ALTERNATIVE ANALYSIS

2 ALTERNATIVE ANALYSIS

In considering the development options, three alternatives can be exercised. These are:

1. The No Action Alternative
2. The Proposed Development
3. The Proposed Development with modifications
4. Proposed Development in another location

2.1 THE NO ACTION ALTERNATIVE

The selection of the "No Action" alternative would mean the discontinuation of project designs and result in the site being retained in its existing form. There are physical, biological and socio-economic implications of this alternative.

Physically, the site is unlikely to undergo any major changes from its present condition. Biologically, the vegetation present on the site is unlikely to be severely affected, other than the potential for uncontrolled growth of weeds, bushes and trees introduced by avifauna, wind or other means. Unless the vacant lot is maintained, this could result in an eyesore and a possible venue for illicit and otherwise objectionable activities.

The "No Action" Alternative is likely to have the greatest implications on the socio-economic environment of the area and surrounding communities. Due to the proposed quality of the development it is anticipated that it would provide a major opportunity for employment, foreign exchange revenue, benefits associated with the construction industry and potentially significant business opportunities for existing and new tourism support businesses. In addition, a development of this calibre will add to the islands' ability to market itself to visitors from markets previously under represented through previous marketing activities. It will also fuel the growth and development of the Lucea area, thereby, alleviating sprawl and continued migration of people to the burdening tourism centres of Montego Bay and Negril. If this alternative were adopted, the developers would need to find an alternative site for the development or decide to develop the product outside of Jamaica.

2.2 THE PROPOSED DEVELOPMENT

This alternative would see the construction of the development as proposed by the developers, and as outlined in this EIA document. This option has good support (based on results of socio-economic survey) by the persons who would be most affected by its implementation, i.e., residents within Point Estate, Elgin and Johnson Towns and the greater Lucea area. Therefore, community support is anticipated for the development.

This alternative will provide positive benefits to the communities and Jamaica's tourism product. This includes benefits such as employment opportunities, foreign exchange earnings, increased property values and benefits to ancillary supporters/dependents of the tourism industry. In fact, the total investment is estimated at upwards of US$60,000,000. If approved, construction at the facility is scheduled to last approximately 18 months, and will provide employment for an average of forty (40) individuals during pre-construction, eight hundred (800) tradesmen and labourers during construction, which at its peak will increase to approximately twelve hundred (1200) workers and approximately eight hundred (800) employees during the operational phase. Additionally, the multiplier effects to the construction and support industries during this period are likely to affect a much larger number of persons.

The proposed project will also make a positive contribution to social infrastructure, overall residential development, upkeep and renewal of the residential community. The proposed development is being designed and built to meet or exceed local and international standards and regulations. A key benefit also is the installation of a tertiary level sewage treatment facility that will produce an effluent suitable for use as irrigation water on the facility while meeting, and in some instances exceeding, standards for coastal water quality.

2.3 THE PROPOSED DEVELOPMENT WITH MODIFICATIONS

If there are issues concerning the project that may be enhanced, changed or modified to increase the acceptability of the project, then these issues should be considered. At this time based on communication with residents of surrounding communities, it appears that there are several issues that once resolve satisfactorily whether through modification or compromise would further increase support for the development. These include but are not limited to:

- Guarantees that the sewage treatment system will treat wastewater to be used for irrigation to the tertiary level (the system has been designed to achieve irrigation standards which are more stringent than discharge standards)
- Utilization of different sewage treatment options (due to the availability of space at the proposed site, very few sewage treatment technologies could be implemented that would treat to the same level, with the low operational and maintenance costs and reliability anticipated for this system)
- impact on the existing water supplies in the area
- Established lines of communication with the possibility of a liaison officer between the developers and the community
- Aesthetics, particularly the timely removal of zinc fencing surrounding the site and construction of an aesthetically pleasing fence.

Some of these concerns will not exist on project completion e.g. water supply. All other issues are easily resolvable through either modification or compromise and we do not foresee these issues resulting in disapproval of the development by interested community and regulatory agencies. The developers will work with the communities and residents to design, construct and operate a quality facility that will be the pride of all involved or partake in its operation.

This alternative retains the same positive benefits as with maintaining the proposed development option.

2.4 THE PROPOSED DEVELOPMENT IN ANOTHER LOCATION

Other locations were considered in conjunction with the proposed Point, Hanover location for implementation of this project. However, the Point property offered the following advantages over other locations considered:

- Size of available land was desirable
- Beach and waterfront location was ideal with beautiful white sand beach and high quality marine environment
- Size of property allowed for inclusion of a tertiary level sewage treatment system with capability to treat to a level satisfactory for use as irrigation water

No other location was able to offer the comprehensive package of available land, size, natural resources and access. As a result, no location that was more suitable or amenable than the Point site was identified in the Lucea area.

The recommended alternative is the “Proposed Alternative” because it recognizes the viability and need for the proposed development, is designed to address environmental issues and concerns, meets or exceeds all local regulatory requirements and supports communication and close relations during all stages of the development between the developers and the surrounding communities.

EXISTING ENVIRONMENT

3 EXISTING ENVIRONMENT

The project site is a located in a coastal area at Point Estate, Hanover in close proximity to residential communities of Elgin Town and Johnson Town. The site comprises 80.94 hectares (200 acres) and is mostly undeveloped real estate. The old north coast highway originally ran along the coastline through this property but has been moved further inland in the realignment process of the North Coast Highway Project. As a result, it has been allowed to re-vegetate along the coast under natural conditions. The vegetation communities observed, are a remnant of the original vegetation, and only contain a portion of the species usually found in a typical coastal community. This area is typical of the Dry Limestone Forests of the North Coast of Jamaica. This area provides habitats that encourage diversity among species promoting Jamaica's floral and faunal endemism.

3.1 PHYSICAL ENVIRONMENT

3.1.1 CLIMATE

The parish of Hanover receives an average of 127-178cm of rainfall per year mainly during the rainy period, between the months of May and November. The driest period occurs from January through March, with less than 127 mm (5") per month.

Temperatures are relatively constant throughout the year, but range from 21 ^{0}C to 32 ^{0}C during the hottest months and 18 °C to 28 °C during the cooler months.

Relative humidity in this area averages approximately 73% throughout most of the year but trends upward during the warmer summer months typically not exceeding 90% for extended periods.

Specific wind data was not available for the project area. The closest available data that could be considered reliable was from the Sangster International Airport in Montego Bay which is approximately 45km (28 miles) to the east of the project area. It is assumed that wind patterns and influences at the project site are similar to those in Montego Bay. This means that northeast trade winds occur year round with north-easterly winds predominant

during the daytime ranging from calm up to speeds in excess of 40 km/hour, average speed is estimated to be 25 km/hour. At night, the wind is primarily southerly moving across the land and out towards the sea. Wind speed during the night ranges from calm to over 20 km/hour, with the average estimated to be 15 km/hour.

TABLE 3-1: PREVAILING WIND DIRECTIONS ANNUALLY FOR POINT ESTATE, HANOVER[3]

MONTHLY PERIODS			
December – February	**March – May**	**June – August**	**September - November**
NE – ENE	E	E-ESE	E - SE

Hurricanes are a serious seasonal threat from June to November; since 1886, 21 hurricanes have made landfall in Jamaica, while over 100 have passed within 240 km (150 miles) of the island. Tsunamis are also a major risk.

Considerations have been given to issues related to storm water and potential for erosion during the construction and operational phases of the development. As such, a storm water management system, involving the use of drains and absorption pits (French drains) has been recommended.

3.1.2 TOPOGRAPHY

3.1.2.1 GENERAL AND BEACH TOPOGRAPHY

Elevations at the site increase gently from sea level along the shoreline to a maximum of 22.1 metres above sea level along the boundary with the North Coast Highway. The soil at the shoreline is a part of the Hanover Shale Formation, and consists of sandstone, shale with clay deposits. This soil type tends to be soft and rubbly at depth, so care will be taken in the designs to guarantee structural stability particularly on the slopes. There is a potential for erosion of soil materials during periods of moderate to heavy rainfall when vegetation is removed during construction. This potential is acknowledged and will be mitigated during such events.

Along the beach, the substrate depth ranged from 0 cm to 10 cm, and consists of fine - medium carbonate sand grains. This suggests storm surge activity (less than 50 years) at the site has been minimal since there wasn't much coarse grain material such as angular

[3] Lucea Foreshore Road EIA, ESL, 1997

pieces of coral at the site. The site is not in a major earthquake zone. Only three earthquakes events of intensity greater than six (VI; Modified Mercalli Scale) have been reported in the area between 1897 and 1978.

It is not perceived that the present topography and geology of the coastal lowland requires any special considerations prior to a development such as the one proposed being implemented. The elevated property however, may require soil stability test to be done as it sits on the Hanover Shale Formation. This has been recommended to the developers and will be added as an addendum to this report. As mentioned, the developers will incorporate erosion controls during the construction and operational phases.

3.1.2.2 BASIN BATHYMETRY

The sea basin in the vicinity of point extends to a depth of 24m on a gently sloping contour.

Preliminary studies on wave propagation in the Lucea Harbour, using modelling software, have shown that though potential for impact is low; there still exists storm surge potential along the eastern side of the Harbour from Northers (McDonald, 2002).. This is due in large part to the less developed reef system at Point. The eastern side of the Lucea Harbour is not as protected as the western side from inputs of wave height of 2.5m for a period of 10s. Wave heights of 1.4m to 1.6m are possible from refraction around Lucea Point.

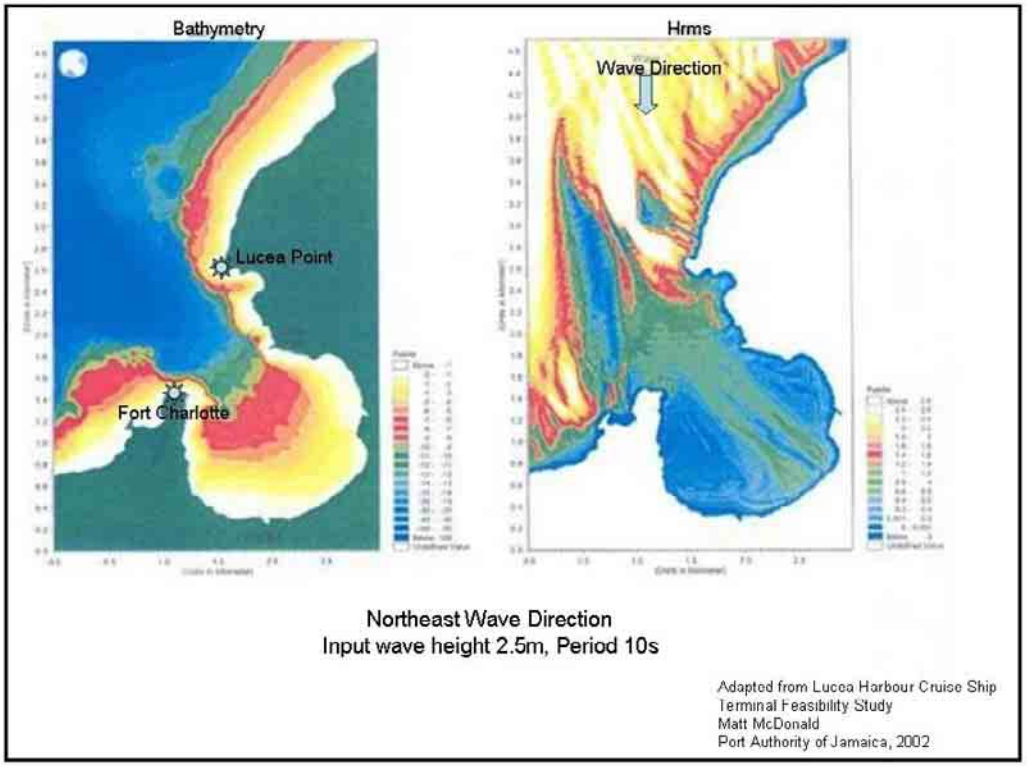


FIGURE 3-1: NORTH EAST WAVE DIRECTION AT POINT, HANOVER

3.1.3 GEOLOGY

The island of Jamaica is subdivided into structural blocks based on fault induced escarpments. There are three (3) blocks with the Hanover Block being the largest. Within the Hanover Block there are three (3) sub-blocks. They are:

1. Dolphin Head-Burnt Savanna sub-block
2. Cave Valley-Moreland Hill sub-block; and
3. The Central sub-block.

Western Jamaica, and in particular Hanover, is comprised of a sequence of Cretaceous sandstones, shales and conglomerates overlain unconformably by Tertiary-Pleistocene shelf edge to deep water limestones which are in turn overstepped by Pleistocene-Recent elevated reefs. The Cretaceous rocks outcrop in inliers the largest of which is the Hanover Inlier and they are encircled sometimes only partially by the younger limestones.

Structurally the Cretaceous sequence exhibits a dominantly northwestern dip averaging less than 35 degrees. The Cretaceous rocks represent the northern limits of a faulted anticline with the fold axis passing through Cash Hill south of Lucea. The hotel site lies on the edge of the northern limb of the anticline (Plates 1 and 2 below).

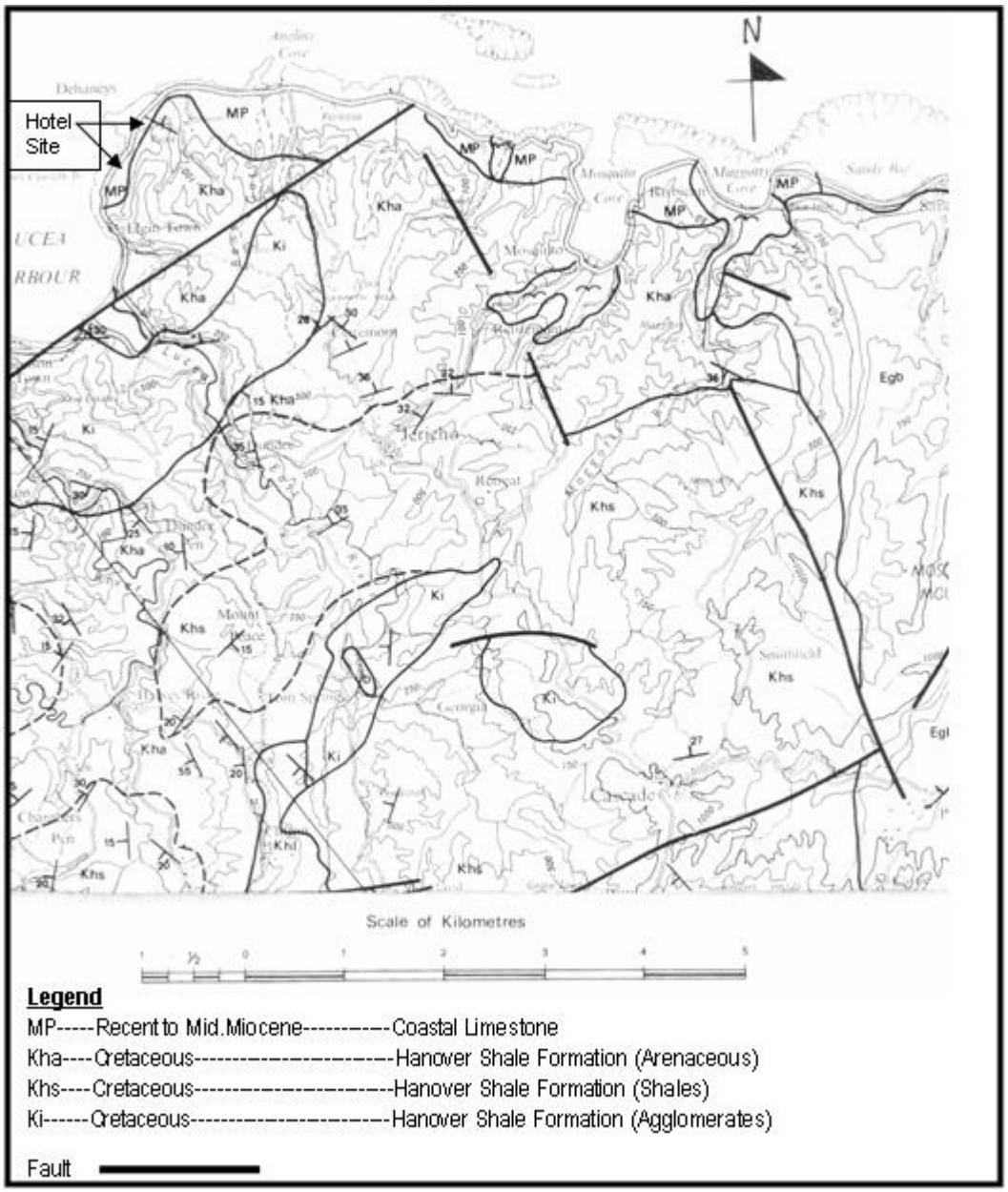


FIGURE 3-2: GEOLOGY MAP OF HANOVER ILLUSTRATING LUCEA AND AREA OF DEVELOPMENT[4]

[4] Information courtesy of the Water Resources Authority (WRA) of Jamaica

The proposed hotel site, located on the eastern side of the Lucea Harbour and along the harbour coastline, is underlain by a lithologically contrasting unit of arenaceous material (Kha) with sandstones, conglomerates and interbedded shales. This formation is a part of the Cretaceous age Hanover Shale Formation. The Hanover Shale Formation is an extensive outcrop of interbedded shales and sandstones stretching from Mosquito Cove in the east to Haughton Court just west of Lucea. The road cut along the Elgin Town-Lucea main road to the east of the site shows the rock types with differential weathering as the softer shales weather out leaving the more resistant sandstones (see Plate 3-1 and Plate 3-2).

PLATE 3-1: GEOLOGICAL FORMATIONS ALONG HIGHWAY

PLATE 3-2: GEOLOGICAL FORMATIONS NEAR BEACH

To the west of the Cretaceous Hanover Shales is an outcrop of the younger Coastal Limestone (MP), which is a raised reef. This reef fringes the eastern coastline of the harbour and extends eastwards around the “Point” (Dehaneys Point) to Paradise. The raised reef is a part of the Recent to Middle Miocene age Coastal Limestone Group.

To the south and southeast of the site are the agglomeratic rocks (Ki) also of Cretaceous age and apart of the Hanover Shale Formation. The exposures in the agglomerates show them to be composed of a matrix of andesitic composition in which are embedded angular fragments and volcanic ejectamenta

To the south of the site and passing through Dry Hill, Johnson Town and Elgin Town is a southwest-northeast trending fault with the north side of the fault (on which the site lies) being the downthrown side. No seismic activity is known to be associated with this fault.

The Hanover Shale Formation weathers to give an alluvium consisting of unconsolidated clayey sand and clay that covers the “Point” area and the hotel site.

3.1.4 HYDROLOGY

Lucea and environs are located within the Great River Hydrologic Basin. The Great River Hydrologic Basin occupies an area of 798 km^2. The basin is subdivided into five (5) sub-basins viz. Lucea River, Flint River, Great River, Montego River and Ironshore. There are six (6) hydrostratigraphic units within the basin including alluvium aquiclude, coastal aquiclude, basal aquiclude, coastal aquifer, limestone aquiclude and limestone aquifer. Only the basal and coastal aquicludes of the 6 hydrostratigraphic units outcrop within the Lucea area and at the proposed site.

A hydrostratigraphic unit is a geologic formation (or series of formations), which demonstrates a distinct hydrologic character. Rock formations are characterized as either aquifers or aquicludes. Those formations with sufficient permeability to support perennial well and/or spring production were classified as aquifers. Surface water is the main potential of aquicludes because of their low permeability.

The proposed hotel site is located within the Lucea River hydrologic sub-basin. The site is underlain by Cretaceous age rocks of the Hanover Shale Formation and the raised reef of the younger Recent to Mid. Miocene Coastal Limestone Group. The hydrostratigraphic units determine the hydrology of the site and surrounding area. Within the Lucea River sub-basin aquicludes outcrop over 88% of the area and the primary water resources potential would be surface water. The hydrostratigraphic map below shows that the area east of Lucea consists primarily of basal aquiclude.

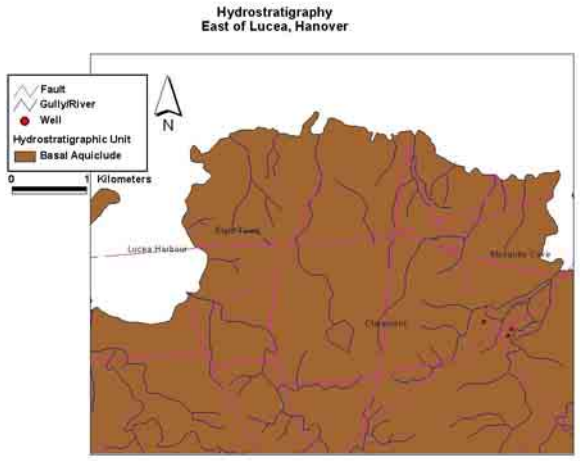


FIGURE 3-3: HYDROSTRATIGRAPHY MAP OF EAST OF LUCEA, HANOVER[5]

[5] Information courtesy of the Water Resources Authority (WRA) of Jamaica

The basal aquiclude is made up of the volcanic and volcani-clastic rocks of Cretaceous age such as the Hanover Shales. The Coastal Limestone is also classified as an aquiclude.

While the water resources potential is surface water there are no perennial surface water sources within the site or any area close to the site. A number of seasonal gullies, which carry water only in the rainy season, run south to north to the east of the site. The closest perennial surface water sources are the Lucea East River (Kew) and the Lucea West River (Riley) and these have a low reliable yield with no potential for development as water supply sources.

The potential for groundwater is non-existent as the aquicludes are of low permeability and do not support perennial well or spring yields. No successful wells have been drilled into the basal aquiclude.

The lack of surface and ground water potential in the Lucea River sub-basin has meant that water supply for the Lucea area has to be brought from the Great River to the east and from the Orange River Bluehole at Logwood to the west of Lucea. Water supply for the proposed hotel would have to come from the NWC's Great River-Lucea pipeline recently commissioned (November 2004) and transmitting water sourced from the Great River.

The lack of any water resources potential under or near to the site means that the pollution of water resources is not a consideration. However runoff from the site and possible wastewater discharges into the coastal zone will be a significant consideration.

3.1.5 WATER QUALITY ANALYSIS

The property has one seasonal pond in the lowland coastal zone and one cattle watering hole in the elevated coastal zone. No rivers or streams pass through the property. Several drainage features were found in the lowland coastal zone, however, they were all associated with the old coastal highway, such as box culverts. In the elevated coastal zone, the steeper terrain rendered few natural drainage features that were vegetated.

Water samples were collected from the pond as well as from the coastal waters near the beaches, to give an indication of the quality of the water for bathing. The water samples

were collected in sampling containers provided by the Scientific Research Council's Analytical Services Department. Visually, the water was clear up to a depth of 20m with no obvious abnormalities seen. The samples were collected and the containers placed in an insulated cooler filled with ice for transport to the laboratory.

No polluted water streams were found that entered the coastal waters from the site or adjacent to the site.

3.1.5.1 Analytical Results

Table 3-2: Results Of Water Quality Analysis Conducted On Samples Collected From The Coastal Waters At Point Estate, Hanover

PARAMETER	ANALYTICAL METHOD	RESULTS	NEPA STANDARD
pH	SMEW Method 9221	7.5 - 7.9	6.5 – 8.5
TDS (mg/L)	SMEW Method 2540C	<37,700	
DO (mg/L)	SMEW Method 2540E	<8.3	
Nitrate (mg/L)	HACH 8039 & 8171	<10.56	10
Total Phosphate (mg/L)	HACH 8048	<0.07	5.0
Faecal Coliform (MPN/100ml)	SMEW Method 9221	<3	< 100
Total Coliform (MPN/100ml)	SMEW Method 9221	<3	<500
Turbidity (FTU)	HACH 8237	4	

The results of the water quality analysis indicate that water quality in the area at the time of the sampling event was in excellent condition. No parameters were observed above the NEPA standards. It is understood that water quality in the marine environment is highly variable, but this analysis provides an understanding of the general water quality in the area, which is very good. The results from our marine assessment corroborate that the marine environment in the area is in a very healthy state, which can only benefit from good water quality.

The proposed development is not designed to have any negative impacts on the marine environment. No treated sewage will be discharged into the sea; the contingency for emergency removal of sewage is to utilize licensed septic service contractors.

3.1.6 NOISE ASSESSMENT

A noise level assessment was conducted at the site to determine background noise levels along the boundaries of the property. Noise levels were measured using a calibrated Quest Technologies Model 2800 Impulse Integrating sound level meter. The meter is capable of accurately measuring decibel levels from as low as 20 dB to as high as 140 dB at varying rates of response. Results of a noise level assessment undertaken at the site to establish background noise levels indicated the following:

- Background noise levels along the property boundary with Molasses Factory ranged between 40db to 68db
- Noise levels measured along the property boundary with the North Coast Highway ranged between 36db to 63db
- Noise levels measured along the southern property boundary away from the North Coast Highway road ranged from 45db to 84db

The NEPA standard for acceptable noise levels in residential communities is 70 dB, while the results of the noise assessment indicated levels within the range 36db to 84 db. This indicates that, at present, the noise level in the community (for the most part) is well within the acceptable limits**.**

The higher noise levels obtained along the boundary with the highway is likely due to vehicular activity along the highway. The use of horns on vehicles will cause elevated readings. These types of noise are usually not perceived as disturbances by persons in proximity, as they are a part of normal activities. However, noise created by loud voices or the use of heavy equipment, such as is likely during the construction phase of the development, although it may be within acceptable limits, may be considered disturbing to residents, as it is of an intrusive nature. The developers plan to implement a monitoring program during the construction phase of the project that will include monitoring of noise and dust levels to guarantee that the comfort of residents in the community is appreciated.

3.1.7 AIR QUALITY

No ambient air quality assessment was conducted. The distance from any major polluters as well as the present vegetated state of the site suggests there is little or no potential for a significant breakdown in ambient air quality of the area. The prevailing winds at the proposed site are from the northeast, typical of the north coast. This wind direction would effectively reduce the potential for nuisance even more by taking any potential wind blown nuisance away from neighbouring communities and the proposed development. The geography of the area also limits the potential for nuisance with wind direction sweeping across the property and Lucea Harbour.

3.1.8 NATURAL HAZARD VULNERABILITY

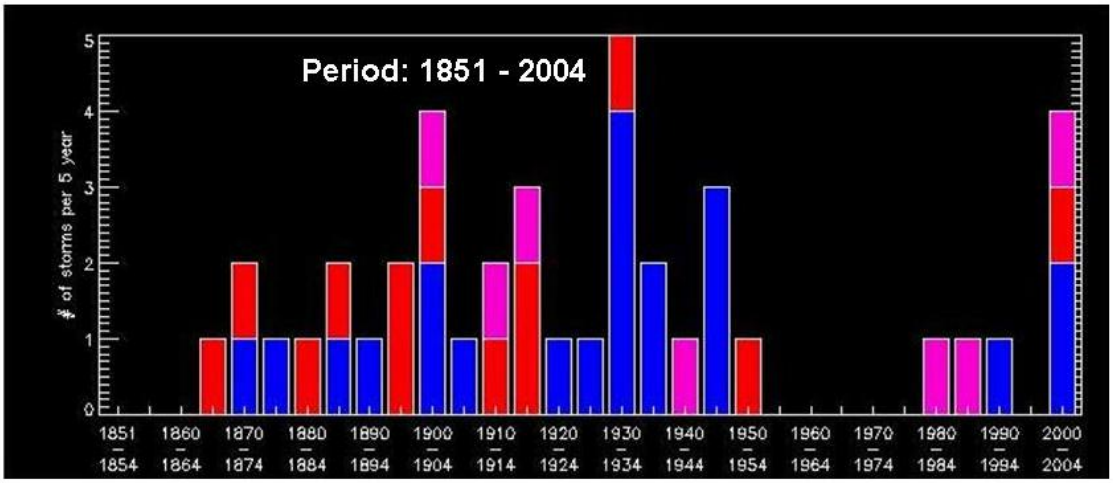
3.1.8.1 HURRICANE ACTIVITY

Using Sangster International Airport in Montego Bay as a reference point location: 18.50N 77.92W, all recorded tropical storm and hurricane activity over a period of 100 years are considered to estimate any trends related to the hurricane activity and the return period of such activities to the island[6]. This can be done confidently as Jamaica is a small island and is likely to be affected wholly regardless of the point of approach of a tropical depression or storm system.

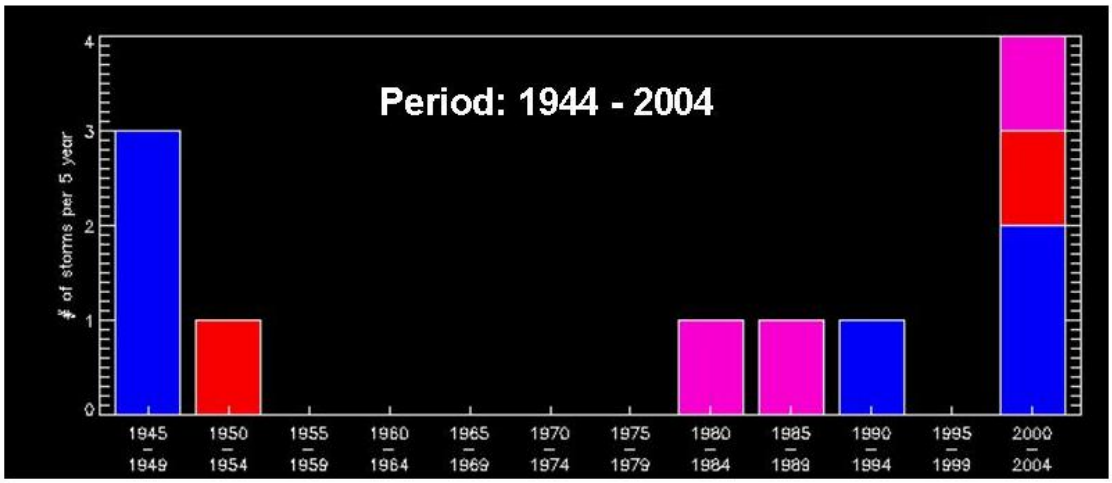
So far this year, there have been two (2) hurricanes within a two-week period that have affected the island. Both considered big hurricanes (Category 3 and above). One passed to the south and one to the north of the island. No significant storm surge activity was recorded along the north coast that affected the property.

[6] ***Caribbean Hurricane Network***.
http://stormcarib.com/climatology/MKJS_5year.htm Accessed July 25, 2005

Analyses of tropical systems passing within 60nm (= 60mi.) of the island per five year period is shown below. Latitude/longitude coordinates (18.50N, 77.92W) used is for Sangster International Airport, one of the island weather stations. In the graphs below the number of tropical systems passing by are plotted for each 5 year period since 1851 and since 1945. This can show if there are more storms lately or which 5-year period in the last 150+ years was most active. Those tropical systems reaching hurricane strength are in red, and the 'big ones' (severe hurricanes, or category 3 and up) in purple. A summary is shown below the graph (Period 1944 – 2004) showing which 5-year period was most active, with the number of storms during that period between brackets.



Category 3-5 hurricanes: purple;
Category 1-2: red;
Tropical storms: blue



Category 3-5 hurricanes: purple;
Category 1-2: red;
Tropical storms: blue

Most active 5 year period since 1944:
Most storms: 2000-2004 (4)
Most hurricanes: 2000-2004 (2)
Most severe hurricanes: 1980-1984, 1985-1989, 2000-2004 (1)

3.1.8.2 SEISMICITY

Jamaica lies in the seismically active northern plate boundary zone of the Caribbean Plate (Draper et al., 1994 and Figure 3-4). High magnitude earthquakes originating from as far away as the south coast of Cuba may be felt in Jamaica. For example the Cabo Cruz earthquake of magnitude 6.9 which occurred in May 1992 was felt with intensity 4 in Kingston, Jamaica. The 1993 earthquake of magnitude 5.4 which originated in Jamaica was felt in Cuba with intensities of 3-4. No damage was reported in either case from the distant country (pers. comm. M. Grandison).

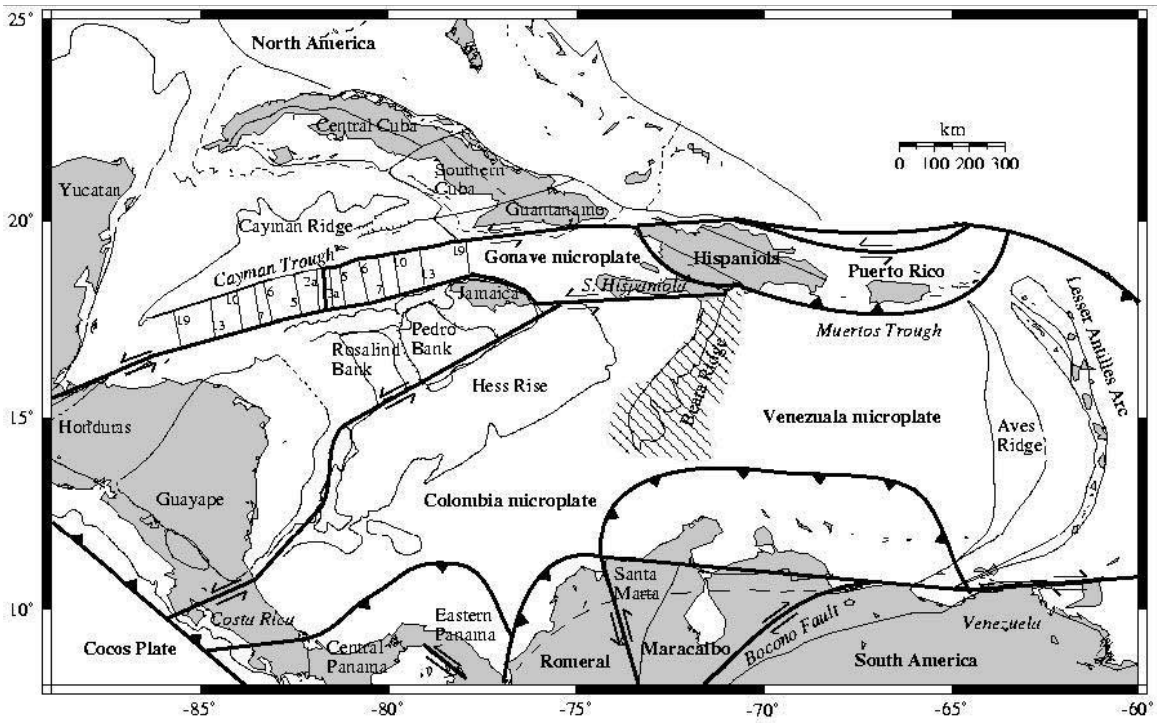


FIGURE 3-4: TECTONIC PLATES IN THE CARIBBEAN REGION

Figure 3-5 shows the epicenters of over one-hundred (100) earthquakes which have occurred in or near Jamaica between 1998 and 2001. With over 100 such occurrences, there was no significant damage to any approved infrastructure within the island to warrant consideration for the adjustment or revision of any building or construction codes for the island.

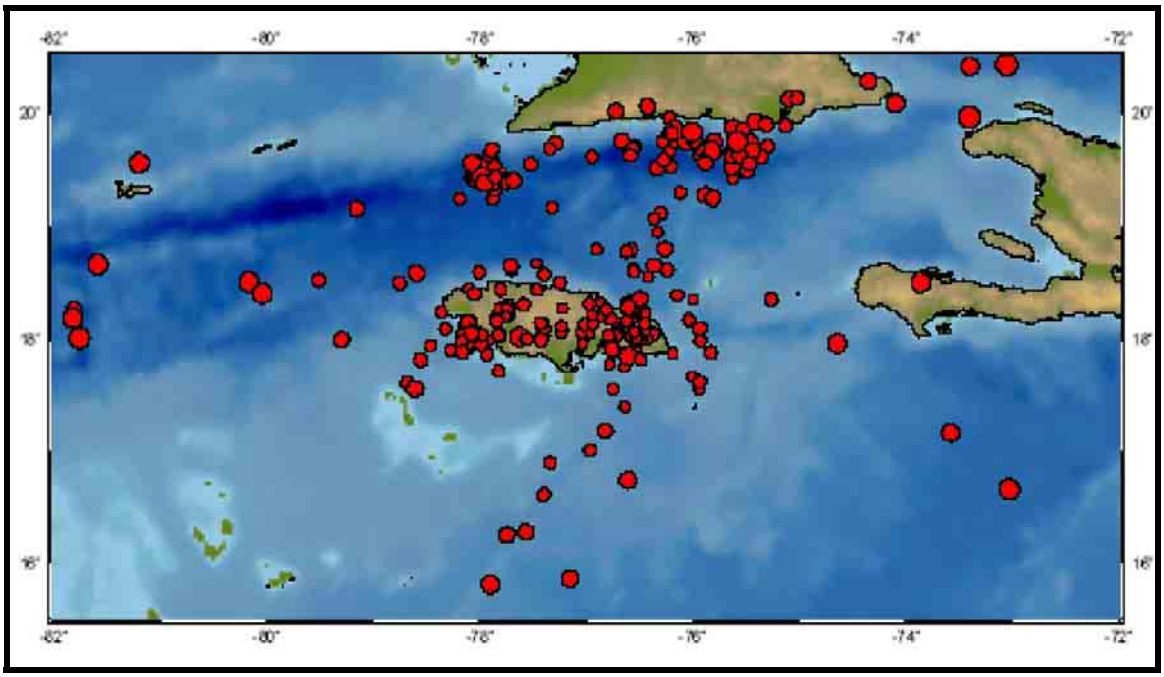


FIGURE 3-5: EPICENTERS OF EARTHQUAKES OCCURRING BETWEEN 1998 AND 2001 IN THE VICINITY OF JAMAICA[7]

Figures 3-6 and 3-7 below outline the Horizontal Ground Acceleration with 10% probability of exceedance in any 50-year period, and the expected maximum Mercalli Intensity with 10% probability of exceedance in any 50-year period. Point, Hanover is situated in the area of Jamaica with the lowest possibility of exceedance in any 50-year period for Horizontal Ground Acceleration or expected maximum Mercalli Intensity of 6.

[7] Source: *Earthquake Unit, University of the West Indies, Mona*

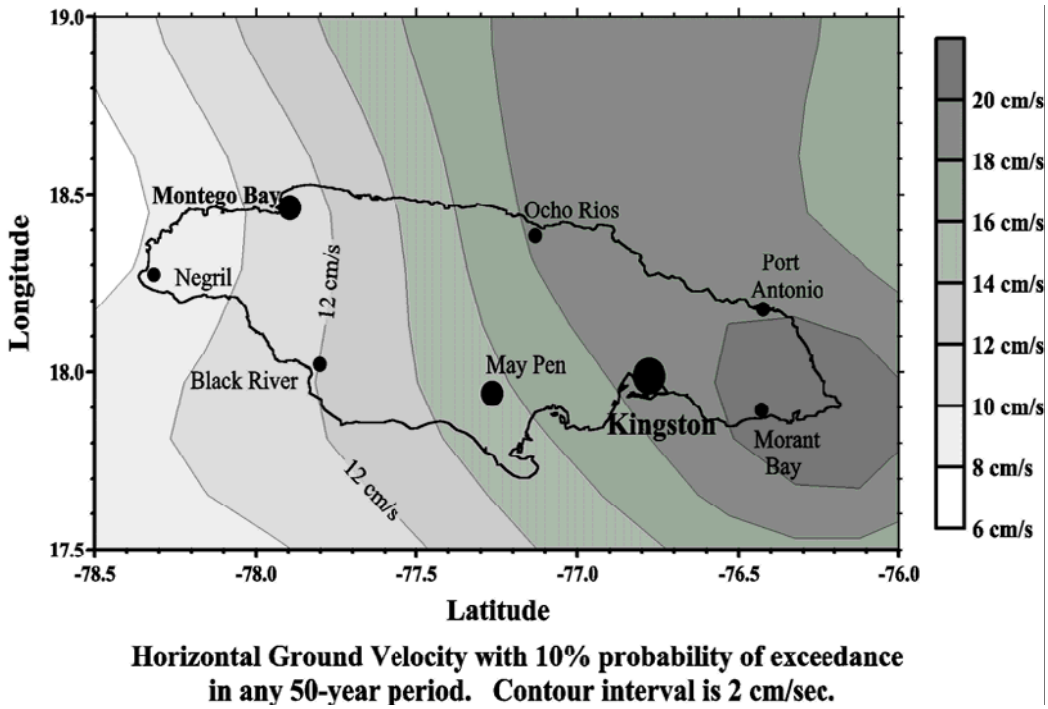


FIGURE 3-6: HORIZONTAL GROUND ACCELERATION IN JAMAICA[8]

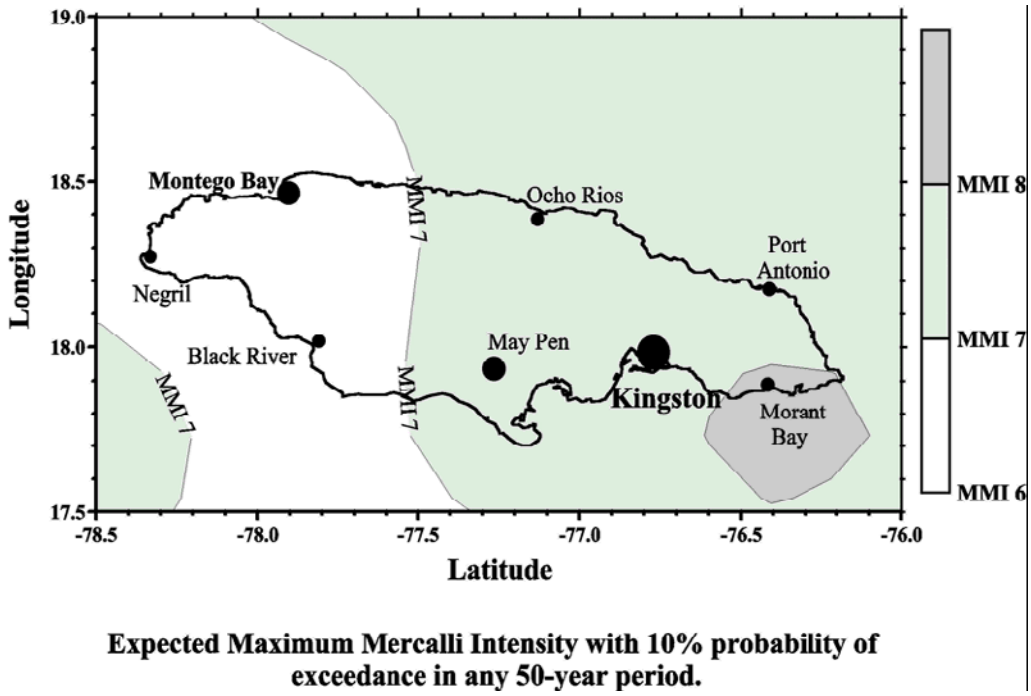


FIGURE 3-7: MAXIMUM MERCALLI INTENSITY IN JAMAICA[9]

[8] OAS **Sub-regional Seismic Hazard Maps,** http://www.oas.org/CDMP/document/seismap/, Accessed August 17, 2005.

3.1.8.3 FLOODING VULNERABILITY AND STORM WATER MANAGEMENT

Assessing whether an area is prone to flooding or not, not only requires a hydrostratigraphic assessment of the area, but also the collection of physical data such as rainfall run-off patterns, topography and information obtained from actual flooding events (especially as perceived by individuals who reside or frequent the area during such events) over a statistically appreciable period. Such information is not readily available from relevant statutory agencies in a compiled and organized format and is beyond the scope of this Environmental Impact Assessment. However, conclusions may be drawn from available data, including informal reports of flooding, or the absence thereof.

It is estimated that the project site is located in areas where the soil can be permeable to semi-permeable. Permeability or semi-permeability of the areas implies that water should percolate through the ground and drain into the underlying aquifers or aquicludes. Hence, in the absence of extreme weather conditions, namely heavy consistent and prolonged rainfall, the mentioned areas should not flood readily. Further, the site is not located in sink holes or areas of deep depression, therefore, issues related to runoffs from surrounding areas should not add to the flooding vulnerability of the area, especially if adequate drainage is employed. There has been no specifically reported flooding for the Point area.

Storm water management is of concern, primarily to the residents of the community. The designs of the proposed development have taken storm water management into consideration. The designs incorporate drainage patterns and channelling incorporated with French drains (gravel soak-away) to reduce the potential for flooding and to keep rainwater from flowing across the property and into the sea. The storm water management system is designed for a 10-year return rainfall event. This method of storm water management has the potential to impact groundwater in the area, however, this impact will be similar to that which occurs under natural circumstances where rainfall percolates into the subsurface and makes its way to groundwater.

[9] OAS **Sub-regional Seismic Hazard Maps,** http://www.oas.org/CDMP/document/seismap/, Accessed August 17, 2005.

The proposed development is responsible for storm water generated on their property and it will be the National Works Agency's (NWA) responsibility to control and contain storm water that is generated on the highways.

3.1.9 SOLID WASTE MANAGEMENT

Solid waste generated during the pre-construction, construction and occupational phases of the project will be properly managed to maintain the aesthetic and cleanliness of the site.

3.1.9.1.1 PRE-CONSTRUCTION

Pre-construction activities will generate waste primarily associated with the removal of vegetation from the site. This waste will be stockpiled on site and removed through a contract waste removal company for proper disposal.

3.1.9.1.2 CONSTRUCTION PHASE

A wide variety of waste materials will be generated during the construction phase of the project. This will include packaging materials, containers, general construction refuse and rubble among other items. During construction, roll-off type waste containers will be situated throughout the project area for collection of solid waste generated. These roll-off containers will be exchanged as they become full and will be removed from the site by a contracted waste disposal company for disposal at landfill. Care will be taken to insure that waste materials are managed and maintained in such a way that they do not get scattered by wind and impact on the property or the surrounding communities.

3.1.9.1.3 OCCUPATIONAL PHASE

During the occupational phase of the project, a variety of solid waste streams will be generated. Where practicable, the facility will undertake recycling and reuse of materials to minimize the volume of waste that must be disposed. Additionally, the facility will be equipped with solid waste dumpsters provided by the contracted solid waste removal company. These will be located at several locations around the facility to make waste management and disposal convenient. Issues relevant to the control of pests, vermin and any other potential waste related problem will be addressed as needed.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 TERRESTRIAL VEGETATION

The terrestrial floral and faunal assessment of Point Estate was carried out over a 3 day period. Initial assessment was done on July 20, 2005, and followed up July 27-28, 2005. The project site was assessed by focussing on two parcel of land separated by the Highway. The two areas identified were:

1. A lowland coastal zone - The main hotel area, projected to house the two-phase 800-room hotel project along with beaches, restaurants etc.
2. An elevated coastal zone - This elevated zone, separated from the coast by the Highway, is projected to be a top-rated golf course.

The terrestrial floras of both sites were assessed by way of literature reviews, on-site walk-throughs and the point centred quarter method. Each plant species encountered along the walk through was identified and recorded and where *in-situ* species identification was not possible, specimens were collected, and tagged for later identification.

3.2.2 THE LOWLAND COASTAL ZONE

The lowland coastal zone was typical of vegetation found along Jamaica's north coast. The dominant tree species in this zone is *Coccoloba uvifera* (Sea Grape) from the beach and cliffs inwards 10-12m and *Acacia tortuosa* (Wild Poponox) inwards from 15m to the Highway. Species such as *Sesuvium portucalastrum* (Seaside purslane), *Ipomea pes-caprae* (Beach Morning Glory), and *Batis maritime* (Salt Wort), pioneer species, were found near the beaches.

Mangrove trees were found in small patches in areas with water influences (both saline and non-saline, primarily *Laguncularia racemosa* (White Mangrove) with an occasional *Avicennia germinans* (Black mangrove). No pneumatophores of the Black Mangrove were found. Other terrestrial species encountered in the lowland coastal zone were *Ficus elastica* (Rubber Tree), *Melicoccus bijugatus* (Guinep), *Morinda citrifolia* (Noni), *Samanea saman* (Guango), *Terminalia catappa* (West Indian Almond) and *Thespesia populnea* (Seaside Mahoe) to name a few.

The shrub layer was represented primarily by grasses with few herbaceous species. The species present on the site are typical coastal species, which are adapted to hot, salty conditions.

The lowland zone can be classified as having three vegetation community types.

1. A beach community and associated rock outcropping of ancient coral reefs. This community type was evidenced by significant stands of Sea Grape interspersed with Seaside Mahoe, and patches of White and Black Mangroves which are all xerophytic in nature. This area was approximately 10 – 12m in width. This area experiences constant salt spray from crashing waves in areas where cliffs or ancient reef outcroppings exists, and strong coastal winds. Trees at sea level were approximately 2m in height and bent due to the windy nature of the environment. Protected beaches and high cliffs had slightly taller trees (Plates 3-3 and 3-4).

PLATE 3-3: PATCH OF WHITE MANGROVES NEAR EASTERN BEACH

PLATE 3-4: PATCH OF COCCOLOBA UVIFERA (SEA GRAPE) NEAR A BEACH AREA

2. An Acacia plant community (Plates 3-5 and 3-6). This plant community was primarily *Acacia* sp. The trees ranged in height from a grove of 0.5-1m just behind the beach community to 3-4m tall closer to the highway. The density of this area was 4 trees / m^2. No significant herb layer was established below these trees aside from grass species. Herbaceous species found were mainly confined to the edges of this community. This area is a re-growth of the old coastal forest that bordered the old coastal highway. Plants in his community were mainly xerophytic in nature, acclimatising the dry harsh environment. *Tillandsia sp.* (Old Man's Beard) was occasionally observed in trees.

Ground vegetation was very sparse except in cases where grasses were observed. This area was the least disturbed with an average tree density of 2500 trees per hectare. Leaf litter was low throughout this area.

PLATE 3-5: PICTURE SHOWING SECTION OF ACACIA SP. GROVE

PLATE 3-6: PICTURE SHOWING SECTION OF *ACACIA SP*. GROVE AND REMNANTS OF THE OLD COAST HIGHWAY

3. A ravine/drainage canal community type. This plant community was comprised of several tree species and herbs. Primarily fruit bearing trees were found in this area. This is indicative of seeds that were possible discarded by passengers along the old coast highway that found good soil and water conditions along the banks of drainage ditches and canals. These trees were on average 3-4m in height. Trees such as *Blighia sapida* (Ackee), Terminalia catappa (West Indian Almond), Morinda citrifolia (Noni), Melicoccus bijugatus (Guinep), and Samanea saman (Guango) were found in this area. This area tends to be narrow, with plants not distributed more than 5m from the banks of the drainage ditches or canals. Leaf litter was highest in this area of the lowland coastal zone.

PLATE 3-7: MELICOCCUS BIJUGATUS (GUINEP) AND BAMBOO PLANTS ALONG THE BANKS OF A DRAINAGE DITCH NEAR A BEACH

The lowland coastal zone had a mineral soil layer that was very thin and stony throughout most areas.

Forty-nine (49) species were the identified of which none were endemic, rare, threatened or endangered (Table 3-3). Additionally, none of the plants have significant cultural or economic value. Plants such as Poor Man's Orchid are attractive, and a

recommendation has been made to the developers to incorporate as many of these trees into the landscape design. Others recommended are large shade trees such as Guango. Additionally, the vegetation of the site has the potential to support fauna.

TABLE 3-3: OBSERVED VEGETATION ON PROPOSED SITE FOR HOTEL CONSTRUCTION (LOWLAND COASTAL ZONE)

Species	Common Name	Status
Acacia tortuosa	Wild poponax	Common
Achyranthes sp.		Common
Allamanda cathartica	Yellow Allamanda	Common
Antigonon leptopus		Common
Avicennia germinans	Black mangrove	Common
Axonopus compressus	Carpet grass	Common
Bambusa vulgaris	Bamboo	Common
Batis maritime	Salt Wort	Common
Bauhinia purpurea	Poor Man's Orchid	Common
Bidens pilosa	Spanish Needle	Common
Blighia sapida	Ackee	Common
Calotropis Procea	Giant Milkweed	Common
Carica papaya	Papaya	Common
Cenchrus brownie	Burr grass	Common
Centrosema virginianum		Common
Chloris barbata		Common
Coccoloba uvifera	Sea Grape	Common
Cocos nucifera	Coconut	Common
Commelina diffusa	Water grass	Common
Commelina erecta		Common
Comocladia pinnatifolia		Common
Crescentia cujete	Calabash	Common
Cyperus odoratus		Common
Dalbergia ecastaphyllum		Common
Euphorbia prostrata		Common
Ficus elastica	Rubber Tree	Common
Ipomoea pes-caprae	Beach morning glory	Common
Laguncularia racemosa	White mangrove	Common
Leucaena leucocephala	Lead tree	Common
Mangifera indica	Mango	Common
Melicoccus bijugatus	Guinep	Common
Mimosa pudica	Shame Weed	Common
Moghania strobilifera	wild hops	Common
Morinda citrifolia	Noni	Common
Panicum maximum	Guinea grass	Common
Passiflora maliformis	Sweetcup	Common
Pimenta dioica	Pimento	Common
Samanea saman	Guango	Common
Sesuvium portulacastrum	Seaside Purslane	Common
Sida acuta	Broomweed	Common

Species	Common Name	Status
Tecoma stans		Common
Terminalia catappa	West Indian Almond	Common
Thalia senegalensis	Water Canna	Common
Thespesia populnea	Seaside Mahoe	Common
Tillandsia recurvata	Old man's beard	Common

3.2.3 THE ELEVATED COASTAL ZONE

The elevated coastal zone is on land at least 10-15m above sea level. The typical vegetation of this zone was grasses and small trees on the lower slopes and large trees on the upper slope. The dominant tree species were *Samanea saman* (Guango), *Pimenta dioica* (Pimento) and *Acacia tortuosa* (Wild Poponox).

PLATE 3-8: PICTURE OF RELIEF OF THE AREA SHOWING THE HIGHWAY SEPARATING THE LOWLAND COASTAL ZONE AND THE ELEVATED COASTAL ZONE (WESTERN-MOST BORDER)

This zone showed signs of pastoral activity, with goats roaming the grassland and evidence of man-made watering holes and pens. Along the southern border other farming activities observed were the growing of cash crops, banana and pimento. Possibly due to the soil type, clay-limestone mix, various trees were able to take root with a closed canopy along the southern ridge. This area also showed evidence of past hurricane damage, possibly from Hurricane Ivan in 2004 and Hurricanes Dennis and Emily since the beginning of this year. Several trees were partially blown over, resting

on other sturdy trees in the vicinity. As a result, few patches of partial canopy cover were observed. The lower slopes featuring mainly *Acacia* sp. also showed evidence of blow-downs.

Several drainage areas were found in this zone, mainly arising from the slope. Large trees such as Guango, Pimento, *Spathodea campanulata* (Flame of Forest) were found along these drainage features and further inland at the top and southern section of this zone. The lower slopes had *Acacia* trees approximately 3m in height with grasses covering the ground. Canopies of these trees were not as closed as those of the lowland coastal zone, and trees were thicker and taller on average.

The canopy height along the southern was on average 4-5m. Taller trees were found along the drainage features, some in excess of 8m such as *Ceiba pentandra* (Silk Cotton tree), and Guango. The shrub layer was more extensive than that of the lowland coastal zone or the lower slopes. Species present were *Amaranthus spinosus* (Prickly calalu), *Sida acuta* (Broomweed), *Allamanda cathartica* (Yellow Allamanda), and *Antigonon leptopus* all of which are adapted to dry limestone coastal conditions.

PLATE 3-9: ELEVATED ZONE SHOWING TALL TREES ALONG THE DRAINAGE FEATURE AND OPEN GRASSLAND USED FOR PASTURE

PLATE 3-10: PART OF THE RELIEF OF THE ELEVATED ZONE ALONG THE HIGHWAY (EAST)

Forty-eight (48) species were identified in the elevated coastal zone, of which none were endemic, rare, threatened or endangered (Table 3-4 below). Additionally, none of the plants have significant cultural or economic value. Plants such as the Silk Cotton and Guango trees are known bird nesting trees, as well as being tall shade trees, and a recommendation has been made to the developers to incorporate as many of these trees into the landscape design.

TABLE 3-4: OBSERVED VEGETATION ON PROPOSED SITE FOR GOLF COURSE/HOTEL CONSTRUCTION (ELEVATED COASTAL ZONE)

Species	Common Name	Status
Agave sp.		Common
Acacia farnesiana		Common
Acacia tortuosa	Wild poponax	Common
Achyranthes sp.		Common
Annona muricata	Soursop	Common
Annona squamosa	Sweetsop	Common
Antigonon leptopus		Common
Arthrostylidium sarmentosum	Dwarf bamboo	Common
Azadiracta indica	Neem	Common
Bambusa vulgaris	Bamboo	Common
Bidens pilosa	Spanish needle	Common
Blighia sapida	Ackee	Common

Species	Common Name	Status
Bursera simaruba	Red Birch	Common
Capparis flexuosa	Limber Caper	Common
Cecropia peltata	Trumpet tree	Common
Ceiba pentandra	Cotton tree	Common
Chloris barbata		Common
Comocladia pinnatifolia		Common
Cocos nucifera	Coconut	Common
Cordia sebestena		Common
Delonix regia	Flamboyant Tree	Common
Ficus elastica	Rubber tree	Common
Guazuma ulmifolia	bastard cedar	Common
Helicteres jamaicensis	screw tree	Common
Hylocereus triangularis		Common
Leucaena leucocephala	Lead tree	Common
Mangifera indica	Mango	Common
Melicoccus bijugatus	Guinep	Common
Moghania strobilifera	wild hops	Common
Mucuna pruriens	Cowitch	Common
Panicum maximum	Guinea grass	Common
Philodendron sp.		Common
Pimenta dioica	Pimento	Common
Rhynchospora nervosa	Star grass	Common
Ricinus communis	Castor oil	Common
Samanea saman	Guango	Common
Sansevieria trifasciata	Tiger cat	Common
Solanum torvum	Susumber	Common
Sparisoma rubripinne	Sweetsop	Common
Spathodea campanulata	Flame of Forest	Common
Sporobolus sp.		Common
Stachytarpheta jamaicensis	vervine	Common
Tamarindus indica	Tamarind	Common
Terminalia catappa	West Indian Almond	Common
Turnera ulmifolia	Ram-Goat Dashalong	Common
Urechites lutea	Night shade	Common
Wedelia trilobata	Marigold	Common

3.2.4 FAUNAL SURVEY

The avifauna was sampled on July 27-28, 2005. On the 27th sampling occurred during the hours of 12pm and 3pm. Sampling on the 28th was conducted during the hours of 5:30am and 7:00am.

The method used was the point count method. Birds were identified *in-situ* via calls and visually with the use of a field guide. Point counts taken within the lowland coastal zone were done at several spots along the old coast road which runs parallel the coast and midway the zone. Within the elevated coastal zone, point counts were taken along the southern ridge and within the *Acacia* stand.

Fourteen (14) bird species were observed in total, of which the Jamaican Crow, Jamaican Blackbird and Sad Flycatcher are endemic. Birds were observed feeding and nesting. This is possibly due to the fruit trees which are found within the property. The area is used by birds specializing in different ecological niches. Table 3-5 provides a list of the avifauna observed at the proposed development site.

Several species of butterflies were observed particulary in the grasslands of the lowland coastal zone. Danaus plexippus (The Monarch), Heliconius charitonius simulator (Zebra Butterflies), and Euptoieta hegesia hegesia (The Tropical Fritillary) were observed.

PLATE 3-11: LYCOREA CLEOBAEA (TIGER BUTTERFLY)

PLATE 3-12: HELICONIUS CHARITONIUS (ZEBRA BUTTERFLY)

Other faunal types observed throughout the site were various ant species such as Duck Ants with nests, Termites, Spiders, Rats, Lizards (*Anolis grahami* and *A. lineatopus*) and Mosquitos. In addition, burrows belonging to the species *Cardisoma guanhumi* (Great land crabs) and Ocypode sp. (Ghost crab) were observed on the site (Table 3-6).

TABLE 3-5: OBSERVED AVIFAUNA ON PROPOSED SITE FOR FIESTA PALLADIUM HOTEL

Species	Common Name	Status
Bubulcus ibis	Cattle Egret	Common Resident
Coereba flaveola	Bananaquit	Common Resident
Columbina passerina	Common Ground Dove	Common Resident
Columba leucocephala	Balpate	Common Resident
*Corvus jamaicensis***	Jamaican Crow	Common Endemic
Egretta caerulea	Little Blue Heron	Common Resident
Leptotila jamaicensis	Caribbean Dove	Common Resident
Loxigilla violacea	Greater Antillean Bullfinch	Common Resident
Mniotilta varia	Black-and-white Warbler	Common Resident
*Myiarchus barbirostris***	Sad Flycatcher	Common Endemic
Nesopsar nigerrimus	Jamaican Blackbird	Endemic
Streptoprocne zonaris	White-collared Swift	Common Resident
Tyrannus caudifasciatus	Loggerhead Kingbird	Common Resident
Zenaida aurita	Zenaida Dove, Pea Dove	Common Resident

** Endemic

TABLE 3-6: OTHER OBSERVED FAUNA (BUTTERFLIES, INSECTS ETC.) ON PROPOSED SITE FOR HOTEL & GOLF COURSE CONSTRUCTION

Species	Common Name	Status
Butterflies		
Ascia monuste eubotia	Greater Antillean Whites	
Danaus plexippus	The Monarch	
Dione (Agraulis) vanillae insularis	The Tropical Silverspot	
Dryas iulia delila	Julia	
Euptoieta hegesia hegesia	The Tropical Fritillary	
Heliconius charitonius simulator	Zebra Butterflies	
Lycorea cleobaea	Tiger Butterfly	
Phoebis sp.	Sulphur	
Other Fauna		
Anolis garmani	Green lizard	
Anolis lineatopus.	Brown lizard	
	Green grasshopper	
	Brown grasshopper	
Austrolestes sp.	Dragonfly	
Crematogaster sp.	Duck Ants	
Eleutherodactylus sp.	Frogs	
Cardisoma guanhumi	Great Land Crab	
Gecarcinus lateralis	Black Land Crab	
Ocypode sp.	Ghost crab	

3.2.5 MARINE ENVIRONMENT

A marine assessment was conducted of the marine environment at Point, Hanover at four (4) locations in the vicinity of the proposed development, tow transects running south-north and two transects running east-west (Figure 3-8). The marine assessment utilized dives of the area, video, and still photography to document the condition of the structures and marine life in the study area. The list of marine flora and fauna follows the end of this section. The sites assessed are:

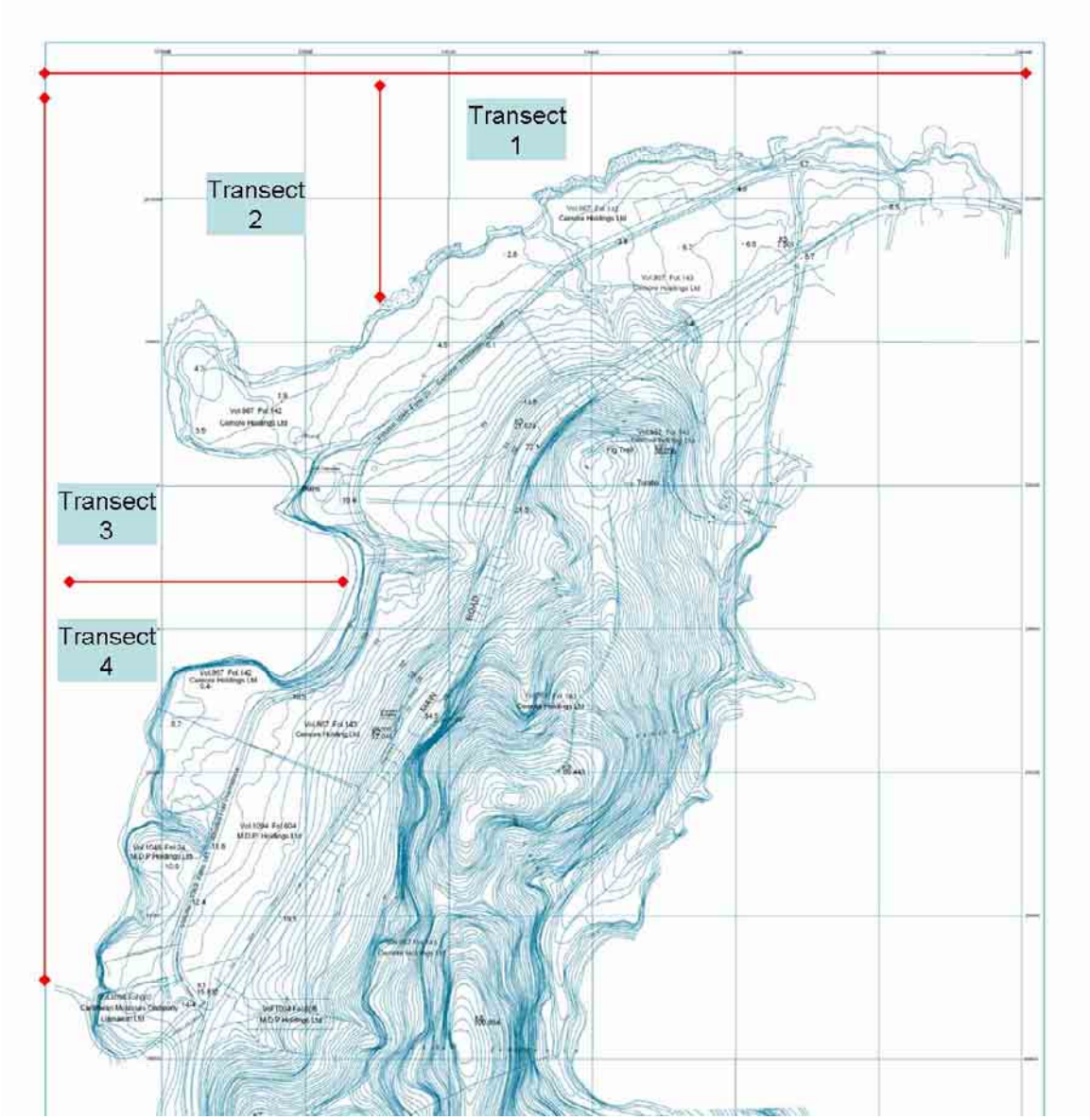


FIGURE 3-8: TRANSECT MAP FOR MARINE SURVEY

The observations of the typical progression from shore to reef included: sandy shore, to algae (usually *Penicilius* sp.), to extensive and healthy sea grass beds, followed by a fringing coral reef system indicative of a highly productive marine environment. Development of this area may result in an attractive opportunity for ecotourism, snorkelling, fish watching etc., but has the potential to be negatively impacted if the necessary preventative measures are not put in place during the construction and operation phases of the project.

Overall, at least 18 different species of fish, 7 different species of stony coral, and an assortment of other marine flora and fauna were observed**.** The coral reefs offshore were moderately healthy and supported an abundant and diverse benthic community of hard and soft corals, sea fans and rods, anemones and echinoderms. However, the reefs showed signs of stress in the form of damaged and diseased corals, and algal growth throughout. On a positive note, the population of sea urchins and other reef cleaners was good indicating a reef that may be classified as recovering. Bare coralline sand patches, dead coral and coralline rubble and algae accounted for about the 50 % of the benthic substrate, with the rest being living coral reef structure.

Significant seagrass beds interspersed, approximately 70-75% ground cover, with patches of sand characterised the three beach areas of the site. Two types of seagrasses were encountered; manatee grass (*Syringodium filiforme*) and turtle grass (*Thalassia testudinum*). Turtle grass accounted for approximately 70-80% of seagrass cover and appeared to have longer and thicker blades with increasing depth, as well as significant algal growth on the blades. Evidence of grazing was also observed on the seagrass blades. Among the marine fauna observed in this area were the sea urchins, *Diadema antillarum* (Black Sea Urchin) and *Trypneustes ventricosus* (White Sea Urchin), as well as numerous Mantis shrimp mounds and an occasional sea cucumber. Calcareous algae such as *Halimeda* sp. were also present in these areas.

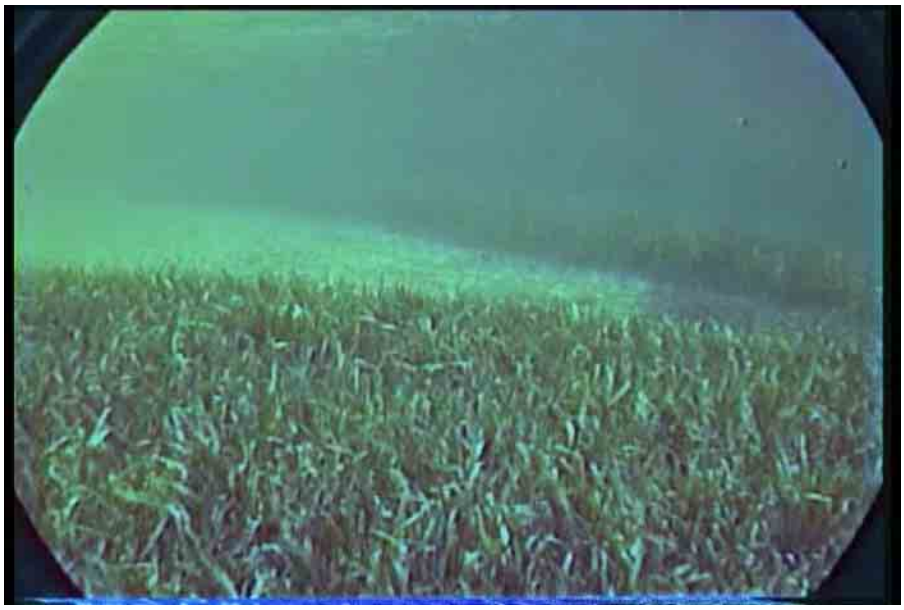


PLATE 3-13: TURTLE GRASS

Few coral heads were observed scattered in the shallow coralline substrate between the back reef and the sea grass beds, and in close proximity to the rocky outcropping along the shore.

The main fringing reef system is located directly across from the reef offshore Fort Charlotte, which is on the western side of the Lucea Harbour. This reef is known as the point reef. Due to its proximity to the site it could easily be negatively affected by poor wastewater and above-ground run-off from the site or the neighbouring environs.

This reef system comprised a fairly young coral structure represented by several healthy coral heads. Hard coral species represented included, the dominant species *Diplora strigosa* (Symmetrical Brain Coral), and *Siderastrea sidarea* (Massive Starlet Coral) as well as *Porites* sp. (Finger corals) and *Millepora complanata* (Fire coral). Coral species expected on the reef crest were not observed in significant numbers. The Elkhorn coral (*Acropora palmate)* and Staghorn corals (*Acropora cervicornis*) observed were mostly in a dead or decaying stage and predominantly covered by algae.

Soft corals were represented by sea fans, sea rods (*Plexaurella sp*.), and sea plumes (*Pseudopterogorgia sp*.). Sea rods, silt-pore sea fans and sea plumes were dominant throughout.

PLATE 3-14: MASSIVE STAR CORAL (*SIDERASTREA SIDAREA)*

PLATE 3-15: BRAIN CORAL (*DIPLORA STRIGOSA*)

PLATE 3-16: SEA RODS AND ASSORTED REEFSCAPE

PLATE 3-17: SEA FAN

PLATE 3-18: SEA RODS (*PLEXAURELLA SP.*) AND SEA PLUMES (*PSEUDOPTEROGORGIA SP.*)

PLATE 3-19: SEA ANEMONE

Various algal species were observed such as, *Gracilaria* (Red Algae), *Caulerpa* sp. (Green alage) and *Dictyota linearis* (Brown algae). Algal cover on the reef was approximately 30-40%. Macrophytic algae were observed interspersed in and around coral heads and on living and dead coral colonies and coralline rubble.

PLATE 3-20: MACROPHYTIC ALGAE COVERING DEAD ELKHORN CORAL AND GROUND SUBSTRATE

Marine fauna was limited to the numerous fishes, few echinoderms and rays observed during the study. No sea turtles or lobsters were observed. However, the grazing noted on the seagrass may potentially indicate turtle activity in the recent past. Several reef fish species were observed in this area, including, Juvenile wrasses, parrot fishes and damselfishes. Several yellow stingrays (*Urolophus jamaicensis*) were observed as well as sea cucumbers and sea worms. Microfauna were represented at the site by mantis shrimp mounds, snails and crabs.

Nerites (small snails) were found in large numbers along the rocky shores. The Nerites feed on the available algae. They scrape small bits of plant off the rocks with their rough tongue. Chitons were also fairly well represented.

PLATE 3-21: SEA CUCUMBER

PLATE 3-22: BLACK SEA CUCUMBER

PLATE 3-23: SEA WORM

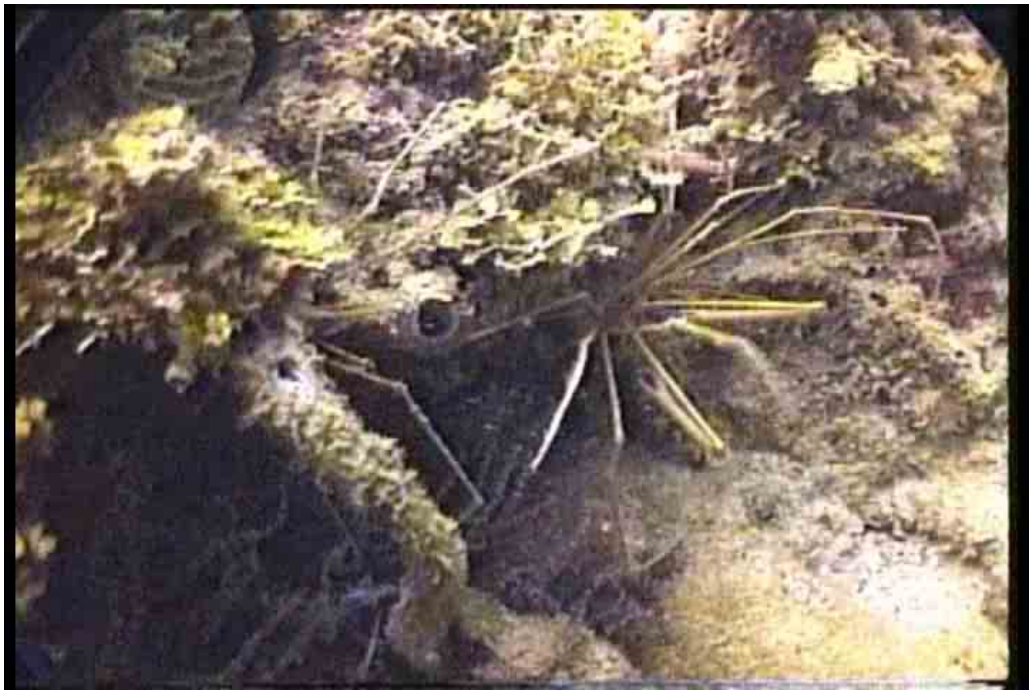


PLATE 3-24: REEF CLEANER SHRIMP

PLATE 3-25: BLACK SEA URCHIN (DIADEMA ANTILLARUM) CLOSE TO STAR CORAL AND SEA ROD

PLATE 3-26: BLACK (DIADEMA ANTILLARUM) AND WHITE (*TRYPNEUSTES VENTRICOSUS*) SEA URCHINS

PLATE 3-27: YELLOW STINGRAYS (*UROLOPHUS JAMAICENSIS*)

No turtles, turtle tracks or turtle nests were observed were observed on the first visit along the shoreline of the sandy beaches. However, on the second visit, evidence of turtle tracks and nest were observed. Two of these nests were observed to be invaded the following day, circumstances unknown. Therefore, the possibility, though remote, exists that at least one of the beaches is a nesting site. Turtle nesting is more commonly known along the beaches in the Negril area. It should be noted however, that beaches along the north coast with extensive sea grass beds, fairly good reef diversity, little or no light intrusion and minimal noise are ideal areas for marine turtles to nest. A recommendation has been made to the developers to include in their plans systems to protect the beaches as possible turtle nesting grounds.

Tables Table 3-7 and 3-8 below outline the marine flora and fauna identified at Point, Hanover.

TABLE 3-7: OBSERVED MARINE FLORA AT POINT, HANOVER

Species	Common Name
Algae	
Amphiroa sp.	Red algae
Gracilaria	Red Algae
Caulerpa sp.	Green alage
Halimeda sp.	Green algae
Penicillus sp.	Green algae
Dictyota linearis	Brown algae
Udotea sp.	Carpet algae
Sea Grasses	
Syringodium filiforme	Manatee Grass
Thalassia testudinum	Turtle Grass

TABLE 3-8: OBSERVED MARINE FAUNA AT POINT, HANOVER

Species	Common Name
Fishes	
Abudefduf saxatilis	Sergeant Major
Acanthurus chirurgus	Doctor fish
Chaetodon sp.	Banded Butterflyfish
Eupomacentrus sp.	Dusky Damselfish
Holocentrus adscensionis	Squirrel fish
Gramma loreto	Royal Basslet
Thalassoma bifasciatum	Bluehead Wrasse
Ocyurus chrysurus	Yellow tail Snapper
Pomacanthus paru	Angel fish
Holacanthus sp.	Angel fish
Stegastes fuscus	Dusky Damselfish
Stegastes variabilis	Beaugregory
Chromis verater	Threespot Chromis
Centropomus sp.	Snook
Sparisoma sp.	Striped Parrot fish
Lutjanus sp.	Snapper
Diodon holocanthus	Puffer
Bothus lunatus	Peacock Flounder
Invertebrates	
Diadema antillarum.	Black Sea Urchin
Trypneustes ventricosus	White Sea Urchin
Lytechinus variegatus	Green sea urchin

Species	Common Name
	Mantis shrimp
Nerita versicolor.	Nerite
Littorina sp.	
Holothuria atra	Black Sea cucumber
Acanthopleaura granulata	Chiton
Potamilla reniformis	Sea worm, Feather duster
Corals & Sponges	
Diplora strigosa	Symmetrical Brain Coral
Montastrea annularis	Boulder star coral
Plexaurella sp.	Slit-pore Sea Rods
Porites astroides	Mustard hill coral
Porites portes	Finger coral
Siderastrea sidarea	Massive Starlet Coral
Plakortis sp.	Mustard sponge
Millepora sp.	Fire coral
Acropora palmata	Elkhorn coral
Muricea muricata	Sea whip
Vertebrates	
	Marine Turtles
Urolophus jamaicensis	Rays

3.3 HISTORICAL ENVIRONMENT

The Point area is not known to be a major National Heritage location. However, the property contains several historical artefacts. There is a pier of cut stone similar to those used in other Forts across Jamaica by the British, including Fort Charlotte just across the Harbour. There are tombs on both sides of the property dating back to the 17th century. It is very possible that British Navy soldiers of that period are among those entombed on the property.

The possibility also exists for Taino settlements to be found on the property though none are presently known for the site. This was evidenced by the most recent assessment, the North Coast Highway Project, which made cuts to realign the Highway through the property.

3.3.1 HERITAGE SITES IN CLOSE PROXIMITY

There are two famous heritage sites, one in close proximity to the Point area of Hanover. They are:

- Fort Charlotte, and
- Tryall Estate and Great House

Fort Charlotte, located across the Harbour, was built around 1746. It was erected for the defense of the harbour and stands on the peninsula overlooking the channel. It was named in honour of King George III's Queen, Charlotte, and is probably one of the best kept forts in the island.

There are still three guns in reasonably good condition located on the compound and access to the fort has been made easier for visitors.

The Tryall Estate & Great House is on the main road between Hopewell and Sandy Bay to the east of Point. Once a sugar estate, Tryall Golf & Country Club is maintained as a national heritage site. The property is known to exhibit nineteenth century grave stone fragments, the ruins of a sugar works including a huge cast-iron water wheel which still functions, an old cast-iron boiler and a beautiful brick structure chimney.

SOCIAL ENVIRONMENT

4 SOCIAL ENVIRONMENT

4.1 SURVEY POPULATION

The surveyed areas were chosen based on the Enumeration Districts as outlined by the Statistical Institute of Jamaica, which were in closest proximity to the site at Point, Hanover.

The survey population was devised based on a 5% sample of the Total Housing Units (THU) in the area. Each respondent was from a different household, such that, each respondent would represent one Housing Unit.

The Enumeration Districts surveyed, along with their corresponding THU values are found in the table below.

TABLE 4-1: ENUMERATION DISTRICTS SURVEYED

ENUMERATION DISTRICT CODE	THU	5% SAMPLE VALUE	SURVEYS ISSUED
W24	179	9	10
W25	171	9	10
E1	110	6	6
E2	124	6	8
E3	185	9	6
TOTAL	769	39	40

Please see the map following, showing the location of the Enumeration Districts in which socio-economic surveys were issued concerning the development.

Also, please refer to the Appendix 1 for a copy of the Survey Instrument.

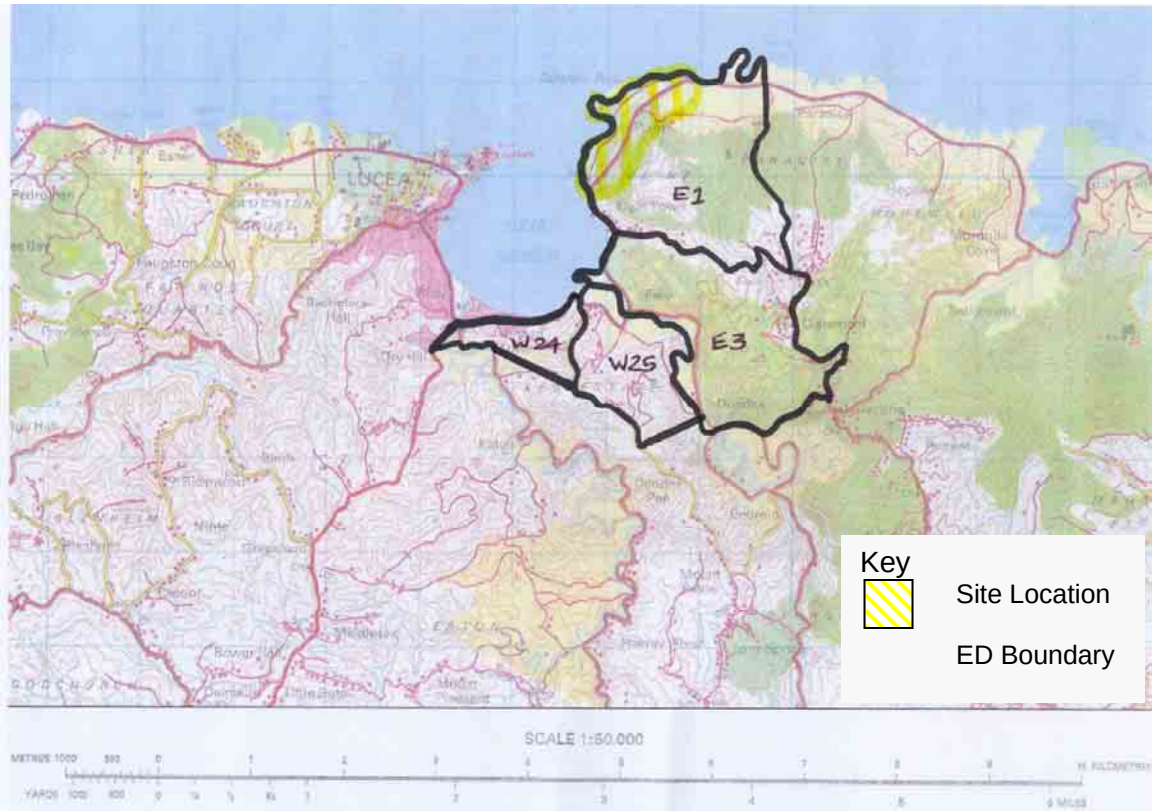


FIGURE 4-1: MAP SHOWING THE LOCATION OF EDS SURVEYED

4.2 SURVEY ANALYSIS

4.2.1 PERSONAL CHARACTERISTICS

TABLE 4-2: TABLE SHOWING RESPONSES TO QUESTIONS ABOUT THE RESPONDENTS' PERSONAL CHARACTERISTICS

ED ► Parameter ▼	W24	W25	E1	E2	E3	TOTAL
GENDER						
Male	5	5	3	5	5	23
Female	5	5	3	3	1	17
AGE RANGE						
Under 20	0	0	0	0	0	0
20-39	6	4	3	4	3	20
40-49	1	4	1	1	1	8

50-59	3	2	2	1	1	9
60 and over	0	0	0	2	1	3
Not stated	0	0	0	0	0	0
YEARS OF RESIDENCE						
0-5	1	0	0	2	0	3
6-10	0	0	0	0	1	1
11-20	3	5	1	4	0	13
More than 20	6	5	5	2	4	22
Not stated	0	0	0	0	1	1

4.2.2 PERSONAL CHARACTERISTICS

Twenty-three (23) of the forty (40) respondents were male. No one surveyed was younger than 20 years old, and all but five persons stated that they had been living in their respective communities for more than 10 years.

4.2.3 AWARENESS

All but two (2) of the respondents were aware of the plans for development. Only one person expressed aversion to the development, on the basis that he would not receive employment from it. When asked if they knew when the development was to begin, only two said yes. Six persons thought that the hotel operation would affect the availability of electricity or water to them.

4.2.4 SITE USE

27 persons stated that they use the site for various activities, including swimming, sailing and fishing. Six persons identified the area as being of cultural interest. Some interesting features described were the beach, and the gravesite.

4.2.5 EMPLOYMENT

Twenty-nine (29) of the forty (40) respondents indicated that they were in paid employment at the time. Their occupations included self employed mechanics and vendors, labourers, construction workers, and civil servants. When asked about the employment status of people in their households, it was revealed that sixty-six (66) people in the households of the respondents were in paid employment at the time. This compared to the 84 people stated to be unemployed.

Unemployment was a major issue for the residents. This was reflected in their responses in Sections 2, 3 & 4 of the Survey Instrument. (Please refer to Appendix II) When asked about their dislikes of the community, (Question 9), thirty-four (34) persons gave unemployment as one of their dislikes. Thirty-seven (37) persons stated that large scale development would be beneficial to the community. When asked how, they all indicated the anticipated impact on job opportunities. Twenty-three (23) were also anticipating skills development, which would enhance employability.

In section 4, 38 respondents were anticipating the new hotel. Twenty-four (24) of those thirty-eight (38) specifically anticipated job availability.

POLICY, LEGISLATION, STANDARDS AND REGULATORY FRAMEWORK

5 POLICY, LEGISLATION, STANDARDS AND REGULATORY FRAMEWORK

The policies, legislation, regulations and environmental standards of the Government of Jamaica (GOJ), which pertain to this development have been researched and analyzed, to ensure that the project complies with all policy, legal and regulatory requirements. The areas examined included environmental quality, health and safety, protection of sensitive areas, protection of endangered species, site selection and land use control at the regional, national and local levels, which relate to or should be considered within the framework of the project.

5.1 AGENDA 21

In June 1992, Jamaica participated in the United Nations Conference for Environment and Development (UNCED). One of the main outputs of the conference was a plan of global action, titled Agenda 21, which is a "comprehensive blueprint for the global actions to affect the transition to sustainable development" (Maurice Strong). To which, Jamaica is a signatory. Twenty seven (27) environmental principles were outlined in the Agenda 21 document. Those relevant to this project, which Jamaica is obligated to follow are outlined below:

Principle 1 – Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature.

Principle 3 – The right to development must be fulfilled to equitably meet developmental and environmental needs of present and future generations.

Principle 10 – Environmental issues are best handled with the participation of all concerned citizens, at the relevant level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in the decision making process.

Principle 11 – States shall enact effective environmental legislation, environmental standards, management objectives and priorities should reflect the environmental and developmental context to which they apply.

Principle 15 – In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

5.2 DEVELOPMENT GUIDELINES

All development applications are submitted for approval to the Town Country Planning Authority, through the local Parish Council and then forwarded to the relevant authorities including NEPA and the Environmental Control Division (ECD) of the Ministry of Health. NEPA, the governing environmental agency, may require an environmental impact assessment (EIA) to be considered along with the development plan for the Authority's approval. The ECD imposes guidelines for air, water and soil standards to be maintained after construction.

5.3 RELEVANT LEGISLATION

Legislation relevant to the establishment of a hotel development in St. Ann is outlined below.

5.3.1 THE NATURAL RESOURCES CONSERVATION AUTHORITY (NRCA) ACT, 1991

The NRCA Act (1991) is the overriding legislation governing environmental management in Jamaica. It requires that all new projects, (or expansion of existing projects), which fall within prescribed categories be subject to an environmental impact assessment (EIA).

The regulations require that eight (8) copies of the EIA Report be submitted to the Authority for review. There is a preliminary review period of ten (10) days to determine whether additional information is needed. After the initial review the process can take up to ninety (90) days for approval. If on review and evaluation of the EIA the required criteria are met, a permit is granted. In the event that the EIA is not approved, there is provision for an appeal to be made to the Minister.

Specifically, the relevant section(s) under the Act which address the proposed project are:

Section 10: Empowers the Authority to request EIAs for the construction of any enterprise of a prescribed category.

Section 12: Addresses the potential for contamination of ground water by trade effluent and sewage.

Section 15: Addresses the implementation of stop orders and fines associated with the pollution of water resources.

Section 16: Authorizes the government to intervene in order to prevent the contamination of ground water.

Section 17: Addresses the authority of the government to request in writing, any information pertaining to the:

1. performance of the facility
2. quantity and condition of the effluent discharged
3. the area affected by the discharge of effluent

In keeping with the requirements of this Act, the following submittals have been in support of this project:

- Permit Application (pursuant to Section 9)
- Project Information Form (PIF) pursuant to Section 10 (1)(a)
- Completed EIA document (8 copies to NEPA and one electronic copy)

5.3.2 WILDLIFE PROTECTION ACT, 1945

This act involves the declaration of game sanctuaries and reserves, game wardens, control of fishing in rivers, protection of specified rare or endemic species. The Act also provides for the protection of animals and makes it an offence to harm or kill a species which is protected. It stipulates that, having in one's possession "whole or any part of a protected animal living or dead is illegal.

This Act has to be considered for the proposed project, ecological assessments will determine if rare or endangered species will be impacted.

5.3.3 THE BEACH CONTROL ACT (1956)

The Beach Control Act provides for the regulation of activities within twenty-five (25) metres of the shoreline. It includes control of the construction of sheds and huts on beaches, and prohibits the use of public beaches for fishing activities. The Act is administered by NEPA, and also makes provisions for the creation of Marine Protected Areas. The sections of the Act relevant to the project are:

Section 7:

1. Notwithstanding anything to the contrary in this Act, the Minister may, upon the recommendation of the Authority, make an order declaring:
   a) any part of the foreshore and the floor of the sea defined in the Order together with the water lying on such part of the floor of the sea to be a protected area for the purpose of this Act; and
   b) such activities as may be specified in the Order to be prohibited activities in the area defined in the Order, being any or all of the following activities:
      i) fishing by any means specified in the Order;
      ii) the use of boats other than boats propelled by wind or oars where such boats are used for purposes other than for the doing of anything which may be lawfully done under the Harbours Act, the Marine Board Act, the Wrecks and Salvage Law, the Pilotage Act or the Exclusive Economic Zone Act;
      iii) the disposal of rubbish or any other waste material;
      iv) water-skiing;
      v) the dredging or disturbance in any way of the floor of the sea

Section 9:

1. Subject to the provision of Section 8 (this does not apply to docks wharves pier etc. constructed prior to June 1, 1956), no person shall erect, construct or maintain any dock, wharf, pier or jetty on the foreshore or the floor of the sea, or any structure, apparatus or equipment pertaining to any dock, wharf, pier or jetty and encroaching on the foreshore or the floor of the sea, except under the Authority of a license granted by the Minister on behalf of the Crown.

5.3.4 THE PUBLIC HEALTH ACT (1974)

This Act falls under the ambit of the Ministry of Health (MOH) and governs all matters concerning the handling of food material. In addition, provisions are also made under this Act for the activities of the Environmental Control Division (ECD), a division of the MOH. The ECD has no direct legislative jurisdiction, but works through the Public Heath Act to monitor and control pollution from point sources. Action against any breaches of this Act would be administered by the Central Health Committee. The functions of the department include:

- The monitoring of waste water quality, including regular water quality analysis, using water standards published by NEPA;
- Monitoring of occupational health as it relates to industrial hygiene of potentially hazardous working environments;
- Monitoring of air pollutants through its laboratory facilities.

5.3.5 JAMAICA NATIONAL HERITAGE TRUST ACT (1985)

The Jamaica National Heritage Trust, formerly the Jamaica National trust, administers the Act. This Act provides for the protection of important areas, including the numerous monuments, forts, statues, and buildings of historic and architectural importance in Jamaica.

This Act will prove applicable if any structures of archaeological and/or architectural importance are located on the site, affected by the site activities or unearthed during site activities. Since this project is in an area that may contain items of archaeological importance, an Archaeological Retrieval Plan is included as part of this document.

5.3.6 TOWN & COUNTRY PLANNING ACT (1987)

This Act governs the development and land use (excluding agriculture) in specified areas, through Development Orders, local planning authorities, development planning processes and Tree Preservation Orders. Under this Act the Town Planning Department is the agency responsible for the review of any plans involving development. The Act allows for specific conditions to be stipulated and imposed on any approved plans. The planning decision is based upon several factors, including;

- Location of the development;
- Land use and zoning;
- Effect of the proposal on amenities, traffic, etc.

IMPACT IDENTIFICATION

6 IMPACT IDENTIFICATION

This development has the potential to create a variety of impacts as it is implemented. These potential impacts can be either positive or negative depending on the receptors involved and other parameters such as magnitude and duration. It is anticipated that this project will have significant positive impacts on areas such as the economy, employment, foreign exchange earnings among others. Since this report is geared primarily towards identification of environmental impacts those will be presented in greater detail later in this report, other impacts will be presented in less detail as indicated below:

6.1.1 SOCIO-ECONOMIC IMPACTS

Employment – Direct employment of approximately 1200 tradesmen and labourers during pre-construction and construction phases. Direct employment of approximately 1000 employees is anticipated during the operational phase. The development will also spawn indirect employment throughout the surrounding communities and within the tourism industry as a whole. This represents a significant positive, both direct and indirect, long-term impact.

Foreign Exchange Earnings/Benefit to Economy – The proposed development represents an upward investment of at least US$60,000,000 and a long-term source of foreign exchange in keeping with success of the resort. The Island should see increased revenues from Income and General Consumption Taxes resulting from the development. This is a significant positive, both direct and indirect, long-term impact on the economy of the communities and the country.

Community Benefits – Other than providing direct and indirect employment and revenue sources, the development will result in an improvement of infrastructure and resources in the area (water and electricity) along with improved property values. These are significant positive, direct, long-term impacts to the community.

6.1.2 ENVIRONMENTAL IMPACTS

The following tables provide a clear indication of potential environmental impacts associated with this development, and provide information on potential receptors, duration, magnitude, and mitigation measures. Since these are potential impacts, there is no certainty that they will materialize, however, the developers will be prepared to deal with any adverse impacts should they arise during all phases of development.

6.1.2.1 PRE-CONSTRUCTION, CONSTRUCTION & OPERATION PHASES

TABLE 6-1: POTENTIAL IMPACTS & PROPOSED MITIGATION STEPS

Potential Impact	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Removal of Vegetation, Loss of Habitat	Pre-Construction [Site Clearance]	Land, Flora, Fauna, Endemic Species	Medium & Immediate/Long-term	Direct/Minor Negative / Reversible impact	Included in cost of construction
Mitigation Measures: The removal of vegetation and ecological habitats is unavoidable and is the main trade-off to be made against the economic benefits to be derived from project implementation. By design many mature trees will be left intact, and by extension, any endemic terrestrial fauna. Species re-introduction should occur naturally in these areas.					
Activity	**Action**	**Environmental Receptor**	**Magnitude & Duration**	**Significance**	**Economic Value**
Aesthetics	Construction [Zinc Fencing around Project Area]	Humans (Nearby Residential Communities)	Minor & Approx. 18 months	Minor Negative/Indirect /Sporadic/ Unavoidable Impact	Minimal cost if existing fence is maintained

Mitigation Measures:

Maintenance and Upkeep. Construction Monitoring. Communication with Residents/Resorts. Speedy Removal.

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Noise, Fugitive Dust, Air Pollution	Pre-Construction & Construction [Vehicular Traffic (Trucks/Heavy Equipment), Soil Stockpiles, Construction Activities]	Humans (Residential and Resort Communities)	Medium & Occasional (Approx. 18 months)	Minor Negative/ indirect/Sporadic/ Avoidable Impact	External monitoring

Mitigation Measures:

Appropriate scheduling of activities. Construction Monitoring. Dust Suppression through sprinkling. Proper Servicing of Equipment. Quick Response. Communication With Residents/Resorts. Covered vehicles on public roads Flag men will be utilized to manage traffic flow in and out of the site

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Storm water, Erosion, Sedimentation, Silting, Run-Off to Sea	Pre-Construction & Construction [Site Clearance, Vegetation Removal, Excavation]	Marine/Coastal Zone	Medium & Occasional/Long -Term (through occupational phase)	Minor Negative/Indirect /Sporadic/ Avoidable Impact	Should not exceed JA$1.0 Million

Mitigation Measures:

Careful Phasing of Activities With Consideration of Rainy Seasons. Construction Monitoring. Implementation of Control Devices (Drainage, Silt Fencing, Soak-away, etc.)

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Flooding Potential, Drainage Patterns, Storm Surge, High Water Table.	Construction & Operation [Incidental Rainfall, Hurricane, Excavation, Soak Away]	Groundwater, Coastal Waters, Project Area	Medium & Occasion/Long-term	Minor Negative/Indirect /Sporadic/ Avoidable Impact	Included in construction cost

Mitigation Measures:

Site designed to withstand 10-year return rainfall event. Construction Monitoring. Maintain design elevations. Maintain site drainage mechanisms. Not a typical problem in the area.

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Sewage and Wastewater (Effluent/Odour)	Construction & Operation [Sewage Treatment System, Temporary Sewage Handling during Construction]	Coastal Waters, Groundwater, Human	Minor & Long-term	Minor Negative, indirect, avoidable impact	Septic Hauler during construction period (included contract)

Mitigation Measures:

Operate and Maintain facility in keeping with designs. Quick Response to issues. Implement contingency plans as needed (Septic Hauler, etc.). System has no direct discharge to the environment. Treated effluent goes to irrigation. Utilize licensed temporary sewage system provider for Portable Toilets and associated disposal.

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Socio-Economic/Cultural/Loss of Traditional Use and Access to Beach	Pre-Construction, Construction & Operation [Entire Development]	Human	Large & Long-term	Minor Negative/direct impact	Not Quantifiable

Mitigation Measures:

Positive socio-economic impacts. Provide public access if possible or prudent to beaches. Identify optional public resources in proximity for bathing, fishing, etc. Recognize Prescriptive Rights of population to utilize beach. Secure any identified cultural heritage resources through JNHT.

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Solid Waste Handling and Disposal	Pre-Construction, Construction & Operation [Vegetation Removal/Construction Activities/Packaging]	Coastal Waters, Land, Groundwater, Humans, Aesthetic	Minor & Occasional/Long-term	Minor negative, direct, avoidable impact	Included in cost of construction

Mitigation Measures:

Minimize and reduce quantities of solid waste generated during site preparation and construction. A waste management plan should be prepared and followed. If practical, branches and leaves can be put through a wood chipper to make soil cover for garden beds, etc. Solid Waste not utilized on site should be disposed of in an approved landfill by approved haulers. An approved waste removal service should be contracted to remove waste produced on site.

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Noise, leaks, exhaust from construction implements (batching plants, heavy equipment), petrol/oil/lubricant storage	Pre & Post Construction, Operation	Soils, Groundwater, Coastal Waters, Air, Humans	Medium & Long-term	Minor negative, direct, sporadic, avoidable impact	Equipment Maintenance included in contractors scope

Mitigation Measures:

Equipment and chemical storage will be monitored and maintained on a regular basis. Any indication of leaks, discharge to the ground will be addressed immediately. Equipment maintenance on site will be minimal and monitored. Construction monitoring will include these potential impacts.

Chemicals and fuels with a potential to leak, will be stored in secured, impermeable areas to reduce the likelihood of contamination (e.g. the diesel fuel tank proposed for the facility, will be housed in a reinforced concrete vault and properly sealed).

TABLE 6-2: POTENTIAL IMPACTS & PROPOSED MITIGATION STEPS CONT.

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Beach Aesthetics	Construction [Vegetation Removal/Construction Activities/Coastline Modification]	Soils, Groundwater, Coastal Waters and Marine Flora & Fauna therein,	Medium & Short-term	Minor negative, direct, sporadic, avoidable impact	Included in cost of construction
Mitigation Measures: Requires excavation of sea grass and coarse material (gravel etc.) and the introduction of higher quality sand (finely graded, possibly from offshore). Silt screens will be used to contain sedimentation during beach filling exercises. Sea grasses removed may be transplanted at a suitable location along the coast. Equipment and chemical storage will be monitored and maintained on a regular basis. Any indication of leaks, discharge to coastal waters will be addressed immediately. Equipment maintenance on site will be minimal and monitored. Construction monitoring will include these potential impacts.					
Activity	**Action**	**Environmental Receptor**	**Magnitude & Duration**	**Significance**	**Economic Value**
The increase in traffic (buses, cars, staff vehicles etc.) noise levels, gaseous emissions	Construction & Operation of Facility	Human	Minor & Occasional over Long-Term	Minor negative, direct, occasional, avoidable impact	No major cost associated

Mitigation Measures:

The increase in traffic, while a notable impact, is not anticipated to be significant due to planned improvements to the local roadways (Highway 2000) and the overall development of the area as a tourist resort area. If the facility owns vehicles, they will insure that they are properly maintained at all times. Offending contract vehicles will be prohibited from the property.

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Utilities Shortfall (Potable Water Supply and Electricity Shortfall)	Operation of Facility	Human (Community and General Area)	Medium & Unsure	Minor negative, direct, avoidable impact	NWC & JPS Co responsibility

Mitigation Measures:

Work with NWC and JPS Co to develop independent/reliable source of each utility for the resort. Initiate water and energy conservation and minimization. Utilize treated wastewater for irrigation.

Activity	Action	Environmental Receptor	Magnitude & Duration	Significance	Economic Value
Solid Waste Management	Operation of Facility	Land, Soils, Air, Human, Coastal Waters	Minor & Occasional	Minor indirect, occasional, avoidable impact	Included in waste haulers contract

Mitigation Measures:

It is in the best interest of the facility to maintain high quality waste management and disposal practices. Garbage skips/dumpsters will be strategically placed throughout the site and emptied as needed by a contract solid waste company for disposal at an approved landfill.

TABLE 6-3: IMPACT IDENTIFICATION MATRIX

	EIA Activities																	
	Site Preparation				Construction								Operation					
	Site Surveying	Site Clearance	Site Access	Solid Waste Disposal	Materials Sourcing	Materials Transport	Construction Camp/Materials Storage	Construction Works	Solid Waste Disposal	Sewage Treatment	Surfacing/Paving	Landscaping	Traffic	Solid Waste Disposal	Water Supply	Electricity Generation	Increased Migration	Watersports and Beach Usage
TOPOGRAPHY																		
GEOLOGY																		
AMBIENT NOISE & VIBRATION																		
WINDS																		
RAINFALL																		
NOISE AND DUST																		
DRAINAGE																		
TEMPERATURE																		
NATURAL HAZARD VULNERABLITY																		
Ecological Parameters:-																		
TERRESTRIAL ECOSYSTEMS																		
VEGETATION																		
BIRDS																		
OTHER FAUNA																		
AQUATIC ECOSYSTEMS																		
VEGETATION																		
FAUNA																		
SENSITIVE HABITATS																		
Socio-Economic Parameters:-																		
AESTHETICS																		
LAND USE COMPATIBILITY																		
EMPLOYMENT																		
FOREIGN EXCHANGE EARNINGS																		
STRUCTURES/ROADS																		
WASTE MANAGEMENT																		
TRAFFIC ON THE ACCESS ROAD																		

KEY
NO IMPACT
MAJOR POSITIVE IMPACT
MINOR POSITIVE IMPACT
MAJOR NEGATIVE IMPACT
MINOR NEGATIVE IMPACT

	EIA Activities																	
	Site Preparation				Construction								Operation					
	Site Surveying	Site Clearance	Site Access	Solid Waste Disposal	Materials Sourcing	Materials Transport	Construction Camp/Materials Storage	Construction Works	Solid Waste Disposal	Sewage Treatment	Surfacing/Paving	Landscaping	Traffic	Solid Waste Disposal	Water Supply	Electricity Generation	Increased Migration	Watersports and Beach Usage
INCREASED CRIME																		
TOURIST HARASSMENT																		
HAZARD VULNERABILITY																		
SOLID WASTE DISPOSAL																		
SEWAGE DISPOSAL																		
OCCUPATIONAL HEALTH & SAFETY																		

KEY	
NO IMPACT	
MAJOR POSITIVE IMPACT	
MINOR POSITIVE IMPACT	
MAJOR NEGATIVE IMPACT	
MINOR NEGATIVE IMPACT	

IMPACT MITIGATION MATRIX

7 IMPACT MITIGATION

The following are mitigative actions proposed for the project. Provided below is a key explaining the type, magnitude of each impact identified.

TABLE 7-1: IMPACT MITIGATION MATRIX (PRE-CONSTRUCTION PHASE)

	Proposed Mitigative Measures													
	Detailed Topographic Surveys	Effective Site Management	Scheduling of Construction Activities	Waste Management Plan	Regular Solid waste collection	Placing of Solid waste Receptacles	Road Paving and Surfacing	Dust Management Techniques	Proper Vehicle Maintenance	Installation of Sediment Traps	Security & Fencing	Positive Impact No Mitigation	Community Relations	Flora & Fauna Relocation
Impacts - Preconstruction Phase														
Clearing of Site Vegetation														
Leveling of Site														
Transportation of Construction Material														
Increase in Noise														
Increase in Dust														
Disturbance of flora and fauna														
Aesthetics														
Increased Traffic														
Increased Employment														
Road Wear														
Increased Sedimentation of Coastal Waters														
Change in the Natural Drainage Patterns														
Solid Waste Generation														
Disturbance of Marine Communities														
Increased Earning Potential for Community														
Tresspassers into Conservation Area														
Traffic Inconveniences														

KEY	
NO IMPACT	
MAJOR POSITIVE IMPACT	
MINOR POSITIVE IMPACT	
MAJOR NEGATIVE IMPACT	
MINOR NEGATIVE IMPACT	

TABLE 7-2: IMPACT MITIGATION MATRIX (CONSTRUCTION PHASE)

	Proposed Mitigative Measures															
	Detailed Topographic Surveys	Phasing of Building Plans	Scheduling of Construction Activities	Waste Management Plan	Regular Solid waste collection	Placing of Solid waste Receptacles	Road Paving and Surfacing	Dust Management Techniques	Proper Vehicle Maintenance	Landscaping Measures	Effective Site Management	Security & Fencing	Installation of Sediment Traps	Scheduling of Heavy Vehicles	Positive Impact No Mitigation	Community Relations
Impacts - Construction Phase																
Increased Employment																
Leveling of Site																
Transportation of Construction Material																
Increase in Noise																
Increase in Dust																
Occupational Health & Safety Concerns																
Aesthetics																
Increased Earnining Potential for ommunity																
Increased Traffic																
Road Wear																
Increased Sedimentation of Coastal Waters																
Change in the Natural Drainage Patterns																
Solid Waste Generation																
Sewage Disposal																
Trespassers into Conservation Area																
Accomodations for workers																
Disturbance of Marine Communities																

KEY	
NO IMPACT	
MAJOR POSITIVE IMPACT	
MINOR POSITIVE IMPACT	
MAJOR NEGATIVE IMPACT	
MINOR NEGATIVE IMPACT	

TABLE 7-3: IMPACT MITIGATION MATRIX (OPERATIONAL PHASE)

	Community Wide Plan	Operation & Maintenance Plan	Regulatory Monitoring	Waste Management Plan	Regular Solid waste collection	Placing of Solid waste Receptacles	Security & Fencing	Landscaping Measures	Positive Impact No Mitigation
Impacts - Occupational Phase									
Increased Employment opportunities									
Sewage Treatment System Management									
Drainage Patterns									
Solid Waste Management									
Water Conservation									
Energy Conservation									
Aesthetics									
Regulatory Compliance									
Trespassers in Conservation Area									
Fugitive Dust									
Increased Earning Potential for Community									

KEY	
NO IMPACT	
MAJOR POSITIVE IMPACT	
MINOR POSITIVE IMPACT	
MAJOR NEGATIVE IMPACT	
MINOR NEGATIVE IMPACT	

ENVIRONMENTAL MONITORING

8 ENVIRONMENTAL MONITORING

The Monitoring Plan to be devised for the development should be implemented during the pre-construction and construction phases of the project. Monitoring involves the observation, review and assessment of onsite activities to ensure adherence to regulatory standards and the recommendations made to reduce negative impacts. The Plan must be comprehensive and address relevant issues, with a reporting component that will be made available to the regulatory agencies based on a mutually agreed frequency. It is recommended that a minimum monthly monitoring report be submitted to NEPA.

The monitoring report will include at a minimum:

- Raw data collected
- Tables/graphs (where appropriate)
- Discussion of results with respect to the development in progress, highlighting parameters which exceed standards
- Recommendations
- Appendices with photos/data, etc.

At a minimum, the following activities will be monitored in the various phases:

8.1 PRE-CONSTRUCTION PHASE MONITORING

- During site clearing activities, those trees that will be saved and incorporated into the facility must be identified and protected. The plants to be retained should be pegged and flagged and if necessary fenced. It is suggested that the developers assess a monetary value (e.g. $2,500) be placed on each plant, for which the contractor will be made liable. Should the contractor damage or remove a protected tree, the penalty should be assessed. An inventory and map (if applicable) of all trees to be retained must be developed. (Weekly Monitoring)
- Where identified, endemic and rare species should be preserved in place or collected for transplanting (As Observed)
- Stockpiles of soil and vegetative debris generated during site clearing activities should be monitored and maintained to eliminate generation of fugitive dust. (Daily Monitoring)

- Noise levels along the perimeters of the project area should be monitored and recorded to insure that activities at the site are not exceeding standards. (Daily Monitoring)

8.2 CONSTRUCTION PHASE MONITORING

- Sewage - Ensure that temporary portable chemical toilets are available for construction personnel and that the contents are disposed by an approved waste hauler in an appropriate waste disposal facility. (Weekly Monitoring)
- Sand/Marl/Aggregate Supply - Routinely monitor sourcing of quarry materials to ensure supplier is obtaining supplies from licensed operations. (Monthly Monitoring)
- Solid Waste Management - Ensure that solid waste management plan is prepared, and that workers are aware that no solid waste material should be scattered around the site. Monitor availability and location of skips/dumpsters. (Weekly Monitoring)
- Monitor the disposal of refuse to insure that skips/dumpsters are not overfilled. (Weekly Monitoring)
- Routine collection of solid waste for disposal must be implemented, and disposal monitored to ensure use of approved disposal facilities. (Weekly Monitoring)
- Exposed soil areas must be monitored to determine potential for erosion, silting and sedimentation particularly during storm events. (Weekly Monitoring)
- If erosion, silting or sedimentation is a potential or occurs, immediate steps must be taken to negate the impact on the coastal waters and other receptors where applicable. (As Needed)
- Equipment staging and parking areas must be monitored for releases and potential impacts. (Weekly Monitoring)
- If any cultural heritage resources are unearthed during construction activities, activities should be stopped and the Archaeological Retrieval Plan included in this report implemented. (As Needed)
- Noise levels along the perimeters of the project area should be monitored and recorded to insure that activities at the site are not exceeding standards. (Daily Monitoring)

8.3 OPERATION PHASE MONITORING

- Sewage - Monitor effluent quality periodically to determine compliance with regulatory standards and appropriateness for use as irrigation water. (Monthly Monitoring or as determined by regulatory standards)
- Solid Waste - Monitor solid waste skips/dumpsters and removal contractor to ensure proper waste handling and disposal. (Weekly Monitoring)
- Drainage - Regular inspections of drainage systems should be performed to ensure that the drains remain clear of blockages to safeguard against flooding or erosion of beach. (Monthly Monitoring).

APPENDICES

APPENDIX I: REFERENCES

APPENDIX I: REFERENCES

- Adams, C.D., 1972. *Flowering Plants of Jamaica*. University of the West Indies.
- Downer A. and R. Sutton, 1990. *Birds of Jamaica – A Photographic Field Guide*. Cambridge University Press.

APPENDIX II: SURVEY INSTRUMENT

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SURVEY INSTRUMENT
Conrad Douglas & Associates Limited

ENVIRONMENTAL IMPACT ASSESSMENT
For
Fiesta Group Hotel Construction, Point, Hanover

Social Impact Assessment

Community Name _____ Community Code | | | | | |

SECTION 1: PERSONAL CHARACTERISTICS

1) Gender
   1. Male
   2. Female

2) Age Range
   1. Under 20
   2. 20 – 39
   3. 40 – 49
   4. 50 – 59
   5. 60 – over
   6. Not Stated/No Response

3) How many years have you been living in the community?
   1. 0 – 5 Years
   2. 6 – 10 Years
   3. 11 – 20 Years
   4. more than 20 Years
   5. Not Stated/No Response

4) How many people live in this household? M ☐ F ☐ Total ☐

5a. How old are they?

Age Range	#
0-14	
15-19	
20-35	
36-45	
46-55	
56-64	

65 and over	

5b. How many persons are in paid employment? _____

5c. How many persons are unemployed? _____

6. Are you in paid employment? Yes ☐ No ☐

7. If Yes, what is your occupation? _____

SECTION 2: OPINIONS ON THE COMMUNITY

8. What do you like most about the community? ***ASK & WAIT FOR RESPONSE***
    1. Friendly people
    2. Clean environment:
    3. Availability of farmland
    4. Quiet
    5. No crime & violence
    6. Other, (specify)_____
    7. Not Stated/No Response

9. What don't you like about the community? ***ASK & WAIT FOR RESPONSE***
    1. Poor roads
    2. Lack of Utilities
    3. Crime & violence
    4. Unemployment
    5. Dirty environment
    6. Other, (specify)_____
    7. Not Stated/No Response

10. "Large scale development is beneficial to this community " (e.g. construction activities, hotels, mining operations, housing) Do you agree?
    1. Yes
    2. No
    3. Not Stated/No Response

11. Why do you think so?
    1. Job opportunities
    2. It will reduce the peacefulness of the area
    3. Offers skills development
    4. Improves utilities
    5. It will affect environmental quality in a negative way
    6. Other (specify)
    7. Not Stated/No Response

SECTION 3: KNOWLEDGE AND VIEWS ON HOTEL PLANS

Public Awareness

12. Are you aware of the proposal to set-up a resort hotel on the property at Point beside the Molasses warehouses (on both sides of the road)?

Yes ☐

No ☐

13. If yes, are you:

Strongly in favour ☐

In favour ☐

Neither in favour or against ☐

Against ☐

Strongly against ☐

14. What are your reasons? _____

_____

_____

_____

15. Do you know when the proposed development will begin?

Yes ☐

No ☐

16. What effect do you think the proposed hotel construction in or near your area will have on the following:

Economic value of the community

1. Positive
2. Negative
3. No Change
4. Don't Know
5. Not Stated/No Response

Job Opportunities

1. Positive
2. Negative
3. No Change
4. Don't Know
5. Not Stated/No Response

Pollution

1. Positive
2. Negative
3. No Change
4. Don't Know
5. Not Stated/No Response

17. Do you think the proposed hotel will affect you personally?

1. Yes
2. No
3. Don't Know/Not Sure
4. Not Stated/No Response

18. If Yes, how?

_____
_____
_____
_____

SECTION 4

19. Have you or any member of your household ever worked in the hotel industry?

1. Yes
2. No
3. Don't Know/Unsure
4. Not Stated/No Response

Social Attitude

20. Do you look forward to this development?

Yes ☐

No ☐

21. If yes, why? _____

22. If no, why not? _____

23. Do you think that the construction and operation of the proposed development will affect the availability of any of your resources (e.g. water, light, aesthetics etc)

Yes ☐

No ☐

24. If Yes, please state which of the resource(s) you suspect will be affected?

25. For each affected resource, describe briefly, the nature/extent of the effect

Resource	Nature/ extent of effect

26. Do you use the proposed site for any activity?

Yes ☐

No ☐

27. If Yes, what do use the proposed site for? _____

28. Are there any natural resources on the site that you know of?

Yes ☐

No ☐

29. If Yes, what are these? _____

30. What impacts do you think the proposed hotel resort development will have on this community?

31. Will the development have any impact on your livelihood?

Yes ☐ No ☐

32. If yes, what are the impacts?

33. Do you think the proposed development will have any impacts on the environment?

Yes ☐ No ☐

If yes, please explain.

34. What benefits do you think the proposed development will have on the community?

35. Do you have any other expectations?

Yes ☐ No ☐

If Yes, what are these?

36. Is the site of any cultural/historical interest?

Yes ☐ No ☐

If Yes, what/where?

37. Do you have any involvement in the proposed development?

Yes ☐ No ☐

38. If Yes, how are you involved?

HOUSING CONDITIONS

(Surveyor can ask these questions if he cannot ascertain the answers from observation)

39. Type Of Dwelling

Separate house, detached ☐

Semi-detached ☐

Part of a house ☐

Part of a commercial building ☐

Other ☐

40. Construction Material

Block and Steel ☐

Wood ☐

Concrete ☐

Stone/Brick ☐

Wattle and Daub ☐

Other ☐

AMENITIES

41. Toilet Facilities

Type: _____

WC linked to sewer ☐

WC not linked to sewer ☐

Pit ☐

Other ☐

None ☐

42. Shared

Yes ☐

No ☐

43. SOURCE OF WATER

Indoor tap/pipe ☐

Outside Private tap/pipe ☐

Public stand pipe ☐

River/Pond/Well ☐

Rainwater (tank) ☐

44. KITCHEN (OUTDOOR)

Yes ☐

No ☐

45. SOURCE OF LIGHTING

Electricity ☐

Kerosene ☐

Other ☐

None ☐

46. TENURE

Owner ☐

Rent-free ☐

Rented ☐

Squatter-occupied ☐

Other ☐

All the completed survey instruments are available for review at your discretion.

Name of Interviewer:
Date of Interview:

Appendix III: PROJECT TEAM MEMBERS

APPENDIX III: PROJECT TEAM MEMBERS

Team members participating on the project, include:

1. Dr. Conrad Douglas
2. Paul Thompson
3. Orville Grey
4. Geomatrix Ltd.
5. Vance Johnson
6. Deonne Caines
7. Noel Watson
8. Burklyn Rhoden
9. Richard Farrier

APPENDIX IV: DETAILED DESIGN CRITERIA, PARAMETERS, CODES/RULES

APPENDIX IV: DETAILED DESIGN CRITERIA, PARAMETERS, CODES/RULES

Actions : NBC of JAMAICA, ANSI/ASCE 7-95
Wind : BSCP 3 chapter V part 2, NBC 2nd edition 4.1.2
[BSCP 3 Chapter V, Part 2, BRITISH STANDARD CODE OF PRACTICE, LOADING FOR BUILDINGS, CODE OF PRACTICE FOR WIND LOADS]
Earthquake: Recommended Lateral Force Requirements and Commentary Seismology Committee Structural Engineers Association of California
Concrete : NBC of JAMAICA, ACI 318
[ACI-318-05 BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE AND COMMENTARY]

Others :
INTERNAL FORCES COMPUTE METHOD

Classic

LOAD FACTORS
(Categories II and III, Table 1-1 CLASSIFICATION OF BUILDINGS AND OTHER STRUCTURES FOR FLOOD, WIND, SNOW, AND EARTHQUAKE LOADS - ASCE 7-02)

A4-1 1.40/1.00 D
A4-2 1.20/1.00 D + 1.60/1.00 L + 0.50/1.00 S
A4-3 1.20/1.00 D + 1.60/1.00 S + (0.50/1.00 L or 0.80/1.00 W)
A4-4 1.20/1.00 D ± 1.30/1.00 W + 0.50/1.00 L + 0.50/1.00 S
A4-5 1.20/1.00 D ± 1.00/1.00 E + 0.50/1.00 L + 0.20/1.00 S
A4-6 0.90/1.00 D ± (1.30/1.00 W or 1.00/1.00 E)
D: Permanent Loads, Condition 0
L : Gravitationals, Conditions 1,2,9,10,11 a 20 y 21
W: Wind, Conditions 3 y 4
E: Earthquake, Conditions 5,6,7,8 y 24

LOAD SETTINGS

Wind enabled. Direction+- enabled
Earthquake enabled. Direction+- enabled
Automatic Self-weight enabled

EARTHQUAKE LOAD SETTINGS

Computation method: Dynamic
Ground level (cm) 0
Seismic in vertical direction not considered
Rigid Frames structure (Q = 2.0)
Regular structure
Building Group B2

Compute of vibration modes: Globally with condensation
Consider rotational mass
No consider accidental eccentricity
Combine the horizontal seismic actions by the "30% rule"
Rotational seismic acceleration: 0.00 (rd/s²) / (cm/s²)
No. vibration modes to combine: 30
% effective mass to combine: 90 %

COMPUTATION OPTIONS

Undistorted members in horizontal slabs
Take into account column dimensions in reticular and solid slabs discretization

STRUCTURE MATERIALS

Concrete 25 MPa [25 MPa = 250 Kg/cm2 = 3,625 psi]
Corrugated Steel 412 MPa
Resistance factors, Fr
0.65 (Bending and Compres.)
0.80 (Bending and Traction)
0.80 (Bending)
0.75 (Shear and Tors.Mom.)
0.65 (Punching)

REINFORCEMENT SETTINGS

Cover (mm): Beams = 25, Columns = 25

Yp: Buckling checked (sway mode)
Zp: Buckling checked (sway mode)
Beams torsion checked
Columns torsion checked
Beams plastification 15%
Minimum positive moment $qL^2 / 16$
It's considered lateral flexion
Maximum grave size 20 mm
Compute step 30 cm

DEFLECTION OPTIONS
Verify active deflection:
Spans
Combinated deflection L / 240 + 5 mm
Projections
Relative deflection L / 250
70% Structure self-weight (0 cond.)
20% Partitions
100% Long-lasting live loads
3 months Structure / partitions
60 months Creep deflection
28 days Formwork removement
It's considered shear distortion

Second order effects are not considered
Main bars in beams:
Upper ø 3/4" Resistant
Lower ø 3/4" Resistant
Side ø 1/2"
Suppl. reinforcement in beams:
ø Minimum 5/8"
ø Maximum 3/4"
Maximum number 8
Maximum length 1200 cm
Permit 2 levels
Maximum geometric longitudinal rate 100·As / Ag = 4.00 %
Maximum mechanics longitudinal rate (As·fy) / (Ag·f'c) = 0.85
Main bars in columns:
ø Minimum 1"
ø Maximum 1"
Homogenize in height
Maximum number of supplementary reinforcements by face in rectangular columns: 8
Maximum number of reinforcements in circular columns: 10
Maximum geometric longitudinal rate 100·As / Ag = 4.00 %
Maximum mechanics longitudinal rate (As·fy) / (Ag·f'c) = 0.85
Stirrups reinforcement in beams:
ø Minimum 3/8"
ø Maximum 1/2"
Minimum separation 10 cm. Module 5 cm
% of aplicated load in the lower face (pending load):
0% in beams with upperly plained slab(s)
100% in beams with lowerly plained slab(s)
50% in the other cases
Stirrups reinforcement in columns:
ø Minimum 3/8"
ø Maximum 1/2"
Minimum separation 10 cm. Module 5 cm
Consider constructive criterions of ACI 318-99
To apply constructive criterions according as next values: