Task 3b Report
DRAFT Environmental Assessment for San Souci

Feasibility Study & Environmental Assessment for Georgetown Coastal Defence

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Submitted to:

Ministry of Finance and Economic Planning
Central Planning Division
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by

SMITH WARNER INTERNATIONAL
COASTAL ENVIRONMENT

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TASK 3b REPORT

DRAFT Environmental Assessment

San Souci

A Feasibility Study and Environmental Assessment for Georgetown Coastal Defense

SAN SOUCI

St. Vincent and the Grenadines

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EXECUTIVE SUMMARY

The consulting team from Environmental Solutions Limited has been working closely with coastal engineers from Smith Warner International Limited on the project: *Regional Disaster Vulnerability Reduction Project: Georgetown Sea Defense - Coastal Zone Investigations and Feasibility Studies*, in St. Vincent and the Grenadines.

This report represents an extension to the Task 3 Environmental Assessment report required by the project Terms of Reference. The main report for Task 3 covered an area of shoreline approximately 2 km long, between the headlands of Georgetown and Black Point. This report covers the San Souci area, south of Georgetown, with shoreline length of approximately ½ km. The project is required to address shoreline erosion at San Souci, which if allowed to continue, would put a number of commercial businesses, housing and the Windward Highway at risk. To mitigate this, Smith Warner International Limited have proposed the construction of an armour stone revetment along the shoreline.

This report assesses the environmental conditions in the project area; assesses the impacts of the proposed engineering solution on the environment and community, and identifies measures by which these impacts may be mitigated.

The assessment showed no ecologically significant species in the project area. The measured physical, chemical and biological water quality parameters are within the acceptable range for the ocean sample. However, the biological parameters for the San Souci River sample reflected contamination from faecal matter. It is likely that the proximity of the river to a settlement that has soakaways and nearby animal farms could be the reason for this result. This matter is not within the scope of this project although critical from a public health standpoint and should be examined in the future. The flow of the river is minimal and dasheen planted in the river bed appears to reduce the flow under low rainfall conditions.

The working population relies on a range of job types for their livelihood. These include crop and animal farming, and a number of shops. The socio-economic survey results reflect that 44% of survey respondents were unemployed. Some respondents were interested in any suitable and available employment during construction of the coastal defence works.

The proposed revetment in the construction and operation phase is likely to impact the community of San Souci in a number of ways. These along with the respective general mitigation measures, where appropriate, are outlined in Table 1 below:

Table 1: Impacts from Proposed Development at San Souci

Potential Impacts	Nature	Duration	Mitigation
Construction Phase			
Residents may likely experience some discomfort from potential respiratory and hearing health risk due to dust, noise and traffic nuisances related to construction activities, as well as, the transport and storage of stockpile of fine material in particular.	Negative	Short term	Appropriate monitoring for particulate matter (PM10), the appropriate covering of trucks and stockpiles of fine material as well as the proper maintenance of trucks should help mitigate these negative impacts. Trucks should travel during designated hours, should not be overloaded and drivers should be qualified and follow appropriate signage.
Poor solid waste disposal, hazardous waste, and sewage management will be a public health risk to the residents within the community if the appropriate facilities are not provided to mitigate such impacts.	Negative	Short term	Solid waste receptacles, hazardous waste clean-up and disposal procedures and equipment, and temporary sanitary facilities should be provided on site.
Workers will be at risk during construction if not provided with the appropriate protective gear and training is not provided.	Negative	Short term	Person protective equipment (PPE) for workers, training and appropriate signage on site are crucial during construction.
The construction site will be a hazard to persons who may loiter in that location	Negative	Short term	Appropriate signage needs to be put in place to prevent unwanted accidents.
Damage and loss prior to the completion of construction may be likely form coastal wave action and the passing of tropical systems during construction	Negative	Short term	To mitigate against this, the construction activities is best scheduled outside of the typical June to November hurricane season. Appropriate site drainage and emergency procedures should be put in place in the event that this becomes a threat.
Employment of persons (largely skilled)	Positive	Long term	Not applicable
Operation phase			
Residences, commercial activity located along the coastline would be protected from coastal erosion with structures expected to withstand a 150 year event.	Positive	Long term	Not applicable
The revetment will result in the protection of the Windward Highway.	Positive	Long term	Not applicable

1 INTRODUCTION

1.1 Purpose

The environmental consulting team from Environmental Solutions Limited has been working closely with the coastal engineers on the project: *Regional Disaster Vulnerability Reduction Project: Georgetown Sea Defense - Coastal Zone Investigations and Feasibility Studies*, in St Vincent and the Grenadines.

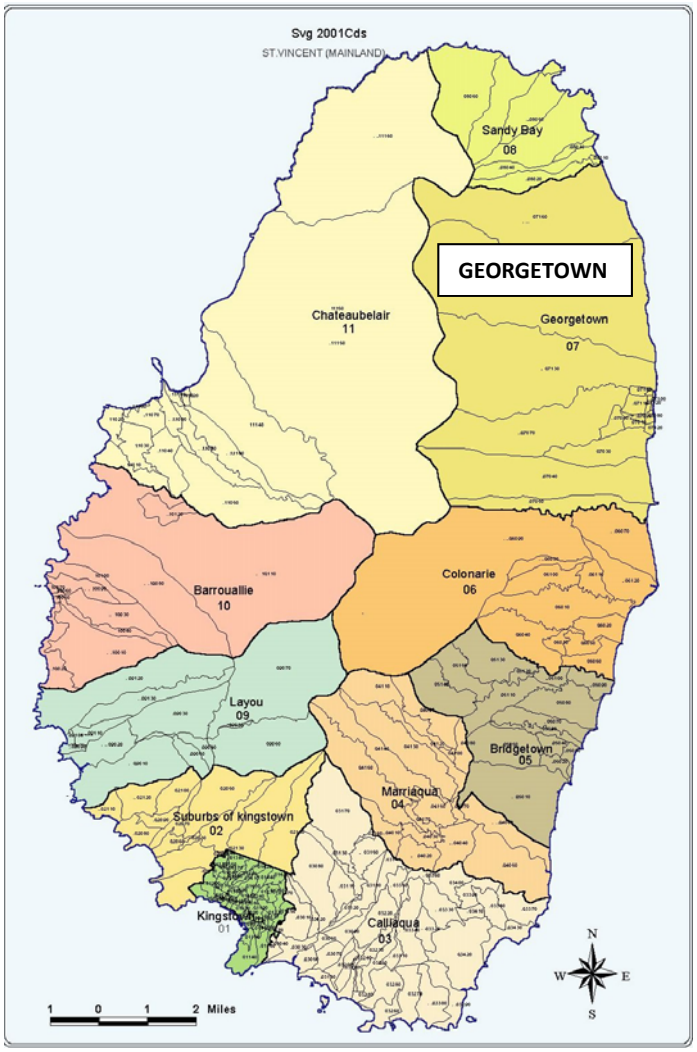

Figure 1.1: Census Districts in Saint Vincent

This report represents an extension to the Task 3a Environmental Assessment report required by the project Terms of Reference. The main report for Task 3a covered an area of shoreline approximately 2 km long, between the headlands of Georgetown and Black Point. This Environmental Impact Assessment (EIA) report covers the San Souci area, which is approximately 6-7 km south of Georgetown proper, see Figure 1.2. The sphere of influence extends to the residents in the community, based on the potential impacts outlined in Section 7. The report outlines the ecological assessment, the physical assessment including water quality, an assessment of the socio economic setting, a policy and legislative review

relevant to the proposed development and an impact assessment. This EIA will be presented in a public consultation as required by the terms of reference along with the other Task 3a EIA Report for the Georgetown study area.

Figure 1.2: San Souci Project Area

2 METHODOLOGY

A site visit to the San Souci project area was conducted on June 16, 2015. The ecological, physical and socioeconomic setting of the project area was assessed. As part of this assessment, water quality samples were collected at three points within the project area. The physical, ecological and socio-economic setting of the community was examined.

Ecological

The general environmental setting in the project area was noted during the site visit. Overall land use was identified. The project area was walked and key floral and faunal species were identified along the beach and inland of the beach for approximately 100 metres. The Consultants also determined the status of the flora and fauna in terms of their presence and health, and identified the existing communities.

Particular flora and fauna of interest were:

- Turtles and turtle nesting sites
- Avifauna
- The presence or absence of mangroves

- Benthic species including: marine algae, sessile and burrowing invertebrates, etc.
- Fish life

Water Quality Analysis

Water quality samples were collected on June 16, 2015 at the areas illustrated in Figure 2.1 below. Sampling was undertaken in accordance with US Environmental Protection Agency standard sampling guidelines for water. Sample Point 1 and 2 were marine and 3 was freshwater taken near the mouth of the San Souci River. The location and description of the sampling sites are provided in Table 2.1 below.

Figure 2.1: Location of Water Quality Sample Points in San Souci

The sampling sites were located to capture the influence of various land uses, such as, residential and farming, within the project area. It was important to capture baseline conditions of the surface water systems in the area while at the same time determine the nature and extent of existing land use impacts prior to construction activities.

Sampling procedures are guided by a quality assurance (QA) and quality control (QC) plan. Field observations and *in situ* measurements were made with respect to odour, colour, pH, dissolved oxygen, electrical conductivity, salinity and temperature at each site. The sampling event took one day and the samples were packaged and sent to the ISO 17025 Environmental and Food Accredited Quality and Environmental Health Laboratory at Environmental Solutions Ltd in Kingston, Jamaica for analysis using DHL courier services. The Laboratory analyzed the samples on June 17th, 2015. The following parameters were measured:

- pH
- Temperature

- Total Dissolved Oxygen (TDS)
- Total Suspended Solids (TSS)
- Dissolved Oxygen
- Total Coliform
- Faecal Coliform
- Enterococci
- Nitrates
- Marine Nitrates
- Phosphates
- Turbidity
- Manganese
- Copper

Socio-economic Analysis

A socio-economic survey was administered on June 17th and 18th, 2015 to capture a sample of the views of residents within the project area with respect to the project. A total of 39 questionnaires were completed and tallied. Respondents were made of up persons within the community namely: residents, business persons, students, and other passerbys that were interviewed individually. Respondents were asked a number of questions to capture public opinion on the project, livelihoods and employment within the area, threats faced by the community, land use, heritage features and community growth. The data have been analyzed and incorporated into the assessment below. Observations were also made to validate responses.

In addition to the survey, informal group interviews were held with longstanding residents of the community, which included farmers. This interview process was used to introduce the project to the residents as well as to gather anecdotal information about historical happenings within the area.

Policy and Legislative Review

The relevant policy and legislation are the same similar to that reviewed for the Georgetown area, with the exception of a few. This is presented in Chapter 5 below.

3 EXISTING ENVIRONMENTAL SETTING

3.1 Ecological

The San Souci coastline is a high energy shoreline showing physical and ecological coastal features similar to that of Georgetown as described in the Task 3a Report of this project.

The coastline is flat and narrow between the hillsides rising up to 100 metres or more in height and the shoreline. Hillside vegetation within the project area is largely secondary, including, fruit trees such as coconut, breadfruit and farming crops such as bananas were observed. In many cases, particularly where the cemetery is located, the hillside is lined only with grass (Figure 3.1).

Figure 3.1: The Community of San Souci

The main windward coast roadway separates the beachfront from a very narrow coastal plain, with most of the residential housing in San Souci extending on the landward side of the highway with very few small commercial entities.

Hillsides drain in a general west/east direction towards the sea. One river/stream of note in the project area is the San Souci River. The source of this river only rises as a spring 500m from the coastline and discharges to the southern end of the San Souci beach (Figure 3.2).

Dasheen is planted along the length of much of the river, closer to its source. The dumping of garbage is evident in the river as it runs behinds residential housing and towards the coast. Natural river fauna also appears sparse. Natural river vegetation appears in many places to have been replaced through planning of crops, particularly dasheen.

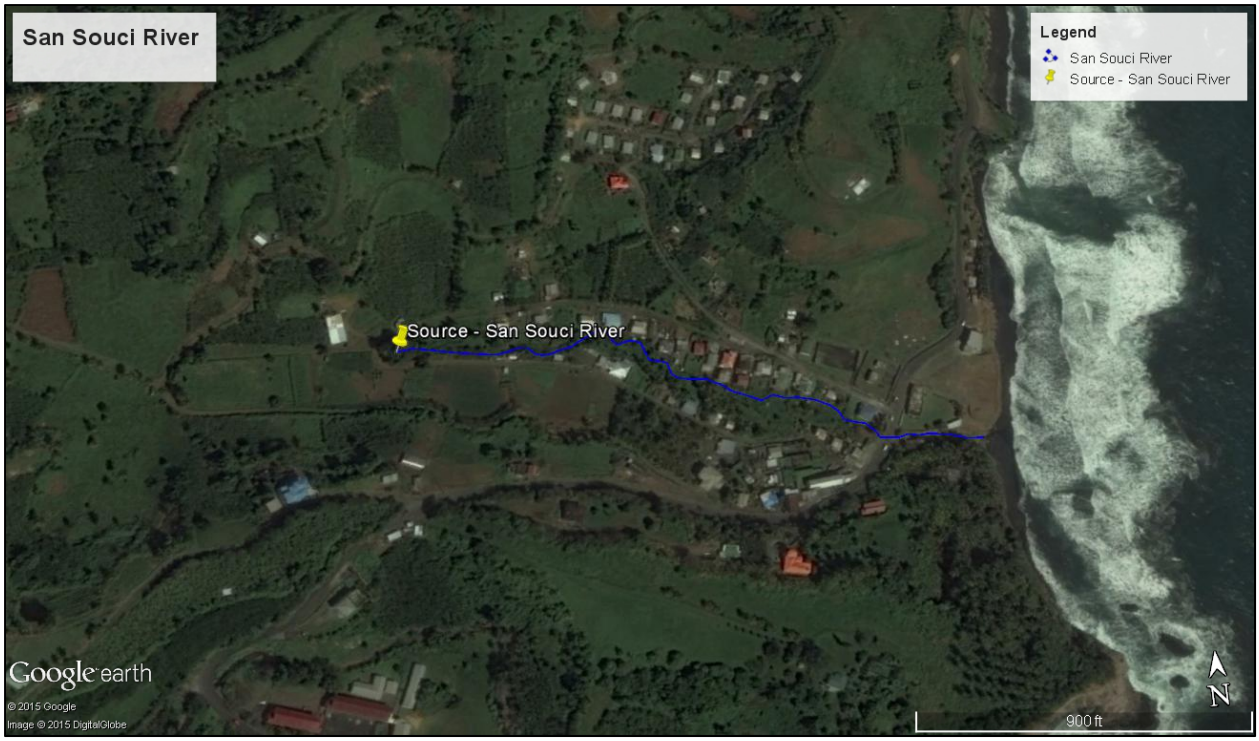

Figure 3.2: San Souci River (Source: Google Maps 2015)

The San Souci coastal project area is characterised by high energy waves with multiple breaker lines that pound the beach frequently. Typical of high energy beach environments, offshore benthic species are very sparse with loose unstable sands. The beach at San Souci is comprised largely of fine to coarse black volcanic sands and pebbles.

Shoreline vegetation consists of grasses (*Sporobolus*), creeping succulents (*Sesuvium* and *Batis*), and sea grapes (*Coccoloba uvifera*). The ghost crab (Ocypode) and fiddler crab (Uca) find some protection from the high energy swash in the lee of such debris. During the site visit there were substantial layers of Sargassum on the San Souci beach, which could smother the natural beach fauna. The wash up of Sargassum was identified as a major issue along much of the eastern (Atlantic) coastline of St. Vincent and the Grenadines (SVG) (Figure 3.3).

Figure 3.3: Sargussum on the beach at San Souci

The land behind the backshore at San Souci is being eroded. This area is largely used as a parking lot which borders the Windward main road. Attempts were made in 2014 to create rock berms behind the backshore to reduce erosion as illustrated in Figure 3.4.

Figure 3.4: Creation of berms to reduce erosion

3.2 Physical - Coastal Water Quality Analysis

Water quality analyses were conducted along the coastline at San Souci, two marine samples and one river sample as already illustrated above in Figure 2.1.

Sample 1, which was collected along the coastline north of the river outfall, showed no unusual physical, chemical or microbiological features based on the parameters analysed (Table 3.1). Sample 2 was taken in the sea at the point where the river drains and sample 3 was taken in the San Souci River. The physical and chemical parameters for Samples 2 and 3 are within acceptable ranges, however, the bacterial parameters with the exception of enterococci are outside the ambient standard limit for Sample 2. Elevated levels of all bacterial parameters for Sample 3 were detected (Figure 3.2).

Table 3.1: Water Quality Results for Marine Samples

PARAMETERS	TEST METHOD	SAMPLE		NRCA/USEPA AMBIENT MARINE WATER QUALITY STANDARDS
		SS 1	SS 2	
Total Suspended Solids (mg/L)	SM-2540D	3.0	9.7	-
Nitrate (mg NO_3/L)	H-8192	-	-	-
Nitrate as Nitrogen (mg NO_3-N/L)		<0.01	<0.01	-
Phosphate (mg PO_4^{3-}/L)	H-8048	<0.02	0.02	0.001-0.003
Turbidity (mg/L)	EPA 180.1	0.80	2.94	-

PARAMETERS	TEST METHOD	SAMPLE		NRCA/USEPA AMBIENT MARINE WATER QUALITY STANDARDS
		SS 1	SS 2	
Manganese[a] (µg/L)	F-AAS	15	17	-
Copper[a] (µg/L)	F-AAS	21	34	-
Total Coliform (MPN/100ml)	SM-9222	17	1,600	**2.0 – 256**
Faecal Coliform (MPN/100ml)	SM-9222	6.8	1,600	**<2 – 13**
Enterococci[a] (MPN/100ml)	SM-9230C	2	<1.8	*

***Grey shaded parameters are ISO/IEC 17025 accredited**

[a]Parameter was subcontracted

*** The USEPA geometric mean marine water is 35 CFU /100ml**

Legend

BG – Brilliant Green Bile Broth
DS LTB – Double Strength Lauryl Tryptose Broth
EC – *E. coli* Media
RED – Parameter Non-compliant
SM – Standard Methods for the Examination of Water and Wastewater 22nd Edition
SS LTB – Single Strength Lauryl Tryptose Broth

Table 3.2: Water Quality Results for Freshwater Samples

PARAMETERS	TEST METHOD	SAMPLE	NRCA AMBIENT FRESH WATER QUALITY STANDARDS
		SS 3	
Total Suspended Solids (mg/L)	SM-2540D	13.0	-
Nitrate (mg NO_3/L)	H-8192	0.18	**0.01 - 7.5**
Nitrate as Nitrogen (mg NO_3-N/L)		-	-
Phosphate (mg PO_4^{3-}/L)	H-8048	0.84	**0.01-0.8**
Turbidity (mg/L)	EPA 180.1	7.46	-
Manganese[a] (µg/L)	F-AAS	15	-
Copper[a] (µg/L)	F-AAS	<10	-
Total Coliform (MPN/100ml)	SM-9222	>1,600	-
Faecal Coliform (MPN/100ml)	SM-9222	>1,600	-
Enterococci[a] (MPN/100ml)	SM-9230C	>1,600	*

***Grey shaded parameters are ISO/IEC 17025 accredited**

[a]Parameter was subcontracted

***The USEPA geometric mean ambient water is 33 CFU /100ml**

Legend

BG	–	Brilliant Green Bile Broth
DS LTB	–	Double Strength Lauryl Tryptose Broth
EC	–	*E. coli* Media
RED	–	Parameter Non-compliant
SM	–	Standard Methods for the Examination of Water and Wastewater 22nd Edition
SS LTB	–	Single Strength Lauryl Tryptose Broth

The bacterial (faecal) contamination of the river sample may be due to the river traversing human settlements, which largely utilize soakaways as their key method of sewage disposal, above the sample. The planting of dasheen and any fertilizer utilised and evidence of garbage in the river, as well as the presence of animal farming (pigs and goats in particular) near the banks of the river are consistent with such a result. Figure 3.5 illustrates.

Figure 3.5: San Souci River

3.3 Socioeconomic

3.3.1 Population and Demographics

San Souci falls within the Georgetown Census District which has a population of 6,585 persons in the 2011 census. This is a decline of 5.4 percent when compared to the census period of 2001. While not a significant decline, it could be attributed to decline due to deaths and migration as a result of limited employment opportunities in the area.

The age cohort of those interviewed is reflective of a generally youthful population with 63% of respondents being less than 39 years in age (Figure 3.6).

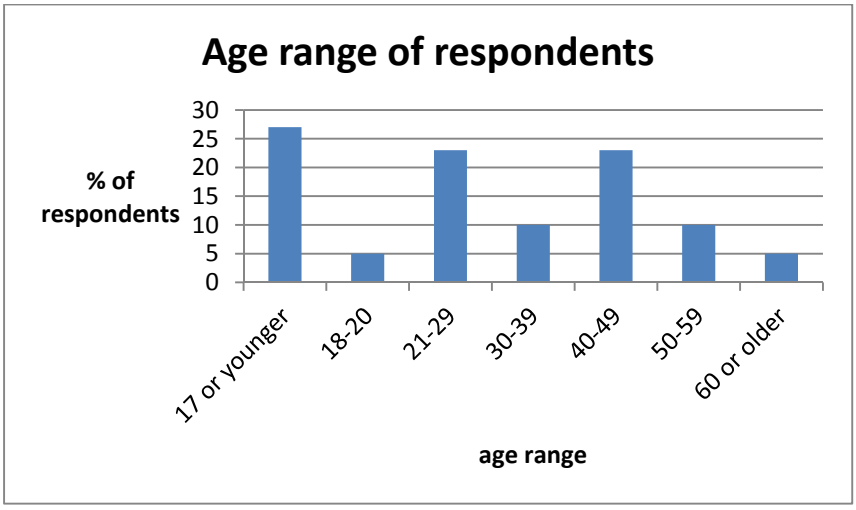

Figure 3.6: Age Range of Respondents

The 2011 census data revealed that the population of Georgetown was 51% male and 49% females. In our survey, we attempted to have a gender balance which was relatively achieved as 56% females and 44% males responded to the survey (Figure 3.7).

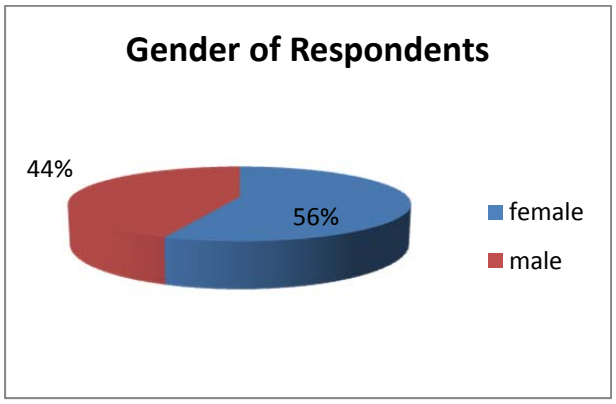

Figure 3.7: Gender of Respondents

3.3.2 Settlement and Housing

San Souci is a small community along the narrow northeastern coast just south of Georgetown which is the second largest town in St. Vincent and the Grenadines.

The housing is largely of concrete structures with hip, gabled or flat roofing in most cases. Houses are sturdy and largely of good aesthetic and quality. Figure 3.8 illustrates.

Figure 3.8: Housing in San Souci

3.3.3 Service Provision

The project area receives piped water from the local provider, the Central Water and Sewage Authority. The community is powered by electricity from the St. Vincent Electricity Services (VINLEC) and the two main telecommunication providers Digicel and Lime are active in the area.

San Souci is accessed by the paved Windward Highway and one main side road that provide access to residential housing and farming activities.

The Solid Waste Management Unit reports in the Country Poverty Assessment 2007/8 that there is 100 percent coverage in terms of garbage collection for St. Vincent and the Grenadines. Residents confirm

regular collection by garbage trucks but observation shows some improper disposal does take place in the San Souci River. It is therefore to be noted that not all waste reaches the disposal system provided by Government.

Local resident's advised that soakaways are widely utilised in the community.

3.3.4 Livelihoods and Employment

Based on the interviews the community is largely reliant on agriculture as an important economic earner. Figure 3.9 illustrates the extent of farming activities in the project area. It was noted on the site visit that several crops were planted, such as: bananas, dasheen, corn, and tomatoes. The farmers interviewed said that they plant whatever they can find and are able to plant. Reaped goods are often sold within the community and sometimes taken to Kingstown for sale. The rearing of goats/sheep, pigs and chickens were also evident in the community.

Figure 3.9: Agricultural Activities in the San Souci Project Area

There are, however, other livelihood activities, which were indicated in the survey responses. Figure 3.10 below illustrates the responses, which show that most of the respondents were involved in the educational sector following this, farmers and shopkeepers are prevalent.

The category "other" represented those persons who are not working, housekeepers, students and police officers.

Fishing is not identified as a livelihood in the study area. Residents say they utilize the beach for swimming, although they recognized that due to ocean conditions it is not the safest environment for recreational swimming.

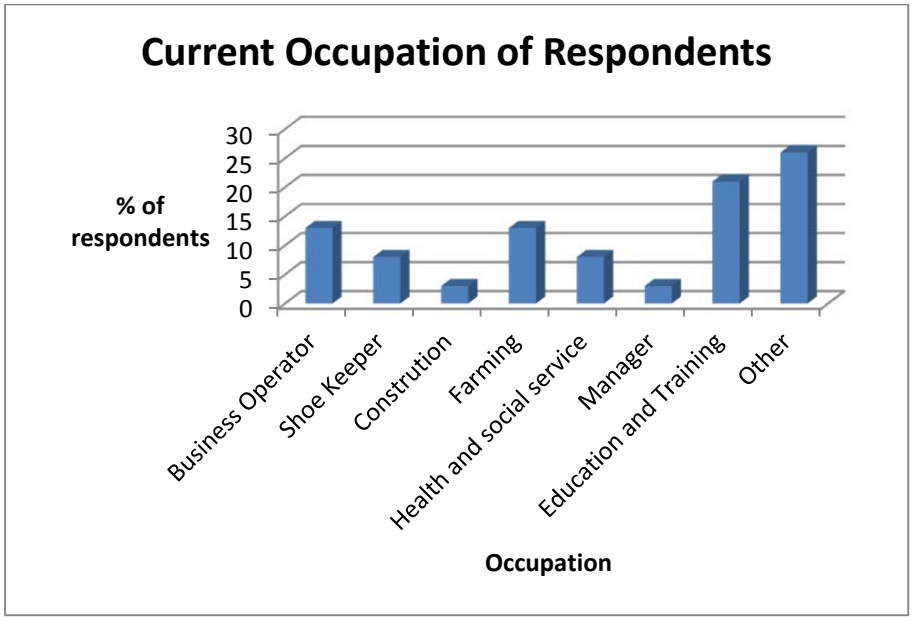

Figure 3.10: Occupation of Respondents

Unemployment within the project area based on the survey results is 44% of respondents. 46% of respondents worked full-time and 13% are part-time workers (Figure 3.11).

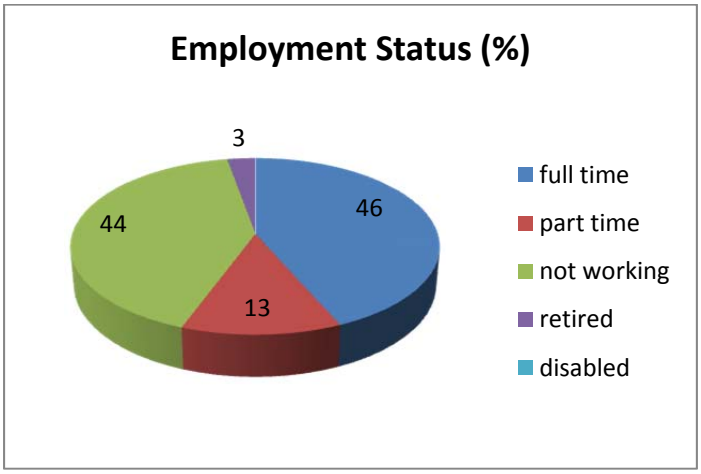

Figure 3.11: Employment Status of Survey Respondents

The Population and Housing Census (2001) indicate that the Georgetown census district for which San Souci is a part, has an unemployment rate of 24.4% which is higher than the national rate of 21.1%

(Table 2.3, 2001 Census data). Both the project survey and the census data reveal a significant challenge with unemployment in the Georgetown and San Souci areas.

Table 3.3: Unemployment Rates in 2001 (Population and Housing Census, 2001)

Census Division	Employment			Unemployed		
	Male	Female	Total	Male	Female	Total
Kingstown	79.3	85.6	82.1	20.7	14.4	17.9
Kingstown Suburbs	76.7	77.3	77.0	23.3	22.7	23
Calliaqua	78.6	84.8	81.2	21.4	15.2	18.8
Marriaqua	82.6	83.5	82.9	17.4	16.5	17.1
Bridgetown	75.7	78.8	76.6	24.3	21.2	23.4
Colonarie	75.7	78.8	76.6	26	25.1	25.7
Georgetown	***73.0***	***81.5***	***75.6***	***27***	***18.5***	***24.4***
Sandy Bay	67.7	81.9	71.0	32.3	18.1	29
Layou	72.8	68.0	71.1	27.2	32	28.9
Barrouallie	78.1	71.6	76.0	21.9	28.4	24.0
Chateaubelair	73.6	73.7	73.6	26.4	26.3	26.4
Northern Grenadines	80.4	88.1	82.9	19.6	11.9	17.1
Southern Grenadines	85.0	89.9	86.8	15.0	10.1	13.2
Total	**77.4**	**81.4**	**78.9**	**22.6**	**18.6**	**21.1**

Approximately 53% of the respondents indicated that they would be interested in employment from the development. Persons are interested in looking for jobs as labourer's during construction, special skilled construction workers as well as the selling of food items.

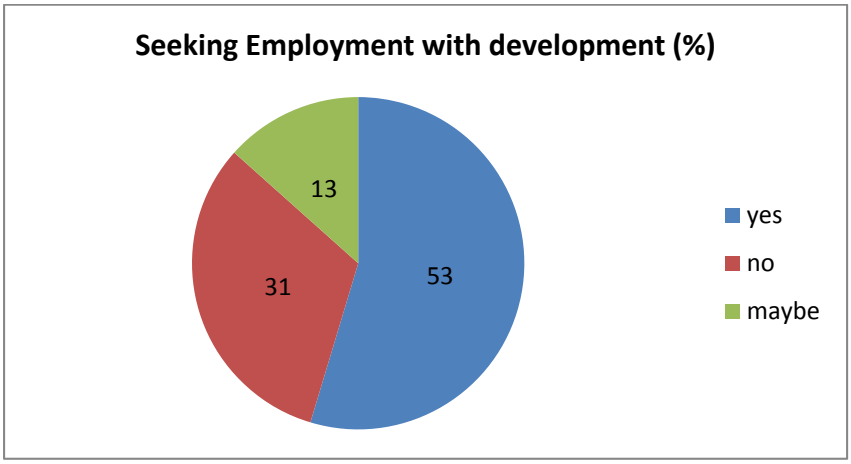

Figure 3.12: Seeking Employment with Development

3.3.5 Land Ownership and Use

The San Souci project area has both privately owned and publicly owned lands. The area is largely residential. The seaward side of the Windward highway that runs through San Souci is of greatest

concern with respect to this project. These are among the facilities already at risk from coastal hazards. In this area, a few dwellings and commercial facilities as well as and open space and the beach are located.

Anecdotal information, along with evidence from the site visit, indicates that erosion is taking place and has led to loss of land in the open parking area behind the beach. Residents also indicate a fear that this land will be lost if left unprotected which will then threaten the Windward highway.

In light of the existing nature of the coastline at San Souci, coastal protection is needed to reduce the impacts likely to be experienced from coastal processes.

4 PUBLIC OPINIONS ON THE PROJECT

Residents are largely welcoming of the coastal protection works along the San Souci coastline. Approximately 84% of the survey respondents fully approve of the project and look forward to the positive benefits that it will bring. Some of the benefits they foresee include:

- The protection of coastal infrastructure and facilities from damage and loss
- The provision of employment for the community
- The maintenance of the beach and surrounding area.

A minority of respondents were hesitant to approve the project because they feared that it will be costly and the project will not go forward. Others felt that the coastal defense cannot stop natural hazards and not much can be done. A few feared that it will result in the removal of sand from the beach and that it may invite unwanted guests in the area and crime and violence.

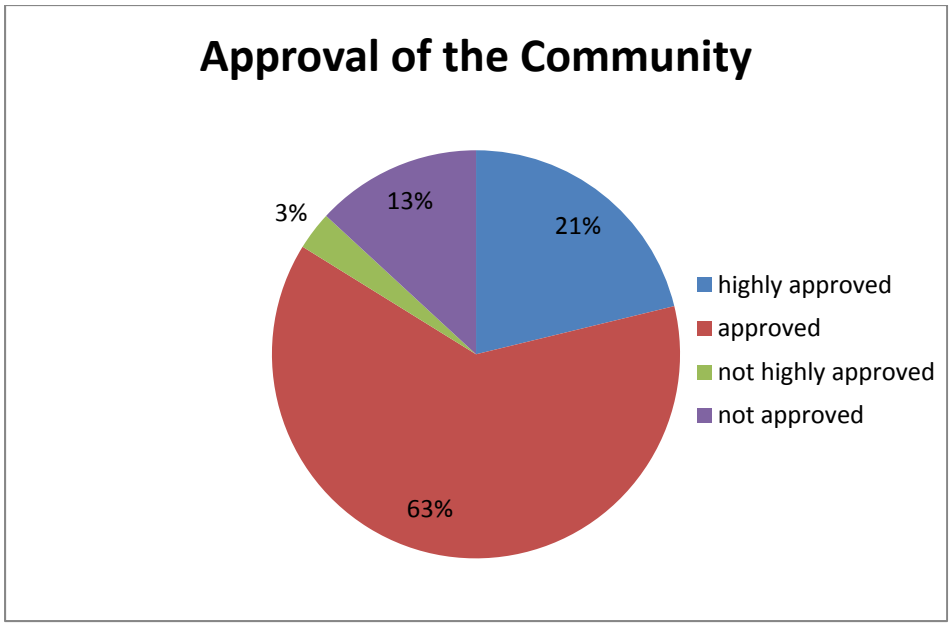

Figure 4.1: Approval of the San Souci Community

5 POLICY AND LEGISLATIVE REVIEW

5.1 National Obligations

The consultants have reviewed thirteen pieces of legislation relevant to this project. It has been noted that there are no housing or land use Acts or Policies. There is also no legislation related to coastal zone management, as well as, land ownership and acquisition associated with the loss or accretion of land by sea. Table 5.1 below outlines briefly the critical activities that relate to these policies and legislation. Appendix III of the Georgetown main report outlines further details of the review conducted.

Table 5.1: Review of Relevant Policy and Legislation

Legislation/Regulation	Comments
Town and Country Planning Act (Physical Planning) No 26 of 2008	Based on the review of policies and legislation, this Town and Country Planning Act (2008) is the only legal document making reference to coastal zone management (CZM) which falls under the purview of the Physical Planning Unit. The Physical Planning Unit is therefore a critical stakeholder in any coastal defense works recommended for the San Souci coastline. The Coastal Zone Management Workshop conducted by the Consultants at the end of the data collection visit for the Task 3a Report was done in October, 2013, in which participants from 11 Government Agencies took part expressed the strong opinion that a CZM Unit would be best established in the Physical Planning Department.
The National Emergency and Disaster Management Act,	It is recognized that the coastal area of San Souci is exposed to erosion impacts from swells, wave action, tropical storms and hurricanes. Any

Legislation/Regulation	Comments
2006	proposed engineering works should be acceptable to NEMO who would be a major stakeholder for any prevention or mitigation measures for disaster risk reduction in SVG.
St. Vincent and the Grenadines National Disaster Plan, 2005	Any mitigation measure to be considered for San Souci in the form of coastal defence would need to be acceptable to NEMO.
Central Water and Sewerage Act	The Act restricts the pollution of any water by activities. It is important that water quality is monitored during the construction of any coastal works at San Souci so that undue pollution of coastal waters can be avoided.
Draft Environmental Management Act 2009	This environmental impact assessment conducted for San Souci coastal defense works will inform any decision that the Department of the Environment in SVG will need to make.
Draft Environmental Management (Pollution) Regulations, 2009	This environmental impact assessment conducted for San Souci coastal defense works will inform any decisions that the Department of the Environment in SVG will need to make with respect to the prevention and mitigation of pollution of the environment at San Souci during construction.
Draft Environmental Impact Assessment Regulations, 2009	Once this draft regulation is enacted, all projects will be required to follow the guidelines presented for conducting an EIA in SVG. Although this regulation is still a draft, the Consultants have reviewed these criteria and found them to be standard or similar to EIAs in other jurisdictions.
Environmental Health Services Act, No 34 of 1996	Part III of the Act states that the Chief Environmental Health Officer may require that an application be submitted for certificate of approval for activities that may cause discharge, contamination or pollution of any part of the environment. Part III of the Act restricts persons from dumping or otherwise depositing or leaving any refuse in any public or open space. Suitable solid waste management during construction of any defense structures will be required.
Beach Protection Act, 1987	The Authority may grant permission for the removal of material providing specific conditions that are deemed fit to impose. Any dredging of sand that may be proposed under the project would need to be approved by the respective Government Agency.
Maritime Areas Act, 1983	Transportation of material and activities to be undertaken for any proposed engineering works should take into consideration pollution prevention and mitigation measures to protect coastal waters and marine life.
Waste Management Act, 2000	The Act outlines the conditions/ regulations under which Licenses and Permits may be granted. The Act also classifies and lists a number of hazardous wastes and the entities from which they may originate. Solid waste management will be taken into consideration during the construction phase of the project.

5.2 International Obligations

International law is much different from domestic law. Domestic law describes the rights and obligations of persons and their relationship to each other and the government. International laws set out the powers and obligations of nations not individuals.

Nations will sometimes sign non-binding statements of policy or principle. These may serve as a step towards future treaties. Nevertheless, both binding and non-binding international law may be felt in domestic situations. St. Vincent and the Grenadines have signed on to a number of such international environment related agreements; some relevant ones are outlined below.

1. **United Nations Framework Convention on Climate Change (UNFCCC)**

The main objective of this Convention is to stabilize the level of greenhouse gases in the atmosphere, to avoid triggering rapid climate change. By signing it each party pledge to work for the reduction of greenhouse gas (GHG) emissions, the protection of greenhouse gas sinks and reservoirs, and the mitigation of any effects of climate change. This project does not directly address GHG emissions but addresses climate change impacts. The proposed works have been design with the consideration that the coastline is affected by climate change impacts including seas level rise and increased intensity of tropical cyclone events causing storm surges.

2. **Kyoto Protocol**

The Kyoto Protocol represents the first binding reduction target under the United Nations Framework Convention on Climate Change (UNFCCC). Under the Protocol, developed countries (Annex I Parties) agreed to reduce their emissions of greenhouse gases (GHGs) by at least 5% below 1990 levels (Art. 3.2). Individually, each Annex I Party agreed to a specific reduction target to achieve the overall goal.

Obligations of Annex I Parties to developing countries are set out in Articles 2.3, 3.14, 10, and 11. Article 2.3, in combination with Article 3.14 requires Annex I countries to strive to minimize adverse effects on other Parties. This includes the issue of adaptation to the adverse effects of climate change such as sea level rise and extreme weather events. Currently, this project already feeling the impacts of climate change aims to mitigate against the coastal damage climate change causes.

3. **The Convention on Biological Diversity**

The conservation of ecosystems is also promoted through general obligations for the identification and monitoring of important components of biological diversity (Article 7). Parties are required to identify processes and categories of activities which may have significant adverse impacts on the conservation and sustainable use of biological diversity. Environmental impact assessment obligations are set out in Article 14. This report represents the EIA being done for the proposed works to ensure the impacts from the proposed works are minimal and if any, reversible.

4. **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their disposal**

This convention is the response of the international community to the problems caused by the annual world-wide production of hundreds of millions of tons of waste. These wastes are hazardous to people or the environment because they are toxic, poisonous, explosive, corrosive, flammable, eco-toxic, or infectious.

This global environmental treaty strictly regulates the transboundary movements of hazardous wastes and provides obligations to its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner. Recommendations have been made for hazardous waste management during the construction phase of the project.

6 PROPOSED DESIGN

6.1 San Souci Summary Option

The proposed design for San Souci involves the construction of an armour stone revetment along the backshore of the San Souci beach (Figure 6.1). This option was identified in the Task 2 Report done by Smith Warner International Limited (SWIL) as the feasible solution for protecting the coastline from high wave energy and erosion. The option may result in loss of sand over time from the beach; however, no fishing and minimal recreational swimming have been reported by the residents in the area.

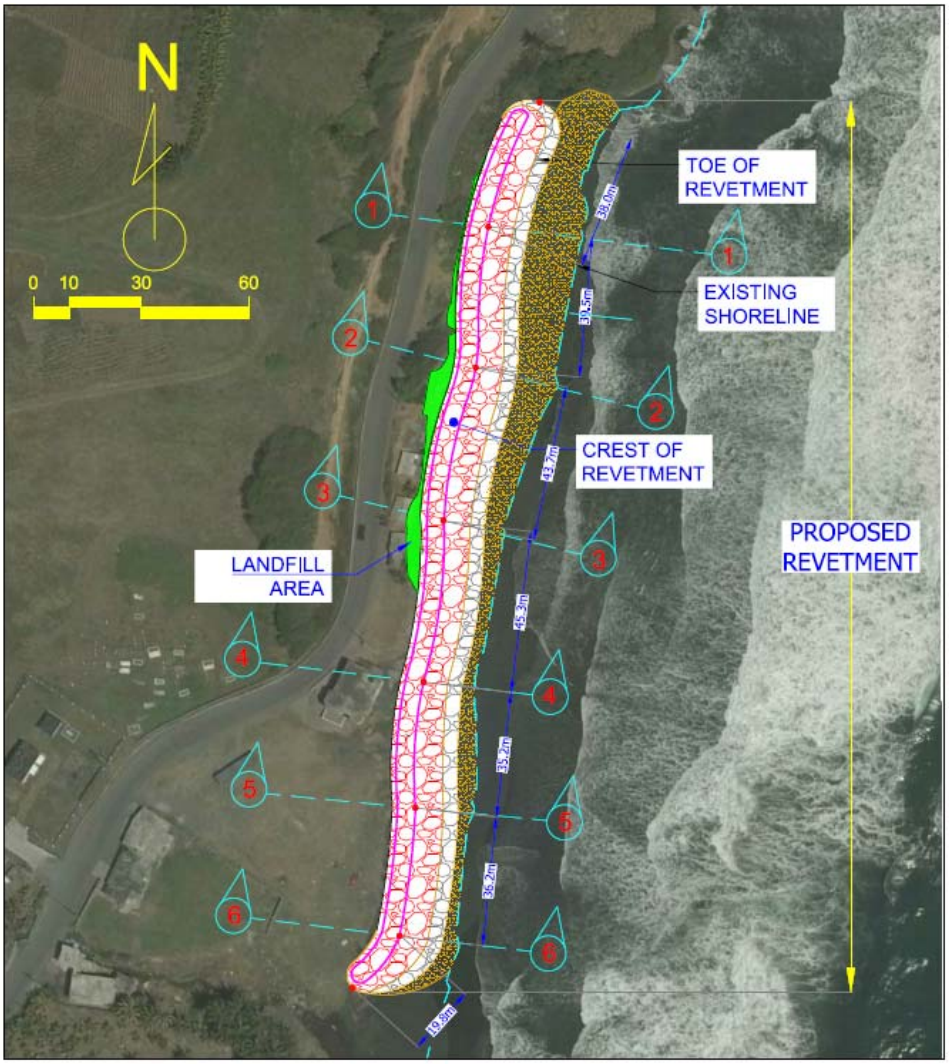

Figure 6.1: Proposed Revetment for San Souci Coastline

7 IMPACT ASSESSMENT AND MITIGATION

Assessment of the potential impacts of construction and operation entails consideration of short duration reversible impacts, long term permanent impacts and those with medium term significance. Impacts may be positive, negative or benign. Similar to the main Georgetown area, it is important to note that the project may have impacts on the natural as well as built environment, and importantly the project can be affected by environmental processes. The activities during the construction phase are detailed in Section 6 above. An impact matrix is outlined in Table 7.1 below followed by an elaboration on each aspect during the construction and operation phase. The impacts for San Souci are similar to those already expressed for Georgetown in the Task 3a Report. It is important to note that the mitigation measures recommended have been developed based on World Banks' Environmental, Health, and Safety (EHS) Guidelines for air quality, noise level standards and other environmental guidelines as well as World Banks' 4.01 operational policy and bank procedures for Environmental Assessments.

Table 1 also outlines the risk involved with the coastal works proposed. Risk is defined as "a combination of the probability, or frequency of the occurrence of a particular hazard and the magnitude of the adverse effects or harm arising to the quality of human health or the environment" (Royal Society, 1992 In Morris and Therivel, 2001). The level of risk is determined based on the legend below.

Legend

Type of consequence	Description
Very high risk	Environmental aspect/human health irreversibly altered; no recovery. Over 100 km^2 affected in distance
High risk	Environmental aspect/human health altered but not irreversibly; recovery may take as long as 50 years. 50-100 km^2 affected
Moderate risk	Only one component of environmental aspect/human health altered; 10 year recovery period
Low risk	Temporary alteration; effects confined to less than 0.5 km^2; recovery less than 5 years.
Very low risk	Temporary alteration; very localized and minor consequences

Table 7.1: Impact Matrix

Activities	Possible Impacts	Possible Impacts				Risk	Mitigation Measures
		Direction	Duration	Magnitude	Type	Type	
Construction Phase							
Construction of armour revetment	• These works may likely result in fugitive dust emissions and negatively impact ambient air quality in the immediate and surrounding area impacting residents nearby construction works at San Souci. • Potential noise and vibration nuisance to residents nearby construction works at San Souci. • Construction activities will discourage community use of the beach at San Souci.	Negative	Short term	Major	Reversible	High	• Dampening of exposed surfaces during dry periods should be implemented as part of the site activities during construction, particularly for the revetment which will involve. • Signage to residents about construction activities and impeded beach use. • Advise neighbouring properties at least 24 hours in advance of planned noisy activities. • PM10 be monitored in µg/m3 using the World Health Organisation (WHO's ambient air quality guidelines during the construction period.

Activities	Possible Impacts	Possible Impacts				Risk	Mitigation Measures
		Direction	Duration	Magnitude	Type	Type	
Transportation of material - boulders, sand, cement etc. by heavy duty trucks	• Potential for accidents arising from heavy duty vehicles on roads from Rabacca along the Windward highway. • Changes in traffic type and volume are expected to negatively affect traffic flow on the Windward Highway in the vicinity of San Souci when heavy vehicles are entering and leaving the construction site for deliveries for materials and equipment. • Potential dust nuisance arising from transporting, loading and unloading light material. • Damage to roads and road furnishings, curbs, bridges culverts and poles. • Removal of structures and creation of temporary roadways for access to the shoreline	Negative	Short term	Moderate	Reversible	High	• Trucking material on site during off-peak periods. • Appropriate signage during construction. • Ensure that trucks are not overloaded to prevent road damage • Ensure that trucks carrying material are properly covered to ensure that material does not litter the road or cause a dust nuisance or damage to pedestrians or housing and business along the truck route. • Ensure that road rules are followed, drivers are qualified, and that trucks are not over the load limit to reduce risk of accidents.

Activities	Possible Impacts	Possible Impacts				Risk	Mitigation Measures
		Direction	Duration	Magnitude	Type	Type	
	• The creation of temporary erosional features and other undesirable earth movements • Personnel accidents and other human vulnerabilities.						
Placement and use of equipment	• Potential dust nuisance to residents nearby construction works at San Souci. • Equipment usage onsite will likely result in high noise levels for an extended period Potential noise nuisance to residents nearby construction works at San Souci.	Negative	Short term	Major	Reversible	High	• Inspect (daily) all vehicles and equipment for potential leakage of fuel, oil, hydraulic fluid or coolant. Any machinery found to be leaking will be repaired or replaced. • Vehicles and equipment used should be serviced to reduce noise levels. • During the construction period the beaches as well as all the construction equipment will be vulnerable to storm surges. As a result, it would be prudent to time the

Activities	Possible Impacts	Possible Impacts				Risk	Mitigation Measures
		Direction	Duration	Magnitude	Type	Type	
							construction activities outside the hurricane season. • Standard operating practices for construction should be adhered to: E.g restricting the time of day that such activities (during work hours). World Bank has a 55 dBa daytime limit and a 45 dBa night-time noise limit for residential areas and a 70 dBA limit for commercial and industrial areas for both day and night time which is the limit used for construction sites (IFC, 2007). • Hazardous materials such as fuels and oils should not be stored near storm water drains and should also be bunded where they are

Activities	Possible Impacts	Possible Impacts				Risk	Mitigation Measures
		Direction	Duration	Magnitude	Type	Type	
							stationed. • Provide appropriate signage and security for all storage of dangerous goods. All incompatible materials will be segregated. • Provide Material Safety Datasheets (MSDS) for dangerous goods used or stored on-site. Personnel will be made aware of the environmental and safety requirements for these hazardous materials. Health and Safety Provisions associated with these should be on-site.
Dredging for construction of breakwaters	• Construction and dredging activities for the Breakwater at will likely negatively impact the coastal waters as such displace recreational activities in both areas.	Negative	Short term	Significant	Reversible	Moderate	• Mechanisms need to be implemented that prevent the removed dredged material from re-entering the water. • Conducting the

Activities	Possible Impacts	Possible Impacts				Risk	Mitigation Measures
		Direction	Duration	Magnitude	Type	Type	
	• Onsite hazard						dredging activities when weather conditions are calm to limit disturbance of bottom sediments. • Using berms around the base of all fine earth material stored on site for construction activities. • Ensure stockpiles are not placed in any drainage channels. • Ensure proper solid waste and public health management practices. • Ensure proper management of waste oils, lubricants from equipment/vehicle service areas. • Implement a spills control plan. • Develop implementation plan to guide construction

Activities	Possible Impacts	Possible Impacts				Risk	Mitigation Measures
		Direction	Duration	Magnitude	Type	Type	
							activities.
Solid waste disposal	• Construction waste material, other domestic waste, dredged material that would be generated on site are to be appropriately disposed. • Poor solid waste disposal pose a health risk.	Negative	Short term	Major	Reversible	Moderate	• Refuse bins should be placed on site to meet the needs of the workforce • Arrange for the collection of solid waste by certified contractors and disposal at an approved site • Any hazardous waste should be separated and stored in areas clearly designated and labelled • Identification of appropriate and approved site for disposal of dredged material. • Open burning of solid wastes will not be conducted as these generate polluting emissions which cannot be controlled effectively.

Activities	Possible Impacts	Possible Impacts				Risk	Mitigation Measures
		Direction	Duration	Magnitude	Type	Type	
							• Garbage storage area will always be kept clean. • If a bin is damaged, the contents will be transferred to another container in good condition. • The waste container will be coated with a waterproofing material to prevent the escape of fluids. • The stored waste should be covered to prevent rain water from flooding the waste and overflow.
Sewage treatment	• Improper sanitary facilities pose a health risk.	Negative	Short term	Major	Reversible	Moderate	• Construction camps and work areas must be adequately equipped with portable chemical toilets. • Portable chemical toilets must be provided, maintained and removed by a

Activities	Possible Impacts	Possible Impacts				Risk	Mitigation Measures
		Direction	Duration	Magnitude	Type	Type	
							certified contractor to mitigate inappropriate disposal.
Worker health and safety	• Accidents and adverse effects on workers may occur on construction sites in San Souci and should be prevented	Positive	Short term	Significant	Reversible	High	• Worker safety should be protected implementing safe site practices. • Wearing of the appropriate protective gear on site should be stipulated and mandatory. • Sanitary practices in regard to providing potable water and the disposal of human waste should be enforced to safeguard worker health. • Construction crews should be provided on-site with the appropriate safety gears such as: hard hats, gloves, safety shoes, reflector vests where appropriate, first response emergency

Activities	Possible Impacts	Possible Impacts				Risk	Mitigation Measures
		Direction	Duration	Magnitude	Type	Type	
							supplies.
Community safety	• Accidents on site or route based on transportation of material or on site construction activities.	Positive	Short term	Major	Reversible	Moderate	• Appropriate caution signs to be erected to restrict access to site during construction. • Warning signs on site outlining risk to prevent unwanted accidents. • Notices to nearby residents and businesses about precautionary measures to take place to prevent unwanted accidents • Ensure trucks are appropriately covered and not overloaded to prevent unwanted material spills which can become a hazard to pedestrians and other road users.
Operation Phase							
Revetment in San Souci	• Protection of Windward Highway at San Souci.	Positive	Long term	Major	Irreversible	No risk	The impacts are positive and mitigation is not essential.

Activities	Possible Impacts	Possible Impacts				Risk	Mitigation Measures
		Direction	Duration	Magnitude	Type	Type	
	• Protection of housing and commercial entities at San Souci						
Revetment in San Souci	• Possible loss of sand on beach overtime	Negative	Long term	Major	Irreversible	Moderate	Mitigation is not essential or economical since the beach is not being used largely for recreational purposes.

CONCLUSION

It is clear from the impact assessment that the negative impacts from the proposed works largely occur during the construction phase of the project cycle. These impacts largely relate to possible air and noise impacting nearby residences and businesses, poor coastal water quality, improper solid waste, improper sewage and hazardous waste disposal, worker health and safety, general site safety, transportation and coastal and physical hazard issues. Mitigation measures have been identified to address all the impacts identified. With these measures in place, the project can be carried out successfully without significant negative impacts to the environment and community.

REFERENCES

APHA (American Public Health Association), AWWA (American Water Works Association), WEF (Water Environment Federation). 2012. *Standard Methods for the Examination of Water and Wastewater 22nd Edition*, Author

IFC (International Finance Corporation), 2007. *Environmental, Health, and Safety (EHS) Guidelines General EHS Guidelines: Environmental*. The World Bank Group

Morris P., Therivel, R., (2001) *Methods of Environmental Impact Assessment, Second Edition*. Spon Press Taylor and Francis Group: London

Smith Warner International Limited. *Task 2 Report Feasibility Study and Environmental Assessment for Georgetown Coastal Defence*

Smith Warner International Limited. *Task 3a Report Environmental Impact Assessment for Georgetown*

United States (US) Food and Drug Administration. 2002. *Bacteriological Analytical Manual, Chapter 4, Enumeration of Escherichia coli and the Coliform Bacteria*. Author

World Bank (2013) *Bank Procedure (BP) 4.01: Environmental Assessment*. Available [Online] Website: http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20064614~menuPK:64701637~pagePK:64709096~piPK:64709108~theSitePK:502184~isCURL:Y,00.html. Retrieved: 11th September 2015

World Bank (2013) *Operational Policy (OP) 4.01: Environmental Assessment*. Available [Online] Website: http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/EXTPOLICIES/EXTOPMANUAL/0,,contentMDK:20064724~menuPK:64701637~pagePK:64709096~piPK:64709108~theSitePK:502184,00.html. Retrieved: 11th September 2015

WHO (World Health Organisation). 2008. *Guidelines for Drinking-water quality, Volume 1*. Author

WHO (World Health Organisation) Ambient Air Quality Guidelines for Particulate Matter (PM).

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1. What is your gender?

- Female
- Male

2. Which category below includes your age?

- 17 or younger
- 18-20
- 21-29
- 30-39
- 40-49
- 50-59
- 60 or older

3. Do you think this project would meet the approval of your community?

- Highly approved
- Approved
- Not highly approved
- Not approved

Why?

4. Please identify any specific fears or reservations that you may have about the Project.

5. Which of the following best describes your employment status?

- Full time
- Part time
- Not working
- Retired
- Disabled

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6. Which of the following best describes your current occupation?

- ○ Fishing
- ○ Business operator
- ○ Shop keeper
- ○ Trader
- ○ Construction
- ○ Farming
- ○ Health and Social Service
- ○ Manager
- ○ Administrative
- ○ Education and Training
- ○ Other (please specify)

7. What threats are faced by the community as a result of coastal hazards?

- ☐ Loss of housing
- ☐ Damage to housing
- ☐ Loss of livelihood
- ☐ Temporary disruption in livelihood
- ☐ Loss of recreational space
- ☐ Loss of critical facilities (electricity, water mains, health, road, emergency, etc.)
- ☐ Disruption in social infrastructure (school, church, community centre)
- ☐ Other (please specify)

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8. What improvement would you like to see in this coastal area?

- [ ] Protection of coastal recreational spaces
- [ ] Protection of coastal road
- [ ] Protection of coastline for housing
- [ ] Protection of coastline for fishing purposes
- [ ] Protection of coastline for beach use
- [ ] Other (please specify)
- [ ] If you checked any of the responses above, please detail below the specific location/site that you see the potential for this improvement.

9. If any improvements were to be made in the area, would you be seeking employment with the development?

- ( ) Yes
- ( ) No
- ( ) Maybe

10. If you answered yes to question 9 above, what type of job would you be seeking?

- ( ) Labourer for construction
- ( ) Special skills construction worker
- ( ) Selling of food items
- ( ) Other (please specify)

11. Is the community

- ( ) Growing in size
- ( ) Declining in size
- ( ) Not changing

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12. What are some of the reasons for this pattern?

- ☐ Migration for a better life
- ☐ Many births
- ☐ Marriage
- ☐ Other (please specify)

13. Are there any known heritage site near your community?

- ○ Yes
- ○ No

If yes, where?

14. What key land use (including facilities such as business/industry/recreation etc.) can you identify in the community?

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