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# ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR SOUTHBEACH  
BELIZE

A PROPOSED  
RESIDENTIAL  
& TOURISM  
DEVELOPMENT PROJECT  
SOUTH END OF  
AMBERGRIS CAYE

SEPTEMBER 2008

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## GLOSSARY OF TERMS

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

**Avifauna:** birds

**Bathymetry:** is the study of underwater depth of the seafloor or seabed. This type of study is important in analyzing the profile of the 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 feces.

**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.

**Dredging:** is an excavation activity or operation usually carried out at least partly underwater, in shallow seas or fresh water areas with the purpose of gathering up bottom sediments and disposing of them at a different location, mostly to keep waterways navigable.

**Effluent:** water discharged from a development or a man made structure 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: this involves the description or relation to all the plant life in or around the field of study.

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.

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

Mangal: of or relating to mangroves

Mangroves: collective term used for range of salt-tolerated inter-tidal plants found throughout the tropics.

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.

Sport Fishing:, also called Recreational fishing is fishing for pleasure or competition. It can be contrasted with commercial fishing, which is fishing for profit, or subsistence fishing, which is fishing for survival

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.

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## **GLOSSARY OF ACRONYMS**

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**ACLBA:** Ambergris Caye Local Building Authority

**AST:** Above ground Storage Tank.

**BAS:** Belize Audubon Society.

**BWSL:** Belize Water Services Limited.

**BEL:** Belize Electricity Limited.

**BESST:** Biological Engineered Single Sludge Treatment.

**BHA** Belize Hotel Association

**BOD<sub>5</sub>:** 5 days Biological Oxygen Demand test.

**BSWMP:** Belize Solid Waste Management Program.

**BTB:** Belize Tourism Board

**CEQ:** Council of Environmental Quality.

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

**CSO:** Central Statistical Office, *See SIB*

**CZMAI:** Coastal Zone Management Authority and Institute.

**DoE:** Department of the Environment.

**ECP:** Environmental Compliance Plan

**EIA:** Environmental Impact Assessment

**GoB:** Government of Belize.

**GPS:** Global Positioning System.

**HCMR:** Hol Chan Marine Reserve

**IMO:** International Marine Organization.

**IUCN:** International Union for the Conservation of Nature.

**MoH:** Ministry of Health

**MPA:** Marine Protected Areas.

**MSL:** Mean Sea Level.

**NEAC:** National Environmental Appraisal Committee.

**NEMO:** National Emergency Management Organization.

**NFS:** National Fire Service

**NGO:** Non-Government Organization.

**REA:** Rapid Environmental Assessment.

**RTE:** Rare Threatened or Endangered.

**SPBA:** San Pedro Business Association

**SIB:** Statistical Institute of Belize

**SPT:** Standard Penetration Test

**SWMA:** Solid Waste Management Authority

**TBFIM:** To Be Filled In later by Management

**TNCE:** Tunich Nah Consultants and Engineering

**TOR:** Terms of Reference.

**TSS:** Total Suspended Solids.

**WTS:** Waste Transfer Site

## **PLACEMENT NOTES**

The proposed South Beach Belize project is an intended tourism/residential subdivision development aimed at attracting potential investors to the area as well as attracting a larger 'pool' of visitors to the site and the caye on a whole. This EIA submission is supported by data

collected in the field (physical, biological and social) as well as from references and citations from reliable sources.

This document is comprised of two main components which includes a detailed description of the general setting of the project which is in the form of an expansive narrative ( Sections 1,2 and 3) and its influence or outcome on the receiving environment and community at large (Sections 4,5,6 and 7).

### *Narrative*

The general setting of the project and its associated elements are identified in an expansive narrative which consists of a description of the overall project, its immediate surroundings and the supporting services required for operation. These components are also supported by a number of annexes that in principle provide further details to the narration. The main narrative is further broken down into two subcomponents as summarized in the following:

- The main narrative begins with Section 1 with the description of the overall project and Section 2 which gives a picture of the physical environment of the project. These Sections an important component in any EIA as it allows the reader to get an understanding of the overall project development along with a description of the environmental setting in which the project will be located.
- The other component or Section 3 relates to the infrastructural supporting services that will be derived from the utilities and amenities components in order to make the project viable. Such support services include the calculation of the water and energy demands as well as the estimation of the wastewater and solid waste production. In addition, other components in this narrative include the transportation mechanism that will be employed and the associated carrying capacity that is expected on the site.

### *Outcome*

The resulting outcome of the different activities and actions are identified by means of the magnitude, scope and duration of the impacts and alternatives arising from project's undertaking. These components are described in Sections 4 and 5 of the document and entail a detailed description of the development alternatives, potential impacts and the proposed mitigation measures in order to abate the negative impacts that could arise from the operation of the anticipated project.

### *Management*

The management aspect of the proposed project is summarized in Sections 6 and 7 of the EIA submission. Section 6 deals with the implementation of an environmental management system (EMS) plan to address the different environmental impacts, its mitigational measures and

proposed monitoring plans. On the other hand, Section 7 of the EIA document accounts for the response mechanisms to the natural disasters. The term ‘disaster’ is loosely used in this section and is referred to as any incident, accident, or natural occurrence that could affect the operation of the project in whatever way.

### *Conclusion*

The overall document was prepared with the fundamental view of understanding the project, its development concept and anticipated impacts on the receiving environment (water, soil, air and social components). Care was taken in obtaining the necessary information to satisfy the project’s TOR and the overall intentions of the developer which is to develop the land or project site in an environmentally sustainable manner.

## **EXECUTIVE SUMMARY**

### **Project Location**

The proposed South Beach Belize development is to be located on the southern portion of Ambergris Caye. San Pedro Town which is a popularly known tourist destination lies 3.24 miles to the north of the project. Caye Caulker, another favorite tourist destination is approximately 8.50 miles to the south. The site is also 28.77 miles southwest of Belize City. The project site is bordered to the south by Hol Chan Marine Reserve and to the west by the Laguna de Boca Ciega.

The project site currently lies on some 545.25 acres of land with the most part being inundated mangrove wetlands. The land is currently owned by Jeff Pierce, an American investor residing in San Pedro Town. The site is presently accessible by boat from mainland Belize but accessible by road from San Pedro Town. The nearest airstrip to the area is the San Pedro Airstrip, which is located approximately 2.88 miles north of the project site.

### **Historical Background**

The property to be developed has had some queries as to encroachment into the Hol Chan Marine Reserve Zone "C", which was declared in 1985. The following is a review of the transfer of said property since 1961.

In 1961, Ambergris Cay Development Company Ltd. acquired 4,800 acres of property which was sold to Caribbean Coves Ltd. in 1984 in its entirety. Caribbean Coves Ltd then sold two separate parcels of 312 acres each on June and December, 1989 respectively to Island Resorts. The parcel sold in December is the parcel that includes the section of land in question. The entire description can be gotten from Annex III, which has three Deeds, one from 1984, and two from 1989. Also included is a document of agreement for sale between Island Resorts Limited and South Beach Development Ltd, the developer of the property in question.

Therefore, by reviewing said documents, all said property has been in private hands since 1961, and any query or queries can be resolved by referring to said conveyances.

See Annex III for all legal documents mentioned in the above paragraph.

### **Project Setting**

In general most of the project site located in an inundated mangrove wetland that is isolated for the most part from the Laguna de Boca Ciega and Caribbean Sea. These wetlands are what dominate the project's landscape as one flies over the project site. The development is bordered to the northwest by a low-berm beach ridge that extends eastwards towards the central coastal portion of the project site. This highest portion of the project site is subsequently the Marco Gonzales Site which was inhabited by the Mayans some centuries ago.

It is important to note that this site will not form part of the project site and therefore will not be incorporated into the overall development plans. As mentioned previously, the site is bordered to the south by the marine reserve. The Boca Chica channel currently separates the project site from the marine reserve. This reserve is frequented mainly by tourists visiting San Pedro Town.

The geological setting of the project site is dominated by the peat and sandy soils that are located in the mangrove swampland and small beach respectively. Probing carried out on land and sea indicates that the bedrock is about 4 to 6 feet. This depth was instrumental in designing the canal network and consequently the placement of the individual lots. In regard to the water quality aspect, the parameters analyzed were within the prescribed limits with some minor elevation in the bacteriological component.

In terms of the immediate environmental influences, the project site is presently located downwind from the municipal dumpsite and from the BWSL sewer ponds. Other influences on the project include the dredging activities presently being undertaken in the Laguna de Boca Ciega and development activities being carried out on the east coast of south Ambergris Caye.

### **Project Background**

South Beach Belize is a proposed tourism based and residential subdivision development that will be carried out in several phases over a period of about 10 years or more. The subdivision lots will vary in size and cost and will include the following:

<b>TYPE OF LOTS</b>	<b>NUMBER OF LOTS</b>
<b>L</b>	206
<b>P</b>	121
<b>MULTI-FAMILY</b>	51
<b>VILLAS</b>	90
<b>HOTEL</b>	30
<b>E</b>	24
<b>MANSION</b>	39
<b>GRAND VILLAS</b>	39
<b>T</b>	39
<b>SINGLE FAMILY</b>	16
<b>BUNGALOWS</b>	57
<b>OVERWATER CABAÑAS</b>	38
<b>TOTAL</b>	<b>750</b>

Most of these types of lots will be circumvented by the Grand Canal network which is a canal network that will be dug to traverse the project site. This canal network will also function as a transportation mechanism to allow the residents to access their particular lot.

In order to better appreciate the development concept and to facilitate the engineering calculations, the proposed project was divided into several development zones as oppose to construction phases. With this in mind, the proposed development was divided into nine (9)

zones each characterized by a distinct set of structures/amenities. These zones are briefly described as these are further elaborated in Section 1 and Figures 1.3, 1.4 and 1.5 of this document.

- **Zone 1** - This zone will act as the primary entrance gateway to the project site and focal access point for the project activities. About 154 residential lots will be constructed in this zone and will include Multi Family, Mansions, Single Family, Villa, Bungalows and E lots.
- **Zone 2** – This zone is located on the northern portion of the project site and is separated from the development by the canal network and Laguna de Boca Ciega. In this area, the developer proposes to make 104 lots available for development which includes hotels, Multi Family, Gran Villas and Villa Lots. This zone will also house the much anticipated hotel and casino which is expected to be one of the project’s focal point.
- **Zone 3** - This zone lies immediately south of Zone 1 and has been slated to make 235 lots available which will consist of Multi Family, P, T, Mansion and Villa lots. Other lots included in this zone will be the commercial lots and anticipated Lincoln Mall, which is another of the project’s focal interests.
- **Zone 4** - This zone is located in the mid latitudes of the project site and will be highlighted by the development of the 206 L lots along with the Utility Zone and fuel services. This zone will also entail the Marco Gonzales Site, which is an archaeological mound that is surrounded by the project site.
- **Zone 5** - This zone is situated on the southwestern portion of the project site and is the only residential subdivision closest to the marine reserve. This zone is also adjacent to Zone 6 and will be designed to support about 15 super luxury grand villa lots. This zone is expected to be a high end low density subdivision.
- **Zone 6** - This zone has been classified as the public recreational zone that will be divided into two component with the first being a multipurpose sporting complex and the second a small to medium based water theme park.
- **Zone 7** – This zone is considered to be an extension of the previous zone and will entail the construction of a natural history museum that will open up into an elevated boardwalk that will circumvent the zone. Several observation decks will be constructed to view either the project site or surrounding areas.
- **Zone 8** –This particular zone is to be located on the islet or ‘island’ that is on the northern portion of the project site. This zone is slated to be a high end low density development that will be linked to the project site by a causeway to that is to be constructed from Zone 2. This zone is considered to be a future development project aimed at complementing the overall design.

- **Zone 9** - This zone has been designated as a reserve or ‘green area’ where no development is to take place. These areas will be left intact its natural state to enhance and promote the natural existing environment of the project. This zone is divided into two sections and is located adjacent to Zone 5 and 8 respectively. The most important ‘green area’ is to one adjacent to Zone 5 which buffers the project site from the Boca Chica channel which is adjacent to the marine reserve.

Of these nine (9) zones, it is anticipated Zone 1 will be the first to be developed as part of the South Beach Belize project. In addition to these zones being developed and conserved, the anticipated project will also include several amenities and infrastructural works that will be added as part of the developmental process. These include a:

- *Shopping Mall/Plaza* - This will be constructed to complement the overall project and to offer services in the form of convenience stores, mini marts, restaurants, bars, boutiques, pharmacy, medical etc.
- *Parks and Playgrounds* - This will be incorporated and woven into each zone that is to be developed. These are considered as part of the overall recreational aspect of the South Beach Belize development.
- *Water Theme Park* - This water park will be modeled to include water slides, water-rivers, water scapes and water waves along with the required amenity services that accompany these types of parks such as restaurants, galleries, lockers, bathrooms, outdoor showers, beverage consoles, life guards, security etc.
- *Museum and Ecological Center* – This is to be utilized to complement the Marco Gonzales Site and to offer further information of the history and development of San Pedro Town and greater Ambergris Caye. Furthermore the ecological center is to highlight the conservation component of the development and offer visitors and guests an overview of the overall project.
- *Parking Lots* – These will be situated at every commercial oriented establishment in particular the casino, theme park, shopping plaza and beach areas. The dimensions of the lots will vary but will service golf carts and small vehicles when completed.
- *Grand Canal* – This canal system will be a network of interwoven canals that will circumvent the different development zones and in particular Zones 1, 2, 3, 4,6 and 7. This canal network will also facilitate the transportation vessels along the canal in order for the residents to access their lots. Navigation through this network will be limited to small vessels as it is expected that the overall depth of the canal will be about 6 to 8 feet.
- *Piers and Associated Infrastructure* – It is anticipated that several small piers will be accommodated along the project’s waterways. These piers will not facilitate any services and will only be used for the temporary docking of boats and vessels. These piers are trivial to the development as it intends to cater primarily to land based tourism arrivals.

- *Roadways and Associated Infrastructure* –the construction of the roads are an integral and focal point of any residential development. For this reason, there will be two entrances for proposed project. At the development, access to the different zones and residential lots will be by means of well constructed sandy/clay roads that will eventually merge into the Palm Avenue, a boulevard type road.
- *Beaches* - Two (2) beach areas are to be developed on the leeward side of the project site. These two beaches will be situated on the lagoonal side of the project area and will allow for the present beach to be re-nourished while still maintaining the existing ecosystem of the near vicinity.
- *Utility Zone (Water, Wastewater, Solid Waste and Energy)* – This is the most important zone in terms of project maintenance and operation. All of the utilities will to be located in a centralized area. This is to make for the efficient use of space. It also cuts down on visual or aesthetic pollution. The utilities to be located in the Utility Zone includes: electrical distribution and generation facilities, waste water treatment installation, potable water distribution and sourcing equipment, fuel storage, and solid waste sorting and storage facilities, international waste incineration (if serviced is provided).

Collectively, it is anticipated that when completed and operational, the residential subdivision would be able to accommodate about 4,498 patrons at maximum capacity. This occupancy translates to 3,598 persons being residents, 400 persons as commercial workers along with 50 permanent workers and 450 transient visitors that would visit the development and utilize the various amenities and marina services (See Tables 1.3 and 3.1). It is anticipated that the majority of the transient visitors will be in the casino, followed by the shopping mall and water theme park.

### **Project Justification**

The proposed South Beach Belize development will be a modern suburban residential development that is intended to attract potential home owners, investors and visitors to the project. It is also anticipated that the added amenities to the residential subdivision will attract visiting tourists to the site and to San Pedro Town on a whole. This economic inputs into the area will benefit the developer and all the San Pedranos on the longer run as it is anticipated that the returns, spin offs and employment will help to the community to prosper and grow.

### **Potential Environmental Impacts**

The environmental impacts arising from the proposed project are ecological and social in nature as well as beneficial and negative in orientation. The aim of the project developer is to develop South Beach Belize into an environmentally friendly residential development by planning around and utilizing the existing resources. The impacts associated with the intended development are related to both the construction and operational phase of the project. The negative impacts of the project are for the most part minor, although some have been categorized as moderate.

The primary developmental activities that are likely to give rise to environmental impacts of note are the dredging/excavation and land reclamation operations, the generation of domestic effluents and wastes as well as the general operations of the project when it has been fully commissioned. In the case of the domestic effluent and wastes, 'nutrient enrichment' or eutrophic impacts, as well as BOD and human health impacts are relevant.

#### *Dredging and Land Reclamation Impacts and Mitigation*

The pertinent ecological impacts related to the dredging activities are the water quality impacts. The primary or causative parameters of note are 'suspended solids' and 'turbidity' impacts. The geographic areas most significantly impacted by this activity are the burrow pit and access channel. However, the impact has been categorized as 'minor adverse' only given the sparsity of biota on the seabed and consequently its low productivity and conservation value. This also holds true for the excavation of the Grand Canal network that will facilitate the movement of small vessels as well as to reduce the spoils being generated.

The Belize Barrier Reef (Mesoamerican Barrier Reef System) is a couple of miles away from the development site and should not be affected by the proposed dredging activities and more so, is the Hol Chan Marine Reserve which borders the development to the southwest. Although the reef and the marine reserve are some distance from the burrow pit and access channel, every precaution will be taken to ameliorate the impacts through the use of double 'silt curtains' and the confinement of dredging operations to calmer sea state conditions.

The total volumes of materials to be dredged from the seafloor is roughly about 1,482,749 yd<sup>3</sup> of spoils which will mostly consist of coralgall sand mixed with smaller fractions of clay and carbonaceous debris. This volume is larger compared to the estimated volume of spoils that would be generated from the canal network. Overall, the proposed dredging and excavation process will yield a total of 2,027,747 yd<sup>3</sup> of materials of which 544,998 yd<sup>3</sup> are peat and silt obtained from the canal excavation.

The other issue related to the dredging operation is navigational safety. The area is fairly busy in relation to boat traffic. Thus, the threat of physical harm and injury from a dredge berthed and operating in the area is highly relevant. The mitigating responses to be implemented are the deployment of navigational aids such as buoys and lights to alert and ward off mariners. This will be pertinent to both the dredge itself and the 'spoil discharge' pipes running ashore.

Once available, the anticipated dredged and excavated volume of material will be used for land reclamation purposes. It is anticipated that about 2,021,820 yd<sup>3</sup> of material will be required for this purpose. The remaining volume will be used for beach nourishment, roads, parks and playground construction and to compensate for the compaction of the material. The mitigating response to this impact will be to conserve certain areas of the development such as Zone 9 as well as to promote areas of regeneration such as those found in Zone 7.

### *Water Resources and Wastewater Treatment*

It is anticipated that 296,850 gallons of water will be required daily at full operation and occupancy of the project. It is also anticipated that 70 % of the demand will be converted to wastewater or 207,795 gallons a day. It is anticipated that potable water for the development will be gotten from the commissioning of two water desalinization plants to suffice the project needs. Part of the demand will also be met by BWSL, especially for the first phase of construction. It is envisioned that the national provider will account for a larger percentage of the water demand sometime in the future as the southern portion of the caye develops.

Development alternatives were also analyzed as part of the environmental process and several potential sources were investigated including the BWSL issue. Other sources analyzed were the use of rainwater harvesting and the recycling of the wastewater for bathroom/restroom flushing, irrigation and non potable uses. These alternatives can also be envisioned as potential supplementary sources to the chosen option.

Wastewater and sewage derived from human activities are to be treated through the use of a tertiary treatment technology in the form of a 'BESST' Treatment Plant. The technology implemented will reduce the major pollutants such as the macro-nutrients (nitrates and phosphates), ammonia, as well as Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD) to levels where they do not pose a threat to the integrity of the environment.

The collection and treatment system will be divided into smaller zones with various pumping stations. This will be able to facilitate growth without having to purchase a big treatment plant from the beginning. The post-treated effluent from the BESST Treatment Plan is to be stored and used for irrigation, fire-fighting processes and other non-potable uses as mentioned previously.

### *Solid Waste Management*

The issue of solid waste is important, especially considering the magnitude of the development and the present mismanagement of the San Pedro dump site. With this in mind, one of the potential impacts of solid waste will be the introduction of pathogenic diseases and ground contamination as a result of the inadequacy of the dump site. The attraction of feral animals such as rats, crocodiles and birds to the area to scavenge is also seen as a potential impact to the site and surrounding areas.

The mitigating response to be implemented by the proposed project is the judicious collection and segregation of the wastes into organic and inorganic components. Therefore, the intended development plans to compost the organic waste for landscape enrichment. The inorganic wastes will be compacted by a trash compacter and carted away to the mile 3 dump site in Belize City in lieu to the Mile 24 sanitary landfill. The compacted wastes will be removed from the site on a regular and recurrent basis.

It is estimated that about 19,250.8 lbs of solid waste will be generated by the proposed development. In considering the final volume after management, it can be deducted that the waste minimization strategy can reduce the waste volume considerably after composting from

19,250.8 lbs to 7,700.32 lbs a day. This volume can further be reduced drastically if paper products were composted or recycled.

### *Energy*

The energy requirement for the proposed project are expected to be mainly for residential (domestic) and commercial purposes. Energy for the different development zones will be created by connecting to the national grid provider. It is estimated that the development will require about 3,497,500 kWh per annum or roughly 9,582.19 kWh per day at full capacity (100% occupancy).

In considering this option, the anticipated development intends to buy the energy in bulk and then redistribute it to the different consumers within the project site. This is a novel concept aimed at maximizing the energy from its source and taking advantage of the fact that the energy grid is readily available.

Several other potential sources were examined as part of the environmental process. These potential sources were identified as being alternative energy sources and diesel or natural gas generators. With this in mind, the proposed development has opted in using diesel generators to complement the proposed source. It is important to note that these sources will be further investigated by the individual residents to power their homes.

It is anticipated that the energy will be required to power domestic appliances, project infrastructure as well as the recreational components of the development. The environmental impacts related to the energy generation will be minimal as the development aims at tapping into the national grid provider.

### *Transportation Activities*

The anticipated transportation activities include the design of the canal network along with the construction of the roads and elevated walkway. These important infrastructures will be carried out accordingly by the project developer in view of addressing all the pertinent impacts. In terms of the proposed canal network, the edges or banks will be protected from erosion by the placement of a concrete bulkhead. Other mitigating measures include the creating of a gradient on the sides for the flushing of the overall network. In regards to the construction of the roads, these will be built according to specifications and standards in order to allow the safe transiting of vehicles. It is anticipated that the proposed canal network will be protected from erosion by the erection of a retaining wall or bulkhead. The intended canal will facilitate the transiting of boats up to the required draft. Dockside berthing will only be facilitated for residents living at the subdivision.

Other transportation activities of note include the servicing of boats and vessels at the designated fuel service station that will be constructed as part of the overall development. This service station will be located in Zone 4 and will consist of both diesel and gasoline fuel. Potential impacts associated with this activity include hydrocarbon spills and leaks that can arise during

marine vessel servicing. Mitigation measures include the use of a certified attendant trained in these sorts of activities and the use of spill control kits at key areas.

### *Social Impact and Mitigations*

The fisher folk of the area are limited to fly or sport fishing. This practice is primarily utilized for tourism purposes and the livelihood and vocation of these folks would be interrupted or impaired to some extent. Every consideration has been taken on board in regards to the dredging operation to ensure that access to the area, or the loss, or destruction of fishing gear and grounds will not be a problem. Related ecological impacts are only limited to the near shore ecosystem where the dredging will occur. Mitigation measures include the conservation of much of the coastal ecosystem for recreational use.

### **Environmental Management System**

The proposed expansion project plans to implement an Environmental Management System to reduce its environmental impact and increase its operational efficiency and investment returns by developing sound environmental practices towards its tourism and residential related components. In addition, the project will carry out its monitoring plan which will focus on water quality parameters, biodiversity issues, engineering considerations and socio-economic concerns. The proposed monitoring program has been developed not only in relation to satisfying the statutory requirements of the EIA process, but also as a consequence of the proper implementation of the proposed development and its relationship to the integrity of the environment and indeed the stakeholders in the area.

### **Conclusion**

The proposed South Beach Belize project intends to attract potential home owners and investors to the area and to the greater Ambergris Caye on a whole. This is especially important to the tourism sector as there has been a steady decline in visitation to the country on a whole. The developer hopes that this new venture will help the San Pedro community by offering several distinct amenities and services once thought impossible for the area. The service in particular involves the anticipated hotel and casino that is planned to be constructed at the project site. Like the Princesses in Corozal, the Dune's Casino will have a positive impact to the community, especially in the transportation and logging spin offs. Other services include the water theme park, sport complex and the ecological reserves. All these services and amenities can be viewed as a possible mitigating measure against the increasing visitation pressure of the marine reserve.