

ENVIRONMENTAL IMPACT ASSESSMENT

for

FALSE CAYE RESORT & RESIDENTIAL DEVELOPMENT

A Tourism Project to be Located on False Caye, 5 Nautical Miles North of
the Placencia Peninsula



Prepared by



SEPTEMBER, 2007

Table of Contents

	Pg.
1.0 Project Description	1-1
1.1 Project Location	1-1
1.2 Physical Plan	1-1
1.2.1 Existing Development	1-1
1.2.2 Planned Development	1-1
1.2.2.1 Pers	1-2
1.2.2.2 Utility Zone Construction and Installation of Associated Infrastructure	1-3
1.2.2.3 Beaches	1-8
1.2.2.4 Lagoon and Channel Works	1-8
1.2.2.5 Dredging Works	1-8
1.2.2.6 Utility Zone Construction and Installation of Associated Infrastructure	1-11
1.2.2.6.1 Energy Generation Facilities	1-11
1.2.2.6.2 Potable Water Supply Infrastructure	1-11
1.2.2.7 Sewage Treatment Facilities	1-11
1.2.2.8 Solid Waste Infrastructure	1-12
1.2.2.9 Transportation	1-12
1.2.2.10 Chronology Construction Phase	1-12
1.3 Operational Phase	1-12
1.3.1 Hotel Resort and Residential Facilities.	1-12
1.3.2 Capacity	1-13
1.3.3 Staffing	1-13
2.0 Physical Environment	2-1
2.1 Meteorology	2-1
2.2 Oceanography	2-1
2.2.1 Tides	2-1
2.2.2 Currents	2-4
2.2.3 Water Temperature	2-4
2.2.4 Salinity	2-10
2.2.5 Turbidity	2-10
2.2.6 Total Coliform and E. coli	2-11
2.3 Biological Oceanography	2-11
2.3.1 Flora and Fauna	2-11
2.3.1.1 Flora	2-11
2.3.1.2 Fauna	2-24
2.3.1.2.1 Invertebrates	2-24
2.3.1.2.2 Vertebrates	2-27
2.3.1.2.2.1 Fish	2-27
2.3.1.2.2.2 Aquatic and Semi-Aquatic Reptiles and Mammals	2-30

2.3.1.2.2.3 Birds	2-31
2.4 Conservation Issues	2-34
2.4.1 Endangered Species of Special Significance	2-34
2.4.2 Protected Areas	2-34
2.5 Geology	2-35
2.5.1 Regional Geology	2-35
2.5.2 Structural Geology	2-36
2.5.3 Geomorphology	2-36
2.5.3.1 Surficial Geology	2-36
2.5.3.2 Supratifal and Subtidal Features	2-38
2.5.4 Local Area Geology	2-39
2.5.5 Soils	2-39
2.6 Archaeology	2-45
3.0 Policy, Legal and Administrative Issues	3-1
3.1 Environmental Protection Legislation	3-1
3.1.1 The Environmental Protection Act	
SI 22/1992 and 328/2003	3-1
3.1.2 Environmental Impact Assessment Regulations SI 107/1995	3-2
3.1.3 Coastal Zone Management Strategy Chap. 329 2000	
Revised Edition	3-3
3.1.4 Effluent Limitation Regulations SI 94/1995	3-3
3.1.5 Pollution Regulations SI 56/1996	3-3
3.1.6 Solid Waste Management Authority Act SI 224 of 2000	3-4
3.1.7 Ancient Monuments and Antiquities Act SI 330/2000	3-4
3.1.8 Belize Water Industry Act No. 1 of 2001	3-4
3.1.9 Belize Port Authority Act SI 233 of 2000/2003	3-5
3.1.10 National Lands Act (No. 6 of 1992) and SI 191 of 2000	3-5
3.1.11 Crown Land Rules SI 60 of 1939	3-5
3.1.12 Mines and Minerals Act Chap. 226 of 2000	3-5
3.1.13 Forests (Mangrove Protection) Regulations, SI No. 52 of 1989	3-6
3.1.14 The Forest Act SI 213/2000	3-6
3.1.15 Belize Tourist Board Act SI 275 of 2000	3-6
3.1.16 Hotels and Tourist Accommodation Act 285/2000	3-6
3.1.17 Protected Areas Conservation Trust Act (PACT) Chap. 218/2000	3-7
3.1.18 Customs and Excise Duties Act Revised Edition SI 48 of 2000	3-7
3.2 International Conventions and Agreements	3-7
4.0 Water Resources	4-1
4.1 Overview	4-1
4.2 Projected Occupancy	4-1
4.3 Water Resources	4-2
4.4 Potable Water Demand	4-2
4.5 Water Source Selection	4-3
4.5.1 Source Selection Description	4-4
4.5.2 Ground Water Distribution, Storage and Treatment Options	4-4

4.6 Zone of Influence	4-9
4.7 Water Conservation	4-9
4.8 Surface Water Analysis	4-9
4.9 Water Quality Monitoring Program	4-10
5.0 Wastewater Management	5-1
5.1 Overview	5-1
5.2 Composition and Nature of Liquid Waste	5-1
5.3 Wastewater Production	5-2
5.4 Environmental Wastewater Load	5-2
5.5 National Environmental Effluent Standards	5-3
5.6 Wastewater Collection and Treatment Alternatives	5-4
5.6.1 The Preferred Option	5-6
5.6.2 Typical BESST Plant Treatment Effluent and Loading Parameters	5-6
5.7 Wastewater Management	5-6
5.7.1 Wastewater Disposal	5-7
5.7.2 Wastewater Piping	5-7
5.7.3 Wastewater Recycling	5-7
6.0 Solid Waste	6-1
6.1 Overview	6-1
6.2 Projected Waste Profile and Generation	6-1
6.3 Construction and Field Waste - Waste Category I	6-3
6.4 Domestic Waste – Waste Category II	6-4
6.4.1 Domestic Waste disposal	6-4
6.4.2 Selection of the preferred option	6-6
6.5 Commercial Waste (Waste category III)	6-6
6.6 Solid Waste Management Plan for False Caye	6-6
6.6.1 Waste Minimization Strategies	6-8
6.6.2 Waste Classification Volumes	6-8
6.6.3 Solid Waste Collection	6-9
6.6.4 Public Awareness Program	6-10
6.7 Reporting Requirements	6-10
7.0 Energy Generation	7-1
7.1 Energy Demand	7-1
7.2 Energy Sources	7-2
7.2.1 Primary Source	7-2
7.2.2 Secondary Source	7-2
7.3 Energy Transmission Lines and Routes	7-3
7.4 Energy Management	7-4
7.5 Fuel Requirements	7-4
7.5.1 Cooking Fuel	7-4
7.5.2 Fuel Storage	7-4
7.5.3 Fuel Management	7-6

8.0 Disaster Management	8-1
8.1 Disaster Classification	8-1
8.2 Disaster Management Structure	8-2
8.3 Hurricane Preparedness Plan (Evacuation Plan)	8-2
8.3.1 Purpose of Plan	8-2
8.3.2 Information System	8-3
8.3.3 Pre-Season Preparation	8-3
8.3.4 Implementation Plan during Threats	8-4
8.4 Fire Prevention and Response Plan	8-5
8.4.1 Purpose of Plan	8-5
8.4.2 Fire Protection Equipment/Systems	8-6
8.4.3 Fire Prevention	8-6
8.4.4 Fire Response	8-7
8.5 Spill Contingency Plan	8-8
8.5.1 Purpose of Plan	8-8
8.5.2 Mechanism	8-9
8.5.3 Response Policy	8-9
8.5.4 Fuel Management	8-9
8.5.5 Waste Oil Management	8-10
8.5.6 Contingency Equipment and Safety Priorities	8-10
8.6 Tidal Rise Contingency Plan	8-11
8.6.1 Purpose of the Plan	8-11
8.6.2 Tidal Rise and Erosion	8-11
8.6.3 Vulnerability to Climate Change	8-11
8.7 Medical Emergency Plan	8-12
8.7.1 Purpose of the Plan	8-12
8.7.2 Basic First Aid	8-13
8.7.3 Transportation (Evacuation) of Patient	8-13
8.7.4 Contact Information	8-14
8.8. Training and Development	8-14
9.0 Social Factors	9-1
9.1 Introduction	9-1
9.2 Regional Demographics/Population/Impacts of Proposed Development	9-1
9.3 Cultural/Historical Resources in Peninsula Area and Surrounding Areas and Protected Areas Management	9-6
9.4 Social Infrastructure and Services	9-7
9.4.1 Education/Health Services	9-7
9.4.2 Labor and Employment	9-8
9.4.3 Communication and Services	9-9
9.4.4 Roads and Transportation	9-9
9.4.5 Planning	9-10
9.5 The Tourism Sector in the Placencia Peninsula Area	9-10
9.6 NGO and Public Interest	9-12

10.0 Environmental Impacts of Proposed Development	10-1
10.1 General Principles Underpinning Environmental Impacts	10-1
10.2 Overview of Environmental Impacts	10-2
10.3 Details of Environmental Impacts	10-3
10.3.1 Dredging Impacts	10-3
10.3.2 Land Reclamation Impacts	10-4
10.3.3 Domestic Effluent Impacts	10-6
10.3.4 Potable Water Impacts	10-7
10.3.5 Solid Waste Impacts	10-7
10.3.6 Pier and Boating Impacts	10-8
10.3.7 Impacts from Energy Generation	10-10
10.4 Social and Economic Impacts	10-10
11.0 Impact Mitigation	11-1
11.1 General Principles Underpinning Environmental Impact Mitigation	11-1
11.2 Specific Mitigation Measures	11-1
11.2.1 Mitigation Measures In Relation To Dredging and Land Reclamation Activities	11-1
11.2.2 Mitigation Measures In Relation To Human Wastes and Domestic Effluents	11-5
11.2.3 Mitigation Measures In Relation To Solid Wastes	11-8
11.2.4 Mitigation Measures In Relation To Potable Water	11-10
11.2.5 Mitigation Measures In Relation To Energy Generation	11-12
11.2.5 Social Impact Mitigation	11-13
12.0 Monitoring Plans	12-1
12.1 Principles Underpinning Environmental Monitoring	12-1
12.2 Specific Monitoring Issues	12-1
13.0 Alternatives to Development	13-1
13.1 Principles Underpinning Alternatives to Development	13-1

ANNEXES

Annex I - TOR
Annex II – EIA Preparers
Annex III – Legal Documents
Annex IV – BESST Plant Specifications
Annex V – Water Test Results
Annex VI – Soil Test Results
Annex VII – Architectural Sketches
Annex VIII – False Caye Geotechnical Study
Annex IX – Earth Tub Technology
Annex X - Archaeology
Annex XI - Storm Surge Estimations

List of Figures

No. Sec./Pg.	Title	
	Fig. 1.1: Project location relative to the Placencia Peninsula	1-4
	Fig. 1.2: Project Site in relation to surrounding areas	1-5
	Fig. 1.3: Project site in relation to road networks	1-7
	Fig. 1.4: Development Concept	1-9
	Fig. 1.5: Site Specific Road Network	1-15
	Fig. 1.6a: Projected dredging volumes/landfill requirement	1-16
	Fig. 1.6b: Location of seabed borehole sample sites	1-17
	Fig. 1.7: Sea Defenses	1-19
	Fig. 1.8A: Pier Plan	1-20
	Fig. 1.8b: Typical Over-Water Cabana	1-21
	Fig. 1.8c: Typical Pier End View	1-22
	Fig. 1.9: Post-reclamation beach profile	1-23
	Fig. 1.10a: Hotel 'A' – End View & Plan View	1-24
	Fig. 1.10b: Hotel 'A' – Side View	1-25
	Fig. 1.11: Hotel 'B' – Side View and Plan View	1-25
	Fig. 1.12a: Villa Type 'A'	1-26
	Fig. 1.12b: Villa Type 'B'	1-27
	Fig. 1.12c: Villa Type 'C'	1-28
	Fig. 2.1: Rainfall distribution for Belize including the Project Site	2-2
	Fig. 2.2: Storm Surge Map of Belize including the Project Site	2-3
	Fig. 2.3: Hydrographic profile of project area	2-5
	Fig. 2.4: Topography of Caye and Hydrography of surrounding seas of project Site	2-6
	Fig. 2.5: Sample locations and Water Quality Test Results	2-7
	Fig. 2.6: Vegetation Map of Project Site	2-8
	Fig. 2.7: Eulittoral/Sub-tidal Habitat Map	2-9
	Fig. 4.1 Cross Section of Proposed Well	4-5
	Fig. 4.2 Proposed well location site	4-6
	Fig. 4.3 False Caye Development Second Option	4-7
	Fig. 4.4 Wastewater treatment plan	4-8
	Fig. 4.5 Water Sample Location for False Caye	4-11
	Fig. 6.1 Placencia Dump Site in Relation to the Project Site	6-7
	Fig. 7.1 Proposed BEL HV Line Underwater Route	7-1
	Fig. 7.2 Above Storage Tank for Diesel Fuel	7-2
	Fig. 10.1 Environmental Impact Cycle	10-1

List of Tables

No.	Title	Pg.
Table 1.1:	Development Components	1-10
Table 1.2:	Chronological Schedule of Development	1-14
Table 2.1:	Aquatic and Terrestrial Vegetation Found in the Project Area	2-13
Table 2.2:	Marine Macro-Invertebrates Found in and Around the Project Area	2-25
Table 2.3:	Fish Species Found in Project Area	2-28
Table 2.4:	Aquatic and Semi-aquatic Reptiles and Mammals occurring in the project area	2-30
Table 2.5:	Birds Found in and Around the Project Area	2-32
Table 3.1:	Licenses and Permits required by the Development	3-9
Table 4.1	Projected Occupancy Rate for the Proposed Project	4-1
Table 4.2	Estimated Potable Water Demand for False Caye	4-2
Table 4.3	Selection of the Preferred Source for False Caye	4-3
Table 5.1	Typical Composition of Untreated Domestic Sewage	5-1
Table 5.2	Projected Wastewater Production according to Facilities	5-2
Table 5.3	Project Domestic Wastewater Profile	5-3
Table 5.4	Effluent Limitation Standard for Commercial Activities	5-3
Table 5.5	Evaluation of Wastewater Disposal Alternatives	5-5
Table 5.6	Projected Performance of BESST Treatment Plant.	5-6
Table 5.7	Wastewater Alternative Uses	5-8
Table 6.1	Estimated Solid Waste Generation for Belize Municipalities	6-2
Table 6.2	Projected Domestic Waste Production for False Caye	6-3
Table 6.3	False Caye Solid Waste Disposal Options	6-5
Table 6.4	Project Domestic Waste Profile	6-9
Table 7.1	Project Energy Demand	7-1
Table 7.2	Selection of Secondary Sources for False Caye	7-2
Table 8.1	Summary of the Disaster Preparedness Plans for False Caye	8-1
Table 8.2	Marine Spills Levels	8-9
Table 8.3	Inland Spill Level	8-9
Table 8.4	Caye Caulker Emergency Services	8-14
Table 9.1	Current and Projected Population of 3 Villages Directly Impacted by the Development (CSO Census 2000)	9-2
Table 9.2	National Population by District, For Belize, 2000.	9-2
Table 9.3	Social Infrastructure/Amenities of Villages Impacted by Project.	9-8
Table 9.4	Employment Data in the Stann Creek District during 2003-2006	9-9
Table 9.5:	Comparative Tourism Industry Statistics in the Placencia Peninsula	9-11
Table 10.1:	EIA Matrix	10-1
Table 11.1:	Mitigation Responses in relation to Dredging Impacts	11-1
Table 11.2:	Summary of impacts associated with human wastes and domestic effluents	11-6

Table 11.3: Mitigation Matrix in Relation to Solid Wastes	11-9
Table 11.4: Summary Mitigation Measures in Relation to Socio-Economic Impacts	11-10
Table 11.5: Mitigation Measures in relation to Power Generation	11-12
Table 11.6: Mitigation in Relation to Potable Water Sourcing	11-14
Table 12.1: Proposed Monitoring Plan False Caye	12-2
Table 13.1: Options for Development	13-1

Glossary of Terms

Algae: one celled or many celled plants that have no root, stem, or leaf system.

Bathymetry: depth profile of the ocean bottom or seafloor.

Beach: sediment seaward of the coastline through the surf zone that is in transport along the shore and within the surf zone.

Benthic: pertaining to the ocean bottom or seafloor.

Benthos: the forms of marine life that live on the ocean bottom or seafloor.

Biogenic Sediments: sediments containing materials produced by plants or animals such as corals, shell fragments and tests housing diatoms and radiolarians.

Biomass: total weight of the organisms in a particular habitat, species, or group of species.

Biota: the total plants and animals of a given area.

Coast: a strip of land that extends inland from the coastline as far as marine influence is evidenced in the landforms.

Coastline: landward limit of the highest storm waves' effect on the shore.

Coliform: Type of bacterial found in feaces.

Construction: excavation, movement of earth, erection of forms or structures, or similar activities at a development or project site.

Disposal: the discharge, deposit, injection, dumping, spilling, leaking, or placing of any waste into or on any land, water so that it may enter the wider environment, including ground water sources.

Effluent: water discharged from a development into receiving water body or the environment otherwise.

Euryhaline: pertaining to the ability of a marine organism to tolerate a wide range of salinity.

Eutrophication: elevation of nutrient content of water through input of fertilizers, fecal materials and domestic effluents

Fauna: animals.

Fecal: of or related to feces.

Flora: plants.

Finfish: collective terms for aquatic vertebrates with scales which uses fins for propulsion.

Groundwater: water below the land surface in a zone of saturation.

Habitat: a place where a particular plant or animal lives: Generally refers to a smaller area than environment.

Intertidal Zone: lies between the high and low tide extremes and can be divided into a high tide zone which is mostly dry and covered by the highest high tide but not the lowest high tide, the middle tide zone exposed and covered equally by all high tides and exposed during all low tides, and the low tide zone which is mostly wet and covered during the highest low tides and exposed during the lowest low tides.

Lagoon: a body of water separated from the sea by a bank or coral reef: Also the region between a shore and a barrier reef or inside a ring of islands composing an atoll.

Lagoonal: Of or relating to lagoon

Littoral Zone: also known as the foreshore or intertidal zone, lies between the high and low tide extremes.

Macroalgae: algae that project more than 1 cm above the substrate, such as *Dictyota* spp., and *Halimeda* spp.

Mangal: a swamp dominated by mangroves.

Mangroves: collective term used for range of salt-tolerated inter-tidal plants found throughout the tropics and within latitude of 20° north and south of the equator.

Neap Tide: tide of minimal range occurring when the moon in quadrature, or its 1st Quarter and 3rd Quarter Phases.

Nearshore Zone: the seaward zone from the shoreline to the line of breakers.

Pelagic Environment: the open ocean environment which is divided into a neretic province with water depths 0 to 200 m and the oceanic province with depths greater than 200 m.

Pelagic Organism: free-swimming or floating biota that live exclusively in the water column, not on the sea floor or ocean bottom.

Permitting Agency: a Government Agency responsible for issuing permits to allow various aspects of a development to proceed within the context of the Laws of Belize.

Permit: authorization, license, or equivalent control document issued by an Agency of the Government of Belize to implement various aspects of a development.

Pollutant: any dredged spoil, solid waste, incinerator residue, sewage, garbage, chemical waste, heat, industrial, domestic, municipal or agriculture waste discharged into the environment.

Primary Productivity: the amount of organic matter organisms synthesize from inorganic substances within a given volume of water or habitat in a unit of time.

Project Proponent: developer proposing a particular project.

Red List: Catalogue of Threatened Species compiled by IUCN.

Salinity: a measure of the quantity of dissolved solids in ocean water: it is expressed in part per thousand by weight after all carbonates have been converted to oxide, the bromide and iodide to chloride, and all the organic matter oxidized.

Sessile: attached to the bottom or to rocks, pilings, etc. and unable to move.

Sewage: any human body waste and the waste from toilets and other receptacles intended to receive or retain body wastes that are discharged into the environment.

Sand: particle size ranging from 1/16 to 2 mm: It pertains to particles that lie between silt and granules on the Wentworth Scale of grain size.

Sanitary Landfill Site: a facility at which municipal, industrial wastes and hazardous wastes are applied onto or incorporated into the soil surface.

Shore: the section of land seaward of the coast: This extends from the highest level of wave action during storms to the low water line.

Shoreline: the line marking the intersection of the water surface with the shore: It migrates up and down as the tide rises and falls.

Silt: a particle size ranging from 1/128 to 1/16 mm: It is intermediate between sand and clay.

Spring Tide: tide of maximum range occurring every fortnight and coincides with when the moon is new and full respectively.

Sublittoral: seabed below the low tide mark.

Tide: periodic rise and fall of the ocean surface and connected bodies of water resulting from the unequal gravitational attraction of the moon and sun on different parts of the earth.

Tidal Range or Amplitude: the difference in height between consecutive high and low water: The comparison may also be a day, month or year.

Topography: the physical shape of the land surface.

Transect: a line or narrow belt used to survey the distribution of organisms or substrate across a given area.

Vertebrates: animals belonging to the Subphylum Chordata, also known as the Chordates that include those animals with a well-developed brain and a skeleton of bone or cartilage: Includes fishes, amphibians, reptiles, birds and mammals.

Wave: a disturbance that moves over or through a medium with a speed determined by the properties of the medium.

Wave Height: vertical distance between a crest and the preceding trough.

Wave Length: horizontal distance between two corresponding points on successive waves such as from crest to crest.

Glossary of Acronyms

CITES: Convention on the International Trade in Endangered Species of wild flora and fauna.

CZMAI: Coastal Zone Management Authority and Institute.

EIA: Environmental Impact Assessment.

DOE: Department of the Environment.

GOB: Government of Belize.

IUCN: International Union for the Conservation of Nature.

NGO: Non-Government Organization.

TOR: Terms of Reference.

ORIENTATION NOTES

The current EIA submission consists of two (2) major components, viz: a project brief or executive summary and an expansive narrative. The latter consists of the immediate project concerns as stipulated by the TOR for the initiative, supplemented by a number of annexes which in principle provides further details to issues covered in the main part of the narrative.

The main narrative is broken down into a number of components which are to some extent segregated into chapters. The narrative begins with the physical description of the project which is captured in Chapter 1. This includes among other issues an introductory overview of how the utilities for the project are to be addressed – these issues are further expanded and dealt with in details in Chapters 4, 5, 6 & 7 of the document.

Chapter 2 focuses on a description of the physical and biological environment. This includes a description of the flora and fauna of the area, as well as issues such as water quality, bathymetry and water quality. The geology and archaeology of the area are also dealt with in this chapter.

The orientation of the document changes in Chapter 8, which is focused on disaster management.

Chapter 9 is focused on a description of the social environment and the impact that the project would have on the communities in the area.

Arguably, the most substantive part of the document deals with the magnitude and orientation of the impacts arising as a consequence of the implementation of the project: This is captured in Chapter 10 of the document. The assessment of the impacts of the project is divided into two (2) main areas, viz: the ecological impacts and the social impacts. The mitigation measures to ameliorate, or circumvent the negative environmental impacts is dealt with in Chapter 11 of the document.

The issue of environmental monitoring is dealt with in chapter 12 of the document. Chapter 13 focuses on ‘Alternatives to Development’. This section entails some detailed analysis and response: This was both in relation to the broad concepts of the project, as well as specific components. Great care was taken to avoiding generic and simplistic responses to issues that require studied intervention(s).

The overall document was prepared not only with a view of responding to the prescriptions of the TOR, but also with the view of understanding that documents of this nature are an resource material for researchers, administrators, natural resource managers, students, faculty and the public at large. In this regard great care was taken in undertaking the necessary field based surveys and assessments, as well as in providing information with the requisite level of academic integrity.

Executive Summary

Project Location

The project is to be located on False Caye which lies 1 km east of the Placencia Peninsula, in the vicinity of Seine Bight Village.

The only access to False Caye is by boat. The caye is 13.1 km from the Placencia Municipal Pier by navigable boat route: It is 10.6 km from the Placencia Air Strip and 14.7 km from the Big Creek Port.

False Caye has been classified as a 'Moat Island' with an 'over-wash mangrove forest', which is 61 acres in size. The caye is unoccupied with no pre-existing development.

Project Profile

The proposed project is of a recreational tourism orientation, complimented by an upscale residential development. The hotel resort development entails rooming accommodations, meeting/conferencing facilities, restaurants and bars, pool facilities and a spa.

The residential component is to be in the form of villas of varying sizes, designs and costs. The marketing arrangements hinges on 'time-share' participation of the clientele.

Complimentary amenities and infrastructure include: beaches, swimming pools, biking and nature trails, lawns and hedgerows, recreational waterways and open green spaces, as well as piers and roadway.

The hotel component entails two (2) types of facilities, these include: Hotel 'A' which is to be comprised of 74 One Bedroom Typical Hotel Suites, and Hotel B which entails 32 Double Beds Lock-out Units [See Table 1.1]. The combined capacity of these hotels is to be 276 patrons [See Table 1.1].

The hotels are designed to be a series of Cluster Units with a Tropical Canopy Décor and Façade.

Apart from the main hotels, there are 14 'Over Water' Cabanas that have been integrated into the design of the project. These cabanas are to be located extra-adjacent the bay located in the mid-latitudes on the eastern side of the caye.

The residential villas are to be designed along the lines of three (3) separate models, viz: Type 'A' Villas, Type 'B' Villas and Type 'C' Villas. There are to be 19 Type 'A' Villas [See Table 1.1]. These villas are 75' x 120' and are collectively designed to accommodate 114 patrons [See Table 1.1].

There are to be 19 Type 'B' Villas [See Table 1.1]. These villas are also 75' x 120' and are collectively designed to accommodate a total of 152 patrons [See Table 1.1].

There are to be 15 Type ‘C’ Villas [See Table 1.1]. These Villas are 80’ x 150’ and are collectively designed to accommodate 120 patrons [See Table 1.1].

The overall development is designed to accommodate 874 patrons.

The facilities are to be staffed by 76 full-time persons [See Table 1.1] whom are to include: managers, administrative staff, chamber maids, bar tenders, chefs, waitresses, grounds keepers, security personnel, boat handlers and janitors.

A Utility Zone has been integrated into the design of the project. The Utility Zone is to house energy generation facilities, potable water storage and harvesting infrastructure, sewage treatment technologies and solid waste sorting, storage and disposal facilities.

The primary source of energy is to be from the BEL Grid via an underwater cable line, supplemented by diesel generators in a stand-by capacity.

The primary source of potable water is to be from groundwater sources. If this proves infeasible, water is to be sourced from the peninsula via an underwater line to the caye. The most likely option is to connect to the Zeebos Hotel Line.

Table 1.1: Development Components

Series	Description	# of Units/Lots	Unit Prototype	# of Keys	Occupancy (persons)
1	Typical Hotel Unit	74	1 Bedroom	74	148
2	Type B Hotel Unit	32	2 Bd Lock Out	64	128
3	Villa Type A	19	3 Bd Lock-Out	57	114
4	Villa Type B	19	4 Bd Lock-Out	76	152
5	Villa Type C-1	6	4 Bd Lock-Out	24	48
6	Villa Type C-2	9	4 Bd Lock-Out	36	72
7	Special Lot	6	4 Bd Lock-Out	24	48
8	Over Water Cabanas	14	2 Bedroom	14	56
9	Special Estate	1	4 Bedroom	2	8
10	Employees	1	Workers	1	76
11	Transient Visitors	1	Guests	1	100
Projected Occupancy		185		373	950

Sewage derived from human waste and domestic effluents is to be treated through the deployment of secondary treatment technology. A ‘package plant’ known by its trade name “BESST” is to be employed in the treatment of all wastewater generated by the resort facilities. This technology, which the acronym stands for Biologically Engineered Single Sludge Treatment - reduces major pollutants such as the macro-nutrients nitrates and phosphates, and ammonia, as well as Total Suspended Solids (TSS), BOD substances and microbes to levels where they do not pose a threat to the integrity of

Table 1.2: Chronological Schedule of Development

Project Concept	Project Components	Time Frame							
		Yr. 1				Yr. 2			
		Qt. 1	Qt. 2	Qt. 3	Qt. 4	Qt. 1	Qt. 2	Qt. 3	Qt. 4
Main Hotel	Hotel Type A				→	→			
	Hotel Type B					→	→		
	Villa Type A						→	→	
	Villa Type B							→	→
	Villa Type C							→	→
	Special Lots								
	Workers Quarters					→	→		
Ancillary Infrastructure	Piers & Docks		→	→	→				
	Beach				→	→			
	Swimming Pools							→	→
	Foot Paths & Roadways						→	→	→
	Utilities Infrastructure					→	→		
	Lawns and Hedge Rows							→	→
Dredging & Reclamation	Construction Retaining Wall	→	→						
	Dredging Seabed & Deposition Spoils		→	→					
	Dredging Internal Lagoons & Waterways			→	→				

the environment, or human health. The post-treated effluents from the BESST Treatment Plant, is to be chlorinated, stored and used for the flushing of toilets, as well as the irrigation of lawns and hedgerows, and fire-fighting purposes.

Solid waste management entails the separation of the garbage generated by the facilities into its organic and inorganic components. The organic or biodegradable component is to be composted on-site through the application of ‘earth tub’ technology. The waste in the

form of a semi-dry mulch is to be used as an organic fertilizer for the hedge rows and lawns. The inorganic components are to be further separated into combustible and non-combustible components: These are to be bagged in color coded impervious plastic bags and transported to the Placencia Regional Dump Site for disposal.

The construction phase is to be accomplished over a two (2) years time-frame [See Table 1.1].

State of the Environment

False Caye is located in the lower southwestern part of the 'Shelf Lagoon' where it is heavily influenced by marine processes. This is seen in both the supra-tidal or 'terrestrial' component of the property as well as the sub-tidal or below water component of the environment.

The caye-based vegetation is heavily dominated by mangroves, with a minor but noticeable littoral forest component. The most abundant and widely distributed mangrove was the Red Mangrove (*Rhizophora mangle*), followed by the Black Mangrove (*Avicennia germinans*) and subsequently the White Mangrove (*Laguncularia racemosa*).

The mangroves growing on the peripheral were relatively tall and in a good state of health. There were significant stands of Black Mangroves (*Avicennia germinans*) in the internal areas of the property, much of which were significantly damaged by storms. These mangroves were in a state of varying degrees of recovery.

The littoral forest component included typical species such as: the Button Wood (*Conocarpus erectus*), the Gumbo Limbo (*Bursera simaruba*), the Black Poisonwood (*Metopium brownei*) and the Sea Grape (*Coccoloba uvifera*).

The sub-tidal component of the surrounding seas was dominated by the Turtle Grass (*Thalassia testudinum*). A number of macro-algae were found growing in intermittent tufts with the seagrass, these included: the Clump Halimeda (*Halimeda opuntia*), the Shaving Bush Algae (*Penicillus spp.*), the Feather Algae (*Caulerpa prolifera*), and the Green Club Bubble Algae (*Valonia macrophysa*).

The most significant attached benthic faunal component was corals. These included both reef-building or 'stony' coral forms, as well as soft coral forms. The reef-building forms occurred in significant profusion as 'Patch Reef' as well as isolated coral heads. Both representations were dominated by boulder type corals such as: the Boulder Star Coral (*Montastrea annularis*), the Masive Starlet Coral (*Siderastrea siderea*) and the Knobby Brain Coral (*Diploria clivosa*). Other digitating and blade-like forms were also present such as: the Staghorn Coral (*Acropora cervicornis*), the Elkhorn Coral (*Acropora palmata*) and the Lettuce Coral (*Agaricia agaricites*).

Soft coral species included: the Bent Sea Rod (*Plexaura flexuosa*), the Corky Sea Finger (*Briareum asbestinum*), and the Common Sea Fan (*Gorgonia ventalina*).

Apart from corals, other macro-invertebrates found in the area included: the Spiny Lobster (*Panulirus argus*), the Queen Conch (*Strombus gigas*), the Long Spined Black Urchin (*Diadema antillarum*) and the Sea Star (*Oreaster reticularis*).

The most abundant vertebrate fauna in the area were the fishes and the birds. The fish species found in the area included: the Spotfin Butterflyfish (*Chaetodon capistratus*), the Bucktooth Parrotfish (*Sparisoma radians*), the Queen Triggerfish or 'Old Wife' (*Balistes vetula*), and the Barracuda (*Sphyraena baracuda*).

The bird species included typical seabirds such as: the Brown Pelican (*Pelicanus occidentalis*), the Laughing gull (*Larus atricilla*), the Neotropic Cormorant (*Phalacrocorax brasilianus*) and the Frigate Bird (*Fregata magnificens*). Littoral forest and woodland species included: the White Crowned Pigeon (*Columba leucocephala*), the Melodious Blackbird (*Quiscalus mexicanus*), the Golden Fronted Woodpecker (*Melanerpes aurifrons*) and the Flycatcher (*Empidonax sp.*).

The amphibians were not present in the forms observed on and around the caye. This is not unexpected since mangrove areas globally are known to be species poor in terms of amphibians.

The most significant reptile reported at the project site, from a conservation and management standpoint, is the American Crocodile (*Crocodylus acutus*). The species was reported to inhabit the lagoonal wetlands in the internal areas of the caye.

Although it was perhaps likely that other reptiles inhabited the caye such as lizards, snakes and the scaly iguanas (*Ctenosaura similis*) - these were not observed during the Tunich Nah Survey between February and April 2007.

The other vertebrate fauna of note occurring in the area included aquatic mammals such as the West Indian Manatee (*Trichechus manatus*) and the Bottlenose Dolphin (*Tursiops truncatus*). Although these animals were not seen in the area, they were reported to occur there by parties frequenting the area.

Environmental Impacts

The environmental impacts arising from the project were both ecological and social in orientation. The project activities that are likely to give rise to some environmental impacts of note are the dredging and reclamation operations, the generation of domestic effluents, solid wastes, and energy generation.

The primary turbidity and sedimentation impacts arising as a consequence of the dredging activities scheduled to be undertaken in conjunction with the currently proposed project are moderate in scope. The secondary impacts have been assessed as 'moderate' at their most severe: This is related to the source of the 'fill' material or dredged spoils, the nature of the 'fill' material, and the dredging methods and associated protocols to be applied. In relation to the latter, a cutter-head dredge will be applied: This is to be

accompanied by sediment curtains. Additional mitigative measures will also be applied such as dredging in calm sea-states only, and suctioning the barrow pits of mobile sediments on a daily basis to curtail re-suspension and the re-broadcasting of sediments.

The primary impacts in relation to human and domestic wastes were evaluated as major given the scope of the development. These relate to nutrient enrichment or eutrophication, increase in BOD compounds and the elevation of fecal pathogens in the water column. Much of the secondary nutrient effluent impacts were positive, given the very limited liberation of nutrients into the environment and its positive influence on primary production and fisheries productivity. The secondary impacts in regard to BOD and fecal coliform were evaluated in the 'minor deleterious' category at their most severe.

Apart from the limited dispersal of effluents into the environment, the sewage treatment methodology applied was also responsible for the minor deleterious categorization of the secondary impacts. The adoption of the BESST Sewage Treatment System in the design of the proposed project will reduce macro-nutrients, BOD substances and fecal pathogens to levels that are well within national standards. The storage and chlorination of effluents that are to be reused for flushing toilets and the watering of lawns and hedgerows should denature any pathogens that would remain after treatment by the BESST Plant.

The most severe primary impacts in regard to solid waste, has been evaluated as major. The secondary ecosystems level impacts have been evaluated as 'minor' deleterious. This is attributable to the solid waste management strategies to be applied. The composting of organic wastes, and the collection and off-site disposal of the inorganic components should greatly reduce its impacts on opportunistic and scavenging birds such as: the Great Tailed Grackle (*Quiscalus mexicanus*), the Frigate Bird (*Fregata magnificens*) and the Laughing Gull (*Larus atricilla*).

Crocodiles may also become a nuisance if the solid wastes are not appropriately managed.

The consequence of unattended or inappropriately discarded solid waste items in providing breeding grounds for nuisance insects such as mosquitoes, which may be vectors for malaria and other diseases was recognized. The risks or level of impact however was viewed as minimal given the efficacious disposal strategy to be employed, thus the 'tertiary level' or human health was assessed as 'minor deleterious' at their most severe.

Other social impacts related to exposure to fecal pathogens, threat of injury and physical trauma, and aesthetic pollution. The threat of injury and physical trauma relates to potential encounter with guests of the facilities with wildlife attracted to the area such as crocodiles, as well as collision-at-sea events associated with the dredging event and the piers and other standing infrastructure in the nearshore seas. Aesthetic pollution relates mainly to the muds, turbidity and odor associated with the dredging and land reclamation

event. These have all been described as ‘level 3’ or ‘tertiary level’ impacts. These impacts have been all assessed as ‘minor deleterious’ at their most extreme.