Table 2 below shows a summary of the data for 2014.

Parameter	Average Value	Highest Value	Standard Value
Dissolved oxygen	7.68 mg/l	8.45 mg/l	5-8 mg/l
Salinity	34.4 ppt	36.5 ppt	32-37 ppt
Turbidity	0.8 NTU	2.17 NTU	< 5NTU
Faecal coliform	2 cfu/100 ml	26 cfu/100 ml	< 126*
Enterococci	7.35 cfu/100 ml	179 cfu/100 ml	< 35*

**Table 2.** Summary of 2014 water quality data collected by NARWASA for Grand Anse. [\* values from the LBS Protocol].

Average sea surface temperature recorded for Grenada by satellite on the World Sea Temperatures website is 28.18°C, with the lowest average temperature occurring in February and March (27.2°C) and the highest average temperature occurring in September (29.5°C). NAWASA recorded the highest sea temperature at Grand Anse for 2014 in October at 30.7°C.

### Freshwater Inputs

There are no rivers, or permanent streams that flow into the GAMPA, however the St John's River which exits on the coast north of the MPA at Queen's Park, provides some freshwater inputs. Seasonal streams and drains become active during the rainy season bringing much water from overland runoff. There are also three paved drains that empty into Grand Anse Bay; one at Silver Sands, another near the Radisson Hotel, and the last one near the Spice Isle Hotel. Inputs from these drains, seasonal streams and overland runoff will impact on water quality during the rainy season, but high flushing rates in the bay will minimise the duration of the impacts. It should be noted that the area on Grand Anse Bay known as Silver Sands was the only wetland site in that area that provided some fresh water and attenuated nutrient and sediment inputs. Conversion of the site for a hotel development started in 2015.

### Benthic

Eight coral reefs sites were surveyed in the Grand Anse Bay area by Stephen Nimrod (WINDREF) in March 2015 at depths ranging from 2.4 to 12.8 m (Figure 4). The survey identified a total of 19 species of corals from 13 genera and 8 families. *Porites astreoides* (45%), *Porites porites* (18%) and *Orbicella faveolata* (16%) were the primary hard coral species in the 4 cm size category. The dominant species of hard coral in the 10 cm size category were *Porites astreoides* (44%), *Porites porites* (19%) and *Orbicella faveolata* (15%). The most abundant species of corals in the 25 cm size category were *Porites porites* (29%), *Orbicella faveolata* (17%) and *Porites astreoides* (17%). The mean percentage cover of live hard coral over most of the sites ranged between 30 % at Upper Boss and 17% at Mid Boss. The Grand Anse Inshore site was exceptional in having a coral cover of 64%.

The mean percentage cover of macroalgae across the sites ranged between 20% at Northern Exposure and 44% at Red Buoy. There was no macroalgae at the Grand Anse Inshore site. The

survey also found that the mean percentage cover of turf algae ranged between 1% at Red Buoy and 33% at Lower Boss. Grand Anse Inshore had the highest mean percentage cover of turf algae and sediments (15%), while Lower Boss had the smallest (1%). Mean percentage cover of crustose coralline algae was between 5% at Mid Boss and 15% at Kahonae. Cyanobacteria were recorded at all sites with a mean percentage from 0.8% at Upper Boss to 5% at Mid Boss, except at the Grand Anse Inshore site where they were absent.

### **Fish**

During the survey of eight coral reefs sites in the Grand Anse Bay area by Stephen Nimrod (WINDREF) in March 2015, a total of 30 key indicator species of fish from 17 Genera and 14 families were also recorded using the AGRRA method. Parrotfish (54%), grunts (17%), surgeonfish (15%) and butterflyfish (5%) were the most abundant fishes noted. The mean biomass of all fish species surveyed ranged from about 129 g/100 m<sup>2</sup> at Grand Anse Inshore to 1579 g/100 m<sup>2</sup> at Northern Exposure. Mean biomass of herbivorous fish species ranged from about 62 g/100 m<sup>2</sup> at Grand Anse Inshore to 1258 g/100 m<sup>2</sup> at Northern Exposure. The survey also found that the number of commercially important species were few and their mean biomass ranged between 39 g/100 m<sup>2</sup> at Lower Boss to 116 g/100 m<sup>2</sup> at Northern Exposure. These commercially important fish species were *Haemulon flavolineatum* (French Grunt), *Cephalopholis fulva* (Coney), *Caranx ruber* (Bar Jack), and *Lutjanus mahogoni* (Mahogany Snapper). The mean fish density of these commercially important species ranged between 1 individual/100 m<sup>2</sup> at Lower Boss and about 14 individuals/100 m<sup>2</sup> at Northern Exposure.

### **Diadema**

Nimrod's 2015 survey additionally found that the Grand Anse Inshore site had the highest mean density of *Diadema antillarum*, about 16 individuals/m<sup>2</sup> (as well as the lowest mean percentage cover of macroalgae). Lower Boss, Upper Boss, Mid Boss and Northern Exposure had a mean density of less than 1 individual/m<sup>2</sup>. No *Diadema antillarum* were recorded for Kahonae and Quarter Wreck.





**Figure 4.** Location of eight coral reef survey sites at Grand Anse, March 2015 (Nimrod, S. 2015).



After further analysis, Nimrod then made the following conclusions from his survey:

- Although the two main types of herbivorous fish (parrotfish and surgeonfish) were relatively abundant on the reefs in Grand Anse Bay, the individuals observed however, were relatively small in size, resulting in relatively low herbivorous fish biomass. A considerable increase in herbivorous fish biomass will be required to significantly reduce the high abundance of macroalgae on those reefs.
- Many of the commercially significant fish species were either rare or absent on the reefs in Grand Anse Bay, and those individuals that were observed, were also relatively small in size. The varying degrees of fishing pressure observed in the area might partly explain these results. He recommended monitoring fishing pressure in Grand Anse Bay.
- If left unchecked, the relatively high abundance of macroalgae observed at all but one site can continue to proliferate and rapidly out-compete corals for space on the reefs. This proliferation can further reduce live coral cover at the sites.
- The presence of Cyanobacteria at all but one site suggests that runoff from land or other sources might be negatively affecting water quality in Grand Anse Bay. In addition to bacteria, excess nutrients associated with land runoff can further increase macroalgae abundance on the reefs in Grand Anse Bay. He recommended monitoring water quality in the bay for bacteria and excess nutrients.
- While hard coral cover was relatively high, coral diversity was relatively low at all the sites. Low coral diversity can potentially reduce reefs resilience to cope with catastrophic disturbances and impacts associated with climate change.
- Crustose Coralline Algae (CCA) which is an important component on reefs for the purpose of settlement and attachment of coral recruits was relatively abundant at all sites surveyed. A further increase in CCA on the reefs will help to facilitate increased coral recruitment.

### **Other marine fauna**

Other large marine fauna commonly seen by dive operators in the proposed GAMPAs include: Southern Sting Rays, Eagle Rays, Manta Rays, Green and Hawksbill Turtles, Nurse Sharks and other sharks, Dolphins and recently, Sperm Whales were sighted a few miles off-shore of Grand Anse.

## Description of Management Issues

### Historic and current conflicts/threats/challenges

The issue of conflicting use along the beach at Grand Anse was examined by Findlay and Hoschtialek in 2001 when they first proposed a Grand Anse Beach Land and Sea Use Management Plan. The main conflicts identified at that time were:

- Jostling among water taxi operators for job opportunities at choice sites along the beach;
- Accidents between various beach craft and swimmers and accidents between crafts themselves;
- Haphazard landings and pick ups of passengers;
- Insecurity on the part of swimmers and snorkelers;
- Over-accumulation of vendors at focal points; and
- Irresponsible ski activity in areas that should be reserved for wading by bathers.

In discussions with key stakeholders representing 15 agencies/sectors during May 2015, held to guide the preparation of this management plan, the following issues were identified as key challenges:

- Frequent catching of small immature fish particularly by spear fishermen. From Nimrod's survey it was clear that the area seemed overfished and species poor; therefore recovery of fish stocks will not occur unless measures are put in place to restrict fishing and manage key habitats.
- Cleaning of fish and discarding of offal in the beach bathing areas. While this has been a traditional practice, continued disposal of fish waste on the beach or in the bathing areas will have a negative impact on public health and on the quality of the tourism product promoted by the government.
- Anchoring and anchor chain damage of coral reefs and seagrass beds. The resource survey of the Grand Anse area conducted in 2014/15, indicated that the current anchorage has significant seagrass and some coral, which serve as fish nursery. A rapid assessment of the current anchorage in November-December 2015 provided evidence of considerable anchor and anchor chain damage. Continued anchoring and discharge of waste from boats in that area will prevent recovery of the habitat. Recovery of coral and sea grass beds should be encouraged to develop habitats for marine species and to build resilience of the ecosystem to climate change. Therefore alternatives to destructive anchoring practices need to be identified.

- Swimming areas not demarcated and used by boats with high risk of injury to swimmers. The demarcation, maintenance and monitoring of a swimming zone will assist in improving safety of swimmers and reducing the risk of accidents. It will also help to improve the visitor experience, particularly for new users of the beach front.
- Use of power boats within 200 m of the shoreline in conflict with existing legislation. Reducing the risk of collision with swimmers or other users of the near shore marine area from speeding power boats remains a challenge because of a lack of enforcement.
- Inadequate compliance with existing rules and regulations. The lack of a dedicated enforcement and management presence in the marine area at Grand Anse minimise the possibility that resource users comply with existing rules and regulations.
- Development of land adjacent to the MPA with uncontrolled adverse impacts on the marine environment. Awareness building on the existing rules and regulations, and dedicated law enforcement may assist with compliance. However, systemic and institutional weaknesses among key government agencies may get in the way of timely and decisive action to control negative impacts on the marine environment.

## Pollution

- Impact of raw sewage from a broken pipe entering the proposed MPA in the south (Pt. Salines) and to the north of the proposed MPA from an inadequate discharge pipe at Queen's Park. SCUBA divers have noted an increase in the coverage of macroalgae in the northern portion of the GAMPA. Nimrod also noted a high abundance of macro algae in this area during his 2015 survey. Such excessive growth is usually associated with nutrient enrichment and reduced availability of grazers (e.g. parrot fish and sea urchins). The authorities are aware of this problem and the challenge has been acquisition of resources to fix the problem.
- Inadequate cleaning of drains and ditches that empty into the Grand Anse Bay area. Effluent discharges from these drains and ditches become more acute during the rainy season as garbage and other household wastes tend to get washed into the sea.
- Contamination of the marine environment from toxic leachates. This concern was raised by the yachting community and concerns the use of particular anti-fouling paints on hulls of ships that navigate through the area. The extent of this threat has not been examined or estimated, but requires some data collection and analysis to determine the level of risk and mitigation measures.
- Discharge of sewage and wastes from yachts anchored in the GAMPA. This issue was raised by some stakeholders, since waste discharge is not controlled within the present site and there is no other facility in the area for handling wastes from yachts, except at the Port Louis Marina. However, it should be noted that sewage from the Port Louis

Marina is collected and put into the local sewage system which empties at the Pt. Salines outfall.

## Future demand

Future demand for recreational uses along the beach and in the GAMPA has the potential for increasing, especially with increased marketing. For example, the highest visitor arrivals to Grenada over the past 15 years was in 2009 (463,481 persons) and in 2010 (447,948 persons) , in comparison to an annual average of about 365,000 visitors. The ongoing expansion of hotel stock as well as planned refurbishment of several hotels and the planned increased marina capacity suggest that there will likely be an further demand for recreational activity and support services in the Grand Anse and adjacent areas. Increased boat traffic and recreational use may cause some negative impacts related to spread of anchorages and garbage/sewage disposal.

## Potential Conflicts/Challenges

- Port Louis Marina's agreement with the government to develop or use the Port of St George's. About 60% of the proposed GAMPA is within the Port of St George's marine jurisdiction. Any proposed marine development by the Managers of the GAMPA, including the establishment of a mooring field that falls within the Port of St George's jurisdiction, requires the approval of the Grenada Ports Authority. However, Port Louis Marina's current agreement gives it the first right of refusal for any activity within the port area that it determines "may limit or damage the development or operation or profitability or quality of environment of the marina". This potential challenge may also present an opportunity for collaboration with Port Louis Marina in the establishment and management of any mooring field in the area.
- Prohibiting anchoring in selected areas of the GAMPA. During consultations with representatives of the yachting industry and yachters in May, July and November 2015, it was clear that they were unwilling to give up the free anchorage within the GAMPA, when suggestions were made to put conservations measures in place, by the Fisheries Division. The primary reasons for their reluctance were the convenience of the current site in terms of access to onshore goods and services, traditional practice of free safe anchorage, bad experiences with poor mooring facilities in the past, and their belief that the current anchorage had no coral or seagrass of value. There were considerable efforts at lobbying the government to ensure that the current arrangements do not

change. In November 2015 there were further discussions with representatives of the Marine and Yachting Association of Grenada (MAYAG) and the Fisheries Division, where evidence was shown of the recovery of coral, hampered by continued anchor and chain damage. It was proposed that a suitable mooring field will be developed in the current anchorage and another area will be identified for anchoring.

- Payment for services within the GAMPAs. When the proposed GAMPAs become established by law there are likely to be new charges that will be introduced for selected services, based on the existing legislative framework for other MPAs in Grenada. Such charges may include fees for SCUBA diving, snorkeling and use of mooring buoys. Usually, there is always an initial reluctance to pay new fees by resource users, especially when they are accustomed to using the marine resources for free. Another challenge will be a determination of an appropriate fee structure that will help in defraying the maintenance costs of MPA infrastructure. Recently, a willing-to-pay survey for diving and snorkeling in Grenada was carried out during January-May, 2015 (Campbell and Daniel, 2015). The researchers found that on average people were prepared to pay higher fees for diving and snorkeling, with non-locals willing to pay a higher fee than locals for such activities. Based on their analysis of the results the researchers recommended an increase in the current fees differentiated between locals and foreigners, special fees for other activities within the MPA and an increase in the mechanisms available for the purchase of dive and snorkel bands. They also recommended that campaigns be initiated to increase public awareness on the importance of paying user fees to access MPAs in order to raise local acceptance and support.
- Displacement of fishermen when the MPA is declared. One option discussed during consultations with many of the fishermen who use the Grand Anse area was the possibility of the establishment of a no-fishing/fish sanctuary in the northern half of the proposed MPA. There was consensus from among the fishermen and they identified the potential boundary for the no fishing/fish sanctuary zone. However, a few of the older fishermen are likely to be displaced if the no-fishing option is exercised. Further discussions with this group of stakeholders will need to be undertaken to determine what options or alternative livelihoods are possible.
- Effective management of the GAMPAs. The GAMPAs will need adequate staffing and dedicated equipment and resources for effective management. A key element will also be a proactive stakeholder engagement process to ensure that the boundaries, rules and regulations of the MPA are known to all resource user groups, hoteliers and the general public.

## Policy and Legislative Framework

Perhaps the most important policy statement related to protected areas was made in March 2006 by the Government of Grenada when they adopted the Grenada 25-25 Declaration to “Effectively conserve at least 25% of the near-shore marine resources and at least 25% of the terrestrial resources across Grenada by 2020.” This Declaration demonstrated Grenada’s commitment to its obligations under the Convention on Biological Diversity and was again reaffirmed at the Caribbean Summit of Political and Business Leaders under the Caribbean Challenge Initiative which took place in the British Virgin Islands in May 2013.

There are also several other policy instruments that indirectly provide some support for the establishment of MPAs, such as the National Environmental Management Strategy and Action Plan, and the Tourism Master Plan. However a more recent, specific MPA policy statement was in the Prime Minister's 2016 Budget Statement that indicated the: "Government will continue to strengthen Marine Protected Areas to enhance the management of critical marine species and improve marine biodiversity". This statement clearly indicated that MPAs are a key priority mechanism identified by the government for the management of the nation's marine resources.

In terms of legislative support for MPAs, the Fisheries Act, its Fisheries (Marine Protected Areas) Order and the Fisheries (Marine Protected Areas) Regulations are the most significant laws that provide for the establishment, prohibitions, governance arrangements, schedule of fees and general management of activities in MPAs.

The Yachting Act provides for the management of some yachting activities in the territorial waters of Grenada, however, the Act also provides for the Minister to make regulations, rules and orders prescribing the designation of marine parks and approved anchorages.

The Ports Authority Act has a supporting role in the management of MPAs through its jurisdiction in the approval and installation of buoys and moorings, restrictions on anchoring, and regulation of shipping and navigation and general maritime administration. Anchoring is prohibited within 200 metres of any beach without written permission. The entire area referred to as Grand Anse Bay has been declared prohibited anchorages by the Ports Authority. It is prohibited to bring organic waste into Grenada. Organic waste may be dumped at least 12 nautical miles offshore. Small organic waste (pieces less than 25 mm) may be dumped at least three nautical miles offshore.

The Physical Development and Control Act is intended to control physical development, through the Land Development Authority, to require the preparation of physical plans for



Grenada, to protect the natural and cultural heritage, and for related matters. The Authority, on the advice of the Natural and Cultural Heritage Advisory Committee may compile and amend from time to time lists of places of natural beauty or natural interest, including submarine and subterranean areas, and their flora and fauna, not being areas, *inter alia*, designated or declared as national parks or protected areas under any enactment; or regulated as marine protected areas under any enactment.

The Power Craft Act is an Act to regulate the operation and use of power-craft in the territorial waters of Grenada. One of the key elements of this piece of legislation directly relevant to MPAs, is the restriction on the use of a power-craft within two hundred metres from the shore. Such an offence, on summary conviction, carries a fine of three thousand dollars, and in default of payment, to imprisonment for six months. The Minister may also make regulations for the navigation, operation and conduct of power-crafts.

The Birds and Other Wildlife (Protection) Act provides for the protection of birds and wild life including fish, lobsters, turtle and oysters. Closed seasons for catching listed species are prescribed, however there is absolute protection of turtles and their eggs whilst on land.

Protective status of the Grand Anse MPA will be secured when it declared under the Fisheries (Marine Protected Areas) Order.

## Management Activities

### Objectives

The goal for the establishment of MPAs in Grenada is to maintain the ecological integrity of the coral reef ecosystem and improve its resilience to the impacts of climate change. The Government of Grenada has made the commitment to ensure that at least 25% of the near-shore marine resources are effectively conserved, consistent with its international obligations and national needs. Specifically, the objectives for the establishment and management of the Grand Anse Marine Protected Area (GAMPA) are:

1. To protect and enhance the area as a habitat for key species of fish and other aquatic flora and fauna.
2. To enhance and maintain the quality of the marine resources for sustainable livelihoods.
3. To improve and maintain user experiences in the marine protected area.

These objectives will be achieved through the establishment of zones within the MPA, that will have clearly defined areas, specific uses and prohibitions; and the implementation of several key activities outlined below.

## **Zoning**

### **Fish Sanctuary**

The GAMPA is divided by a line from the seaward boundary at 12° 1'13.32"N/61°48'25.05"W to the low water mark at the tip of Quarantine Point at 12° 1'27.85"N/ 61°46'31.98"W. The portion of the GAMPA north of this dividing line was proposed as a no-fishing area/fish sanctuary (Figure 5) by most of the fishermen present at the consultation on 27th July, 2015. Figure 5 also shows that most of the MPA's coral reefs are located in the sanctuary area. Fishing will be allowed in the area south of the dividing line and at designated Beach Seine Fishing Zones and at traditional rock fishing areas. Catching or removal of any marine organism or parts of the marine environment outside of the fishing areas will be prohibited. Transit through the area will not be restricted.

### **Multiuse Zone**

Fishing will be allowed in this zone, however, spear fishing and the use of nets will be prohibited. All other activities currently undertaken in this area will be allowed except where restricted under existing legislation.

### **Swimming Zones**

A swimming zone that runs parallel with the beach along the south western shoreline of the GAMPA is proposed. This zone will be 50 m wide (Figures 6 & 7) and is intended to minimise the risk of collision between swimmers and boats. All vessels including personal water crafts, powered and non-powered, will not be permitted in this area, except through designated boat access lanes. It is anticipated that these zones will be clearly demarcated. Bathing, swimming, snorkeling and SCUBA diving are allowed.

### **Power Craft Exclusion Zone**

A zone parallel with the swimming zone and extending 200 m from the shoreline will be designated as the Power Craft Exclusion Zone (Figures 6 & 7), where the operation of power crafts will not be permitted except at designated boat access lanes. The existing Power Craft Act already provides support for restricting the use of such power crafts within 200 m of the shore. Non-motorised activities such as kite boarding, sail boarding and other wind based boating will be permitted in this zone.

### **Boat Access Lanes**

Boat Access lanes 50 m wide will be provided at key points along the shore, particularly in front of dive shops and hotels (Figures 6 & 7). The speed of vessels using these lanes should not exceed 5 knots or produce any wake. Swimming snorkeling and SCUBA diving will not be permitted in these lanes. Anchoring will be prohibited in these lanes, except at the shoreline to allow for loading and unloading of boats. The lanes will also be clearly demarcated.

### **Beach Seine Fishing Zone**

Three designated Beach Seine Fishing Zones are proposed based on discussions with fishermen. These are located in the predominantly sandy areas north and south of the floating jetty on Grand Anse and at BBC Beach (Figure 6). During beach seining, fishermen will have priority use of the area and swimming and other activities will be restricted until the beach seining is completed.

### **Anchoring Zone**

No anchoring will be permitted in the GAMPAs except at designated anchoring zones. An anchoring zone for small fishing boats, water taxis and other small crafts will be located 30 m south of the floating jetty at Grand Anse and will allow for easy maneuvering and minimise congestion at the jetty. The size of the anchoring zone will be 900 m<sup>2</sup>.

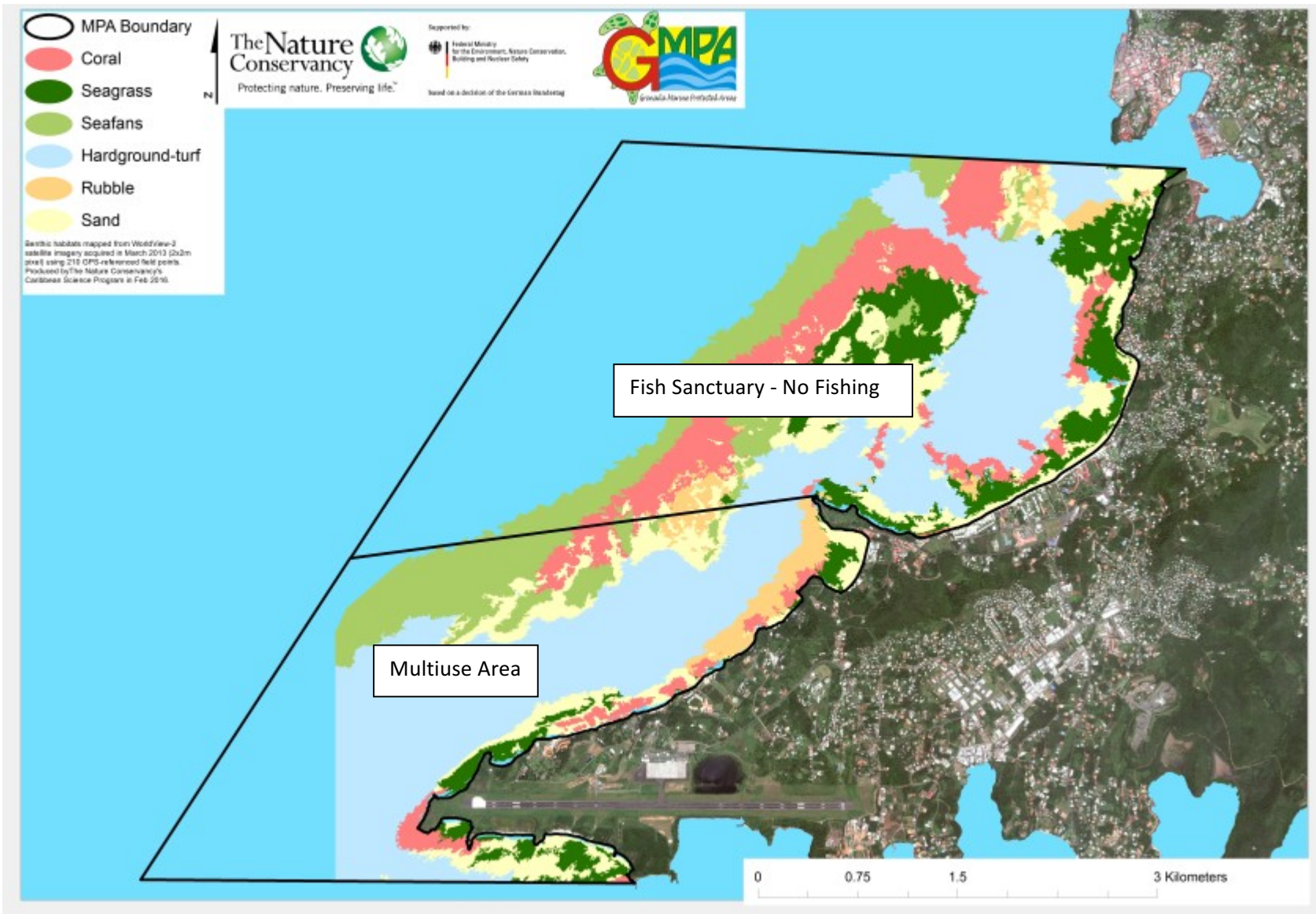
An anchoring zone for yachts will be located west of the current anchorage, to minimise further damage to corals and sea grass beds and to allow for recovery at that current site (Figure 8). The new anchorage will be located in a predominately rubble and sandy area at:

NW: 12° 02'39.90"N/061°45'38.90"W	SW: 12° 02'29.30"N/061°45'43.70"W
NE: 12° 02'36.56"N/061°45'33.23"W	SE: 12° 02'28.60"N/061°45'37.60"W

### **Mooring Zone**

A mooring zone will be located to the east of the new anchorage and will occupy much of the former anchorage site (Figure 8). All vessels that cannot be accommodated in the anchoring zone will be able to utilise the mooring buoys in the new mooring zone. The coordinates for this mooring zone are:

NE 12° 02' 35.09" N/61° 45' 19.41" W	SE 12° 02' 2.03" N/61° 45' 26.76" W
NW 12° 02' 37.30"N/61° 45' 31.18" W	SW 12° 02' 4.33" N/61° 45' 38.66"



**Figure 5.** Proposed boundaries for the Grand Anse Marine Protected Area and the proposed Fish Sanctuary.





Figure 6. Grand Anse MPA - location of zones along the beach south of Quarantine Point.



**Figure 7.** Grand Anse MPA - location of zones along the beach north of Quarantine Point.



## Demarcation of Boundaries

Demarcation of the seaward boundaries of the GAMPA and the anchoring zones should be a priority activity. The following key activities will be undertaken during the first year of establishment of the MPA:

1. Determine the best physical location along the boundaries for the demarcation buoys, using the GPS and line of site estimation. Also estimate the quantity of buoys and other hardware which will be needed.
2. Obtain specifications of anchors, pins and other hardware for installation of demarcation buoys.
3. Select appropriate types and quantity of hardware and place an order for purchase.
4. Prepare a schedule for installation of demarcation buoys.
5. Hire expertise to install demarcation buoys.

For demarcation of the swimming zones, the hoteliers along the coastline of the MPA should be engaged to determine who would be prepared to assist in the demarcation of the swimming zones in front of their property. Once support is identified and resources committed then demarcation of selected areas for swimming can begin in the first year of establishment. If this approach is unable to get sufficient support, it should be possible to start the demarcation of the swimming zones in the second year of establishment of the MPA.

The demarcation of the beach seine zones could also be done in the second year depending on the availability of resources. Appropriate signage will need to be designed and installed near the landward boundary of the MPA.

## Installation of Mooring Buoys

Installation of mooring buoys will need to be preceded by a detailed assessment of the proposed mooring zone to determine appropriate anchoring systems to be utilised, types of buoys, number of buoys to be deployed and specific locations for each buoy to ensure the safety of boats using the system. An appropriately experienced contractor should be hired to conduct the assessment and undertake the installation.

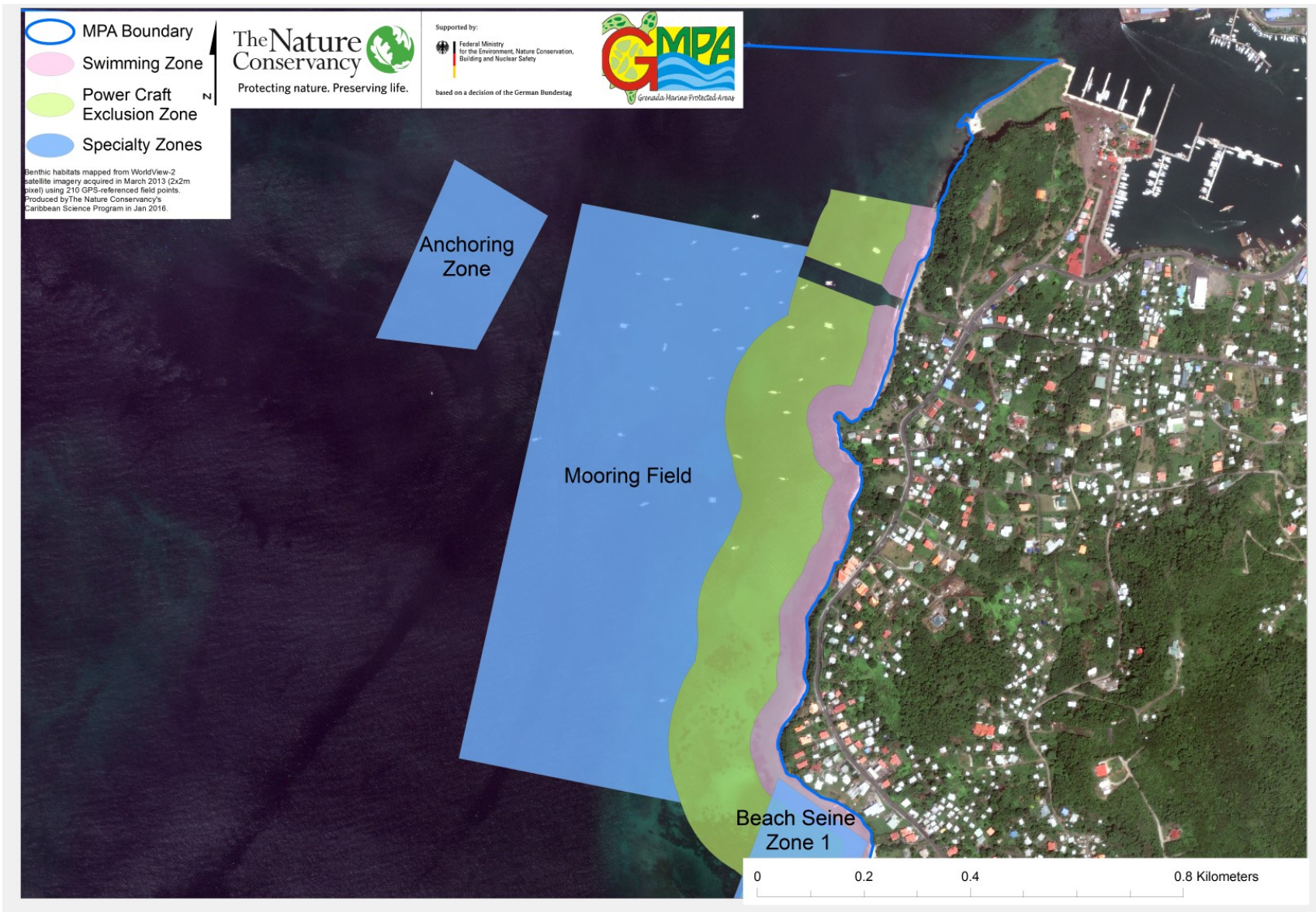


Figure 8. Grand Anse MPA - proposed location of anchoring and mooring zones.

## Maintenance

Maintenance of the GAMPA infrastructure (signs, buoys, etc) and equipment (boat, radios, etc) will be the responsibility of the MPA Manager. Equipment should generally be inspected at least monthly to determine the need for servicing. The following schedule for maintenance of mooring buoys is proposed (van Breda and Gjerde, 1992):

1. Monthly
  - i. Inspect condition of all buoys and pick-up lines; note GPS location.
  - ii. Clean algal growth from pick-up lines or replace if necessary.
  - iii. Clean buoy and check for cracks, replace if necessary.
  - iv. Inspect and clean exposed portions of buoy through-line and replace as appropriate.
  
2. Every three months
  - i. Inspect down line for wear and damage, replace if necessary.
  - ii. Inspect shackle for wear and damage, replace if necessary.
  - iii. Inspect anchor and examine area between anchor and shackle for signs of wear.
  - iv. Inspect anchor mount site and surrounding area, look for signs of movement or looseness between the anchor and cement core or between the cement core and the substrate.
  
3. Every six months  
Replace buoy through line and pick up line after six months of use if the system is used regularly.
  
4. Annually  
Replace pin in down line shackle.
  
5. Every two years  
Replace down line if necessary.

Demarcation buoys can be inspected every three months or sooner if accidental damage is observed or reported. Maintenance of the mooring buoys may also be contracted out to a service provider, so that the MPA Park Rangers could be more usefully engaged elsewhere.

## Surveillance and Enforcement

The activities of people and vessels in the GAMPA will be monitored through routine patrols by the MPA Rangers. Irregular schedules should also be planned to detect infringement of the MPA regulations and to assess user activities. Interpretative enforcement of the regulations will be the preferred method of dealing with infringement of the regulations. First-time offenders

may be given a warning and will be provided with information on the GAMPAs, including the boundaries, zones, regulations and why it is important to respect and support conservation of marine resources in the GAMPAs. If a first-time offender is a boat captain/owner, he/she may be asked to report to the GAMPAs Office within 24 hours for an orientation on the GAMPAs. Failure to comply will be recorded in a log to guide further action if there is another infringement by that individual. All infractions or offences in the GAMPAs should be recorded in a log, including data on persons involved, location, type/description of the offence and the action taken by the MPA staff or Coast Guard. A database with this information should be created for quarterly analysis and recommendations.

Fisheries Officers and the Coast Guard (Royal Grenada Police Force) will also be able to enforce the regulations to the fullest extent of the law. Collaboration with the Tourism Task Force 'Beach Police' should be formalised to assist with the surveillance and enforcement of the Swimming Zones. The following list outlines the activities in the GAMPAs that will be prohibited:-

1. Taking any animal or plant by any method, except to the extent permitted in any fishing zone;
2. Destruction, damage or injuries to any animal or plant;
3. Taking or damaging any artefact, including those found on wrecks and other dive sites;
4. Removal of sand, rock, coral or coral rag or any calcareous substance;
5. Anchoring of a vessel except in an anchoring zone;
6. Anchor damage to artefacts or to coral or reef structure living or dead or to associated marine plant or animal life;
7. Mooring a vessel other than at a buoy;
8. Diving using SCUBA, unless the person is under the supervision of a Diver Master or Dive Instructor;
9. Using any vehicle, except as permitted in an access zone or parking zone;
10. Using jet skis or hovercraft;
11. Using water skis within 200 m of the shore;
12. Dumping any refuse, abandoned vehicle, toxic or other waste, bilge, oil or other petroleum product, pesticide or any other item harmful to animals or plants, or any unsightly item, or substance which does or is likely to destroy or reduce amenities of the area;
13. Discharge of sewage from any vessel;
14. Erecting or deploying any structure, except with the written permission of the Ports Authority and the Minister.

## **Scientific Monitoring and Research**

The monitoring stations established by Nimrod in 2015 should be maintained and the same parameters (benthic condition, corals, fish, and diadema) surveyed at least annually, starting in March 2016. This will provide detailed records on the status of key elements of the marine



biodiversity in the GAMPA and may help in determining the impacts of management interventions, particularly in the Fish Sanctuary/No Fishing Zone. A sea grass bed baseline assessment should also be given priority. The recovery of corals, sea grass and fish in current anchorage should also be monitored to identify the rate of changes over time which may help to inform recovery in other areas.

Water quality data should also be monitored at each of the coral reef monitoring stations to determine the changes over time to find a correlation with such changes. The key water quality parameters for attention will be: nitrates, phosphates, faecal coliform and enterococci, dissolved oxygen, salinity and turbidity.

Number of users in the GAMPA, types of usage, frequency of use, impact of use and evaluation of operator procedures should be assessed. This information will guide decisions on levels of usage and interventions that may be necessary if negative changes in the ecosystem are detected.

Research on the impact of alien invasive species (IAS), particularly the lion fish on the marine environment and the impact of current control methods could also be undertaken, to help improve management interventions. An assessment to determine if there are any other marine IAS that require attention should be conducted as soon as resources permit.

### **Control of Alien Invasive Species**

The control of lion fish through the current method of physical removal from key sites should continue until research determines otherwise. The removal of lion fish and other alien invasive species will be permitted in any area of the GAMPA, including the Fish Sanctuary, under the supervision of the GAMPA staff. Control measures should be prepared for any other IAS that has been determined to be a threat to the GAMPA and adjacent areas.

### **Awareness Building and Education**

Promoting protection, wise use, public understanding and enjoyment of the GAMPA will need to be done in collaboration with other similar activities undertaken by the Fisheries Division, the Grenada Tourism Authority and the Grenada Hotel and Tourism Association. Key elements of the awareness and education programme will include: rules and regulations of the GAMPA; importance of a fish sanctuary in sustaining local livelihoods; conservation of marine habitats and species. The awareness communications should: 1) be positive, 2) present alternatives to current negative actions, 3) encourage good practice, 4) be done in the context of existing regulations, 5) be unambiguous and packaged based on the nature of the target group. Representatives of the target group could also be involved in drafting the messages to improve effectiveness of design. The development of effective awareness/education activities requires

that the following questions be considered during the planning process (Fazio and Gilbert, 1981):

1. What do you want to accomplish in realistic and reasonably measurable terms? That is, do you want to simply build awareness or do you want some change in behaviour or practice?
2. What are the expected results that will help you know if you are achieving your objectives? For example, better use of moorings? Reduced reef damage?
3. What are the internal policies that need to guide the initiative?
4. What are the problems that need to be addressed?
5. What are the socio-economic and environmental trends that provide the context for the initiative?
6. What groups are you trying to reach and what are some of their characteristics? For example, with some groups, literacy or language may be a problem; for young people materials need to be catchy and cater to their level of understanding.
7. What is the message you need to convey to the selected target groups?
8. Is the message 'packaged' so that it is most likely to achieve the expected results to improve knowledge, persuade, change behaviour, etc?
9. What is the best communications channel to use to reach those target groups with your message?
10. Have you put it all together by matching the message, target group and media in implementation of the initiative?
11. Have you developed a means of evaluating the initiative?
12. Are you open to feedback and have you established channels to receive that feedback?
13. Did the activity have the desired effect? Consider both long and short term impacts.
14. Are you reasonably willing to make changes if necessary as a result of the feedback and results?

All awareness and education activities should be evaluated within 3 months of completion to determine if the objectives were met and to what extent. Changes in awareness, perceptions, knowledge, understanding, attitudes and actions should be measured to determine success of the activities undertaken.

## **Administration and Staffing**

The National MPA Management Committee has the legislative authority for the management of MPAs in the State of Grenada. The Fisheries Division (Ministry of Agriculture, Lands, Forestry, Fisheries and Environment) implements management activities in MPAs with co-management as the adopted approach. A stakeholder advisory committee has been appointed for each MPA, established in the country. The National MPA Coordinator currently serves the function

of the Manager of MPAs and the Management Committee is comprised of one representative of:

1. the Ministry of Finance;
2. the Ministry of Tourism;
3. the Board of Tourism;
4. the Ministry of Agriculture;
5. the Science and Technology Council;
6. the Grenada Coast Guard;
7. the Grenada Ports Authority;
8. the Marine and Yachting Association of Grenada;
9. the Grenada SCUBA Divers Association;
10. any non-governmental organisation which has a specialised interest in marine or environmental matters (currently, a representative from each MPA Stakeholder Advisory Committee).

The Management Committee's function is to advise the Management Authority on all matters which require to be decided by the Authority except day-to-day matters. Decisions of the Authority must be signified under the hand of the Manager of MPAs and the Chairperson or Deputy Chairperson of the Authority jointly. The Act also provides for the Management Authority to have assigned to it such enforcement officers and other support staff as the Minister, if necessary after consultation with the Public Service Commission, considers appropriate.

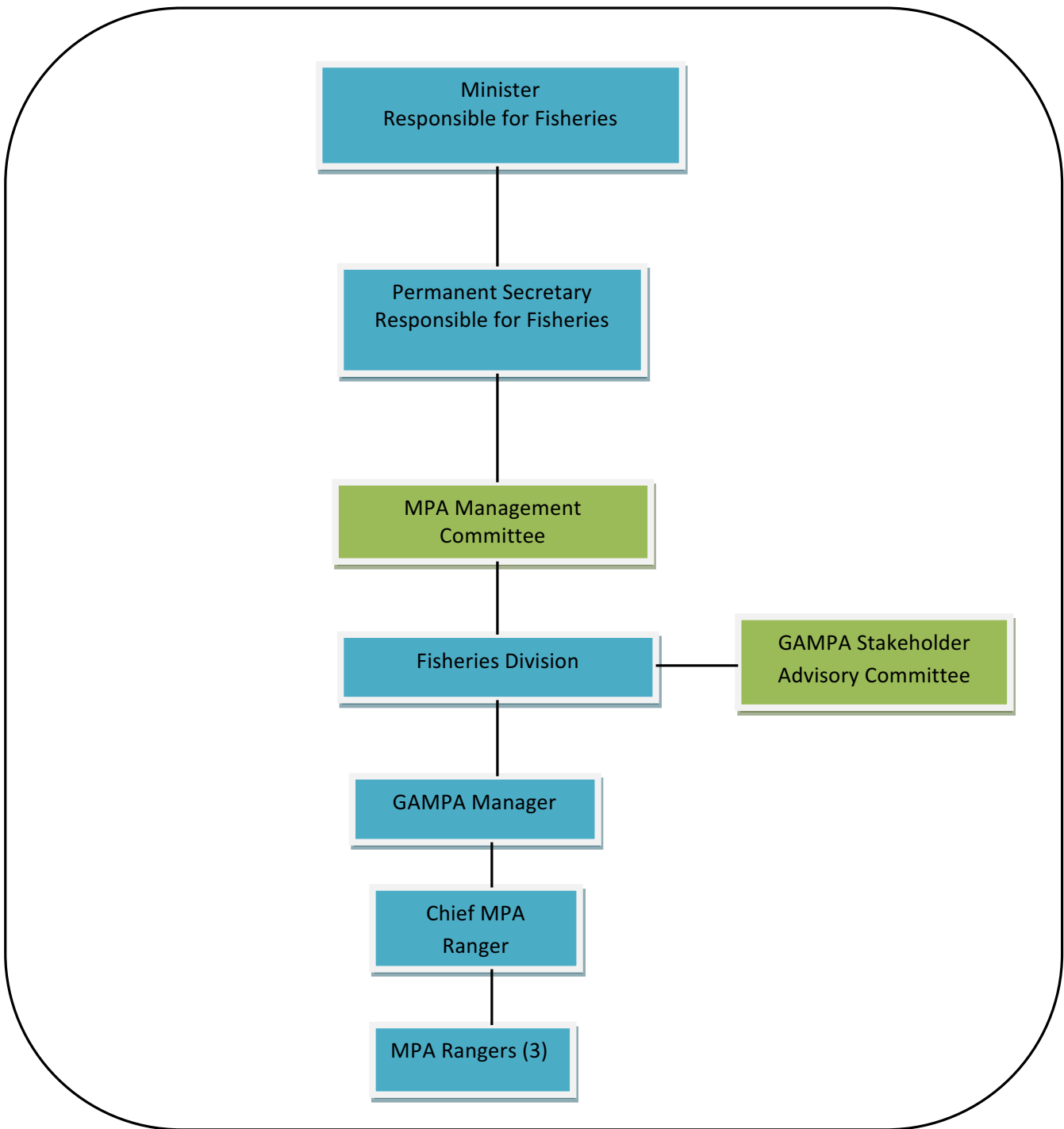
Currently, a Marine Biologist, Park Manager, Rangers and other support staff under the MPA Unit of the Fisheries Division conduct management activities in MPAs in Grenada. The GAMPA will be managed under a similar arrangement and will need its own MPA Manager (who may also have responsibility for other MPAs) and at least four (eight would be ideal) MPA Rangers for the implementation of the management plan. The role of the MPA Rangers will be primarily surveillance and enforcement, but will assist in maintenance of MPA infrastructure and equipment, awareness and education, and scientific monitoring and research.

The GAMPA Stakeholder Advisory Committee was established in January 2016 to serve as the primary consultative body for the GAMPA. It draws from about 15 stakeholder organizations including academic institutions, community interest groups and local community to facilitate the development and implementation of the Management Plan for the GAMPA (Table 3). The GAMPA Advisory Committee will contribute to the planning of the work plan, budgets and timeline; however the direct responsibility for implementation of the work plan will be that of the Fisheries Division through the GAMPA Manager. The organisational chart for the GAMPA is shown in Figure 9.



	<b>INSTITUTION</b>	<b>REPRESENTATIVE</b>
1	St George's University	Academic Staff
2	Fisheries Division	Fisheries Extension Officer
3	Fisheries Division	MPA Manager
4	Fisheries Division	National MPA Coordinator
5	Fishers operating in the Grand Anse area	Line Fisher
6	Fishers operating in the Grand Anse area	Spear Fisher
7	Fishers operating in the Grand Anse area	Net Fisher
8	Grenada Coast Guard	Representative
9	Grenada Hotel & Tourism Association	Executive Member
10	Grenada Ports Authority	Port Manager
11	Grenada SCUBA Divers Association	Executive Member
12	Physical Planning Unit	Senior Officer
13	Grenada Tourism Authority	Nautical Development Manager
14	Marine & Yachting Association of Grenada	Executive Member
15	Ministry of Tourism	Senior Staff
16	Water Taxi Association	Executive Member
17	Day Charters Association	Executive Member
15	Grand Anse Community	Group Representative
16	NAWASA	Senior Staff

Table 3. List of Members of the GAMPA Stakeholder Advisory Committee.



**Figure 9.** Proposed Organisational Chart for the GAMPA

## Training

The GAMPA management staff should have access to in-house training opportunities and relevant overseas training courses, however, to ensure that such training can be utilised in management activities, the process of learning has to be encouraged. Learning requires reinforcement of a message or action. Learning is hampered by the manner in which the message or action is communicated to an individual, that individual's ability to understand, and his/her acceptance or rejection of the information. Once the information is accepted it has to be internalised by the individual and related to some interest or activity that the individual deems useful, important or worth knowing. A mechanism needs to be developed in-house for this process of learning, which at this time, could be through the engagement of a short term Consultants to provide the training. This Trainer will be responsible for development of materials and implementation of activities to reinforce the training to which staff has been exposed. Key areas in which staff proficiency will be required include:

1. Report writing
2. Work planning
3. Coastal ecology
4. Species/habitat identification and description
5. Standard operating practice for surveillance and enforcement
6. Scientific monitoring and assessment
7. Use and maintenance of specialised equipment
8. Communication skills
9. Public relations
10. Interpretation of legislation related to the GAMPA
11. Maintenance of mooring and demarcation buoys.

Off-island training of staff should be encouraged as the need and opportunities arise. Skills and knowledge gained at such training should be formally passed on to other staff members within one month of the participant's return to ensure maximising of benefits to the institution.

## Quality Assurance

The GAMPA Manager and the National MPA Coordinator will have overall responsibility for quality control/assurance of programme activities but may call upon specific technical expertise to assist as needed. Continuous improvement in the performance of staff should be encouraged, especially through periodic examination in detail of how work is currently carried out, and challenging every aspect of it; whether it needs doing at all, and whether it is done in the right way, at the right time and by the right people.

The adoption of a quality management system is a strategic decision for an organization that can help to improve its overall performance, its ability to consistently provide products and

services that meet customer and applicable statutory and regulatory requirements; and to enhance customer satisfaction. In deciding on the quality management system perhaps the first questions that the MPA manager has to ask are: "Whom do we serve?" and "Whom should we serve?" The GAMPA should be serving at least, the needs of the majority of users of the GAMPA, while ensuring that the marine resources are not adversely impacted and the quality of the visitor experience is not diminished. So, the product will be healthy marine habitats and abundant, diverse species and the service will be the activities (processes) undertaken to keep the marine resources healthy and abundant.

Elements of the International Standard ISO 9001 Quality management system-Requirements (ISO, 2015), should be considered in guiding the quality assurance of the GAMPA operations, especially in the application of its seven quality management principles of:

1. Customer focus
2. Leadership
3. Engagement of people
4. Process approach
5. Improvement
6. Evidence-based decision making, and
7. Relationship management.

One of the key elements of the ISO 9001 standard, relevant to the GAMPA, is that the organization should determine the processes (activities) needed for the quality management system and should:

1. determine the inputs required and the outputs expected from these processes;
2. determine the sequence and interaction of these processes;
3. determine and apply the criteria and methods (including monitoring, measurements and related performance indicators) needed to ensure the effective operation and control of these processes;
4. determine the resources needed for these processes and ensure their availability;
5. assign the responsibilities and authorities for these processes;
6. address the risks and opportunities as determined in accordance with requirements;
7. evaluate these processes and implement any changes needed to ensure that these processes achieve their intended results;
8. improve the processes and the quality management system;
9. maintain documented information to support the operation of its processes;
10. retain documented information to have confidence that the processes are being carried out as planned.

Other elements of the ISO 9001 standard that will be of use to the GAMPA are: the guidance on Support (resources, competence, awareness and communication), Operational Planning and Control, and Performance Evaluation.

## **Budget**

The estimated cost of operation of the GAMPA (in US dollars) is summarised in Table 4. The costs were projected based on previous estimates for MPAs in Grenada developed by staff of the MPAP Unit, Fisheries Division. Potential sources of funding will include subventions from the Government of Grenada, user fees, the Grenada Sustainable Development Trust Fund, the Caribbean Biodiversity Fund, the Caribbean Community Climate Change Centre and donors active in the Eastern Caribbean.

## **Monitoring and Evaluation**

Quarterly work plans should be developed by the staff of the GAMPA. These workplans will contain elements of the management plan that staff think are feasible for implementation, based on the human resource capacity, financial allocations and administrative challenges of the MPA Unit and the GAMPA. Progress on implementation of the management plan should be reviewed quarterly or at least twice per year so that difficulties in execution of activities could be identified and resolved and slippage in timely outputs could be controlled. Progress can be measured by achievement of tangible outputs within a given timeline. The use of indicators of progress can provide an easy means of verifying achievement, linking management activities to outputs. Several indicators are proposed in Table 5 below for each major activity.



KEY ACTIVITIES	2016	2017	2018	2019	2010
<b>Demarcation of Boundaries and Zoning</b>					
1. Assessment of MPA boundaries and mooring zones (including yacht and dive moorings)	\$ 5,000.00	\$ -	\$ -	\$ -	\$ -
2. Procurement of materials for demarcation of yacht and dive moorings	\$ 50,000.00	\$ -	\$ -	\$ -	\$ -
3. Procurement of materials for swimming and power craft exclusion zones	\$ -	\$ 30,000.00	\$ -	\$ -	\$ -
4. Installation of demarcation buoys, dive and yacht moorings	\$ 30,000.00	\$ -	\$ -	\$ -	\$ -
5. Installation of demarcation buoys for swimming and power craft exclusion zones	\$ -	\$ 20,000.00	\$ -	\$ -	\$ -
<b>Surveillance and Enforcement</b>					
6. Acquisition of patrol boat	\$ 40,000.00	\$ -	\$ -	\$ -	\$ -
7. GPS, VHF radio & other supplies for MPA Rangers (including uniforms, etc.)	\$ 10,000.00	\$ 2,000.00	\$ -	\$ 5,000.00	\$ -
8. Daily patrols/Fuel	\$ 10,000.00	\$ 10,000.00	\$ 12,000.00	\$ 12,000.00	\$ 15,000.00
<b>Scientific monitoring and research</b>					
9. Benthic habitat	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00	\$ 45,000.00
10. Fish surveys	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00
11. Water quality	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00

<b>KEY ACTIVITIES</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2010</b>
12. Alien invasive species control	\$ 10,000.00	\$ 10,000.00	\$ 10,000.00	\$ 10,000.00	\$ 10,000.00
<b>Awareness Building and Education</b>					
13. Signage and posters	\$ 20,000.00	\$ 10,000	\$ 10,000.00	\$ -	\$ 10,000.00
14. Seminars/tours/school visits	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00
15. Stakeholders meetings	\$ 5,000.00	\$ 5,000.00	\$ 5,000.00	\$ 8,000.00	\$ 8,000.00
<b>Training</b>					
16. In-house training	\$ 8,000.00	\$ 5,000.00	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00
17. Overseas training	\$ -	\$ 8,000.00	\$ 6,000.00	\$ 6,000.00	\$ 6,000.00
<b>Maintenance</b>					
18. Boat	\$ 8,000.00	\$ 10,000.00	\$ 12,000.00	\$ 15,000.00	\$ 15,000.00
19. Buoys	\$ 10,000.00	\$ 15,000.00	\$ 15,000.00	\$ 20,000.00	\$ 20,000.00
20. Signage	\$ 4,000.00	\$ 4,000.00	\$ 4,000.00	\$ 6,000.00	\$ 6,000.00
<b>Staffing</b>					
21. Park Manager	\$ 25,000.00	\$ 25,000.00	\$ 25,000.00	\$ 30,000.00	\$ 30,000.00
22. MPA Rangers (4 Rangers)	\$ 32,000.00	\$ 32,000.00	\$ 32,000.00	\$ 40,000.00	\$ 40,000.00
<b>Quality assurance</b>					
23. Technical assistance	\$ 10,000.00	\$ 10,000.00	\$ 10,000.00	\$ 15,000.00	\$ -
<b>TOTAL ESTIMATED COST (USD)</b>	<b>\$ 295,000.00</b>	<b>\$ 214,000.00</b>	<b>\$ 163,000.00</b>	<b>\$ 189,000.00</b>	<b>\$ 182,000.00</b>

**Table 4.** Estimated annual cost (in USD) of implementation of the GAMPA Management Plan.

<b>Key Activity</b>	<b>Indicators of Progress</b>
Demarcation of boundaries and zoning	<ol style="list-style-type: none"> <li>1. Mooring assessment report completed</li> <li>2. Number of demarcation buoys purchased</li> <li>3. Number of demarcation buoys installed</li> <li>4. Number of mooring buoys purchased</li> <li>5. Number of mooring buoys installed</li> </ol>
Surveillance and enforcement	<ol style="list-style-type: none"> <li>1. Boat procured</li> <li>2. Number of marine patrols per month</li> <li>3. Number and type of infringement of MPA regulations per month</li> <li>4. Number and type of follow-up action with offenders</li> <li>5. Log entries of MPA Rangers on patrol</li> <li>6. Annual report on surveillance and enforcement</li> </ol>
Scientific monitoring and research	<ol style="list-style-type: none"> <li>1. Number and location of monitoring stations in GAMPA</li> <li>2. Number and type of measurements taken per quarter</li> <li>3. Data analysis reports</li> <li>4. Number of quarterly park user surveys conducted</li> <li>5. Number and type of research activities initiated</li> <li>6. Recommendations for management interventions prepared</li> <li>7. Annual report on monitoring and research</li> </ol>
Awareness building/education	<ol style="list-style-type: none"> <li>1. Programme of activities for priority groups developed</li> <li>2. Number of different types of awareness materials prepared</li> <li>3. Number of awareness events planned</li> <li>4. Number of awareness events executed</li> <li>5. Annual report on awareness and education</li> <li>6. Evaluation of effectiveness completed</li> <li>7. Redesign of future activities (if needed)</li> </ol>
Training	<ol style="list-style-type: none"> <li>1. Number and type of in-house learning undertaken</li> <li>2. Number and type of overseas training activities undertaken</li> <li>3. Annual report on training and use of such training</li> </ol>
Maintenance	<ol style="list-style-type: none"> <li>1. Insurance paid for boat</li> <li>2. Maintenance schedule for boat developed utilized and recorded in maintenance log</li> <li>3. Maintenance log for mooring buoys and demarcation buoys records periodic activities</li> </ol>
Quality assurance	<ol style="list-style-type: none"> <li>1. Technical assistance obtained for developing quality management system</li> <li>2. Quality management system developed and approved</li> <li>3. Quality management procedures documented and used by staff</li> </ol>

**Table 5.** Indicators of progress for key management activities in the GAMPA.

An annual evaluation of the implementation on the Management Plan including its effectiveness should be conducting using commonly available toolkits such as the World Bank's Management Effectiveness Tracking Tool or the IUCN's Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness (How is Your MPA Doing?). At the end of the 5-year period of this management plan, it is recommended that an independent evaluation be undertaken to determine the extent to which the objectives were achieved, challenges that impacted on the implementation of the plan, approached used to overcome or mitigate those challenges, innovative management approaches, emerging issues, recommendations and lessons that should be learnt. This evaluation will inform a new management plan for the next 5-year cycle.

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