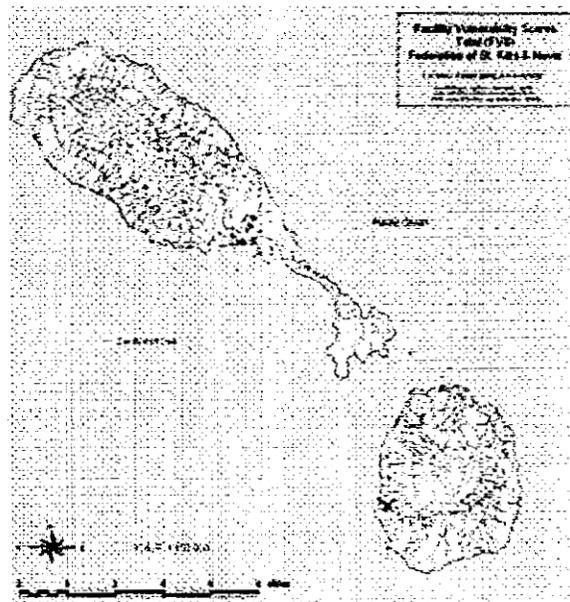


PN-ACT-414



# NATURAL HAZARD MITIGATION POLICY AND PLAN FOR THE FEDERATION OF ST. KITTS AND NEVIS



**POST-GEORGES DISASTER MITIGATION PROGRAMME  
GUIDANCE COMMITTEE**

**PREPARED BY: *EUPHEMIA BRICE ROBERTS*  
JULY 2001**

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## TABLE OF CONTENTS

	<b>Page</b>
TABLE OF CONTENTS	i
LIST - FIGURE AND TABLES	iii
ACKNOWLEDGEMENTS	iv
PREFACE	vi
EXECUTIVE SUMMARY	vii
GLOSSARY	xxi
ACRONYMS AND ABBREVIATIONS	xxiii
<b>SECTION 1 – INTRODUCTION</b>	<b>1</b>
1.1 LEGAL FRAMEWORK	1
1.2 AERIAL EXTENT OF THE PLAN	3
1.3 HISTORICAL BACKGROUND	3
1.4 SCOPE AND PURPOSE	6
1.5 PLAN MISSION	8
1.6 INSTITUTIONAL FRAMEWORK FOR PLAN PREPARATION	8
1.7 TIME SCALE	10
1.8 METHODOLOGY	10
<b>SECTION II - HAZARD AND VULNERABILITY ASSESSMENT</b>	<b>12</b>
2.1 HAZARD IDENTIFICATION AND PRIORITIZATION	12
2.2 HAZARD ANALYSIS AND VULNERABILITY ASSESSMENT	12
2.3 CONCLUSIONS	17
<b>SECTION III – ANALYSIS AND EVALUATION OF EXISTING SYSTEMS</b>	<b>30</b>
3.1 CAPABILITY ASSESSMENT	30
3.2 MITIGATION OPPORTUNITY ANALYSIS	32
3.3 CONCLUSIONS	34

## TABLE OF CONTENTS

	<b>Page</b>
<b>SECTION IV – PLAN FORMULATION</b>	<b>35</b>
4.1 GOALS AND OBJECTIVES	35
4.2 STRATEGIES, POLICIES AND PROGRAMMES	37
<b>SECTION V – PHASING AND IMPLEMENTATION</b>	<b>58</b>
5.1 PHASING	58
5.2 RESPONSIBILITY FOR IMPLEMENTATION	59
<b>SECTION VI – EVALUATION, MONITORING AND UPDATING</b>	<b>60</b>
<b>REFERENCES</b>	<b>61</b>
<b>APPENDICES</b>	
1. CAPABILITY ASSESSMENT SUMMARY	
2. HAZARD AND VULNERABILITY ASSESSMENT (DETAILS)	
2A.FACILITY VUNERABILITY SCORES---ST.KITTS	
2B. FACILITY VUNERABILITY SCORES---NEVIS	
3. LIST OF SUPPORTING POLICIES	
4. I. LIST OF MEMBERS OF THE NATIONAL DISASTER MITIGATION COUNCIL	
II. LIST OF MEMBERS OF THE PGDM PROGRAMME GUIDANCE COMMITTEE	
5. MAPS (ENLARGED) SHOWING HAZARD VULNERABILITY ASSESSMENT AND FACILITY VULNERABILITY SCORES FOR THE PRIORITY HAZARDS	

## LIST - FIGURE AND TABLES

### Page

### Figure

Figure 1 Chart showing institutional framework for *The Plan* preparation. 9

### List of Tables

Table 1	Major hazards which have struck St.Kitts and Nevis since 1899.	4
Table 2	Coding used for Locational risk.	14
Table 3	Coding used for damaged history, structural vulnerability and operational vulnerability.	14
Table 4	St.Kitts- Facility vulnerability assessment – Summary	18
Table 5	Nevis - Facility vulnerability assessment – Summary	24
Table 6	Summary capability assessment analysis	33

## ACKNOWLEDGEMENTS

*The Natural Hazard Mitigation Policy and Plan for the Federation of St Kitts and Nevis* afterwards referred to as *The Plan* delineates a proactive approach to Disaster Management through emphasis on preventative and vulnerability reduction measures, and represents the culmination of efforts of a number of parties. These parties include International Organisations, the Government of the Federation, Regional and International Consultants, Public and Private sector Representatives and the General Public.

I owe a debt of gratitude, the profundity of which is not adequately expressed in words, to these various organisations and persons whose support, advice and guidance made possible the drafting of this noteworthy document.

My gratitude is specially extended to the United States Agency for International Development (USAID) for establishing the signal programme entitled *Hurricane Georges Reconstruction and Recovery in the Eastern Caribbean*, of which the *Post Georges Disaster Mitigation (PGDM) Programme* forms a part.

To the Organisation of American States (OAS), in particular the Unit for Sustainable Development and Environment, I say thank you for overseeing the development and adoption of *The Plan* under the *PGDM Programme*. Special thanks are extended to Mr Steven Stichter, the OAS/ PGDM Technical Co-ordinator for the vigilant manner in which he co-ordinated the project.

The local OAS office provided ample institutional support, and for this I am grateful to the staff and in particular the Director, Mr Kenneth Parker, also Chairperson of the *PGDM Programme Guidance Committee*. Mr Parker's resourcefulness and insightful interventions afforded me useful guidance in drafting *The Plan*.

My appreciation is expressed to the Government of St Kitts-Nevis for facilitating the writing of *The Plan* and for the support given by the respective Ministries, in making the required information available.

The international and regional consultants provided valuable support and guidance for the drafting of *The Plan*. I am grateful in particular to the Geographic Information System (GIS) consultant Mr Eduardo Mattenet, for his contribution in compiling the Vulnerability Assessment Analyses. Appreciation is also extended to

Dr Cassandra Rogers, Hazard Management Consultant for her able guidance on mitigation planning, and Planning Consultant, Ms Lynette Atwell for providing invaluable direction on putting together the contents of *The Plan*.

The members of the *PGDM Programme Guidance Committee* were a constant source of support while offering a wealth of knowledge. To all the members of the Committee, in particular Mr Carl Herbert of the National Emergency Management Agency (NEMA) St Kitts, and Mr Patrick Williams of the Physical Planning Division, St Kitts, who readily placed information at my disposal, I say thank you. I am also grateful to Mr Llewelyn Newton of the Office of Disaster Preparedness, Nevis, for his general support. Of course, my expression of appreciation would be incomplete without making special mention of Mr David Keith, the local coordinator for the Project, for the organised manner in which he directed the project.

For all the comments received from various individuals and from the public during the Public Consultations, I say a heartfelt thank you for your involvement in the process.

Finally, commendation is also due to my editorial support team, Mrs Dianne Marshall-Holdip, Mrs Novelette Morton Hanley, Ms Alison Phils and Ms Cecile Kemi Jacobs who so graciously gave of their time, under much pressure, to help improve on the presentation of the final product. Thanks to all of you.

## PREFACE

Over the last twelve years, and in particular since Hurricane Georges, there has been a growing awareness in the Eastern Caribbean Region that more can be done about disasters than simply preparing for the event, and carrying out recovery and reconstruction following the event.

Governments and the private sector have traditionally paid relatively little attention to the potential impact of natural hazards when investing in physical and economic infrastructure. While the damage to physical and economic infrastructure experienced over the last twelve years has contributed to creating greater awareness of the need for mitigative (preventive and/or damage reducing) activities by Governments and the private sector, there is still the need to pay more attention to carrying out such practices.

Practising disaster mitigation raises challenges. It entails influencing the traditional mindset to move from simply paying attention to preparation, recovery and reconstruction approaches, and move towards proactivity, disaster prevention and/or reduction, through emphasis on risk-reduction measures at an early stage. It also involves various technical challenges with regard to capacity building, as well as the challenge of sourcing adequate funding.

Against the aforementioned background, this document, also referred to as *The Plan* has been developed under a capacity building component of a programme funded by the United States Agency for International Development (USAID), and implemented by the Organisation of American States (OAS).

*The Plan* is expected to be used as a working document, providing guidance on mitigative strategies. It envisages a co-ordinated approach among Government Departments/Agencies and collaboration where necessary with the private sector.

*The Plan* has been divided into six sections for facilitating ease of reference. Section I through to Section III, provide largely background information, and include the results of the work of consultants on the priority hazards identified for St Kitts and Nevis, and the vulnerability assessment of critical facilities. Sections IV to VI outline the proposed *Strategies, Policies and Programmes (SP&P's)*, and also speak to the related *Phasing, Implementation and Monitoring of the SP&P's*.

It is anticipated that *The Plan* will help address public perception with regard to mitigation as well as institutional weaknesses, towards reducing the vulnerability of the Federation to natural disasters.

## EXECUTIVE SUMMARY

### NATURAL HAZARD MITIGATION POLICY AND PLAN

#### 1.0 INTRODUCTION

##### 1.1 General Background

The *Natural Hazard Mitigation Policy and Plan hereinafter called The Plan*, presents proactive approaches for reducing the vulnerability of the Federation of St Kitts and Nevis to natural hazards through enhancing the capacity for mitigation and influencing the practice of mitigation activities.

The Plan forms part of a broader programme of support from the United States Agency for International Development (USAID) through its USAID-Jamaica/Caribbean Regional Programme (USAID-J/CAR), which has established a programme in response to the damage from Hurricane Georges which struck the Federation in September 1998. Implementation of the programme for disaster mitigation capacity building, referred to as the *Post-Georges Disaster Mitigation (PGDM) Programme* has been undertaken by the Organisation of American States (OAS).

##### 1.2 Legal Framework

The National Disaster Management Act of St Christopher and Nevis, No. 5 of 1998 governs activities relating to disaster management (including mitigation). Legislation governing physical planning and development policies of which the main one is the *Development Control and Planning Act (2000)* also has implications for disaster mitigation.

Other pieces of legislation specific to Nevis with development related objectives are – (a) the *Nevis Zoning Plan Ordinance 1991* and (b) the *Nevis Housing and Land Development Corporation Act 1988 (1984 Act amended)*.

Another formal policy document guiding disaster management activities is the *National Disaster Plan*, but that Plan is largely response-oriented.

### **1.3 Aereal Extent of *The Plan***

*The Plan* covers the geographic area of St Kitts and Nevis.

### **1.4 Historical Background**

Over the years, the islands of St Kitts and Nevis have been struck by a number of natural hazards. These hazards have on occasion caused damage of varying degrees to infrastructure including buildings and roads, and the natural environment including beaches. They have also inflicted personal injury and loss of life. Such damage and personal injury have ultimately been detrimental to the economy.

Both islands are exposed to volcanic activity. Both have experienced damage from storms (including hurricanes) earthquakes and floods. St Kitts (only) has been faced with significant damage from inland erosion, while Nevis to a larger extent, has suffered from severe periods of drought.

The frequency of hurricanes striking the islands has increased within the last twelve years with major ones causing extensive damage in 1989, 1995, 1998 and 1999. Major earthquakes were experienced in 1961, 1974 and 1985 and 1988. Severe flooding occurred in 1987 and 1998.

### **1.5 Scope and Purpose**

It is noted that Global-warming has been affecting global climate change such that past weather patterns may no longer be used as a reliable indicator of future weather patterns. The climate change phenomenon, the damage experienced from natural hazards and the high costs associated with recovery, have all indicated a need for a proactive approach to disaster management.

*The Plan* therefore presents mitigation *Strategies, Policies and Programmes* (SP&P's) towards: -

- I. Developing integrated approaches which govern the initial development and re-development process so as to reduce vulnerability to natural hazards.***
- II. Increasing public understanding of the need, and options for hazard mitigation.***

## 1.6 Mission

Bearing in mind the need to ensure a vibrant economy which is as resilient as possible in the face of natural disasters, the **Natural Hazard Mitigation Policy and Plan for St Kitts and Nevis** seeks to foster -

- (a) an environment supportive of proper building and land use practices for sustainable development*
- (b) effective co-ordination among agencies and institutions involved in guiding and directing development, and*
- (c) community consciousness and commitment to carrying out disaster mitigation practices.*

## 1.7 Institutional Framework for Plan Preparation

Overall responsibility for overseeing the programme resides in the OAS *PGDM Programme* Technical Co-ordinator, who is attached to the *OAS Unit of Sustainable Development and Environment* of the OAS office in Washington D.C. USA.

The *PGDM Guidance Committee* comprising representatives from the public and private sectors, and chaired by the Director of the St Kitts-Nevis OAS office, was set up at the local level for co-ordinating the *PGDM* programme including activities relating to the preparation of *The Plan*.

The *PGDM Guidance Committee* reports to the *National Disaster Mitigation Council* which (through its Chairperson, the Deputy Prime Minister) reports to Cabinet.

Various consultants have been contracted by the OAS to work on different aspects of the *PGDM* programme relating to Hazard Vulnerability Assessment, Geographic Information System, Plan Development and Writing.

The *Plan writer* who is a member of the *PGDM Guidance Committee* is given guidance by that committee as a body, and by individual members depending on the member's area of expertise.

The plan covers a ten-year period and is expected to be reviewed periodically within that time frame for maintaining relevance.

## **1.8 Methodology**

Bearing in mind the need for rationalisation of various functions relating to Development Planning and Disaster Management as well as collaboration among the various players and agencies, *The Plan* has been developed as a broad-based consultative effort of the stakeholders who it is designed to serve.

The *PGDM Programme Guidance Committee* provided direction for writing *The Plan*. Information was also received from consultations held with the different stakeholders including representatives from the public and private sectors as well as the general public.

*The Plan* took into account existing legislation and policy documents which have implications for disaster mitigation. The findings and recommendations of consultants contracted by the OAS, specialists in the priority hazards, have also been included in *The Plan*. Workshops (attended by representatives from various public and private sector agencies) which were aimed at giving guidance on the workplan (for preparing *The Plan*) and in particular on identifying priority natural hazards, critical facilities and data needs for the hazard mapping exercise, have also informed *The Plan*.

## **2.0 HAZARD AND VULNERABILITY ASSESSMENT**

### **2.1 Hazard Identification and Prioritisation**

The following priority hazards were identified during a formal prioritisation exercise to be of critical importance to St. Kitts and Nevis:

- (i) *Wind*
- (ii) *Drought (Nevis only)*
- (iii) *Storm Surge*
- (iv) *Volcano*
- (v) *Floods*
- (vi) *Ground Shaking*
- (vii) *Coastal Erosion and*
- (viii) *Inland Erosion (St. Kitts only).*

*Volcano* and *Ground Shaking* are however, not addressed by *The Plan* as the Seismic Research Unit in Trinidad & Tobago is currently conducting research with respect to these hazards.

## 2.2 Hazard Analysis and Vulnerability Assessment

For the priority hazards identified, Hazard Vulnerability Zone Maps and detailed reports<sup>1</sup> were developed by various consultants specialising in the respective hazards. Recommendations made by the consultants for enhancing mitigation with regard to the identified hazards have been included in the proposed programmes and policies of *The Plan*.

Vulnerability of critical facilities was also examined with the following facilities identified as being critical:

- i. Facilities which were used as Emergency Shelters
- ii. Hospitals and Clinics
- iii. Government Administrative Buildings
- iv. Airports, Sea Ports and Bridges
- v. Power, Water and Telecommunication Installations
- vi. Oil and Gas Facilities
- vii. Protective Services

To assess the vulnerability of the critical facilities identified, critical vulnerability scores were developed for each of the facilities, based on a vulnerability assessment process developed by Dr Cassandra Rogers, consultant in the area of hazard management.

Hazard maps were superimposed over maps showing the location of critical facilities, facilitating identification of the locational risk of the facility.

A Facility Vulnerability Score was considered high if it was more than 50% of the highest score attained for a listed facility.

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<sup>1</sup> See detailed reports and maps at <http://www.oas.org/pgdm>

### 2.2.1 Hazard Analysis and Vulnerability Assessment - St Kitts

A number of facilities with relatively high vulnerability to *wind* were located in the Basseterre, Cayon and Sandy Point areas. These included the respective high schools and hospitals.

With regard to *Inland Erosion* vulnerable areas were found to be spread around the island, with a greater concentration towards the south. Facilities affected included water intakes and some emergency shelters.

Areas which are significantly affected by *Storm Surge* lie largely along the south-western seafront in particular and the *stretch along Parsons to Saddlers* as well as *Brimstone Hill to Old Road*. Facilities which show high vulnerability to *Storm Surge* lie along the waterfront of the Basseterre area, and include *the Arrival area of Port Zante, the Pelican Mall and the Robert L Bradshaw Building (which houses the Social Security Board)*.

North-east Basseterre shows high vulnerability to *Flood*, in particular areas alongside the College Street Ghaut, the Basseterre waterfront, and Pond Road. Critical facilities affected included the *Police Training Complex and buildings which are used as Emergency shelters*.

Sections of the road along the Atlantic coast have relatively high vulnerability to *Coastal Erosion*. In particular, the *stretches of road along Parsons to Saddlers* and *Brimstone Hill to Old Road*, are vulnerable to coastal erosion. These areas are also highly vulnerable to storm surge.

### 2.2.2 Hazard Analysis and Vulnerability Assessment - Nevis

There are a number of facilities on the eastern side of the island with relatively high vulnerability to *Wind*. These include *churches and educational facilities which are also used as Emergency Shelters*. Of particularly high vulnerability also, are the *Community Centres at Hickman and Hard Times* and the *Grove Park Pavilion in Charlestown*.

Vulnerability to *Drought* is spread throughout the island, with the greatest vulnerability towards the south and south-east section of the island. The *Charlestown water zone* and the *Butlers/Manning water zone* in particular are high-risk areas.

Areas along the north-eastern to south-eastern seafront and the respective port facilities have relatively high vulnerability to *Storm Surge*.

Facilities with high vulnerability to *Flood* are concentrated in the Charlestown area. Infrastructure of high vulnerability include the *Stoney Grove to Charlestown road* and the *Newcastle International Airport*.

Sections of the western coastline have relatively high vulnerability to *Coastal Erosion*. Infrastructure which has high vulnerability includes the *Stoney Grove to Charlestown road area* and the *ports of Charlestown and Long Point*.

### **3.0 ANALYSIS AND EVALUATION OF EXISTING SYSTEMS**

#### **3.1 Capability Assessment**

Responses to questionnaires sent to Government Departments/Agencies gave an indication of their capability to carry out disaster mitigation (damage-prevention or damage-reducing) activities. With relatively minor exceptions, the responses generally revealed similar strengths and weaknesses existing for the Departments/Agencies in St Kitts and Nevis.

##### **3.1.1 St Kitts and Nevis**

###### ***Institutional***

The Departments/Agencies from St Kitts which responded, indicated that generally, they were involved in all four (4) aspects of disaster management, namely,

- (i) *Preparation,*
- (ii) *Response,*
- (iii) *Recovery and Reconstruction.* and
- (iv) *Mitigation.* Mitigation activities, however, appeared to be limited.

###### ***Legal***

Legislation for facilitating mitigation activities was cited as being in place for some departments/agencies while others indicated that there is a need for

legislation. In some instances the legislation needed to be reviewed, and/or regulations developed for facilitating enforcement.

***Political***

All of the departments/agencies noted that there is awareness of and interest in the need for disaster management practices (including mitigation) by their respective Ministry.

***Financial***

According to the respondents, funding support for mitigation is either non-existent or inadequate.

***Technical***

The various departments/agencies indicated that there is need for enhancing their technical capability for dealing with mitigation activities. The Ministry of Education (Nevis) indicated that there is no technical capability within its administration.

**3.2 Mitigation Opportunity Analysis**

For St Kitts as well as Nevis, the analysis revealed that legislative support for mitigation activities needs be reviewed towards providing adequate legislative powers for carrying out mitigation activities. The need also exists for enhancing the capacity for mitigation through additional funding as well as technical training. In this regard, opportunities must be sought for enhancing the legal, financing, and technical capabilities of the departments/agencies.

**4.0 PLAN FORMULATION**

**4.1 Plan Goals**

The goals of *The Plan* are as follows:

- ***Goal I: To create and continually improve a disaster-resistant environment by reduction of vulnerability to natural hazards.***
- ***Goal II: To improve the national capability to manage the impact of natural hazards.***

- **Goal III: To develop public awareness of natural hazards and their potential impacts.**
- **Goal IV: To increase, encourage, and promote effective mitigation practices.**
- **Goal V: To reduce the impact of natural hazards on life and property.**

## **4.2 Strategies, Policies, Programmes for attaining Goals and Objectives**

The objectives of *The Plan* are outlined under each goal (re-) stated below. The *Strategies, Policies and Programmes* to be carried out for addressing mitigation activities relative to the identified hazards for achieving the identified objectives and goals are as follows:

### **4.2.1 Goal I: To create and continually improve a disaster-resistant environment by reduction of vulnerability to natural hazards**

#### *4.2.1.1 Objective i. Develop Legislative Framework to encourage orderly management of development*

- a) Pass Development Control Planning Act for Nevis and Development Control and Planning Regulations for St Kitts and Nevis.
- b) Review existing incentives to hotels to incorporate mitigation issues.
- c) Put systems in place for periodic review and update of legislation, regulations and policies.

#### *4.2.1.2 Objective ii. Create a Planning process that provides an environment for the management of development such that vulnerability to natural hazards is reduced.*

- a) Produce Local Area plans taking into account mitigation planning.
- b) Produce a new Land Use Map for St Kitts & Nevis taking into account the restructuring of the St Kitts Sugar Manufacturing Corporation (SSMC).
- c) Develop Local Area plans and guidelines for areas that are prone to disaster.
- d) Monitor climate change for informing Land use and Development plans.

#### *4.2.1.3 Objective iii. Ensure that the natural environment is maintained and preserved in order to reduce the impact of natural hazards.*

- a) Re-establish and re-activate the National Conservation and Environment Protection Commission.
- b) Ensure that Environmental Impact Assessments (EIA's) are a requirement for all new developments
- c) Develop and or enforce specific regulations for preserving the environment, e.g relating to sand mining, natural waterways.
- d) Develop an environment management plan incorporating scientific monitoring of various sectors of the environment.

*4.2.1.4 Objective iv. Ensure that mitigation planning is integrated into the institutional framework*

- a) Utilise Geographic Information System (GIS) & hazard maps produced under this project when considering Environmental Impact Assessments.
- b) Integrate hazard mitigation planning into Land Use and Development planning.
- c) Put systems in place to facilitate co-ordination and collaboration among the various departments/agencies which have responsibilities for planning and development..

*4.2.1.5 Objective v. Develop a database which facilitates the continuing collection, analysis & provision of information, supportive of disaster mitigation activities*

- a) Upgrade the existing GIS data base for St Kitts & Nevis and provide integrated networking facilities across sectors e.g. Intranet GIS . The data base should be aimed ultimately at including all buildings in St Kitts & Nevis

**4.2.2 Goal II: To improve the national capability to manage the impact of natural hazards**

*4.2.2.1 Objective i. Review existing organisations as well as upgrade and or establish new organisations to undertake mitigation activities*

- a) Construct a new Emergency Operating Centre for NEMA.
- b) Maintain and /or retrofit existing emergency shelters in compliance with the Building Code
- c) Review Disaster Management Office staffing and other resources to ensure that adequate capacity exists for undertaking mitigation.

- d) Increase the capability of the Building Inspectorate.
- e) Ensure that the Planning Offices of St Kitts & Nevis are adequately equipped to address mitigation issues.
- f) Enforce the Building Code especially with respect to the qualifications of (building, plumbing, electrical etc.) contractors.
- g) The essential services – Ministry of Communications, Works & Public Utilities (water, electricity, and Public Works) and the National Radio should be adequately staffed, equipped and funded to carry out their vital mitigation tasks.

**4.2.3 Goal III: To develop public awareness of natural hazards and their potential impacts**

*4.2.3.1 Objective i. Provide communities with information relating to natural hazards in St Kitts & Nevis, the impacts of those hazards and the vulnerability of communities to those impacts*

- a) Publicise *The Plan*.
- b) Develop and plan periodic awareness programmes/activities to enhance mitigation practices and also develop a Community Contingency Plan specific to each community.
- c) Encourage the introduction of hazard mitigation awareness activities in Community and National Festivals.
- d) Develop mitigation awareness programmes to empower Non-Governmental Organisations (NGO's), community-based organisations, Festival Committees and other cultural and social groups.

*4.2.3.2 Objective ii. Increase public knowledge and awareness of mitigation practices.*

- a) Hold public meetings/fora/workshops to make the public more aware of mitigation practices.

**4.2.4 Goal IV: To increase, encourage, and promote effective mitigation practices**

*4.2.4.1 Objective i. Develop incentive programmes which will encourage mitigation activities to reduce vulnerability*

- a) Encourage the formation of a private sector committee among stakeholders e.g Banks, Insurance Companies, Mortgage Companies and underwriters to develop mitigation criteria which can assist in decision-making .
- b) Provide incentives to small business and entrepreneurs including farmers and fishermen who adopt mitigation practices in their loan and development application.

*4.2.4.2 Objective ii. Disseminate information supportive of mitigation practices*

- a) Publicise the Building Code and Guidelines, and aggressively advertise the procurement / availability to the construction sector
- b) Disseminate brochures, fliers and multi-media products to raise awareness of mitigation.

*4.2.4.3 Objective iii. Develop Technical Training Programmes*

- (a) Facilitate and develop Training in Disaster Mitigation

*4.2.4.4 Objective iv. Increase awareness of disaster mitigation practices in the education sector, through the development of school curricula which incorporate such practices.*

- a) Hold workshops to sensitise teachers to mitigation practices.
- b) Carry out programmes (which reflect support for mitigation practices) in schools.

**4.2.5 Goal V : To reduce the impact of natural hazards on life and property**

*4.2.5.1 Objective i. Empower communities to take a proactive role in the reduction of the impact of natural hazards on life and property*

- a) Ensure that the public is aware of the Shelter Management Policy.
- b) Hold simulation exercises periodically, for handling emergencies.
- c) Offer programmes relating to disaster planning by families and stress management.

4.2.5.2 *Objective ii. Reduce personal injury and loss of life as well as damage to existing and future development.*

- a) Distribution lines for essential services (e.g. electricity) should be laid sub-surface

## **5.0 PHASING AND IMPLEMENTATION**

### **5.1 Phasing**

This ten-year plan is subject to review at least within the next five years. The phasing of projects which would be identified by the respective Ministries/Agencies under the various programmes would be carried out in accordance with the overall plans and annual budgetary process of that Ministry/Agency.

#### **5.1.1 Immediate Next Steps**

The way forward for implementation of *The Plan* requires an orderly approach which may be executed in the following steps:-

- 1. Present *The Plan* to all Government Departments/Agencies.**
- 2. Publicise *The Plan*.**
- 3. Prioritise the strategies, policies and programmes to be undertaken.**  
The National Disaster Mitigation Council would need to guide the setting of the priorities.
- 4. Identify projects to be carried out based on the prioritised strategies, policies and programmes.**
- 5. Prioritise the projects identified.**
- 6. Identify the resources (human and material) and other requirements (e.g additional studies/research to be undertaken) which would be required for execution of the project.**
- 7. Identify the Government Departments/Agencies which have responsibility for implementation of specific projects.**
- 8. Identify the projects which would require collaboration among Departments/Agencies, and specify those Departments/Agencies.**
- 9. Agree on an approach/system for facilitating collaboration among agencies specified in #8, above.**
- 10. For each project, agree on a time-frame for expected commencement and completion of that project.**

**11. Identify milestones for ensuring that the project is on track..**

**12. Develop a 'Phased Implementation Schedule' based on the  
aforementioned.**

## **5.2 Responsibility for Implementation**

The Government Departments/Agencies are responsible for implementing and enabling (where the private sector is involved) the implementation of *The Plan*. The National Emergency Management Agency under the guidance of the National Disaster Mitigation Council is responsible for monitoring implementation of *The Plan*. Accordingly, a mitigation officer should be appointed to NEMA to assist with monitoring.

## **6.0 EVALUATION, MONITORING AND UPDATING**

*The Plan* would be monitored, and updated periodically, with continued evaluation of the effectiveness of the strategies, policies and programmes, as well as the respective projects developed. Periodic reports would be submitted to the National Disaster Mitigation Council on the implementation of *The Plan*.

## GLOSSARY

### **Capability Assessment**

*A determination of the jurisdiction's ability to deal with identified hazards and to identify shortfalls in capability.*

### **Development Standards**

*Site planning, building and engineering standards which are applied to development proposals to achieve conformity with established land use policy, building codes and other regulations.*

### **Disaster Management**

*Group of activities performed to manage a potential or existing disaster.*

### **Disaster Mitigation**

*Medium and long-term actions taken prior to the occurrence of a disaster event to reduce or eliminate the adverse effects of the disaster.*

**Disaster State**     See *States of Social Behaviour*

**Emergency State**   See *States of Social Behaviour*

### **Hazard**

*The event itself or the probability of the event.*

### **Hazard Assessment**

*The process of estimating the probability of the occurrence of potentially damaging phenomena of given magnitudes within a specified period of time.*

### **Land Use**

*The broad types of uses that are permitted within specified areas.*

### **Mitigation Opportunity Analysis**

*An examination and assessment of all areas of planning and development activities in order to identify mitigation opportunities.*

**Normal State**        See *States of Social Behaviour*

**Recovery State**     See *States of Social Behaviour*

**Risk**

*A measure of the expected losses due to a hazard event of a particular magnitude occurring in a given area over a specific time period.*

**States of Social Behaviour****Disaster State**

*Demand on human and material resources due to a hazard which exceeds response capability.*

**Emergency State**

*Sudden increase in demand of human and material resources due to the impact or threat of an impact by a hazard.*

**Normal State**

*Normal societal behaviour; partial or total fulfillment of society's needs.*

**Recovery State**

*Society recovers from event and approaches the pre-disaster state.*

---

**Sustainable Development**

*A process of social, economic, political and environmental change through which the best use is made of all available resources so that present needs are met without compromising the ability of future generations to meet their own needs.*

*Given the reality of limited resources, sustainable development (of a project) also assumes that infrastructural support and resources will be integrated and utilised in a manner so that the need for ongoing infusion of new external resources is not necessary for continuity (of the project).*

**Vulnerability**

*The extent to which a community, structure, service or geographic area is likely to be damaged or disrupted by the impact of a particular hazard.*

**Zoning**

*The detailing of the use and intensity of development for specified parcels of land.*

## ACRONYMS AND ABBREVIATIONS

EIA's	-	Environmental Impact Assessments
EWS	-	Early Warning System
GIS	-	Geographic Information System
J/CAR	-	Jamaica/ Caribbean Regional Programme
NCEPA	-	National Conservation and Environment Protection Act
NEMA	-	National Emergency Management Agency
NGO's	-	Non-Governmental Organisations
OAS	-	Organization of American States
PGDM	-	Post-Georges Disaster Mitigation
PPD	-	Physical Planning Department
SKB	-	St.Kitts, Basseterre
SP&P	-	Strategies, Polices and Programmes
USA	-	United States of America
USAID	-	United States Agency for International Development-
Adeq.	-	Adequate
Amend.	-	Amendment
Cap.	-	Capability
Com.	-	Communication
Dev.	-	Develop
Develop.	-	Development
Environ.	-	Environment
Esp.	-	Especially
Extens.	-	Extensive
Fin.	-	Financial
Int.	-	Interest
Involv.	-	Involved
Legis	-	Legislation
Mgt.	-	Management
Min.	-	Ministry
Mitig.	-	Mitigation
Ordinan.	-	Ordinance
Pol.	-	Police
Prep.	-	Preparation
Prov.	-	Provision
Reconstruc	-	Reconstruction
Tech.	-	Technical
Train.	-	Training

# NATURAL HAZARD MITIGATION POLICY AND PLAN FOR THE FEDERATION OF ST KITTS & NEVIS

## SECTION 1 – INTRODUCTION

### 1.1 Legal Framework

The *Natural Hazard Mitigation Policy and Plan* hereinafter called *The Plan* has been developed under the auspices of the United States Agency for National Development (USAID) and the Organisation of American States (OAS) taking into account the existing legal framework of St Kitts and Nevis.

The *National Disaster Management Act of St Christopher and Nevis, No. 5 of 1998* was passed “to provide for the effective management and control of disasters, and to provide for related or incidental matters.” In the Act, ‘disaster management’ is defined to include “all aspects of preparedness, prevention, mitigation, planning, control, response and recovery as they relate to natural and technological disasters.” Provision is made for the establishment of a *National Disaster Management Agency*, a corporate body for co-ordinating the general policy of the Government of the Federation of St Kitts-Nevis in relation to disaster management. The Agency is governed by a Board of Directors {no more than nine (9) members}, all of whom are *appointed by the Prime Minister of St Kitts-Nevis*. Membership of the Board includes the *Director General of the Agency, the Disaster Manager for the Island of Nevis, and two nominees from Nevis nominated by the Premier of the Nevis Island Administration*.

Apart from the above-mentioned legislation which speaks directly to disaster management (including mitigation), the legislation which governs Physical Planning and Development policies also has implications for disaster mitigation. This is to the extent that the nature of development (building codes and land use practices) can create environmental pressures which could exacerbate vulnerability to natural hazards. The Planning Divisions of St Kitts and Nevis respectively, are authorised under the *Development Control and Planning Act 2000* to exercise development control measures. The Act deals with various development issues such as the management of development, building regulation, and management of the environment including coastal waters. *The National Conservation and Environment*

*Planning Act (NCEPA) 1987* covers issues relating to the preservation of the environment, and vests powers of administration in the National Conservation Commission. The *St Kitts-Nevis Building Code* addresses building regulations. Building regulations have also been incorporated into the *Development Control and Planning Act 2000*.

*Regulation of onsite septic tank systems* which specifies minimum design and siting standards for septic tanks and drainfields is administered by the Department of Public Health.

Other pieces of legislation specific to Nevis with development-related objectives and which have indirect implications for disaster mitigation are – (a) the *Nevis Zoning Plan Ordinance 1991* which deals with land use matters and (b) the *Nevis Housing and Land Development Corporation Act 1988 (1984 Act amended)*.

Another formal policy document which has been developed for directly addressing disaster management efforts is the *National Disaster Plan*. That Plan is largely response oriented and indicates strategies to be adopted by committees comprising representatives from various critical sectors such as *Health, Transportation, Education and Tourism*, in the face of an impending disaster or in the event a disaster strikes. A review of the Plan reveals that it does not address the following areas which are key to disaster mitigation:

1. Management of Development to take into account reduction of exposure to natural hazards.
2. Strengthening of buildings and related facilities to reduce the impact of damage from storms.
3. Preservation of environmental features (beach, dune, and ghaut-side systems) for maintaining natural storm protection capabilities.
4. Management of the coastal environment to aid in the reduction of vulnerability to disasters, with particular reference to storms.
5. Post-storm redevelopment to ensure that rebuilding efforts do not repeat mistakes made in initial development. (*Hazard Mitigation and Post-Storm Redevelopment Policies in St Kitts – prepared by Physical Planning Unit, Nov. 1999* )

The existing legal framework indicates a need for reviewing and updating legislation which is outdated. There is also the need for linking and/or integrating current legislative policies which affect Development Planning and Environmental issues, in instances where such legislation is administered by separate Authorities.

## **1.2 Aereal Extent of the Plan**

*The Plan* covers the geographic area of St Kitts and Nevis.

## **1.3 Historical Background**

Over the years, the islands of St Kitts and Nevis have been impacted by a number of natural hazards, some of which have increased significantly in frequency over the past ten years.

### ***1.3.1 Wind***

Since 1989, as many as ten storms (see Table 1) have inflicted varying degrees of damage on both islands. The damage caused by those storms has occurred largely as a result of the impact from high velocity winds, with speeds in excess of *75 miles per hour*. Damage from these storms vary in terms of magnitude and nature of the facility impacted. Damage has included coastal erosion, destruction of infrastructure – roads, bridges, water and electricity facilities, public property e.g. schools, hospitals, community buildings, as well as destruction of private property. Damage costs also include the opportunity cost of lost revenues due to interruption of commercial business activities such as tourism, a major revenue earner for the Federation. Human lives have also been affected through physical injuries, psychological trauma, and indeed on occasion, actual loss of life.

Prior to 1989, the incidence of wind hazard impacting St Kitts and Nevis has been relatively infrequent compared with the later years (Table 1).

**Table 1**

**Major hazards which have struck St Kitts and Nevis since 1899**

<b>Period</b>	<b>Hazard Type</b>	<b>Comments</b>
<i>1928</i>	<i>Hurricane</i>	
<i>1950</i>	<i>Earthquake</i>	
<i>1955</i>	<i>Hurricane Alice</i>	
<i>1961</i>	<i>Earthquake</i>	<i>6+ magnitude</i>
<i>1974</i>	<i>Earthquake</i>	<i>7.4 Richter Scale</i>
<i>1984</i>	<i>Flood</i>	<i>Basseterre SK only</i>
<i>1985</i>	<i>Earthquake</i>	<i>6.6 Richter Scale</i>
<i>1987</i>	<i>Flood (major)</i>	
<i>1989</i>	<i>Hurricane Hugo</i>	
<i>1989</i>	<i>Storm Felix</i>	
<i>1989</i>	<i>Hurricane Gilbert</i>	
<i>1989</i>	<i>Hurricane Iris</i>	
<i>1995</i>	<i>Hurricane Luis</i>	
<i>1995</i>	<i>Hurricane Marilyn</i>	
<i>1996</i>	<i>Hurricane Bertha</i>	
<i>1998</i>	<i>Hurricane Georges</i>	
<i>1998</i>	<i>Flood (severe)</i>	
<i>1999</i>	<i>Hurricane Jose</i>	
<i>1999</i>	<i>Flood (minor)</i>	
<i>1999</i>	<i>Hurricane Lenny</i>	

*As can be seen from the above table, storms have been known to impact St Kitts and Nevis more frequently in recent times; hence, disaster management efforts by these islands appear to have paid more attention to storms.*

Other natural hazards which have had varying impact on St Kitts and Nevis have been – *Coastal Erosion, Flood, Volcano, Ground Shaking*. Apart from the above mentioned hazards which have impacted both islands at one time or another, St Kitts has been subject additionally to *Inland Erosion*, and Nevis has been faced additionally, with the hazard of *drought*.

### *1.3.2 Coastal Erosion*

St Kitts and Nevis is exposed to coastal erosion with varying degrees of damage, resulting from the effects of storms and storm surge. As a result of Hurricane Luis (1995), the western coastal area of Nevis suffered significant damage through erosion brought upon by the force of waves. The western coastal areas of St Kitts and Nevis suffered most significantly as a result of the impact of Hurricane Lenny (1999) which approached from a westerly direction, an unusual development.

### *1.3.3 Flood*

Flooding is largely localised in St Kitts. Heavy rainfall normally results in the overflow of Ghauts, as well as the retention of water in some sections of Basseterre. In 1998 severe flooding of one of the Ghauts in Basseterre resulted in significant damage and one loss of life was recorded. Flooding has been recorded in 1987 and more recently minor flooding in 1999. Prior to 1998 the last severe flooding was in 1880.

For Nevis, the Charlestown area along the Bath Ghaut has experienced relatively high flooding. Other areas where flooding has been experienced include the Stoney Grove to Charlestown road and the Newcastle International Airport.

### *1.3.4 Volcano*

The islands of St Kitts and Nevis lie along a volcanic chain passing through the Lesser Antilles. Cones with crater formation include Mount Olivees, the Verchilds Mountain and Mount Liamuiga. It is believed that Mount Liamuiga (formerly known as Mount Misery) may have erupted in 1692 and in 1843 (*Bender 1986 with reference to World Data Centre, 1981*). Note – Volcanic Activity is one of the priority hazards which has been identified; however, mitigation activities specific to that hazard have not been covered under *The Plan*, as work relating to vulnerability assessment relative to volcanic activity is being carried out by the Seismic Research Unit in Trinidad and Tobago, West Indies under the auspices of another ongoing OAS project.

### *1.3.5 Ground Shaking*

St Kitts as well as Nevis is prone to earthquakes. Relatively minor tremors have been felt infrequently, with little or no damage having been reported. Seismic activity is being monitored through the Seismic Research Unit in Trinidad and Tobago, West Indies, which is also carrying out updated work with respect to vulnerability assessment of the islands as part of their wider mandate. Accordingly, mitigation efforts for addressing Ground Shaking are not included specifically in this plan.

### *1.3.6 Inland Erosion*

Inland Erosion is identified as a critical hazard for St Kitts only. St Kitts has been subject to inland erosion as a result of storm winds and ghaut flooding. The areas along ghaut levels have been susceptible to landslides and damage has been suffered particularly in areas where sub-standard housing has been erected, generally by squatters without official planning authority (*Bentley Associates 1998*).

### *1.3.7 Drought*

Drought has been identified as a critical hazard for Nevis only. More than one-half of the island receives less than fifty (50) inches of rainfall per year. Rainfall per year has been known to average forty-six (46) inches as compared to an average of 64 inches for St Kitts . Rainfall is lowest on the eastern side of the island and increases in areas of higher altitude. Although short periods of drought may occur throughout the year, extended periods of drought are more often experienced from the months of February through April.

## **1.4 Scope and Purpose**

### *1.4.1 Influence of Global Climate Change*

Data on various environmental phenomena have indicated that global warming has been affecting global climate changes. Increases in global temperatures, a general decline in precipitation in tropical areas, and an accompanying rise in sea levels, all symptoms of climate changes, are compelling Governments to strengthen their responses to the concomitant risks. Research has revealed that sea level has risen worldwide approximately 15 – 20 cm, (6 – 8 inches) in the last century of which 2 to 7 cm have been as a result of warmer ocean temperatures. Whereas past weather patterns have been used as a guide for future weather conditions, the

continuing impact of global warming is reducing predictability based on past weather patterns. The pattern shown for hazards in St Kitts and Nevis, Table 1, indicates that the incidence of hazards over the last ten years could not have been predicted based on the pattern for previous years. The process of change is very disruptive to the natural environment and ecological systems. The climate change disrupts planning, and forces new approaches to Development Planning and Disaster Management.

#### *1.4.2 Learning from Experiences of St Kitts and Nevis*

The damage from natural hazards experienced by St Kitts and Nevis and the high costs associated with recovery indicate a need for a proactive approach to disaster management. Vulnerability to natural hazards is dependent on location, type of development and environmental conditions. Vulnerability will therefore increase as communities grow and develop.

No longer is it sufficient for the Government to settle for disaster management strategies which speak simply to preparation just prior to the disaster or post disaster recovery efforts. The Government of St Kitts and Nevis seeks to broaden the scope of its disaster management efforts as envisaged under the 1998 Act and include strategies which speak to enhancing *hazard mitigation activities, programmes and policies*. Such strategies are aimed at reducing the vulnerability of the population and economic activities in St Kitts and Nevis to natural hazards. *The Plan* is aimed therefore at putting forward strategies for the following areas:-

- I. Developing integrated policies which govern the initial development and re-development process – e.g. through building codes and improved building practices, environmental protection – so as to reduce vulnerability to natural hazards.***
- II. Increasing public understanding of the need and options for hazard mitigation, through public information and education programmes.***

*The Plan* identifies *Strategies, Policies and Programmes (SP&P's)* to be undertaken in order to achieve specified goals and objectives within the overall framework of its mission. It is anticipated that projects based on those SP&P's would be identified and developed by the respective Agencies/Government Departments within their annual budgetary cycle and would be subject to periodic review under the monitoring mechanism proposed by *The Plan*.

## 1.5 Plan Mission

Taking into account the vulnerability of St Kitts and Nevis to natural hazards, and bearing in mind the need to ensure a vibrant economy which is as resilient as possible in the face of such disasters, the **Natural Hazard Mitigation Policy and Plan for St Kitts and Nevis** seeks to foster -

- (a) an environment supportive of proper building and land use practices for sustainable development*
- (b) effective co-ordination among agencies and institutions involved in guiding and directing development, and*
- (c) community consciousness and commitment to carrying out disaster mitigation practices.*

## 1.6 Institutional Framework for Plan Preparation

The development and adoption of *The Plan* is one of four objectives being pursued under the *USAID/OAS sponsored Post-Georges Disaster Mitigation (PGDM) Programme*. The goal of the *PGDM* programme in St Kitts-Nevis is to reduce the vulnerability of the population and economic activities in St Kitts and Nevis to natural hazards.

Overseeing the overall programme is the OAS *PGDM* technical co-ordinator, who is attached to the *OAS Unit of Sustainable Development and Environment* of the OAS office in Washington D.C. USA

At the local level, is the *PGDM Programme Guidance Committee* which has been set up to co-ordinate the St Kitts and Nevis *PGDM Programme* including activities relating to the preparation of *The Plan*. Membership of the committee is cross-sectoral and consists of (i) *the Director of the OAS*, who is the Chairperson of the Committee, (ii) *the PGDM Co-Ordinator contracted by the OAS*, (iii) *representatives from the Government Planning Division in St Kitts*, (iv) *representatives from the Government Planning Division in Nevis*, (v) *a representative from the Disaster Management Office in St Kitts* (vi) *one from the Office of Disaster Preparedness in Nevis*, (vii) *representatives from various other Government Departments in St Kitts and Nevis - the Tourism Department, Public Works Department, the Department of Environment*, (viii) *a representative from the Building Contractors Association and (viii) the Plan Writer contracted by the OAS.*

The *PGDM Programme Guidance Committee* reports to the *National Disaster Mitigation Council* which reports to Cabinet through the Chairperson of the Council, who is the Deputy Prime Minister. The Minister

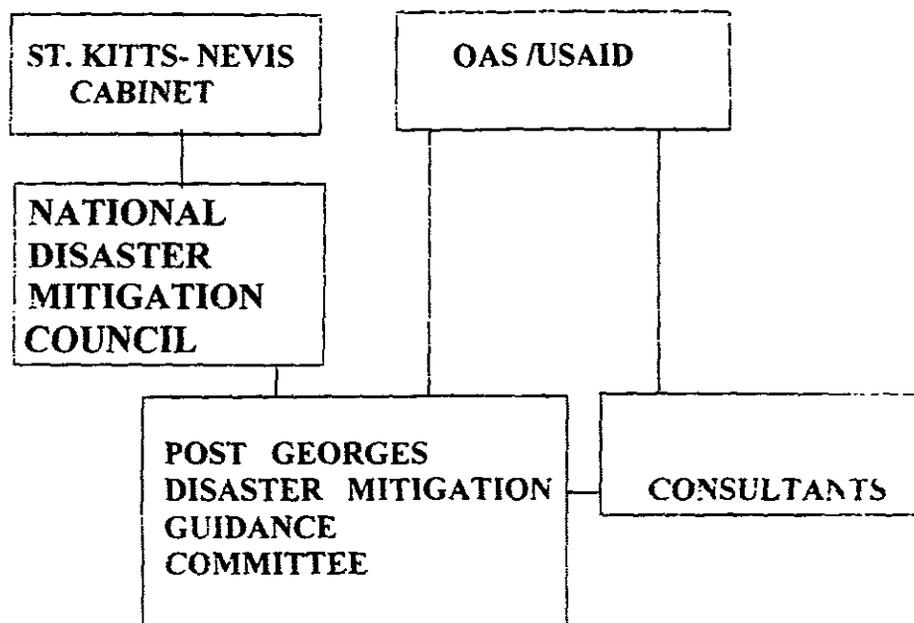
of Communications, Works and Public Utilities is the Deputy Chairperson. Other members of the Disaster Mitigation Council include senior officers from the Public and Private Sector as well as Non-Governmental Organisations (NGO's) and The Religious Community.

Consultants have been contracted by the OAS for facilitating and advising on various aspects of preparation of *The Plan* under the PGDM Programme – namely, for providing *hazard assessment information and maps, Geographic Information System (GIS) assistance, mitigation planning with a hazard information and a development planning focus* respectively.

For writing of the plan, the *Plan writer* is given guidance by the *PGDM Guidance Committee* as a body. Individually, members of the Committee also provide information and support on technical and other related issues falling within their respective areas of competence and experience.

**Figure 1**

**Chart showing Institutional Framework for Plan Preparation**



## 1.7 Time Scale

*The Plan* covers a ten-(10) year time horizon from 2001 to 2011. Goals and objectives are identified for the ten-year period. Programmes are developed with a ten-year time frame in mind while it is expected that the respective Agencies/ Government Departments would develop projects in their annual budgetary provisions subject to periodic review under the programme.

## 1.8 Methodology

Recognising that *The Plan* is a **National** Mitigation Plan, the document has been developed as a broad-based consultative effort of stakeholders who *The Plan* is designed to serve. These stakeholders include the Government and the Government policy-making bodies, public and commercial enterprises and the general public.

Consultations were carried out with the respective parties with a view to creating awareness of *The Plan* and for incorporating their ideas. The *PGDM Programme Guidance Committee* provided direction for the development of *The Plan*. Existing legislation and policy documents which have implications for *The Plan* preparation were also reviewed.

Workshops were facilitated for the various agencies and Government Departments by OAS sponsored consultants on *Hazard Mitigation Planning* with a hazard information focus as well as a development planning focus. These workshops were aimed at giving guidance to participants (who came from various Government agencies and Departments) for the *PGDM workplan* and in particular on –

- a) Identifying the priority natural hazards,
- b) Identifying the critical facilities, and
- c) Conducting a data needs assessments for the hazard mapping exercise, identifying hazard information gaps and making recommendations for filling those gaps.

Reports of hazard vulnerability assessments conducted by specialists (contracted by OAS) in the areas of the various priority hazards, have also been included in *The Plan*.

The *PGDM Project Guidance Committee* met periodically with, and reported to the St Kitts and Nevis National Disaster Mitigation Council.

Public consultations on the draft plan have informed the final copy of *The Plan*, taking into account the various issues and concerns raised by the public.

The development and implementation of the Disaster Mitigation Plan envisages collaboration among the various agencies. It also anticipates rationalisation of various functions relating to Development Planning and Disaster Management to avoid waste of resources through duplication of efforts. The plan envisages that rationalisation would involve centralization of aspects relating to Development Planning while maintaining formal and operational links with the Disaster Management Agency.

## SECTION 1I – HAZARD AND VULNERABILITY ASSESSMENT

### 2.1 Hazard Identification and Prioritisation

A workshop<sup>1</sup> was held to carry out a formal prioritisation exercise to identify and prioritise natural hazards of critical importance to St Kitts and Nevis. Natural hazards which had impacted St Kitts and Nevis over the past years were identified. The methodology used for the prioritisation exercise involved a ranking of hazards identified on a relative ranking scale according to their probability, frequency, areas of impact and magnitude. The priority hazards identified were

- (i) *Wind*
- (ii) *Drought (Nevis only)*
- (iii) *Storm Surge*
- (iv) *Volcano*
- (v) *Floods*
- (vi) *Ground Shaking*
- (vii) *Coastal Erosion and*
- (viii) *Inland Erosion (St Kitts only).*

*The Plan* does not address *Volcano* and *Ground Shaking* as the Seismic Research Unit in Trinidad & Tobago is currently conducting research with regard to these hazards, as well as daily monitoring of related activities.

### 2.2 Hazard Analysis and Vulnerability Assessment

For the priority hazards identified, Hazard Vulnerability Zone Maps and detailed reports<sup>2</sup> were developed by various consultants specialising in the respective hazards. The consultants examined the vulnerability of various areas in St Kitts and Nevis to the respective hazards and made recommendations for enhancing the hazard mitigation capability of St Kitts and Nevis relative to these hazards. These recommendations have been included in the proposed programmes and policies of *The Plan*.

Vulnerability of critical facilities were also assessed. The following facilities were identified by workshop<sup>1</sup> participants, and the PGDM Guidance Committee as critical:

- i. Facilities which were used as Emergency Shelters

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<sup>1</sup> Rogers. C (Ph D) Natural Hazard Mitigation Workshop Report September 2000 - <http://www.oas.org/pgdm>

<sup>2</sup> See detailed reports and maps at <http://www.oas.org/pgdm>

- ii. Hospitals and Clinics
- iii. Government Administrative Buildings
- iv. Airports, Sea ports and Bridges
- v. Power, Water and Telecommunication Installations
- vi. Oil and Gas Facilities
- vii. Protective Services

*Note: See Appendix for the detailed list of facilities*

For assessing the vulnerability of the critical facilities identified, critical vulnerability scores were developed for each of the facilities, based on a vulnerability assessment process developed by Dr Cassandra Rogers, a consultant in the area of hazard management. (see details in the Appendix ).

During a workshop attended by persons from the PGDM committee including representatives from various agencies such as *Physical Planning Units, the National Emergency Management Agency, and Public Works Department* of St Kitts and Nevis respectively, *a hazard priority score (HPS)* was computed for each of the prioritised hazards. The score took the following into account –

- a) **Probability of occurrence**
- b) **The frequency of occurrence**
- c) **The magnitude of the Hazard**
- d) **The area impacted upon**

The Facility Vulnerability Score (FVS) was computed using the following equation:

$$FVS = (L + V)HPS$$

*Where L is the Locational risk; V is Vulnerability = DH + S + O  
DH is Damage History; S is Structural Vulnerability; O is Operational Vulnerability.*

Hazard maps were superimposed over maps showing the location of critical facilities, enabling identification of the locational risk of the facility (see table below). The Facility Vulnerability Score was then computed by the Geographic Information System.

**Table 2**

***CODING USED FOR LOCATIONAL RISK***

<b>HAZARD CATEGORY</b>	<b>LOCATIONAL RISK</b>	<b>MEANING</b>
Very Low	0	No risk
Low	1	Minimal risk
Moderate/Medium	2	Possible/Probable
High	3	Probable/High
Very High	4	Extreme

**Table 3**

***CODING USED FOR DAMAGE HISTORY, STRUCTURAL VULNERABILITY AND OPERATIONAL VULNERABILITY***

<b>NUMBER CODING</b>	<b>DAMAGE HISTORY (DH)</b>	<b>STRUCTURAL VULNERABILITY (S)</b>	<b>OPERATIONAL VULNERABILITY(O)</b>
0	None	Exceeds Code	No effect
1	Minor	Meets Code	Minimal
2	Moderate	Does not meet Code	Significant
3	Repetitive / Significant	Known deficiencies	Life-threatening

The vulnerability assessment was carried out for each critical facility identified for St Kitts and Nevis. Kindly see the Appendix 2A and 2B for the Vulnerability scores for the full list of facilities relative to the respective hazard. Tables 4 and 5 show a ' *Facility Vulnerability Analysis Summary*' listing facilities having the highest scores for St Kitts and Nevis respectively. *A Facility Vulnerability score was considered high if it was more than 50% of the highest score attained for a listed facility. A high score indicates relatively high vulnerability to the hazard, while a low score indicates relatively low vulnerability to the hazard.*

## 2.2.1 Hazard Analysis and Vulnerability Assessment - St Kitts

### *Wind*

Table 4 shows that there are a number of facilities with relatively high vulnerability to wind in the areas of Basseterre, Cayon and Sandy Point. With regard to educational facilities, high scores were noted for the *High Schools of Basseterre, Verchilds and Cayon*, indicating the need for a review of the capacity of those buildings to withstand wind from storms (including hurricanes). Of note also of relatively high vulnerability, are twoss medical facilities, namely - the *Pogson Hospital, Sandy Point* and to a lesser extent the *JNF General Hospital, Basseterre*.

### *Inland Erosion*

Facilities with the highest vulnerability to Inland Erosion are spread around the island, with a greater concentration towards the south. It is noted that *five of the six main water intakes*, as well as *six Emergency Shelters* show high vulnerability to inland erosion.

### *Storm Surge*

Areas along the south-western seafront in particular and the *stretch along Parsons to Saddlers* as well as *Brimstone Hill to Old Road* show high vulnerability to storm surge. Other areas showing extreme vulnerability to storm surge lie along the waterfront of Basseterre, and include *The Arrival area of Port Zante, the Pelican Mall and the Robert L Bradshaw Building (which houses the Social Security Board)*.

### *Flood*

The areas showing high vulnerability to flooding lie in the north-east of Basseterre and include areas/roads alongside the College Street Ghaut, the Basseterre waterfront and Pond Road. Some of the critical facilities affected include the *Police Training Complex* and *buildings which are used as Emergency Shelters*. It is noted that a number of the facilities which are vulnerable to storm surge are also vulnerable to flooding.

### *Coastal Erosion*

Sections of the road along the Atlantic coast have relatively high vulnerability to beach erosion. In particular, the *stretches of road along*

*Parsons to Saddlers* and *Brimstone Hill to Old Road*, are vulnerable to coastal erosion. These areas also have high vulnerability to storm surge.

## **2.2.2 Hazard Analysis and Vulnerability Assessment - Nevis**

### ***Wind***

Table 5 shows that there are a number of facilities on the eastern side of the island with relatively high vulnerability to wind including *Churches and Educational facilities which are also used as Emergency Shelters*. Of particularly high vulnerability also, are the *Community Centres at Hickman and Hard Times* respectively and the *Grove Park Pavilion in Charlestown*.

### ***Drought***

Vulnerability to drought is spread throughout the island, with the greatest vulnerability towards the south and south-east section of the island. The *Charlestown water zone* and the *Butlers/Manning water zone* in particular are high-risk areas.

### ***Storm Surge***

Areas along the north-eastern to south-eastern seafront have relatively high vulnerability to storm surge. It is noted that the *Charlestown Port and the Deep Water Port at Long Point* have relatively high vulnerability to storm surge.

### ***Flood***

Facilities with high vulnerability to flooding are concentrated in the Charlestown area. Infrastructure of high vulnerability include the *Stony Grove to Charlestown Road and the Newcastle International Airport*. The *Netball Complex* in Charlestown also has high vulnerability to flooding.

### ***Coastal Erosion***

Sections of the western coast have relatively high vulnerability to beach erosion. The *Stony Grove to Charlestown Road* which has high vulnerability to flooding is subject to high coastal erosion. *The Ports of Charlestown and Long Point* which have high vulnerability to storm surge also have high vulnerability to coastal erosion.

## **2.3 Conclusions**

The hazard and vulnerability assessment indicate that a number of critical facilities are at high risk with respect to various hazards. The risk of some facilities is further increased to the extent that they have high vulnerability to more than one hazard. Mitigating these risks would involve the introduction and application of policies and the development of programmes with respect to land use practices.

**Table 4****ST KITTS  
Facility Vulnerability Analysis****Summary**

		<i>FVS break points:</i>	>24	>4	>9	>21	>14	Total
<b>FAC_Type</b>	<b>NAME_FAC</b>	<b>LOCATION</b>	<b>WIND</b>	<b>I.EROS</b>	<b>S.SURGE</b>	<b>FLOOD</b>	<b>C.EROS</b>	<b>FVS</b>
Community	Redeemed Baptist Church	Upper Cayon	25					37
Community	Anglican Church Building	Victoria Road	25					36
Community	Estridge Moravian Church	Mansion	25					37
Community	Hope Chapel	George Street	25					51
Community	Trinity Anglican Church	Palmetto Point	40	5				54
Community	Estridge Moravian Church School	Mansion	35					47
Community	Rivers of Living Waters Christian Centre	Southwell Industrial Park	25					53
Community	Seventh-Day Adventist Church	Phillips		6				35
Community	Pavilion	Molineux	30					42
Community	Pavilion	Verchilds Pasture	30					42
Community	Eastern Benevolent Society Building	Camps		5				29
Community	Community Centre	Palmetto Point		5				29
Community	New Pavilion	Cleverly Hill	40					52
Community	Pavilion	St. Mary Play Field	30					42
Community	Warner Park	Basseterre	45					56
Community	Community Centre	Conaree	25					37
Community	Moravian Church Pre-School	Victoria Road	30					41
Education	Half Way Tree Pre-School	Half Way Tree			10		12	44
Education	Slack's Pre-School	New Pond Site	30					42
Education	Day Care Centre	Frigate Bay Road	25					53

Education	Women's Training Centre	Connell Street	25					43
Education	Old Girl Guides Building	Freeman's Village	25					43
Education	Edgar T. Morris	Tabernacle	25					37
Education	Saddlers	Saddlers	35					47
Education	Sandy Point	Sandy Point	25					39
Education	Deanne-Glasford	St. Peters	30					42
Education	George Moody Stuart	Basseterre	30					42
Education	Cayon Primary	Cayon	25					37
Education	Bronte Welsh	Trinity		5				29
Education	AVEC Building	Taylor's Range	25					37
Education	Sandy Point High	Sandy Point	45					56
Education	Washington Archibald High	Taylor's Range	50					62
Education	Basseterre High	Basseterre	45					56
Education	Verchilids High	Verchilids	45					57
Education	Cayon High	Cayon	50					62
Education	Ross University	Trinity		5				34
Government	Customs Adm. Building	Bird Rock	30					42
Government	Arrivals Hall	Port Zante	25		20			53
Government	Pelican Mall	Basseterre	30		10			48
Government	Social Security Building	Basseterre		6	10	32		66
Government	Gov't Headquarters	Basseterre	25					43
Government	Treasury Building	Basseterre	30					56
Government	Electricity Department HQ	Basseterre	25					35
Government	Electricity Building	Basseterre	25					43
Government	O A S Building	Fortlands	30					40
Government	Ministry of Health & Environment	Basseterre	25					35
Government	Community Affairs	Basseterre	25					36
Government	Physical Planning, Development Bank	Basseterre	25			24		55
Government	Finance Department	Basseterre	30					40

Government	Estate House	Stonefort Estate	25	5				39
Government	Estate House	Phillips Estate		5				34
Government	Public Market	Basseterre	30			28		68
Government	Customs Warehouse	Bird Rock	30					42
Government	Customs Shed	RLB Int'l Airport	45					57
Government	Post Office	Basseterre	25					35
Government	Factory Shells	Basseterre	35					63
Government	Customs Headquarters	Bay Road	30					42
Government	Abattoir	Basseterre	40	5				54
Government	School Meals Building	Basseterre	30					58
Infrastructure	International Airport ILS (approach)	Camps		5				29
Infrastructure	International Airport	Golden Rock	35					45
Infrastructure	Bay Rd. (War Memorial - Circus)				12	32		67
Infrastructure	Ponds Rd.					44		67
Infrastructure	Bay Rd. (Circus - Fishing Complex)				12	32		67
Infrastructure	Christ Church – Mansion			6		24		50
Infrastructure	College Ghaut (Lower)			8		44		75
Infrastructure	Stonefort			9				33
Infrastructure	College Ghaut (Upper)			8		44		75
Infrastructure	Fort Thomas - War Memorial				12	32		67
Infrastructure	SEP Rd. (Mayor's Bay)	Mayor's Bay		6				33
Infrastructure	SEP Rd. (Friar's Bay)	Friar's Bay		7			12	46
Infrastructure	Keys – Cayon			6		36		62
Infrastructure	Phillips			7				40
Infrastructure	Parsons – Saddlers				16	24	30	88
Infrastructure	Brimstone Hill - Old Road			6	16		27	76
Infrastructure	Deep Water Port	Bird Rock	40		12			60
Infrastructure	Port Zante	Basseterre			18			41

Medical Facilities	Newtown Health Centre	Basseterre	25						56
Medical Facilities	Old Road Health Centre	Old Road	30						41
Medical Facilities	Sandy Point Health Centre	Sandy Point	30						41
Medical Facilities	Cayon Health Centre	Cayon	30						42
Medical Facilities	Molineux Health Centre	Molineux	25						37
Medical Facilities	St. Peter Health Centre	St Peters	25						37
Medical Facilities	Mary Charles Hospital	Molineux	25						37
Medical Facilities	JNF General Hospital	Basseterre	35	5					49
Medical Facilities	Pogson Hospital	Sandy Point	45						56
Protective	Fire Hall	RLB Int'l Airport	25						37
Protective	Fire Station	Basseterre	25						52
Protective	Defence Force HQ	Basseterre	30						42
Protective	Police Station	Stapleton	35						47
Protective	Police Training Complex	Basseterre	45				32		85
Protective	Police Station	Cayon	45						57
Protective	Police Station	St Pauls	40						52
Protective	Police Station	Old Road	30	5					44
Protective	Police Station	St. Johnston Village, Basseterre	30						41
Protective	Police Station	Frigate Bay	25						52
Protective	Police Station	Tabernacle	40						52
Utilities	TEXACO Buckleys	Buckleys	25	5					39
Utilities	TEXACO Key	Keys Village	30						42
Utilities	SHELL Buckleys	Buckleys	25	5					39
Utilities	SHELL Sandy Point	Sandy Point	25						37
Utilities	SHELL Terminal	Basseterre					28		59
Utilities	Radio & TV Studios	Basseterre	30						42
Utilities	Conaree	Conaree	25						53
Utilities	17168	Basseterre Valley	25						53
Utilities	St.Paul's#2	St.Pauls	25						37

Utilities	17533	Newton Ground	25					53
Utilities	Profit	Profit	25					37
Utilities	Godwins	Godwins Ghaut	25					37
Utilities	Taylor's	Taylor's	25					37
Utilities	Mansion	Mansion	25					37
Utilities	Water Intake Lodge	Lodge	40	6				71
Utilities	18629	La Guerite	25	5				39
Utilities	Stonefort	Stone Fort	25	5				39
Utilities	Lodge#2	Lodge Estate	25					37
Utilities	Tabernacle	Tabernacle	25					37
Utilities	Sir Gillies	Sir Gilles		5				34
Utilities	Orton's	Orton's		5				34
Utilities	Water Intake Phillips	Phillips	40	7				72
Utilities	Water Intake Wingfield	Wingfield	30	6				61
Utilities	Water Intake Franklands	Franklands	35	6				66
Utilities	Water Intake Stonefort	Stonefort	40	6				71
Utilities	16072	Basseterre Valley	25					37
Utilities	R.L.B Airport	Conaree	25					53
Utilities	Lodge#1	Lodge Village	25					37
Utilities	St.Paul's#1	St.Pauls	25					37

**TABLE 4 KEY:**

**FACILITY VULNERABILITY ANALYSIS SUMMARY**

**ST. KITTS**

FVS break points:

Facility Vulnerability Score (FVS) rated with more than 50% of the possible hazard's FVS

$$\text{FVS} = (\text{L} + \text{V}) \text{HPS}$$

“FVS” Facility Vulnerability Score

“L” Locational Vulnerability

$$\text{V} = \text{DH} + \text{S} + \text{O}$$

“V” Vulnerability Score

“HPS” Hazard Priority Score

**Table 5**

**Nevis  
Facility Vulnerability Analysis  
Summary**

				FVS break points:	>22	>2	>6	>14	>11	Total
FAC_Type	Fac_Class	NAME_FAC	LOCATION	WIND	DROU	S.SURGE	FLOOD	C.EROS	FVS	
Community	Church	Zion Chapel (Emmaus)	Webb's Ground		5					34
Community	Church	Wesleyan Holiness Church	Cotton Ground		3					32
Community	Church	Roman Catholic Hall	Craddock Road		4					28
Community	Church	Wesleyan Holiness Church – Barnes Ghaut	Barnes Ghaut		3					32
Community	Church	New Testament Church of God Jessups	Jessups Village		3					22
Community	Church	Methodist Church Hall –Cotton Ground	Cotton Ground		3					27
Community	Church	Methodist Church Hall – Fountain	Fountain	25	3					37
Community	Church	Rehoboth Church Of God – Liburd Hill	Liburd Hill		3					32
Community	Church	Seventh Day Adventist Church - Butlers	Butlers	25	4					38
Community	Church	Calvary Baptist Church – Rawlins	Hard Times	25	5					45
Community	Church	Wesleyan Holiness Church – Buck Hill	Bucks Hill	25	5					39
Community	Church	Church Of God of Prophecy	Jessups Village		3					27
Community	Church	Ebenezer Church of God - Old Manor	Old Manor	25	5					39
Community	Church	Church of God - Cox Village	Cox Village	25	5					39
Community	Church	Anglican Church Fig Tree	Church Ground		5					29
Community	Church	Church of God - Brick Kiln	Brick Kiln		4					33
Community	Community Centre	Grove Park Pavilion	Charlestown	40	4					62
Community	Community Centre	Community Centre	Bath Village		4					28
Community	Community Centre	Community Centre	Brown Hill		5					40
Community	Community Centre	Netball Complex	Charlestown		4		18			43
Community	Community Centre	Community Centre – Hickmans	Hickmans	30	5					44
Community	Community Centre	Sports Complex	Church Ground		5					29

Community	Community Centre	Community Centre Hard Times	Hard Times	35	5				49
Education	Nursery	St.Thomas Pre-school	Lowlands		3				27
Education	Nursery	Vern N Llew Pre-school	Charlestown		4				28
Education	Nursery	Charlestown Pre-school	Charlestown		4				42
Education	Nursery	Brown Hill Pre-school	Brown Hill	25	5				39
Education	Nursery	Maude Smith Pre-school	Butlers		4				33
Education	Nursery	Charlestown Preparatory School	Charlestown		4				28
Education	Nursery	Newcastle Pre-School	Newcastle		3				32
Education	Nursery	Newcastle Pre-school	Newcastle		3				32
Education	Nursery	Stepping Stone Nursery	Charlestown		4				37
Education	Nursery	Butlers Pre-school	Butlers	25	4				38
Education	Nursery	Learning Center	Charlestown		4				28
Education	Nursery	Gingerland Pre-school	Gingerland	25	5				39
Education	Others Education	Girls Guides HD/Qtrs	Stoney Grove		4		18		38
Education	Primary	St. John's Primary School (Bottom floor)	Brown Pastures		5				37
Education	Primary	Combermere Primary School	Combermere		3				32
Education	Primary	Charlestown Primary School	Charlestown		4				28
Education	Primary	Prospect School - Staff Room	Brown Hill		5				29
Education	Primary	St. John's Primary School (Top floor)	Brown Pastures		5				37
Education	Primary	Charlestown Preparatory School	Charlestown		4				28
Education	Primary	Charlestown Primary School	Charlestown		4				28
Education	Primary	St.Thomas Primary School	Lowlands		3				27
Education	Primary	St.James Primary School	Butlers	25	4				38
Education	Primary	St. John Primary School	St. John		5				37
Education	Primary	Prospect Primary School	Prospect		5				34
Education	Primary	Gingerland Primary School	Gingerland	25	5				39
Education	Primary	Anglican School Hall - Lowlands	Lowlands		3				32
Education	Secondary	Charlestown Secondary School	Charlestown		4		15		40
Education	Secondary	Gingerland Secondary School	Gingerland	25	5				42
Education	Secondary	Lyn Jeffers Secondary School	Charlestown		4				36
Education	Technical	Charlestown Sixth Form College	Charlestown		4		15		40
Education	University	University of the Americas	Potworks		3				32
Government	Administration	Long Point Port	Long Point		4				28
Government	Administration	Treasury Building	Charlestown		4				28
Government	Administration	Ministry of Youth & Sports	Charlestown		4				33
Government	Administration	Department of Agriculture	Prospect		5				34
Government	Administration	CMC Building	Charlestown		4			20	44
Government	Administration	Adm. Building	Charlestown		4				42

									25
Government	Administration	Charlestown Sea Port	Charlestown		4				28
Government	Administration	Ministry of Communications	Stoney Grove		4				28
Government	Administration	Public Works Department	Charlestown		4				33
Government	Administration	Newcastle Airport	Newcastle		3				43
Government	Residential	Nurses Home	Charlestown	30	4				63
Government	Residential	Doctor's Residence	Gingerland	45	6				47
Government	Residential	Married Quarters	Belle Vue	25	4			20	54
Government	Storage	Public Market	Charlestown		4				34
Government	Storage	Government Repair Shop	Prospect		5				32
Government	Storage	New Castle Pottery	New Castle		3				62
Government	Storage	Cotton House	Charlestown		4	8	15	20	28
Government	Storage	Post Office	Charlestown		4				27
Government	Storage	Repair Shop & Garage	Cades Bay		3			24	70
Government	Storage	International Airport	Newcastle	35	3			30	72
Infrastructure	Airport	Stony Grove - Charlestown			5			18	50
Infrastructure	Roads	Cades Bay - Jones Estate			3			12	54
Infrastructure	Roads	Newcott - Jessup			4			18	60
Infrastructure	Roads	Jones Estate - Newcastle			3		24	16	60
Infrastructure	Roads	Charlestown Port	Charlestown		4	12		24	53
Infrastructure	Sea Port	Deep Water Port	Long Point		4	14		20	56
Infrastructure	Sea Port	Butlers Health Centre	Butlers		4				33
Medical Facilities	Clinic	Charlestown Health Centre	Charlestown		4				23
Medical Facilities	Clinic	Combermere Health Centre	Combermere		3				32
Medical Facilities	Clinic	Cotton Ground Health Centre	Cotton Ground		3				27
Medical Facilities	Clinic	Gingerland Health Centre	Gingerland		5				34
Medical Facilities	Clinic	Brown Hill Health Centre	Brown Hill	35	5				49
Medical Facilities	Hospital	Alexandra General Hospital	Charlestown	30	4		15		55
Protective	Court	Magistrate's House	Charlestown		4				33
Protective	Court	Courthouse/Library	Charlestown		4				28
Protective	Fire	Fire Hall	New Castle Airport		3				38
Protective	Fire	Fire Station	Charlestown		4				33
Protective	Police	Police Station	Charlestown		4				33

Protective	Police	Police Station							
Protective	Police	Police Station	Gingerland	25	5				
Protective	Police	Police Station	Cotton Ground		3				39
Protective	Prison	Prison Farm	New Castle		3				32
Utilities	Electricity	Power House (2 buildings)	Maddens		4				32
Utilities	Gas	DELTA Jessup	Prospect		5				33
Utilities	Gas	SHELL Lloyd Powell	Jessups Village		3				34
Utilities	Gas	SHELL Reliable Motors	Bath Village		4				29
Utilities	Gas	Govt. Garage	Charlestown		4				39
Utilities	Gas	DELTA Noel	Prospect		5				44
Utilities	Gas	SHELL Pinney	Farm Estate		5				36
Utilities	Gas	DELTA Skitti	Pinney		4				31
Utilities	Gas	DELTA ENF	Newcastle		3				30
Utilities	Gas	DELTA Market Shop	Cotton Ground		3				40
Utilities	Gas	DELTA Stanley	Market Shop	25	5				29
Utilities	Petroleum	DELTA Terminal	Fig Tree		5				41
Utilities	Petroleum	SHELL Terminal	Low Ground		4				36
Utilities	Telecommunication	Church Ground	Charlestown		4				35
Utilities	Telecommunication	Mem's Pizzeria	Church Ground		5	15	12		52
Utilities	Telecommunication	Rambury X	Mem's Pizzeria		5				35
Utilities	Telecommunication	Newcastle X	Rambury X		4				35
Utilities	Telecommunication	Newcastle Pottery	Newcastle X		3				38
Utilities	Telecommunication	Methodist Church Liburd Hill	Newcastle		3				37
Utilities	Telecommunication	Butlers	Liburd Hill		3				33
Utilities	Telecommunication	Bottom Zion Hill	Butlers		4				33
Utilities	Telecommunication	Fenton Hill	Zion Hill		5				39
Utilities	Telecommunication	Hanleys Rd.	Fenton Hill		5				40
Utilities	Telecommunication	Rawlins	Hanleys Rd.		5				40
Utilities	Telecommunication	Chicken Stone	Rawlins		5				40
Utilities	Telecommunication	JNC Senior Home Prospect rd.	Chicken Stone		5				40
Utilities	Telecommunication	Market Shop X	Prospect Rd.		5				40
Utilities	Telecommunication	Bottom Craddock Rd.	Market Shop X		5				35
Utilities	Telecommunication	Newcastle Airport	Craddock Rd.		4				44
Utilities	Telecommunication	Jones Estate	Newcastle		3				34
Utilities	Telecommunication	JNC Cotton Ground	Jones Estate		3	15			39
Utilities	Telecommunication	JNC Jessups	Cotton Ground		3				28
Utilities	Telecommunication	Strikers Car Rental	Jessups		3				33
Utilities	Telecommunication	New Cut Rd.	Strikers rental		5				28
			New Cut Rd.		4				35
									29

Utilities	Telecommunication	Barclays Bank	Barclays Bank		4		20	45
Utilities	Telecommunication	JNC Govt. Rd. & Rd. to RMD	Govt. Rd.		4			29
Utilities	Telecommunication	Super Foods	Super Foods		4	18		43
Utilities	Telecommunication	Top of Govt. Rd.	Govt. Rd.		4			29
Utilities	Telecommunication	Bath Round-About	Bath Round-About		4	18		43
Utilities	Telecommunication	Market Shop	Market Shop		5			40
Utilities	Telecommunication	Four Seasons Clarke Estate	Four Seasons		3			28
Utilities	Water	Pump House	Fothergills	25	5			39
Utilities	Water	Pump House	Stoney Grove		4			37

TABLE 5 KEY: FACILITY VULNERABILITY ANALYSIS SUMMARY

NEVIS

*FVS break points:*

*Facility Vulnerability Score (FVS) rated with  
More than the 50% of the possible hazard's FVS*

$$FVS = (L+V) HPS$$

"FVS" Facility Vulnerability Score

"L" Locational Vulnerability

$$V=DH+S+O$$

"V" Vulnerability Score

"HPS" Hazard Priority Score

## SECTION III – ANALYSIS AND EVALUATION OF EXISTING SYSTEMS

### 3.1 Capability Assessment

Questionnaires were sent to ten (10) Government Departments/Agencies both in St Kitts and Nevis. The survey was designed to assess the capability of Government agencies to carry out measures to mitigate the impact of hazards in St Kitts and Nevis. Responses were received from seventy percent (70%) of the Departments/Agencies in St Kitts and fifty percent (50% ) of those in Nevis. A summary of the responses received is included in Appendix 1.

#### 3.1.1 St Kitts

##### *Institutional*

Responses were received from the Ministry of Tourism, Ministry of Planning and the Physical Planning Division, the National Emergency Management Agency, The Water Services Department, the Ministry of Communications, Works and Public Utilities, the Ministry of Health and the Environment, and the Royal St Christopher-Nevis Police Force. The responses revealed that even in some of the instances where mitigation was said to be carried out, the extent of such activities appeared to be limited.

Six (6) of the seven agencies from St Kitts which responded, indicated that they were involved in all four (4) aspects of disaster management, namely, (i) *Preparation*, (ii) *Response*, (iii) *Recovery and Reconstruction* and (iv) *Mitigation*. One of the agencies, Ministry of Tourism, indicated that it was involved in *Preparation, Response, and Recovery and Reconstruction* only.

##### *Legal*

Disaster Management activities of the National Emergency Management Agency (NEMA) are governed by the Disaster Management Act 1998, while the activities of the Physical Planning Department of St Kitts are governed by the Development Control and Planning Act 2000. In the case of the St Kitts Water Services Department, the 1959 Ordinance gives that Department its mandate for disaster management activities. There is no legal mandate given to the Ministry of Tourism, the Ministry of Communications and

Works and the Ministry of Health and Environment for carrying out disaster management activities.

### ***Political***

There is awareness of, and interest in the need for disaster management practices for all of the agencies. For NEMA in particular, much emphasis is placed on disaster preparation and mitigation.

### ***Financial***

Most of the respondents indicated that funding support for mitigation was negligible or non-existent..

### ***Technical***

All of the agencies indicated that there is need for enhancing their technical capability for dealing with mitigation activities

## **3.1.2 Nevis**

### ***Institutional***

The five (5) Agencies / Departments in Nevis, from which responses were received are - the Ministry of Education, the Department of Agriculture, the Nevis Water Services Department, the Fire and Rescue Department and the Office of Disaster Preparedness. All of the respondents indicated that they are involved in the four aspects of disaster management.

### ***Legal***

There is legislation in place with regard to disaster mitigation for three (3) of the five (5) respondents. Although legislation is in place in the case of the Water Services Department, it was noted that the legislation is not being enforced. In the case of the Office of Disaster Preparedness in Nevis, it was noted that there is need for amendment of the existing legislation.

### ***Political***

The various Agencies indicated that there was general interest in mitigation activities, with the Agricultural Department, in particular, noting that there is commitment to mitigation activities.

### ***Financial***

Relatively little, or no provision is made by the respective Agencies for financing of mitigation activities.

### ***Technical***

While the other agencies made reference to having some technical expertise, albeit inadequate, in dealing with mitigation, the Ministry of Education indicated that it had no technical capability.

## **3.2 Mitigation Opportunity Analysis**

In both St Kitts and Nevis, training of personnel in different aspects of mitigation is required in the various Agencies/Departments, for equipping these agencies with the necessary skills. The specific skills required by each Agency need to be identified and officers from the respective Agencies should be exposed to programmes with a view to upgrading their skills.

### **3.2.1 St Kitts**

The inadequate legislative support for mitigation activities, which was cited in a number of instances, indicate a need for enhancing the legislative mandate of the respective agencies. Although, to the credit of NEMA and the Physical Planning Division of St Kitts, the legislation granting them their mandate was relatively recent, further review of the legislation would need to be carried out in light of the objectives and proposed programmes of the disaster mitigation Plan. The Water Services Ordinance of 1959 would also need to be updated, to take into account current circumstances. Efforts should also be made to establish the required legislative mandates for The Ministries of Tourism, Communication and Works, and Health and Environment, which had indicated that they had no legislative mandate relative to disaster mitigation.

The success of disaster mitigation efforts depends to a large extent on the amount of financing available, and the technical expertise present for carrying out various measures and programmes. Given that five (5) out of the seven (7) respondents in St Kitts indicated that no provision for funding was made for mitigation activities, Government needs to be mindful of the need to budget for such activities.

### 3.2.2 Nevis

Legislation needs to be put in place where necessary, for governing mitigation practices by the respective Agencies. For the Water Services Department, efforts need to be made to enforce the existing legislation, as appropriate.

Only the Agriculture Department indicated that some, albeit small, budget allocation was being made for disaster mitigation. This points to the need for more attention to be given to mitigation financing.

### 3.2.3 Summary -Capability Assessment Analysis - St Kitts and Nevis

The assessment of the capabilities of the respective Departments/Agencies is summarised in the Table below –

**Table 6**  
**Summary Capability Assessment Analysis**

ASSESSED AREAS	LOW 1	MEDIUM 2	MEDIUM/HIGH 3	HIGH 4
<i>INSTITUTIONAL</i>		2		
<i>LEGAL</i>		2		
<i>POLITICAL</i>			3	
<i>FINANCIAL</i>	1			
<i>TECHNICAL</i>		2		

### 3.3 Conclusions

The assessment of the capabilities of the Agencies/Departments in both St Kitts and Nevis for handling mitigation activities revealed opportunities for enhancing their capabilities in various areas. There is an awareness of, and interest in the need for carrying out mitigation activities. The opportunity exists, however, for (a) increasing the technical capabilities of the agencies through training, (b) for updating and in some cases enforcing existing regulations, and (c) increasing financial allocations for mitigation. It is also important that information on mitigation practices be continually disseminated in order to heighten awareness and interest.

## SECTION IV – PLAN FORMULATION

### 4.1 Goals and Objectives

The goals and objectives were developed during a workshop held for that purpose, for the members of the *PGDM Programme* Guidance Committee, and facilitated by the Planning Consultant, contracted by the OAS.

The goals and objectives articulated were subsequently submitted to the St Kitts and Nevis National Disaster Advisory Committee for review and approval.

*The goals and objectives were developed, taking into account -*

- i. the vulnerability of St Kitts and Nevis to the priority hazards identified,*
- ii. the existing capability of the Government Agencies to apply hazard mitigation practices,*
- iii. community awareness and practices with regard to hazard mitigation, and*
- iv. Expected future capability of St Kitts and Nevis to carry out hazard mitigation practices, to reduce the negative impact – socially and economically – of natural hazards on St Kitts and Nevis.*

#### 4.1.1 Goals

- I. To create a disaster resistant national environment by the reduction of vulnerability to natural hazards;*
- II. To improve the national capability to manage the impact of natural hazards;*
- III. To develop public awareness of natural hazards and their potential impacts;*
- IV. To increase, encourage and promote effective mitigation practices;*
- V. To reduce the impact of natural hazards on life and property.*

## 4.1.2 Objectives

The objectives to be pursued under the respective goals are as follows:

***Goal I – To create a disaster resistant national environment by the reduction of vulnerability to natural hazards.***

### 4.1.2.1 Objective(s)

- i. Develop a legislative framework to encourage orderly management of development.
- ii. Create a planning process that provides an environment for management of development to reduce vulnerability to natural hazards.
- iii. Ensure that the natural environment is maintained and preserved in order to reduce the impact of natural hazards.
- iv. Ensure that mitigation planning is integrated into the institutional framework.
- v. Develop a database which facilitates the continuing collection, analysis and provision of information, supportive of disaster mitigation activities.

***Goal II – To improve the national capability to manage the impact of natural hazards.***

### 4.1.2.2 Objective(s)

- i. Review existing institutions with a view to upgrading and/or establishing new institutions to undertake mitigation activities.

***Goal III – To develop public awareness of natural hazards and their potential impacts.***

### 4.1.2.3 Objective(s)

- i. Provide communities with information relating to natural hazards in St Kitts and Nevis, the impacts of those hazards and vulnerability of communities to those impacts.

***Goal IV – To increase, encourage and promote effective mitigation practices.***

***4.1.2.4 Objective(s)***

- i. Develop incentive programmes which will encourage mitigation activities to reduce vulnerability.
- ii. Disseminate information supportive of mitigation practices.
- iii. Develop technical training programmes
- iv. Increase awareness of disaster mitigation practices in the education sector, through the development of curricula which incorporates mitigation.

***Goal V – To reduce the impact of natural hazards on life and property.***

***4.1.2.5 Objective(s)***

- i. Empower communities to take a proactive role in the reduction of the impact of natural hazards on life and property.
- ii. Increase public knowledge and awareness of mitigation practices through the conduct of workshops.

**4.2 Strategies, Policies and Programmes**

Strategies, Policies and Programmes (SP&P's) have been identified for enhancing the disaster mitigation capability and practices of St Kitts and Nevis. These SP&P's take into account the experiences of St Kitts and Nevis as well as recommendations made by the consultants specialising in the respective hazards.

Consultations were held with the Government Line Ministries/ Departments in a workshop-type setting, for reviewing and making recommendations with respect to the following: -

- (i) The Goals and Objectives outlined in *The Plan* and
- (ii) The Strategies, Policies and Programmes (SP&P's).

The SP&P's also incorporate recommendations made during the aforementioned Consultations as well as Public Consultations held in St Kitts and Nevis – one in each island.

Schedules 1 and 2 outline various strategies, policies and programmes (SP&P's) recommended for enhancing the disaster mitigation capability and practices of St Kitts and Nevis. Schedule 1 identifies SP&P's for mitigating against the hazards in general, while Schedule 2 addresses mitigation activities specific to the priority hazards relative to St Kitts and Nevis.

The SP&P's take into account the following considerations:

- i. *Legal and Regulatory framework , instruments governing Land Use as well as the mandate of the respective Agencies which are charged with monitoring.*
- ii. *The capacity and capability of the respective Government Agencies for carrying out mitigation activities*
- iii. *Influencing Environmental Conditions – relative to the level of development, susceptibility to the various Hazards. and vulnerability to damage*
- iv. *Incentives for encouraging appropriate behaviours by Government agencies, private organisations and the general public*

Projects are to be developed by the respective Government Agencies Departments based on the SP&P's outlined. The Agencies Departments responsible for developing and carrying out the projects based on the SP&P's would be identified by the Government through the National Disaster Mitigation Council which includes senior representatives from all of the Government Agencies / Departments.

The following are SP&P's which are to be carried out in order to attain the respective goals and objectives:

**4.2.1 Goal I: To create and continually improve a disaster resistant environment by reduction of vulnerability to natural hazards.**

*4.2.1.1 Objective i. Develop Legislative framework to encourage the orderly management of development.*

- a) Pass Development Regulations for the Development Control Planning Act 2000 (St Kitts).
- b) Pass Development Control Planning Act and Development Control Planning. Regulations for Nevis.
- c) Review existing incentives to hotels to take into consideration mitigation practices.
- d) Put systems in place for periodic review and update of legislation, regulations and policies (e.g The Development Control and Planning Act 2000, and the Building Code) to ensure that they remain relevant.

*4.2.1.2 Objective ii. Create a planning process that provides an environment for the management of development such that vulnerability to natural hazards is reduced.*

- a) Produce local area plans (including maps) taking into account mitigation, vulnerability and hazard mapping already established under this project.
- b) Produce a new Land Use map for St Kitts & Nevis taking into account the restructuring of the St Kitts Sugar Manufacturing Corporation.
- c) Develop local area plans and guidelines for areas that are prone to disaster.
- d) Monitor climate change for informing Land Use and Development plans, as part of developing a proactive approach to planning.

*4.2.1.3 Objective iii. Ensure that the natural environment is maintained and preserved in order to reduce the impact of natural hazards.*

- a) Referring to the National Conservation and Environment Protection Act (NCEPA) of 1987, re-establish and re-activate the National Conservation Commission.
- b) Ensure that Environmental Impact Assessments (EIA's) are completed for all new developments
- c) Develop and /or enforce specific regulations relative to the environment e.g. sand mining, protection of natural waterways, waste water disposal, solid waste management.
- d) Develop an environmental management plan incorporating regular scientific monitoring of various sectors of the environment.

*4.2.1.4 Objective iv. Ensure that mitigation planning is integrated into the institutional framework.*

- a) Ensure that full use is made of Geographic Information System (GIS) & Hazard maps produced under this project when considering Environmental impact assessments.
- b) Integrate hazard mitigation planning with Land Use and Development planning, e.g mitigation planning housing with development planning.
- c) Put systems in place to facilitate co-ordination and collaboration among the various departments/agencies which have responsibilities for planning and development, e.g among the *Physical Planning Department, the Department of Lands and Housing, the National Housing Corporation and the Public Works Department.*

*4.2.1.5 Objective v. Develop a database which facilitates the continuing collection, analysis & provision of information, supportive of disaster mitigation activities*

- a) Upgrade the existing GIS database for St Kitts & Nevis and provide integrated networking facilities across sectors e.g. Intranet GIS . The data base should be aimed ultimately at including all buildings in St Kitts & Nevis

**4.2.2 Goal II: To improve the national capability to manage the impact of natural hazards.**

*4.2.2.1 Objective i. Review existing organisations as well as upgrade and/ or establish new organisations to undertake mitigation activities*

- a) Construct a new Emergency Operating Centre for the National Emergency Management Agency (NEMA)
- b) Maintain and /or retrofit existing emergency shelters to ensure compliance with the Building Code. Where necessary, build new shelters in accordance with the Building Code.
- c) Review Disaster Management Office staffing and other resources (such as equipment) in St Kitts and Nevis to ensure that mitigation capacity is added along with other staffing requirements.
- d) Increase the Building Inspectorate capability in terms of manpower and required qualifications
- e) Ensure that the Planning Offices of St Kitts & Nevis are adequately staffed, housed, & equipped to address mitigation issues.
- f) Ensure that the provision under the Building Code for qualification of contractors is rigidly enforced.

- g) The essential services – Ministry of Communication, Works & Public Utilities (water, electricity, and Public Works), as well as the National Radio and the Ministry of Health should be adequately staffed, equipped and funded to carry out their vital mitigation tasks.

**4.2.3 Goal III: To develop public awareness of natural hazards and their potential impacts.**

*4.2.3.1 Objective i. Provide communities with information relating to natural hazards in St Kitts & Nevis, the impacts of those hazards and vulnerability of communities to those impacts.*

- a) Publicise *The Plan* for informing the public of the hazard and vulnerability assessments, as well as activities which are being undertaken, and can be carried out for disaster mitigation. The publicity awareness programmes is also aimed at encouraging the public to carry out mitigation activities.
- b) Develop mitigation awareness programmes to empower NGO's, community-based organisations, Festival Committees and other cultural and social groups to carry out mitigation practices.
- c) Each district should develop a Community Contingency Plan as appropriate to potential disasters in that Community.
- d) District committees and other Agencies should develop and plan periodic awareness programmes/activities to enhance mitigation practices.
- e) Encourage the introduction of hazard mitigation awareness activities in Community and National Festivals.

*4.2.3.2 Objective ii. Increase public knowledge and awareness of mitigation practices.*

- a) Hold public meetings/fora, workshops to make the public aware of mitigation practices, taking the opportunity to highlight good mitigation practices.

**4.2.4 Goal IV: To increase, encourage, and promote effective mitigation practices.**

*4.2.4.1 Objective i. Develop incentive programmes which will encourage mitigation activities to reduce vulnerability.*

- a) Encourage the formation of a private sector committee among stakeholders e.g. Banks, Insurance Companies, mortgage Companies and underwriters to develop mitigation criteria which can assist in decision making - e.g. *a loan for a home would be conditional upon the housing plan including hurricane clips and proper ties between the walls and the foundation.*
- b) Government and Lending Institutions should consider providing incentives to small business and entrepreneurs including farmers and fishermen who adopt mitigation practices in their loan and development application - e.g. *allowing for a minimum period for deferring loan payments on loans taken to repair damage resulting from a hazard.*
- c) Government should consider granting incentives to house owners who adopt mitigation practices, e.g. *where shutters have been used consideration may be given to adjusting Land and House Tax payments.*
- d) Review the incentive regime to the Tourism Sector with a view to granting incentives to those who meet mitigation requirements.

*4.2.4.2 Objective ii. Disseminate information supportive of mitigation practices.*

- a) Publicize the Building Code and Guidelines and aggressively advertise the procurement / availability to the construction sector.
- b) Disseminate brochures, fliers and multi-media products to raise awareness of mitigation.

*4.2.4.3 Objective iii. Develop Technical Training Programmes.*

- a) Government should facilitate and develop Training in Disaster Mitigation wherever the need has shown up through the capability assessment.
- b) Provide ongoing training for Emergency Shelter managers, including such areas as management of people and other resources and dealing with issues of security.
- c) Conduct Training programmes for the construction industry (e.g. building contractors, architects). Such training should include courses on site preparation for helping to minimize environmental damage.

*4.2.4.4 Objective iv. Increase awareness of disaster mitigation practices in the education sector, through the development of curricula which incorporates such practices.*

- a) Hold workshops to sensitise teachers to mitigation practices.
- b) Encourage the holding of programmes in school which reflect support for mitigation practices.
- c) Integrate Disaster Mitigation practices into relevant subject areas.

**4.2.5 Goal V : To reduce the impact of natural hazards on life and property.**

*4.2.5.1 Objective i. Empower communities to take a proactive role in the reduction of the impact of natural hazards on life and property.*

- a) Implement the Shelter Management Policy ensuring that the Public is aware of those aspects which would advise them of actions which may be taken to reduce possible damage.
- b) Hold simulation exercises periodically, so that the public becomes more alert to actions which may be taken for reducing the impact of natural hazards.
- c) Offer programmes relating to disaster planning by families and stress management.

*4.2.5.2 Objective ii. Reduce personal injury and loss of life as well as damage to existing and future development.*

- b) Distribution lines for essential services (e.g. electricity) should be laid sub-surface.

While the aforementioned mitigative SP&P's reflect approaches which may be taken for hazards generally for St Kitts and Nevis, consideration needs to be given to SP&P's relative to specific hazards, for St Kitts and Nevis respectively. These SP&P's, summarised in Schedule 1 are as follows:

**4.2.6 ST KITTS AND NEVIS**

**4.2.6.1 Wind and Storm Surge**

- i. Strengthen and reinforce the structure of public buildings along with accompanying facilities such as water and power distribution lines, and roads.
- ii. Encourage communities to strengthen and reinforce private-owned structures.

#### 4.2.6.2 Flood

- i. Frequent ghaut maintenance , in particular at road crossings.
- ii In sizing culverts and bridges, pay attention to the extra waterway area for sediment deposition.
- iii Develop appropriate design for silt traps and trash racks.
- iv. Consider diverting the lower reach of College street Ghaut, **St Kitts**, away from its current alignment through the town centre. *As a further consideration, an economic analysis should be carried out comparing (a) likely savings in averted losses with (b) likely lost revenue because of postponement of planned development due to the flooding*
- v. Institute an 'Early Warning System' (EWS) to alert residents of pending flood wave. *EWS may be based on measurement of rainfall in the upper parts of the ghauts and an awareness of the soil saturation levels.*
- vi. **Nevis Airport-** Consider diverting crossings to the end of the runway, since the present arrangement of construction of a steel cage at the entrance of the culvert contributes to flooding when debris becomes entangled.
- vii. Enforce Land Use Zoning Regulations, especially in the Hermitage Region, *Nevis*.

*It is important to note that in St Kitts where the sugarcane plantations are replaced by housing developments, one needs to be mindful of the increased runoff downstream and the potential for greater velocities which may aggravate erosion.*

#### 4.2.6.3 Coastal erosion

- i Perform preliminary selection of coastal areas for sand mining, tourism and housing development, coastal structures and infrastructure development, taking into account coastal areas that have shown historical patterns of erosion and are likely to display similar patterns in the future.
- ii. Develop strategies for addressing problems relating to coastal erosion e.g. for prioritising beaches for sandmining. *Further work in this area may include an investigation of seasonal erosion, and accretion patterns may be carried out for guiding the development of a rotation system for sand mining.*

- iii. Sensitise the general public about coastal erosion and associated impacts.
- iv. Prioritise the allocation of resources for erosion defense, increased monitoring and/ or further research of coastal dynamics.

#### 4.2.7 ST KITTS

##### 4.2.7.1 Inland erosion

- i. Institute and implement policies with respect to land use management
- ii. Develop and invest in programmes for informing farmers and the public on good conservation practices for minimising fertility loss and avoiding the problems created by sedimentation.
- iii. Review Town and Country Planning policies and practices, to avoid/ reduce the need for correctional action –(e.g. the need for reworking of stream banks, and natural excavation of stream courses by the stream in sate indicate that planning has been neglected.
  - a) *Avoid the building of roads across an occasional stream without providing adequate culverts.*
  - b) *House construction within a gully or on the edge of vertical stream banks in weak materials should not be allowed.*
  - c) *Identify sites which are subject to earthquake induced rock falls.*
- iv. Plan adequate drainage systems and monitor.
  - a) *Plan drainage systems to deal with a whole sub-catchment.*
  - b) *Keep drainage ways clean of impediments.*
- v. Take action in response to Land Use Change.
  - a) *Planners and developers need to consider that converting a piece of land under bush into dwelling house lots results in a marked reduction in the way water enters the soil and hence greater run-off of water, with a likelihood of increased land erosion.*
- vi. Retain windbreaks, avoid large areas of exposed soil, through the use e.g. of vegetation slips.
- vii. Monitor and avoid areas at hazard.
- viii. Provide cut off-drains.
- ix. Use stabilising techniques which may be a costly approach and therefore used as a last resort.

## 4.2.8 NEVIS

### 4.2.8.1 Drought

- i. Develop and monitor indicators for future identification of drought, e.g. –

#### Meteorological/ Environmental

- a) Wilting as grass roots becomes progressively damaged by lack of soil water
- b) Increase in leaf fall
- c) Damage (dried leaves / broken stems) to 'indicator' plant species e.g. cacti which utilise stored water in dried periods.

#### Hydrological

- d) Monitor water levels by measuring data such as rainfall, temperature, wind speed, evaporation and seepage.
- e) *Ration water before ground water levels recede to critical points.*

- ii. *Develop policies relative to:*

- a) *Cost of water for irrigation.*
- b) *Regulation of livestock grazing and livestock population densities.*
- c) *Incentives for water and soil conservation practices.*
- d) *Drought Insurance.*
- e) *Drought relief programmes.*
- f) *Further work for mitigating the effects of drought may need to place emphasis on -*

- i. identifying more appropriate boundaries for water resources and drought management, through a thorough analysis of drainage basins on the island.
- ii. Developing data to accurately predict the gap in time between recovery from meteorological / agricultural drought and the replenishment of water to average levels.

**Schedule 1**

**PLAN FORMULATION SCHEDULE - STRATEGIES, POLICIES, PROGRAMMES**

**GOAL I: TO CREATE AND CONTINUALLY IMPROVE A DISASTER RESISTANT ENVIRONMENT BY REDUCTION OF VULNERABILITY TO NATURAL HAZARDS**

OBJECTIVES	STRATEGIES /POLICIES/ PROGRAMMES	ACTION BY - AGENCY (NAME)
<p>i. Develop Legislative Framework to encourage the orderly management of development</p> <p>ii. Create a Planning process that provides an environment for the management of development such that vulnerability to natural hazards is reduced.</p> <p>iii. Ensure that the natural environment is maintained and preserved in order to reduce the impact of natural hazards.</p> <p>iv. Ensure that mitigation planning is integrated into the institutional framework</p> <p>v. Develop a database which facilitates the continuing collection, analysis &amp; provision of information, supportive of disaster mitigation activities</p>	<p>a) Pass Development Regulations for the Development Control Planning Act (St Kitts).</p> <p>b) Pass Develop. Control Plan Act for Nevis &amp; Develop. Regulations (Nevis)</p> <p>c) Review existing incentives to hotels taking into consideration mitigation practices.</p> <p>d) Put system in place for facilitating periodic review and update of legislation, regulations, and policies.</p> <p>a) Produce Local Area Plans (including maps) taking into account mitigation, vulnerability and hazard mapping already established under this project.</p> <p>b) Produce a Land Use map for St Kitts &amp; Nevis taking into account the restructuring of the St Kitts Sugar Manufacturing Corporation.</p> <p>c) Produce Local Area Plans and guidelines for areas which are prone to disaster.</p> <p>d) Monitor climate change for informing land use and development plans.</p> <p>a) Referring to the NCEP Act of 1987, re-establish and re-activate the National Conservation Commission.</p> <p>b) Ensure that EIA's are completed for all new developments</p> <p>c) Develop and /or enforce specific regulations and Environmental Management Plans, e.g. relating to sand mining, waste water disposal.</p> <p>a) Ensure that full use is made of Geographic Information System (GIS) &amp; Hazard maps produced under this project when considering environmental impact assessments.</p> <p>b) Develop systems for facilitating co-ordination and collaboration among Planning departments/agencies</p> <p>a) Upgrade the existing GIS database and provide integrated networking facilities across sectors e.g. <i>Intranet GIS</i>. The data base should be aimed ultimately at including all buildings in St Kitts &amp; Nevis.</p>	

**GOAL II: TO IMPROVE THE NATIONAL CAPABILITY TO MANAGE THE IMPACT OF NATURAL HAZARDS**

OBJECTIVES	STRATEGIES /POLICIES/ PROGRAMMES	ACTION BY - AGENCY (NAME)
<p><i>i.</i> Review existing organisations as well as upgrade and/ or establish new organisations to undertake mitigation activities</p>	<ul style="list-style-type: none"> <li>a) Construct a new Emergency Operating Centre for NEM.A</li> <li>b) Maintain &amp; /or retrofit existing emergency shelters to ensure compliance with the Building Code</li> <li>c) Review Disaster Management Office staffing and other resources (e.g. equipment) in St Kitts &amp; Nevis to ensure that mitigation capacity is added along with other staffing requirements.</li> <li>d) Increase the Building Inspectorate capability in terms of manpower and required qualifications</li> <li>e) Ensure that the Planning Offices of St Kitts &amp; Nevis are adequately staffed, housed, &amp; equipped to address mitigation issues.</li> <li>f) Ensure that the provision under the Building Code for qualification of contractors is rigidly enforced.</li> <li>g) The essential services – Ministry of Communication, Works &amp; Public Utilities (water, electricity, and public works) and the National Radio should be adequately staffed, equipped and funded to carry out their vital mitigation tasks.</li> <li>h) Distribution lines for essential services (e.g. electricity) should be laid sub-surface.</li> </ul>	

**GOAL III: TO DEVELOP PUBLIC AWARENESS OF NATURAL HAZARDS AND THEIR POTENTIAL IMPACTS**

OBJECTIVES	STRATEGIES /POLICIES/ PROGRAMMES	ACTION BY - AGENCY (NAME)
<p>i. Provide communities with information relating to natural hazards in St Kitts &amp; Nevis, the impacts of those hazards and vulnerability of communities to those impacts</p> <p>ii Increase public knowledge and awareness of mitigation practices.</p>	<p>a) Publicise <i>The Plan</i></p> <p>b) Each district should develop a Community Contingency Plan as appropriate to potential disasters in that Community</p> <p>c) District committees and other agencies should develop &amp; plan periodic awareness programmes/activities to enhance mitigation practices.</p> <p>d) Encourage the introduction of hazard mitigation awareness activities in Community and National Festivals.</p> <p>e) Develop mitigation awareness programmes to empower Non Governmental Organisations (NGO's), community-based organisations, Festival Committees and other cultural and social groups..</p> <p>a) Hold public meetings/fora, workshops to make the public aware of mitigation practices, taking the opportunity to highlight good mitigation practices.</p>	

**GOAL IV: TO INCREASE, ENCOURAGE, AND PROMOTE EFFECTIVE MITIGATION PRACTICES**

OBJECTIVES	STRATEGIES /POLICIES/ PROGRAMMES	ACTION BY - AGENCY (NAME)
<p>i. Develop incentive programmes which will encourage mitigation activities to reduce vulnerability</p>	<p>a) Encourage the formation of a private sector committee among stakeholders e.g. Banks, Insurance Companies, Mortgage companies and underwriters to develop mitigation criteria which can assist in decision-making e.g. <i>a loan for - a home would be conditional upon the housing plan including hurricane clips and proper ties between the walls and the foundation</i></p> <p>b) Gov't and Lending Institutions should consider providing <i>-incentives to small business owners and entrepreneurs including farmers and fishermen who adopt mitigation practices in their loan and development application - a minimum period for which loan re-payments on loans taken to repair damage resulting from hazards is deferred.</i></p> <p>c) Review the incentive Regime to the Tourism Sector with a view to granting incentives to those who meet mitigation requirements.</p>	
<p>ii. Disseminate information supportive of mitigation practices</p>	<p>a) Publicise the Building Code and Guidelines, and aggressively advertise the procurement / availability to the construction sector.</p> <p>b) Disseminate brochures, fliers and multi-media products to raise awareness of mitigation.</p>	
<p>iii. Develop Technical Training Programmes</p>	<p>a) Government should facilitate Training (to include simulation) in Disaster Mitigation - - wherever the need has shown up through the capability assessment. - for persons in the Construction sector including in particular site preparation and development.</p>	
<p>iv. Increase awareness of disaster mitigation practices in the education sector. through the development of curricula which incorporate mitigation.</p>	<p>a) Hold workshops to sensitise teachers to mitigation practices.</p> <p>b) Encourage holding programmes (for students) in schools which reflect support for mitigation practices.</p>	

**GOAL V : TO REDUCE THE IMPACT OF NATURAL HAZARDS ON LIFE AND PROPERTY**

OBJECTIVES	STRATEGIES /POLICIES/ PROGRAMMES	ACTION BY - AGENCY (NAME)
<p>i. Empower communities to take a proactive role in the reduction of the impact of natural hazards on life and property</p> <p>ii Reduce personal injury and loss of life as well as damage to existing and future development.</p>	<p>a) Ensure that the public is aware of the Shelter Management Policy, particularly those aspects which would inform them of actions to be taken to reduce possible damage.</p> <p>b) Hold simulation exercises periodically.</p> <p>c) Offer programmes relating to disaster planning by families and stress management.</p> <p>a) Distribution lines for essential service (e.g. electricity) should be laid sub-surface.</p>	



## ST KITTS AND NEVIS

### PLAN FORMULATION SCHEDULE (cont'd) - STRATEGIES, POLICIES, PROGRAMMES

HAZARD TYPE	STRATEGIES/ POLICIES/ PROGRAMMES	OBJECTIVES	GOALS	FURTHER WORK REQUIRED/ CONSIDERATIONS
<u>FLOOD</u>	<p>I. Frequent Ghaut maintenance , in particular at road crossings</p> <p>Ii. In sizing culverts and bridges, pay attention to the extra waterway area for sediment deposition</p> <p>Iii. Develop appropriate design for silt traps and trash racks.</p> <p>Iv. Consider diverting the lower reach of College Street Ghaut, St. Kitts away from its current alignment through the town centre.</p> <p>v. <b>Nevis Airport</b> - Consider diverting crossings to the end of the runway, since the present arrangement of construction of a steel cage at the entrance of the culvert contributes to flooding when debris becomes entangled</p> <p>v. Enforce Land use Zoning Regulations, especially in the <b>Hermitage Region, Nevis</b></p>	<u>Objective ii</u>	<u>Goal I</u>	<p><i>Consideration to replace the sugarcane plantations in St. Kitts by housing developments need to be mindful of the increased runoff downstream and the potential for increased velocities and therefore greater erosion potential within the ghauts.</i></p> <p>With regard to <b>Programme (iv)</b> carry out economic analysis comparing (a) likely savings in averted losses with (b) likely lost revenue due to postponement of planned development on account of flooding</p> <p>Re. <b>Programme (v)</b> – EWS may be based on measurement of rainfall in the upper parts of the ghauts and an awareness of the soil saturation levels</p>

## ST KITTS AND NEVIS

### PLAN FORMULATION SCHEDULE (cont'd) - STRATEGIES, POLICIES, PROGRAMMES

HAZARD TYPE	STRATEGIES/ POLICIES/ PROGRAMMES	OBJECTIVES	GOALS	FURTHER WORK REQUIRED/ CONSIDERATIONS
<u>COASTAL EROSION</u>	<p>Coastal Erosion Maps may be used to:</p> <p>i Perform preliminary selection of coastal areas for sand mining, tourism and housing development, coastal structures and infrastructural development</p> <p>ii Identify coastal areas that have shown historical patterns of erosion and are likely to display similar patterns in the future.</p> <p>iii. Sensitise the general public about coastal erosion and associated impacts</p> <p>Iv. Assist with the development of strategies for addressing problems relating to coastal erosion e.g. the information may be used for prioritising beaches for sandmining.</p> <p>v. Prioritise the allocation of resources for erosion defence, increased monitoring and/ or further research of coastal dynamics.</p> <p>Vi. Display the spatial relationship of coastal hazard areas with existing coastal developments and infrastructure – as it is important to be able to identify the developments located near coastal areas that are susceptible to erosion</p>	<p><u>Objective v</u></p> <p><u>Objective ii</u></p>	<p><u>Goal I</u></p> <p><u>Goal V</u></p>	<p>With regard to Coastal Erosion Map <i>Use (Iv) under . 'Programmes'</i> additional investigation of seasonal erosion and accretion patterns may be carried out for guiding the development of a rotation system for sand mining.</p>

## ST KITTS

### PLAN FORMULATION SCHEDULE (cont'd) - STRATEGIES, POLICIES, PROGRAMMES

HAZARD TYPE	STRATEGIES/ POLICIES/ PROGRAMMES	OBJECTIVES	GOALS	FURTHER WORK REQUIRED/ CONSIDERATIONS
<p><u>INLAND EROSION</u></p>	<p>i. Institute and implement policies with respect to land use management.</p> <p>ii Develop and invest in programmes for informing farmers and the public on good conservation practices for minimising fertility loss and avoiding the problems created by sedimentation.</p> <p>iii. Review Town and Country Planning policies and practices, to avoid/ reduce the need for correctional action –(e.g. the need for reworking of stream banks, and natural excavation of stream courses by the stream in spate indicate that planning has been neglected.</p> <p>a) Avoid the building of roads across an occasional stream without providing adequate culverts</p> <p>b) House construction within a gully or on the edge of vertical stream banks in weak materials should not be allowed.</p> <p>c) Identify sites which are subject to earthquake induced rock falls.</p>	<p><u>Objectives i. iv</u></p> <p><u>Objective v</u></p> <p><u>Objective I</u></p> <p><u>Objective iii</u></p>	<p><u>Goal I</u></p> <p><u>Goal II</u></p> <p><u>Goal III</u></p> <p><u>Goal I</u></p>	

**ST KITTS**

**PLAN FORMULATION SCHEDULE (cont'd) - STRATEGIES, POLICIES, PROGRAMMES**

HAZARD TYPE	STRATEGIES/ POLICIES/ PROGRAMMES	OBJECTIVES	GOALS	FURTHER WORK REQUIRED/ CONSIDERATIONS
<p><u>INLAND EROSION</u> <u>(Continued)</u></p>	<p>iv. <u>Plan adequate drainage systems and Monitor</u>            a) Plan drainage systems to deal with a whole sub-catchment            b) Keep drainage ways clean of impediments</p> <p>v. <u>Take action in response to Land Use Change</u>            Planners and developers need to consider that converting a piece of land under bush to dwelling house lots results in a marked reduction in the way water enters the soil and hence greater run-off of water, with a likelihood of increased land erosion.</p> <p>vi. Retain windbreaks, avoid large areas of exposed soil, through the use e.g. of vegetation slips</p> <p>vii. Monitor and avoid areas at hazard</p> <p>viii. Provide cut off-drains</p> <p>ix. Use stabilising techniques (a costly last resort)</p>	<p><u>Objectives ii</u></p>	<p><u>Goal I</u></p>	



## SECTION V – PHASING AND IMPLEMENTATION

### 5.1 Phasing

The Plan identifies Strategies, Policies and Programmes for the next ten years, and would be subject to review within at least the next five years.

It is anticipated that the respective Government Ministries would develop projects based on the foregoing Strategies, Policies and Programmes, taking into account appropriate phasing periods.

#### 5.1.1 Immediate Next Steps

A number of Strategies, Policies and Programmes have been presented for facilitating disaster mitigation. Specific projects would need to be identified towards a phased implementation of *The Plan*. The way forward for implementation of *The Plan* requires an orderly approach which may be executed in the steps listed below. It is noted that some of these steps may be carried out concurrently. The next steps may be summarised as follows:-

1. **Present *The Plan* to all Government Departments/Agencies.**
2. **Publicise *The Plan*.**
3. **Prioritise the strategies, policies and programmes to be undertaken.** The National Disaster Mitigation Council which includes representation from all Government Departments/Agencies would need to set the priorities.
4. **Identify projects to be carried out based on the prioritised strategies, policies and programmes.**
5. **Prioritise the projects identified.**
6. **Identify the resources (human and material) and other requirements (e.g additional studies/research to be undertaken) which would be required for execution of the project.**
7. **Identify the Government Departments/Agencies which have responsibility for implementation of specific projects.**
8. **Identify the projects which would require collaboration among Departments/Agencies, and specify those Departments/Agencies.**
9. **Agree on an approach/system for facilitating collaboration among agencies specified in #8, above.**
10. **For each project, agree on a time-frame for expected commencement and completion of that project.**
11. **Identify milestones for ensuring that the project is on track..**
12. **Develop a ‘*Phased Implementation Schedule*’ based on the aforementioned.**

## **5.2 Responsibility for Implementation**

Responsibility for implementation of *The Plan* rests with the Government Departments/Agencies. In instances where (mitigation) projects are undertaken by the private sector, or where there is private sector joint participation, the Government Department/Agency under whose umbrella such activities fall, would be responsible for enabling and monitoring the implementation of that project.

It is therefore necessary for the various Departments/Agencies to schedule execution of the identified project(s) and related activities within the annual work programme and to obtain budgetary allocations for such projects.

## **SECTION VI – EVALUATION, MONITORING AND UPDATING**

The National Emergency Management Agency under the guidance of the National Disaster Mitigation Council is responsible for monitoring implementation of The Plan. Accordingly, a mitigation officer should be appointed to assist with such monitoring.

In order to keep the Plan current and relevant to the needs of St Kitts and Nevis, *periodic review and evaluation of the implementation of the Plan* with respect to - Strategies, Policies, Programmes and the related projects would be required.

*A periodic reporting system should be established for –*

- a) advising the National Disaster Mitigation Council on the status of the implementation of The Plan, and*
- b) making recommendations for keeping The Plan up to date.*

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## **Appendix1**

### **CAPABILITY ASSESSMENT SUMMARY**

**APPENDIX 1 - CAPABILITY ASSESSMENT SUMMARY  
ST.KITTS**

<i>Institutional</i>	<i>Tourism</i>	<i>Min Plan; &amp; P.P.D</i>	<i>NEMA</i>	<i>SKB water Services</i>	<i>Min . Com.&amp; works</i>	<i>Min. Health &amp; Environ.</i>	<i>St Kitts -Nevis Pol.Force</i>
<i>MGT: 1.PREPARATION</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>2. RESPONSE</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>3.RECOVERY &amp; RECONSTRUC.</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>4 MITIGATION</i>		Yes	Yes	Yes	Yes	Yes	Yes
<u><i>LEGAL</i></u>	No Legis.	Dev. Control & Plan Act	Disaster Mgt. Act'98	Legis. In Place Ordinan.'59	No Legal Capability	No Legal Capability	No specific legis.
<u><i>POLITICAL</i></u>	Aware of need for mitigation	Int. in all areas of Disaster	Int. in all areas esp. Prep. & Mitigation	Int. in all areas	Int. in all areas	Int. in all areas	Int. in all areas
<u><i>FINANCIAL</i></u>	No Prov. For Mitig.	No Prov for Mitig.	Special funds not allocated	Allocation made for Prep. & Response	No Prov. For Mitig.	No funds directly. Possible indirect	No special provision
<u><i>TECHNICAL</i></u>	Not adequate	Some tech. Cap.	Some cap in Mitigation	Has tech. Expertise	Has some tech. Cap.	Not adequate tech. Cap.	Inadequat. Skills
<u><i>STRENGTHS</i></u>							
	Aware of need for Mitig.	-Legis. - Aware of need for Mitig	Involved in all areas of Disaster Mgt. -Legis - Aware of fund Need	-Aware of Mitig. - Legis - Aware of fund / tech need	Involved in all aspects of Disaster Mgt. Aware of Mitigation	Involved in some mitig. Political Int. Aware of Training need	Has expertise in mitig.
<u><i>WEAKNESSES</i></u>							
	Not involved in Mitig. Does not have tech. Capability	Legis / Techn inadequat. Mitig. Planning inadequat.	Legis / Tech inadequat  No funds	Legis inadequate Lack of comprehensive mitig. Progr.	Legis. /Train. Inadequate  No fin. Prov	No Legis  Funding inadequate	Ltd exposure to mitig.

**APPENDIX 1 - CAPABILITY ASSESSMENT SUMMARY**  
**NEVIS**

<b><i>Institutional</i></b>	<i>Min. Educ. Nevis</i>	<i>Agric. Nevis</i>	<i>Nevis Water Services</i>	<i>Fire &amp; Rescue Services</i>	<i>Office of Disaster Prepar.</i>
<b>MGT:</b> <b>1. PREPARATION</b>	Yes	Yes	Yes	Yes	Yes
<b>2. RESPONSE</b>	Yes	Yes	Yes	Yes	Yes
<b>3. RECOVERY &amp; RECONSTRUC.</b>	Yes	Yes	Yes	Yes	Yes
<b>4 MITIGATION</b>	Yes	Yes	Yes	Yes	Yes
<b><u>LEGAL</u></b>	No legis	No legis	Legis in place not enfor	No specific legis.	Need to amend Legis.
<b><u>POLITICAL</u></b>	Interest in all areas of Mitig	General commitment	Int in all areas	Int. in all areas	Int. in all areas
<b><u>FINANCIAL</u></b>	Funds not allocated	Little Prov.	Not allocated	No special provision	Not allocated
<b><u>TECHNICAL</u></b>					
	No Tech.	Some tech.	Some tech.		Inadequate Skills
<b><u>STRENGTHS</u></b>					
	Aware of need for mitig.	Involv. In mitig. Tech cap.	Staff can be trained	Aware of need for mitig	Involv. In mitig.
<b><u>WEAKNESSES</u></b>					
	No formal mitig. Plan	Limited involve. In mitig. Not aware of need for fund. Lack of extens train.	Ltd involv in Mitig. Legis not enforced Lack of capabil. in mitig.	Lack of adeq. Tools	-Need for training - Legis. Needs amend.

## **Appendix 2**

### **HAZARD VULNERABILITY ASSESSMENT (Details)**

#### **APPENDIX 2A — FACILITY VULNERABILITY SCORES ST.KITTS**

#### **APPENDIX 2B - FACILITY VULNERABILITY SCORES NEVIS**

APPENDIX 2A

FACILITY VULNERABILITY SCORES ----- ST. KITTS

Facility Vulnerability Score (FVS) - ST. KITTS										
FAC CODE	GIS CODE	NAME	LOCATION	Wind	SSurge	CErosion	IErosion	Flood	Tot FVS	REMARKS
		<b>GOVT. BUILDING</b>								
SKFC001	SKGB0010	Police Station	Basseterre, Central	15	2	3	2	4	26	
SKFC002	SKGB0020	Police Station	St. Johnston Village, Bass.	30	2	3	2	4	41	
SKFC003	SKGB0030	Police Station	Old Road	30	2	3	5	4	44	
SKFC004	SKGB0040	Police Station	Sandy Point	15	2	3	3	4	27	
SKFC005	SKGB0050	Police Station	St Pauls	40	2	3	3	4	52	
SKFC007	SKGB0070	Police Station	Tabernacle	40	2	3	3	4	52	
SKFC008	SKGB0080	Police Station	Cayon	45	2	3	3	4	57	
SKFC009	SKGB0090	Police Station	Stapleton	35	2	3	3	4	47	
SKFC010	SKGB0100	Police Station	Frigate Bay	25	2	3	2	20	52	
SKFC011	SKGB0110	Police Training Complex	Basseterre	45	2	3	3	32	85	
SKFC012	SKGB0120	Fire Station	Basseterre	25	2	3	2	20	52	
SKFC013	SKGB0130	Arrivals Hall	Port Zante	25	20	3	1	4	53	
SKFC014	SKGB0140	Administration Building	Port Basseterre	30	2	3	1	4	40	
SKFC015	SKGB0150	Operations Building	Port Basseterre	25	2	3	1	4	35	
SKFC016	SKGB0160	Transit Shed	Port Basseterre	45	18	3	1	4	71	
SKFC017	SKGB0170	Fire Hall	RLB Int'l Airport	25	2	3	3	4	37	
SKFC018	SKGB0180	Customs Shed	RLB Int'l Airport	45	2	3	3	4	57	
SKFC019	SKGB0220	Coast Guard Station	Bird Rock	20	4	3	1	4	32	
SKFC020	SKGB0230	Customs Adm. Building	Bird Rock	30	2	3	3	4	42	
SKFC021	SKGB0240	Customs Warehouse	Bird Rock	30	2	3	3	4	42	
SKFC022	SKGB0250	Customs Headquarters	Bay Road	30	2	3	3	4	42	
SKFC023	SKGB0360	Post Office	Basseterre	25	2	3	1	4	35	
SKFC024	SKGB0370	Post Office	Cayon	20	2	3	3	4	32	
SKFC025	SKGB0380	Post Office	Sandy Point	15	2	3	3	4	27	
SKFC026	SKGB0410	Gov't Headquarters	Basseterre	25	2	3	1	12	43	
SKFC027	SKGB0430	Radio & TV Studios	Basseterre	30	2	3	3	4	42	
SKFC028	SKGB0440	Defence Force HQ	Basseterre	30	2	3	3	4	42	
SKFC029	SKGB0450	Treasury Building	Basseterre	30	2	3	1	20	56	

SKFC065	10107	Rivers of Living Water Christian Centre	Southwell Industrial Park	25	2	3	3	20	53
SKFC066	10201	Anglican Church Building	Victoria Road	25	2	3	2	4	36
SKFC067	10202	Wesleyan Holiness Outreach Centre	Shadwell	10	2	3	3	4	22
SKFC068	10203	Old Girl Guides Building	Freeman's Village	25	2	3	1	12	43
SKFC069	10204	Church of God	Westbourne Street	10	2	3	1	20	36
SKFC070	10205	Women's Training Centre	Connell Street	25	2	3	1	12	43
SKFC071	10206	Moravian Church Pre-School	Victoria Road	30	2	3	2	4	41
SKFC072	10207	Wesleyan Holiness Church	Cayon Street	20	2	3	3	4	32
SKFC073	10208	AVEC Building	Washington Archibald	25	2	3	3	4	37
SKFC074	10301	Eastern Benevolent Society Building	Camps	15	2	3	5	4	29
SKFC075	10302	Community Centre	Palmetto Point	15	2	3	5	4	29
SKFC076	10303	Trinity Anglican Church	Palmetto Point	40	2	3	5	4	54
SKFC077	10304	Apostolic Faith Church	Infirmary Road	10	2	3	1	4	20
SKFC078	10401	Day Care Centre	Wingfield Road	10	2	3	3	4	22
SKFC079	10402	Pavilion	Verchields Pature	30	2	3	3	4	42
SKFC080	10403	Grace Gospel Hall	Middle Island	10	2	3	2	4	21
SKFC081	10404	Estate House	Stonefort Estate	25	2	3	5	4	39
SKFC082	10405	Church of God	Half way Tree	15	6	9	3	8	41
SKFC083	10406	Community Centre	Half way Tree	15	2	3	3	4	27
SKFC084	10501	Fishermen's Cooperative Building	Sandy Point	15	2	3	3	4	27
SKFC085	10502	Day Care Centre	Sandy Point	5	2	3	1	4	15
SKFC086	10503	Basket Ball Facility	Sandy Point	10	2	3	2	4	21
SKFC087	10504	New Pavilion	Cleyerly Hill	45	2	3	3	4	57
SKFC088	10601	Pavilion / Community Centre	Newton Ground	15	2	3	3	4	27
SKFC089	10602	Calvary Baptist Church	St. Pauls	15	2	3	3	4	27
SKFC090	10603	Church of God	St. Pauls	15	2	3	3	4	27
SKFC091	10604	Wesleyan Holiness Church	St. Pauls	15	2	3	3	4	27
SKFC092	10605	Day Care Centre	Dieppe Bay	15	2	3	3	4	27
SKFC093	10606	Community Centre	Dieppe Bay	15	2	3	3	4	27
SKFC094	10607	Day Care Centre	Saddlers	15	2	3	3	4	27
SKFC095	10608	Pentecostal Church	Saddlers	15	2	3	3	4	27
SKFC096	10609	Seventh Day Adventist Church	Harri's Village	15	2	3	3	4	27
SKFC097	10701	Community Centre	Tabernacle	15	2	3	3	4	27
SKFC098	10702	Estridge Moravian Church School	Mansion	35	2	3	3	4	47
SKFC099	10703	Estridge Moravian Church	Mansion	25	2	3	3	4	37
SKFC100	10704	Pavilion	Molineux	30	2	3	3	4	42

SKFC030	SKGB0460	Finance Department	Basseterre	30	2	3	1	4	40
SKFC031	SKGB0470	Public Works Department	Basseterre	25	2	3	1	4	35
SKFC032	SKGB0480	Electricity Department HQ	Basseterre	25	2	3	1	4	35
SKFC033	SKGB0490	Electricity Building	Basseterre	25	2	3	1	12	43
SKFC034	SKGB0500	Physical Planning, Development Bank	Basseterre	25	2	3	1	24	55
SKFC035	SKGB0510	GOVT. House	Basseterre	15	2	3	2	4	26
SKFC036	SKGB0520	O A S Building	Fortlands	30	2	3	1	4	40
SKFC037	SKGB0530	Pelican Mall	Basseterre	30	10	3	1	4	48
SKFC038	SKGB0550	Ministry of Health & Environment	Basseterre	25	2	3	1	4	36
SKFC039	SKGB1070	Community Affairs	Basseterre	25	2	3	2	4	36
SKFC040	SKGB1080	NHC Central Housing	Basseterre	15	2	3	1	4	25
SKFC041	SKGB1090	Water Dept. New Building	Basseterre	15	2	3	3	4	27
SKFC042	SKGB1100	Education Building-Cayon St.	Basseterre	15	2	3	2	4	26
SKFC043	SKGB1110	Curriculum Dent. Unit	Basseterre	15	2	3	1	4	25
SKFC044	SKGB1120	NEMA	Basseterre	15	2	3	3	4	27
SKFC045	SKGB1130	Dept. of Agriculture	La Guerite	15	2	3	2	4	26
SKFC046	SKGB1140	Multy Purpose Lab	Basseterre	15	2	3	1	4	25
SKFC047	SKGB1150	School Meals Building	Basseterre	30	2	3	3	20	58
SKFC048	SKGB1160	Social Security Building	Basseterre	30	10	3	6	32	66
SKFC049	SKGB1170	Public Market	Basseterre	15	6	3	1	28	68
SKFC050	SKGB1180	Abattoir	Basseterre	40	2	3	5	4	54
SKFC051	SKGB1190	Cardin Home	Basseterre	15	2	3	1	4	25
SKFC052	SKGB1200	Children Home	Basseterre	15	2	3	2	4	26
SKFC053	SKGB1210	Youth Skills Programme	Basseterre	15	2	3	2	4	26
SKFC054	SKGB1220	Warner Park	Basseterre	45	2	3	2	4	56
SKFC055	SKGB1230	Court House	Basseterre	15	2	3	1	4	25
SKFC056	SKGB1240	Govt. Supply Office	Basseterre	20	2	3	1	4	30
SKFC057	SKGB1250	Factory Shells	Basseterre	35	2	3	3	20	63
SKFC058	SKGB1260	CEMACO	Basseterre	5	2	3	1	20	31
		<b>SHELTERS</b>							
SKFC059	10101	Day Care Centre	Frigate Bay Road	25	2	3	3	20	53
SKFC060	10102	Seventh Day Adventist School	Ponds Estate	20	2	3	3	4	32
SKFC061	10103	Jehovah Witness Kingdom Hall	Ponds Estate	20	2	3	3	4	32
SKFC062	10104	Health Centre	Newtown	20	4	3	2	8	37
SKFC063	10105	Seventh Day Adventist Church	Wellington Road	20	2	3	1	20	46
SKFC064	10106	Hope Chapel	George Street	25	2	3	1	20	51

SKFC101	10705	Seventh-Day Adventist Church	Phillips	20	2	3	6	4	35
SKFC102	10706	Estate House	Phillips Estate	20	2	3	5	4	34
SKFC103	10707	Community Centre	Lodge	20	2	3	3	4	32
SKFC104	10801	Day Care Centre	Cayon	20	2	3	3	4	32
SKFC105	10802	Pavilion	St. Mary Play Field	30	2	3	3	4	42
SKFC106	10803	Church of God	Cayon	20	2	3	3	4	32
SKFC107	10804	Redeemed Baptist Church	Upper Cayon	25	2	3	3	4	37
SKFC108	10805	Pre-School Building	Keys Village	15	2	3	3	4	27
SKFC109	10806	Community Centre	Conaree	25	2	3	3	4	37
SKFC110	10807	Community Centre	St. Peters	20	2	3	3	4	32
SKFC111	10808	Church of God	Lower Monkey Hill	20	2	3	3	4	32
SKFC112	10809	Anglican Church Hall	St. Peters	15	2	3	3	4	27
SKFC113	10810	Factory Social Centre	Kittstoddarts	15	2	3	3	4	27
	<b>EDUCATION</b>								
SKFC114	SKED002	St. Theresa Convent	East Independence Square	20	2	3	1	20	46
SKFC115	SKED003	Beach Allen	Taylor's Range	15	2	3	3	4	27
SKFC116	SKED004	Bronte Welsh	Trinity	15	2	3	5	4	29
SKFC117	SKED005	Cayon Primary	Cayon	25	2	3	3	4	37
SKFC118	SKED006	Dieppe Bay	Dieppe Bay	20	2	3	3	4	32
SKFC119	SKED007	Dr. William Corner	St. Johnston Village	15	2	3	1	4	25
SKFC120	SKED008	Deanne-Glasford	St. Peters	30	2	3	3	4	42
SKFC121	SKED009	Edgar T. Morris	Tabernacle	25	2	3	3	4	37
SKFC122	SKED011	Irish town	Irish town	15	2	3	1	4	25
SKFC123	SKED012	Molineux	Molineux	20	2	3	3	4	32
SKFC124	SKED013	Newton Ground	Newton Ground	15	2	3	3	8	31
SKFC125	SKED014	Sandy Point	Sandy Point	25	2	6	2	4	39
SKFC126	SKED015	Tucker-Clarke	Newtown	20	6	3	2	12	43
SKFC127	SKED016	Tyrell Williams	Verchilds	15	2	3	3	4	27
SKFC128	SKED017	Seventh Day Adventist	Ponds Estate	15	2	3	3	4	27
SKFC129	SKED018	Saddlers	Saddlers	35	2	3	3	4	47
SKFC131	SKED029	Bradshaw's Nursery	Dorset	15	2	3	2	4	26
SKFC132	SKED035	Industrial Site day Care	Industrial Site	15	2	3	3	20	43
SKFC133	SKED040	Lily of the Valley Pre-School	Dorset	15	2	3	2	4	26
SKFC134	SKED042	Mc Knight Nursery	Cunningham Street	15	2	3	1	12	33
SKFC135	SKED045	Pilgrim Pre-School	Cayon Street	15	2	3	1	4	25
SKFC136	SKED050	Salvation Army Pre-School	Cayon Street	15	2	3	1	4	25

SKFC137	SKED051	Slack's Pre-School	New Pond Site	30	2	3	3	4	42
SKFC138	SKED053	Victoria Road Pre-School	Victoria Road	15	2	3	2	4	26
SKFC139	SKED055	Wings of Love Pre-School	Dorset	15	2	3	2	4	26
SKFC141	SKED066	Half Way Tree Pre-School	Half Way Tree	15	10	12	3	4	44
SKFC144	SKED078	Auntie May's Nursery	Conaree	15	2	3	3	4	27
SKFC145	SKED079	Cayon Day Nursery	Cayon	20	2	3	3	4	32
SKFC146	SKED080	Louisa Grant Pre-School	Conaree	15	2	3	3	4	27
SKFC150	SKED088	Mount Carmel Pre-School	Lodge	15	2	3	3	4	27
SKFC151	SKED090	St. Peter's Nursery	St. Peters	20	2	3	3	4	32
SKFC152	SKED105	Ross University	Trinity	20	2	3	5	4	34
SKFC153	SKED106	University of W.I.	Basseterre	20	2	3	1	4	30
SKFC154	SKED108	Clarence Fitzroy Bryant College	Basseterre	20	2	3	2	4	31
SKFC155	SKED109	Basseterre High	Basseterre	45	2	3	2	4	56
SKFC156	SKED110	Washington Archibald High	Taylor's Range	50	2	3	3	4	62
SKFC157	SKED111	Cayon High	Cayon	50	2	3	3	4	62
SKFC158	SKED112	Sandy Point High	Sandy Point	45	2	3	2	4	56
SKFC159	SKED113	Verchilds High	Verchilds	45	2	3	3	4	57
SKFC160	SKED114	St. Theresa Convent High	East Independence Square	20	2	3	1	20	46
SKFC161	SKED124	George Moody Stuart	Basseterre	30	2	3	3	4	42
SKFC162	SKED125	Maurice Hillier	Basseterre	20	2	3	2	4	31
	<b>HEALTH</b>								
SKFC163	SKHL01	JNF General Hospital	Basseterre	35	2	3	5	4	49
SKFC164	SKHL02	Mary Charles Hospital	Molineux	25	2	3	3	4	37
SKFC165	SKHL03	Pogson Hospital	Sandy Point	45	2	3	2	4	56
SKFC166	SKHL04	Newtown Health Centre	Basseterre	25	6	3	2	20	56
SKFC167	SKHL05	Basseterre Health Centre	Basseterre	20	2	3	1	4	30
SKFC168	SKHL06	Cayon Health Centre	Cayon	30	2	3	2	4	41
SKFC169	SKHL07	Sandy Point Health Centre	Sandy Point	30	2	3	2	4	41
SKFC170	SKHL08	Old Road Health Centre	Old Road	30	2	3	3	4	42
SKFC171	SKHL09	Saddlers Health Centre	Saddlers	20	2	3	3	20	48
SKFC172	SKHL10	St. Peter Health Centre	St. Peters	25	2	3	3	4	37
SKFC173	SKHL11	Molineux Health Centre	Molineux	25	2	3	3	4	37
SKFC174	SKHL12	St. Pauls Health Centre	St. Pauls	20	2	3	3	4	32
SKFC175	SKHL13	Tabernacle Health Centre	Tabernacle	20	2	3	3	4	32
SKFC176	SKHL14	Dieppe Bay Health Centre	Dieppe Bay	20	2	3	3	4	32
SKFC177	SKHL15	Dental Clinic	Basseterre	20	6	3	1	4	34

GAS DISTRIBUTION									
SKFC178	SKGS01	SHELL Terminal	Basseterre	20	6	3	2	28	59
SKFC179	SKGS02	BYRON Wellington Rd.	Basseterre	20	2	3	1	4	30
SKFC180	SKGS03	SHELL Victoria Rd.	Basseterre	20	2	3	2	4	31
SKFC181	SKGS04	SHELL Pond Rd.	Basseterre	15	2	3	3	20	43
SKFC182	SKGS05	TEXACO Buckleys	Buckleys	25	2	3	5	4	39
SKFC183	SKGS06	SHELL Buckleys	Buckleys	25	2	3	5	4	39
SKFC184	SKGS07	SHELL Sandy Point	Sandy Point	25	2	3	3	4	37
SKFC185	SKGS08	TEXACO Key	Keys Village	30	2	3	3	4	42
SKFC186	SKGS09	TEXACO Wellington Rd.	Wellington Road	20	2	3	3	4	32
SKFC187	SKGS10	TEXACO Terminal	Basseterre	20	6	3	2	4	35
WATER NETWORK - INTAKES									
SKFC188	SKWI04	Water Intake Wingfield	Wingfield	30	2	3	6	20	61
SKFC189	SKWI03	Water Intake Cayon/Greenhill	Cayon/Greenhill	20	2	3	2	4	31
SKFC190	SKWI05	Water Intake Franklands	Franklands	35	2	3	6	20	66
SKFC191	SKWI01	Water Intake Phillips	Phillips	40	2	3	7	20	72
SKFC192	SKWI06	Water intake Stonefort	Stonefort	40	2	3	6	20	71
SKFC193	SKWI02	Water Intake Lodge	Lodge	40	2	3	6	20	71
WELLS									
SKFC194	SKWE15	1-41	Basseterre Valley	20	2	3	3	20	48
SKFC195	SKWE01	1-44	Mansion	25	2	3	3	4	37
SKFC196	SKWE12	1-47	Sandy Point	25	2	3	3	20	53
SKFC197	SKWE16	1-48	Newton Ground	25	2	3	3	20	53
SKFC198	SKWE13	Ponds#1	St. Pauls	20	2	3	3	4	32
SKFC199	SKWE14	Ponds#2	Dieppe Bay	20	2	3	3	20	48
SKFC200	SKWE17	Taylor's	Tabernacle	25	2	3	3	4	37
SKFC201	SKWE11	Conaree	Lodge Village	25	2	3	3	20	53
SKFC202	SKWE10	R.L.B Airport	Lodge Estate	25	2	3	3	20	53
SKFC203	SKWE18	1-51	Basseterre Valley	25	2	3	5	4	39
SKFC204	SKWE08	Lodge#1	Basseterre Valley	25	2	3	3	4	37
SKFC205	SKWE09	Lodge#2	Basseterre Valley	25	2	3	3	4	37
SKFC206	SKWE02	Mansion	Basseterre Valley	25	2	3	3	4	37
SKFC207	SKWE07	Tabernacle	Basseterre Valley	25	2	3	3	4	37
SKFC208	SKWE06	Profit	Basseterre Valley	25	2	3	3	4	37
SKFC209	SKWE05	St.Paul's#1	Basseterre Valley	25	2	3	3	4	37
SKFC210	SKWE21	St.Paul's#2	Taylor's	25	2	3	3	4	37

SKFC211	SKWE04	Orton's	La Guerite	20	2	3	5	4	34
SKFC212	SKWE03	Sir Gillies	Stone Fort	20	2	3	5	4	34
SKFC213	SKWE20	Godwins	Godwins Ghaut	25	2	3	3	4	37
SKFC214	SKWE19	Stonefort	St. Pauls	25	2	3	5	4	39
<b>PORTS</b>									
SKFC215	SKB	International Airport	Golden Rock	35	2	3	3	4	47
SKFC216	BAS	Port Zante	Basseterre	15	18	3	1	4	41
SKFC217	SKP	Deep Water Port	Bird Rock	40	12	3	1	4	60
<b>TRANSPORTATION (MAIN ROAD)</b>									
SKFC218	SKRM010	SEP Rd		20	2	3	3	4	32
SKFC230	SKRM01A	SEP Rd	Major's Bay	15	2	6	6	4	33
SKFC231	SKRM01B	SEP Rd	Friar's Bay	15	4	12	7	8	46
SKFC219	SKRM020	Fort Thomas - Newtown		15	12	6	2	32	67
SKFC220	SKRM030	Ponds Rd.		15	2	3	3	44	67
SKFC221	SKRM040	College Ghaut		15	2	6	8	44	75
SKFC222	SKRM050	Stonefort		15	2	3	9	4	33
SKFC223	SKRM060	Brimstone Hill - Old Road		15	14	24	6	12	71
SKFC224	SKRM070	Granstown Ghaut		10	2	3	4	8	27
SKFC225	SKRM080	Parsons - Saddlers		15	16	30	3	24	88
SKFC226	SKRM090	Phillips		20	2	3	7	8	40
SKFC227	SKRM100	Christ Church - Mansion		15	2	3	6	24	50
SKFC228	SKRM110	Keys - Cayon		20	2	3	6	36	67

Highest FVS  
FVS break point

50	20	30	9	44	153
>24	>9	>14	>4	>21	

FVS break points: Facility Vulnerability Score (FVS) rated with more than the 50% of the possible hazard's FVS

FVS = (L+V) HPS

"FVS" Facility Vulnerability Score

"L" Locational Vulnerability

"V" Vulnerability Score

$$V = DH + S + O$$

"HPS" Hazard Priority Score.

APPENDIX 2B

FACILITY VULNERABILITY SCORES -----NEVIS

Facility Vulnerability Score (FVS) - NEVIS										
FAC CODE	GIS CODE	NAME	LOCATION	Wind	Surge	Corrosion	Drought	Flood	Tot FVS	REMARKS
<b>GOVT. BUILDINGS</b>										
NVFC001	NVGB056A	Police Station	Charlestown	20	2	4	4	3	33	
NVFC002	NVGB056B	Magistrate House	Charlestown	20	2	4	4	3	33	
NVFC003	NVGB0570	Police Station	Cotton ground	20	2	4	3	3	32	
NVFC004	NVGB0580	Police Station	Gingerland	25	2	4	5	3	39	
NVFC005	NVGB0590	Police Station	New Castle	20	2	4	3	3	32	
NVFC006	NVGB0760	Fire Hall	New Castle Airport	20	2	4	3	9	38	
NVFC007	NVGB0770	Fire Station	Charlestown	20	2	4	4	3	33	
NVFC008	NVGB0780	Courthouse/Library	Charlestown	15	2	4	4	3	28	
NVFC009	NVGB0790	Public Market	Charlestown	15	6	20	4	9	54	
NVFC010	NVGB0800	Adm. Building	Charlestown	20	2	4	4	12	42	
NVFC011	NVGB0810	Power House (2 buildings)	Prospect	20	2	4	5	3	34	
NVFC012	NVGB0820	New Castle Pottery	New Castle	20	2	4	3	3	32	
NVFC014	NVGB0840	Department of Agriculture	Prospect	20	2	4	5	3	34	
NVFC015	NVGB0850	Public Works Department	Charlestown	15	2	4	4	3	28	
NVFC016	NVGB0860	Ministry of Communications	Stoney Grove	15	2	4	4	3	28	
NVFC017	NVGB0870	Post Office	Charlestown	15	2	4	4	3	28	
NVFC018	NVGB0890	Treasury Building	Charlestown	15	2	4	4	3	28	
NVFC019	NVGB0900	Cotton House	Charlestown	15	8	20	4	15	62	
NVFC020	NVGB0910	CMC Building	Charlestown	15	2	20	4	3	44	
NVFC021	NVGB0920	Pump House	Folthergills	25	2	4	5	3	39	
NVFC022	NVGB0930	Pump House	Stoney Grove	15	2	4	4	12	37	
NVFC023	NVGB0940	Repair Shop & Garage	Cades Bay	15	2	4	3	3	27	
NVFC024	NVGB0950	Government Repair Shop	Prospect	20	2	4	5	3	34	
NVFC025	NVGB0960	Married Quarters	Belle Vue	25	2	4	4	12	47	
NVFC029	NVGB1000	Nurses Home	Charlestown	30	2	4	4	3	43	
NVFC030	NVGB1020	Ministry of Youth & Sports	Charlestown	20	2	4	4	3	33	
NVFC031	NVGB1030	Doctor's Residence	Gingerland	45	2	4	6	6	63	
NVFC034	NVGB1270	Prison Farm	Maddons	20	2	4	4	3	33	
NVFC035	NVGB1280	Charlestown Sea Port	Charlestown	10	4	4	4	3	25	
NVFC038	NVGB1290	Newcastle Airport	Newcastle	15	2	4	3	9	33	
NVFC037	NVGB1300	Long Point Port	Long Point	15	2	4	4	3	28	
<b>SHELTERS</b>										
NVFC038	20101	Netball Complex	Charlestown	15	2	4	4	18	43	
NVFC039	20102	Grove Park Pavillion	Charlestown	40	2	4	4	12	62	
NVFC040	20103	Charlestown Primary School	Charlestown	15	2	4	4	3	28	

NVFC041	20104	Roman Catholic Hall	Craddock Road	15	2	4	4	3	28
NVFC042	20105	Community Centre	Bath Village	15	2	4	4	3	28
NVFC043	20106	Girls Guides HD/Qtrs	Stoney Grove	10	2	4	4	18	38
NVFC044	20201	Prospect School - Staff Room	Brown Hill	15	2	4	5	3	29
NVFC045	20202	Community Centre	Brown Hill	20	2	4	5	9	40
NVFC046	20203	Anglican Church Fig Tree	Church Ground	15	2	4	5	3	29
NVFC047	20204	Sport Complex	Church Ground	15	2	4	5	3	29
NVFC048	20205	St. Johns Primary School (Top floor)	Brown Pastures	20	2	4	5	6	37
NVFC049	20206	St. Johns Primary School (Bottom floor)	Brown Pastures	20	2	4	5	6	37
NVFC050	20207	Church of God - Cox Village	Cox Village	25	2	4	5	3	39
NVFC051	20301	Ebenezer Church of God - Old Manor	Old Manor	25	2	4	5	3	39
NVFC052	20302	Wesleyan Holiness Church - Buck Hill	Bucks Hill	25	2	4	5	3	39
NVFC053	20303	Community Centre Hardtimes	Hard Times	35	2	4	5	3	49
NVFC054	20304	Calvary Baptist Church - Rawlins	Hard Times	25	2	4	5	9	45
NVFC055	20305	Community Centre - Hickmans	Hickmans	30	2	4	5	3	44
NVFC056	20306	Zion Chapel (Emmaus)	Webb's Ground	20	2	4	5	3	34
NVFC057	20401	Seventh Day Adventist Church - Butlers	Butlers	25	2	4	4	3	38
NVFC058	20402	Church of God - Brick Kiln	Brick Kiln	20	2	4	4	3	33
NVFC059	20403	Rehoboth Church Of God - Liburd Hill	Liburd Hill	20	2	4	3	3	32
NVFC060	20404	Newcastle Pre-School	Newcastle	20	2	4	3	3	32
NVFC061	20405	Methodist Church Hall - Fountain	Fountain	25	2	4	3	3	37
NVFC062	20501	Methodist Church Hall -Cotton Ground	Cotton Ground	15	2	4	3	3	27
NVFC063	20502	Wesleyan Holiness Church	Cotton Ground	20	2	4	3	3	32
NVFC064	20503	Anglican School Hall - Lowlands	Lowlands	20	2	4	3	3	32
NVFC065	20504	Church Of God of Prophecy	Jessups Village	15	2	4	3	3	27
NVFC066	20505	New Testament Church of God Jessups	Jessups Village	10	2	4	3	3	22
NVFC067	20506	Wesleyan Holiness Church - Barnes Ghaut	Barnes Ghaut	20	2	4	3	3	32
		<b>EDUCATION</b>							
NVFC068	NVED019	Charlestown Primary School	Charlestown	15	2	4	4	3	28
NVFC069	NVED020	Charlestown Preparatory School	Charlestown	15	2	4	4	3	28
NVFC070	NVED021	Combermere Primary School	Combermere	20	2	4	3	3	32
NVFC071	NVED024	St.James Primary School	Butlers	25	2	4	4	3	38
NVFC072	NVED025	Prospect Primary School	Prospect	20	2	4	5	3	34
NVFC073	NVED093	Maude Smith Pre-school	Butlers	20	2	4	4	3	33
NVFC074	NVED094	Brown Hill Pre-school	Brown Hill	25	2	4	5	3	39
NVFC075	NVED095	Butlers Pre-school	Butlers	25	2	4	4	3	38
NVFC076	NVED096	Charlestown Pre-school	Charlestown	20	2	4	4	12	42
NVFC077	NVED097	Charlestown Preparatory School	Charlestown	15	2	4	4	3	28
NVFC078	NVED098	Gingerland Pre-school	Gingerland	25	2	4	5	3	39
NVFC079	NVED099	Learning Center	Charlestown	15	2	4	4	3	28
NVFC081	NVED101	Newcastle Pre-school	Newcastle	20	2	4	3	3	32
NVFC082	NVED102	St.Thomas Pre-school	Lowlands	15	2	4	3	3	27

NVFC083	NVED103	Stepping Stone Nursery	Charlestown	15	2	4	4	12	37
NVFC084	NVED104	Vern N Llew Pre-school	Charlestown	15	2	4	4	3	28
NVFC085	NVED116	Gingerland Primary School	Gingerland	25	2	4	5	3	39
NVFC086	NVED117	St. John Primary School	St. John	20	2	4	5	6	37
NVFC087	NVED118	St. Thomas Primary School	Lowlands	15	2	4	3	3	27
NVFC088	NVED119	Charlestown Secondary School	Charlestown	15	2	4	4	15	40
NVFC089	NVED120	Gingerland Secondary School	Gingerland	25	2	4	5	6	42
NVFC090	NVED121	Lyn Jeffers Secondary School	Charlestown	20	2	4	4	6	36
NVFC091	NVED122	Charlestown Sixth Form College	Charlestown	15	2	4	4	15	40
NVFC092	NVED123	University of the Americas	Potworks	20	2	4	3	3	32
		<b>HEALTH</b>							
NVFC093	NVHL01	Alexandra General Hospital	Charlestown	30	2	4	4	15	55
NVFC094	NVHL02	Charlestown Health Centre	Charlestown	10	2	4	4	3	23
NVFC095	NVHL03	Brown Hill Health Centre	Brown Hill	35	2	4	5	3	49
NVFC096	NVHL04	Gingerland Health Centre	Gingerland	20	2	4	5	3	34
NVFC097	NVHL05	Butlers Health Centre	Butlers	20	2	4	4	3	33
NVFC098	NVHL06	Comberre Health Centre	Combermere	20	2	4	3	3	32
NVFC099	NVHL07	Cotton Ground Health Centre	Cotton Ground	15	2	4	3	3	27
		<b>GAS DISTRIBUTION</b>							
NVFC103	NVGS01	DELTA Terminal	Low Ground	20	4	4	4	3	35
NVFC104	NVGS02	SHELL Terminal	Charlestown	15	6	12	4	15	52
NVFC105	NVGS03	SHELL Pinney	Pinney	15	4	4	4	3	30
NVFC106	NVGS04	DELTA Jessup	Jessups Village	15	4	4	3	3	29
NVFC107	NVGS05	DELTA ENF	Cotton Ground	15	4	4	3	3	29
NVFC108	NVGS06	DELTA Skilli	Newcastle	20	4	4	3	9	40
NVFC109	NVGS07	DELTA Market Shop	Market Shop	25	4	4	5	3	41
NVFC110	NVGS08	Govt. Garage	Prospect	20	4	4	5	3	36
NVFC111	NVGS09	DELTA Noel	Farm Estate	15	4	4	5	3	31
NVFC112	NVGS10	SHELL Loyd Powell	Bath Village	15	4	4	4	12	39
NVFC113	NVGS11	SHELL Reliable Motors	Charlestown	20	4	4	4	12	44
NVFC114	NVGS12	DELTA Stanley	Fig Tree	20	4	4	5	3	36
		<b>TELECOMMUNICATIONS</b>							
NVFC115	NVTE0100	Rambury X	Rambury X	15	2	8	4	9	38
NVFC116	NVTE0200	Market Shop X	Market Shop X	20	2	8	5	9	44
NVFC117	NVTE0300	Newcastle X	Newcastle X	15	2	8	3	9	37
NVFC118	NVTE0111	JNC Cotton Ground	Cotton Ground	15	2	4	3	9	33

NVFC119	NVTE0107	JNC Jessups	Jessups	10	2	4	3	9	28
NVFC120	NVTE0110	Four Season Clarke Estate	Four Seasons	10	2	4	3	9	28
NVFC121	NVTE0109	New Cut Rd	New Cut Rd	10	2	4	4	9	29
NVFC122	NVTE0106	Bottom Craddock Rd	Craddock Rd	15	2	4	4	9	34
NVFC123	NVTE0103	JNC Govt. Rd. to RMD	Govt. Rd	10	2	4	4	9	29
NVFC124	NVTE0101	Barclays bank	Barclays bank	10	2	20	4	9	45
NVFC125	NVTE0108	Super Foods	Super Foods	15	2	4	4	18	43
NVFC126	NVTE0102	Bath round about	Bath round	15	2	4	4	18	43
NVFC127	NVTE0104	Top of Govt. Rd	Govt. Rd	10	2	4	4	9	29
NVFC128	NVTE0105	Mem's Pizzaria	Mem's Pizzaria	15	2	4	5	9	35
NVFC129	NVTE0112	JNC Senior Home Prospect Rd.	Prospect Rd	15	2	4	5	9	35
NVFC130	NVTE0206	8/13/018/13/018/13/018/13/01	Zion Hill	20	2	4	5	9	40
NVFC131	NVTE0210	Fenton Hill	Fenton Hill	20	2	4	5	9	40
NVFC132	NVTE0209	Market Shop	Market Shop	20	2	4	5	9	40
NVFC133	NVTE0207	Rawlins	Rawlins	20	2	4	5	9	40
NVFC134	NVTE0204	Chicken stone	Chicken stone	20	2	4	5	9	40
NVFC135	NVTE0203	Strikers Car Rental	Strikers Rental	15	2	4	5	9	35
NVFC136	NVTE0208	Church Ground	Church Ground	15	2	4	5	9	35
NVFC137	NVTE0205	Hanleys Rd	Hanleys Rd	20	2	4	5	9	40
NVFC138	NVTE0301	Newcastle Airport	Newcastle	15	2	4	3	15	39
NVFC139	NVTE0302	Newcastle Pottery	Newcastle	15	2	4	3	9	33
NVFC140	NVTE0303	Methodist Church Liburd Hill	Liburd Hill	15	2	4	3	9	33
NVFC141	NVTE0304	Jones Estate	Jones Estate	10	2	4	3	9	28
NVFC142	NVTE0306	Butlers	Butlers	20	2	4	4	9	39
		<b>PORTS</b>							
NVFC143	NVS	International Airport	Newcastle	35	4	4	3	24	70
NVFC144	CRL	Charlestown Port	Charlestown	10	12	24	4	3	53
NVFC145	DWP	Deep Water Port	Long Point	15	14	20	4	3	56
		<b>TRANSPORTATION (MAIN ROAD)</b>							
NVFC146	NVRM001	Stoney Grove-Charlestown		15	2	20	5	30	72
NVFC147	NVRM002	Newcott - Jessup		10	2	20	4	18	54
NVFC148	NVRM003	Cades Bay - Jones Estate		15	2	12	3	18	50
NVFC149	NVMR004	Jones Estate - Newcastle		15	2	16	3	24	60

Highest FVS  
FVS break point

45	14	24	6	30	119
>22	>6	>11	>2	>14	

FVS break points: Facility Vulnerability Score (FVS) rated with more than the 50% of the possible hazard's FVS

FVS = (L+V) HPS

"FVS" Facility Vulnerability Score

"L" Locational Vulnerability

"V" Vulnerability Score

"HPS" Hazard Priority Score.

$$V = DH + S + O$$

## APPENDIX 2 – HAZARD AND VULNERABILITY ASSESSMENT –DETAILS

(Extracted from Report - Hazard Vulnerability Assessment, St Kitts and Nevis  
by Eduardo M Mattenet)

### PART II – ST. KITTS

#### 1.0 St.Kitts - Hurricanes and Storms

##### 2.1 Hazard Zones

Three hazards related to hurricanes and storms were studied: wind, storm surge and waves. Storm surge and waves are dependent upon wind for their generation and the hazards are closely related. Table 4 indicates the categories used to zone these hazards. It indicates the lower and upper bounds of each of the categories and provides a reference for the hazard maps produced. Table 5 describes the Saffir / Simpson Hurricane Scale; it can be used to convert the categories and bounds in Table 4 to measurements and damage estimates.

**Table 4 – Wind, Waves and Storm Surge Hazard Categories**

HAZARD LEVEL	Description	Lower Bound winds (m/sec)	Upper Bound winds (m/sec)	Lower Bound surge (m)	Upper Bound surge (m)	Lower Bound waves (m)	Upper Bound waves (m)
0	none	0	17	0.0	0.1	0.0	0.1
1	low	17	43	0.1	0.5	0.1	1.0
2	moderate	43	50	0.5	1.5	1.0	1.5
3	high	50	59	1.5	3.0	1.5	2.0
4	very high	59	100	3.0	100.0	2.0	100.0

Source: Wagenseil, R. 2001. Wind and Storm Surge Technical Report. <http://www.oas.org/pgdm>.

#### 2.2 Wind

##### 2.2.1 Wind Zones

Map 1 indicates the vulnerability of St. Kitts to winds by the return periods of 10 years, 25 years, 50 years and 100 years. The 10-year return period subjects the entire island to low vulnerability that is of the tropical storm and hurricane category 2 wind strength. Minimal damage would be expected.

The 25-year return period would generate low vulnerability at the northeast of the island, and moderate vulnerability that is with wind strengths of category 2 and 3. Moderate / Extensive damage would be expected in the center and above 500 feet.

Basseterre area shows low vulnerability, Frigate Bay with moderate vulnerability. Southeast Peninsula (SEP) shows moderate vulnerability except for the Cades Bay, Sand bank Bay, and the Caribbean side, which show low vulnerability.

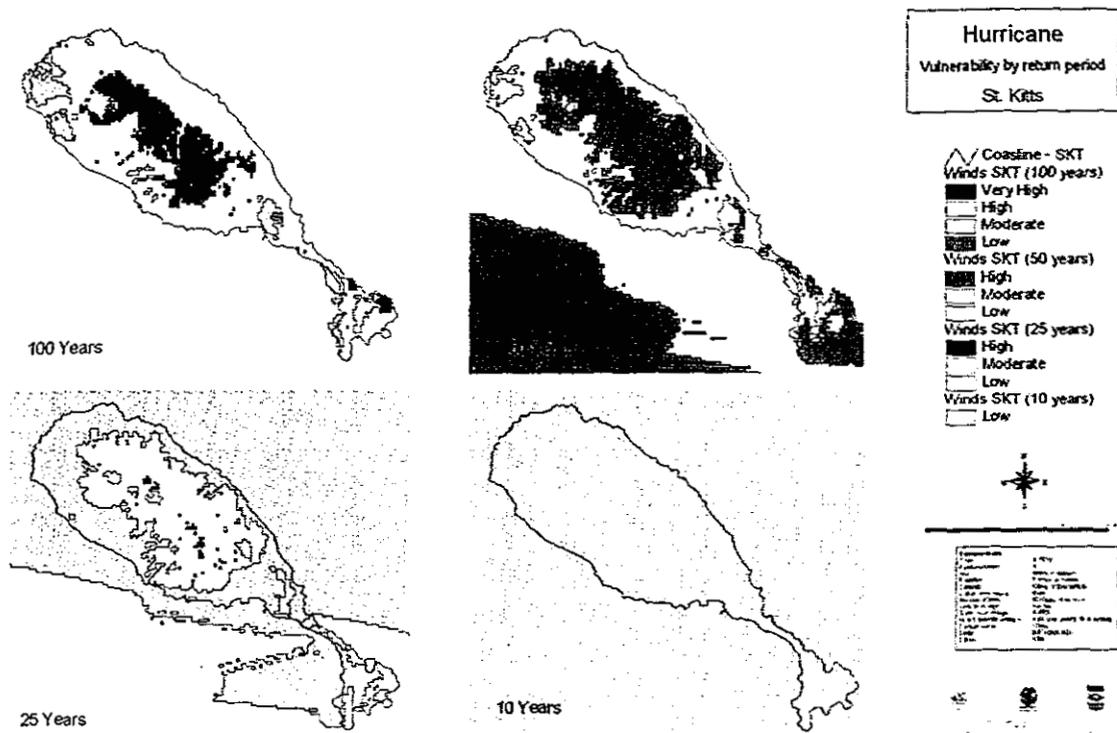
Also some pockets of High vulnerability exist above the 1.500 feet that is with wind strength of category 3 and 4. Extensive / Extreme damage would be expected, it is to mention that the main water intake "Lodge" will have a high vulnerability.

For the 50-year return period most of St. Kitts is in the Moderate vulnerability zone, except for some pockets at the northeast and in the SEP. High vulnerability would be expected above the 500 contour, as well as in Frigate Bay area, and SEP.

The 100-year storm would place most of the island within the high vulnerability zone, including the northeast, Frigate Bay, and some pockets of the SEP. Very high vulnerability would be expected above 1000 feet, as well as in Canada Estate area. In this high vulnerability areas, storm winds of category 4 and 5 winds strength would be expected, resulting in Extreme or Catastrophic damage.

**Table 5- Saffir/ Simpson Hurricane Scale**

Category	Pressure millibars	RMAX		Wind				Storm Surge meters	Damage
		Km	nmi	m/s	kph	mph	knots		
<b>0 Tropical Storm</b>	>= 995			17 - 32	61 - 119	38 - 74	34 - 63	0.5 - 1.2	<b>Some</b>
<b>1 Hurricane</b>	980 - 995	45	25	33 - 42	119 - 153	74 - 95	64 - 82	1.2 - 1.5	<b>Minimal</b>
<b>2 "</b>	965 - 979	40	22	43 - 49	154 - 177	96 - 110	83 - 95	1.6 - 2.4	<b>Moderate</b>
<b>3 "</b>	945 - 964	30	17	49 - 58	178 - 209	111 - 130	96 - 113	2.5 - 3.6	<b>Extensive</b>
<b>4 "</b>	920 - 944	20	12	58 - 69	210 - 249	131 - 155	114 - 135	3.7 - 5.4	<b>Extreme</b>
<b>5 "</b>	< 920	17	9	> 69	> 249	> 155	> 135	> 5.4	<b>Catastrophic</b>

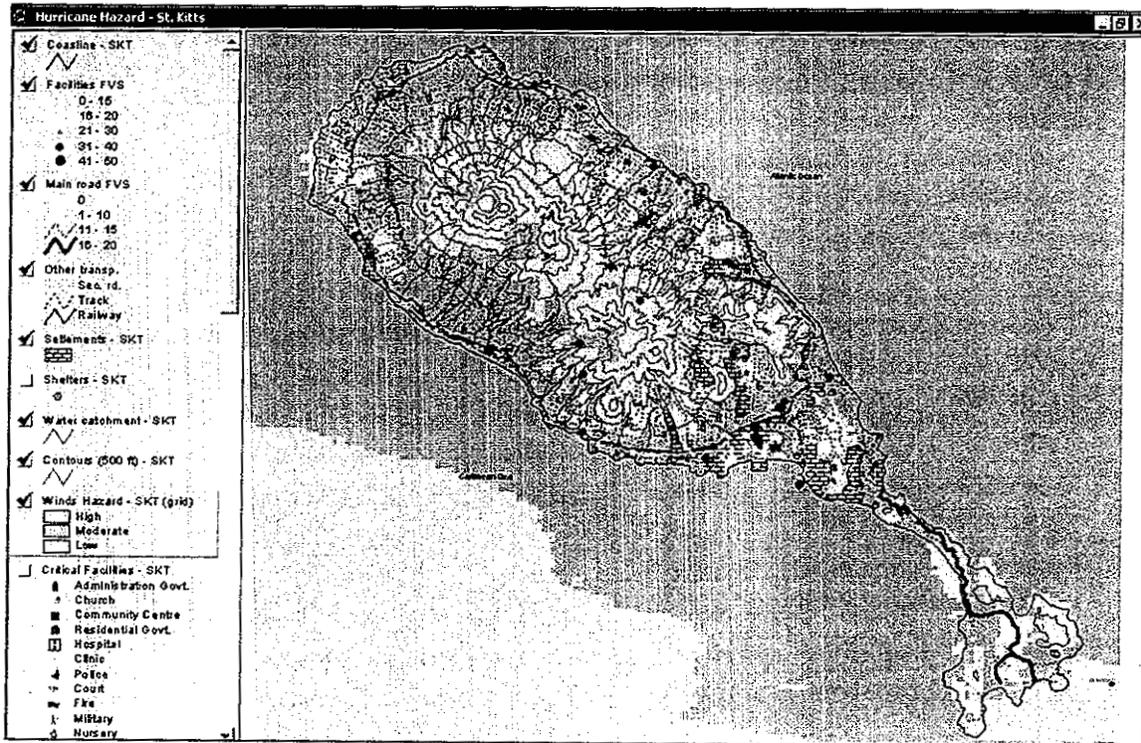


**Map 1- St. Kitts Wind / Hurricane Vulnerability by Return Period**

The long-term vulnerability is similar to the 50-year storm. As Map 2, indicates the central and eastern districts of the island are within the moderate vulnerability zone. The western section of the island is low and some sections of the southern range are within a high vulnerability zone.

### 2.2.2 Wind FVS

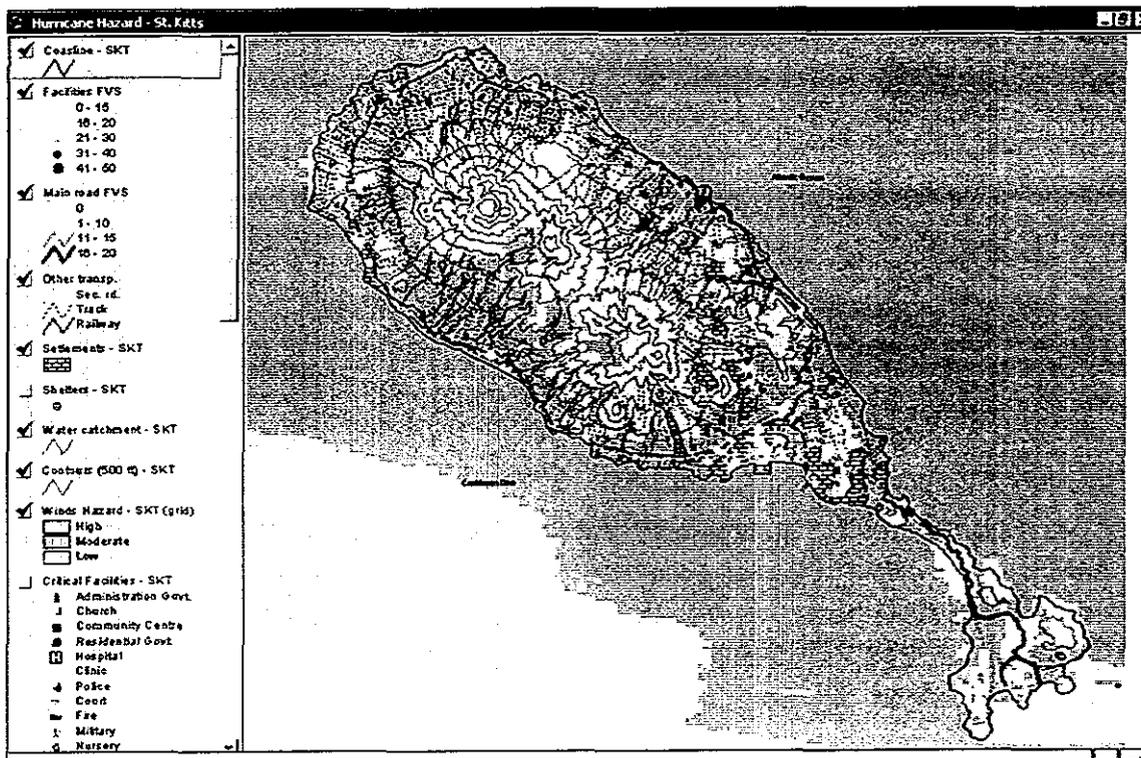
Map 2 indicates the distribution of facilities by wind FVS and the long-term vulnerability to wind. It indicates that facilities with the higher FVS are fairly evenly distributed throughout urban areas Basseterre, Cayon, Mansion, Verchilds, and Sandy Point. Map 3 indicates the location of facilities which have an FVS of more than 50% of the possible wind FVS (50). They are clustered around Basseterre and scattered evenly around the island.



**Map 2- St. Kitts Long Term Vulnerability to Hurricane / Wind and Facility FVS**

The analysis reveals that several key critical facilities have extremely high FVS. The facilities and their FVS are listed below:

Attributes of Critical Facilities - SKT						
FAC Type	Fac. Class	NAME Fac.	LOCATION	WIND FVS	Shelter	
Education	Secondary	Washington Archibald High	Taylor's Range	50	0	
Education	Secondary	Cayon High	Cayon	50	0	
Community	Community Centre	Warner Park	Basseterre	45	0	
Protective	Police	Police Station	Cayon	45	0	
Medical Facilities	Hospital	Pagson Hospital	Sandy Point	45	0	
Protective	Police	Police Training Complex	Basseterre	45	0	
Education	Secondary	Sandy Point High	Sandy Point	45	0	
Government	Storage	Customs Shed	R/LB Intl Airport	45	0	
Education	Secondary	Basseterre High	Basseterre	45	0	
Education	Secondary	Verchilds High	Verchilds	45	0	
Government	Storage	Abbot	Basseterre	40	0	
Utilities	Water	Water Intake Phillips	Phillips	40	0	
Utilities	Water	Water Intake Stonefort	Stonefort	40	0	
Community	Church	Unity Anglican Church	Palmetto Point	40	1	
Protective	Police	Police Station	Tabernacle	40	0	
Utilities	Water	Water Intake Lodge	Lodge	40	0	
Infrastructure	Sea Port	Deep Water Port	Bird Rock	40	0	
Community	Community Centre	New Pavilion	Cleverly Hill	40	1	
Protective	Police	Police Station	St Pauls	40	0	



Map 3. St. Kitts Facilities with Wind FVS Greater than 25

In addition, several Shelters had FVS of 30 or above are listed below in Figure 1.

Attributes of Critical Facilities - SKT						
<i>GIS_CODE</i>	<i>FAC_Type</i>	<i>Fac_Class</i>	<i>NAME_Fac</i>	<i>LOCATION</i>	<i>WIND_FVS</i>	<i>Shelter</i>
10704	Community	Community Centre	Pavillion	Molineux	30	1
10702	Community	Church	Estridge Moravian Church School	Mansion	35	1
10802	Community	Community Centre	Pavillion	St. Mary Play Field	30	1
10504	Community	Community Centre	New Pavillion	Cleverly Hill	40	1
10402	Community	Community Centre	Pavillion	Verchilds Pature	30	1
10206	Education	Nursery	Moravian Church Pre-School	Victoria Road	30	1
10303	Community	Church	Trinity Anglican Church	Palmetto Point	40	1

Figure 1. St. Kitts Shelters with Wind FVS of 30 or greater.

### 2.2.3 Feature Vulnerability to Wind

In the long term most of St. Kitts is moderately vulnerable to winds. The high vulnerability zones consist largely of forest reserves, sugar cane fields, and scrubs lands.

Also there is a concentration of facilities with high FVS in the area of Basseterre, Cayon, Sandy Point, and the port's area.

## 2.3 Storm Surge

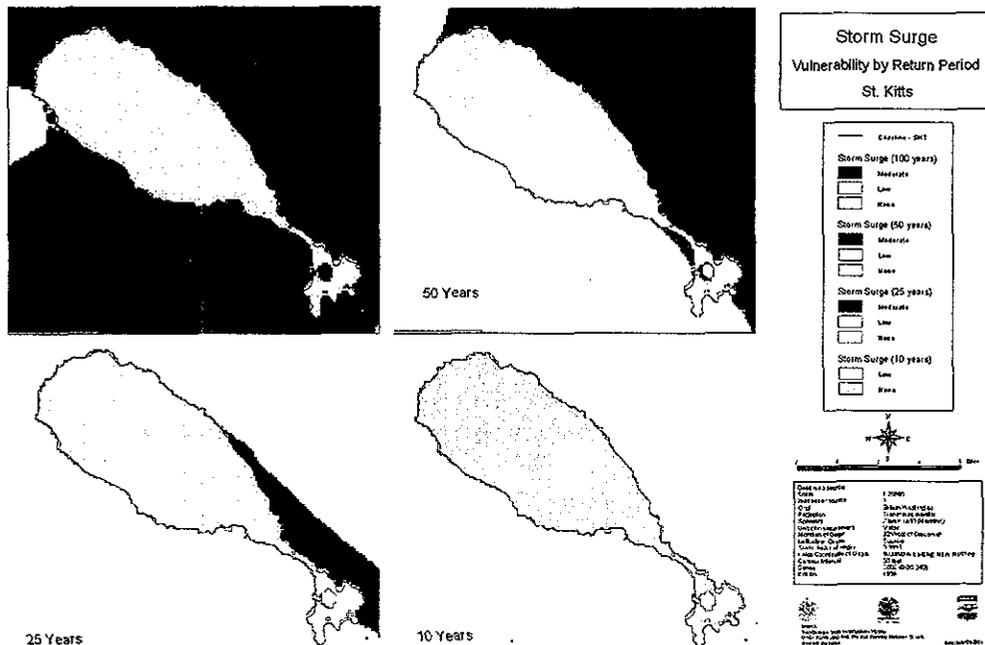
### 2.3.1 Storm Surge Zones

The 10-year return period shows the entire coast would have very low or no vulnerability, with the exception of the Dieppe Bay/Dowson's Ghaut, Grange Bay, North Friars Bay, the southwest of SEP (including Mayors; Bay and the salt ponds), South Friars Bay and the Basseterre waterfront would have low storm surge vulnerability. It would be similar to that experienced in a tropical storm with some damage and surge to the heights of 0.1 to 0.5 meters.

The 25-year return period would place most of the coast, except for the northeast coast in a moderate vulnerability storm surge zone (from Mosquito Bay up to Hermitage Bay) with surge varying between 0.5 and 1.5 meters with minimal damage. Also, two pockets of moderate vulnerability storm surge shows at the northeast and south of the Great Salt pond.

The 50-year return period shows the Atlantic coast with moderate vulnerability storm surge, as well as from South Friars Bay up to Frigate Bay and the salt ponds of the SEP, the sea would surge in the Factory Tank area. The Basseterre waterfront would expect a low vulnerability storm surge. The rest of the coastline would expect none/very low vulnerability storm surge.

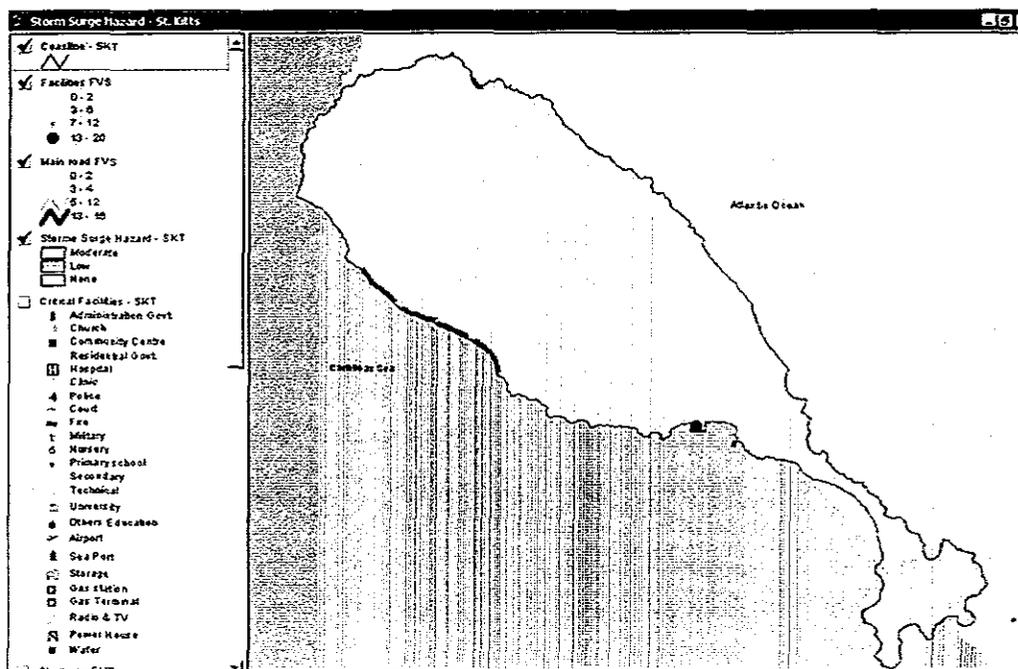
The 100-year return period would expose the entire coastline with a moderate vulnerability storm surge, with the exception of Pump Bay.



**Map 4- St. Kitts Storm Surge Vulnerability by Return Period**

The long-term vulnerability of St. Kitts to storm surge is identical to the 50-year storm. The Atlantic coast with moderate vulnerability storm surge, as well from South Friars Bay up to Frigate Bay and the salt ponds, and a pocket in the Factory Tank area.

Basseterre's waterfront, with a low vulnerability storm surge. The rest of the Caribbean coastline would expect no/very low vulnerability storm surge.



**Map 5- St. Kitts Long Term Vulnerability to Storm Surge and FVS**

### 2.3.2 Storm Surge FVS

Two facilities have an FVS of more than 18 at Port Zante (Arrivals Hall, and pier). Also two segments of the Main Road show a high Surge FVS, the sectors are: Brimstone Hill to Old road (14), and Parsons to Saddlers (16). Map 5 indicates their distribution.

Six of these facilities have a Surge FVS higher than 10 and are shown in Figure 2.

Also two different areas show facilities with high Surge FVS:

- Basseterre: the Deep Water port, the Pelican Mall, and the Social Security Building
- Half Way Tree: the Half Way Tree Pre-School.

In addition the shelter “Church of God” at Half Way Tree indicates a Surge FVS of 6, as well as the Public Market, the Petroleum Terminals of Shell and Texaco, Academy Pre-School, Turcker-Clarke primary school, and the Newtown Health Centre in the Basseterre area.

Attributes of Critical Facilities - SKT					
FAC_Type	Fac_Class	NAME_Fac	LOCATION	Storm_Fvs	Shelters
Government	Administration	Arnyas Drive	Port Zante	20	0
Infrastructure	Sea Port	Port Zante	Basseterre	18	0
Infrastructure	Sea Port	Dieppe Valley	Bird Rock	12	0
Government	Administration	75th St Mall	Basseterre	10	0
Education	Primary	St. Mary's Free Pres School	Half Way Tree	10	0
Government	Administration	Social Serv. Building	Basseterre	10	0
Medical Facilities	Clinic	NEALON BUSH DASH	Basseterre	5	0
Education	Primary	St. Peter's Church	New Guinea	5	0
Government	Storage	Public Works	Basseterre	5	0
Education	Primary	Academy P.C. School	Bay Road	5	0
Utilities	Recreation	4 EXA 30 Terminal	Basseterre	5	0
Utilities	Recreation	SHED Terminal	Basseterre	5	0
Community	Church	CHURCH GOD	Half Way Tree	6	0

**Figure 2- St.Kitts Facilities with High Storm Surge FVS**

It is important to mention that this assessment does not include Tourist facilities, and a large number of hotels, especially in the Atlantic coast, which are located within a moderate storm surge vulnerability zone (e.g. Frigate Bay area). It is recommended that a new assessment should be done that will include tourist facilities.

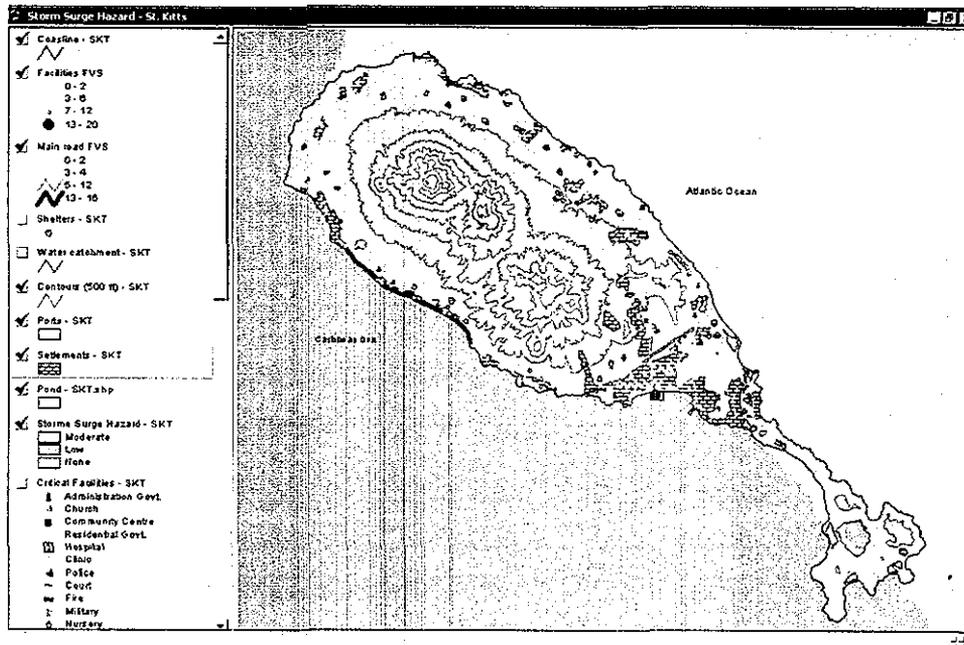
### 2.3.3 Feature Vulnerability to Storm Surge

Most of the coastal features of St. Kitts are vulnerable to moderate and low storm surge. All the piers are vulnerable to moderate storm surge, as well as two portions of the main road: -  
Brimstone Hill/Old Road: Fort Charles, Old Road bay, and Half Way Tree.

- Parsons/Saddlers: Sandy Bay.

The following settlements are most likely to have a low vulnerability to storm surge:

North of Dieppe Bay Town, South of Frigate Bay, Bird Rock south, Basseterre's water front, Fort Charles, Half Way Tree and New Guinea.



**Map 6- St. Kitts Feature Vulnerability to Storm Surge**

## 2.4 Waves

### 2.4.1 Wave Zones

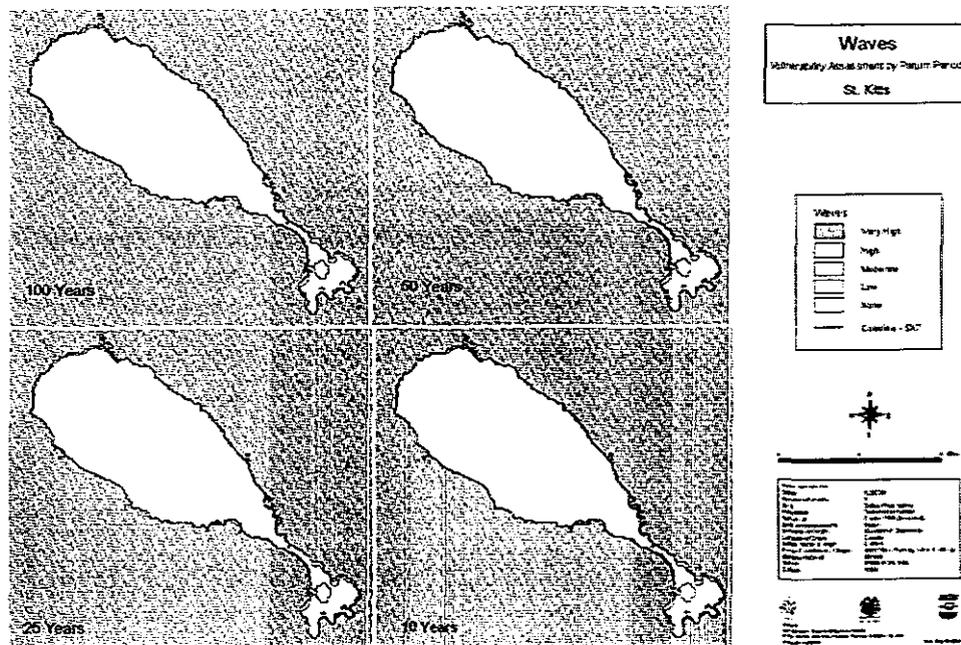
Map 7 indicates the vulnerability of St. Kitts to the various storm return periods. The 10-year return period indicates, in general, high wave vulnerability and very high wave vulnerability all along the Atlantic and Caribbean coastline.

The Caribbean coast: Intrusion of waves are shown in Basseterre waterfront, Port Zante and the Deep Water Port area, a Very High Wave vulnerability and a mix of high, and moderate vulnerability as well as in south Frigate Bay and the SEP.

The Atlantic coast: Intrusion of waves are shown in Dieppe Bay town as well as in Half Moon Bay, with a mix of very high and high wave vulnerability.

Very high vulnerability zones will experience waves between 2.0 and 10.0 meters. High zones will have waves between 1.5 and 2.0 meters. Moderate vulnerability zones can expect waves between 1.0 and 1.5 and low vulnerability zone will have waves below 1.0 meters.

The 25-year, 50-year, and the 100-year wave return period, shows identical results as the 10-year period, except for the South Friar Bay that shows very high wave vulnerability for the 50/100-year return period.



Map 7- St. Kitts Wave Vulnerability by Return Period

### 3.0 St. Kitts –Flooding

#### 3.1 Flood Zones

Cooper<sup>1</sup> indicates that the data required for traditional floodplain mapping was not available for St. Kitts. As a result, the flood analysis “was restricted first to identifying the areas that would generally flood and then to further categorize these areas according to rough estimates of the flood levels expected within the areas”. Areas prone to flooding were identified as those with gentle slopes, poor drainage, large ratios of watershed area to flood plain, rapid run-off to flood plain with high run-off potential.

The hazard category was determined by the water depth of each flood plain on the basis of the Hurricane Lenny rainfall event, using the classification indicated in Table 6. Cooper indicates that this method of categorization provides a measure of the magnitude of flooding to be expected from such an event and provides a measure of the severity of flooding among the identified zones.

**Table 6. Flood Plain Water Depth and Hazard Category**

Water Depth (mm)	<i>Hazard</i>
>1200	Very High
1200-600	High
600-300	Moderate
300-100	Low
<100	Very Low

#### 3.2 Flood FVS

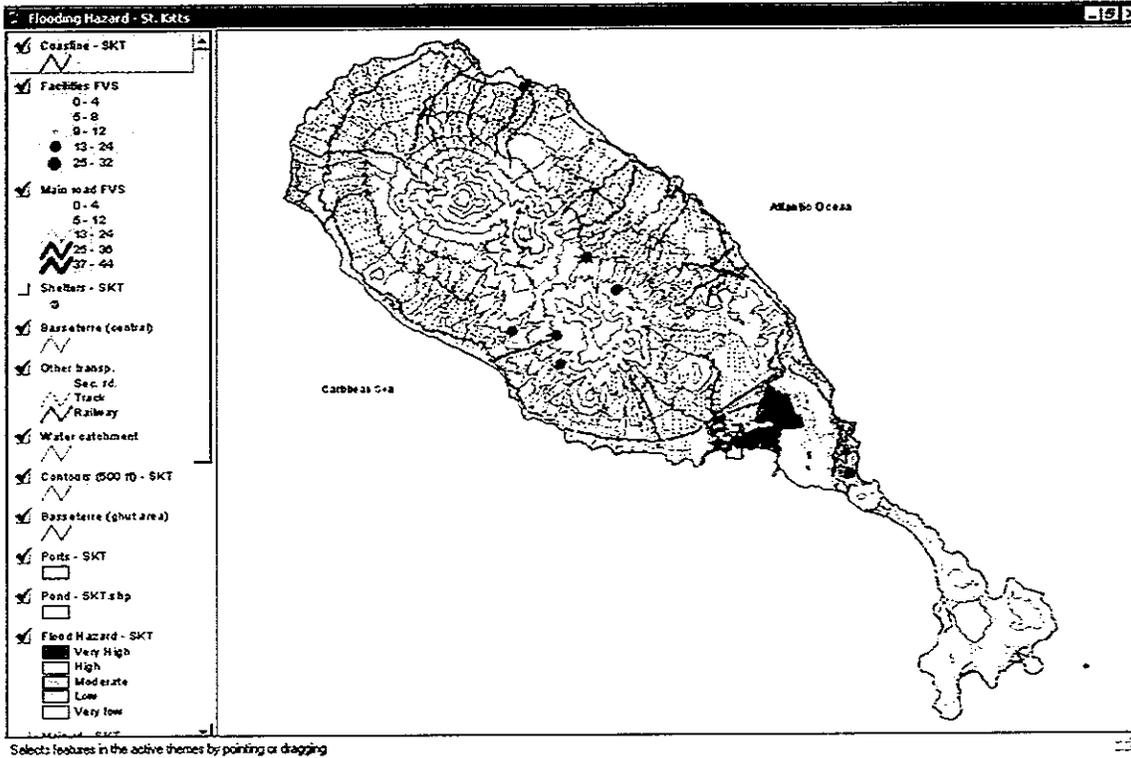
Map 13 indicates the distribution of flood zones and the Facility FVS. The zone of very high vulnerability to flooding is to the northeast of Basseterre. Most of the island has been categorized as a very low flood vulnerability zone.

Figure 3 lists the facilities with high Flood FVS (32). Five shelters are included on the list, Hope Chapel, Rivers of Living Water Church, Church of God, Day Care Centre, Seventh Day Adventist Church.

Other facilities in Basseterre area with high FVS includes: Power Stations B, Police Training Complex , Police Station (Frigate bay), Fire Station, Five of the six main water

<sup>1</sup> Cooper, V. 2001, Flood Methodology Notes. Email .

intakes, six boreholes, Shell Terminal, Social Security Bld., PPD, Public Market, Cemaco, Gas station Shell, and the Newtown Health Centre.



Map 13. St. Kitts Flood Vulnerability Zones and Facility FVS

Attributes of Critical Facilities - SKT					
NAME FAC	FAC Type	Fac Class	LOCATION	Flood FVS	Shelter
Police Training Complex	Protective	Police	Basseterre	32	0
Social Security building	Government	Administration	Basseterre	32	0
Public Market	Government	Storage	Basseterre	28	0
SHELL Terminal	Utilities	Petroleum	Basseterre	26	0
Physical Planning, Development	Government	Administration	Basseterre	24	0
Industrial Site day Care	Education	Nursery	Industrial Site	20	0
St. Theresa Convent	Education	Primary	East Independence Square	20	0
SHELL Pond Rd.	Utilities	Gas	Basseterre	20	0
Water Intake Wingfield	Utilities	Water	Wingfield	20	0
School Meals building	Government	Storage	?	20	0
Water Intake Franklands	Utilities	Water	Franklands	20	0
Water Intake Stonefort	Utilities	Water	Stonefort	20	0
Saddlers Health Centre	Medical Facilities	Clinic	Saddlers	20	0
Water Intake Philips	Utilities	Water	Philips	20	0
R.L.B Airport	Utilities	Water	Conaree	20	0
St. Theresa Convent High	Education	Secondary	East Independence Square	20	0
Police Station	Protective	Police	Figgate Bay	20	0
Factory Shells	Government	Storage	Basseterre	20	0
CEMADO	Government	Storage	Basseterre	20	0
Conaree	Utilities	Water	Conaree	20	0
1-47	Utilities	Water	Basseterre Valley	20	0
Ponds#2	Utilities	Water	Basseterre Valley	20	0
1-41	Utilities	Water	Basseterre Valley	20	0
1-48	Utilities	Water	Newton Ground	20	0
Church of God	Community	Church	Westbourne Street	20	1
Newtown Health Centre	Medical Facilities	Clinic	Basseterre	20	0
Seventh Day Adventist Church	Community	Church	Wellington Road	20	1
Day Care Centre	Education	Nursery	Figgate Bay Road	20	1
Water Intake Lodge	Utilities	Water	Lodge	20	0
Fire Station	Protective	Fire	Basseterre	20	0
Hope Chapel	Community	Church	George Street	20	1
Treasury Building	Government	Administration	Basseterre	20	0
Power Station B	Utilities	Electricity	Needsmust	20	0
Rivers of Living Waters Christi	Community	Church	Southwell Industrial Park	20	1

Figure 3a. St. Kitts Facilities with High Flood FVS

### 3.3 Feature Vulnerability to Floods

The following portions of transportation network are showing high FVS

Attributes of Main road FVS			
FAC Type	Fac Class	NAME FAC	FVS
Infrastructure	Roads	Ponds Rd.	44
Infrastructure	Roads	College Ghaut (Lower)	44
Infrastructure	Roads	College Ghaut (Upper)	44
Infrastructure	Roads	Keys - Cayon	36
Infrastructure	Roads	Bay rd. (Circus - Fishing Complex)	32
Infrastructure	Roads	Bay rd. (War Memorial - Circus)	32
Infrastructure	Roads	Fort Thomas - War Memorial	32
Infrastructure	Roads	Parsons - Saddlers	24
Infrastructure	Roads	Christ Church - Mansio	24

Figure 3b. St. Kitts Transportation network with High Flood FVS

These include: Keys to Cayon and the crossing area of Wash Ghaut and Cayon River. Along Christ Church to Mansion, Parson to Saddlerds (Lavington Ghaut, Linches Ghaut, Pogsons Ghaut). Along Fort Thomas road up to New Town, Ponds road, and Upper and lower College street Ghaut.

Very high flooding vulnerability zones cover urban areas, southeast of Basseterre, Ponds Estate, Kittstoddart's, up to Needsmust Estate, as well as sugar fields.

High flooding vulnerability zones exist in urban areas, Conaree, Canada Estate, as well as in the Dump site, sugar cane field, others agricultural areas and scrubs.

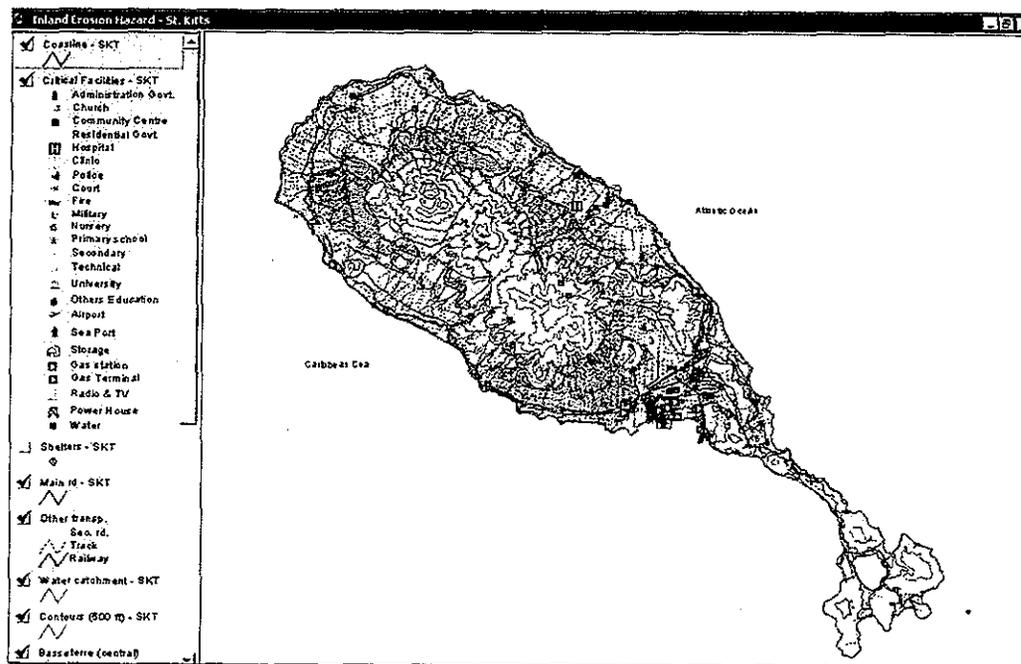
Moderate flooding vulnerability zones covers the Tourist facilities at north Frigate Bay, and center Basseterre Bay road area. Also covering sugar fields.

Low flooding vulnerability zones around the island include, Half Way Tree, Sandy Point, Fig Tree Village, Newton Ground, Dieppe Bay town, and Parsons Ground, Sugar cane fields and scrub too.

## 4.0 St. Kitts - Inland Erosion

### 4.1 Inland Erosion Zones

Lang<sup>1</sup> indicates that “simple empirical models were used to produce hazard scores for each land unit” and that “the models integrate the estimated effects of elements of the environment which cause or influence the hazard and produce a score”. The final score is an estimate of the likely occurrence of the hazard at the location. The scores were classified into 5 equal area classes, very low, low, medium, high and very high groupings. Adding classes and then reclassifying produced the final map. It combines gullying, mass movement and to some extent stream bank erosion. Map 14 indicates the inland erosion zones established.



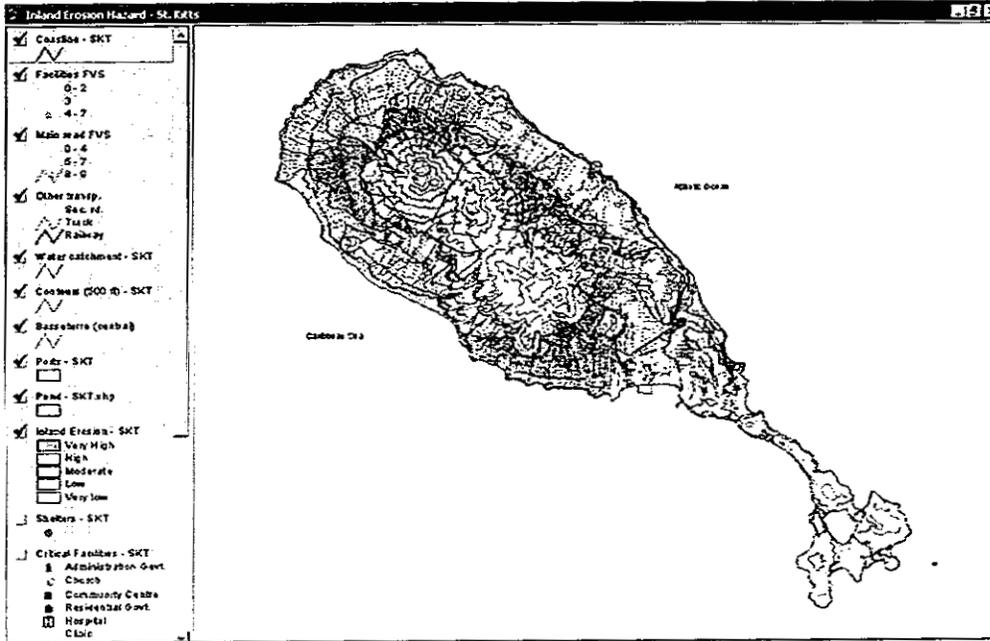
Map 14. St. Kitts Inland Erosion Zones

### 4.2 Inland Erosion FVS

Map 15 indicates that the distribution of facilities with the highest vulnerability to inland erosion are grouped in the south, and spread across the island. It is important to mention that five out of the six main water intakes show a high FVS, as well as other boreholes, shows a high FVS.

<sup>1</sup> Lang, D.M., 2001, 'Inland' Erosion Hazards in St. Kitts and Nevis, <http://www.oas.org/pgdm>

Basseterre area: Social Security building, JNF General Hospital, and the Abbatoir.  
 Trinity area: Bronte Welsh School and Ross University.  
 Also six Shelters show a high FVS for inland erosion.



Map 15. St. Kitts Location of Facilities with high FVS

Attributes of Critical Facilities - SKT					
FAC_Type	Fac_Class	NAME FAC	LOCATION	Erosion FVS	Shelter
Utilities	Water	Water Intake Philips	Philips	7	0
Government	Administration	Social Security building	Basseterre	6	0
Utilities	Water	Water Intake Wingfield	Wingfield	6	0
Community	Church	Seventh-Day Adventist Church	Philips	6	1
Utilities	Water	Water Intake Lodge	Lodge	6	0
Utilities	Water	Water Intake Franklands	Franklands	6	0
Utilities	Water	Water Intake Stonefort	Stonefort	6	0
Utilities	Water	Stonefort	Stone Fort	5	0
Utilities	Gas	SHELL Buckleys	Buckleys	5	0
Utilities	Water	Orton's	Orton's	5	0
Government	Storage	Abbatoir	Basseterre	5	0
Utilities	Water	1-51	La Guente	5	0
Utilities	Gas	TEXACO Buckleys	Buckleys	5	0
Utilities	Water	Sir Giles	Sir Giles	5	0
Education	Primary	Bronte Welsh	Trinity	5	0
Community	Community Centre	Eastern Benevolent Society Building	Camps	5	1
Community	Community Centre	Community Centre	Palmetto Point	5	1
Medical Facilities	Hospital	JNF General Hospital	Basseterre	5	0
Education	University	Ross University	Trinity	5	0
Community	Church	Trinity Anglican Church	Palmetto Point	5	1
Protective	Police	Police Station	Old Road	5	0
Government	Residential	Estate House	Philips Estate	5	1
Government	Residential	Estate House	Stonefort Estate	5	1

Figure 4a. St. Kitts Facilities high Erosion FVS (>4)

### 4.3 Feature Vulnerability to Inland Erosion

Mainly sugar cane fields and agriculture covers the majority of the zones with high and very high vulnerability to inland erosion.

<i>FAC_Type</i>	<i>Fac_Class</i>	<i>NAME_FAC</i>	<i>IE_FVS</i>
Infrastructure	Roads	Stonefort	9
Infrastructure	Roads	College Ghaut (Lower)	8
Infrastructure	Roads	College Ghaut (Upper)	8
Infrastructure	Roads	SEP rd. (Friar's Bay)	7
Infrastructure	Roads	Phillips	7
Infrastructure	Roads	Keys - Cayon	6
Infrastructure	Roads	Christ Church - Mansio	6
Infrastructure	Roads	Brimstone Hill - Old Road	6
Infrastructure	Roads	SEP rd. (Mayor's Bay)	6

Figure 4b. St. Kitts Transportation network with high FVS (>4)

<i>Settl_name</i>	<i>Settl_class</i>
Sir Gillies Estate	Estate
Fig Tree	Village
Farm Estate	Estate
Phillips Village	Village
Sandy Point	Town
Cayon	Town
Keys	Village
Bayford's	Town
Ogee's	Village
Canada Estate	Estate
Wingfield Manor Estate	Estate
Fountain Estate	Estate
Old Road	Town
St. Peters	Town
Milliken Estate	Estate
Basseterre	Capital
Matingley Heights	Village
Shadwell Estate	Estate
Challengers	Village
Olivees Village	Village
Boyd's Estate	Estate
Trinity	Village
Dewars	Village
West Farm Estate	Estate
Boyd's	Village
Frontier Village	Village
Garvey's Estate	Estate
Camps	Estate

Figure 4c. St. Kitts Settlements w/ high vulnerability inland erosion.

The condition of the following roads are adversely affected by erosion:

A segment of the Main road shows the highest FVS (9) at Stone Fort Ghaut area, and in Upper and Lower College Street in Basseterre. The SEP road at Friar's Bay, and Mayor's Bay, also Phillips Village Road, Nicola Town to Mansion Village, in the area of Old Road Town.

Some highly populated settlements such as Basseterre, Sandy Point, and Cayon are located within or expanding towards Very High or High vulnerability to inland erosion.

Figure 4c- lists all the towns, villages, and estates located in zones of very high or high vulnerability to inland erosion are listed.

## 5.0 St. Kitts - Coastal Erosion

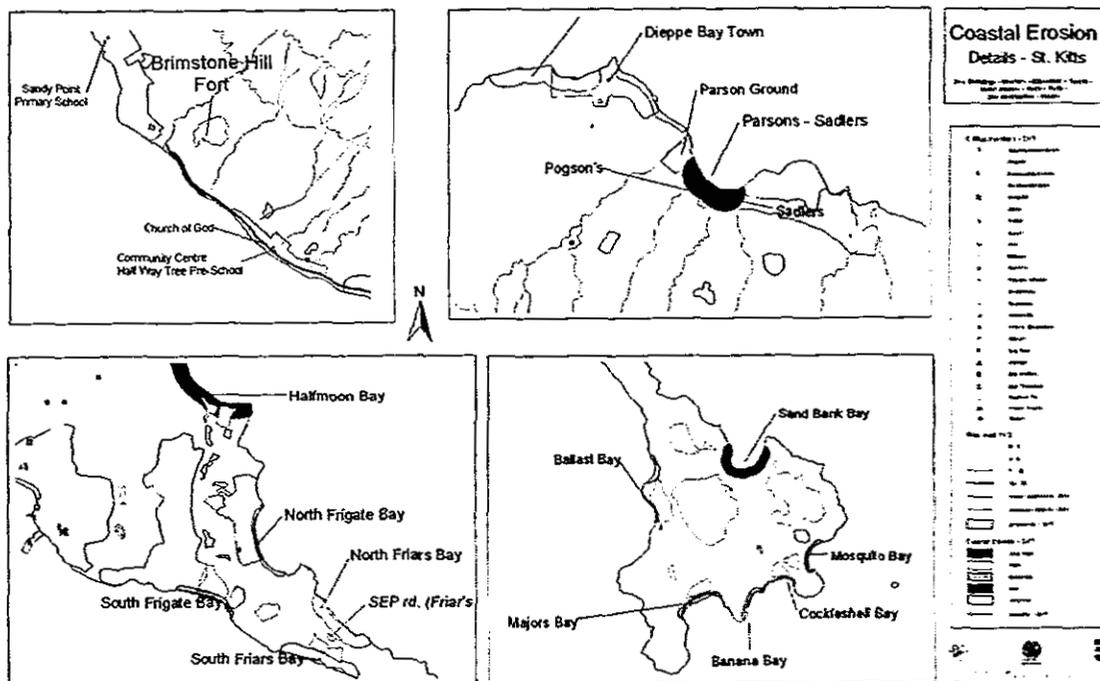
### 5.1 Beach Erosion Zones

<sup>1</sup>Beach erosion zones are established with the beach setbacks recommended by The Department of Environment and applied to the beaches monitored by The Fisheries Division of St. Kitts & Nevis.

Setback distance is calculated for a return period of 50 years, the buffer areas around beach segments shows relative beach erosion hazard zones used in the maps.

The Fisheries Division and the Physical Planning Division actually monitor the beach profiles on 21 beaches in St. Kitts on a quarterly basis. Emphasis is placed on beach changes and data has been collected since 1993. Most of the monitored beaches in St. Kitts are categorized as medium to very high erosion zones.

On the Atlantic coast, five out of six beaches have a high and very high hazard rates. Seven out of nine beaches on the Caribbean coast have a low or very low hazard rating.



**Map 16. Facilities Most Vulnerable to Beach Erosion in St. Kitts**

<sup>1</sup> Edsel B. Daniel, 2001, 'An Assessment of Coastal Erosion in St. Kitts and Nevis', <http://www.oas.org/pgdm>

### 5.2 Beach Erosion FVS

Only three facilities have an FVS of more than 50% of total possible score (12). These facilities are: The Half Way Tree School, the Sandy Point Primary school, and the Church shelter Church of God at Half Way Tree.

FAC Type	Fac Class	NAME Fac	LOCATION	Care/No	Shelter
Education	Nursery	Half Way Tree Pre-School	Half Way Tree	12	0 ▲
Community	Church	Church of God	Half way Tree	9	1
Education	Primary	Sandy Point	Sandy Point	6	0 ▼

Figure 5a. St. Kitts Facilities high Erosion FVS (>6)

It is important to mention that although only three facilities had shown figures over the FVS break point, a future assessment should include existing Tourism facilities as well new projects (e.g. hotels), as many tourist facilities are located within the coastal erosion hazard zones.

Three segments in the Main road shows the highest Beach Erosion FVS: Parsons to Saddlers, Brimstone Hill to Old Road (Brimstone Hill area), and the SEP road at Friar's Bay. Map 16 indicates Facilities and the Beach Erosion FVS.

FAC Type	Fac Class	NAME FAC	FVS
Infrastructure	Roads	Parsons - Saddlers	30 ▲
Infrastructure	Roads	Brimstone Hill - Old Road	24
Infrastructure	Roads	SEP rd. (Friar's Bay)	12 ▼

Figure 5b. St. Kitts Transportation network with high FVS (>12)

### 5.3 Feature Vulnerability to Beach Erosion

The areas affected by the beach erosion zones are generally tourism development areas such as Half Moon Bay, Frigate Bay, Major's Bay, Mosquito Bay, and Banana Bay.

Urban areas, such as Basseterre, and Dieppe Bay Town, are affected with a high vulnerability beach erosion; Sandy Point with low vulnerability, and Parsons Ground with very high beach erosion vulnerability.

Other features affected identified as very high vulnerability are sugar cane fields (Parsons Ground, Pogson) and scrub.

## PART III – NEVIS

### 6.0 Nevis - Hurricanes and Storms

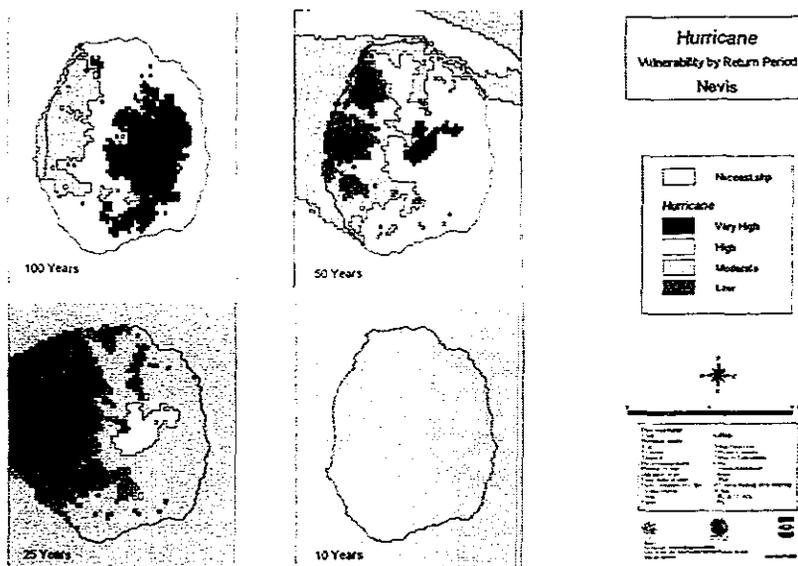
#### 6.1 Wind

##### 6.1.1 Wind Zones

Map 17 indicates the expected vulnerability to winds of Nevis for various return periods. The 10-year storms are predicted to place Nevis in an area of low vulnerability with winds between 17 and 43 meters/second.

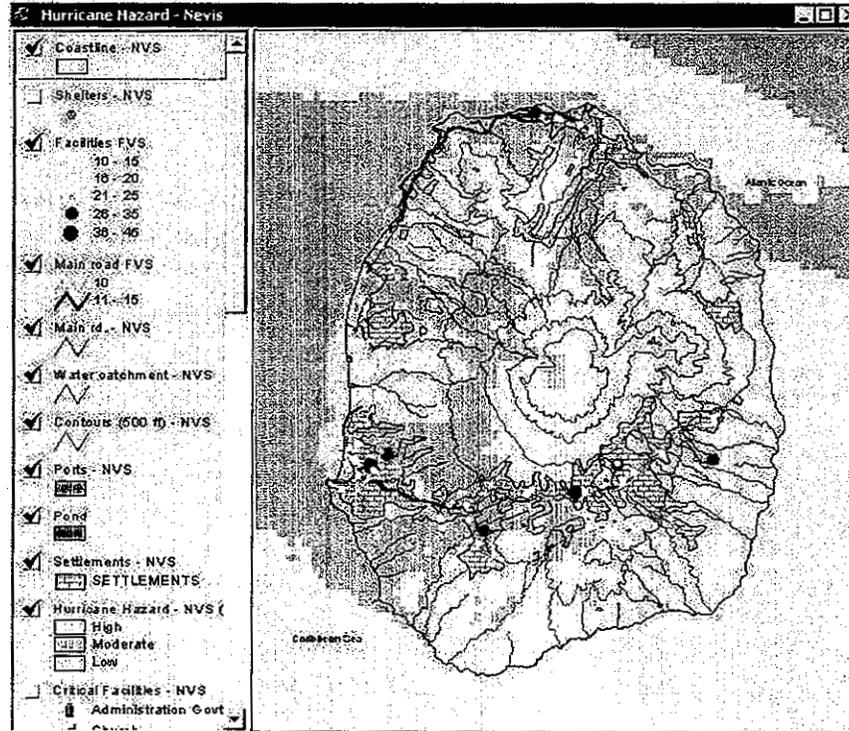
The 25-year storm will subject most of the island to moderate vulnerability to wind-related hazards. Moderate winds are between 43 and 50 meters / second and would be categorized as a category 2 hurricane. The west coast, Newcastle area, and some pockets at the north and south fall into a low vulnerability zone. High vulnerability to winds shows above the 1000 contour. High winds would be of category 3 hurricane force and extensive damage could be expected.

The 50-year storm would place most of Nevis into a zone of high vulnerability to winds. Moderate and Low wind vulnerability are shown at the west and north of the island. A zone of Very High vulnerability to winds above the 1000 contour, which would be of category 4/5 hurricane force and extreme/catastrophic damage, could be expected.



Map 17. Nevis Wind Vulnerability By Return Interval

For the 100-year storm period, all the area along the coastline (from Mosquito Bay up to Fort Charles) moving to the highlands, would be subject to High vulnerability to winds. The rest of the coastal lowlands would be vulnerable to Moderate wind hazard. Areas above 500 feet in elevation would be vulnerable to Very High wind hazards. The long-term vulnerability of Nevis is shown on Map 18. It is similar to the 50-year return storm without very high winds vulnerability above the 1000 contour lines.



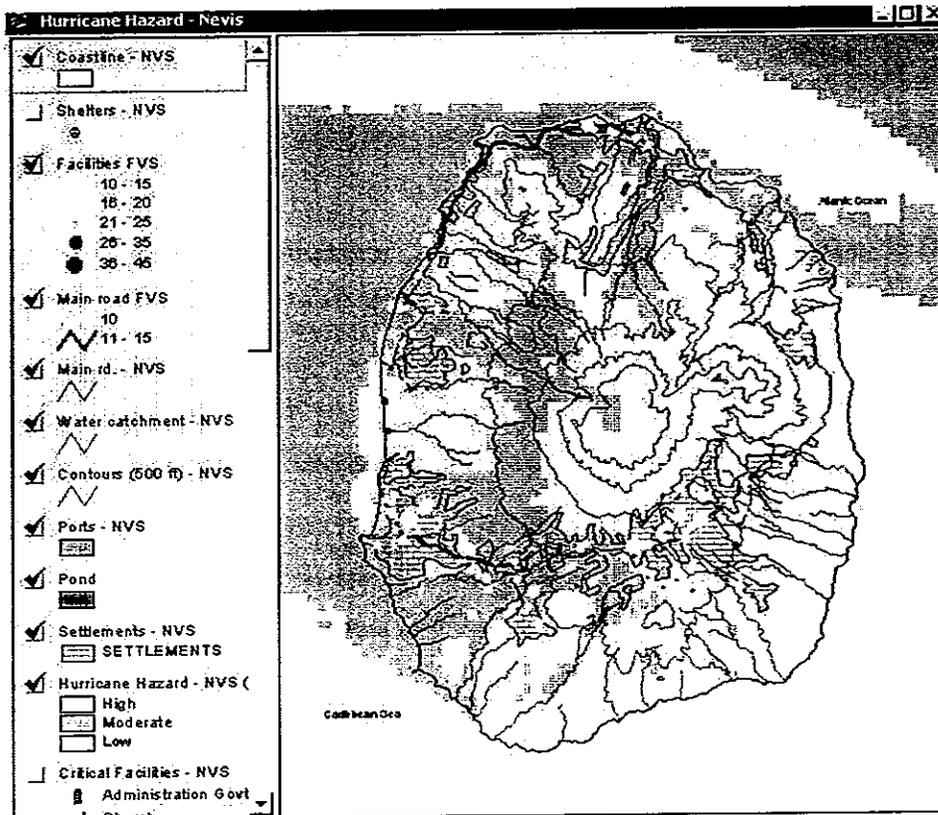
Map 18. Nevis Long Term Wind Vulnerability

### 6.1.2 Wind FVS

Map 19 selects all the facilities that have an FVS greater than 22.

Dis. Id.	FAC Type	Fac. Class	NAME_Fac	LOCATION	WIND_FVS	Shelter
NVGB1030	Government	Residential	Doctor's Residence	Gingerland	45	0.000000
20102	Community	Community Centre	Grove Park Pavilion	Charlestown	40	1.000000
20303	Community	Community Centre	Community Centre Hardtimes	Hard Times	35	1.000000
NVS	Infrastructure	Airport	International Airport	Newcastle	35	0.000000
NVHL03	Medical Facilities	Clinic	Brown Hill Health Centre	Brown Hill	35	0.000000
NVHL01	Medical Facilities	Hospital	Alexandra General Hospital	Charlestown	30	0.000000
20305	Community	Community Centre	Community Centre - Hickmans	Hickmans	30	1.000000
NVGB1000	Government	Residential	Nurses Home	Charlestown	30	0.000000
NVGS07	Utilities	Gas	DELTA Market Shop	Market Shop	25	0.000000
NVGB0580	Protective	Police	Police Station	Gingerland	25	0.000000
20302	Community	Church	Wesleyan Holiness Church - Bl	Backs Hill	25	1.000000
20301	Community	Church	Ebenezer Church of God - Old	Old Manor	25	1.000000
NVED085	Education	Nursery	Butlers Pre-school	Butlers	25	0.000000
20401	Community	Church	Seventh Day Adventist Church	Butlers	25	1.000000
NVED024	Education	Primary	St James Primary School	Butlers	25	0.000000
NVED098	Education	Nursery	Gingerland Pre-school	Gingerland	25	0.000000
NVED116	Education	Primary	Gingerland Primary School	Gingerland	25	0.000000
NVED120	Education	Secondary	Gingerland Secondary School	Gingerland	25	0.000000
NVED094	Education	Nursery	Brown Hill Pre-school	Brown Hill	25	0.000000
20405	Community	Church	Methodist Church Hall - Founts	Fountain	25	1.000000
NVGB0960	Government	Residential	Manned Quarters	Belle Vue	25	0.000000
20304	Community	Church	Celvary Baptist Church - Rawitz	Hard Times	25	1.000000
20207	Community	Church	Church of God - Cox Village	Cox Village	25	1.000000
NVGB0920	Utilities	Water	Pump House	Fothergills	25	0.000000

Figure 6a. Nevis Facilities with Wind FVS (>22)



Map 19. Nevis Facilities with Wind FVS Greater than 22

In addition, several Shelters had FVS of 22 or above are listed below in Figure 6b.

<i>GIS ID</i>	<i>FAC Type</i>	<i>Fac Class</i>	<i>NAME Fac</i>	<i>LOCATION</i>	<i>WIND FVS</i>	<i>Sts</i>
20102	Community	Community Centre	Grove Park Pavilion	Charlestown	40	1. ▲
20303	Community	Community Centre	Community Centre Hardtimes	Hard Times	35	1.
20305	Community	Community Centre	Community Centre - Hickmans	Hickmans	30	1.
20302	Community	Church	Wesleyan Holiness Church - Bi	Bucks Hill	25	1.
20301	Community	Church	Ebenezer Church of God - Old	Old Manor	25	1.
20401	Community	Church	Seventh Day Adventist Church	Butlers	25	1.
20405	Community	Church	Methodist Church Hall - Founta	Fountain	25	1.
20304	Community	Church	Calvary Baptist Church - Rawle	Hard Times	25	1.
20207	Community	Church	Church of God - Cox Village	Cox Village	25	1. ▼

Figure 6b. Nevis Shelters with Winds FVS (>22)

### 6.1.3 Feature Vulnerability to Wind

As Map 19 indicates, most of the features on the west side have a moderate or low vulnerability to wind. The features on the east side are of high vulnerability to winds. The above areas include grazing, rough grazing, coconut plantation, settlements and forest reserve.

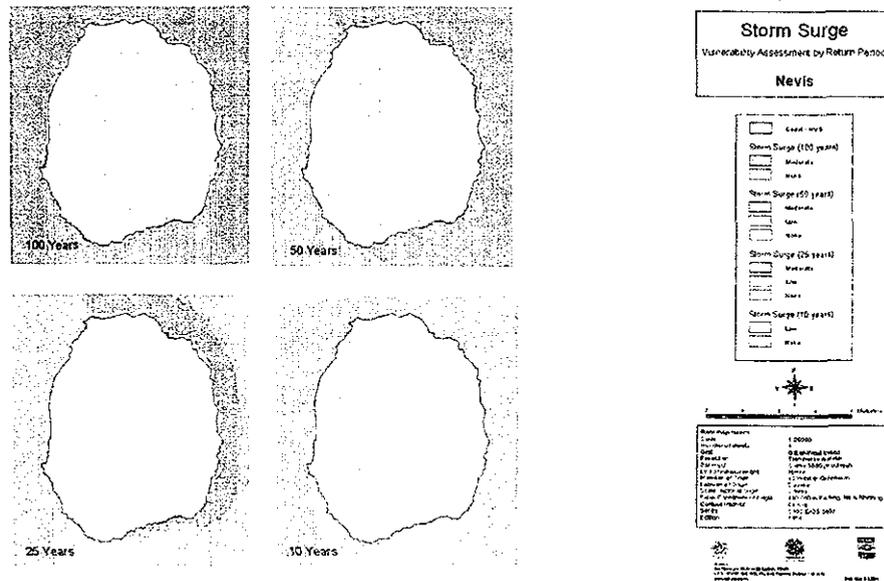
## 6.2 Storm Surge

### 6.2.1 Storm Surge Zones

Map 20 indicates the storm surge vulnerability of Nevis for the 10-year, 25-year, 50-year and 100-year storm. The 10-year storm place all Nevis under a No (or very low) storm surge vulnerability. Exceptions are: Deep Water port, Charlestown port and Fort Charles that shows Low storm surge vulnerability, where the surge can be expected to a range between 0.1 and 0.5 meters and some damage would be expected.

The 25-year storm places the Atlantic coast from Hurricane hill up to south of White Hall Estate in a moderate storm surge vulnerability zone. The surge that can be expected range between 0.5 and 1.5 meter, some minimal damage would be expected. The rest of the Caribbean coastline shows a Low storm surge vulnerability.

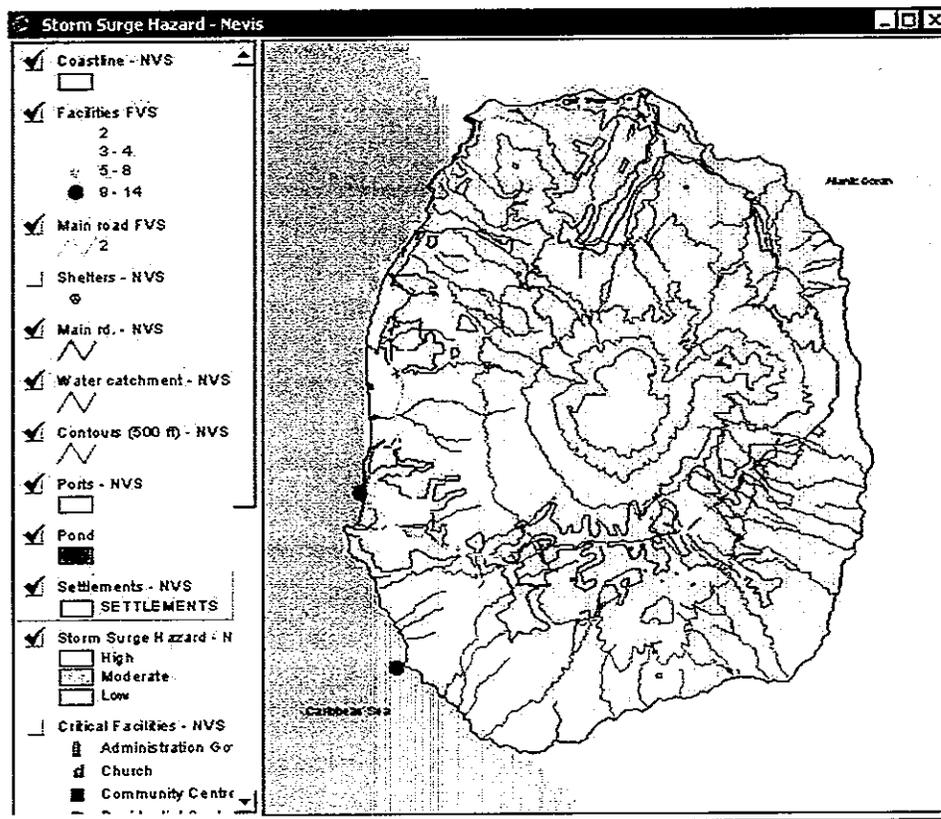
The 50-year storm place the Atlantic coast from Mosquito Bay up to south of Dog wood Estate with a Moderate storm surge vulnerability. The rest of the Caribbean coastline shows a Low storm surge vulnerability



**Map 20-. Nevis Storm Surge by Return Period**

The 100-year storm subjects the coastal zone under Moderate storm surge vulnerability.

Map 21 indicates the expected long-term vulnerability of Nevis to Storm Surge. The Atlantic coast of the island has a moderate vulnerability, and the Caribbean coast Low storm surge vulnerability.



Map 21. Nevis Long Term Vulnerability to Storm Surge

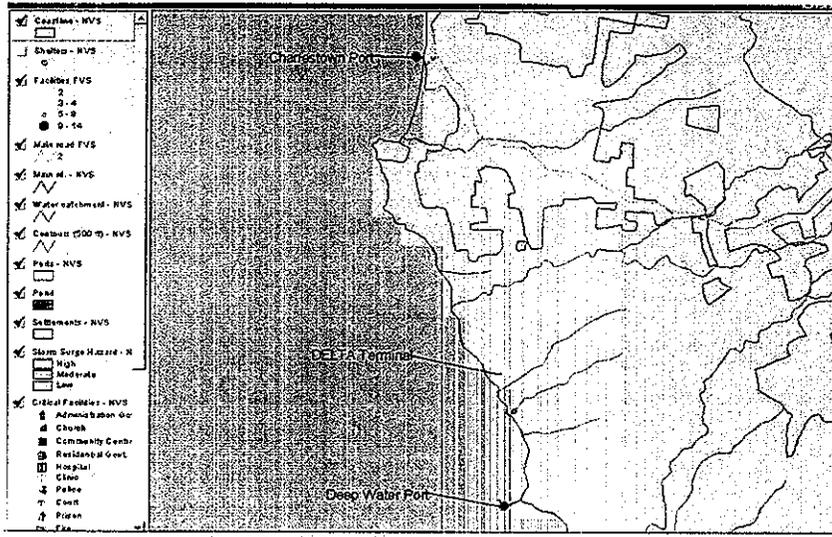
### 6.2.2 Storm Surge FVS

The Facilities with the highest FVS are on the Caribbean coastal zone.

Attributes of Critical Facilities - NVS						
<i>GIS_CODE</i>	<i>Fac_Type</i>	<i>Fac_Class</i>	<i>NAME_Fac</i>	<i>LOCATION</i>	<i>SSURGE_FVS</i>	<i>Str</i>
NVGB0900	Government	Storage	Colton House	Charlestown	8	0 ▲
CRL	Infrastructure	Sea Port	Charlestown Port	Charlestown	12	0
DWP	Infrastructure	Sea Port	Deep Water Port	Long Point	14	0 ▼

Figure 7. Nevis Facilities with Storm Surge FVS (>7)

Map 22 indicates the facilities at Deep Water port, Charlestown port, and the Cotton House (Charlestown) with FVS of 14, 12 and 8 respectively.



**Map 22 – Nevis Facilities with Highest Storm Surge FVS**

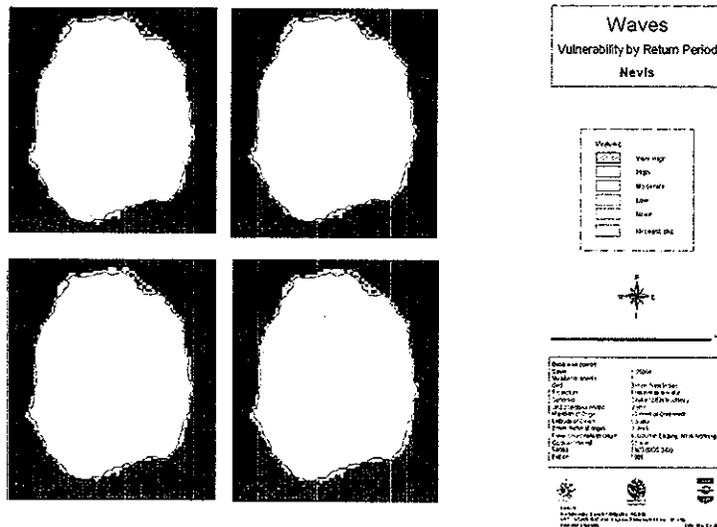
### 6.2.3 Feature Vulnerability to Storm Surge

The two sea ports, coconut plantations, grazing, bushed grassland, and bush-land can be expected to be affected by Storm surge in the long term.

## 6.3 Waves

### 6.3.1 Wave Zones

Map 23 indicates the vulnerability of Nevis to waves for each storm return period.



**Map 23. Nevis Wave Vulnerability by Return Period**

The 10-year wave storm is predicted to subject Nevis coast to moderate and low vulnerability that would develop waves of 0.1 to 1.5 meters. Exceptions are the Deep

Water port, with Very High (with waves of more than 2 meter high), Charlestown Seaport, Delta Terminal, and Shell Terminal with High wave storm vulnerability (with waves of 1.5 to 2 meter high).

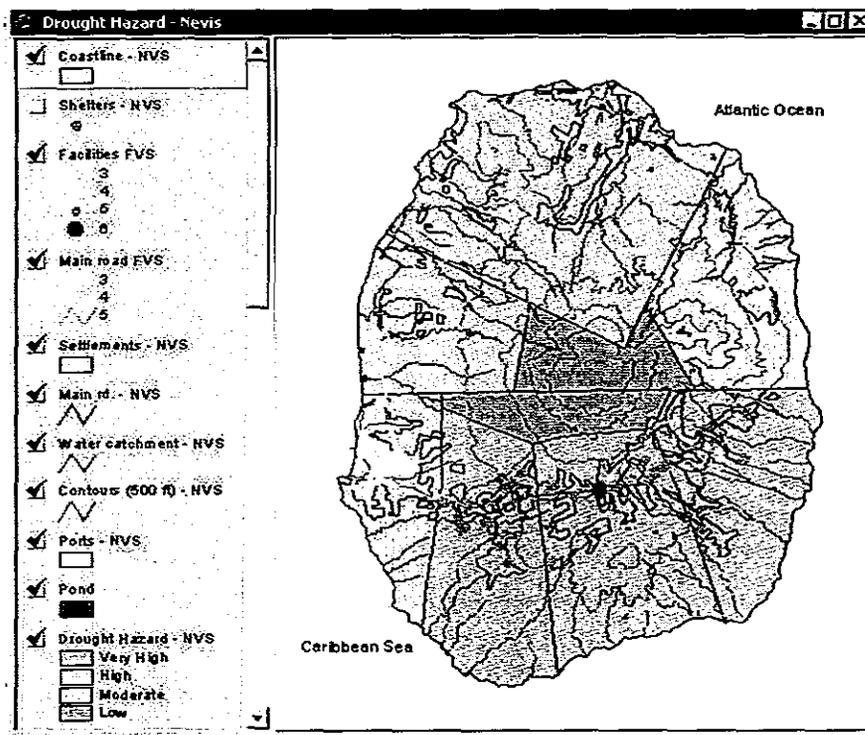
The 25-year and 50-year wave storm shows not much change from the 10-year period storm.

The 100-year storm would generate a Very High wave vulnerability zone in the area of Charlestown Seaport, and Deep Water Port, the coastal zone at Dogwood Estate, and the costal zone at Indian Castle Estate.

## 7.0 Nevis - Drought

### 7.1 Drought Zones

<sup>1</sup>Nevis was divided into 9 sectors that were ranked as low, moderate, high, and very high vulnerability.



**Map 25a. Nevis Drought Vulnerability Zones and Facility FVS**

Map 25a indicates the drought vulnerability zones for Nevis. The central mountain area has the lowest vulnerability to drought. Moderate risk areas include the northwest and

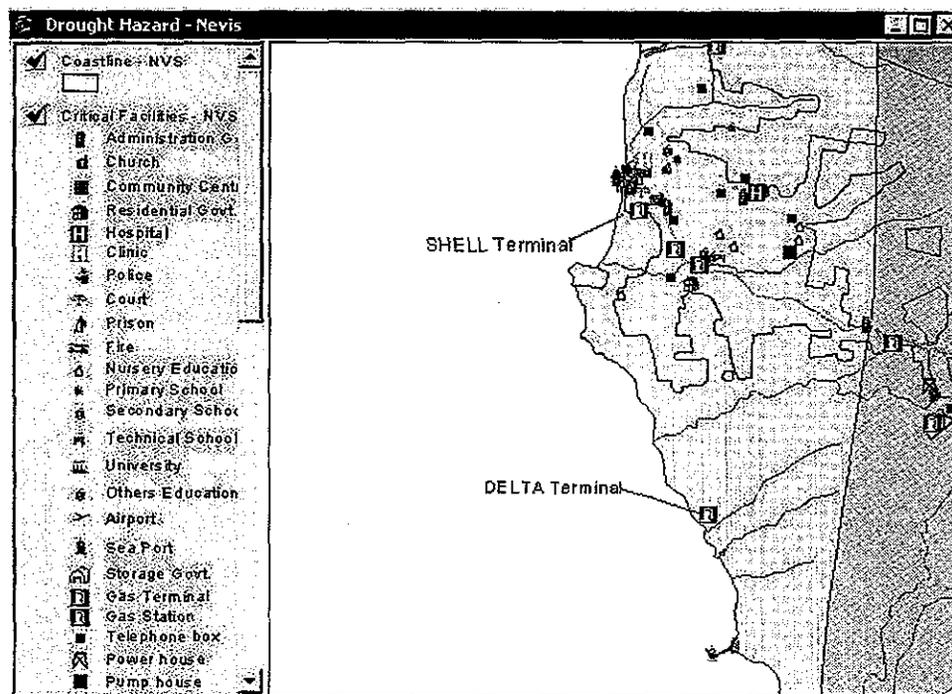
<sup>1</sup> Ivor Jackson, 2001, 'Nevis Drought Assessment and Mapping', <http://www.oas.org/pgdm>

north of Nevis. High vulnerability to drought includes the areas of Charlestown (up to Long Point), the Butlers/Mannings water zone at the east side of the island. The south and southeast is considered to have a Very High vulnerability to drought.

## 7.2 Drought FVS

All the facilities under consideration are into the upper 50% of the highest FVS range (6). The facility with the highest drought FVS is the Doctor's residence at Gingerland, the rest with FVS (5) are located at the south and southeast of the island. Facilities with FVS (4) are clustered in Charlestown area (including Shell Terminal), Long Point (including Delta Terminal), and at the east side of the island along the main road. The north west and west of the island groups the facilities with lowest FVS (3).

The Main road segments under consideration shows the highest FVS from Charlestown to Stoney Grove. The segment from Newcott to Jessup shows an FVS (4), and the Cades Bay to Newcastle FVS (3).



Map 25b. Nevis Facilities with high Drought FVS (>2)

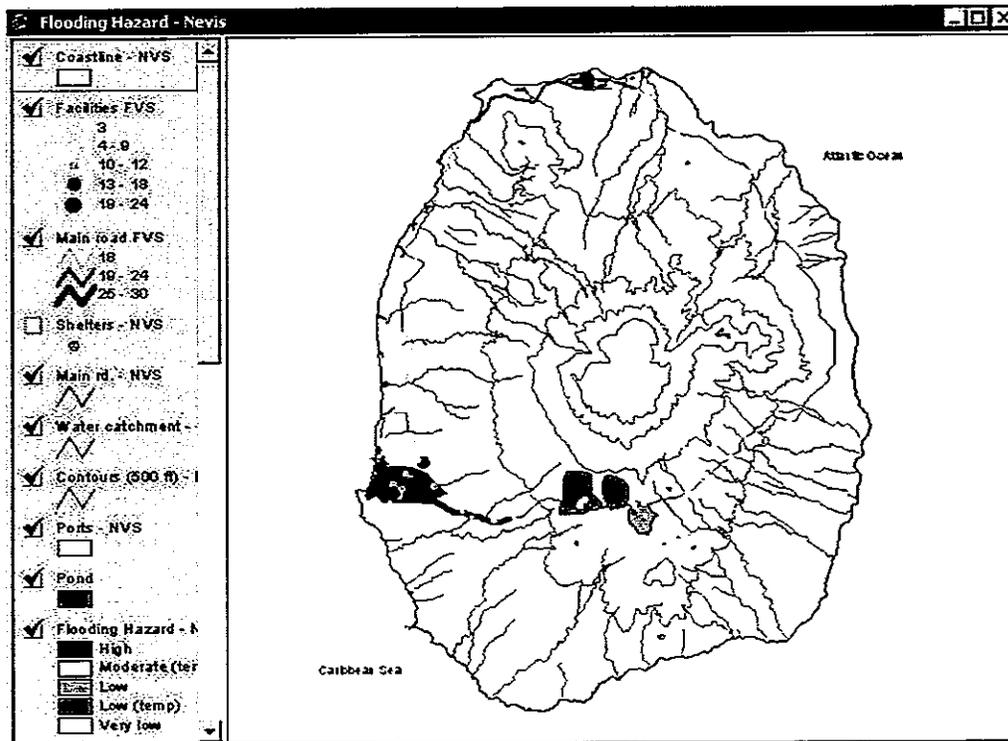
## 7.3 Feature Vulnerability to Drought

Most of the development in Nevis occurs within the zone of high and Very High drought vulnerability.

## 8.0 Nevis - Flooding

### 8.1 Flood Zones

Map 26 indicates the flood vulnerability zones for Nevis. A very low vulnerability zone with three small low vulnerability zones,<sup>2</sup> two have been described as “Low temp” having only temporary problems (Brown Pasture and Hermitage areas), most times caused by careless constructions, and Pond Hill area shows a Low (permanent). A moderate (temp) flood vulnerability zone shows at Newcastle airport. Charlestown area shows a High vulnerability to floods along the Bath Ghaut.



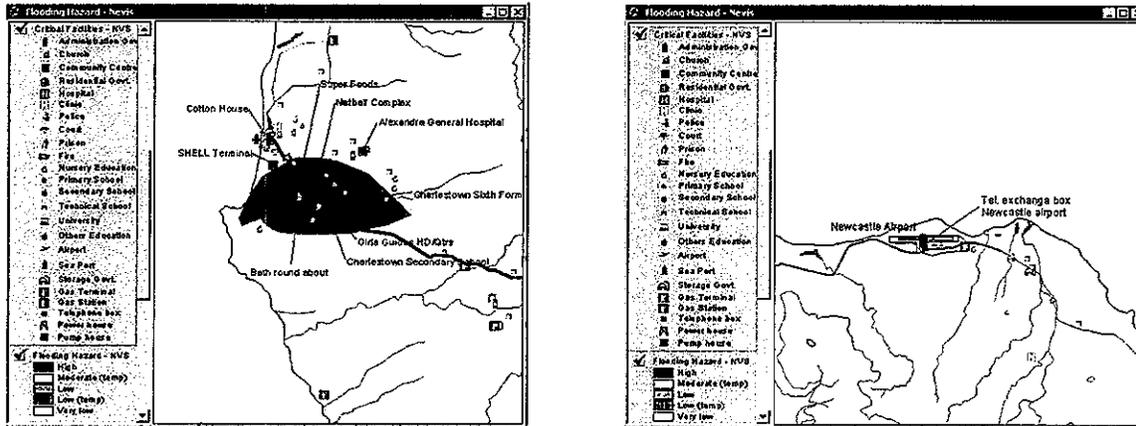
Map 26 Nevis Flood Vulnerability Zones

### 8.2 Flood FVS

Map 27 indicates the distribution of facility flood FVS. The facility with the Highest FVS(24) is Newcastle airport within a zone of Moderate vulnerability to flooding. Most of the facilities with high FVS(>14) are clustered within Charlestown zone within the zone of high vulnerability to flooding.

<sup>2</sup> Vincent Cooper, 2001, Flood Methodology Notes. Email

The main road segment under consideration in this assessment, Charlestown to Stoney Grow, shows the highest road FVS (30) in a zone of high vulnerability to flooding. Jones Estate to Newcastle shows an FVS (24) within the zone with moderate vulnerability to flooding. Newcott to Jessup and Cades Bay to Newcastle an FVS (18) is in zone of very low vulnerability to flood.



**Map 27 Nevis Facilities with high Flood FVS**

Attributes of Critical Facilities - NYS					
FAC Type	Fac. Class	NAME/Fac	LOCATION	FLOOD FVS	SHRts
Infrastructure	Airport	International Airport.	Newcastle	24	0
Utilities	Telecommunication	Bath round about	Bath round	18	0
Utilities	Telecommunication	Super Foods	Super Foods	18	0
Community	Community Centre	Netball Complex	Charlestown	18	1
Education	Others Education	Girls Guides HD/Qtrs	Stoney Grove	18	1
Utilities	Telecommunication	Newcastle Airport	Newcastle	15	0
Medical Facilities	Hospital	Alexandra General Hospital	Charlestown	15	0
Education	Technical	Charlestown Sixth Form College	Charlestown	15	0
Education	Secondary	Charlestown Secondary School	Charlestown	15	0
Government	Storage	Cotton House	Charlestown	15	0
Utilities	Petroleum	SHELL Terminal	Charlestown	15	0

**Figure 8- Nevis Facilities with High Flood FVS(>14)**

### 8.3 Feature Vulnerability to Flooding

The town of Charlestown is the most significant feature vulnerable to flooding on the Island of Nevis, also some areas with coconut tree, and cultivated crops are included. In

Grassing areas are subjected to low flood vulnerability in the areas of Brown Pasture, Hermitage, and Pond Hill.

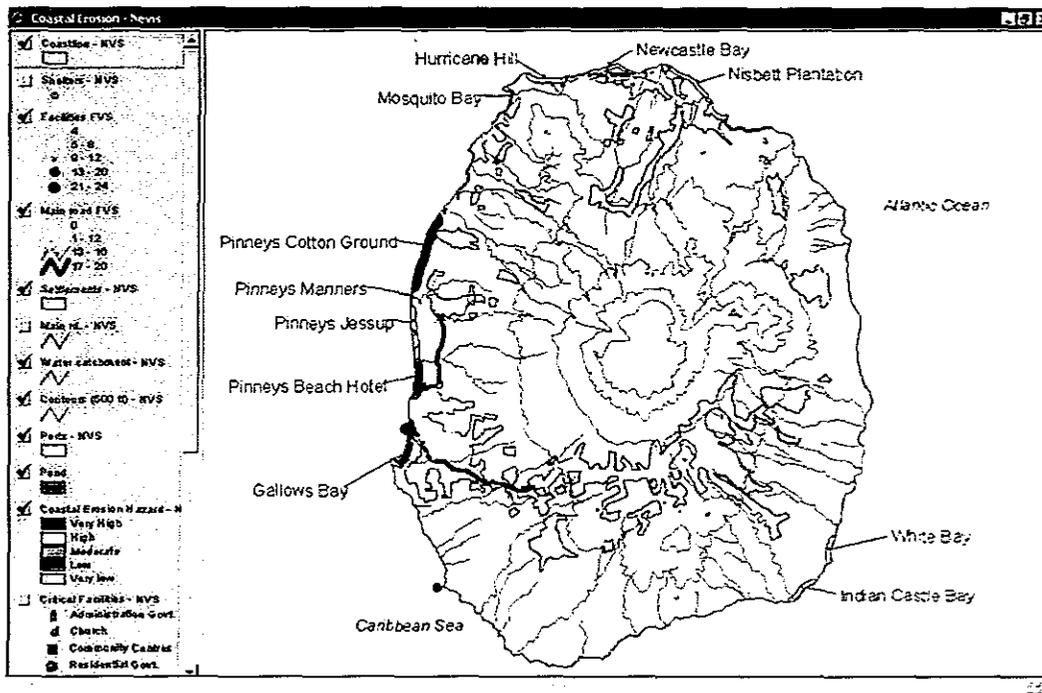
## 9.0 Nevis - Coastal Erosion

### 9.1 Beach Erosion Zones

Fourteen beaches have been monitored quarterly in Nevis since 1991 by the Fisheries Division.

The coastal areas with Very High, High, and Moderate vulnerability are located along the west coast (Caribbean) especially Pinneys Beach, as well as the north, and southeast of the island. Mariners Inn, and Mosquito Bay has Very Low vulnerability to beach erosion, as well as Haul Bay in the Atlantic side.

Map 29- shows Nevis Beach Erosion Zones and Facility Vulnerability.



Map 29 Nevis Beach Erosion Zones and Facility Vulnerability

### 9.2 Coast Erosion FVS

Seven Facilities in Nevis shows a high beach erosion FVS (>11). Most of them are located in Charlestown area.

It is recommended that in the future a hazard vulnerability assessment should include hotels and tourism facilities, as many of them are located in areas of Very High and High vulnerability Beach Erosion.

Fac Type	Fac Desc	NAME/Fac	LOCATION	FVS	STATUS
Infrastructure	Sea Port	Charlestown Port	Charlestown	24	0
Government	Storage	Cotton House	Charlestown	20	0
Infrastructure	Sea Port	Deep Water Port	Long Point	20	0
Utilities	Telecommunication	Barclays bank	Barclays bank	20	0
Government	Administration	CMC Building	Charlestown	20	0
Government	Storage	Public Market	Charlestown	20	0
Utilities	Petroleum	SHELL Terminal	Charlestown	12	0

Figure 9- Nevis Facilities with High Beach Erosion FVS(>11)

### 9.3 Feature Vulnerability to Coast Erosion

Beaches themselves are the features at risk from erosion.

Regarding the main road segment under consideration in this assessment, Charlestown to Stoney Grove (in Charlestown port), and Newcott to Jessup (Pinneys Beach) shows the highest road FVS (20) as it falls in a zone of very high vulnerability beach erosion. Jones Estate to Newcastle (Seahaven Estate) shows an FVS (16) within the zone of high vulnerability, and Cades Bay to Newcastle (Beach Club, and Cades Bay) shows an FVS (12) while crossing zones of low, and moderate beach erosion vulnerability.

## **Appendix 3**

### **LIST OF SUPPORTING POLICIES**

### **APPENDIX 3 —LIST OF SUPPORTING POLICIES**

- ! *DEVELOPMENT CONTROL AND PLANNING ACT 2000*
- ! *NATIONAL CONSERVATION AND ENVIRONMENT PLANNING ACT 1987*
- ! *NATIONAL DISASTER MANAGEMENT ACT 1998*
- ! *NATIONAL DISASTER PLAN*
- ! *NEVIS ZONING PLAN ORDINANCE 1991*
- ! *NEVIS HOUSING AND LAND DEVELOPMENT CORPORATION ACT 1988*
- ! *REGULATION OF ON-SITE SEPTIC TANKS*
- ! *ST. KITTS-NEVIS BUILDING CODE*
- ! *ST KITTS-NEVIS WATER ORDINANCE 1959*

## **Appendix 4**

### **I. LIST OF MEMBERS OF THE NATIONAL DISASTER MITIGATION COUNCIL**

### **II. LIST OF MEMBERS OF THE PGDM PROGRAMME GUIDANCE COMMITTEE**

## **APPENDIX 4.**

### **I. LIST OF MEMBERS OF THE NATIONAL DISASTER MITIGATION COUNCIL**

#### ***MEMBERSHIP OF THE NATIONAL DISASTER MITIGATION COUNCIL***

1. Deputy Prime Minister - Chairperson
2. Minister of Communications, Works and Public Utilities - Deputy Chairperson
3. Secretary of the National Disaster Mitigation Council — National Liaison Officer
4. The Permanent Secretaries and Heads of each Government Ministry and Department
5. A representative of the National Emergency Management Agency
6. A representative of the Chamber of Industry and Commerce
7. A representative of the Hotel and Tourism Association
8. A representative of the St.Kitts And Nevis Police Force
9. A representative of the St.Kitts and Nevis Defence Force
10. A representative each from the Christian Council and the Evangelical Association
11. A representative from Women's organisations

### **II. LIST OF MEMBERS OF THE PGDM PROGRAMME GUIDANCE COMMITTEE**

#### ***MEMBERSHIP OF THE PGDM PROGRAMME GUIDANCE COMMITTEE***

1. Director of the OAS — Chairperson
2. PGDM Programme Co-ordinator — contracted by the OAS
3. Representatives from the Government Planning Division in St.Kitts
4. Representatives from the Government Planning Division in Nevis
5. A representative from the Emergency Management Agency in St. Kitts
6. A representative from the Disaster Planning Office in Nevis
7. A representative from the Tourism Department
8. A representative from the National Housing Corporation
9. A representative from the St. Kitts / Nevis Contractors Association
10. A representative from the Department of Environment
11. A representative from the Public Works Department
11. The Plan Writer — contracted by the OAS

## **Appendix 5**

**MAPS ( ENLARGED ) SHOWING :-**

***HAZARD VULNERABILTY ASSESSMENT***

***AND***

***FACILITY VULNERABILTY SCORES***

**FOR THE PRIORITY HAZARDS**

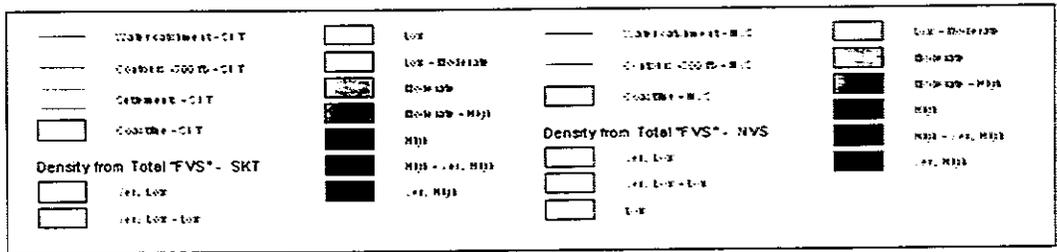
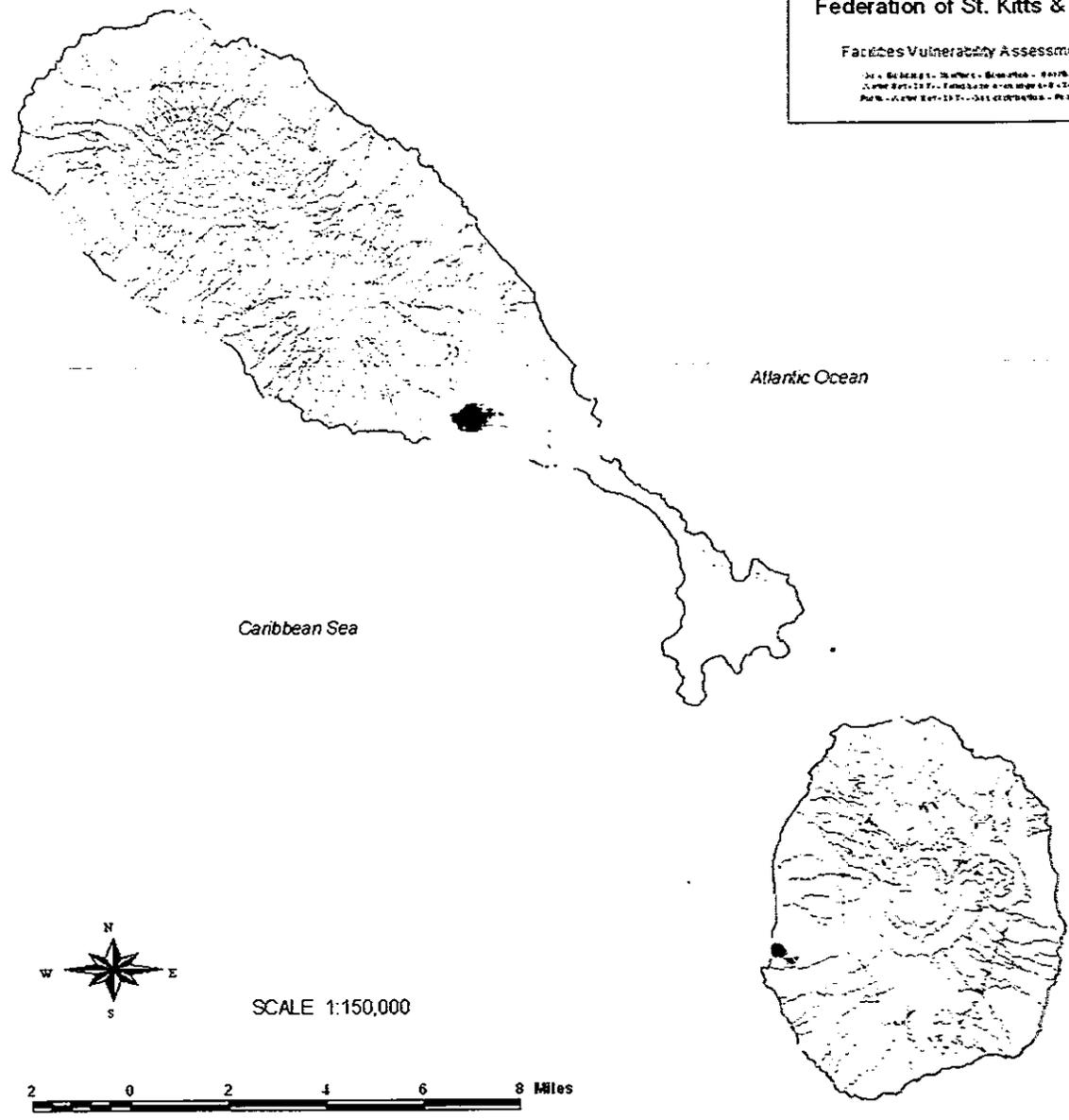
## LIST OF MAPS

1. TOTAL HAZARD VULNERABILITY ZONES FEDERATION OF ST KITTS & NEVIS
2. FACILITY VULNERABILITY SCORES TOTAL (FVS) FEDERATION OF ST KITTS & NEVIS
3. HURRICANE – WINDS HAZARD VULNERABILITY ASSESSMENT ST KITTS
4. HURRICANE / WINDS FVS – ST KITTS
5. STORM SURGE HAZARD VULNERABILITY ASSESSMENT ST KITTS
6. STORM SURGE FVS – ST KITTS
7. FLOODING HAZARD VULNERABILITY ASSESSMENT ST KITTS
8. FLOODING FVS – ST KITTS
9. COASTAL EROSION HAZARD VULNERABILITY ASSESSMENT ST KITTS
10. COASTAL EROSION FVS – ST KITTS
11. COASTAL EROSION DETAILS – ST KITTS
12. INLAND EROSION HAZARD VULNERABILITY ASSESSMENT ST KITTS
13. INLAND EROSION FVS – ST KITTS
14. HURRICANE HAZARD – NEVIS VULNERABILITY ASSESSMENT
15. HURRICANE / WINDS FVS – NEVIS
16. STORM SURGE HAZARD – NEVIS VULNERABILITY ASSESSMENT
17. STORM SURGE FVS – NEVIS
18. FLOODING HAZARD – NEVIS VULNERABILITY ASSESSMENT
19. FLOODING FVS – NEVIS
20. COASTAL EROSION HAZARD – NEVIS VULNERABILITY ASSESSMENT
21. COASTAL EROSION FVS – NEVIS
22. DROUGHT HAZARD – NEVIS VULNERABILITY ASSESSMENT
23. DROUGHT FVS - NEVIS

**Total Hazard Vulnerability Zones  
Federation of St. Kitts & Nevis**

Facilities Vulnerability Assessment

Dr. G. B. BARNETT - 2007/08 - 2008/09 - 2009/10 -  
 2010/11 - 2011/12 - 2012/13 - 2013/14 - 2014/15 -  
 2015/16 - 2016/17 - 2017/18 - 2018/19 - 2019/20



Base map source: 1:25000  
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 Projection: Transverse mercator  
 Spheroid: Clarke 1880 (Modified)  
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 Latitude of Origin: Equator  
 Scale factor at origin: 0.9995  
 False Coordinate of Origin: 400,000 m Easting, Nil m Northing  
 Contour Interval: 50 feet  
 Series: E803 (DOS 343)  
 Edition: 1984

**BEST AVAILABLE COPY**

Project: Post-Georges Disaster Migration (PGDM)  
 OAS - USAID, GIS Unit, Physical Planning & Development - NEVIS  
[www.oas.org/pgdm](http://www.oas.org/pgdm)

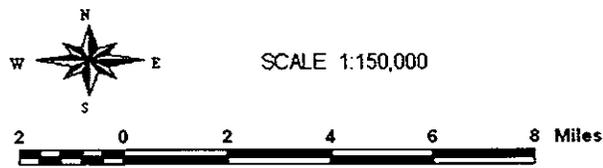
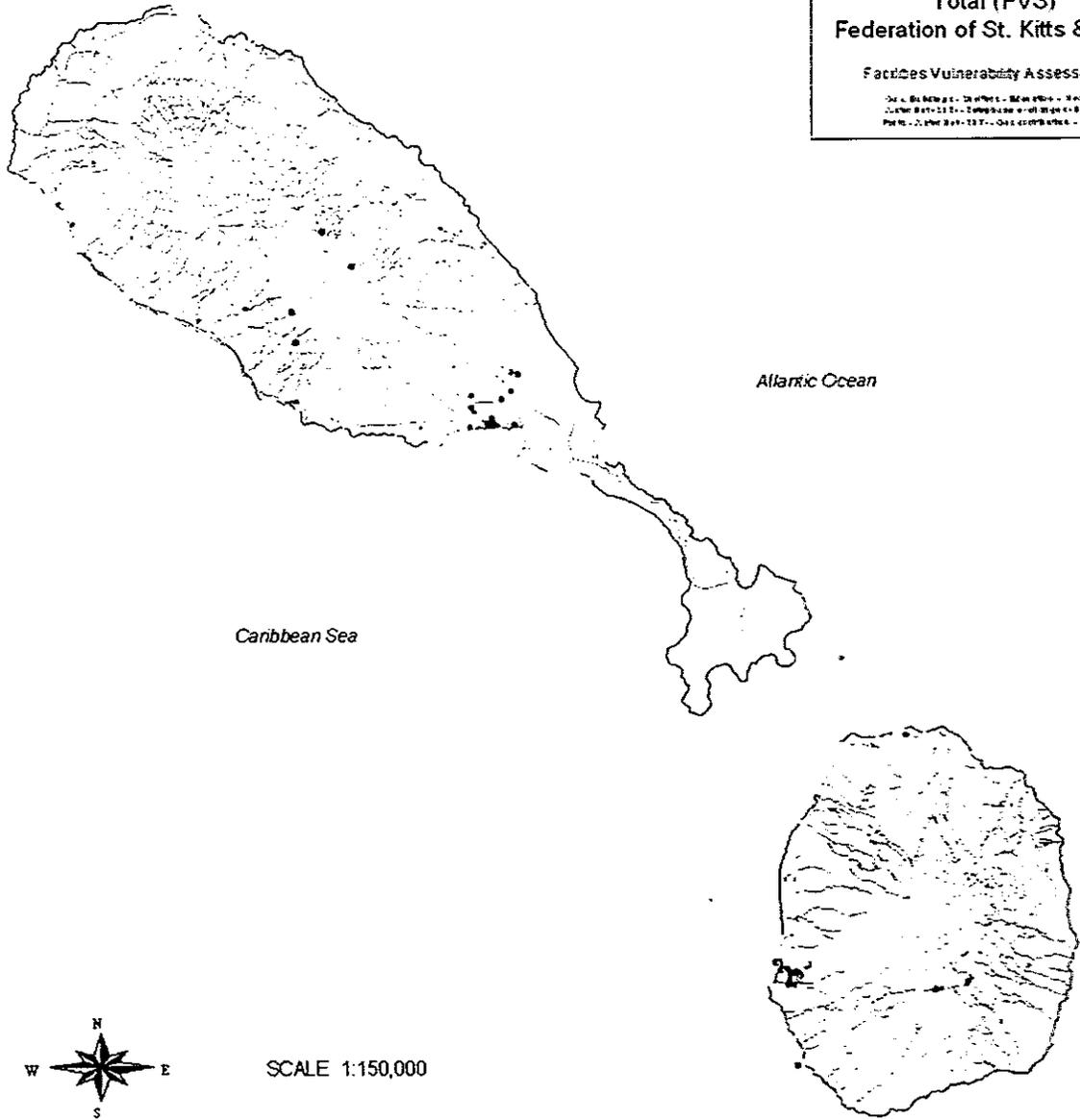


114

**Facility Vulnerability Scores  
Total (FVS)  
Federation of St. Kitts & Nevis**

Facilities Vulnerability Assessment

Dr. G. B. Williams - Director - Disaster Management - NEVIS  
 J. L. Williams - Director - Physical Planning & Development - NEVIS  
 P. M. Williams - Director - Civil Defence - NEVIS



Total FVS - Federation of St. Kitts & Nevis			
<b>Total 'FVS' - SKT</b>	<b>Main rd - SKT</b>	<b>Total 'FVS' - NVS</b>	<b>Main rd - NVS</b>
0 - 29 Very Low	Water catchment - SKT	22 - 30 Very Low	Water catchment - NVS
30 - 37 Low	Contours (500 ft) - SKT	31 - 35 Low	Contours (500 ft) - NVS
38 - 49 Moderate	Settlements - SKT	39 - 41 Moderate	Settlements - NVS
50 - 63 High	Coastline - SKT	42 - 49 High	Coastline - NVS
64 - 85 Very High		50 - 70 Very High	

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Grid	Transverse Mercator
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Spheroid	Meter
Unit of measurement	62 West of Greenwich
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Latitude of Origin	USGS
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Series	1904
Edition	

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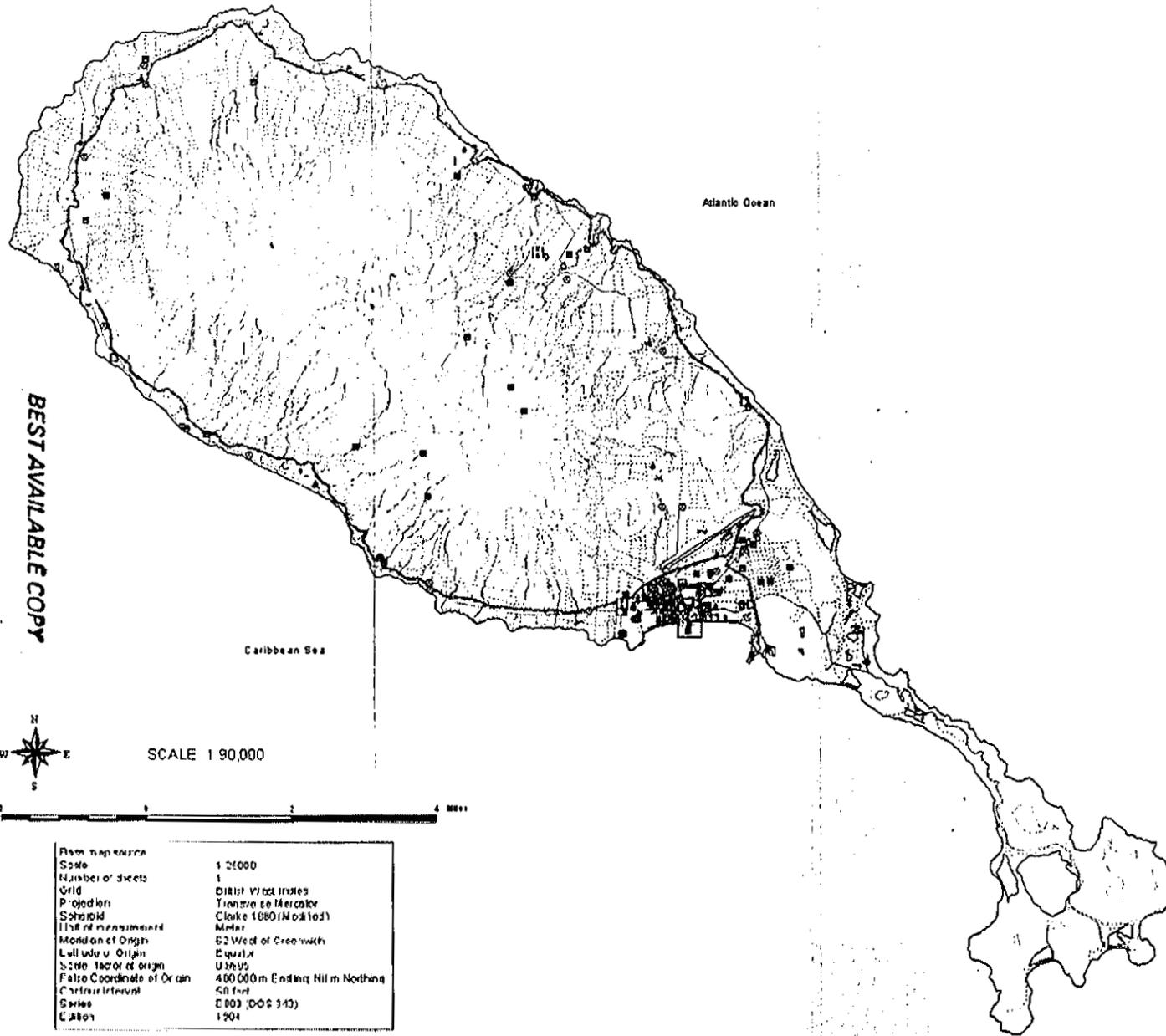
Project:  
 Post-Georges Disaster Mitigation (PGDM)  
 OAS - USAID, GIS Unit, Physical Planning & Development - NEVIS  
 www.oas.org/pgdm



1/15/03

# Hurricane - Winds Hazard Vulnerability Assessment St. Kitts

Gov. Buildings - Shelters - Education - Health -  
Water Intakes - Wells - Ports -  
Gas distribution - Roads



<b>Critical Facilities - SKT</b>	□	Gas station
Administration Govt	□	Gas Terminal
Churches	□	Radio & TV
■	□	Power House
Community Centres	□	Water
Residential Govt.	□	Shelters - SKT
□	□	Main rd - SKT
Hospital	□	Other transp.
Clinic	□	Sec. rd
Police	□	Track
Court	□	Railway
Fire	□	Water catchment - SKT
Military	□	Contours (500 ft) - SKT
Nursery	□	Ports - SKT
Primary school	□	Winds Hazard - SKT (grid)
Secondary	□	High
Technical	□	Moderate
University	□	Low
Others Education	□	Coastline - SKT
Airport	□	
Sea Port	□	
Storage	□	

From map source  
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Grid DMR: West Indies  
Projection Transverse Mercator  
Spheroid Clarke 1880 (Modified)  
Unit Meter  
Line of measurement 62 West of Greenwich  
Location of Origin Equator  
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False Coordinate of Origin 480 000m Easting Nil m Northing  
Contour Interval 50 feet  
Series E 803 (DOP 343)  
Edition 1904

# Hurricane / Winds

## FVS - St. Kitts

Gov. Buildings - Shelters - Education - Health -  
Water Intakes - Wells - Ports -  
Gas distribution - Roads

### Facilities FVS

0 - 15

16 - 20

21 - 30

• 31 - 40

• 41 - 50

### Main road FVS

0

1 - 10

11 - 15

— 16 - 20

### Other transp.

Sec. rd.

Track

— Railway

Water catchment - SKT

Contours (500 ft) - SKT

□ Ports - SKT

### Winds Hazard - SKT (grid)

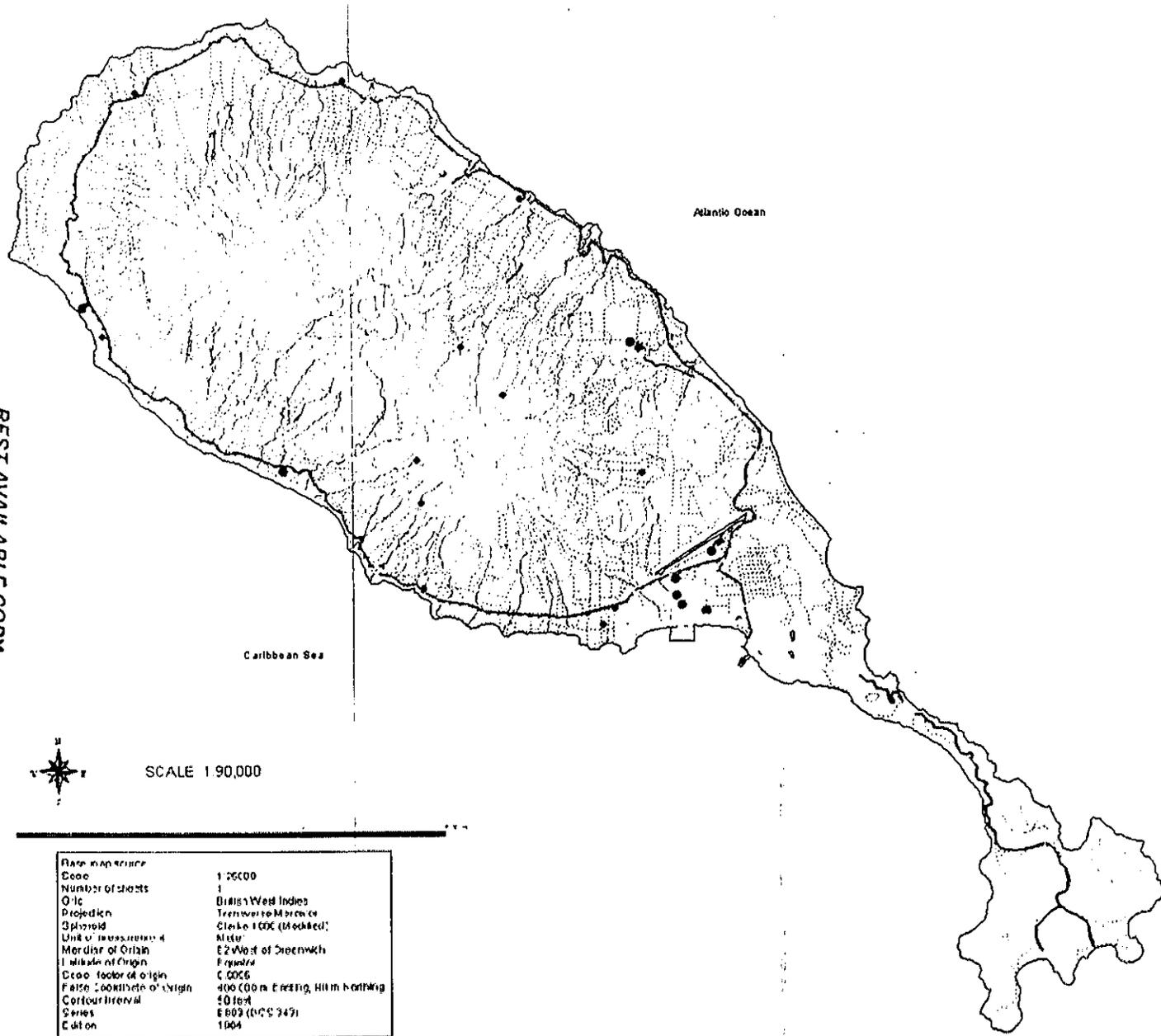
□ High

□ Moderate

□ Low

— Coastline - SKT

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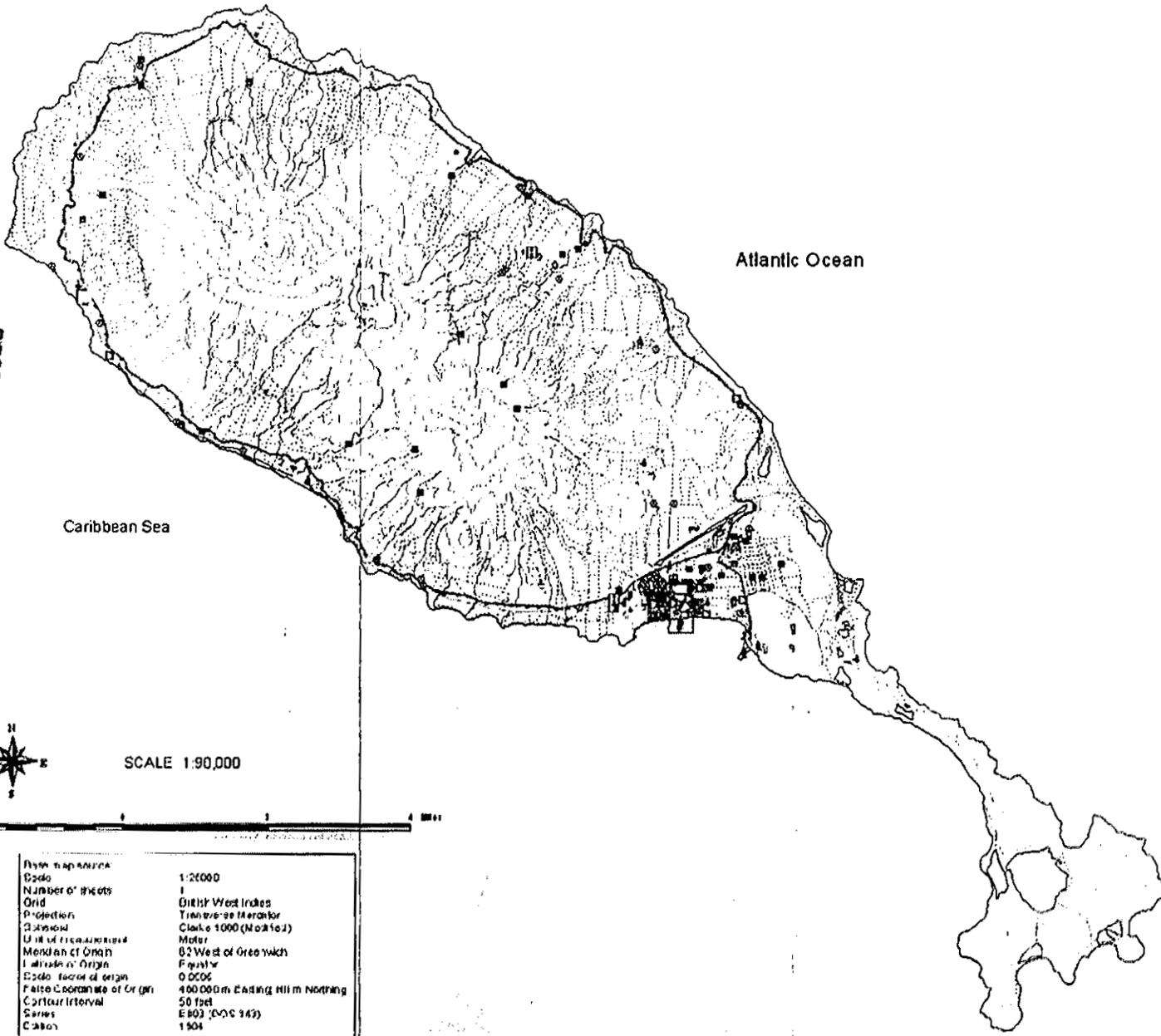


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Latitude of Origin	Equator
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False coordinates of origin	400 000 m Easting, 811 m Northing
Contour interval	50 feet
Series	EB03 (D/C 349)
Edition	1994

Printed by the Government of St. Kitts and Nevis  
 Printed by the Government of St. Kitts and Nevis  
 1994

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**Storm Surge  
Hazard Vulnerability Assessment  
St. Kitts**

Gov. Buildings - Shelters - Education - Health -  
Water Intakes - Wells - Ports -  
Gas distribution - Roads

<b>Critical Facilities - SKT</b>	□ Gas station
Administration Govt.	□ Gas Terminal
Churches	□ Radio & TV
■ Community Centres	⊗ Power House
Residential Govt.	⊙ Water
Hospital	⊙ Shelters - SKT
Clinic	○ Main id. - SKT
4 Police	
Court	<b>Other transp.</b>
⋈ Fire	— Sec. rd.
⊥ Military	— Track
○ Nursery	— Railway
• Primary school	— Water catchment - SKT
Secondary	— Contours (500 ft) - SKT
Technical	□ Ports - SKT
University	
⊖ Others Education	<b>Storm Surge Hazard - SKT</b>
✈ Airport	□ Moderate
⚓ Sea Port	□ Low
Storage	□ None
	— Coastline - SKT

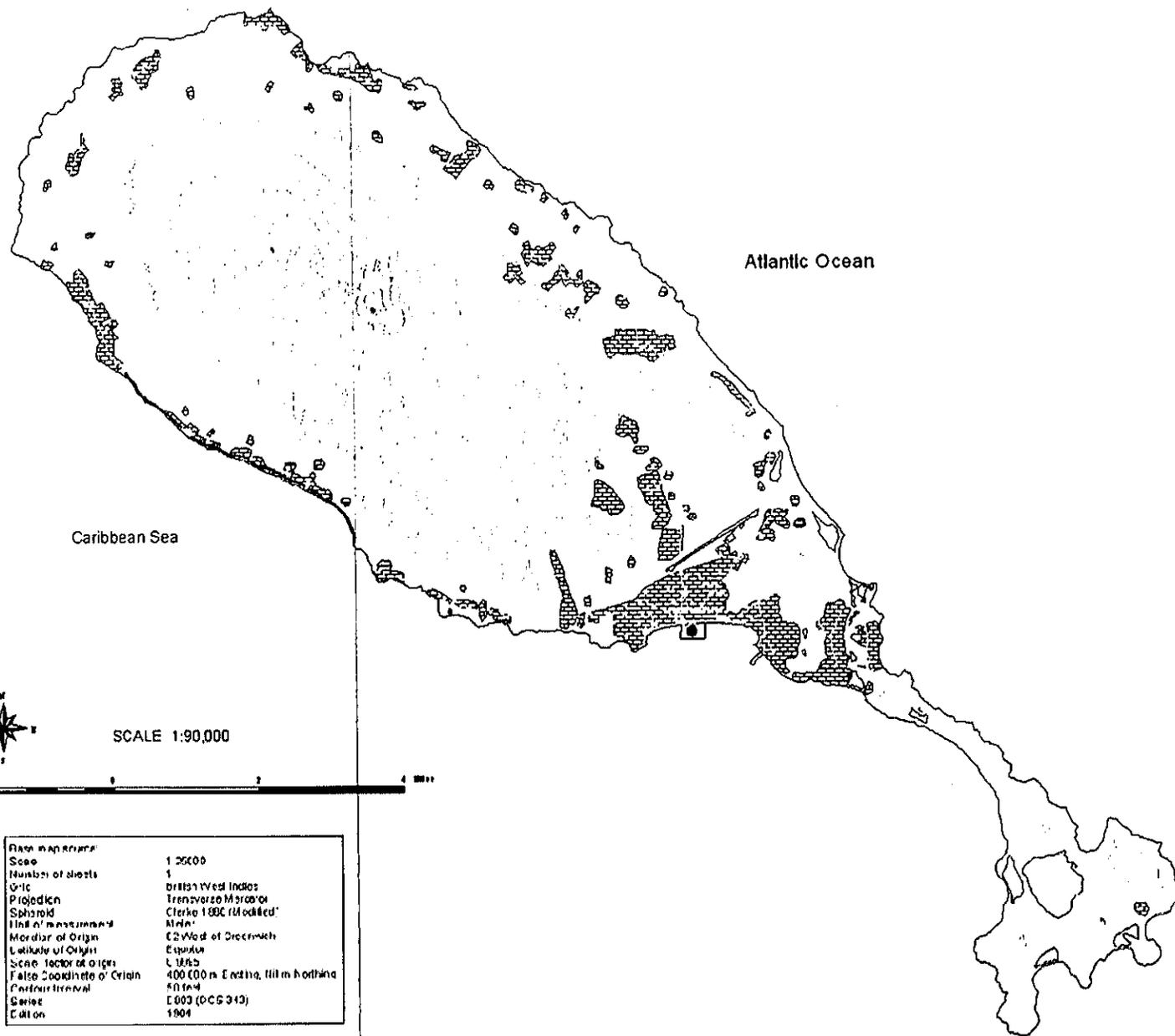
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Contour Interval	50 feet
Series	E 803 (NOC 143)
Color	1504

# Storm Surge

## FVS - St. Kitts

Gov. Buildings - Shelters - Education - Health -  
Water Intakes - Wells - Ports -  
Gas distribution - Roads



### Facilities FVS

- 0 - 2
- 3 - 6
- 7 - 12
- 13 - 20

### Main road FVS

- 0 - 2
- 3 - 4
- 5 - 12
- 13 - 16

Water catchment - SKT

Contours (500 ft) - SKT

□ Ports - SKT

▨ Settlements - SKT

### Storme Surge Hazard - SKT

□ Moderate

□ Low

□ None

— Coastline - SKT



SCALE 1:90,000

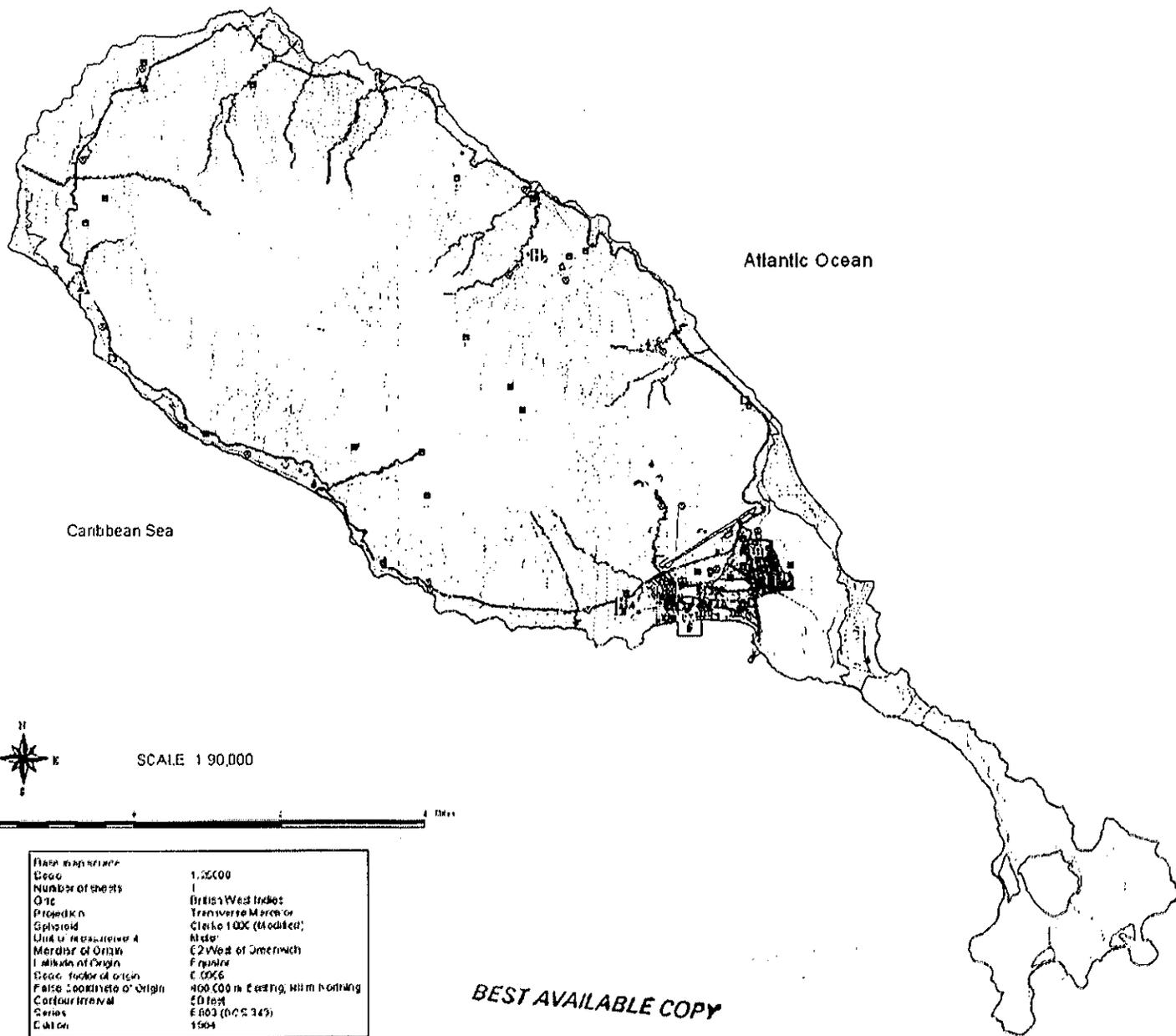


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Edition	1994



Produced by the National Institute of Statistics  
 and the Department of Planning and Economic Development  
 St. Kitts, Nevis and Anguilla  
 1994

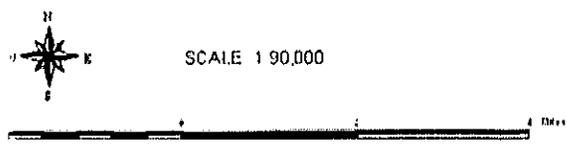
Page 119 of 120



## Flooding Hazard Vulnerability Assessment St. Kitts

Gov. Buildings - Shelters - Education - Health -  
Water Intakes - Wells - Ports -  
Gas distribution - Roads

●	Administration Govt.	⊞	Gas Terminal
■	Churches	⊞	Radio & TV
■	Community Centres	⊞	Power House
■	Residential Govt.	⊞	Water
⊞	Hospital	⊞	Shelters - SKT
⊞	Clinic	⊞	Main rd - SKT
4	Police		Other transp
⊞	Court		Sec rd.
⊞	Fire		Track
⊞	Military		Railway
⊞	Nursery		Water catchment
⊞	Primary school		Contours (500 ft) - SKT
⊞	Secondary	□	Ports - SKT
⊞	Technical		Flood Hazard - SKT
⊞	University	□	Very High
⊞	Others Education	□	High
⊞	Airport	□	Moderate
⊞	Sea Port	□	Low
⊞	Storage	□	Very low
⊞	Gas station	□	Coastline - SKT



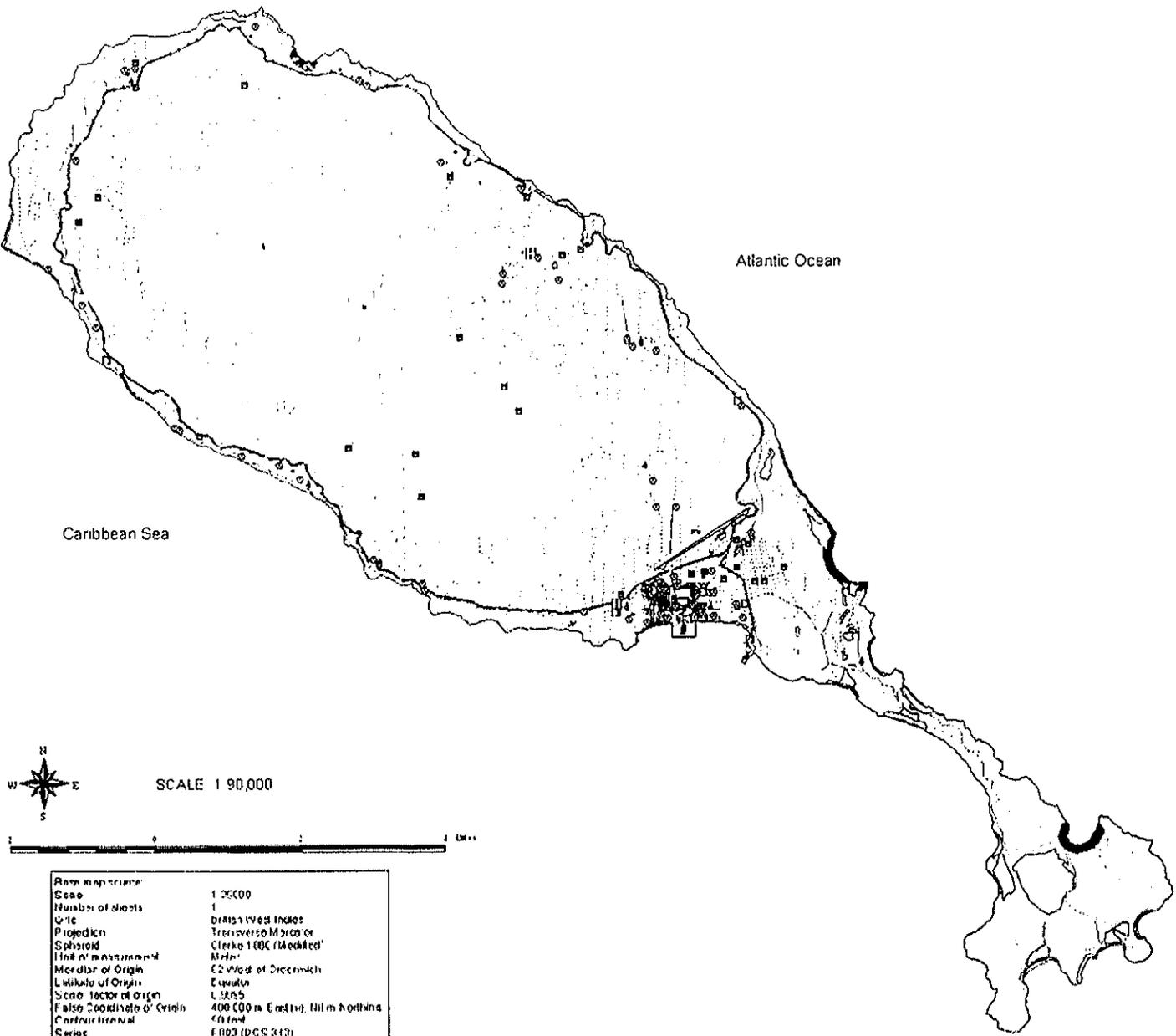
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Number of sheets	1
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Projection	Transverse Mercator
Spheroid	Clarke 1866 (Modified)
Unit of measurement	Meter
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Latitude of Origin	16° 00' N
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False Northing of origin	0 000 m
Contour interval	50 feet
Series	6803 (N/S 34)
Edition	1964

**BEST AVAILABLE COPY**

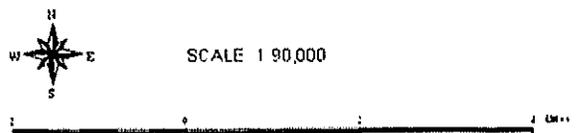


# Coastal Erosion Hazard Vulnerability Assessment St. Kitts

Gov. Buildings - Shelters - Education - Health -  
Water Intakes - Wells - Ports -  
Gas distribution - Roads



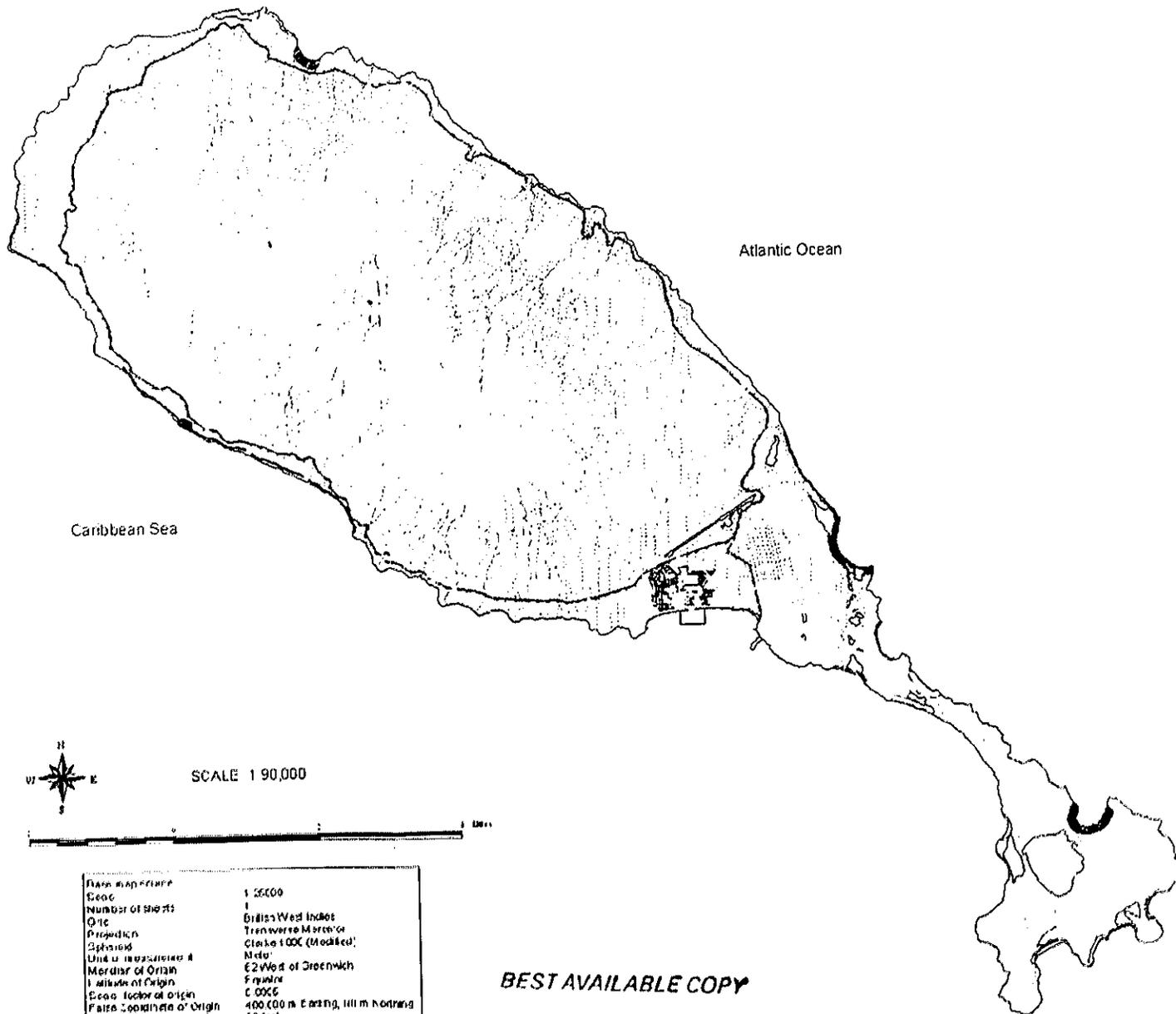
Critical Facilities - SKT	
■	Administration Govt
■	Churches
■	Community Centres
■	Residential Govt
⏏	Hospital
⏏	Clinic
⏏	Police
⏏	Court
⏏	Fire
⏏	Military
⏏	Nursery
⏏	Primary school
⏏	Secondary
⏏	Technical
⏏	University
⏏	Other Education
⏏	Airport
⏏	Sea Port
⏏	Storage
⏏	Gas station
⏏	Gas Terminal
⏏	Radio & TV
⏏	Power House
⏏	Water
⏏	Shelters - SKT
⏏	Main Id - SKT
Other transp.	
⏏	Sea Id.
⏏	Track
⏏	Railway
⏏	Water catchment - SKT
⏏	Contours (500 ft) - SKT
⏏	Ports - SKT
Coastal Erosion - SKT	
⏏	Very High
⏏	High
⏏	Moderate
⏏	Low
⏏	Very low
⏏	Coastline - SKT



Base map scale	1:25000
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QTC	British West Indies
Projection	Transverse Mercator
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Latitude of Origin	Equator
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False Coordinate of Origin	400 000 m Easting, Nil in Northing
Contour interval	5 m
Series	E003 (DCS 343)
Edition	1994

Project:  
P-1104-1991 (Main) Island of St. Kitts  
Scale: 1:90,000, QTC: British West Indies  
Date: 1994

BEST AVAILABLE COPY



# Coastal Erosion FVS - St. Kitts

Gov. Buildings - Shelters - Education - Health -  
Water Intakes - Wells - Ports -  
Gas distribution - Roads

## Facilities FVS

- 0
- 1 - 3
- 4 - 6
- 7 - 12

## Main road FVS

- 0 - 3
- 4 - 6
- 7 - 12
- 13 - 30

## Other transp

- Sec rd.
- Track
- Railway
- Water catchment - SKT
- Contours (500 ft) - SKT

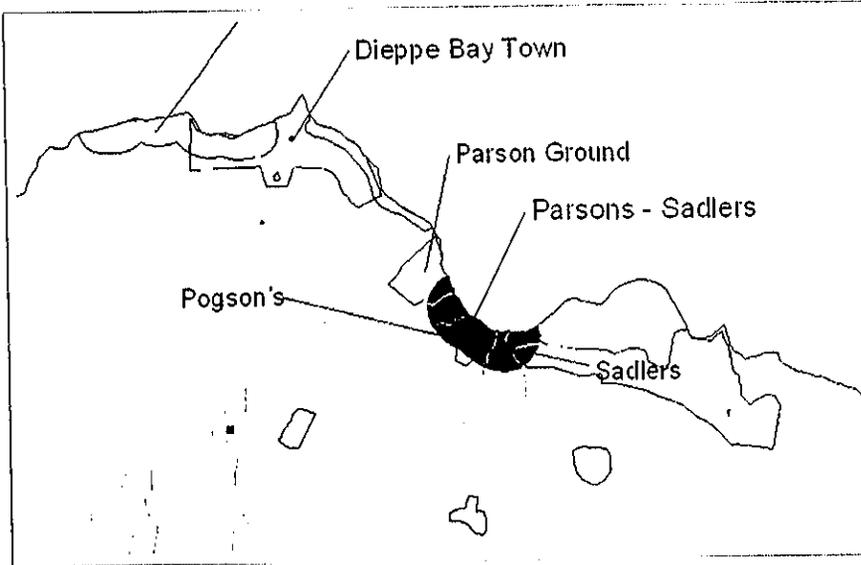
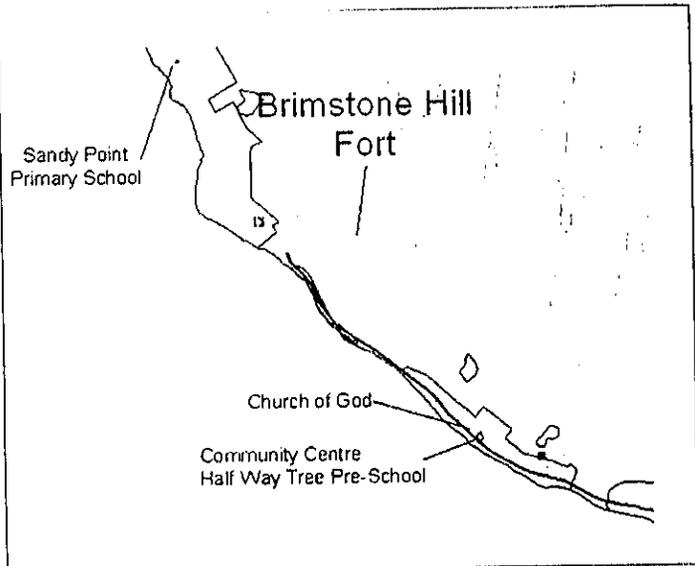
## Ports - SKT

## Coastal Erosion - SKT

- Very High
- High
- Moderate
- Low
- Very low
- Coastline - SKT

Plan scale	1:25000
Scale	1
Number of sheets	1
Q1c	British West Indies
Projection	Transverse Mercator
Dist. in Transverse M	Clarke 1866 (Modified)
Metric of Origin	NAD 83
Latitude of Origin	16° 00' 00" N
Longitude of Origin	62° 00' 00" W
False Easting of Origin	400 000 m
False Northing of Origin	100 000 m
Contour Interval	50 feet
Series	ES 803 (000 345)
Edition	1904

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## Coastal Erosion Details - St. Kitts

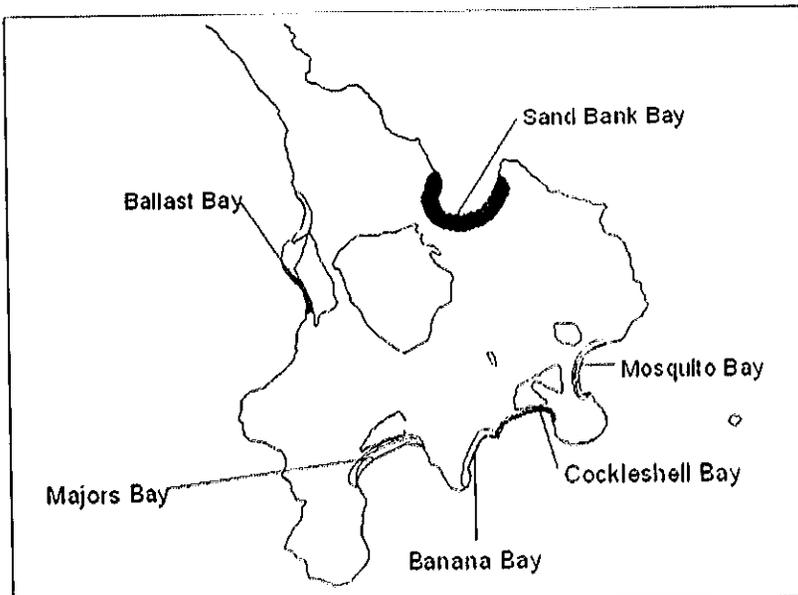
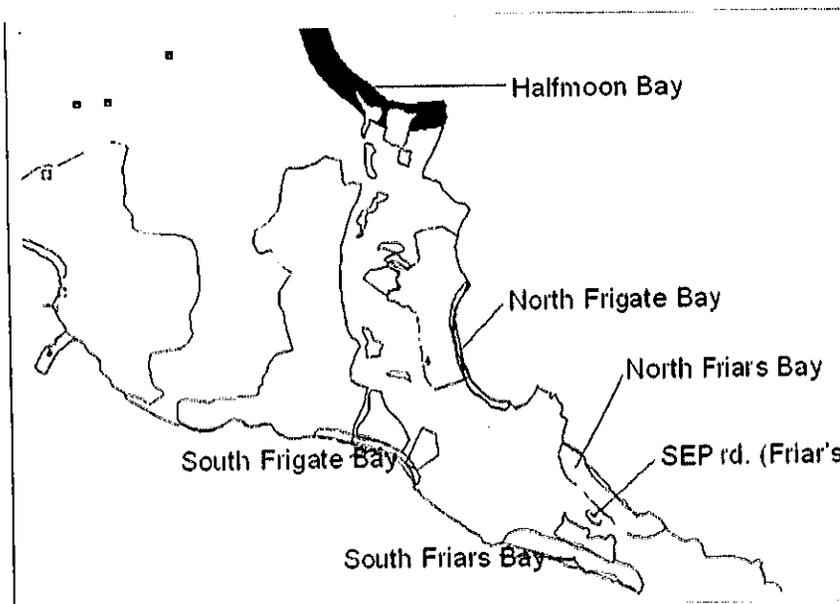
Coastal Buildings - Churches - Education - Health -  
Water Works - Parks - Roads -  
Gas Distribution - Ports

Coastal Buildings - Churches - Education - Health -  
Water Works - Parks - Roads -  
Gas Distribution - Ports

- 1. Coastal Buildings
- 2. Churches
- 3. Education
- 4. Health
- 5. Water Works
- 6. Parks
- 7. Roads
- 8. Gas Distribution
- 9. Ports

Coastal Buildings - Churches - Education - Health -  
Water Works - Parks - Roads -  
Gas Distribution - Ports

- 1. Coastal Buildings
- 2. Churches
- 3. Education
- 4. Health
- 5. Water Works
- 6. Parks
- 7. Roads
- 8. Gas Distribution
- 9. Ports



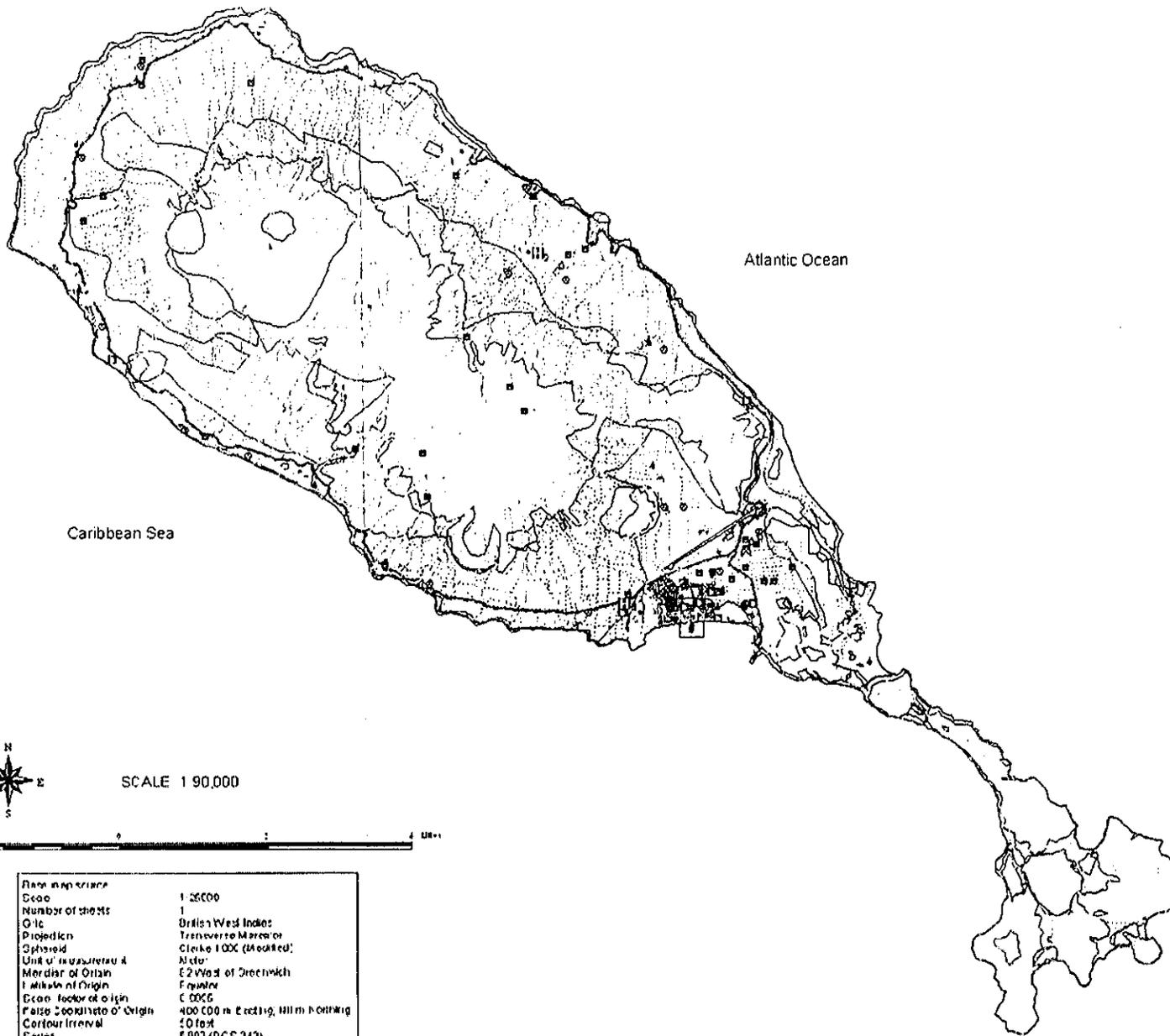
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124

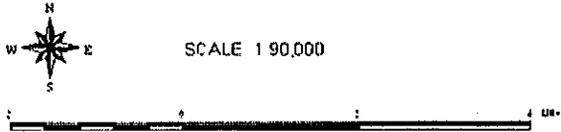
K

# Inland Erosion Hazard Vulnerability Assessment St. Kitts

Gov. Buildings - Shelters - Education - Health -  
Water Intakes - Wells - Ports -  
Gas distribution - Roads



<b>Critical Facilities - SKT</b>	□ Gas Terminal
Administration Govt	Radio & TV
Churches	Power House
■ Community Centres	Water
Residential Govt.	Shelters - SKT
III Hospital	Main rd - SKT
Clinic	<b>Other transp</b>
4 Police	Sec. rd.
Court	Track
✶ Fire	Railway
1 Military	Water catchment - SKT
0 Nursery	Contours (500 ft) - SKT
• Primary school	<b>Inland Erosion - SKT</b>
Secondary	Very High
Technical	High
University	Moderate
• Other Education	Low
✶ Airport	Very low
• Sea Port	Coastline - SKT
Storage	
□ Gas station	



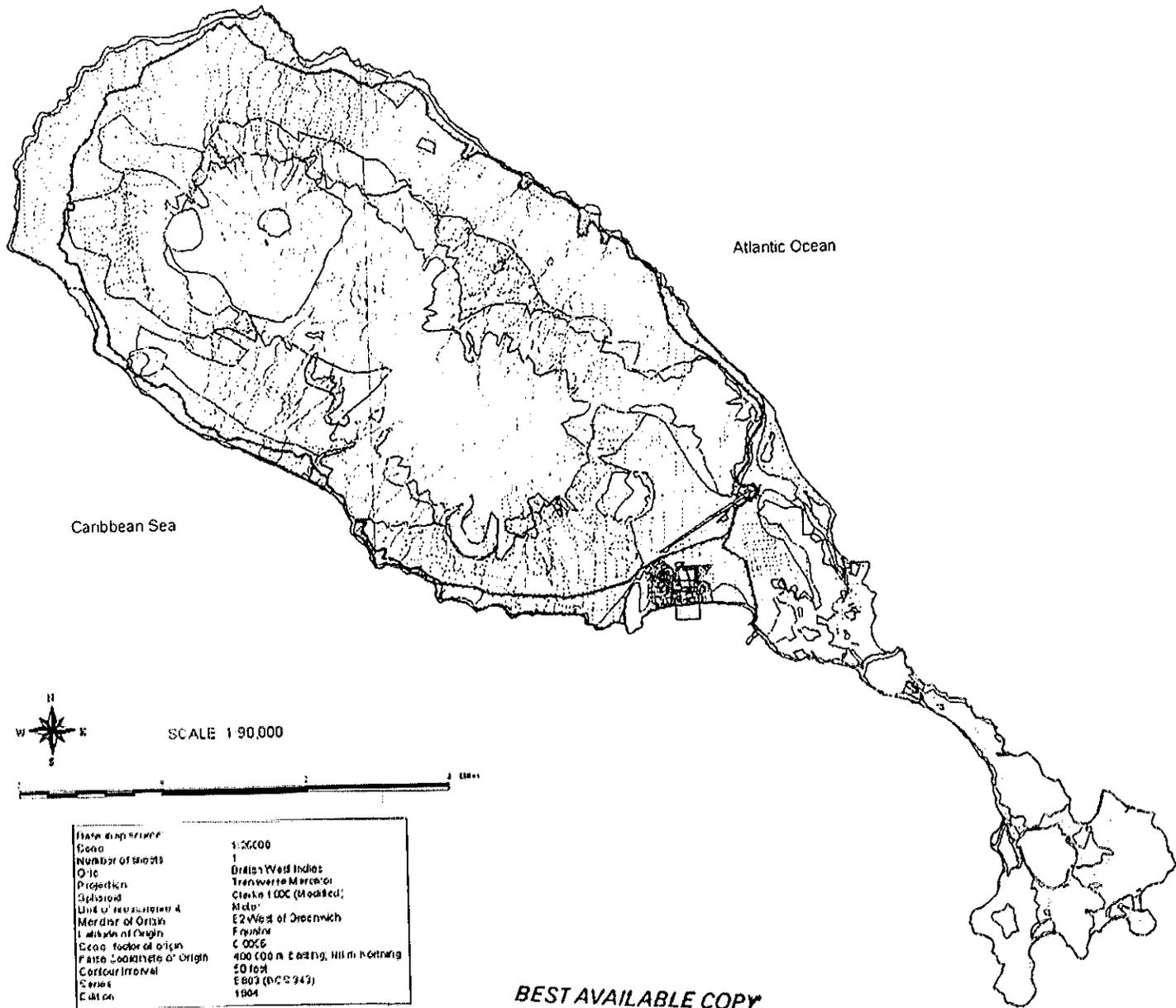
Base map source	1:25000
Scale	1
Number of sheets	1
Grid	British West Indies
Projection	Transverse Mercator
Spheroid	Clerke 1000 (Modified)
Unit of measurement	Metre
Meridian of Origin	2° 30' 0" W of Greenwich
Latitude of Origin	Equator
Scale factor at origin	0.9999
False Coordinate of Origin	400 000 m Easting, 111 m Northing
Contour Interval	50 feet
Series	EB03 (DCC 343)
Edition	1994

Prepared by: National Disaster Preparedness Planning Centre

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125

L



# Inland Erosion

## FVS - St. Kitts

Gov. Buildings - Shelters - Education - Health -  
Water Intakes - Wells - Potts -  
Gas distribution - Roads

**Facilities FVS**

- 0 - 2
- 3
- 4 - 7

**Main road FVS**

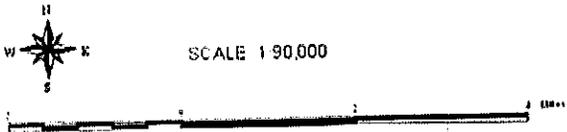
- 0 - 4
- 5 - 7
- 8 - 9

**Other transp.**

- Sec. rd.
- Track
- Railway
- Water catchment - SKT
- Contours (500 ft) - SKT
- Potts - SKT

**Inland Erosion - SKT**

- Very High
- High
- Moderate
- Low
- Very low
- Coastline - SKT



Scale	1:90,000
Number of sheets	1
Projection	British West Indies Transverse Mercator Clarke 1866 (Modified)
Units of measurement	Meters
Meridian of Origin	82 West of Greenwich
Latitude of Origin	Equator
Contour factor of origin	100 feet
False coordinate of origin	400 000 m. Easting, 111 m. Northing
Contour interval	50 feet
Series	EB03 (D/C 943)
Edition	1984

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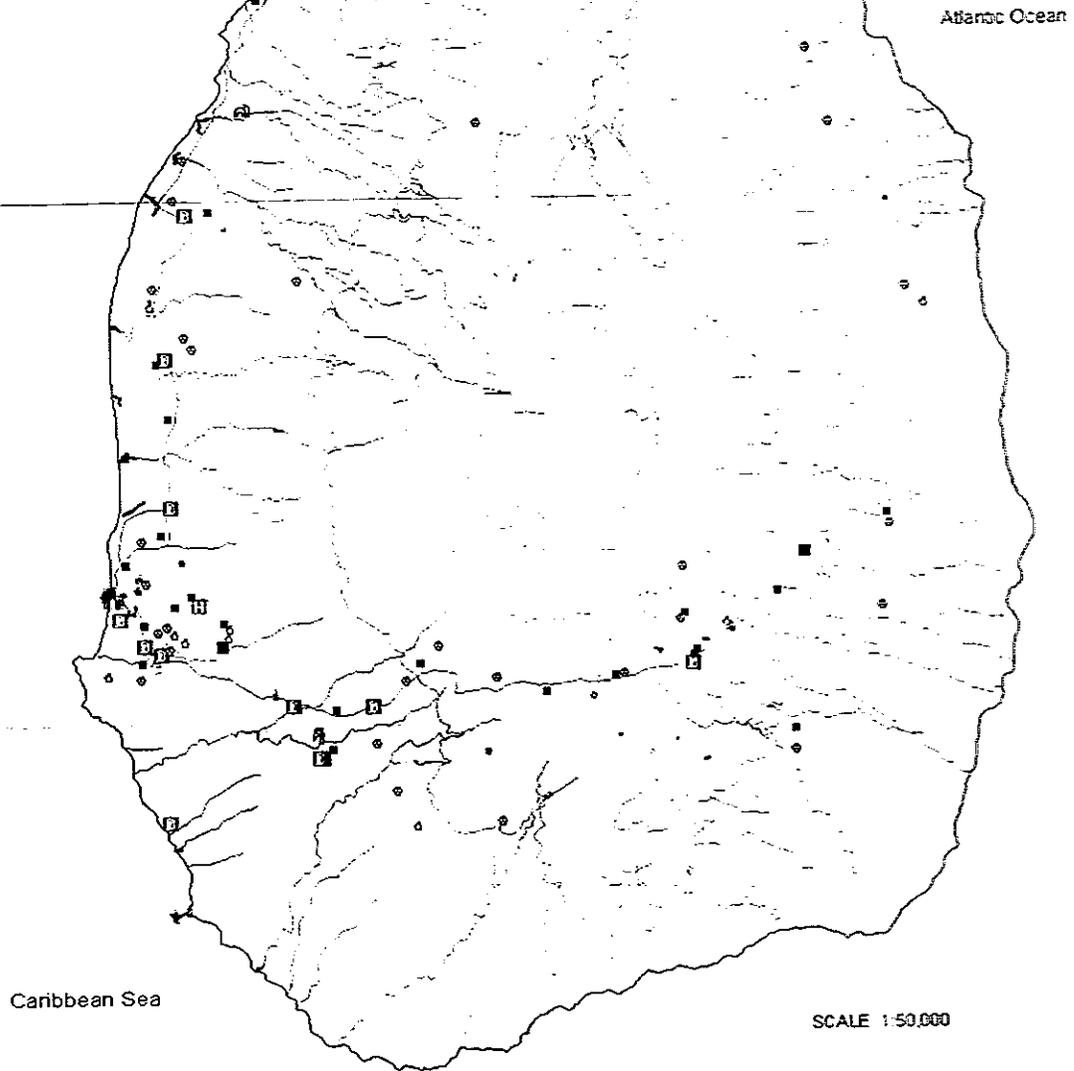
126

M

# Hurricane Hazard - Nevis

## Vulnerability Assessment

Gov. Buildings - Shelters - Education - Health -  
Water pumps - Telephone exchanges - Ports -  
Gas distribution - Roads



Caribbean Sea

SCALE 1:50,000



CIRCUIT FACTORS - NEVIS		ROADS		RAIL		POWER LINES		NEVIS 2001 (2001-01-01)	
1	Administrative District	1	Major Road	1	Major Railway	1	High Voltage	1	Water
2	Church	2	Minor Road	2	Minor Railway	2	Medium Voltage	2	Drainage
3	Community Centre	3	Path	3	Tramway	3	Low Voltage	3	Leak
4	Residential District	4	Water, Sewerage	4	Tramway	4	Power - 110V	4	High Voltage - 110V
5	School	5	Private, Public	5	Gas Pipeline	5	Power - 220V - 110V		
6	Other	6	Secondary, Tertiary	6	Telephone	6	Power - 220V - 110V		

Base map source	1:25000
Scale	1:25000
Number of sheets	1
Grid	British West Indies
Projection	Transverse Mercator
Spheroid	Clarke 1880 (No 3151)
Unit of measurement	Meter
Meridian of Origin	62° West of Greenwich
Latitude of Origin	Equator
Scale factor at origin	0.9999
False Coordinate of Origin	400 000 m Easting Nil m Northing
Contour Interval	50 feet
Series	E 803 (DOS 343)
Edition	1904

Project:  
Post-Georges Disaster Mitigation (PGDM)  
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www.oas.org/pgdm



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137



# Storm Surge Hazard - Nevis

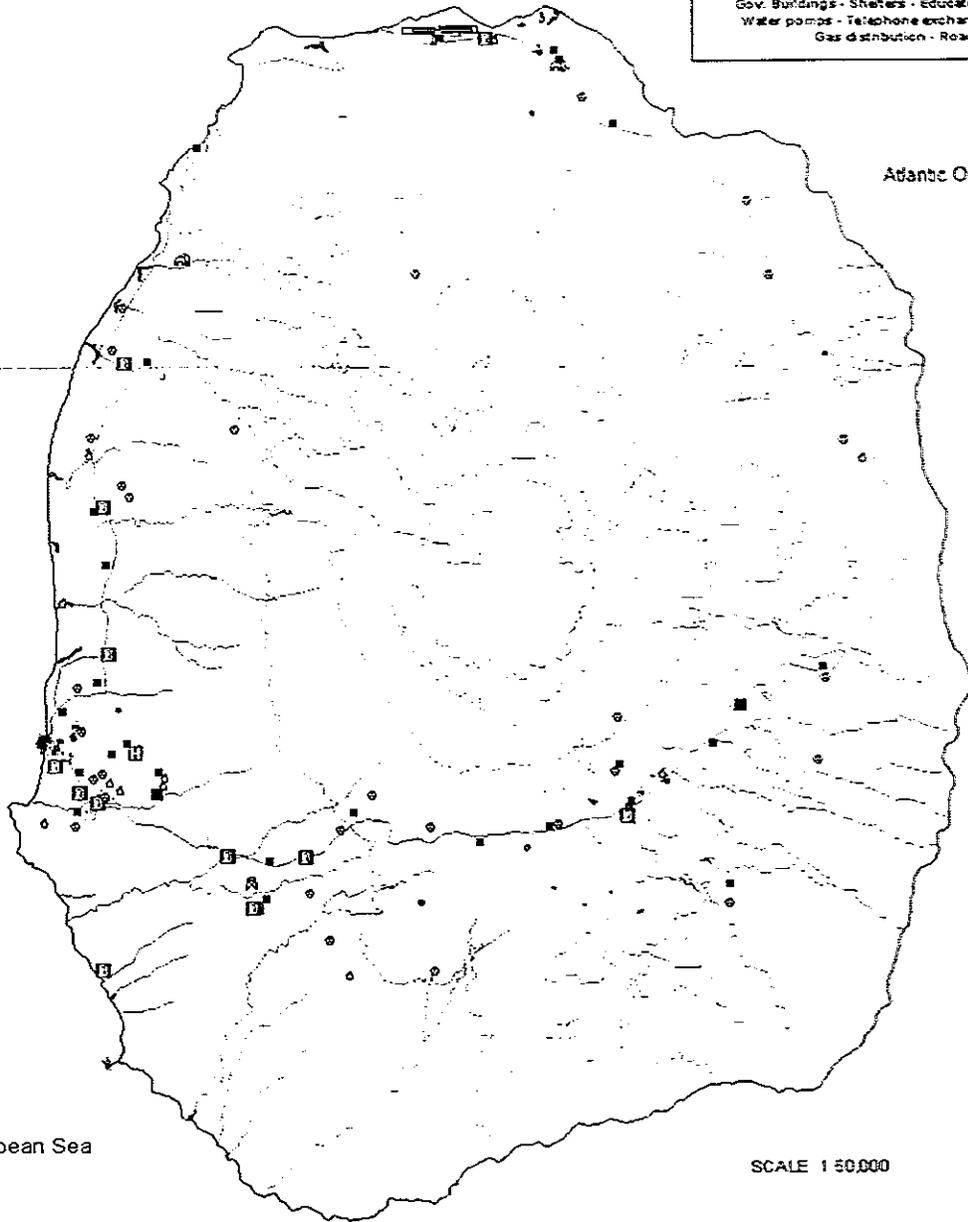
## Vulnerability Assessment

Gov. Buildings - Shelters - Education - Health -  
Water pumps - Telephone exchanges - Ports -  
Gas distribution - Roads



Atlantic Ocean

Caribbean Sea



SCALE 1:50,000



Critical Facilities - NEVIS		Roads		Ports		Other		Storm Surge Hazard - NEVIS - (H)	
▲	Assembly Ground	—	Major	▲	Port	▲	Power House	□	Zone 1
▲	Church	—	Minor	▲	Public Education	▲	Public House	□	Zone 2
■	Community Center	—	By	▲	Health	▲	Stores - R.C.D.	□	Zone 3
▲	Elementary School	—	By	▲	Sea Port	▲	Stores - R.C.D.	□	Zone 4
▲	Hospital	—	Public Education	▲	Crane Dock	▲	Stores - R.C.D.	□	Zone 5
▲	Police	—	Primary School	▲	Gas Terminal	▲	Stores - R.C.D.	□	Zone 6
		—	Secondary School	▲	Gas Station	▲	Stores - R.C.D.	□	Zone 7
		—	Technical School	▲	Telephone	▲	Stores - R.C.D.	□	Zone 8

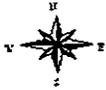
Base map name	1:25000
Scale	1
Number of sheets	British West Indies
Grid	Transverse Mercator
Projection	Clerke 1892 (Modified)
Spheroid	Clarke
Unit of measurement	Meters
Mercator of Origin	22° West of Greenwich
Latitude of Origin	Equator
Scale factor at origin	1.0000
False Coordinate U- Origin	400,000 m Easting, 80 m Northing
Central Meridian	6° West
Series	ES03 (DCS 313)
Edition	1904

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[www.oas.org/pgdm](http://www.oas.org/pgdm)

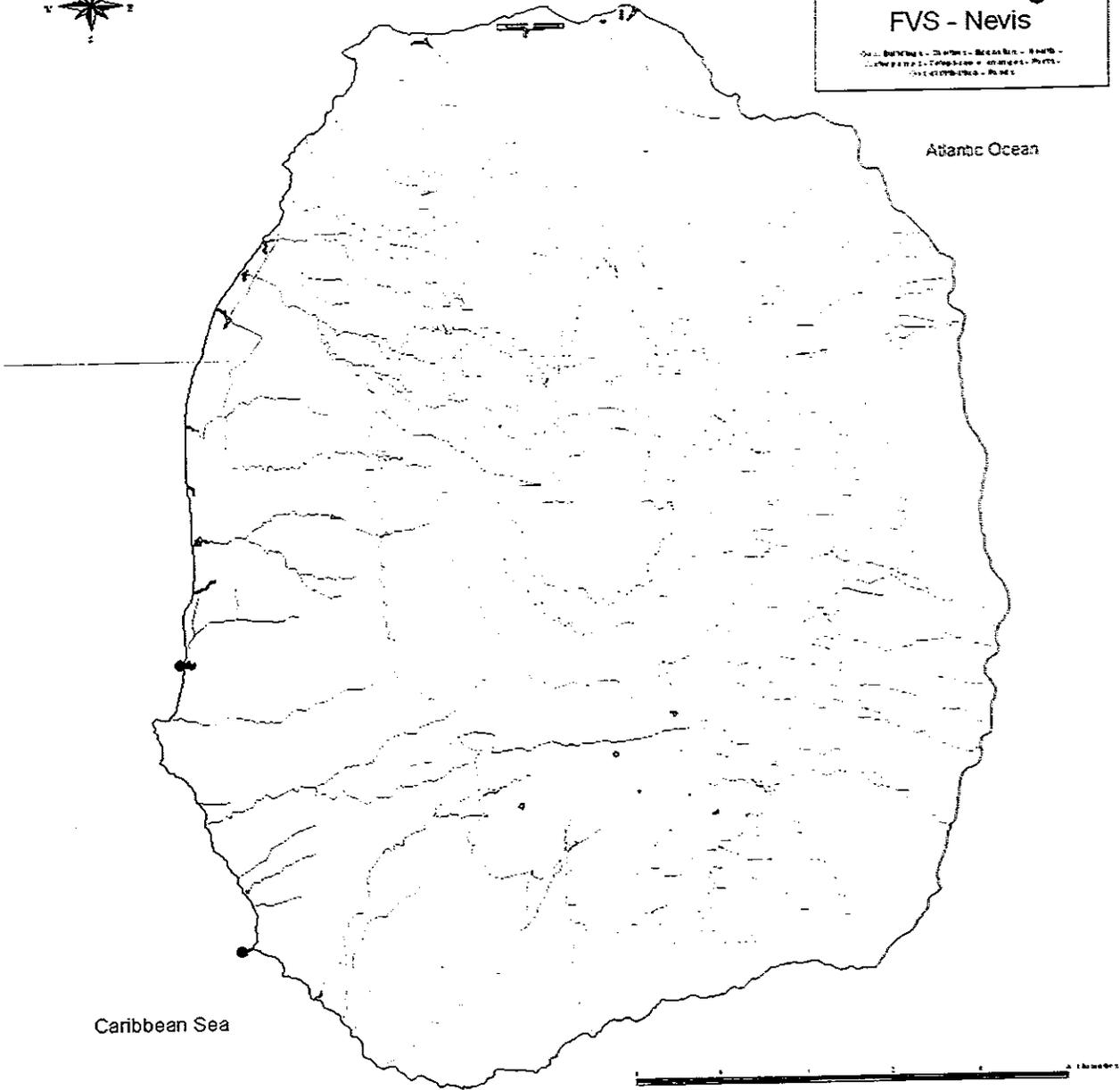


1/28/04, 01:20:11



# Storm Surge FVS - Nevis

Scale: 1:25,000  
Projection: Transverse Mercator  
Datum: Clarke 1880 (Modified)  
Units: Meter



Facilities FVS	Main road FVS	Storm Surge Hazard - NVS (grid)
2	2	High
3 - 4	— Main rd. - NVS	Moderate
5 - 6	— Water catchment - NVS	Low
● 7 - 8	— Contours (500 ft) - NVS	Coastline - NVS
● 9 - 14	Ports - NVS	

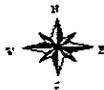
Base map source	1:25000
Scale	1
Number of sheets	1
Grid	British West Indies
Projection	Transverse Mercator
Spheroid	Clarke 1880 (Modified)
Unit of measurement	Meter
Meridian of Origin	62 West of Greenwich
Latitude of Origin	Equal
Scale factor at origin	0.9999
False Coordinate of Origin	400 000 m Easting Nil m Northing
Chart interval	50 feet
Series	E 803 (DOS 343)
C 2501	1904

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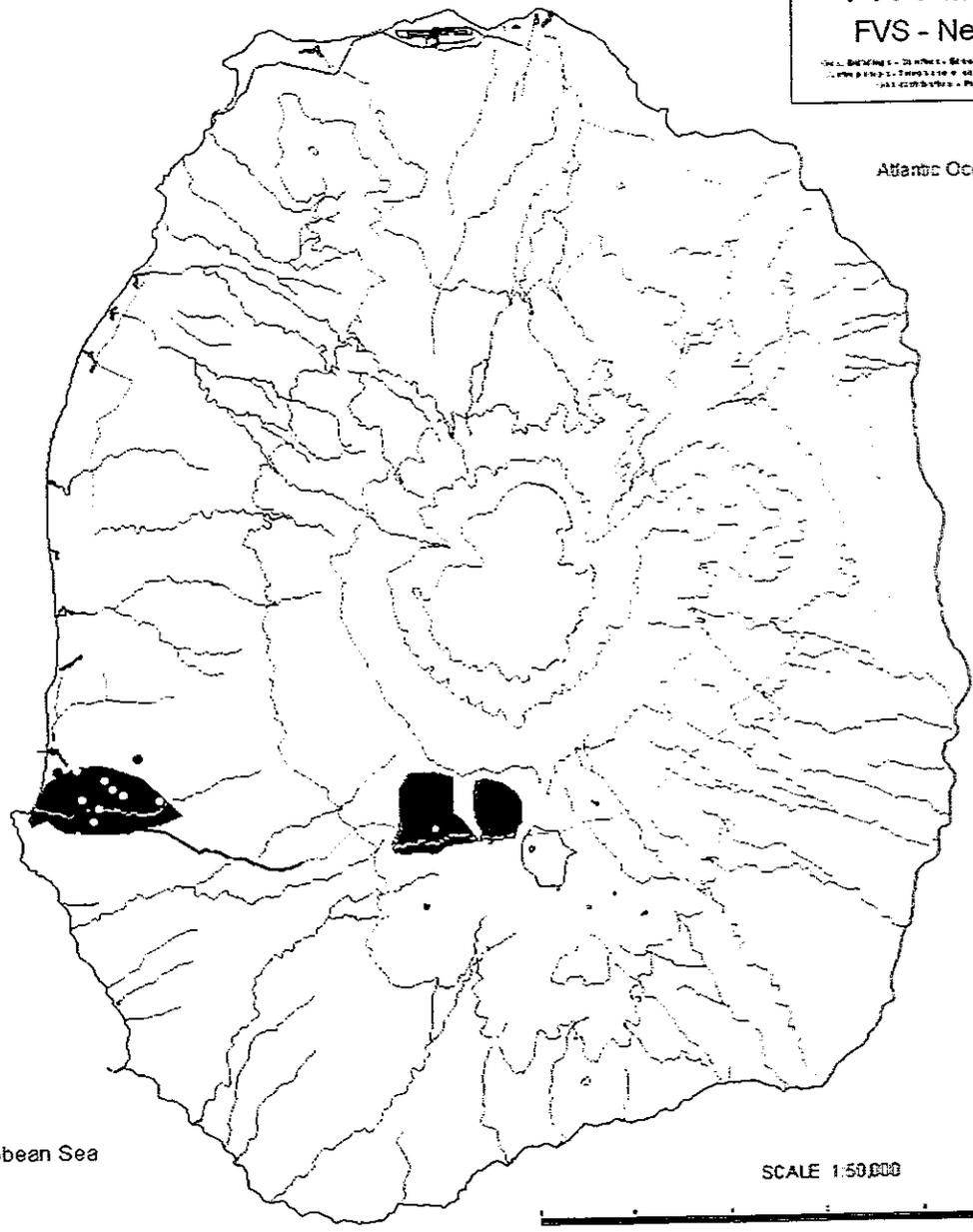






# Flooding FVS - Nevis

U.S. GEOLOGICAL SURVEY - BRITAIN - 2004  
 U.S. GEOLOGICAL SURVEY - BRITAIN - 2004  
 U.S. GEOLOGICAL SURVEY - BRITAIN - 2004



Caribbean Sea

Atlantic Ocean

SCALE 1:50,000

Facilities FVS	Main road FVS	Flooding Hazard - NVS	
3	18	High	
4 - 9	24	Moderate (temp)	
10 - 12	30	Low	
• 13 - 18	Water catchment - NVS	Low (temp)	
• 19 - 24	Contour (500 ft) - NVS	Very low	
	Ports - NVS	Coastline - NVS	

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Base map number	1:25000
Scale	1
Number of sheets	1
GTIC	British West Indies
Projection	Transverse Mercator
Spheroid	Clarke 1886 (Modified)
Unit of measurement	Meter
Meridian of Origin	62 West of Greenwich
Latitude of Origin	Equator
Scale factor at origin	1.0000
False Coordinate of Origin	400,000 m Easting; Nil m Northing
Contour Interval	40 feet
Series	ES03 (DCS 343)
Edition	1904

Project:  
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[www.oas.org/ppdm](http://www.oas.org/ppdm)



326, 001, 01, 2004

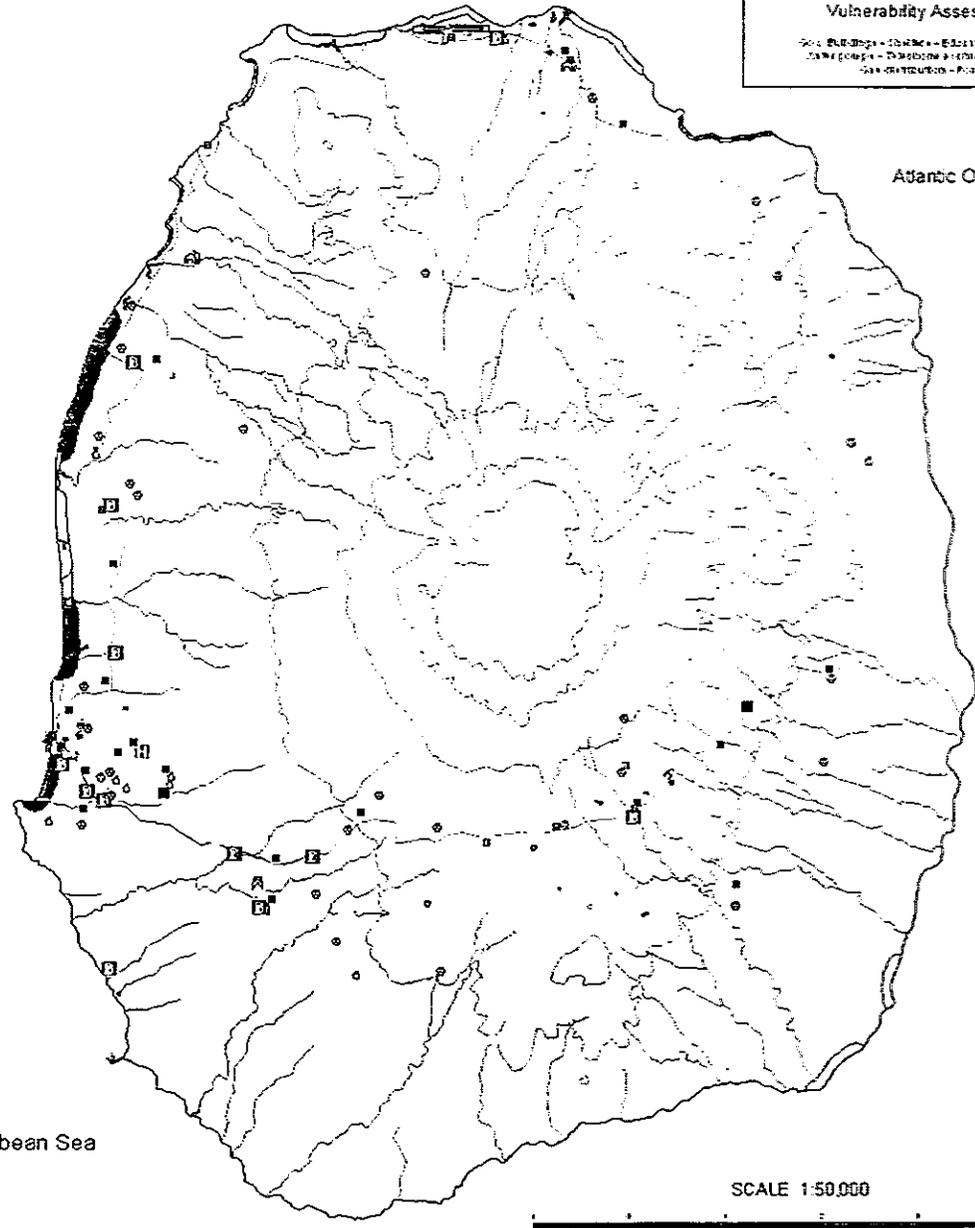
132



**Coastal Erosion Hazard - Nevis**  
**Vulnerability Assessment**  
 Soc. Buildings - Churches - Education - Health -  
 Law Courts - Telephone exchanges - Parks -  
 Gas distribution - Ponds

Caribbean Sea

Atlantic Ocean



SCALE 1:50,000

Critical Facilities - NVS		Others Education		Coastal Erosion Hazard - NVS	
Administration Govt.	Court	Others Education	Pump house	Very High	
Church	Prison	Airport	Shelters - NVS	High	
Community Centres	Fire	Sea Port	Main rd. - NVS	Moderate	
Residential Govt.	Nursery Education	Storage Govt.	Pats - NVS	Low	
Hospital	Primary School	Gas Terminal	Water catchment - NVS	Very low	
Clinic	Secondary School	Gas Station	Contours (500 ft) - NVS	Coastline - NVS	
Police	Technical School	Telephone box			
	University	Power house			

Base map source: 1:25000  
 Scale: 1  
 Number of sheets: 1  
 G.T.C.: British West Indies  
 Projection: Transverse Mercator  
 Spheroid: Clarke 1866 (Modified)  
 Unit of measurement: Meter  
 Meridian of Origin: 62° West of Greenwich  
 Latitude of Origin: Equator  
 Scale factor at Origin: 1.0000  
 False Coordinate of Origin: 400,000 m Easting; Nil m Northing  
 Contour Interval: 50 feet  
 Series: E803 (DCS 343)  
 Edition: 1904

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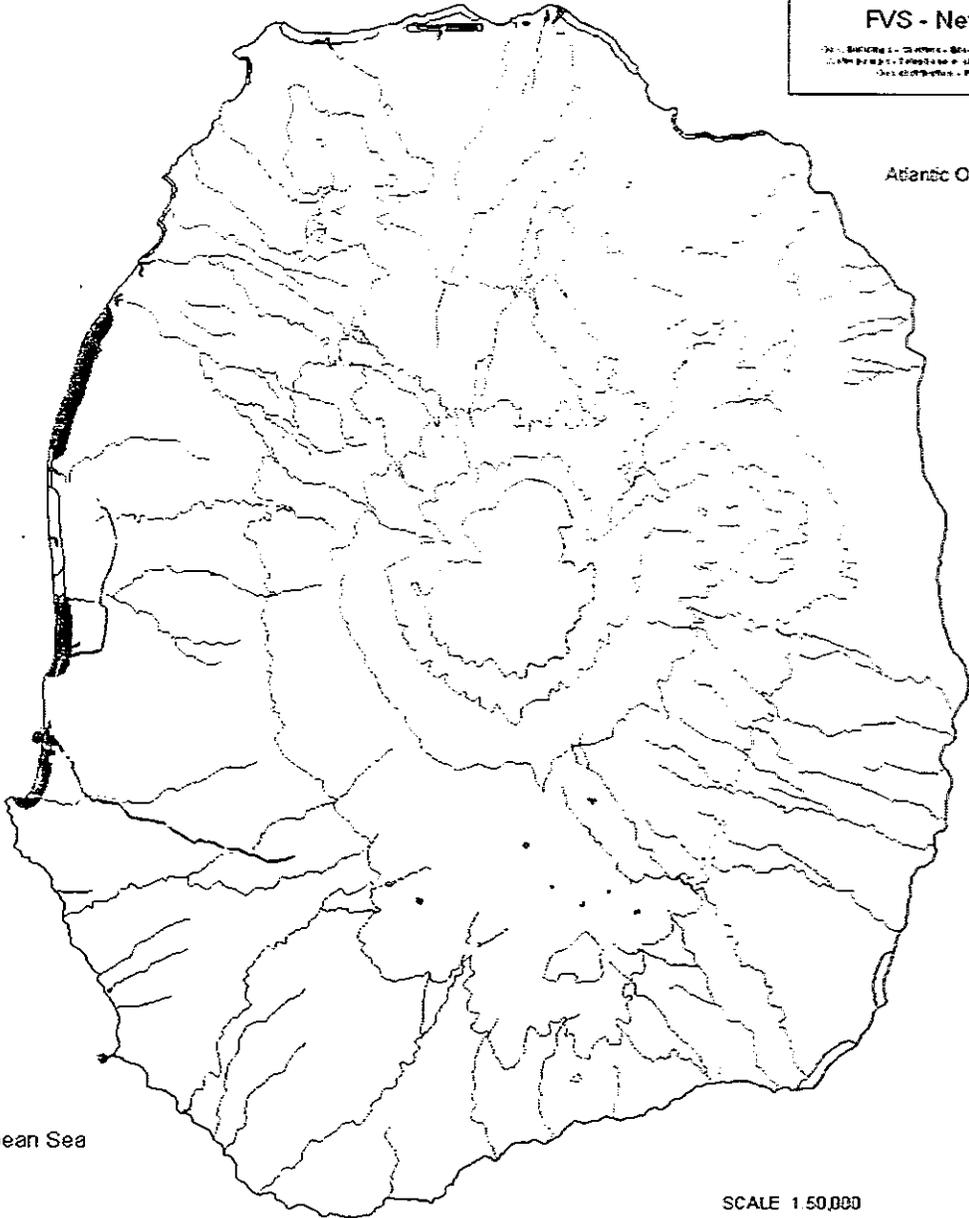
Project:  
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 www.oas.org/pgdm



133



**Coastal Erosion**  
**FVS - Nevis**  
Map Series - Coastal Erosion - FVS - Nevis -  
 Date of Issue - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 -  
 Date of Issue - 1994



Caribbean Sea

Atlantic Ocean

SCALE 1:50,000



<b>Facilities FVS</b>	<b>Main road FVS</b>	Ports - NVS	Coastline - NVS
4	0	<b>Coastal Erosion Hazard - NVS</b>	
5 - 8	1 - 12	Very High	
9 - 12	13 - 16	High	
● 13 - 20	17 - 20	Moderate	
● 21 - 24	Water catchment - NVS	Low	
	Contours (500 ft) - NVS	Very low	

Base map number: 1:25000  
 Scale: 1  
 Number of sheets: 1  
 Grid: British West Indies  
 Projection: Transverse Mercator  
 Spheroid: Clarke 1866 (Modified)  
 Unit of measurement: Meter  
 Meridian of Origin: 62 West of Greenwich  
 False Easting of Origin: 500000  
 False Northing of Origin: 500000  
 Contour Interval: 50 feet  
 Series: E803 (D/C S 343)  
 Edition: 1994

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Project: Post-Georges Disaster Mitigation (PGDM)  
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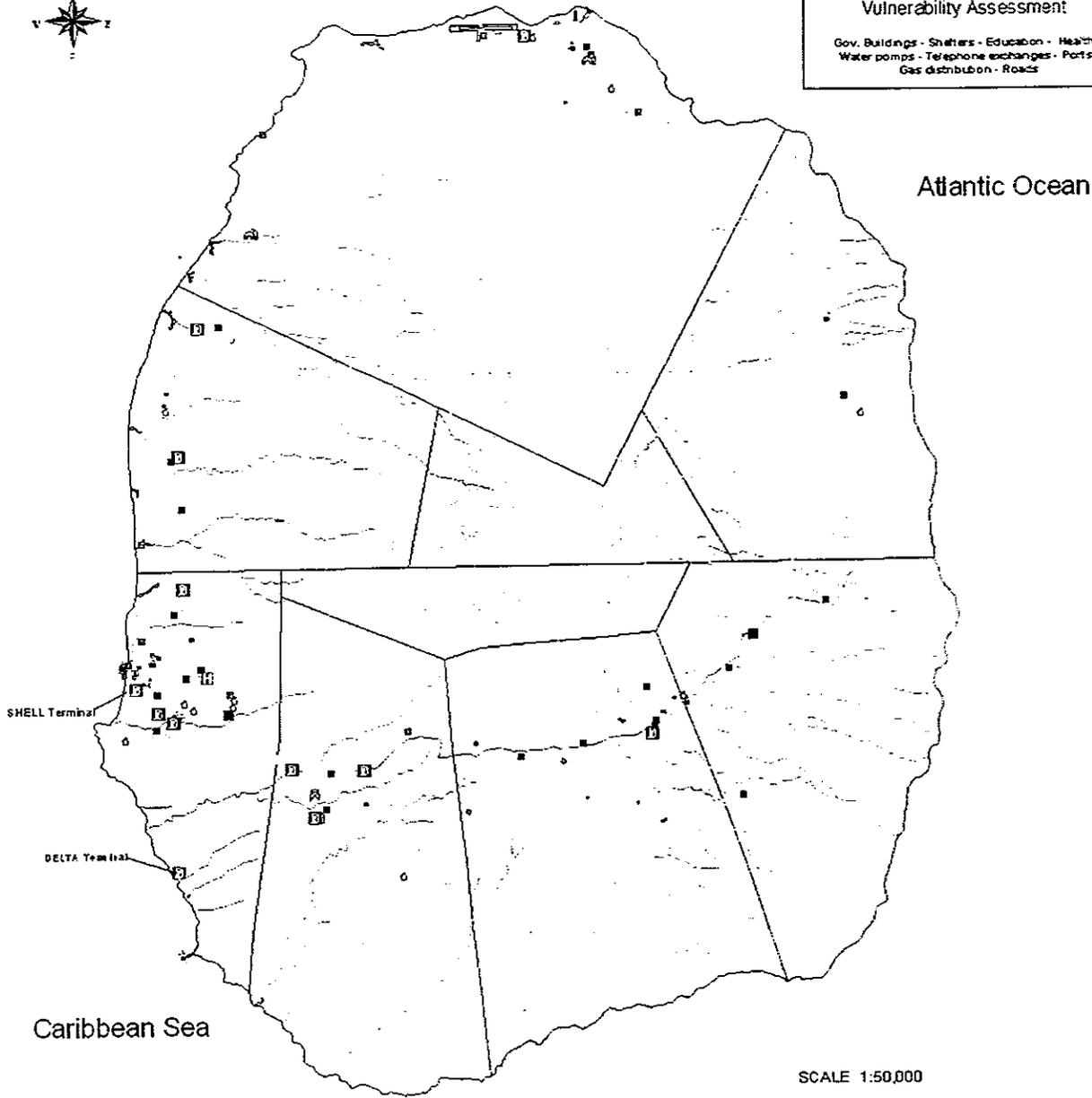


Jan. 1994

134



**Drought Hazard - Nevis**  
**Vulnerability Assessment**  
 Gov. Buildings - Shelters - Education - Health -  
 Water pumps - Telephone exchanges - Ports -  
 Gas distribution - Roads



Critical Facilities - NVS		Others Education		Drought Hazard - NVS	
■ Administration Govt.	○ Court	○ Airport	■ Pump house	□ Very High	
○ Church	○ Prison	○ Sea Port	○ Shelters - NVS	□ High	
■ Community Centres	○ Fire	○ Storage Govt.	— Main rd. - NVS	□ Moderate	
■ Residential Govt.	○ Nursery Education	○ Gas Terminal	□ Ports - NVS	□ Low	
■ Hospital	○ Primary School	○ Gas Station	— Water catchment - NVS	□ Coastline - NVS	
○ Clinic	○ Secondary School	○ Telephone box	— Contours (500 ft) - NVS		
○ Police	○ Technical School	○ Power house			
	○ University				

Base map source	1:25000
Scale	1
Number of sheets	BRITISH West Indies
Grid	Transverse Mercator
Projection	Clarke 1880 (Modified)
Spheroid	Meter
Unit of measurement	62 West of Greenwich
Meridian of Origin	Equal
Latitude of Origin	USGS
Scale factor at origin	400 000 m Easting Nil m Nothing
False Coordinate of Origin	50 feet
Chart interval	E 803 (DOS 343)
Series	1904
Edition	

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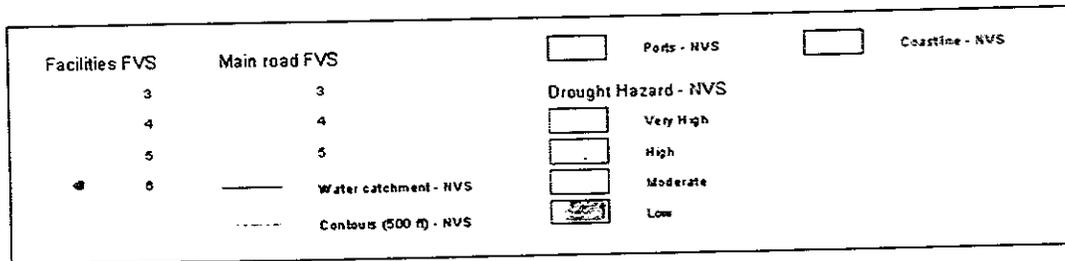
# Drought FVS - Nevis

Scale: Buildings - Churches - Electric Poles - Roads -  
 Water Pumps - Telephone - Airports - Ports -  
 Sea Level Elevation - 100 ft

Atlantic Ocean

Caribbean Sea

SCALE 1:50,000



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Scale in operation	1:25000
Scale	1
Number of sheets	1
Grid	British West Indies Transverse Mercator
Projection	Clarke 1880 (Modified)
Spheroid	Clarke 1880
Unit of measurement	Meter
Meridian of Origin	E2 West of Greenwich
Latitude of Origin	Equator
Scale factor at origin	1.0000
False Coordinate of Origin	400,000 m Easting; Nil m Northing
Contour Interval	50 feet
Series	E803 (DCS 343)
Edition	1904

Project:  
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04/04/2004

1361