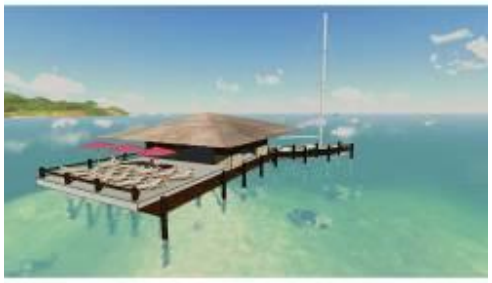
APRIL 2023

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PROPOSED CONSTRUCTION OF AN OVER-WATER BAR AT LILLIPUT, ST JAMES

(REF NO. 2018-07017-BL00088)

PREPARED FOR OFFSHORE OASIS LTD



PETER WILSON-KELLY (MPHIL) & ASSOCIATES

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1.0 EXECUTIVE SUMMARY

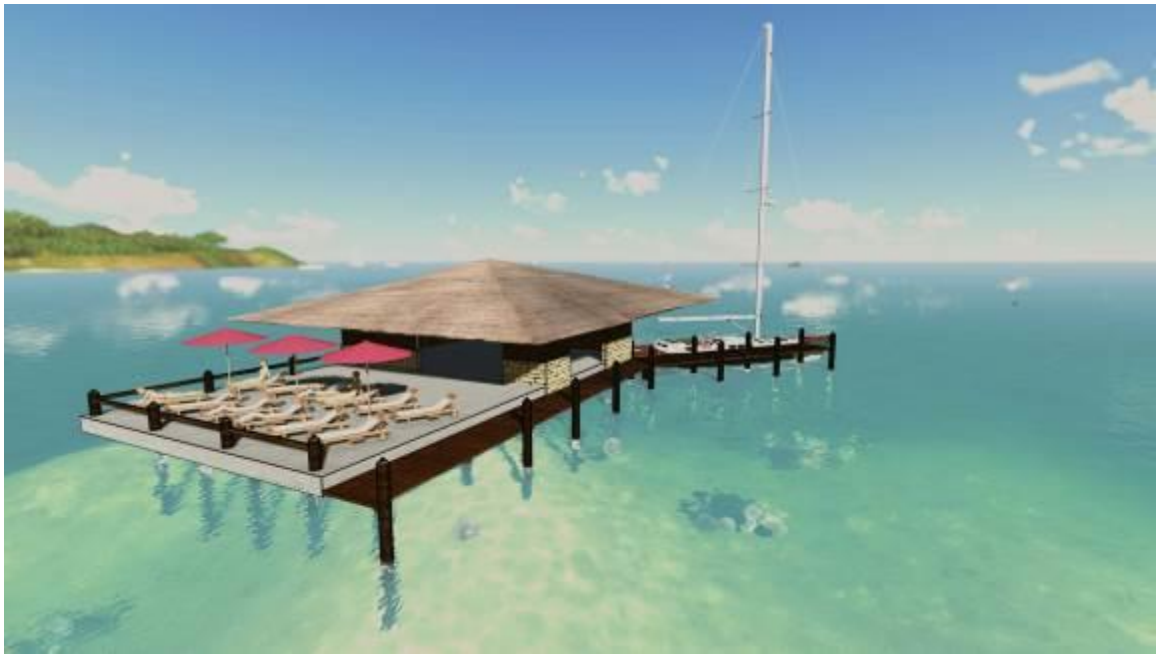
Brief Project Description and Location:
Offshore Oasis Limited has applied for a Beach Licence for the construction and maintenance of an over-water structure to be deployed at Lilliput in the Parish of St. James. The structure will serve as a Bar Attraction. The proposed bar location will be as defined on the figure below.

Proposed Location of Overwater Bar in Relation to the Iberostar Hotel in Lilliput, St. James.

Once constructed, the structure will have a footprint of approximately 19m x 12m, a vertical rise of 6.4m from the waterline, with the base floor of the bar being 2.0 meters above sea level. **The bar will be able to accommodate up to 50 patrons at a time**.

The figure below shows an artist's rendition of what the bar will look like once deployed. The bar has both a tourism attraction and an environmental sustainability component as its main implementation forces, with the latter to be supported by public education efforts made by the bar management and staff to patrons to enhance environmental awareness.

The bar will not be physically connected to the shoreline, the proposed position being approximately 800 meters north of the Grange Pen Fishing Beach in Lilliput, St. James. Thus, the bar will be have to be serviced by way of boats, access for which will be obtained from the adjoining Iberostar Hotel, for which there is a signed arrangement between the hotel and Offshore Oasis Ltd for access, or through water taxi operations from the Grange Pen Fishing Beach (with operators having obtained the required registrations through the relevant government authorities).



Artist's Impression of Completed Over-water Bar.

Brief Construction Description:
To construct the bar, sixty-one 30.5cm diameter PVC sleeved reinforced concrete piles will be driven into the seafloor at the project site, after which a wooden super structure will be built over the piles to support a wooden deck. The bar building will then be built on top of the deck.

The construction process will be supported by a work barge with a mounted crane, as well as a shallow draught work boat and support vessels from appropriately registered persons chartered from the fishing beach. Man-portable construction items will be transported by boat from the Iberostar Hotel's jetty. Heavy items, such as the construction piles and concrete, will be loaded onto the barge from a boatyard site at Greenwood, to the east of the site. **Management personnel from both the hotel and the boatyard have issued signed agreements for the use of the areas for the loading purposes.**

Brief Site Description:
The proposed site is underlain with marine sand with fringing reefs being present approximately 100 meters to the north of the site and a mixture of Turtle and Manatee Grasses (***Thalassia testudinum*** and ***Syringodium filiforme***) being present to the east, west and south of the site. The site location was chosen due to the fact that it had no sensitive attached or mobile benthic organisms within the footprint of the proposed structure. No extensive populations of fish were observed at the time of the conducting of site surveys; however, the surrounding seagrass beds are known to provide nursery support for marine fauna.

Water depths at the site were approximately 1.4 meters, with depths of 1.8 meters existing to the south of the site and 0.3 meters existing at the fringing reef to the north. Wave conditions at the time of the conducting of surveys were estimated to be less than 0.5 meters and were typical of a sheltered back-reef condition.

The site appeared to be influenced by winter storm wave events between the months of December and April, while the area has been influenced by the passage of hurricanes, the most significant of which was Hurricane Allen in 1980. Field investigations conducted by the Geological Survey Division after the passage of Hurricane Allen suggested that storm surge heights of between 1.2m and 1.8m may have influenced the

back reef and shore area. These observations were validified by calculations conducted by the oceanographic firm Sea Control and the Coastal Research Laboratory School of Geosciences, University of Florida for the clients, which suggested that surge heights of 1.5 meters were possible at the site.

Summary of Impacts and Mitigations:
The National Environment and Planning Agency (NEPA), in a letter to the proponents dated November 2, 2018 (reference number 2018-08017-BL00060), advised that an Environmental Impact Assessment (EIA) would be required to facilitate the Agency's review process. The format of the EIA was to conform to a Terms of Reference, which is depicted in **Appendices 1A-B**.

The following **Impact and Mitigation table matrix** summarizes impacts and mitigations evaluated for the proposed project

Table – Impact/Mitigation Matrix: Construction Impacts and Mitigation

Activity	Impact	Mitigation
Boat Access	Potential for grounding and seafloor damage	1. Detailed site navigation mapping 2. Shallow draught vessel selection
Pile driving/casting	1. Noise impacts 2. Turbidity impacts 3. Piling erosion impacts	1. Noise attenuation with distance expected 2. Utilizing tremie method for concrete casting 3. Deployment of erosion mitigation at the base of piles – preference for mitigation that aids in supporting benthic fauna – to be designed.
Superstructure construction	Solid waste generation from construction process (e.g., lumber cuttings)	1. Deployment of nylon mesh screening for base and sides of construction to trap dropped solid waste 2. Packaging of construction waste for transport to shore and approved solid waste disposal site.
	Solid waste generated by construction staff (e.g., packaging)	Refer to above.
	Sewage Waste Impacts due to improper management of both black and grey water	Deployment of porta potties and portable hand sanitization stations for sewage management and water conservation. An authorized contractor would conduct management of these solutions.
	Equipment pollution impacts during refuelling or operation	1. No bulk storage of fuel/oil/lubricants at site 2. Placement of refuelling/replenishment

		containers on spill trays to trap possible spills. 3. Maintenance of Spill/turbidity boom around worksite 4. Maintenance of spill response packs at site 5. Preparation and maintenance of an emergency response plan to include spill responses. 6. Implementation of training for work personnel in oil spill response
	Pollution impacts due to painting and wood staining	1. Placement of paint/stain containers on spill trays while in use 2. Use of pre-stained wood for deck. 3. Placement of spill sheets on deck to prevent splashes into marine environment.
	Spills and other environmental issues due to collisions at sea with structure/construction vessels while at night.	Employment of navigation illumination in accordance with dictates from the relevant maritime agencies.
	Impacts related to fire	1. Maintenance of fire suppression aids at sea 2. Preparation and maintenance of an emergency response plan to include fire responses. 3. Implementation of training for work personnel in fire response
Socio-economic impacts	Impacts related to solid/liquid waste and oil spill impacts as well as collision risks on hotel and fishing interests.	Mitigations as outlined above.
	Positive impacts during construction due to use of fishers' boats for ferrying between mainland and the construction site.	

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Table - Operational Impacts and Mitigation

Activity	Impact	Mitigation
Bar Operation	Operation staff/patron solid waste impacts	As per construction solid waste mitigations above.
	Sewage Waste Impacts due to improper management of both black and grey water	Deployment of porta potties and portable hand sanitization stations for sewage management and water conservation. Containment of grey water from bar sink in built-in storage for transport to land for approved disposal.
	Fuel/fire impacts during operation	1. Maintenance of spill response packs at site 2. Preparation and maintenance of an emergency response plan to include spill and fire responses. 3. Implementation of training for work personnel in oil spill/fire response
	Pollution impacts due to painting and wood staining	4. Placement of paint/stain containers on spill trays while in use 5. Use of pre-stained wood for deck. 6. Placement of spill sheets on deck to prevent splashes into marine environment.
	Spills and other environmental issues due to collisions at sea with structure/construction vessels while at night.	Employment of navigation illumination in accordance with dictates from the relevant maritime agencies.
Socio-economic impacts	**Positive impacts during construction due to use of fishers' boats for ferrying patrons between mainland and the construction.**	Boat crews will have to meet water taxi operation standards stipulated by the responsible agencies.

2.0 INTRODUCTION

2.1 LOCATION AND BASIC DESCRIPTION:

Offshore Oasis Ltd. has applied for a Beach Licence (**Reference Number 2018-08017-BL00060**) for the construction and maintenance of an over water structure to be deployed at Lilliput in the Parish of St. James. The structure will serve as a Bar Attraction and is located approximately 20 kilometres to the east of the Montego Bay city centre.

Figures 1A-B show the proposed location of the bar attraction while **Figures 2A-C** show plan and elevation views and an artist's concept of what the bar attraction will look like once completed. Once constructed, the structure will have a footprint of approximately 19m x 12m, an overall elevation of 6.4m and a deck elevated 2.0 meters above the waterline.

An approximation of the visual footprint of the proposed bar from shore will be equivalent to that of an 18m catamaran anchored approximately 800 meters offshore at the Lilliput site.

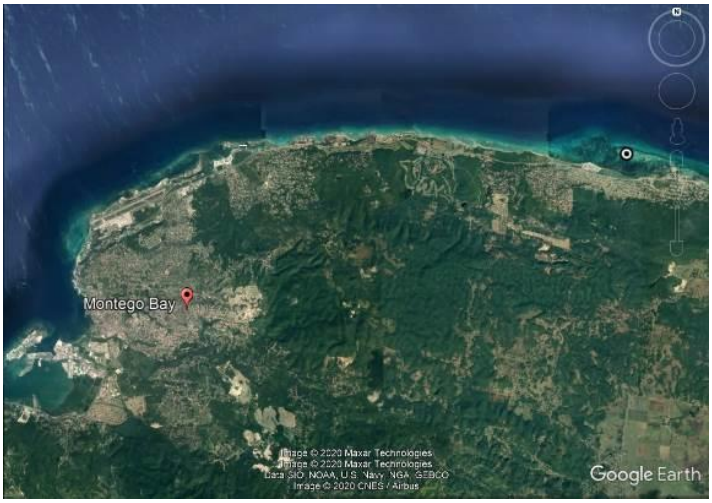

Figure 1A: Proposed Locations for Overwater Bars in Lilliput, St. James In Relation To The City Of Montego Bay

Figure 1B: Close-up of Location of Over-Water Bar At Lilliput, St. James.

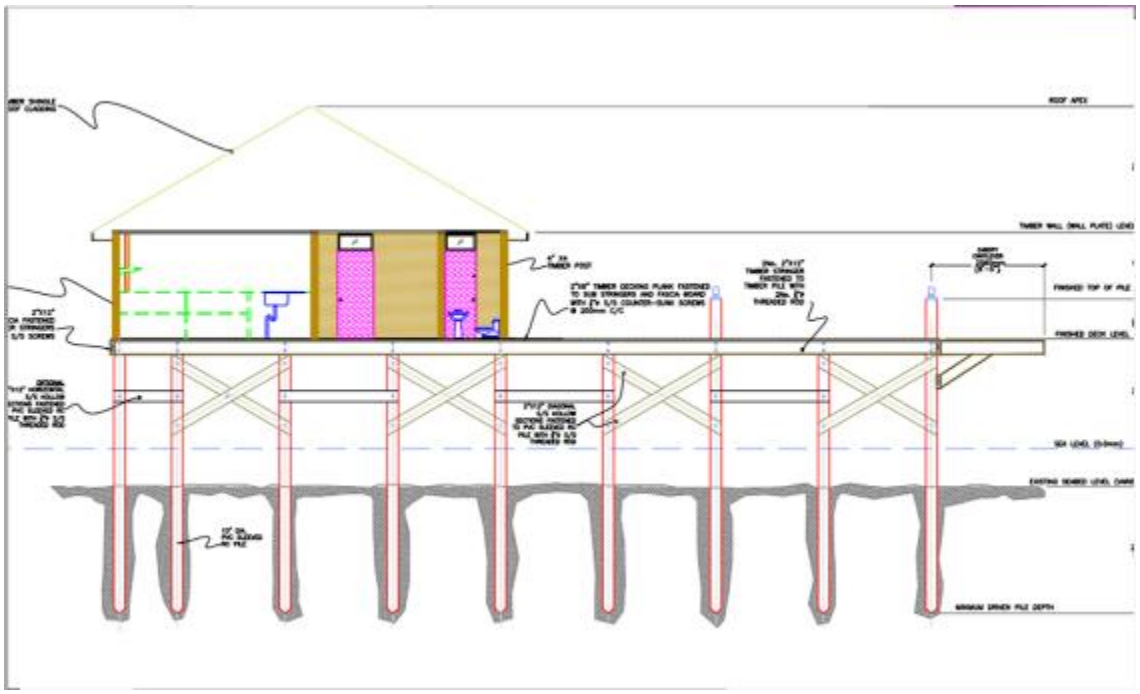

Figure 2A: Elevation View of Over-Water Bar [1]

[1] Refer to detailed drawings submitted.

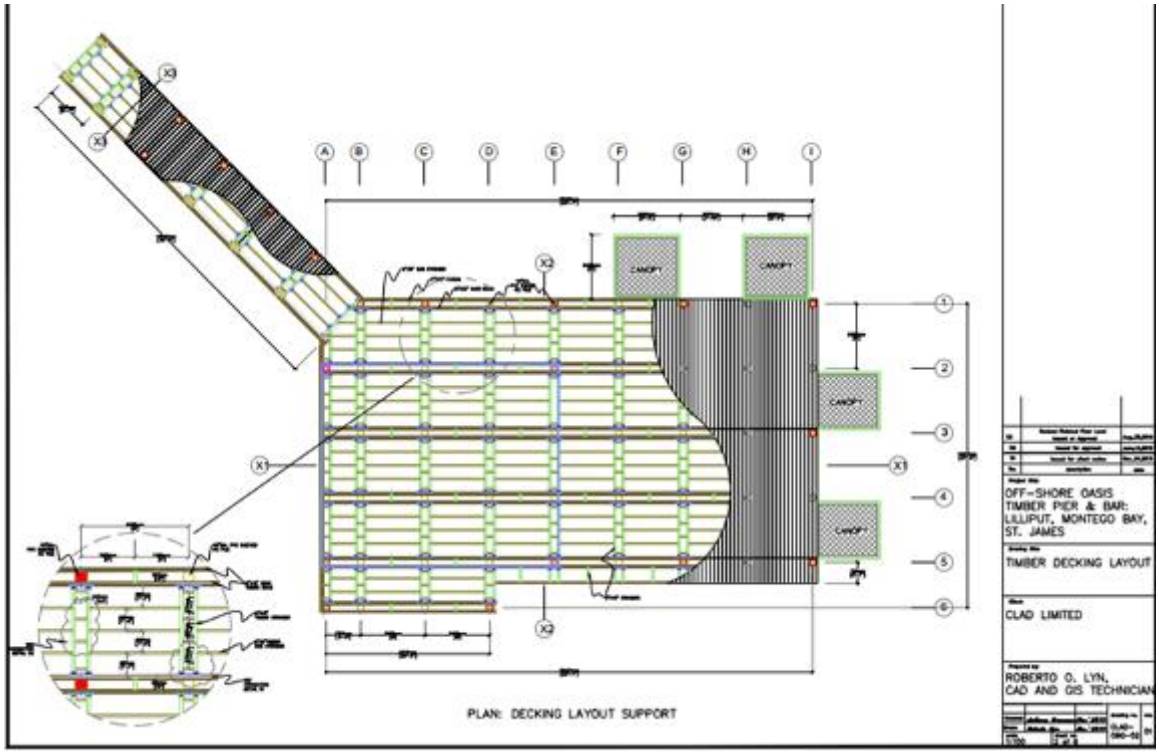

Figure 2B: Plan View of Over-water Bar Design[2]

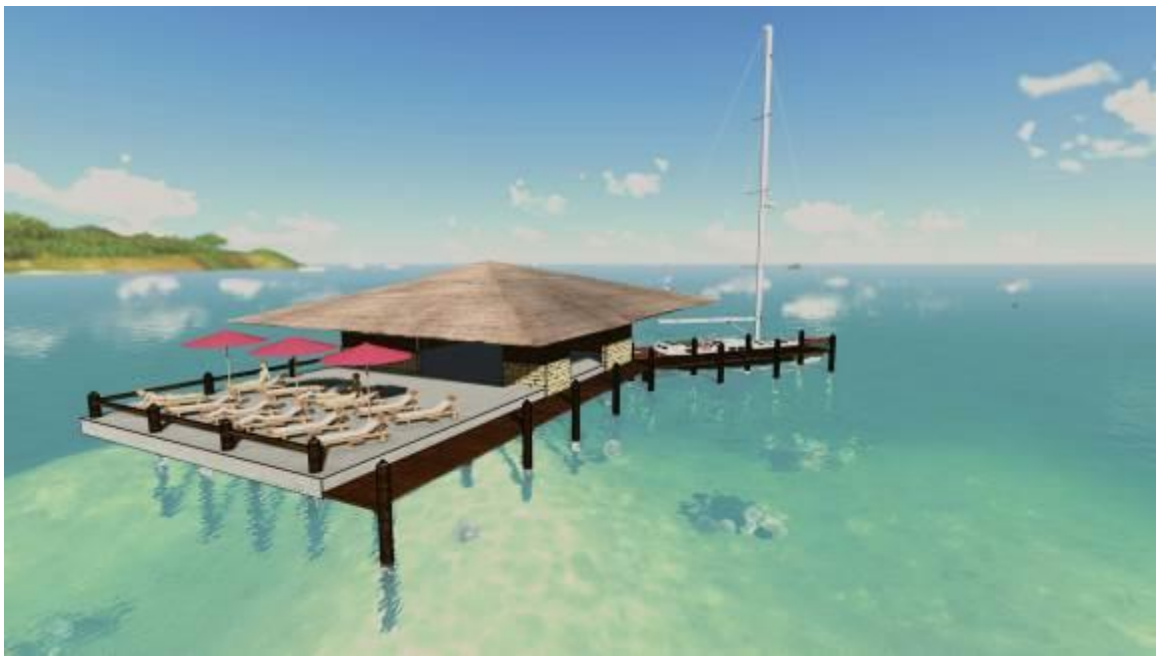

Figure 2C: Artist's Impression Of Completed Over-water Bar

The proposed bar will function as a typical bar, with comparable opening and closing hours. The proponents anticipate being able to accommodate a maximum of 50 persons at any one setting for up to two

[2] Refer to detailed drawings submitted.

hours. Thus, for a 10-hour opening period, it is anticipated that the bar could have a through-put of 250 persons.

Liquid refreshments will be served, and musical entertainment will be provided. No provisions for whole-scale cooking have been illustrated on the supporting drawings for the project at this time. However, it is anticipated that store-bought snacks and other condiments will be provided.

The bar is not connected physically to the shoreline and will be serviced by way of boat access from the adjoining Iberostar Hotel area, arrangements for which have been agreed to by way of a written agreement between Offshore Oasis Ltd and Iberostar Resorts (**discussed in Section 7**). Additionally, it is anticipated that Fishers from a fishing beach adjoining the Iberostar Resort to the east may capitalize on the opportunity to transport clients external to the Iberostar Resort to the site. For these Fishers, it will be incumbent upon them to ensure that they meet the regulatory requirements to provide Water Taxi services.

The bar will not be promoted as a location for swimming and snorkelling, as no changing or showering facilities will be provided, nor will Beach Licences be applied for to facilitate the use of the adjoining sea area for swimming. It is, however, anticipated that some patrons may choose to snorkel or swim on their own accord and at their own risk. As a precaution, the operators will have both lifeguards and lifesaving kit at the site in the event that a rescue is required.

The developers have established a working relationship with the Iberostar Hotel, which has indicated that they would be willing to send patrons to the overwater bar by way of boats to complement the hotel's attraction base. The bar's design will include a jetty extension that will facilitate the movement of persons from boats to the bar and vice versa. Other patrons may wish to charter a vessel to get to the site and the fishers of the Grange Pen (Lilliput) Fishers Cooperative have indicated their willingness to undergo the required training and certification to qualify them as Water Taxi operators to facilitate this movement.

No provisions are currently contemplated to provide mooring facilities for visiting boats other than the jetty accommodation included on the design.

2.2 PROJECT RATIONALE:

The project has a tourism attraction component as its main implementation force. However, there are additional core reasons the Offshore Oasis bar concept is being proposed.

The project will be a platformed bar attraction that will ultimately contribute directly and indirectly to the support of the local community economy as well as the local environment. The plan is to:

- Offer a first world, high quality bar setting, serving top quality cocktails in a stunning and unique over water location out at sea.
- Educate those who come to enjoy the experience at the bar.
- Develop a structure that will, by its design, aid in the provision of a supporting habitat for marine life within the proposed project area.
- Support the creation of alternative livelihoods for the fishermen by using them as registered water taxi operators to shuttle guests to and from the bars.
- Show how Jamaicans can offer the world new innovative approaches to marine conservation, all while having an enjoyable time.

Application Process:

In a correspondence prepared by the National Environment and Planning Agency (NEPA) to the proponents dated November 2, 2018 (reference number 2018-08017-BL00060), the proponents were advised that an Environmental Impact Assessment (EIA) would be required to facilitate the Agency's review process. The format of the EIA was to conform to a Terms of Reference, which is depicted in **Appendices 1A-B**.

This document serves to describe:

a) the manner in which the development will be implemented,
b) the various regulatory considerations required to facilitate an approval
c) the nature of the physical and biological environment within which the development is intended to be positioned
d) select tourism/fishing sector public opinion
e) foreseen impacts and mitigations required to prevent negative impacts.

2.3 PROJECT PROPONENTS AND CONSULTANTS:

The following entities will be integrally involved in the management of the interphase between the project and the reviewing regulating agencies:

Offshore Oasis Ltd:

Mr. Troy King - Partner / General Manager - In addition to being the general manager at start-up, Mr. King is also a partner in the corporation. He will manage the day-to-day operations of the bar and its staff. Mr. King has over 31 years of hospitality management which includes both restaurants and bars. He has worked his way up in the industry from bartender/server all the way to the corporate office of an international hospitality operation, overseeing 140 restaurants and 90 bars. He also holds a Bachelor's of Science degree in Hotel and Restaurant management from the world-acclaimed Conrad N. Hilton college at the University of Houston.

Mr. Nigel Knowles - Partner /Sales and Marketing - Experience of 23 years. Within the top 7 sales people out of 70 national salesmen for 6 years straight. Mechanical engineer by trade, HND qualified starting as an apprentice progressing to development engineer, designing ceramic replacement hip joints and other endo-prosthesis. Company director and business founder for 20 years. Specializing in the sales and marketing side of the business with business partner managing operations. ("I get the work, he does it" is our motto). Jamaican passport holder who was brought up in Jamaican tourism, his father was Director of Tourism for Jamaica for many years.

Peter Wilson-Kelly (MPhil) and Associates

Peter Wilson-Kelly (MPhil) and Associates commenced working in 2006. Its principal is a Marine and Terrestrial Ecologist, Coastal Zone/Watersheds Management, Remote Sensing and Environmental Impact Mitigation specialist with over 30 years working experience in all fields.

Peter Wilson-Kelly and Associates currently consults in the areas of:

1. Natural resources spatial mapping (terrestrial and marine)
2. Natural resources status assessments (terrestrial and marine)
3. Hydrographical assessments
4. Coastal Zone and Watershed Management
5. Environmental Impact Analysis
6. Environmental Impact Mitigation
7. Aerial photography and air photo interpretation

Sea Control

Sea Control is a Jamaican oceanographic and engineering firm established in 1986. Its principal, **Mr. Pierre Diaz**, holds a degree in Physical Oceanography from the Florida Institute of Technology and specializes in coastal modifications for the creation and enhancement of shorelines.

Ping Wang, PhD

Dr. Wang is an associate consultant to Sea Control and is a Professor of Geosciences at the University of South Florida. Dr. Wang is also the director of the University of South Florida's Coastal Research Laboratory group. Dr. Wang has done a considerable amount of research in the areas of coastal geology, sedimentary geology, coastal sedimentary processes, nearshore sediment transport, nearshore wave and current dynamics, coastal morpho dynamics, coastal engineering and management. He has also authored/co-authored over 20 publications related to coastal processes.

3.0 POLICY, LEGISLATION AND REGULATORY CONSIDERATION

The following represents policies, legislation and regulatory implements that would govern the construction and operation of the proposed over-water bars:

3.1 THE NATURAL RESOURCES CONSERVATION AUTHORITY ACT (NRCA ACT), 1991:

The Natural Resources Conservation Authority Act (administered through the Natural Resources Conservation Authority – NRCA), promulgated in 1991 sets the framework for the management and protection of all natural resources in Jamaica. The Act gives (among others) provisions for the following:

1. The environmental management of development under the Natural Resources (Prescribed Areas) (Prohibition of Categories of Enterprise, Construction and Development Order) 1997, as well as the implementation of Environmental Impact Assessments (EIA) under the Act's Permit and Licensing Regulations (Natural Resources Conservation (Permits and Licences) Regulations, 1996 / Natural Resources Conservation (Permits and Licences) Amendment Regulations, 2004).
2. The provision for the establishment of Parks and Protected Areas to protect areas deemed to be of significant environmental importance.
3. The offering of protection from various forms of pollution, in particular, water pollution (Natural Resources Conservation (Wastewater and Sludge Regulations 2013).
4. The provision of mechanisms of appeal to applicants whose applications are not ratified by the NRCA review and approval process (Natural Resources Conservation Authority Appeals Tribunal Rules 1997)

3.2 THE BEACH CONTROL ACT 1956

This Act (administered by the NRCA) governs matters related to access to the shoreline and the commercial recreational use of the foreshore and the floor of the sea. This Act was amended in 2004, along with amendments to the licensing regulations in 2015 (The Beach Control (Licensing) (Amendment) Regulations, 2015). The Act also allows for the declaration of protected areas and the prohibition of specific activities such as fishing, coral removal, dredging and waste disposal.

3.3 THE WILDLIFE PROTECTION ACT 1945

The Wildlife Protection Act (administered by the NRCA) governs the protection of Jamaica's natural wildlife and prohibits the removal and sale of protected wildlife. The Act also provides protection against the introduction of polluting elements into receiving bodies known to harbour important wildlife. Further, the Act facilitates the establishment of Game Sanctuaries and Game Reserves.

Subsequent amendments to the Act include:

- Wildlife Protection Act (Amendment of First Schedule Orders 1997, 1998, 1999,
- Wildlife Protection Act (Amendment of Third Schedule Order 2001,
- Wildlife Protection Act (Amendment of Second Schedule Order 2002,

3.4 NATURAL RESOURCES CONSERVATION (WASTEWATER AND SLUDGE) REGULATIONS, 2013

These regulations were prepared to allow the regulating agency to be able to demand greater accountability

from operators of wastewater treatment plants to ensure that these facilities met the required treatment and disposal standards.

3.5 THE TOWN AND COUNTRY PLANNING ACT (1958, 1987)

This Act (administered through the NRCA) facilitates the orderly development of lands, urban or rural areas, to preserve and improve the amenities thereof within the country. The Act provides for the creation of Development Orders, which are designed to regulate the manner in which applications for the development of lands are to be managed by local planning authorities.

The Town and Country Planning (St. James Parish) Provisional Development Order 2018 represents the most recent instrument for the management of development approvals within the parish of St. James. **Figure 3** illustrates the spatial coverage of development-related planning controlled by Development Orders. Both project areas fall within an area governed by the St. James Parish Confirmed Development Order 1982

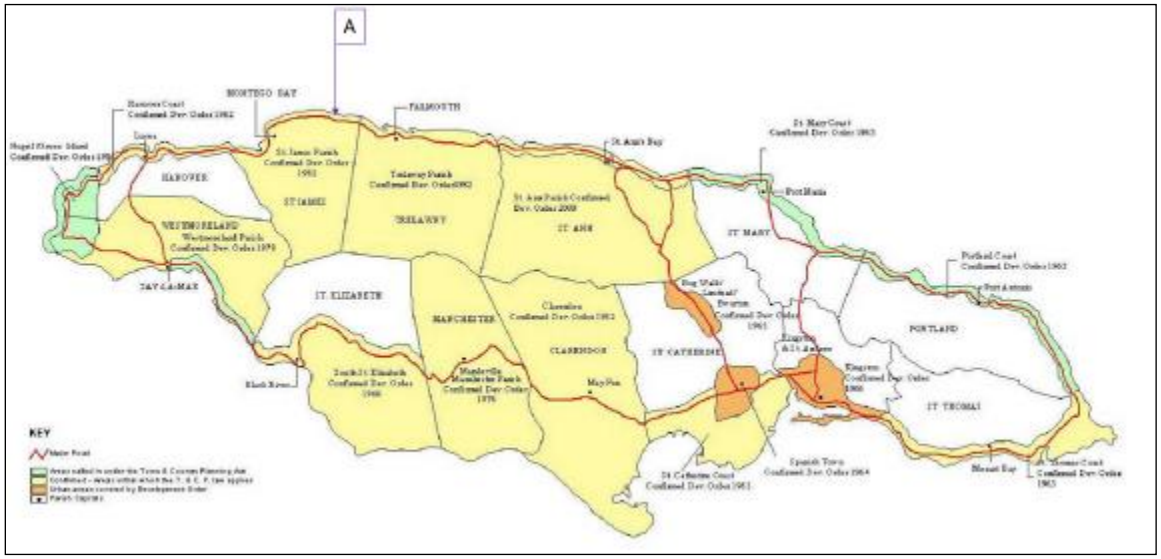

Figure 3: Spatial Coverage of Development-Related Planning Controlled by Development Orders (A: Location Of Project Site)

3.6 THE BUILDING ACT (2019)

The Building Act vests responsibility for the review and approval of building applications to the local Municipal Corporations in each parish as the Local Building Authority. In this instance, the St. James Municipal Corporation would review building applications for the over-water bar. The Building Act also mandates the use of the Jamaica National Building Code in the design of structures.

3.7 THE HARBOURS ACT (2001)

The Harbours Act (administered through the Harbours and Port Services Division of the Port Authority) provides the legal framework within which marine traffic, port facilities and marine safety is regulated in Jamaican Harbours. Aids to navigation, waterways and channel safety, the control of vessel traffic, the maintenance of berthing faces and the provision of pilotage services are all controlled under this Act.

Since the proposed location of the bars is offshore, it will be necessary to ensure that the structure does not pose a hazard to safe boat navigation, particularly at night.

3.8 THE FISHERIES ACT (2018)

This Act is administered by the National Fisheries Authority and repeals the Fishing Industry Act of 1976. The new act serves to manage fishery resources within Jamaican waters and can exercise management

through the declaration of Fishery Management Areas. There are no such Fishery Management Areas at the Lilliput site.

3.9 THE TOURIST BOARD ACT (1999)

The Tourist Board Act, which is administered through the Tourism Product Development Company Ltd. (TPDCo), serves to empower the TPDCo to "facilitate the maintenance, development and enhancement of the Jamaican tourism product"[3]. The project intends to interface with the tourism product within the Montego Bay and Lilliput areas and, as a result, will have to adhere to the dictates of TPDCo.

3.10 SPIRIT LICENCE ACT (AMENDED 2012)

This Act indicates that any person or entity wishing to operate a business involved in the selling of spirits, wine, beer, rum, malt liquors and other alcoholic beverages will have to apply for a Spirit Licence.

3.11 THE NATIONAL LAND AGENCY (NLA)

The NLA's mandate of managing land registration, valuation, ownership and lease is obtained under the following Acts of Parliament:

1. Crown Property (Vesting) Act
2. Land Acquisition Act
3. Land Surveyors Act
4. Land Valuation Act
5. Registration of Titles Act
6. Registration (Strata Titles) Act
7. Executive Agencies Act

The NLA's relevance in this project matter is owed to the fact that access to the floor of the sea upon which the proposed project is intended to be deployed will require the permission of the Agency under a lease.

3.12 NOISE ABATEMENT ACT (1997)

This Act is designed to control and regulate the generation of noise from private and public places. Section 3-1 of the act states that "no person shall, on any private premises or in any public place at any time of day or night (a) sing or sound or play upon any musical or noisy instrument or (b) operate or permit or cause to be operated any loudspeaker, microphone or any other device for the amplification of sound, in such a manner that the sound is audible beyond a distance of 100 meters from the source of such sound and is reasonably capable of causing annoyance to persons..."

3.13 THE NATIONAL SOLID WASTE MANAGEMENT AUTHORITY ACT (2002)

The NSWMA Act established the NSWMA as the government agency vested with the management responsibility for the regulation and management of solid waste in the country. Solid waste management has even greater significance at the project site, owing to the fact that it is offshore.

3.14 LOCAL GOVERNANCE ACT, 2016

This Act provided for the comprehensive reform of Jamaica's local government system through which Local Authorities were granted greater scope and autonomy in the management of local planning affairs.

3.15 PUBLIC HEALTH ACT, 1985

This Act was promulgated as a means to promote general public health and to prevent the spread of communicable epidemic diseases. The regulations of this act governing the management of the dispensing of drink or food will be relevant to the management of the proposed project.

[3] Quoted from https://www.tpdco.org

3.16 MARITIME AREAS ACT

This Act declares the country of Jamaica as an Archipelagic State, with the sovereignty of Jamaica being extended to the seaward limits of the waters enclosed by the archipelagic baselines of the state.

3.17 FIRE BRIGADE ACT

This Act established the country's fire response mechanism and also embodies the Jamaica Fire Brigade's Fire Prevention Division into the development planning process. The division has the responsibility for making recommendations on measures to be implemented by developers to mitigate against or respond to matters related to fire.

3.18 DISASTER RISK MANAGEMENT ACT 2015

This Act establishes the Office of Disaster Preparedness and Emergency Management, whose function includes that of conducting such activities that are necessary to:

- "Advance disaster preparedness and emergency management in Jamaica by facilitating and coordinating the development and implementation of integrated disaster management systems and:
- Institute measures as may be necessary for mitigating disasters"[4].

3.19 PRESCRIPTION ACT 1969

Section 2 of this Act seeks to preserve the right of access or easement over water or any watercourse for any person claiming right of undisturbed passage for a period of twenty years or more.

3.20 NEPA PLANNING GUIDELINES – OVERWATER STRUCTURES JANUARY 2016[5]

The following specific guidance will be relevant to the management of the project:

1. Section 3.1.4 of the guidelines specifies that "The developer of any overwater structure must obtain the necessary licence and permit from the Natural Conservation Authority (NRCA) before proceeding with the development."
2. Section 3.1.2. of the guidelines specifies that "All potential developments will require an Environmental Impact Assessment (EIA). The Terms of Reference of the EIA will address concerns specific to the development and must be approved by the National Environment and Planning Authority (NEPA)."
3. Section 3.1.6 specifies that "A performance bond will be required for companies or persons permitted/licensed to construct an overwater structure. The performance bond seeks to ensure compliance with the terms of the permit/licence including environmental management, monitoring and decommissioning."
4. Sections 3.1.13 and 3.3.9 specify that "The Commissioner of Land is responsible for the vesting of lease of the sea floor or marine space over which the proposed development is to take place. The applicant should identify the location and extent of the land/marine space required for the proposed development by means of a suitably referenced description, map/chart/diagram, bounding coordinates or other appropriate means."
5. Section 3. 4 specifies that "The electrical and mechanical engineered design of the overwater structure should be such that all electrical conduits, water supply, wastewater disposal and butane pipes, must be easily accessible yet shielded from view. The proposed system would need to meet the highest code of International Fire Safety and Systems regulations."
6. Section 3.4.6 specifies that "The artificial lighting of the overwater structures must be shielded from direct transmission on the water and on the shoreline areas of natural habitats."

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[4] Extracted from Disaster Risk Management Act 2015.

[5] Extracted from Technical Report for the Construction and Maintenance of Overwater Structure at Whitehouse, Westmoreland prepared for Sandals Resorts International April 2017.

7. Section 3.4.10 specifies that "All material for construction including roofing, roof structure walls, flooring, pipe works, wires and conduits, to be used in construction must be environmentally friendly and marine resistant."

3.21 NATIONAL BUILDING CODE OF JAMAICA

The National Building Code of Jamaica comprises several international and local documents governing the establishment of buildings, particularly as they relate to structural integrity and disaster resilience. The Code works in concert with the **Building Act of 2018**, which seeks to add legal credence to the enforcement of the Code by Municipal Corporations island wide.

3.22 RELEVANT POLICIES AND CONVENTIONS

The following policies and conventions (listed in **Table 1** below) will also be relevant to the environmental management of the proposed project:

Table 1: Policies and Conventions Relevant to The Environmental Management of The Proposed Project.

Document	Mandate	Project Relevance
National Strategy and Action Plan on Biological Diversity in Jamaica 2016-2021	The Strategy seeks to outline strategies to foster the conservation of Jamaica's natural habitats and species.	The Lilliput site is a marine location surrounded by seagrass beds and a coral reef adjoins the site. The location of the development site therefore makes all the policies and conventions cited relevant to the management of the site
National Policy for the Conservation of Seagrasses (1996)	The policy seeks to guide the issuing of licences or permits for projects that will directly or indirectly impact on seagrasses.	
Coral Reef Protection and Preservation Policy (1997)	The policy seeks to advance 5 management goals that speak to pollution management, fishery management, physical damage reduction and the avoidance of coastal development that contribute to reef destruction.	
Ocean and Coastal Zone Management Policy in Jamaica, 2000	The policy seeks to achieve the sustainable development of coastal resources	
Coastal Management and Beach Restoration Guidelines	The guidelines represent an integration of two pre-existing guidelines, namely, 1-NRCA Guidelines for the Planning, Construction and Maintenance of Facilities for Enhancement and Protection of Shorelines (Circa 1995); and 2- Draft Guidelines for the Relocation and Restoration of Jamaica's Coastal	

	Resources: Corals, Seagrasses & Mangroves, A Guide for Developers (2010).	
United Nations Convention on Biological Diversity	Seeks to advance "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources."[6]	
United Nations Convention on the Law of the Sea (UNCLOS III), 1982	The Law of the Sea establishes a system of law and order in the world's oceans and seas and establishes rules that govern the use of all marine resources.	
Cartagena Convention, 1983	The Convention requires the adoption of measures to prevent, reduce and control pollution from ships, dumping, seabed activities and pollution from land-based sources.	
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	This Convention seeks to "promote the effective control of all sources of marine pollution and to take all practicable steps to prevent pollution of the sea by dumping of wastes and other matter."[7]	

4.0 METHODOLOGY AND APPROACH

4.1 AIR PHOTO INTERPRETATION AND INITIAL SPATIAL MAPPING:

Vertically oriented Google Earth[8] satellite images for the year 2019 were accessed and spatial distinctions in both benthic substrate/lifeforms and adjoining terrestrial lifeforms were interpreted from images using photogrammetric[9] techniques.

The initial spatial interpretations were then inputted into a Geographical Information System[10] so that they could be referenced to the Jamaica map projection/coordinate system (JAD 2001[11]) to determine scale. Ground truthing techniques (defined below in **Section 5.2**) were then used to confirm the photogrammetric interpretations made.

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6 Quoted from www.cbd.int>gbo1>chap-02

7 Quoted from www.imo.org>Environment>LCLP>Pages

8 www.earthgoogle.com

9 Photogrammetry is the science and technology of obtaining reliable information about physical objects and the environment through the process of recording, measuring and interpreting photographic images and patterns of electromagnetic radiant imagery and other phenomena – wikipedia.org

10 www.mapmakerpro.com

11 http://www.jamaicancaves.org/jad2001.htm

4.2 FIELD DATA COLLECTION FOR GROUND-TRUTHING:
4.2.1 BIOLOGICAL DATA COLLECTION:
Field data was collected to support the aerial imagery interpretations made. **Figure 4A**-1represents transect paths of approximately 170m in length over which vertically oriented underwater video imagery was captured with the use of a diver held GoPro video camera. The camera was held approximately a meter above the seafloor substrate and facilitated a field of view approximately 1 meter wide, thus a total seafloor area of approximately 510 square meters was covered.

A hand-held global positioning system (GPS) was carried in a waterproof transparent container along with the diver. Internal clocks on both the GPS and GoPro camera were synchronized, thus, when downloaded, the navigation tracks featured times that could be corroborated with that shown on the underwater video.
Thus, the recorder's position while compiling the video transect could be determined and the character of the seafloor along the transect could be compared with the image interpretations made on the google earth images used for photointerpretation.

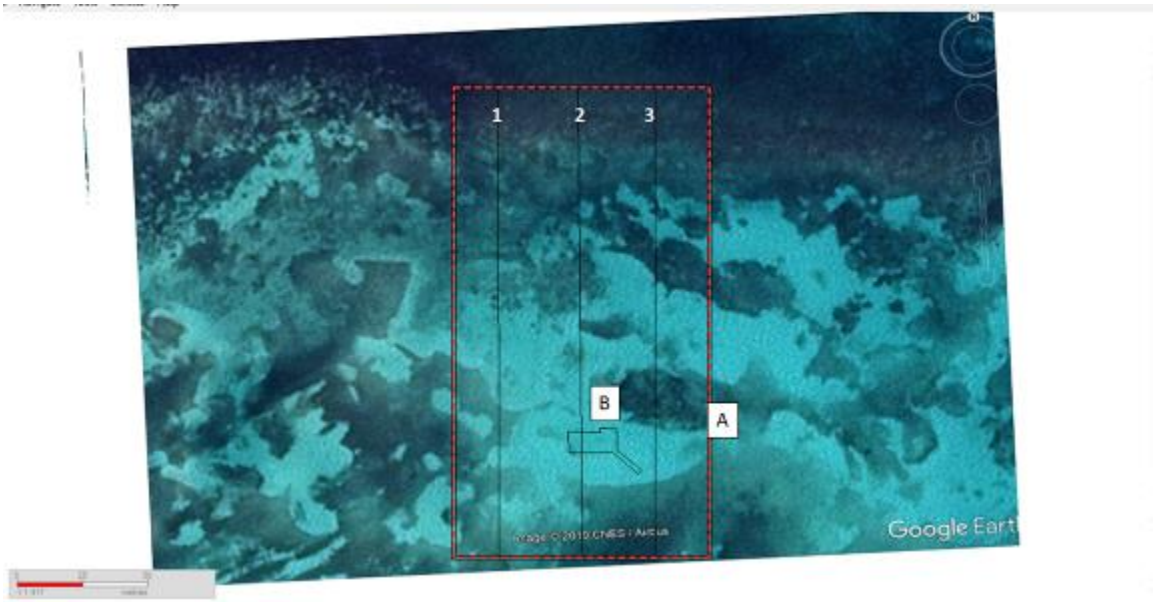


Figure 4A-1: Paths Over Which Visual Observations Were Made at The Lilliput Study Site (A: study area, B: site footprint, 1-3: transect orientations over study area)

Upon viewing the vertically oriented video information, where important seafloor features, such as seagrasses or reef structures were encountered, the CPCe substrate percentage coverage determination software[12] was used to assist in the determination of identities and substrate/benthic lifeform percentage coverage present on the video transects captured. Free-swimming fauna were assessed using the AGRRA fish census method[13]. **Figure 4A-2** shows areas within which CPCe, and AGRRA-based assessments were made.

[12] Kohler, K.E. and S.M. Gill, 2006. Coral Point Count with Excel extensions (CPCe): A Visual Basic program for the determination of coral and substrate coverage using random point count methodology. Computers and Geosciences, Vol. 32, No. 9, pp. 1259-1269, DOI:10.1016/j.cageo.2005.11.009.
[13] www.agrra.org

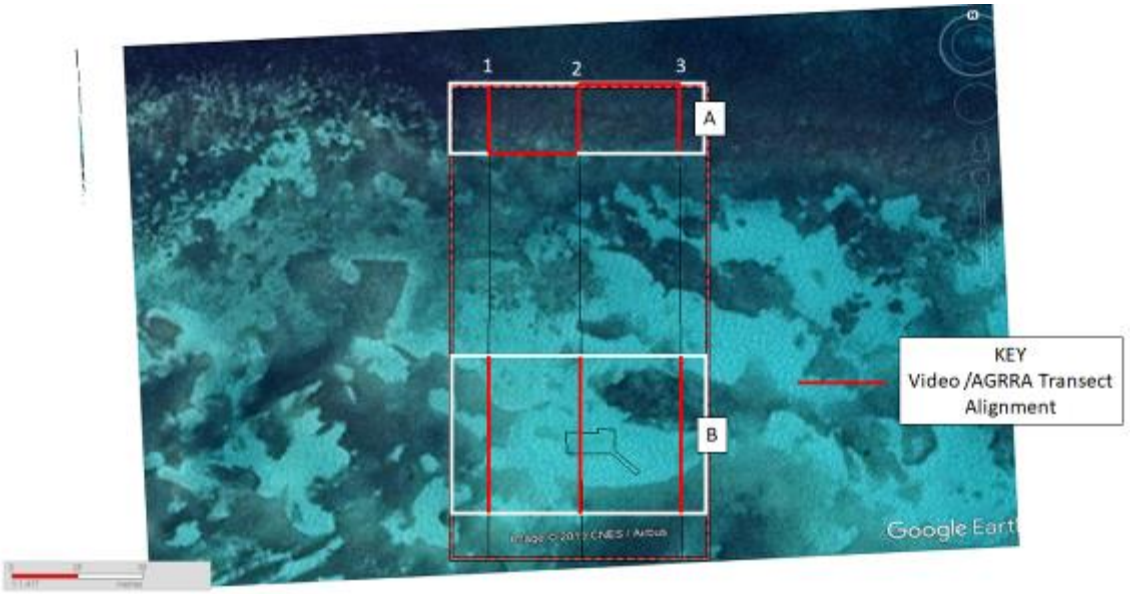


Figure 4A-2: Areas Within Which AGRRA/CPCe-Based Assessments Were Made (A-B) For the Determination of Fish Numbers/Percentage Coverage Of Various Lifeforms.

Both flora and fauna species lists were generated from the video and visually captured information, with levels of importance (threatened, endemic etc) being attributed to the species listed.

4.2.2 GEOPHYSICAL DATA COLLECTION:

4.2.2.1 WATER QUALITY

Five sets of water samples set were collected from the sea surface at the sample locations including the vicinity of the bar, listed below (see **Figure 4B-1A** below):

- 18.519599N 77.756488W (site location)
- 18.521886N 77.756413W (north of site beyond reef)
- 18.512704N 77.755551W (south of the site near to shore)
- 18.516157N 77.749945W (east of site)
- 18.519044N 77.768222W (west of site)

Figure 4B-1A: Water Sample Locations At/Around Project Location

Analysis for the following parameters was done:

1. Nitrates
2. Phosphates
3. Faecal Coliforms
4. Biochemical Oxygen Demand
5. Total Suspended Solids

Results for the analysis are presented in **Appendix 2A**. The values obtained were then compared with the Jamaica National Ambient Water Quality Standard (Marine Water – **Table 2**) for marine environments to determine the status of the waters surrounding the proposed site.

Table 2: Draft Jamaica National Ambient Water Quality Standard - Marine Water, 2009[14]

Parameter	Measured as	Standard Range	Unit
Phosphate,	P*	0.001-0.003	mg/L
Nitrate,	N**	0.007-0.014	mg/L
BOD5	O	0.0-1.16	mg/L
pH	8.00-8.40	-	-
Total Coliform	2-256	MPN/100mL	-
Faecal Coliform	<2-13	MPN/100mL	-

Additionally, historical water quality data was obtained from the National Environment and Planning Agency (NEPA), representing sampling done at four locations to the East and West of the proposed development site.

The locations of the NEPA sampling sites are listed below:

- Greenwood Beach - 18.51020N 77.73251W
- Lilliput - 18.51631N 77.77435W
- Long Bay - 18.517226N 77.74938W
- Rose Hall Resort and Country Club - 18.52284N 77.80829W

The locations of the NEPA sampling sites are outlined on **Figure 4B-1B** below, while the actual sampling data (which spanned sampling events done between June 29, 2002, to May 29, 2018) is represented in **Appendix 2B**. To facilitate a comparison between the results obtained by NEPA and the 2022 study results, the NEPA data was averaged per site (see **Table 7A-6**, **Section 6.4.1**).

[14] https://www.nepa.gov.jm/new/legal_matters/policies_standards/docs/standards/water_quality_standard_marine.pdf

Figure 4B-1B: The Locations of The NEPA Sampling Sites in Relation To The Proposed Development Site.

4.2.2.2 DEPTH

Figure 4B-2 shows the locations at which depths were recorded at the project sites**.** Depths were measured with an RJE International DS-1 handheld sonar system, with depth positions being recorded with a Garmin GPS Map handheld global positioning system.

Two areas were examined. The first immediately surrounded the proposed bar site and extended northwards to the adjoining reef area and southwards to semi-intact seagrass beds. The second was conducted to support wave analysis conducted by oceanographers Sea Control Oceanography and Dr. Ping Wang, Director, Coastal Research Laboratory, School of Geosciences, University of South Florida (covered in **Section 4.2.2.3.4 Supplemental Projections – Expected Wave Force Calculations –check this**). The extent of the depths obtained extended from the vicinity of the proposed bar location, across the adjoining reef and extending northward to deeper water. The actual position of the latter evaluation area was chosen only because this location facilitated safe movement of the surveying vessel across the shallow reef area.

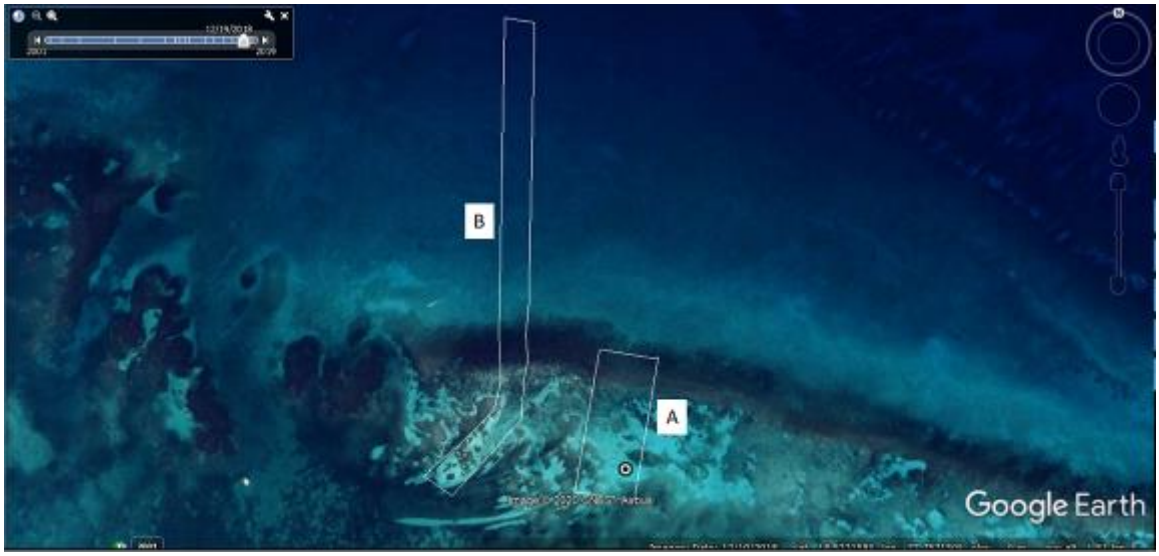


Figure 4B-2: Locations at The Lilliput Site at Which Depth Was Recorded (A: vicinity of proposed bar, B: area where the adjoining reef could be crossed.

4.2.2.3 OCEANOGRAPHY, NATURAL HAZARDS AND CLIMATE CHANGE PROJECTIONS

4.2.2.3.1 OCEANOGRAPHY

Three measures were used to evaluate the oceanographic processes occurring within the study area. The first measure involved the examination of existing literature related to known extreme events, as well as, published storm prediction model results applicable to the project areas.

The following literature sources were referenced:

1. Preliminary Engineering Report Proposed Beach Villas for Sandals Royal Caribbean Hotel prepared by CEAC Solutions Ltd December 2009

2. Storm Surge and Tsunami Coastal Flooding Processes in Jamaica Prepared by Rafi Ahmad, Unit for Disaster Studies, Edward Robinson and Deborah-Ann Rowe – Marine Geology Unit University of the West Indies (UWI).

The second measure involved the examination of historical Google Earth images for patterns indicative of wave movements, as illustrated on **Plate 1** below.

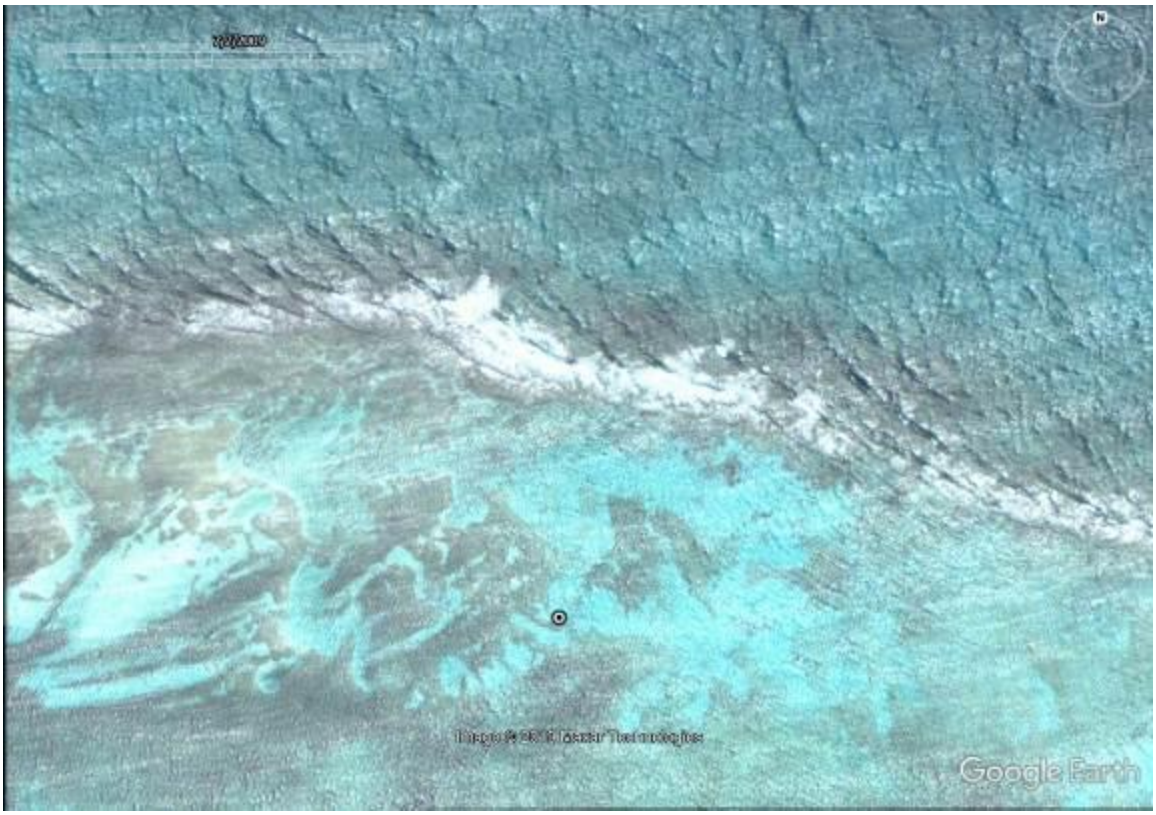


Plate 1: Illustration of Wave Patterns Influencing the Lilliput Bay Site – Extracted from Google Earth (2009-07-02).

For the Lilliput area, Google Earth records were used from the following dates:

1. July 2, 2009 – Suggestive of elevated seas with winds blowing out of the northeast
2. April 5, 2002 – Suggestive of a late season cold front with winds blowing out of the north northwest.

The examination of these illustrations of wave events was done to determine the extent to which the reef area known to exist between the open sea and the proposed site could attenuate incoming waves, thus providing potential protection for the proposed structure.

The third measure involved the use of drogues to measure surface current directions and speeds at both sites. **Figure 4B** show the location at which a surface drogue (see **Plate 2**) was deployed for current tracks. The start position was that of the proposed construction site (N18.519599° W 77.756488°) and the drogue was plotted at 15-minute intervals for a total period of 90 minutes. From these plots, both current speed (using a speed/distance/time calculator) and direction were determined.

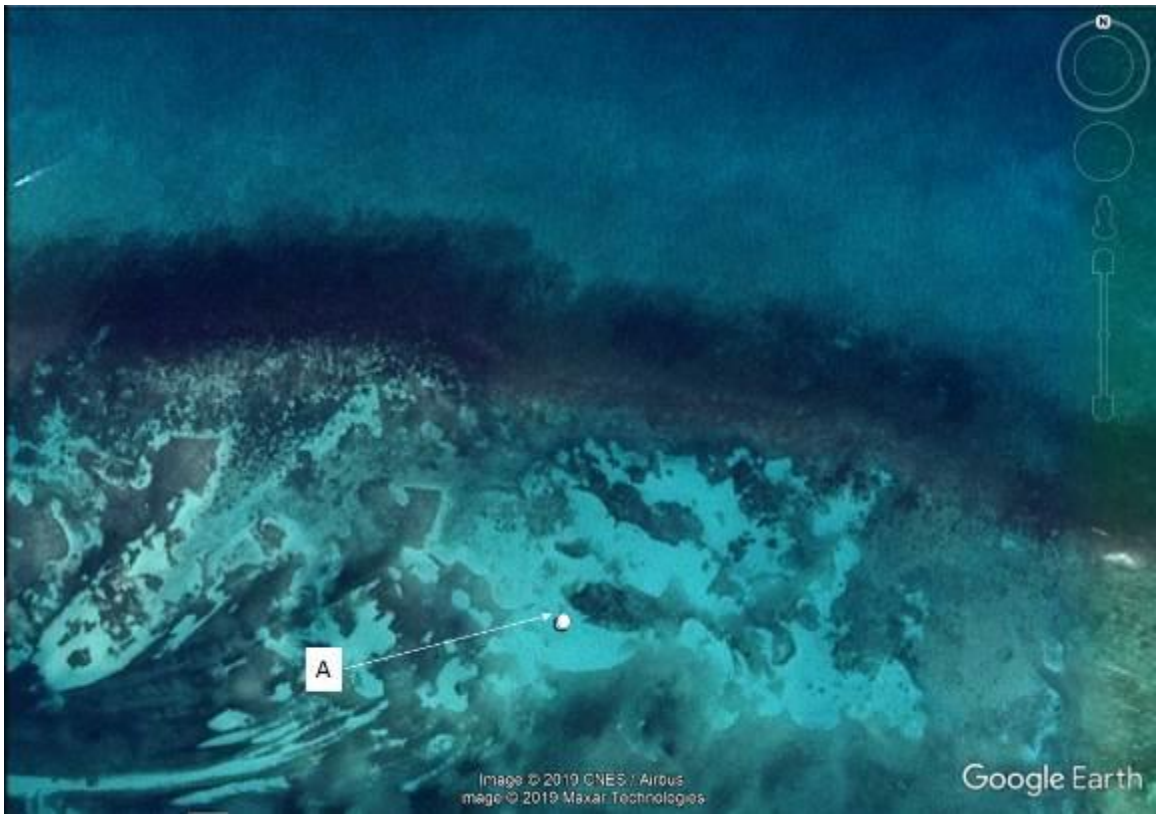


Figure 4C: Location of Commencement Point of Drogue Track – Lilliput.

Plate 2: Illustration of Drogue Deployed at Study Locations

4.2.2.3.2 NATURAL HAZARDS

A technical presentation entitled "Storm Surge and Tsunami Coastal Flooding Processes in Jamaica" Prepared by Rafi Ahmad, Unit for Disaster Studies, Edward Robinson and Deborah-Ann Rowe – Marine Geology Unit UWI West Indies was examined for a determination of natural hazard risks that the proposed project might be vulnerable to. An evaluation of both storm surge and tsunami risks was done considering that the project areas are to be located several hundred meters offshore.

Additionally, an examination of the NOAA Ocean Service Hurricane Track search engine[15] was done to identify historical tracks of tropical disturbances that may have presented some form of impact on the areas at which the proposed projects are to be implemented. From these examinations, an identification of the storm type/s that could have presented the greatest risk to the project area was identified as a baseline system of disturbance.

4.2.2.3.3 CLIMATE CHANGE PROJECTIONS

Sea level rise refers to a gradual rise in the ocean's surface level caused by two climate-related conditions. The first is the expansion of ocean water as it gets warmer with increasing global ocean temperatures. The second is the introduction of ice cap and glacier melt water to the oceans, resulting in an increase in the volume of water in the oceans.

[15] https://oceanservice.noaa.gov/news/historical-hurricanes/

It has been estimated that global and Caribbean Sea level rise over the 20th century is 0.17m +/- 0.05m[16]. The Intergovernmental Panel on Climate Change 4th Assessment Report **(IPCC AR4[17])** cited four global mean sea level elevation predictions, which have been based on four climate change scenarios. **Table 3[18]** illustrates predicted global and Caribbean mean sea level rise by 2100 relative to 1980-1999 levels.

Table 3: Predicted Global and Caribbean Mean Sea Level Rise (in meters) By 2100 Relative To 1980-1999 Levels

Scenario	Global Mean Sea Level Rise by 2100 Relative to 1980-1999	Caribbean Mean Sea Level
IPPC B1 Scenario	0.13-0.43	0.13-0.43
IPPC A1B Scenario	0.21-0.48	IPPC A1B Scenario
IPPC A2 Scenario	0.23-0.51	IPPC A2 Scenario
Rahmstorf, 2007	Up to 1.4m	Rahmstorf, 2007

In summary, it is anticipated that, for Jamaica, sea level increases within the next 80 years will range from a low of 0.13m to a high of 1.4m. These values were used as a means of evaluating overall sea level variations due to climate change and storm conditions combined.

4.2.2.3.4 SUPPLEMENTAL PROJECTIONS – EXPECTED WAVE FORCE CALCULATIONS

Oceanographers Sea Control Oceanography and Dr. Ping Wang, Director, Coastal Research Laboratory, School of Geosciences, University of South Florida were contracted to provide information on the expected character of waves that could influence the proposed project site. This was then used in analysis to provide data to ensure that the pilings that support the over-water bar were designed to be strong enough to withstand the horizontal forcing (or pressure) from expected waves, particularly storm waves. The engineers focused on the use of analyses of wave forcing on impermeable walls or pilings, as outlined by Goda (1974)[19]

Various equations were developed by Goda (1974) to calculate the distribution of pressure induced by non-breaking and breaking waves, which have been adopted in the US Army Corps of Engineers Coastal Engineering (USACE) Manual (2006). These equations were used in order to determine the engineering requirements for the support pilings for the project.

4.2.2.4 AMBIENT NOISE

Figure 4D show the locations at which ambient sound readings were recorded at the project sites**.** Sound data was captured with a **VLIKE LCD Digital Audio Decibel Meter** at the locations depicted so as to establish noise level baselines for the project site. Further, construction noise standards were referenced to determine what could be expected during construction processes. No Jamaican standards were found, therefore the following standards, represented in **Table 4**[20] were used as an example of the kinds of noise levels that could be expected during construction. Note that the loudest construction noises recorded on the table were both impact and vibratory pile drivers at 101 decibels (highlighted in yellow on **Table 4**).

16 IPCC AR4 https://www.ipcc.ch/report/ar4/wg1/

17 https://www.ipcc.ch/report/ar4/wg1/

18 Extracted from GOG/EU/UNEP Climate Change Adaptation & Disaster Risk Reduction Project Publication

19 Goda, Y. (1974). New Wave Pressure Formulae For Composite Breakwaters. *Coastal Engineering Proceedings*, *1*(14), 100. https://doi.org/10.9753/icce.v14.100

20 https://www.fhwa.dot.gov/Environment/noise/construction_noise/handbook/handbook09.cfm

The Inverse Square Law governs sound intensity changes with distance, a process called attenuation. The law states that every doubling of the distance from the sound source in a free field situation, the sound intensity will be diminished by 6 decibels[21]. **Figure 4E** illustrates the process of sound attenuation with distance.

This distance attenuation relationship was applied to the distances estimated from Figure **4D** with the use of an attenuation calculator[22]. This was done to determine the extent of attenuation that could be expected if construction sounds depicted on **Table 3** were allowed to transmit unabated by other means from the construction site to shore.

Figure 4D: Locations of Audio Survey Sites - Lilliput (A: Overwater site, B: shoreline at Grange Pen Fishing Beach, C: beach area in front of Iberostar Hotel, D: boat area east of the Grange Pen Fishing Beach).

[21] https://www.quora.com/How-does-sound-volume-decrease-as-a-function-of-distance

[22] https://www.omnicalculator.com/physics/distance-attenuation

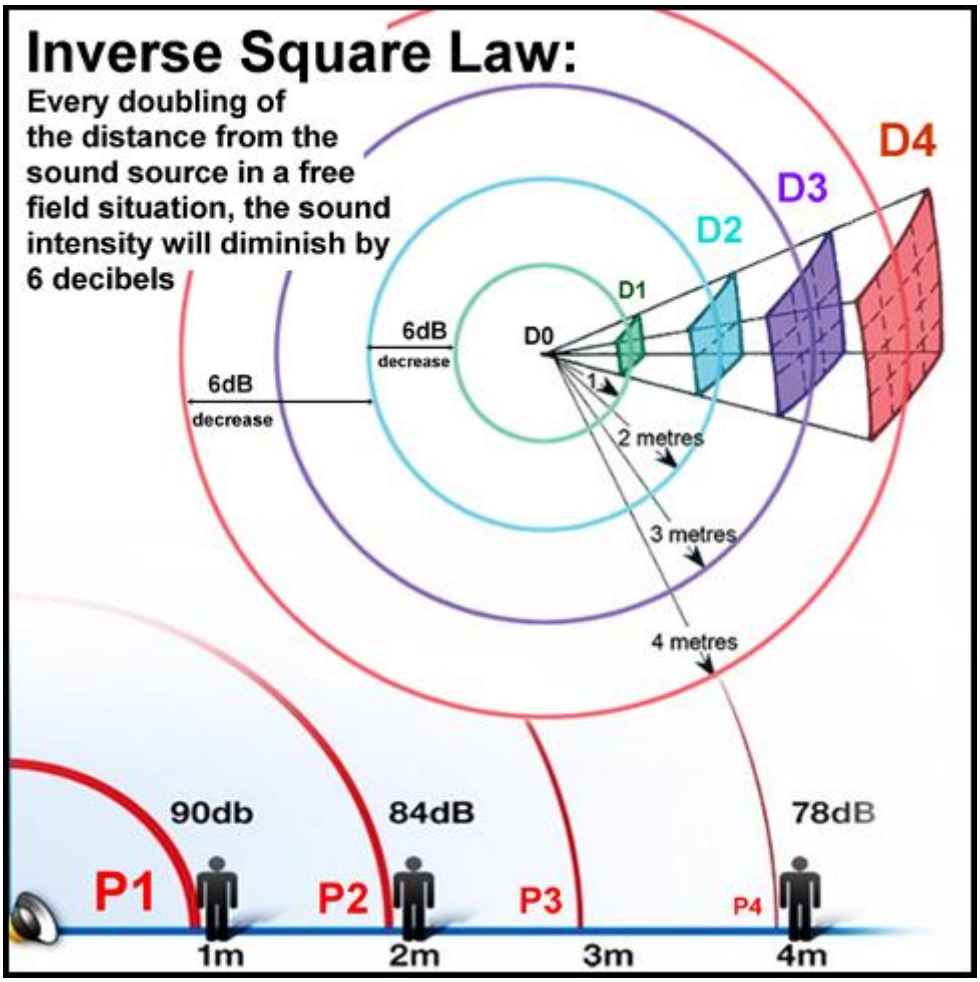


Figure 4E: Pictorial Depiction of The Inverse Square Law[23].

[23] https://www.quora.com/How-does-sound-volume-decrease-as-a-function-of-distance

Table 4 RCNM Default Noise Emission Reference Levels and Usage Factors.

Equipment Description	Impact Device?	Acoustical Usage Factor (%)	Spec. 721.560 L_{max} @ 50 feet (dBA, slow)	Actual Measured L_{max} @ 50 feet (dBA, slow) (Samples Averaged)	Number of Actual Data Samples (Count)
All Other Equipment > 5 HP	No	50	85	N/A	0
Auger Drill Rig	No	20	85	84	36
Backhoe	No	40	80	78	372
Bar Bender	No	20	80	N/A	0
Blasting	Yes	N/A	94	N/A	0
Boring Jack Power Unit	No	50	80	83	1
Chain Saw	No	20	85	84	46
Clam Shovel (dropping)	Yes	20	93	87	4
Compactor (ground)	No	20	80	83	57
Compressor (air)	No	40	80	78	18
Concrete Batch Plant	No	15	83	N/A	0
Concrete Mixer Truck	No	40	85	79	40
Concrete Pump Truck	No	20	82	81	30
Concrete Saw	No	20	90	90	55

Crane	No	16	85	81	405
Dozer	No	40	85	82	55
Drill Rig Truck	No	20	84	79	22
Drum Mixer	No	50	80	80	1
Dump Truck	No	40	84	76	31
Excavator	No	40	85	81	170
Flat Bed Truck	No	40	84	74	4
Front End Loader	No	40	80	79	96
Generator	No	50	82	81	19
Generator (<25KVA, VMS Signs)	No	50	70	73	74
Gradall	No	40	85	83	70
Grader	No	40	85	N/A	0
Grapple (on backhoe)	No	40	85	87	1
Horizontal Boring Hydraulic Jack	No	25	80	82	6
Hydra Break Ram	Yes	10	90	N/A	0
Impact Pile Driver	Yes	20	95	101	11
Jackhammer	Yes	20	85	89	133
Man Lift	No	20	85	75	23
Mounted Impact Hammer (hoe ram)	Yes	20	90	90	212

Pavement Scarifier	No	20	85	90	2
Paver	No	50	85	77	9
Pickup Truck	No	40	55	75	1
Pneumatic Tools	No	50	85	85	90
Pumps	No	50	77	81	17
Refrigerator Unit	No	100	82	73	3
Rivit Buster/Chipping Gun	Yes	20	85	79	19
Rock Drill	No	20	85	81	3
Roller	No	20	85	80	16
Sand Blasting (single nozzle)	No	20	85	96	9
Scraper	No	40	85	84	12
Sheers (on backhoe)	No	40	85	96	5
Slurry Plant	No	100	78	78	1
Slurry Trenching Machine	No	50	82	80	75
Soil Mix Drill Rig	No	50	80	N/A	0
Tractor	No	40	84	N/A	0
Vacuum Excavator (Vac-Truck)	No	40	85	85	149
Vacuum Street Sweeper	No	10	80	82	19

Ventilation Fan	No	100	85	79	13
Vibrating Hopper	No	50	85	87	1
Vibratory Concrete Mixer	No	20	80	80	1
Vibratory Pile Driver	No	20	95	101	44
Warning Horn	No	5	85	83	12
Welder/Torch	No	40	73	74	5

4.2.3 Carrying Capacity:

Two types of carrying capacity points were examined for the purpose of this study:

Carrying Capacity of the Bar:

Jamaica has adopted the New National Building Code of Jamaica, which is designed to provide a standard for the establishment of buildings. The Code represents an amalgamation of local and international building guidance mechanisms, frameworked around the International Building Code (IBC), which is a code developed by the International Code Council and has been adopted for use in the United States and has also been adopted in the Caribbean Community[24]. The Code speaks to health and safety concerns. More specifically, the International Building Code (IBC) provides an international standard for calculating the maximum occupancy for an area, referred to in the Code as **Occupant Load.**

Occupant load is directly linked to the ability of patrons within a building to exit the location. The IBC defines an exit, or a means of egress, as "A continuous and unobstructed path of vertical or horizontal egress travel from any occupied portion of the building or structure to a *public way*." (2009 International

[24] https://en.wikipedia.org/wiki/International_Building_Code

Building Code, p 218)[25] and was used as a means to determine the maximum number of persons that can be safely accommodated within the proposed over water structure.

Section 303.3 of the code speaks to assemblies used for food and/or drink consumption including, but not limited to:

1. Banquet Halls
2. Casinos
3. Nightclubs
4. Restaurants and similar dining facilities
5. Taverns and Bars.

www.cabaretdesigners.com shows an application of the IBC codes in the determination of occupancy loads for a theoretical one-storey bar with a floor area of 436.6 square meters (4700 square feet). **Table 5** shows the occupant loads per numbers per numbers of exits calculated for the theoretical bar present within a one-storey bar with a floor area of 436.6 square meters (4700 square feet).

Table 5: Occupant Load for a Bar[26]

Occupant Load	Exits
0-49	1
50-500	2
501-1000	3
Greater Than 1000	4

Carrying Capacity of the Environment:
The environmental impact assessment being conducted is being regarded as a means of determining the ability of the environment to tolerate the presence of the proposed development and it therefore serves as the means of determining environmental carrying capacity.

Any negative impacts identified by this study will be regarded as factors that will limit the ability of the natural environment to tolerate the presence of the development if not mitigated.

Carrying capacity of the environment will be addressed under **Section 6.0** of this document.

4.2.4 Socio-economic Data Collection:
The area of evaluation for the Lilliput study area was demarcated at a radius of 5 kilometres from the proposed development site, as illustrated on **Figures 4F-1** and **4F-2**. The following socio-economic features were examined:

1. Demography
2. Settlement characteristics and land uses
3. Population Densities
4. Employment characteristics

The following references were evaluated for the determination of the Socio-economic climate of the areas surrounding the Lilliput site:

1. Population data for the Parish of St. James (2011), sourced through the Statistical Institute of Jamaica[27].
2. Community Profiles Listings extracted from the Social Development Commission's website[28]
3. Environmental Impact Assessment for the Iberostar Rose Hall Resort and Spa – Prepared by Environmental Solutions Ltd (July 2004) – chosen for its specificity to the work area at hand.

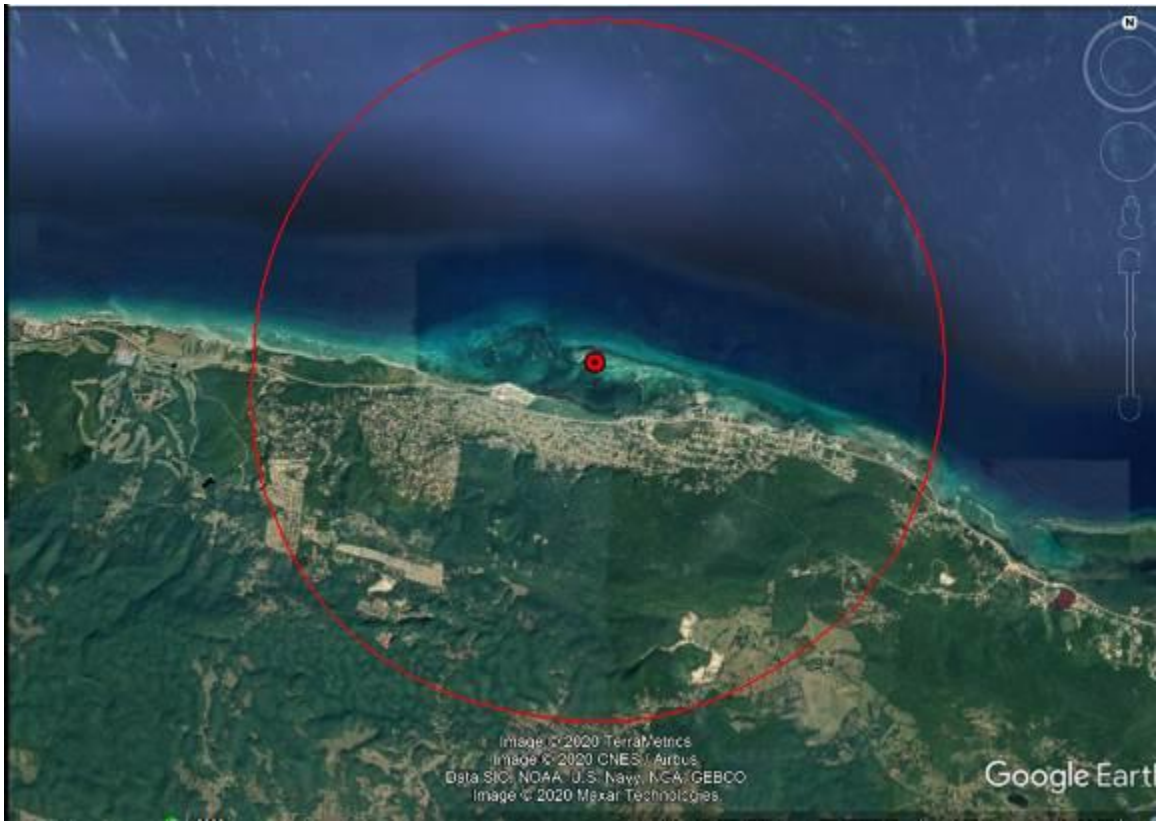


Figure 4F-1: Google Earth Depiction of The Socio-economic Study Area Radius

Figure 4F-2: 1:50,000 Metric Map Showing Depiction of The Socio-economic Study Area Radius

[25] http://www.todayifoundout.com/index.php/2014/08/maximum-occupancy-building-calculated/

[26] https://www.cabaretdesigners.com/how-to-calculate-occupancy-for-a-bar

[27] https://statinja.gov.jm/Census/PopCensus/PopulationbyConstituencyandParish.aspx

[28] https://sdc.gov.jm/communities

4.2.5 Public Perception Surveys:
Public perception surveys can be divided according to public representation by selected resource bodies and by representation through research[29]. It was decided that the use of selected groups for the identification of public perception would be the more appropriate and direct method owing to the tourism interest focused nature of the proposed development.

Two public groups were identified. The first comprised the following Government Agencies (as recommended by the EIA TORs):

1. National Land Agency
2. Port Authority of Jamaica
3. National Fisheries Authority
4. Maritime Authority of Jamaica
5. St James Municipal Corporation
6. Jamaica Civil Aviation Authority
7. Office Of Disaster Preparedness and Emergency Management.

Letters of information were directed to the Agencies listed, with a request for input being made.

The second public group was identified focused around the vicinity of the proposed project site. User groups with vested interests in the use of the area, and which existed within visual range of the proposed project sites (with distances up to 800m) were sent letters of introduction, with both the location and proposed structure design being described. The objectives intended here were to:

1. Announce to the various targeted interest entities that an application had been tendered to relevant government agencies
2. Inform the various interest entities as to what was intended and where the project was intended to be implemented
3. Solicit comments, concerns, and descriptions of any issues that these entities could foresee so that they could be treated with in the evaluation of impacts and mitigations.

Three user groups were identified for the Lilliput area. These were:

1. The Iberostar Hotel,
2. The Grange Pen Fishers Cooperative on a beach immediately adjoining the Iberostar Hotel to its east.
3. A number of bar/restaurant/club operators present within a 200m radius of the Stephenson's boatyard area.

There was another fishing beach near to the project site – the Long Bay fishing beach. However, no patrons could be identified for the establishment of contacts for consultation.

All other entities identified within the Lilliput area were deemed to be land-based, outside of any visual range of the project and therefore deemed to not be relevant to the project. The letters of introduction lead to the execution of a public meeting held on the 7th of January 2020 at the Grange Pen Fishing Beach as well as a meeting with the management of the Iberostar Hotel, held on November 2019. There was considerable resistance put up by the operators of the various establishments within proximity of the Stephenson

[29] Dowler, Elizabeth, Bauer, Martin W., Green, Judith and Gasperoni, Giancarlo (2006) *Assessing public perceptions: issues and methods.* In: Dora, Carlos, (ed.) Health, Hazard and Public Debate: Lessons for Risk Communication From the Bse/Cjd Saga. WHO, Geneva, 40-60 [chapter 3]. ISBN 9789289010702

boatyard to sit and meet or even to affix a signature to a letter to outline viewpoints, therefore, the organization of a consultation with these operators was aborted.

5.0 Project description

5.1 GENERAL:

As indicated in the introduction, the proposed bar will function as a typical bar, with comparable opening and closing hours. The novel concept of the bar is that of being an over-water structure. A similar concept exists at Floyd's Pelican Bar in Parottee, St. Elizabeth.

Once constructed, the structure will have a footprint of approximately 19m x 12m, a vertical rise of 6.4m from the waterline, with the base floor of the bar being 2.0 meters above sea level. **The bar will be able to accommodate up to 50 patrons at a time and will be open from 10am-10pm**.

The project managers have indicated that the development is slated to have primarily a tourism attraction emphasis, with a secondary emphasis being that of environmental sustainability, through the physical design of the structure and through client education. The fishing community could benefit from having an alternative source of livelihood through the provision of Water Taxi services (once they meet the necessary legislative requirements).

In a correspondence prepared by the National Environment and Planning Agency (NEPA) to the proponents dated November 2, 2018 (reference number 2018-08017-BL00060), the proponents were advised that an Environmental Impact Assessment (EIA) would be required to facilitate the Agency's review process. This document serves to describe:

f) the manner in which the development will be implemented,
g) the various regulatory considerations required to facilitate an approval
h) the nature of the physical and biological environment within which the development is intended to be positioned
i) select tourism sector public opinion
j) foreseen impacts and mitigations required to prevent negative impacts.

5.2 CONSTRUCTION:

The project will commence with the deployment of sixty-one 30.5cm diameter PVC sleeved reinforced concrete piles into the seafloor at the project site. **Figure 5A** illustrates the proposed pile layout while **Figure 5B** illustrates the scaled positioning of the piles onto an applicable Google Earth image of the project site.

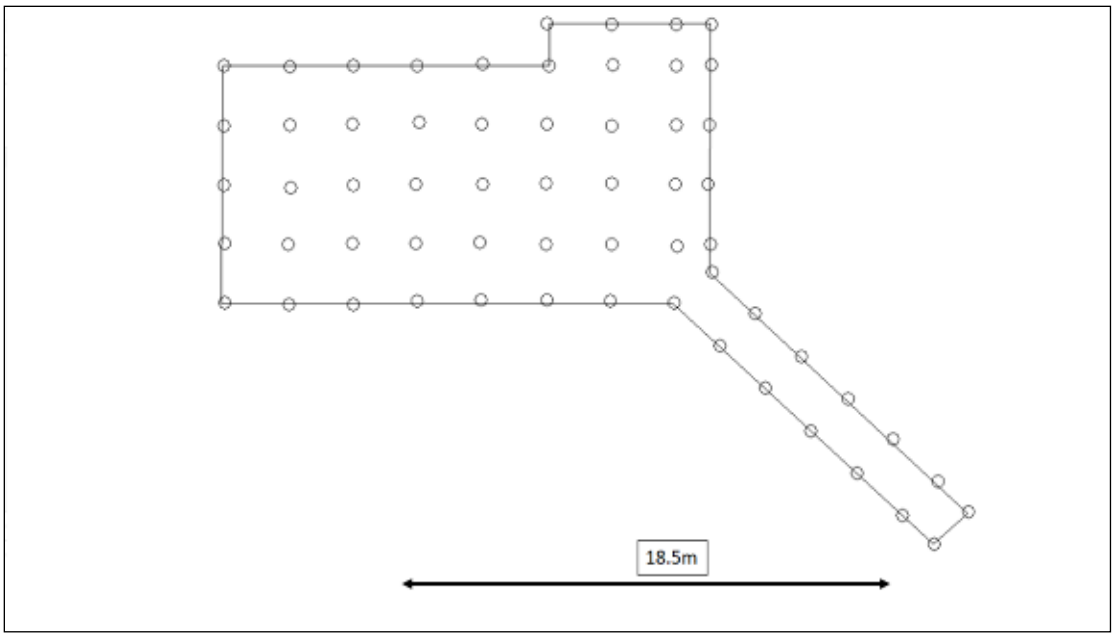


Figure 5A: Pile Layout for Proposed Oasis Over-water Bar[30].

Figure 5B: Pile Layout Superimposed onto Google Earth Image of Proposed Site At Lilliput (relate to Figure 1B)

.

[30] Summarized from supporting Engineering drawing.

All I-beam piles will be driven into bedrock, with required penetration of the piles being to a minimum of 2.75m or driven to refusal. A barge that is capable of driving the size piles will be employed to deploy the pile network (see **Plate 1**). The barge will generally have 3-4 spuds to securely anchor the barge into position during the piling process.

After the I-beams have been driven, they will be sleeved with PVC piping, after which, cement with waterproofing additives will be added to provide protection from the elements.

The super structure will sit on a floor formed from a mechanical connection between the I-beams and the pile heads. The deck, which will be placed on the superstructure, will be made up of eco-friendly, pre-stained/painted hardwood planks screwed down allowing for 12mm spacing between them to assist with dissipating any wave-induced uplift forces that might influence the location.

All man-portable materials for the process of construction will be delivered by truck to the Iberostar Hotel service entrance in Lilliput (see **Figure 5C** and **Plate 4A**) and transported from the Hotel's jetty (see **Plates 4B-C**) for transferral to a shallow draught workboat. The workboat would then deliver the construction materials to the work barge.

Permission details are outlined in **Section 7** below).

Figure 5C: Iberostar Service Entrance And Service Route (A), Hotel Jetty (B) and Hotel Beach Area To Eastern Property Boundary (C).

Plate 3: Iberostar Hotel Service Entrance

Plate 4: Service Roadway from Service Entrance to Jetty Area.

Plate 5: Hotel Jetty with Boat Accommodation Area Facing Proposed Overwater Bar Location.

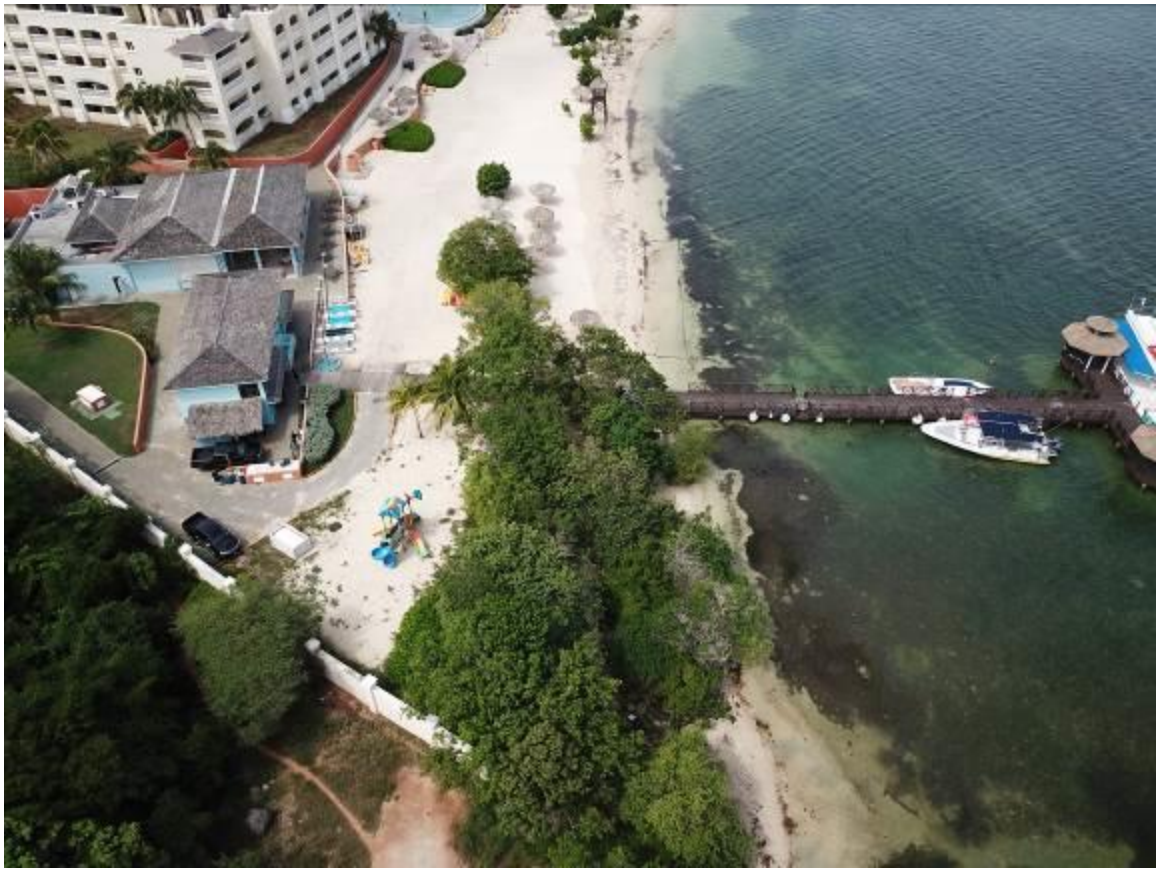


Plate 6: Oblique Aerial Image of Iberostar's Jetty and Eastern Beach Area.

It will be necessary to load the heavy construction components, specifically piles and concrete, from a location that is more prepared for the manoeuvring of heavy equipment. **Figures 5D-1 to 5D-2** and **Plate 5** show a shoreline location at the western end of Greenwood, St James. The location is the site of a private boat yard owned by a Greenwood resident named "Busha" Stephenson (see permission letter and title documents on **Appendices 3A-B**). The site has shoreline and depth conditions that make it appropriate for access by a shallow draught vessel and has g\round conditions that make it suitable for the operation of lifting equipment. **Figure 5E** shows both staging locations in relation to the proposed project site.

Figure 5D-1: Google Earth Image of Boatyard Location at Greenwood, Trelawny (A)

Plate 7: Low Altitude Vertical Aerial Image of Greenwood Boatyard

Figure 5D-2: View Of Land space At Greenwood Boat Yard (A) Land View to Sea, (B) Land View to Main Road

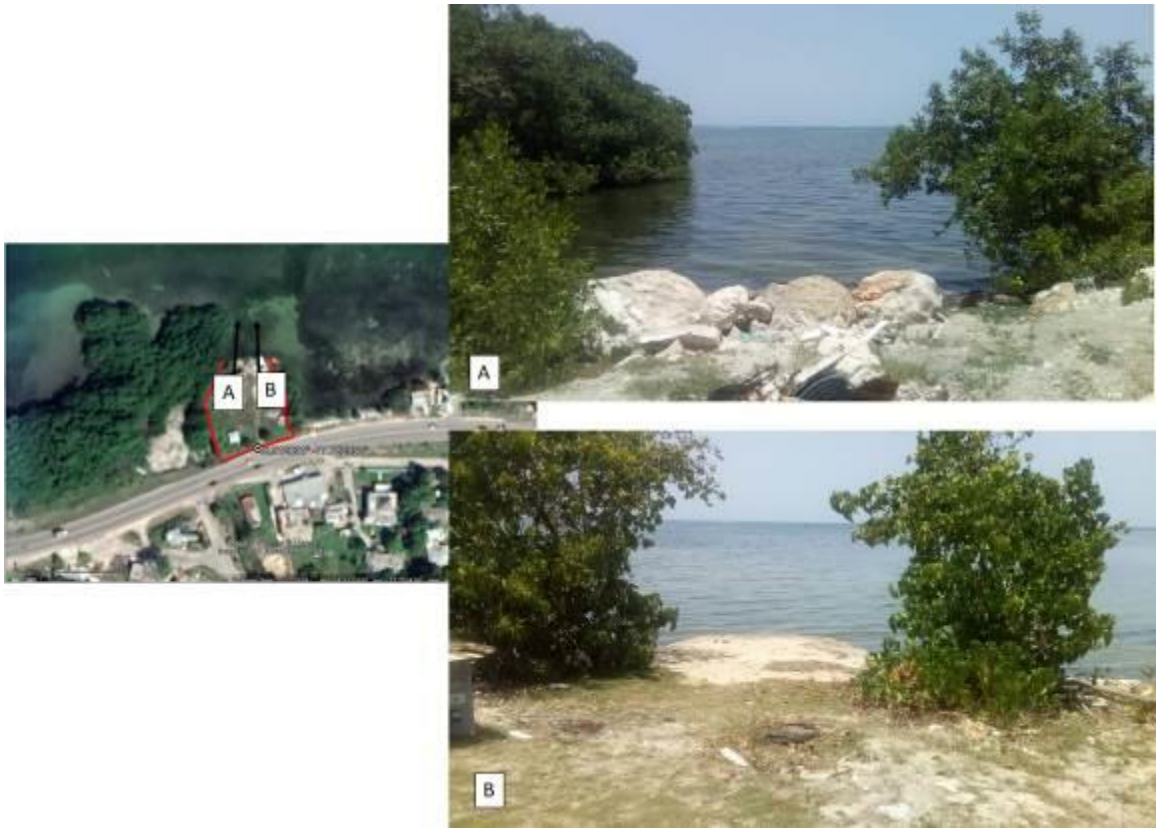


Figure 5D-3: View Of Shoreline And Adjoining Marine Environment From The Western (A) And Eastern (B) Shoreline Of The Boatyard

Figure 5E: Location of Boatyard (A) In Relation to The Proposed Project Site And Iberostar Hotel (B)

Concrete for the pile preparation process will be obtained by way of concrete mixer trucks from a recognized concrete provider and transported to the staging location at the Greenwood boatyard. Here it will be transferred from the trucks to hoppers on the workboat, which will then transport the concrete load to the work site. The hoppers will then be lifted from the work boat and affixed to a tremie, which will then be used to pour the concrete into the PVC sleeve capping the supporting I-beam. "**A tremie is a watertight pipe, usually of about 250mm inside diameter (150 to 300 mm),**[1] **with a conical hopper at its upper end above the water level. It may have a loose plug or a valve at the bottom end. A tremie is used to pour concrete underwater in a way that avoids washout of cement from the mix due to turbulent water contact with the concrete while it is flowing**[31]."

Plate 8A depicts a work-barge configuration similar to that expected to be used at the proposed site. **Plate 8B** shows an example of a shallow draught work boat while **Plate 8C** shows an aerial image of a barge supported piling and construction process used for the development of the Sandals Royal Caribbean hotel's Over-water suites in 2017. It is anticipated that the proposed worksite will look like this, albeit, at a smaller scale.

The process of construction will take approximately 5 months at the site, with the driving and preparation of the support piles taking approximately 2 months to complete.

[31] Quoted from https://en.wikipedia.org/wiki/Tremie

Plate 8A: [32] Illustration of a 3-Spud Work Barge (the barge depicted shows an excavator, however, for this project, a pile driver will be the supported equipment).

Plate 8B: Illustration of a Shallow-Draught Workboat

[32] https://www.alibaba.com/product-detail/POSEIDON-EXCAVATING-BARGE-WITH-3-PUDS_50030191247.html?spm=a2700.7724857.normalList.15.cf5729b653NHMZ

Plate 8C: Aerial View of Over-Water Room Construction Process at Sandals Royal Caribbean

6.0 DESCRIPTION OF THE LILLIPUT ENVIRONMENT

6.1 AIR PHOTO INTERPRETATION AND INITIAL SPATIAL MAPPING:

Figure 6A depict the spatial distribution of both marine substrates and seafloor lifeforms present within the study area defined at the Lilliput development site. At first viewing, the site represented sand-covered marine terrains with fringing reefs within close proximity to the proposed over-water bar locations. The site had shallower, more emergent near-shore reef conditions with breaking waves being observed on the Google Earth image archives examined and more sheltered conditions in the lee areas where the proposed bar would be.

The proposed location adjoins coral reefs located approximately 100 meters to the north of the site. More immediate to the location of the proposed site, the location is immediately underlain with marine sands of a depth greater than 1 meter (area B on **Figure 6A**) and is adjoined by patches of Seagrass beds comprised of both Turtle and Manatee Grasses (***Thalassia testudinum*** and ***Syringodium filiforme*** – areas A and C on **Figure 6A**). **Plates 9A-C** give close-up views of the substrate and lifeform characteristics of the site. It must be noted that while the Manatee Grass beds appeared to be intact and undisturbed, for the most part, the Turtle Grass beds showed signs of bed-edge erosion and seagrass blade abrasion (see close-up on **Plate 9B**).

Area D on **Figure 6A** depicts a transition area marked by the presence of both seagrasses and scattered reef structures while Area E depicts a shallow, semi-emergent reef. **Plates 9D-E** depicts both features.

Estimated areas of benthic lifeforms present within the study area defined on **Figure 6A** were interpreted as follows:

A. Turtle Grass (Thalassia testudinum) – 1716 square meters
B. Marine Sand – 9093 square meters
C. Manatee Grass (Syringodium filiforme) 5283 square meters
D. Reef/Seagrass Transition Area 2094 square meters
E. Shallow Emergent Reef – 2580 square meters

Overall seagrass assessment area – 17,727 square meters

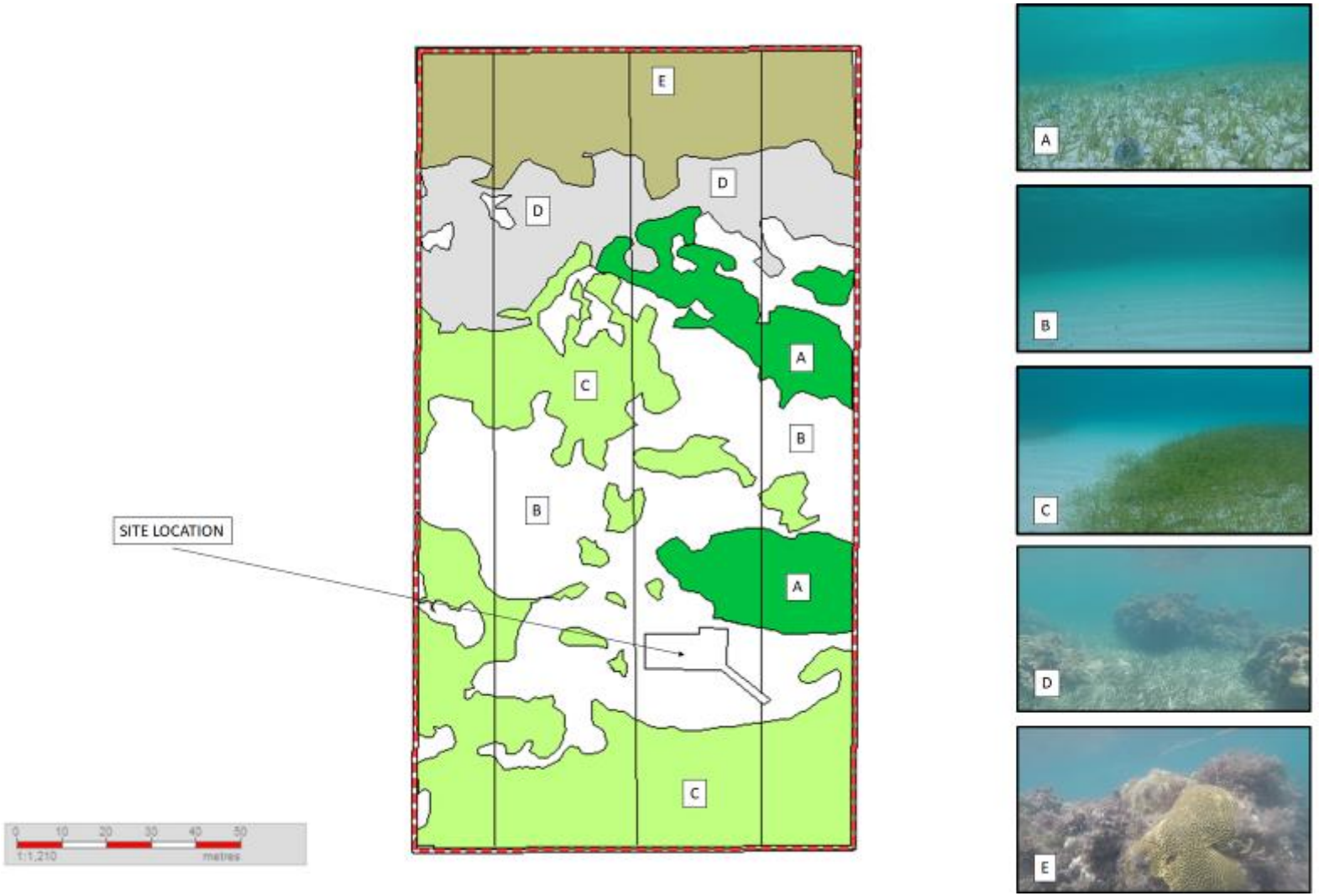


Figure 6A: Depiction of the Spatial Distribution of Substrates and Seafloor Lifeforms Present At The Lilliput Development Site - A: Turtle Grass (***Thalassia testudinum***), B: Marine Sand, C: Manatee Grass (***Syringodium filiforme***) D: Seagrass/Scattered Coral-derived Hard Bottom E: Shallow Reef

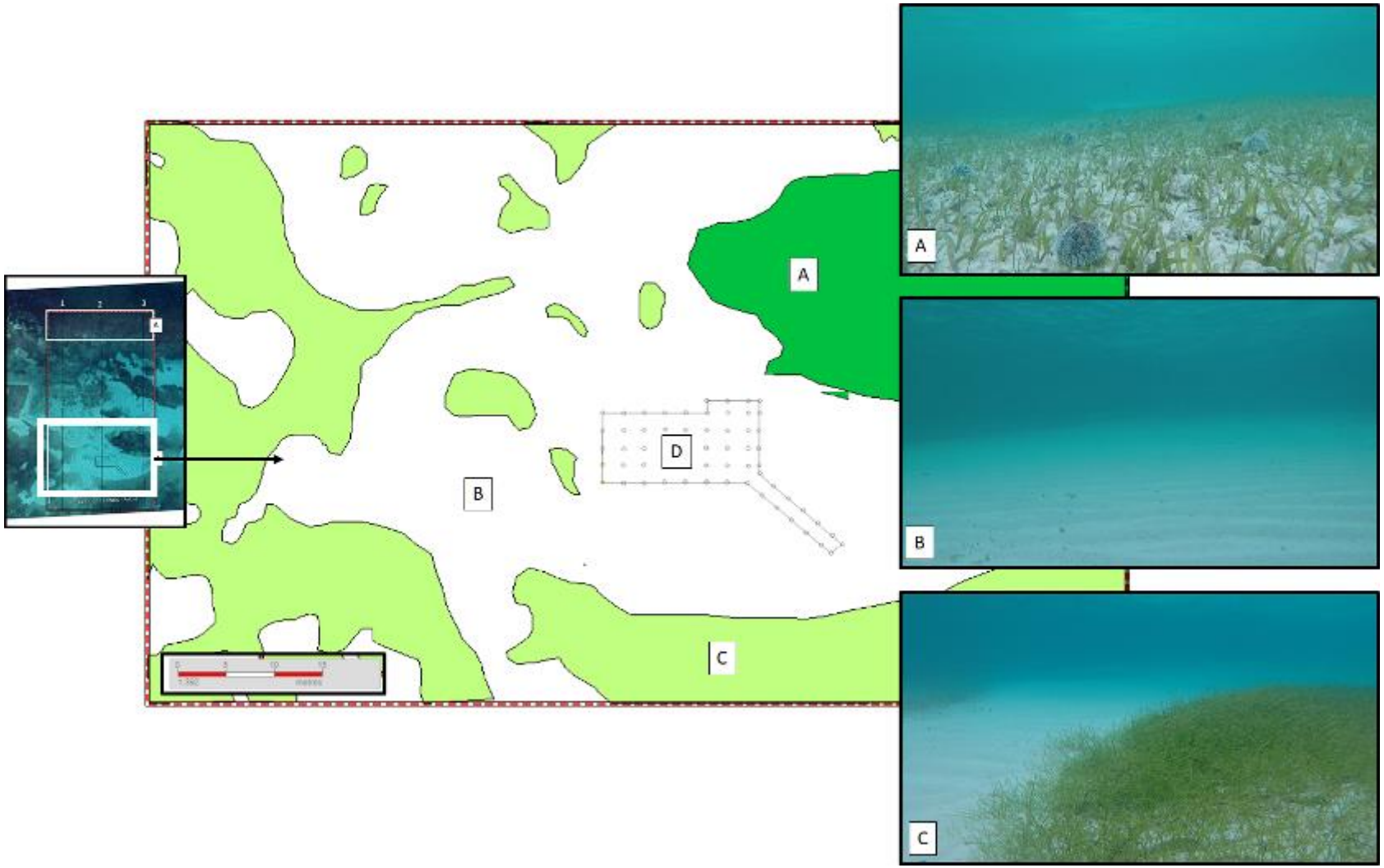
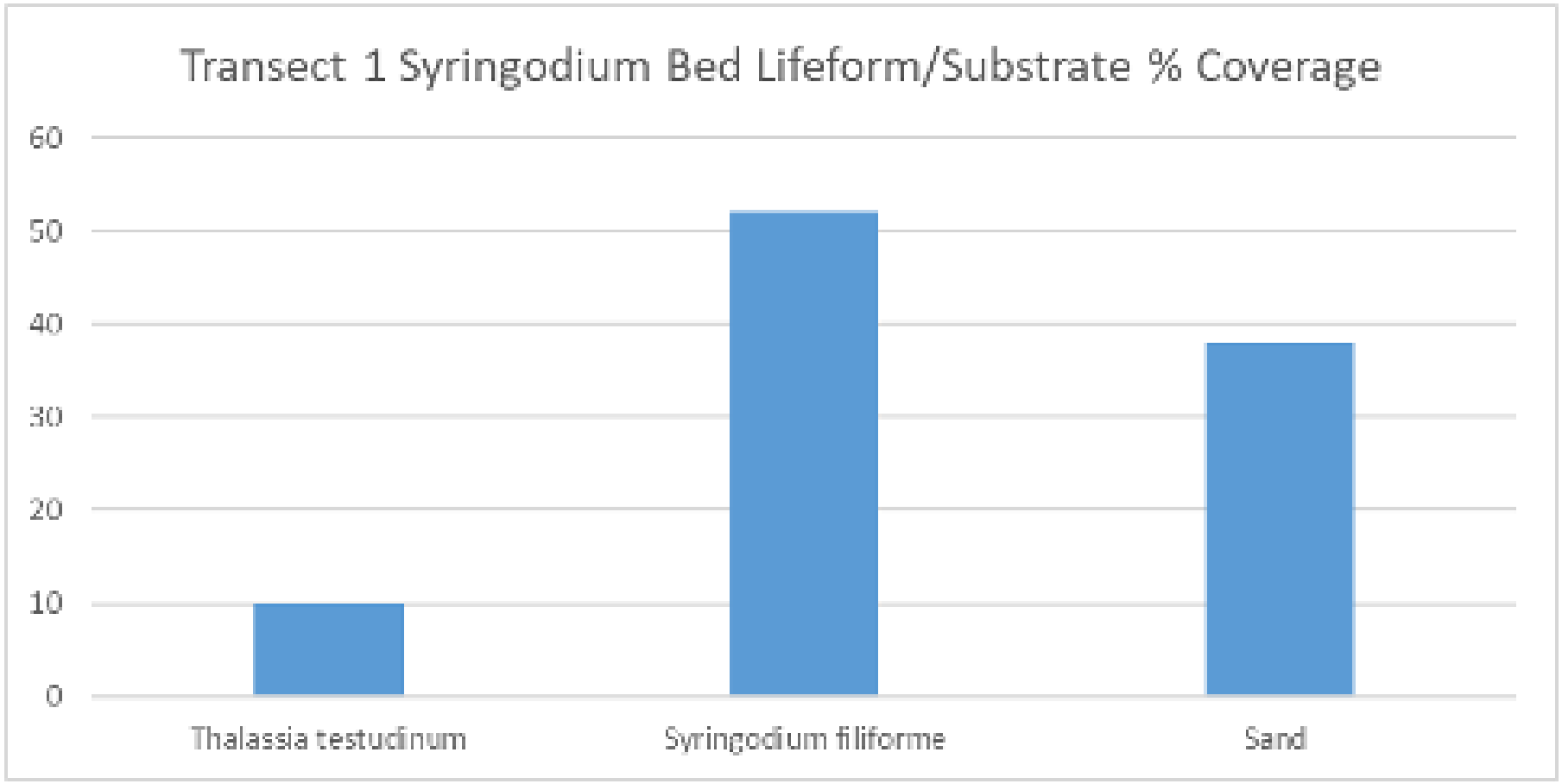
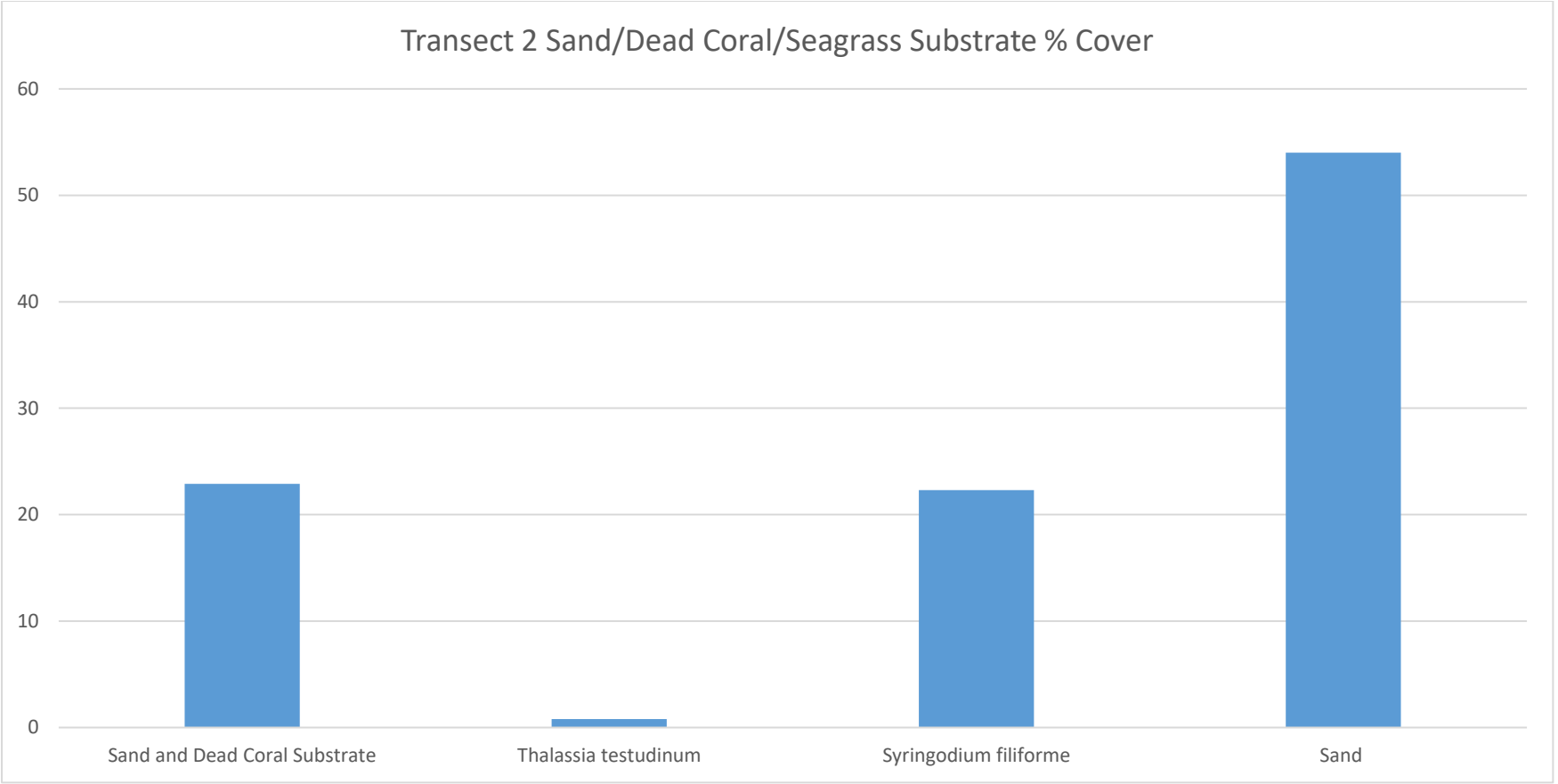


Figure 6B: Close-up of The Spatial Coverage of Benthic Lifeforms Immediately Surrounding The Proposed Bar Site. A: Turtle Grass (***Thalassia testudinum***), B: Marine Sand, C: Manatee Grasses (***Syringodium filiforme***).


Transect 1 Syringodium Bed Lifeform/Substrate % Coverage
60
50
40
30
20
10
0
Thalassia testudinum
Syringodium filiforme
Sand

Graph 1:

Plate 9A: Depiction of Marine Sand at the Study Location with Manatee Grass (***Syringodium Filliforme***) Predominating as the Dominant Marine Flora.

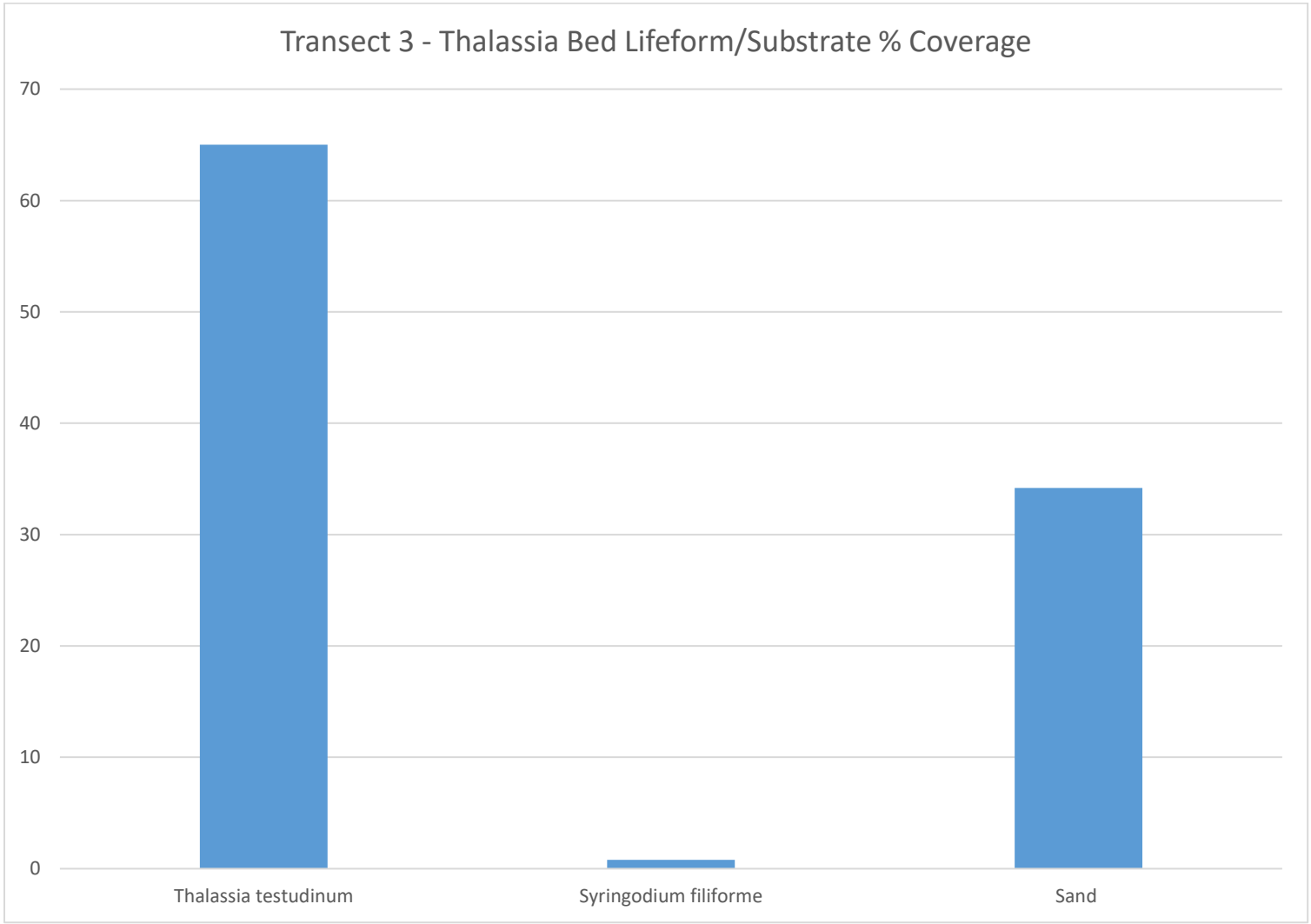

Transect 2 Sand/Dead Coral/Seagrass Substrate % Cover
60
50
40
30
20
10
0
Sand and Dead Coral Substrate
Thalassia testudinum
Syringodium filiforme
Sand

Graph 2:

Plate 9B: Depiction of Marine Sand and Rubble Predominating Along the Northern Section of Transect.

Plate 9C: Seafloor Character at Approximate Location of Proposed Bar.

Plate 9D: Depiction of Manatee Grass (***Syringodium Filliforme***) Present Towards the Southern Section Of The Transect 2.


Transect 3 - Thalassia Bed Lifeform/Substrate % Coverage
70
60
50
40
30
20
10
0
Thalassia testudinum
Syringodium filiforme
Sand

Graph 3:

Plate 9E: Depiction of Turtle Grass (***Thalassia testudinum***) Present on Transect 3.

Numerous West Indian Sea Eggs **(*Tripneustes ventricosus***) were observed throughout the study environment at Lilliput (see **Figure 6C**). These were the only examples of benthic faunal lifeforms observed during the survey.

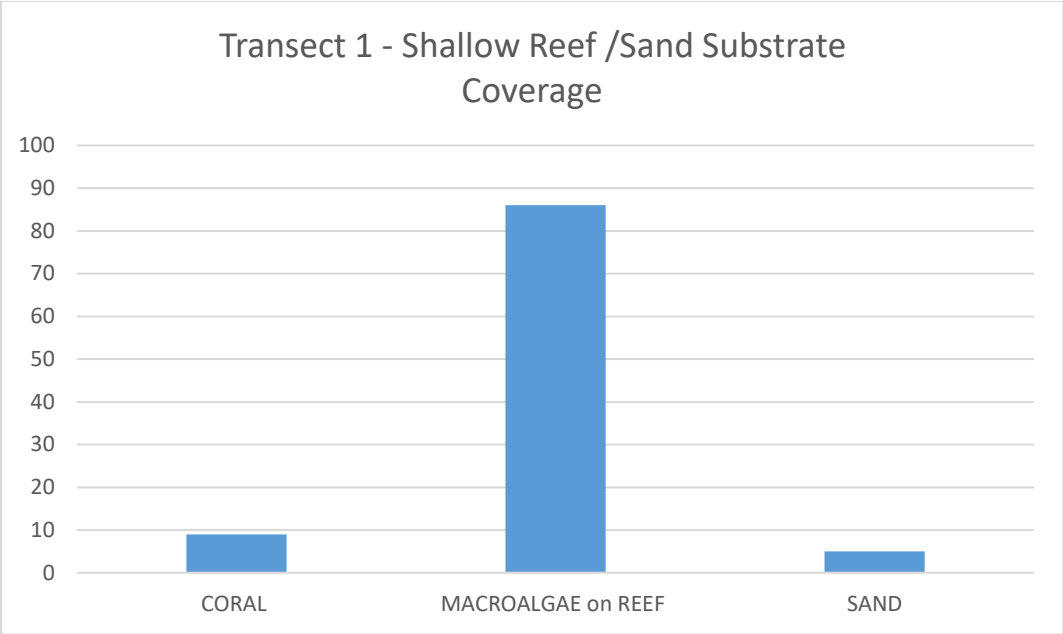
Figure 6C: Benthic Fauna - The West Indian Sea Egg (***Tripneustes ventricosus***) Observed in the Four Benthic Environments Observed on Transects Surveyed at Lilliput (A-Manatee Grass, B-Turtle Grass, C-Dead Coral Outcrops, D-marine sand)

6.2 REEF AREA:

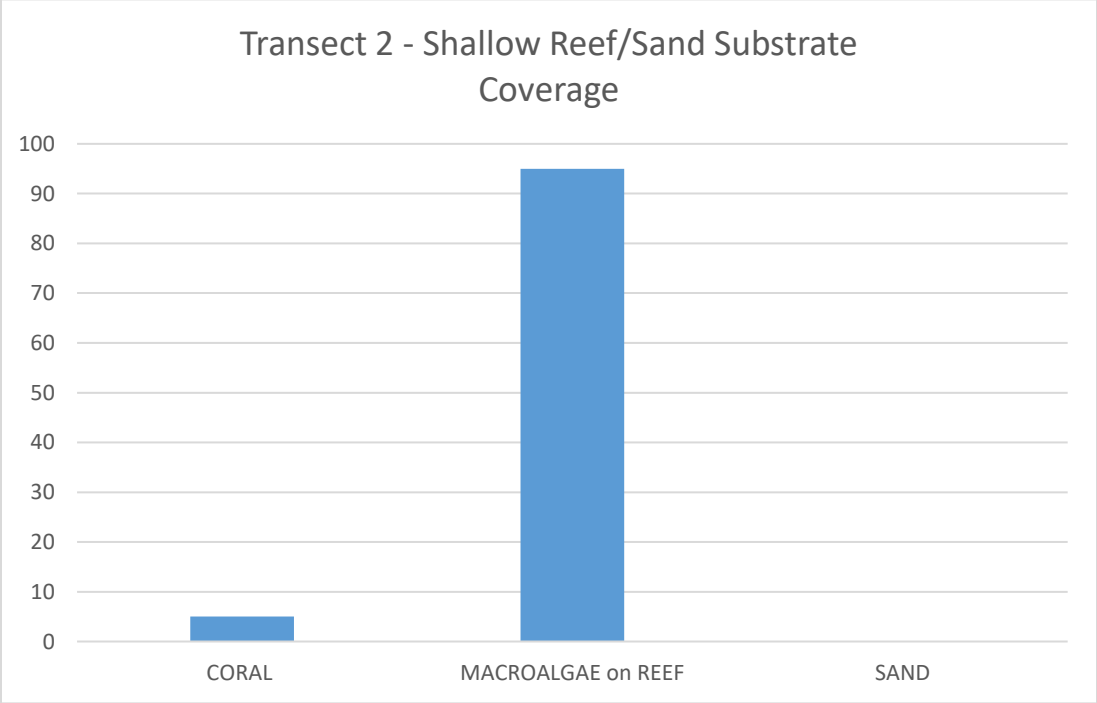
Figure 6D below shows a close-up of the spatial coverage of lifeforms defined within the area A on **Figure 4A-2** above immediately encompassing the reef area north of the proposed bar site. A breakdown of substrate/benthic flora lifeforms for each of the three transects surveyed within this area at the Lilliput site is given below on **Graphs 4-6**.

Graphs 4-6 show a predominance of shallow water, macroalgae covered reef structure with less than 10% cover of live coral being present.

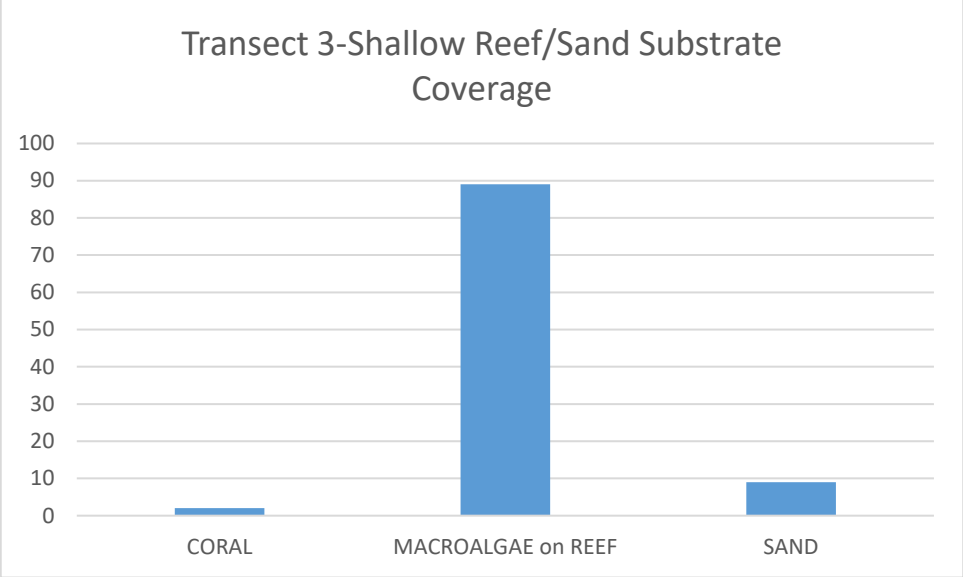
Figure 6D: Close-Up Of The Spatial Coverage of Lifeforms Defined Within The Area A On **Figure 4A-2**



Graph 4



Graph 5



Graph 6

Coral species and sizes observed were primarily as listed on **Table 6A** below:

Table 6A: List of Coral Species Observed Near to the Proposed Site.

Common Name	Scientific Name	Diameter
Mustard Hill Coral	***Porites asteroides***	5-10cm
Symmetrical Brain Coral	***Diploria strigosa***	20-40cm
Great Star Coral	***Montastraea cavernosa***	20-40cm
Massive Starlet Coral	***Siderastrea siderea***	20-40cm

Images of the coral varieties observed on Transects 1-3 within the study area are depicted on **Plates 9F-H** below.

Plate 9F: Mustard Hill Coral **– *Porites asteroides***

Plate 9G: Symmetrical Brain Coral ***–Diploria strigosa***

Plate 9H: Great Star Coral ***Montastrea cavernosa***

6.3 FREE-SWIMMING ENVIRONMENT:

6.3.1 ENVIRONMENT IMMEDIATELY ADJOINING THE PROPOSED BAR SITE

No pelagic species were observed along the transects surveyed at the Lilliput site, with the exception of a solitary Barracuda (***Sphyraena barracuda***) approximately 40cm in length.

6.3.2 REEF SITE

The following fish species were observed on transects at the reef site (see **Table 6B** below):

Table 6B: Fish Species Were Observed on Transects at The Reef Site

Common Name	Scientific Name	Lengths
Bluehead Wrasse	***Thalassoma bifasciatum***	15cm
Striped Parrotfish	***Scarus iseri***	10cm
Threespot Damselfish	***Stegastes planifrons***	10cm
Dusky Damselfish	***Stegastes adustus***	10cm
Foureye Butterfly Fish	***Chaetodon capistratus***	5cm
Blue-striped Grunt	***Haemulon sciurus***	20cm

6.3.3 PROPOSED LAND STAGING SITE AT IBEROSTAR HOTEL EAST – BASIC DESCRIPTIONS.

The lands immediately adjoining the Iberostar jetty to the east are illustrated on **Figure 6E** below, which shows an area of beach front colonized by a mixture of Black Mangrove (***Avicennia germinans***) Sea Grape (***Coccoloba uvifera***) and Seaside Mahoe trees (***Thespesia populnea***). The nearshore seafloor environment was observed to be less than 0.3m in depth extending for a distance of 5 meters seaward from shore and colonized by a mixture of Turtle Grass (***Thalassia testudinum***) and Shoal Grass (***Halodule wrightii***). Depths at the seaward end of the jetty were in excess of a meter.

Figure 6E: Characterization of Coastal Features at Eastern Jetty - Iberostar: (A) marine beach sand, (B) Coastal trees, (C) shallow water seagrass, (D) Jetty.

6.3.4 PROPOSED LAND STAGING SITE AT GREENWOOD –BASIC DESCRIPTIONS.

The lands immediately adjoining the Greenwood boatyard area are illustrated on **Figure 6F** below, which shows an area of beach front that had been reclaimed historically with marl material (A). The marl area on which the boatyard exists is surrounded by Black Mangrove (***Avicennia germinans***) and Seaside Mahoe trees (***Thespesia populnea***). The nearshore seafloor environment was observed to be approximately a meter in depth at the water's edge and was colonized by a mixture of Turtle Grass (***Thalassia testudinum***) and Shoal Grass (***Halodule wrightii***).

Figure 6F: Floral Descriptions at The Greenwood Boatyard

6.4 GEOPHYSICAL ENVIRONMENT:

6.4.1 WATER QUALITY

Tables 7A-1 to 7A-5 depict the results of water quality sampling conducted at the site (full reporting is done in **Appendix 2A**).

Table 7A-1[33] Analysis of Samples Collected for Study Site (Collected March 2022)
18.519599N 77.756488W (site location)

PARAMETERS	National Ambient Interim Water Quality Standard Marine Water 2009	Lilliput Site
BOD (mg/L)	0.0-1.16	0.4
Nitrate (as nitrogen) (mg/L)	0.007-0.014	0.02
Phosphate (mg/L)	0.001-0.003	<0.02
Total Coliform (MPN/100ml)	2-256	5.2
Faecal Coliform (MPN/100ml)	<2-13	<1.8
Total Suspended Solids	-	5.2

Table 7A-2[34] Analysis of Samples Collected for Study Site (Collected March 2022)
18.521886N 77.756413W (north of site beyond reef)

PARAMETERS	National Ambient Interim Water Quality Standard Marine Water 2009	Lilliput Site
BOD (mg/L)	0.0-1.16	0.5
Nitrate (as nitrogen) (mg/L)	0.007-0.014	0.02
Phosphate (mg/L)	0.001-0.003	<0.01
Total Coliform (MPN/100ml)	2-256	-
Faecal Coliform (MPN/100ml)	<2-13	<1.8
Total Suspended Solids	-	4.1

Table 7A-3[35] Analysis of Samples Collected for Study Site (Collected March 2022)
18.512704N 77.755551W (south of the site near to shore)

PARAMETERS	National Ambient Interim Water Quality Standard Marine Water 2009	Lilliput Site
BOD (mg/L)	0.0-1.16	0.1
Nitrate (as nitrogen) (mg/L)	0.007-0.014	0.02
Phosphate (mg/L)	0.001-0.003	<0.02
Total Coliform (MPN/100ml)	2-256	-
Faecal Coliform (MPN/100ml)	<2-13	<1.8
Total Suspended Solids	-	6.0

[33] See **Appendix 2A** for Analysis Report.
[34] See **Appendix 2A** for Analysis Report.
[35] See **Appendix 2A** for Analysis Report.

Table 7A-4[36] Analysis of Samples Collected for Study Site (Collected March 2022)
18.516157N 77.749945W (east of site)

PARAMETERS	National Ambient Interim Water Quality Standard Marine Water 2009	Lilliput Site
BOD (mg/L)	0.0-1.16	0.2
Nitrate (as nitrogen) (mg/L)	0.007-0.014	0.02
Phosphate (mg/L)	0.001-0.003	0.02
Total Coliform (MPN/100ml)	2-256	-
Faecal Coliform (MPN/100ml)	<2-13	<1.8
Total Suspended Solids	-	3.6

Table 7A-5[37] Analysis of Samples Collected for Study Site (Collected March 2022)
18.519044N 77.768222W (west of site)

PARAMETERS	National Ambient Interim Water Quality Standard Marine Water 2009	Lilliput Site
BOD (mg/L)	0.0-1.16	0.7
Nitrate (as nitrogen) (mg/L)	0.007-0.014	0.02
Phosphate (mg/L)	0.001-0.003	0.02
Total Coliform (MPN/100ml)	2-256	-
Faecal Coliform (MPN/100ml)	<2-13	2.0
Total Suspended Solids	-	5.6

What was deemed to be of importance was that for the 2022 site sampling, Nitrate and Phosphate values were elevated. BOD values were below the standards, suggesting that the elevated Nitrate and Phosphate values might not have been attributed to the introduction of a pollutant into the marine environment. The common variable between the sampling locations was that the samples were taken above seagrass beds. It is therefore possible that biological activities related to the seagrass beds may be contributing to the nutrient values at the sample sites.

The comparison with the NEPA water quality sampling results was comparable for Phosphate and Nitrate parameters. However, the NEPA results had BOD and Faecal Coliform values for all sites (with the exception of BOD for the Lilliput site) exceeding the NEPA standards. The averages are presented on **Table 7A-6** below.

[36] See **Appendix 2A** for Analysis Report.

[37] See **Appendix 2A** for Analysis Report.

Table 7A-6 Averages for NEPA Water Quality Analysis of Samples Collected Over The Time-period June 29, 2002 to May 29, 2018 (See **Appendix 2B**)

LOCATION		PO_4 (mg/l)	NO_3 (mg/l)	BOD (mg/l)	Faecal Coliform (MPN/100ml)	TSS (mg/l)
Greenwood Beach		0.089	1.232	1.30	164	139.3
Lilliput		0.083	1.463	1.08	38	237.6
Long Bay		0.271	0.668	1.22	20	179.2
Rosehall Resort & Country Club		0.057	0.284	1.28	44	363.4
NEPA Standard		0.001-0.003	0.007-0.014	0.0-1.16	<2-13	-

6.4.2 DEPTH

Figure 6G-1 illustrates the depths measured at and immediately peripheral to the proposed overwater bar location. **Figure 6G-2** illustrates the depths measured along a transect run immediately west of the proposed bar location, across the adjoining reef into deeper forereef waters.

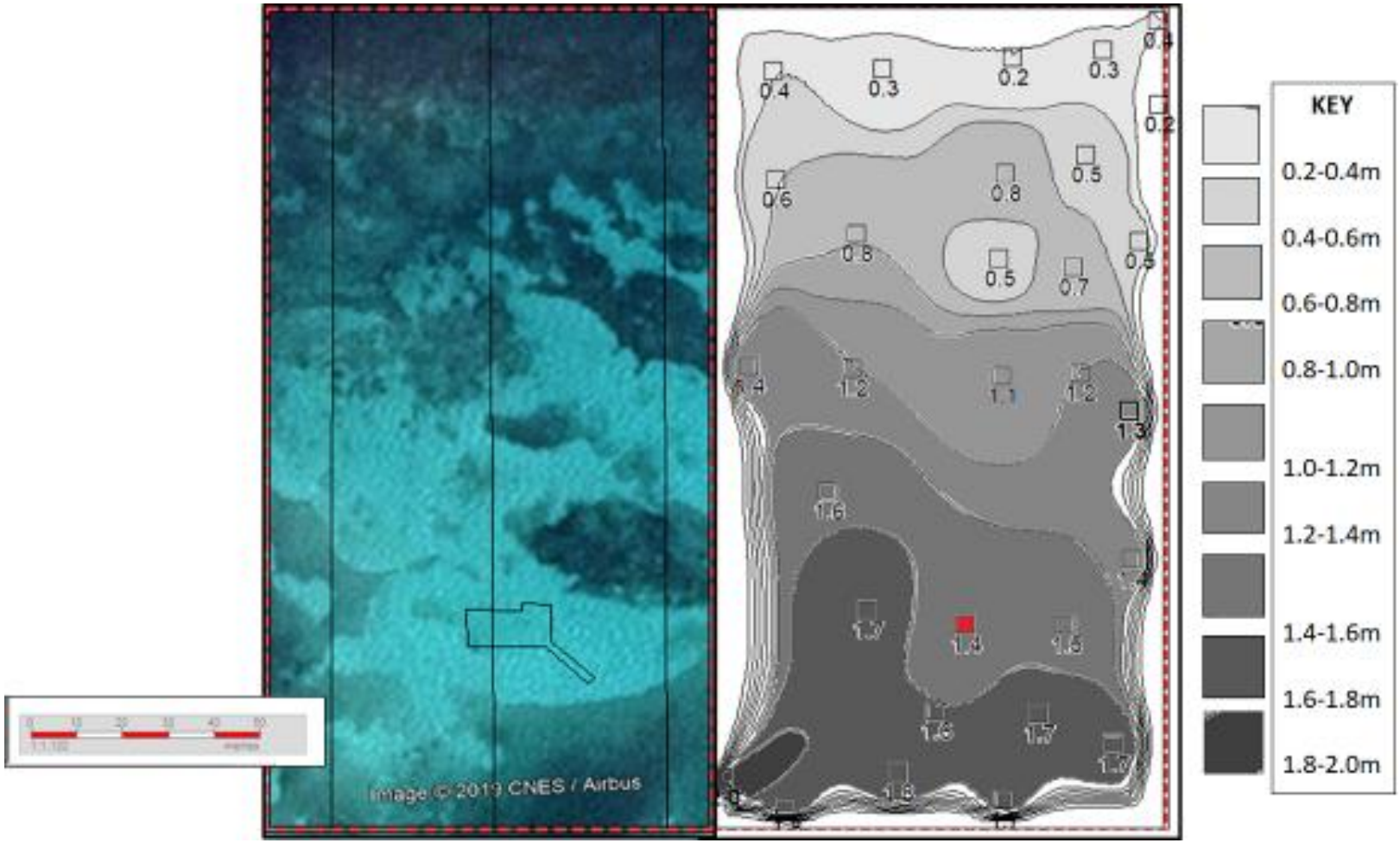


Figure 6G-1: Seafloor Depths (in meters) Within the Lilliput Study Site (proposed site in red square)

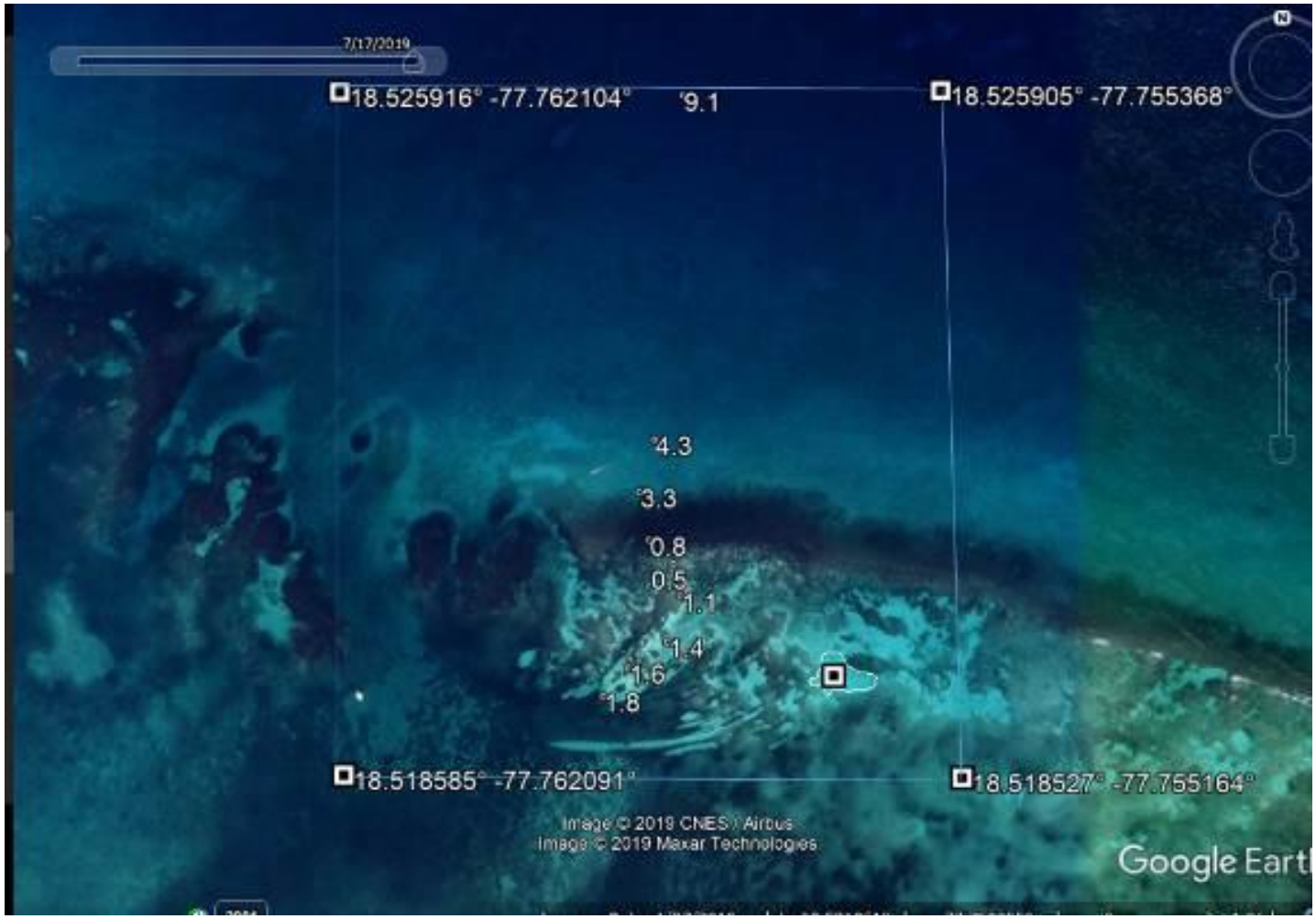


Figure 6G-2: Seafloor Depths (in meters) Within The Lilliput Study Site (proposed site in red square)

6.4.3 OCEANOGRAPHY, NATURAL HAZARDS AND CLIMATE CHANGE PROJECTIONS
6.4.3.1 OCEANOGRAPHY
6.4.3.1.1LITERATURE REVIEW

No predictive modelling studies representing the Lilliput nearshore/offshore area were found. However, an engineering report entitled "**Preliminary Engineering Report Proposed Beach Villas for Sandals Royal Caribbean Hotel prepared by CEAC Solutions Ltd December 2009**" was cited for two reasons:

1. The approaches of the storm simulated for the technical report (tracking along the north coast from an easterly or westerly direction of movement) represented not just an ideal storm evaluation set-up for both evaluated locations but also represented an elevated wave approach that could typically be experienced every winter with the influence of cold fronts.
2. The nearshore and offshore depth conditions at the technical report study site were somewhat similar to that evaluated at the proposed Lilliput site.

The CEAC Solutions report modelled a 10-year hurricane event moving in a north-westerly direction and suggested that a storm surge wave height of 1.4 meters could be expected at the studied site. The report went further to point out that the wave heights that could be exceeded by 1% of the predicted waves could be as high as 2.13 meters, thus leading to the recommendation that the room design, for which the report was prepared, be constructed to have a minimum floor height of 2.73 meters above mean sea level.

A presentation prepared by **Rafi Ahmad, Unit for Disaster Studies – UWI Mona and Edward Robinson and Deborah-Ann Rowe, Marine Geology Unit UWI – Mona entitled "Storm Surge and Tsunami Coastal Flooding Processes in Jamaica"** shed light on storm surge heights measured on the north coast after the passage of Hurricane Allen in 1980. Hurricane Allen, in the opinion of the author, remains to this date the most significant system to influence the north coast of the island from a generated storm surge perspective. The hurricane was a Category 4 in development when it passed the island's north coast, with wind speeds of between 117 knots to 134 knots being possible.

Figure 6H-1 shows a detailed track of the centre of the system in relation to the north coast of Jamaica. **Figure 6H-2**, extracted from the presentation, illustrates the findings of storm surge field measurements made by the Geological Survey Division after the passage of the storm.

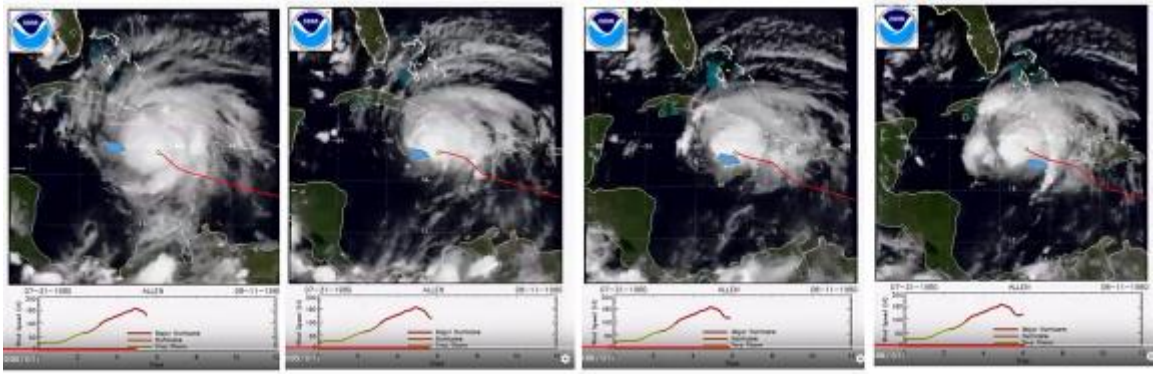


Figure 6H-1: A Detailed Track of The Centre of Hurricane Allen (1980) In Relation To The North Coast Of Jamaica[38]

[38] www.nhc.noaa.gov

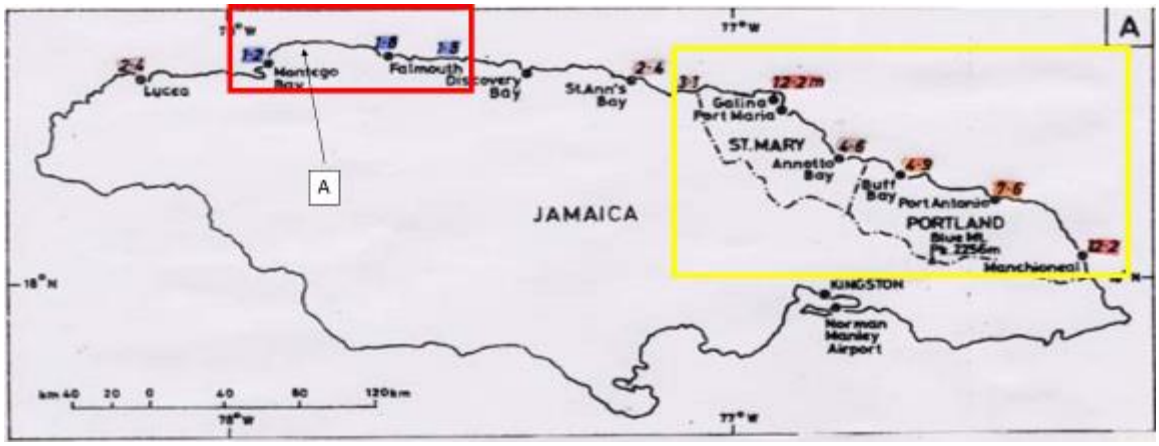


Figure 6H-2: Place Locations in Jamaica and Surge Heights in Meters Recorded By The Geological Survey Division - Post Hurricane Allen 1980 (A: location of study site, **red rectangle**: recorded data near to study site, **yellow rectangle**: recorded extremes.

Based on the track and storm shape depicted on **Figure 6H-1**, winds and waves impacting on the north coast during this storm's passage would have originated from the north. **Surge heights of between 1.2m and 1.8m are likely to have impacted the study area during the storm's passage**.

The extreme surge heights of up to 12.2 meters depicted on **Figure 6H-2** are likely to have been experienced due to two factors, namely:

1. The depth over which wave run-up occurred. If there is an extensive shallow area leading up to the shoreline, then the generated wave will be less pronounced than if the waves approached a shore over deep water (see **Figure 6I** below). The seafloor slopes steeply at much of the island's northeast and east shores, conversely, there is more of a shallow shelf present at and surrounding the proposed project area.
2. The track of Hurricane Allen was closer to the island's northeast coast than at the northwest coast. Thus, there may have been a greater influence of the storm's eyewall on wind speeds – generating more wave generating forces.

[39] www.nhc.noaa.gov

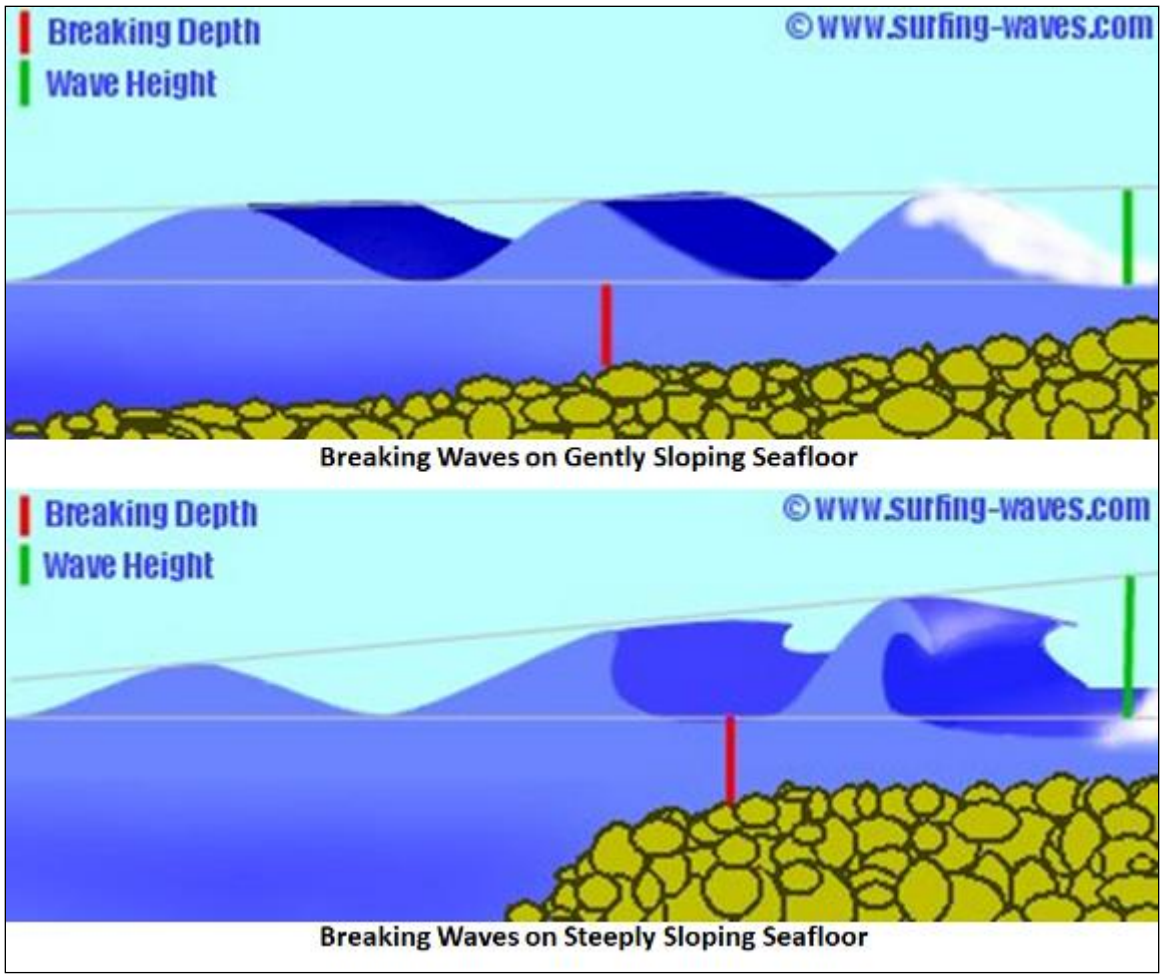


Figure 6I: Character of Waves Breaking on Gently And Steeply Sloping Seafloors [40]

6.4.3.1.2 REMOTE SENSING WAVE PATTERN REVIEW

Figure 6J-1 (Google Earth Image dated April 5, 2002) depicts wave movements apparently driven by winds blowing out of the north northwest. The yellow line on **Figure 6J-1** represents a dividing line between water depths increasing northwards to beyond 9 meters at the northern extent of the diagram and water depths increasing southwards to less than or equal to 1.8 meters. The dividing line defines a fringing reef that runs in an east to west orientation. Depths along this dividing line were depicted on **Figure 6G-1** above as being as shallow as 0.3 meters.

[40] Extracted from http://www.surfing-waves.com/waves/how_waves_break.htm

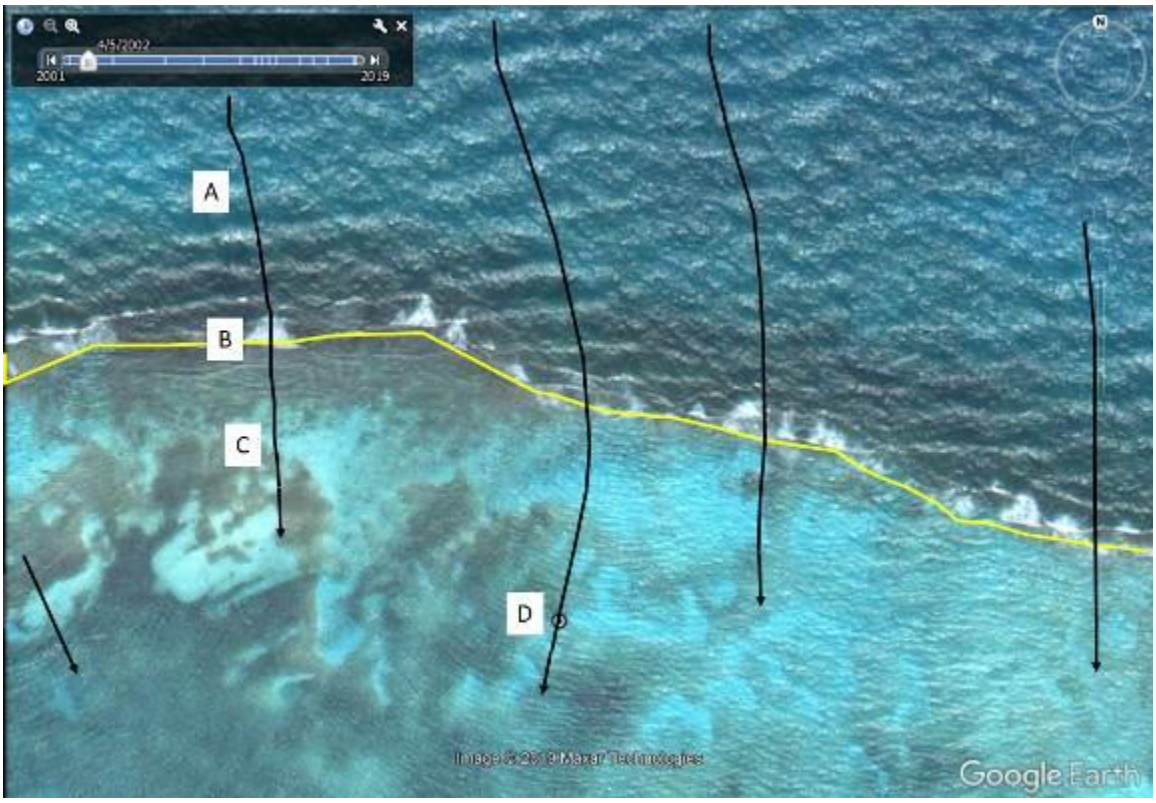


Figure 6J-1: Google Earth Image Dated April 5, 2002 Depicting Wave Movements Aparently Driven By Winds Blowing Out Of The North Northwest (A-areas between 1-9m depth, B-reef area between 0.3m-1m, C-areas between 0.3m-1.8m, D-project location).

The waves depicted show two directions of movement. North of the dividing line has waves moving from the north northwest towards the south southeast. The waves appear to turn towards the south southwest after passing the dividing line, believed to be influenced by a process in oceanography called wave refraction.

The waves depicted on the July 2, 2009, Google Earth image (**Figure 6J-2**) showed waves originating out of the east northeast and heading towards the west southwest - more in keeping with normal prevailing wind directions for the north coast area[41]. The waves appeared to refract further towards the southwest after passing over the fringing reef (reinforced in section **5.4.3.1.4** below).

[41] www.metservice.gov.jm

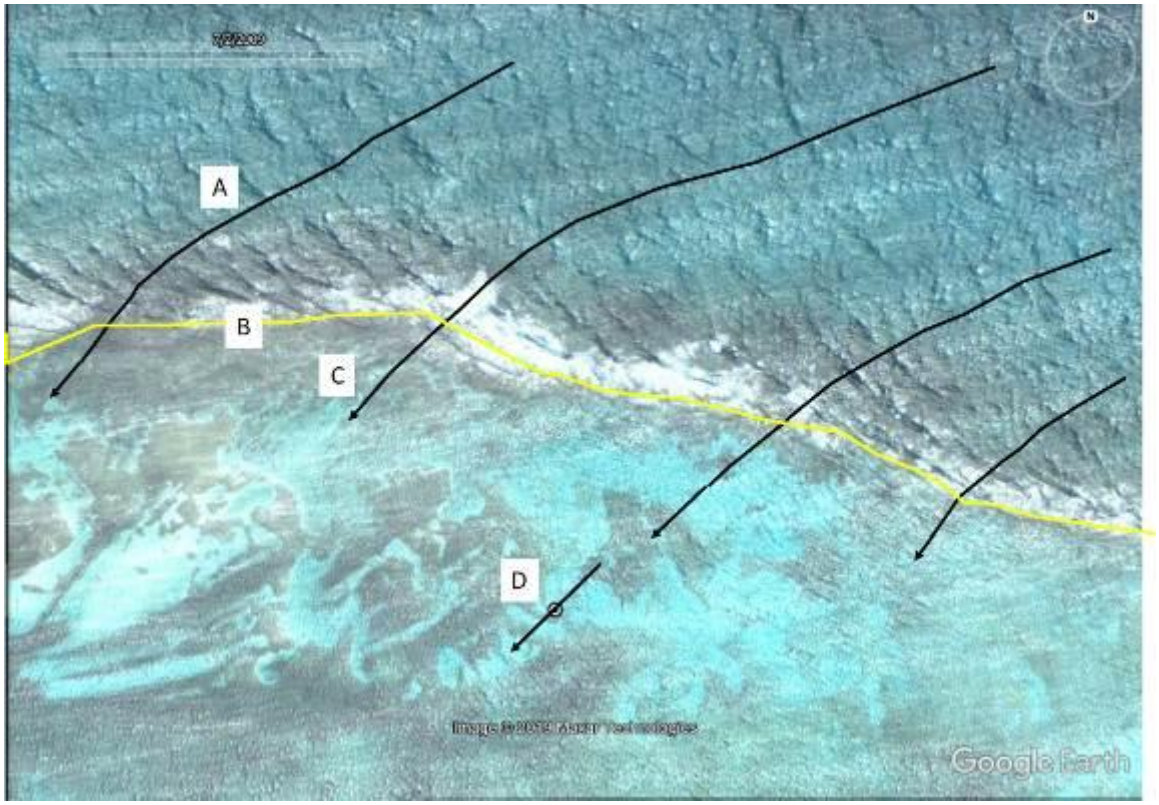


Figure 6J-2: Google Earth Image Dated July 3, 2009, Depicting Wave Movements Apparently Driven by Winds Blowing Out Of The East Northeast (A-areas between 1-9m depth, B-reef area between 0.3m-1m, C-areas between 0.3m-1.8m, D-project location).

6.4.3.1.3 DROGUE SURVEY:

Wind speeds and directions recorded during the drogue survey were 10-15 knots from the east northeast. **Figure 6L** depicts the path that the test drogue moved over the 45-minute (three 15 minute timed) surveys conducted. The drogue's calculated speed of movement was 0.08m/s on a bearing of 235 degrees (true).

Though this was a one-off study event, it is likely that the prevailing currents experienced at the site will be a function of the direction from which the prevailing wind is blowing. Thus, it is likely that, for **Figures 6J-1** and **6J-2** above, current movements would be closely correlated to the direction of wave movement interpreted on the Google Earth images – which in turn would be influenced by the prevailing wind directions.

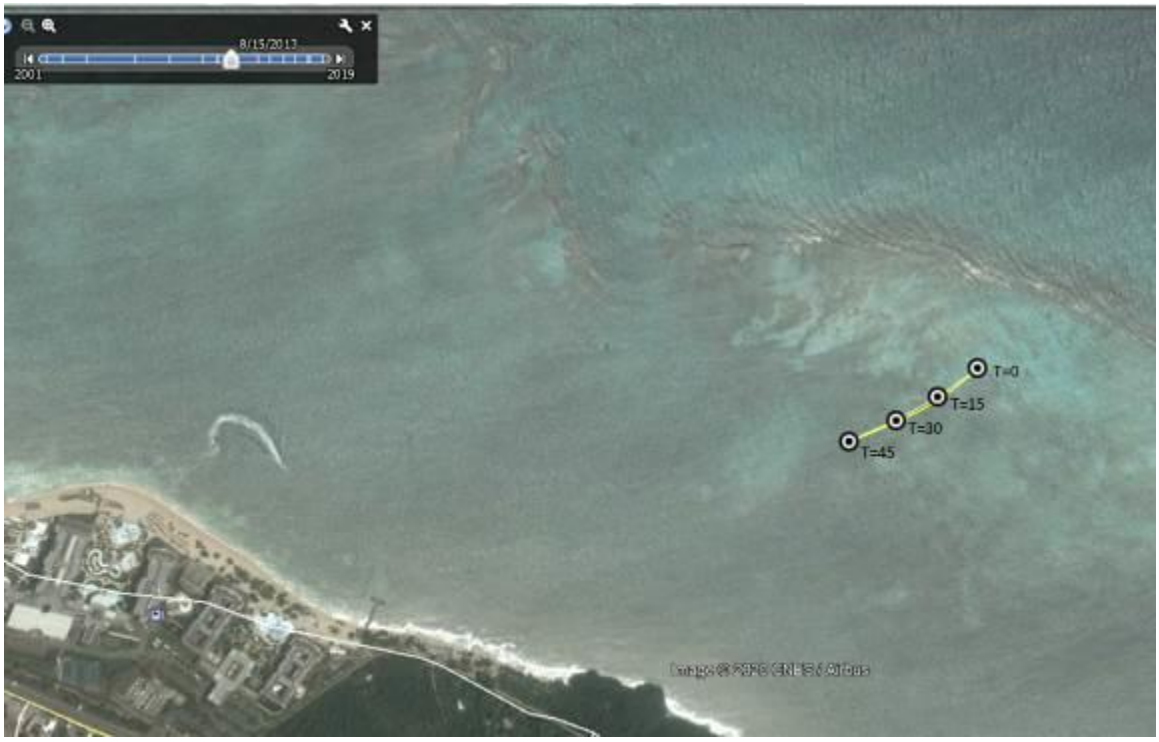


Figure 6L: Path That the Test Drogue Moved Over During the Survey Period (T represents timed intervals of 15, 30 and 45 minutes. T= start point at the proposed bar site).

6.4.3.2 NATURAL HAZARDS

An examination of the NOAA website showed that the centres of 10 tropical cyclones of a magnitude between Categories 1-4 have transited within 25 kilometres north and south of the location of the project site over the history of storm data collection, which covers a reporting period of 150 years. Of this collection, the most significant are listed below:

1. Hurricane Charlie 1951
2. Hurricane Allen 1980
3. Hurricane Gilbert 1988

A distance of 25 kilometres was chosen owing to the fact that the significant hurricane systems listed above had eyes of a diameter of approximately 25 km. The areas of greatest wind force (the eye walls) in these hurricanes would have been closely associated with the eyes.

There were systems, such as Hurricanes Ivan (2004), Dennis (2005), Dean (2007), Paloma (2009) and Sandy (2012) that influenced the country. However, their centres of low pressure, as well as their eyewalls, were not determined to be within 25km from the project location.

Irrespective, there is the possibility that the location could be influenced by hurricanes of a strength leading up to a Category 4. If such a system were to transit within the near future, it is possible that storm surge heights equating to that depicted in Section **6.4.3.1.1** above could be experienced at the site. However, no tropical cyclone centre of low pressure has been tracked passing within the range of the project area in 31 years.

6.4.3.3 CLIMATE CHANGE PROJECTIONS

With Caribbean Sea level rise over the 20th century estimated at 0.17m +/- 0.05m and expected rises of between 0.13m to 1.4m leading up to the year 2100 (depending on which sea level rise scenario is examined), it is expected that sea levels could ultimately rise by an extreme of 1.4m plus that depicted on the development's engineering drawings by 2100.

6.4.3.4 SUPPLEMENTAL PROJECTIONS – EXPECTED WAVE FORCE CALCULATIONS

Professor Ping Wang, Director of Coastal Research Laboratory School of Geosciences, University of Florida, had been consulted by the Clients to determine the structural loading that could be experienced on the pilings during the passage of surges. The Professor assumed a surge movement of 1.5 meters over the proposed site after breaking over the reef adjoining the site, which equates to an average of storm surge values depicted on **Figure 5D-2** for the north-western section of the island, as recorded by the Geological Survey Division Post Hurricane Allen 1980.

The Director's evaluations are quoted in **Appendix 4**. The quoted information was conveyed to the developer's engineers who converted the information to piling dimension and pile depth designs.

6.4.4 AMBIENT NOISE

Figure 6M illustrates ranges of sound intensities recorded at the proposed site, as well as peripheral locations. These recordings were intended to be regarded as baseline references.

Figure 6M: Decibel Ranges Measured at Sample Areas Within Lilliput Study Area.

Values recorded are described below:

1. The roadside noise sample area recorded decibel ranges of between 60 and 81 decibels (dB), with the passage of trucks and motorcycles with modified exhaust systems spiking readings to the upper levels recorded.
2. The beachside noise sample area at the Iberostar Hotel was apparently influenced by a sound system playing music for the entertainment of the hotel patrons near to the beach area. Noise

levels of between 40-65dB were recorded, with the elevated dB values occurring with variations in the intensities of the music and loud-speaker activity occurring.

3. The beachside noise sample area at the Grange Pen Fishing beach was influenced by discussions between fishers, as well as the sound of a radio playing at the location during the time of sound sampling. Spikes in the recording were influenced by fishers elevating their voices occasionally. Readings of 40-63 dB were recorded.
4. The location of the proposed overwater bar was the quietest of the four locations sampled, with noise spikes being influenced by changes in wind speeds or the occasional splash of waves.

6.4.5 BUILDING CARRYING CAPACITY:

Section **4.2.3** defined the carrying capacity of a building, particularly a recreational building like the proposed over-water bar, as being limited by the numbers of entrances and exits contained within its design. **Table 5** above was used for the evaluation of the proposed design and **Figure 6N-1** outlines the presence of two public entrances/exits at the bar. A theoretical one storey bar with a floor area of 436.6 square meters had been used for the calculation of occupancy loading for **Table 5** and a loading of **50-500** patrons for a 2 entrance/exit design was calculated.

The proposed overwater bar, however, has a useable client floor space of approximately 159 square meters (1711.5 square feet), as defined as the blue areas on **Figure 6N-2.** A further review of the International Building Code revealed a formula for the calculation of an **Occupant Load Factor** (OLF). This is the floor area (in square feet) that can be assigned to a patron within an occupiable space. The formula is stated as *OLF* = (0.00007) (*GLA*) + 25, where OLF = The *occupant load* factor (square feet per person) and GLA = The *gross leasable area* (square feet). .

For the proposed bar, the GLA would be 1711.5 square feet (159 square meters). Therefore the OLF for the occupiable space within the proposed bar would be (0.00007) (1711.5) + 25 or **25 persons**. Therefore, it is conservatively surmised that the proposed bar could accommodate between **25 -50** persons at any one period of time, based on both floor space and entrance/exit availability.

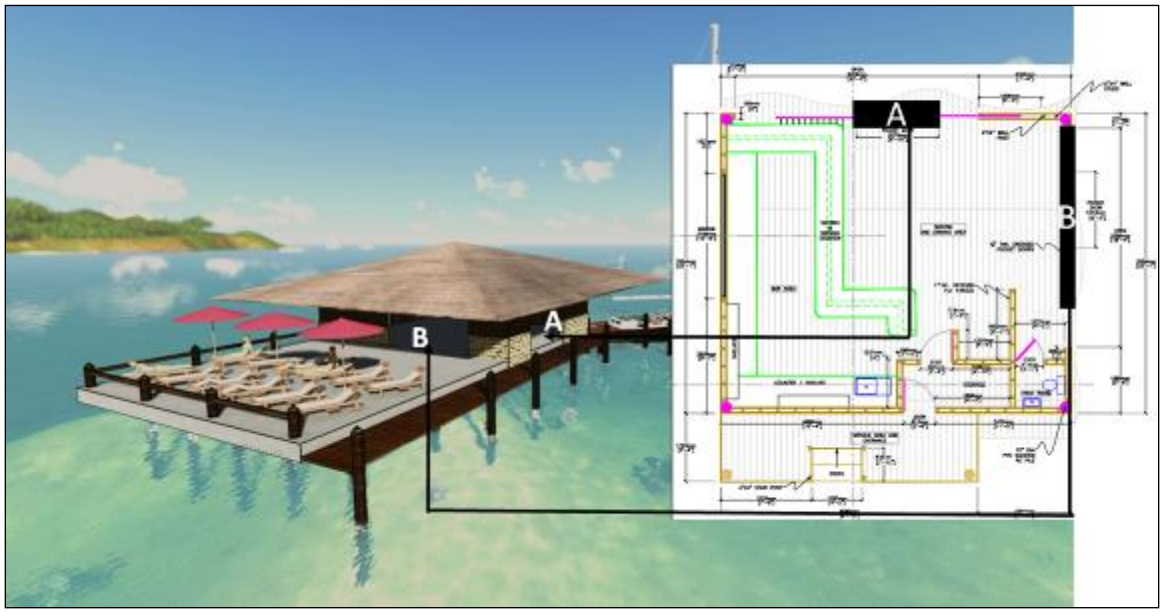


Figure 6N-1: Locations of Two Public Entrances/Exits at The Bar.

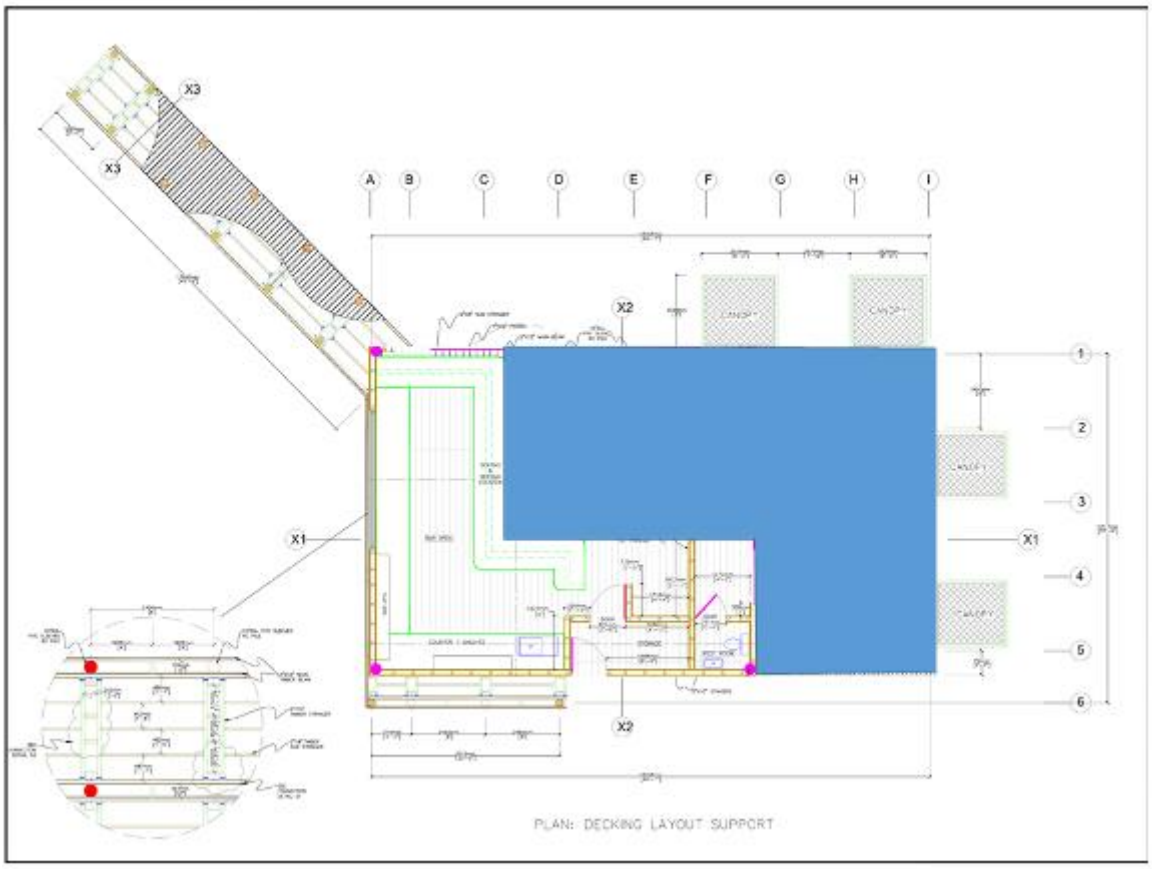


Figure 6N-2: Useable Client Floor Space at The Proposed Overwater Bar.

6.5. SOCIO-ECONOMIC ENVIRONMENT (RELATE TO FIGURES 4H-1 AND 4H-2)

6.5.1 DEMOGRAPHICS

The Statistical Institute of Jamaica's (STATIN) 2011 population census data for the study area defined on **Figure 4H-2** was examined and data for locations on the figure that could be identified in the census data was extracted. **Table 8** below depicts the population of the various communities found within the 5-kilometer socio economic assessment area radius established around the development site. This table breaks down the population numbers according to 17 five-year age groups.

Table 8 is further supported by **Graph 7**, which shows the overall 2011 populations of the various communities for which census data could be identified as compared with similar data obtained from the Iberostar Hotel Environmental Impact Assessment, which was prepared in July 2004, but which reflected the STATIN's 2001 census data.

The table shows a listing of six communities that occupy the 5-kilometre study area radius around the proposed development site, with the community of Lilliput having the largest population numbers in total and for all of the age groups counted. The community of Lilliput was also the most populous in 2001, however, there was not a significant difference in population numbers between that depicted in the 2001 census report and 2011 (an increase by 112). However, the other communities with numbers that could be

compared over the two census reporting periods showed increases varying from 1044 for the community of Barrett Hall to 3,321 for the community of Spot Valley.

Spot Valley's increase in numbers over the 10-year period was caused by the development of the West Indies Home Contractors Ltd.'s (WIHCON) 492 lot Spot Valley Housing Development, which was approved after 2006.
It must be noted that the 5km study area also defined the location of the Gore Development Ltd.'s 900 lot Rhyne Park Village, which was built at approximately the same time as the Spot Valley Housing scheme. 492 lots.

It is apparent that STATIN's 2011 census included the population of the Spot Valley Housing Scheme but did not include Rhyne Park's population. If a conservative estimate of 4 persons per dwelling is applied, then it is possible that the population of the Rhyne Park village could border around 3,600 residents.

6.5.2 SETTLEMENT CHARACTERISTICS AND LANDUSES:

6.5.2.1 GENERAL:

Figure 6O shows the spatial coverage of each of the communities present within the 5km socio-economic study area. The figure includes two resort-based developments, namely the Iberostar Rose Hall Beach Hotel and the Sea Castles Beach Condominiums.

Of the eight communities present within the study radius, six were residential communities while two were planned resort complexes. Of the six residential communities, two represented small residential townships (Barrett Town and Greenwood), one was a planned housing community (Rhyne Park Village), one included a planned housing community (Spot Valley Housing Scheme) while two have been regarded as being fully informal settlements[42].

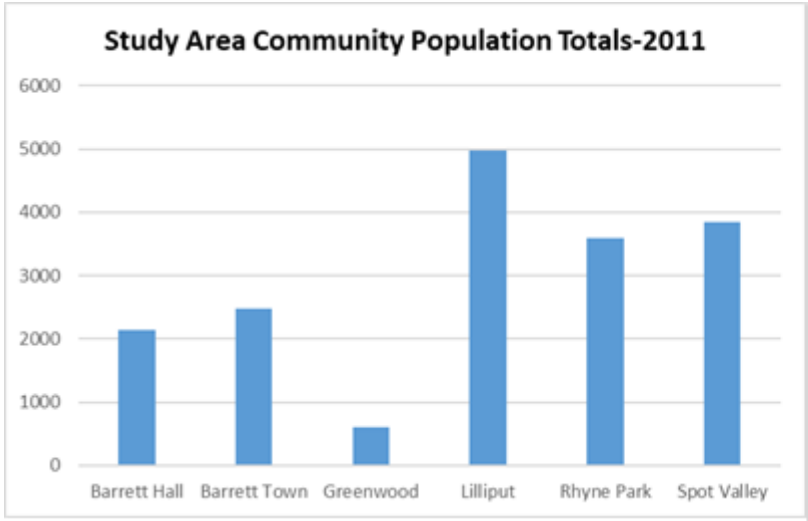
All of the informal communities and townships conforms to a combination of nucleated and linear settlements pattern configurations[43]. All the planned residential and resort developments conformed to that of nucleated settlements.

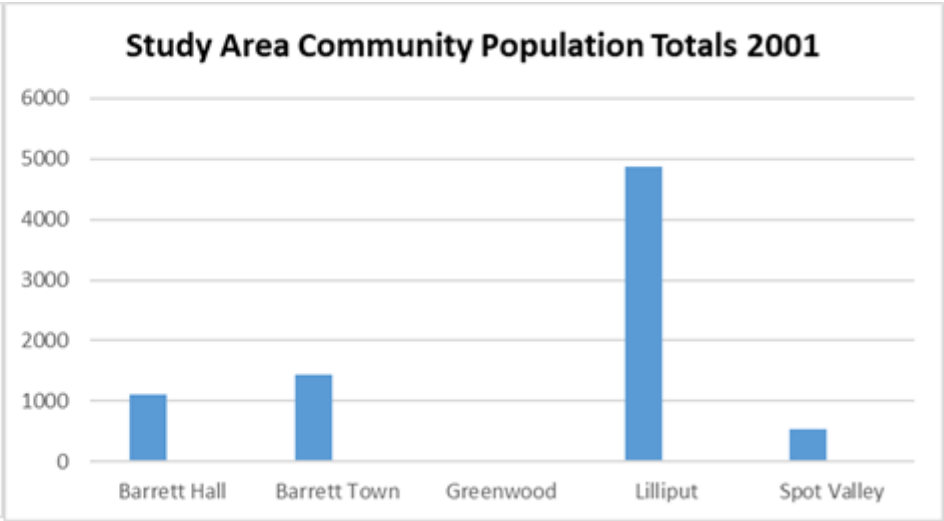
[42] Rapid Assessment of Squatting Report 2007 https://www.yumpu.com/en/document/read/17074439/rapid-assessment-of-squatting-report-note-large-file

[43] Nucleated Settlements - buildings are clustered in relation to internal road networks https://steemit.com/geography/@donfelix/classifying-settlements

Table 8: The Population of The Various Communities Found Within The 5 Kilometre Socio Economic Assessment Area Radius Established Around the Development Site (STATIN 2011 population data).

Community Name	Age Group																	
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80+	Totals
Barrett Hall	211	195	235	209	187	194	149	159	136	134	114	64	65	45	22	16	9	2,144
Barrett Town	191	250	329	233	255	223	160	167	157	130	98	90	51	51	36	28	30	2,479
Greenwood	40	44	42	45	45	51	49	46	43	43	29	26	30	32	21	20	7	613
Lilliput	407	447	553	524	479	478	330	345	311	286	262	174	129	88	83	29	52	4,977
Spot Valley	372	383	448	396	361	328	253	268	266	219	166	127	105	60	40	20	40	3,852
Total	1,221	1,319	1,607	1,407	1,327	1,274	941	985	913	812	669	481	380	276	202	113	138	14065





Graph 7:

6.5.2.2 LAND AREAS, POPULATION DENSITIES AND USES:

Table 9 below shows the respective land areas covered by the communities listed and supports **Figure 6O** in illustrating this spatial coverage. **Table 10** also illustrates population densities for the respective communities present.

The total land area encompassed within the socio-economic study radius was estimated at 34.3 square kilometres. In comparison, the total developed area within the study radius was estimated at 8.6 square kilometres, or approximately 25% of the overall land area within the study radius.

Table 9: Estimated Community Land Areas and Population Densities Within the Socio-Economic Study Radius.

Community Areas and Populations (relate to **Figure 6O**) (* = estimated populations)			
Community	Land Area Km2	Population	Population Density #/km^2
Barrett Hall	1.2	2,144	1757
Barrett Town	1.2	2,479	2066
Greenwood	1.9	613	323
Lilliput	2.7	4,977	1843
Rhyne Park Village*	0.7	**3,600**	5143
Spot Valley (including Housing Development	0.9	3852	4280

Figures 6P-1 to 6P-6 spatially illustrates the land uses present within the populated areas of the study radius. Note the presence of schools in both Barrett Town and Spot Valley (Barrett Town All Age School and Spot Valley High School), a church establishment in Barrett Town and commercial establishments in Barrett Town, Spot Valley, and Greenwood.

Predominating land uses within the study radius were determined to be low to middle income residential developments supporting subsistence agriculture[44]. Small-scale retail and household services were present within the development borders, with employment services being offered outside of the borders of the residential areas – primarily within the tourism sector.

Buildings within the low to middle income residential areas were determined to be primarily constructed of block and concrete components and all have basic amenities, though the provision of consistent water supplies has historically been regarded as an issue and many of the interior road networks have been regarded as being of a poor nature.

[44] Interpreted from https://sdc.gov.jm/ communities summary profiles

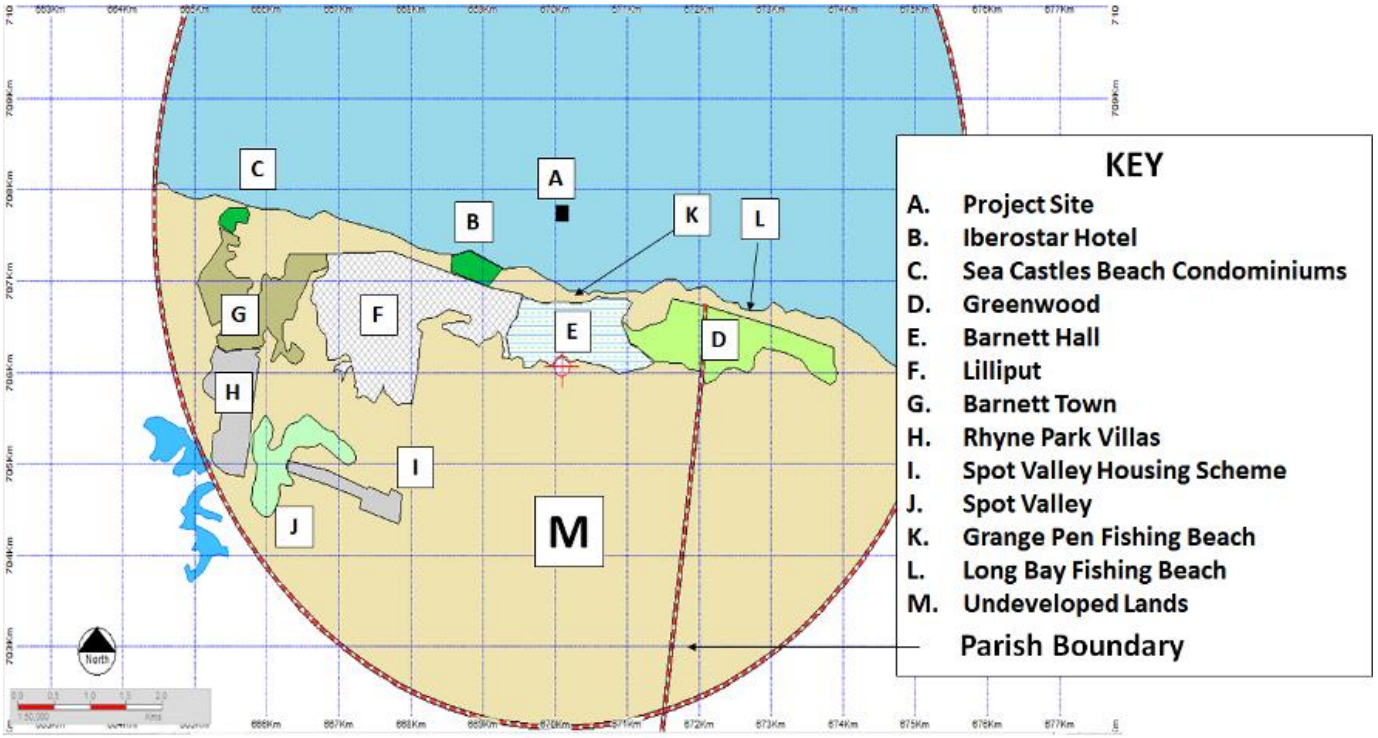


Figure 6O: Respective Land Areas Covered by The Communities Listed Within the Socio-Economic Study Area Radius

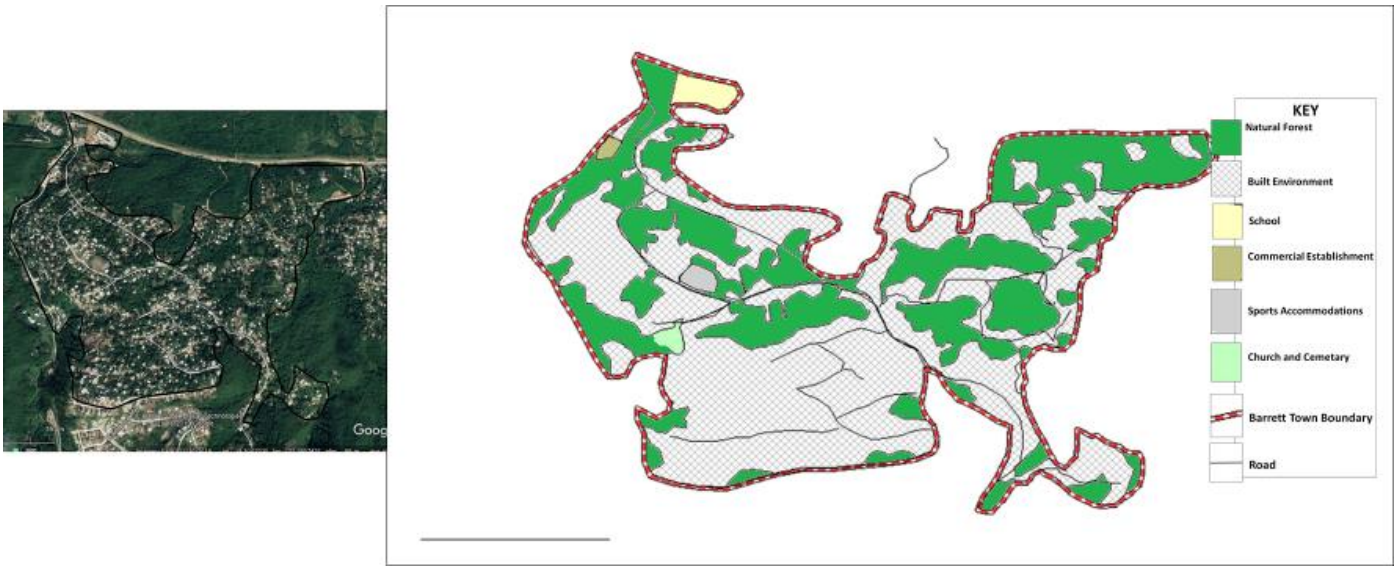


Figure 6P-1: Spatial Distribution Of Land Use Types - Barrett Town

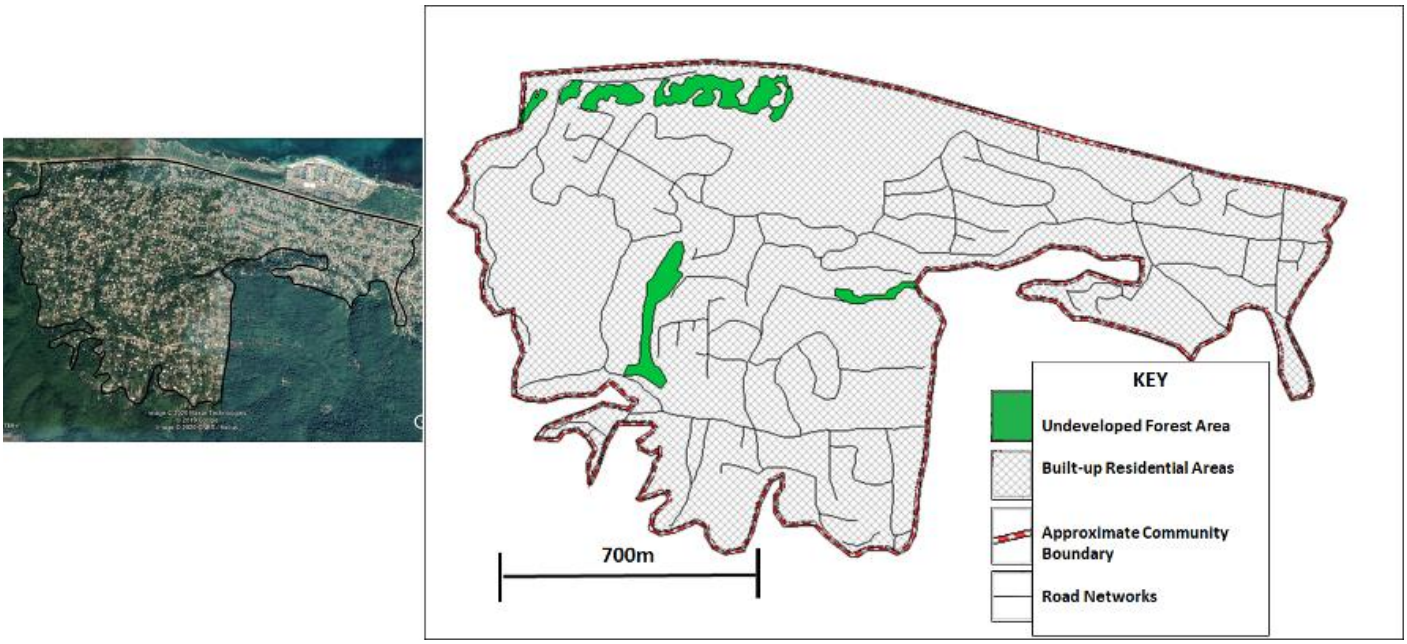


Figure 6P-2: Spatial Distribution Of Land use Types - Lilliput.

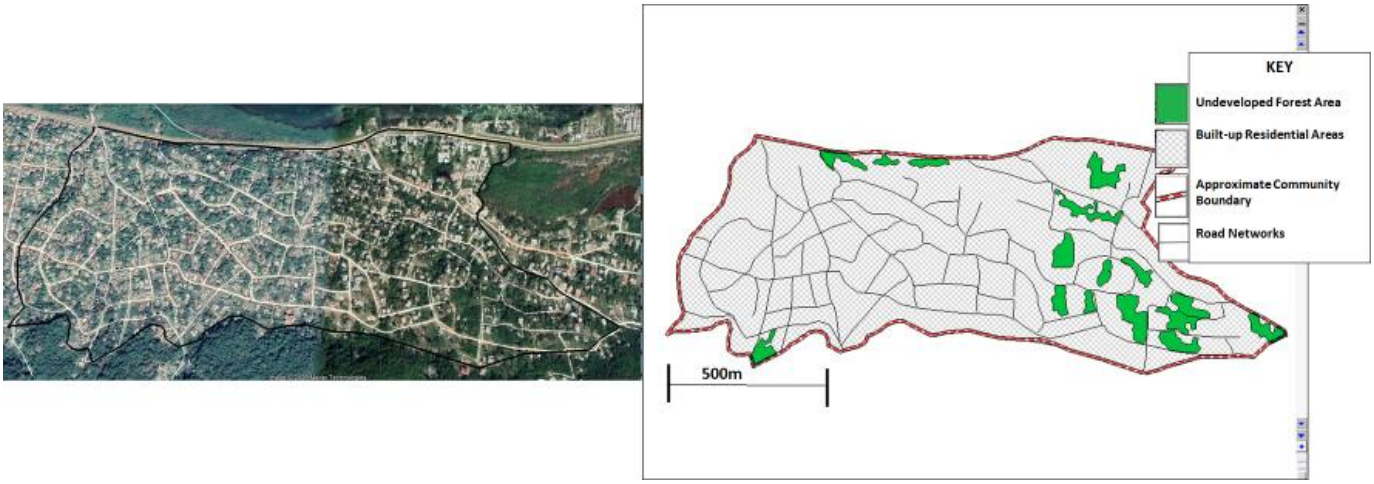


Figure 6P-3: Spatial Distribution Of Land use Types - Barrett Hall

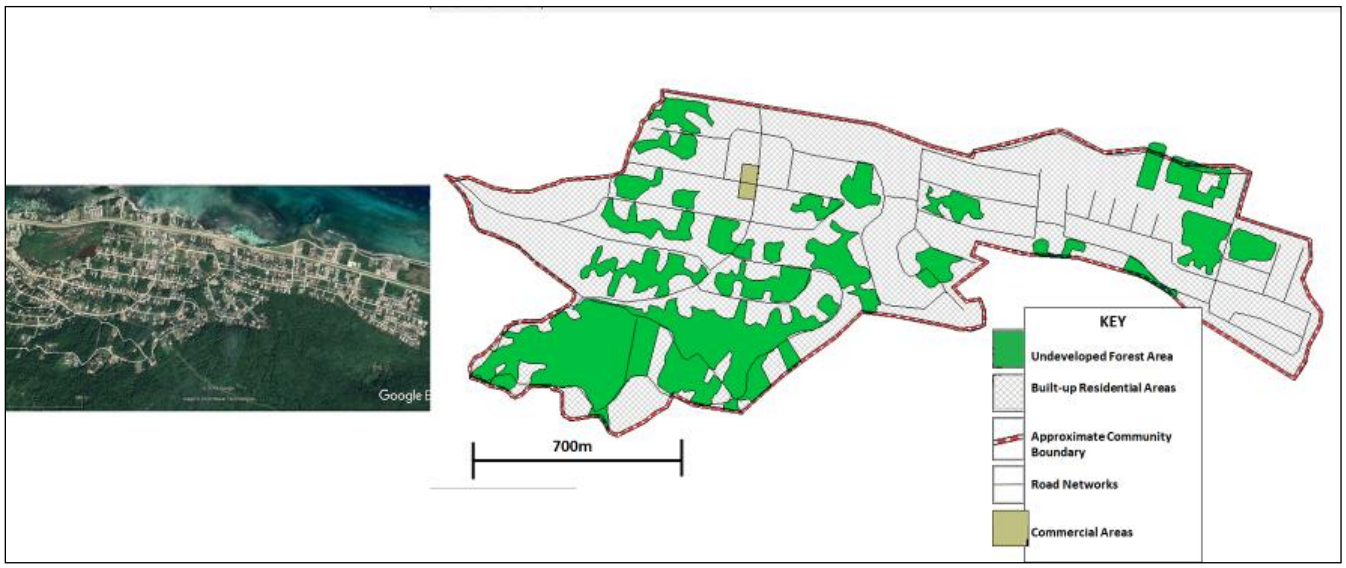


Figure 6P-4: Spatial Distribution Of Land use Types - Greenwood.

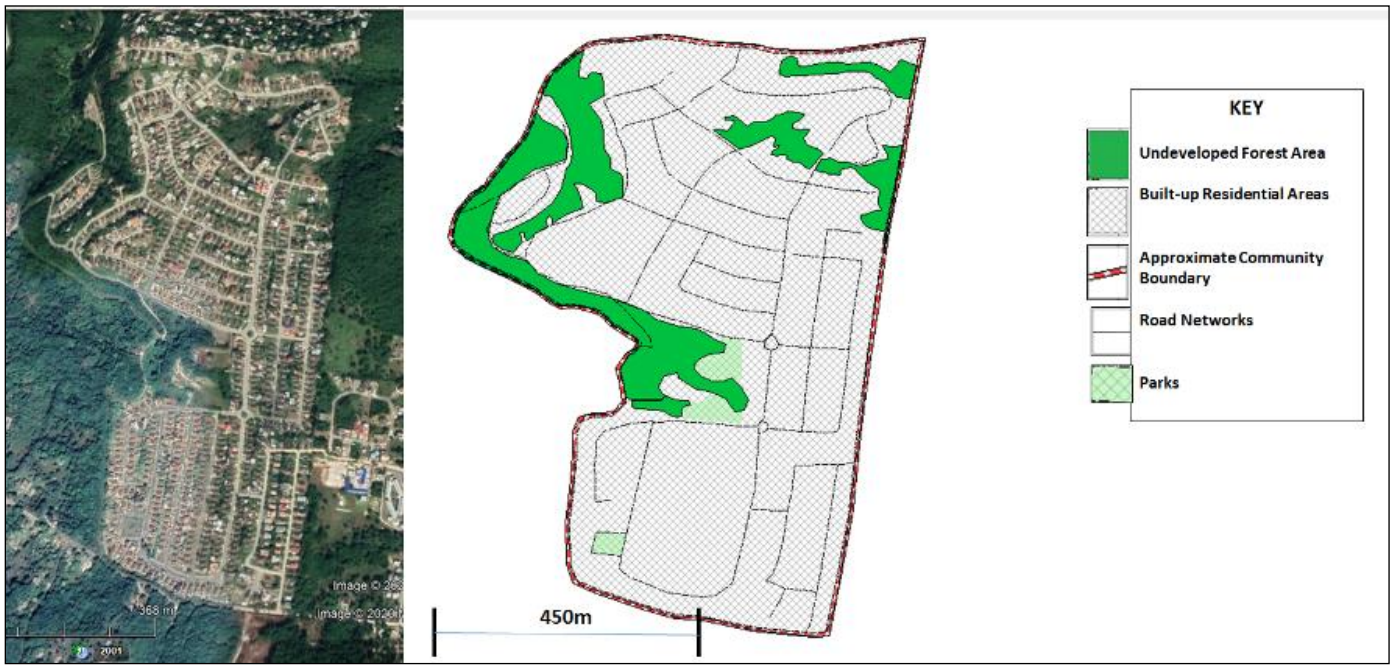


Figure 6P-5: Spatial Distribution Of Land use Types - Rhyne Park Village.

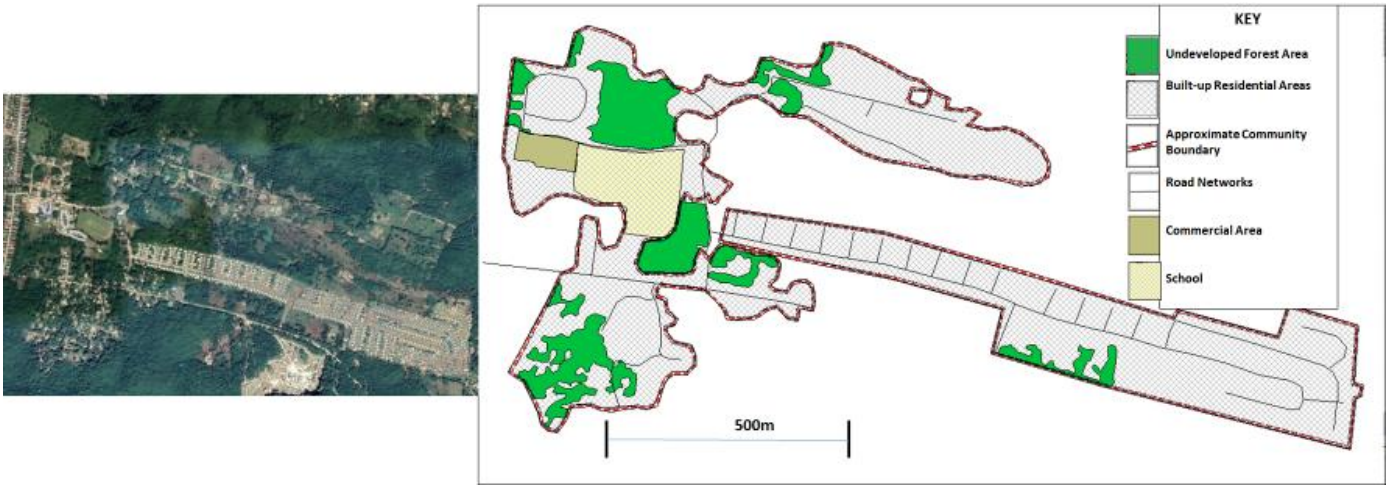


Figure 6P-6: Spatial Distribution Of Land Use Types - Spot Valley.

6.5.2.3 LAND AREAS AND USES – ADJOINING PROPOSED BOAT YARD:

Figures 6P-7 to **6P-9** illustrate the areas evaluated for land use within 200 meters of the location of the proposed boatyard loading station at Greenwood. **Figure 6P-9** shows that, other than a cluster of residential dwellings towards the southern to southwestern sections of the survey area, most of the buildings observed within 200m of the boatyard location were bar and restaurant establishments.

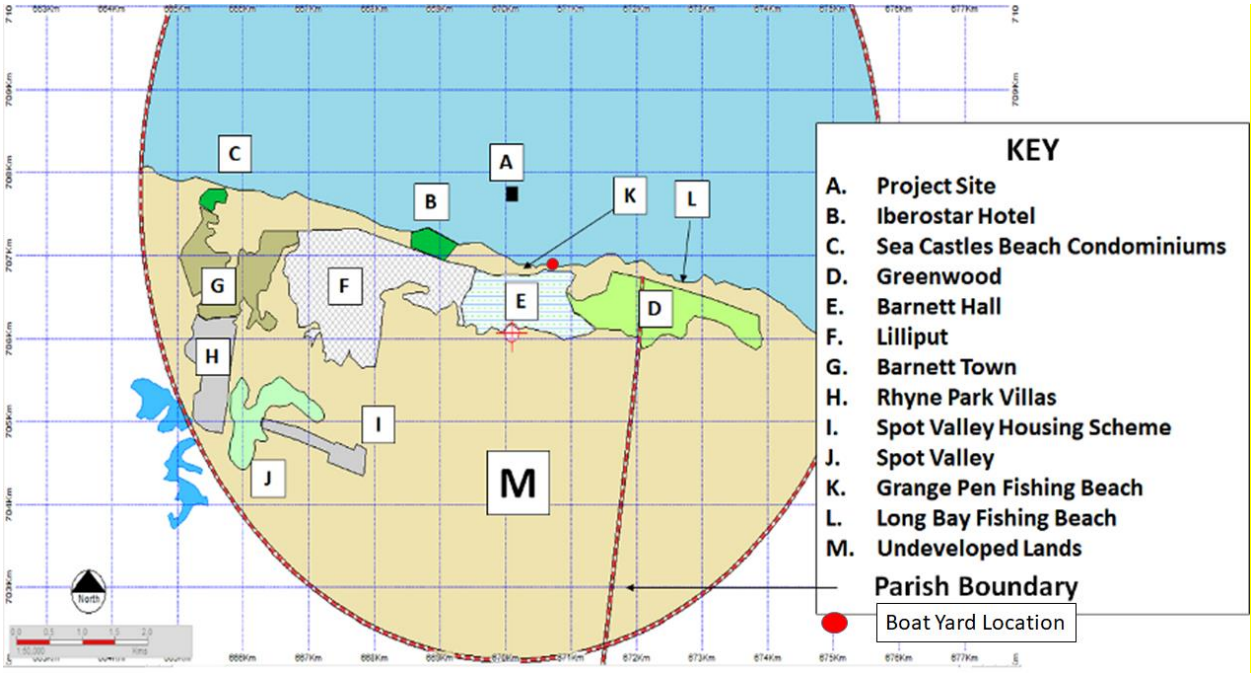


Figure 6P-7: Location of Boat Yard in Relation To Surrounding Communities.

Figure 6P-8: Location of Boat Yard And 200m Radius.

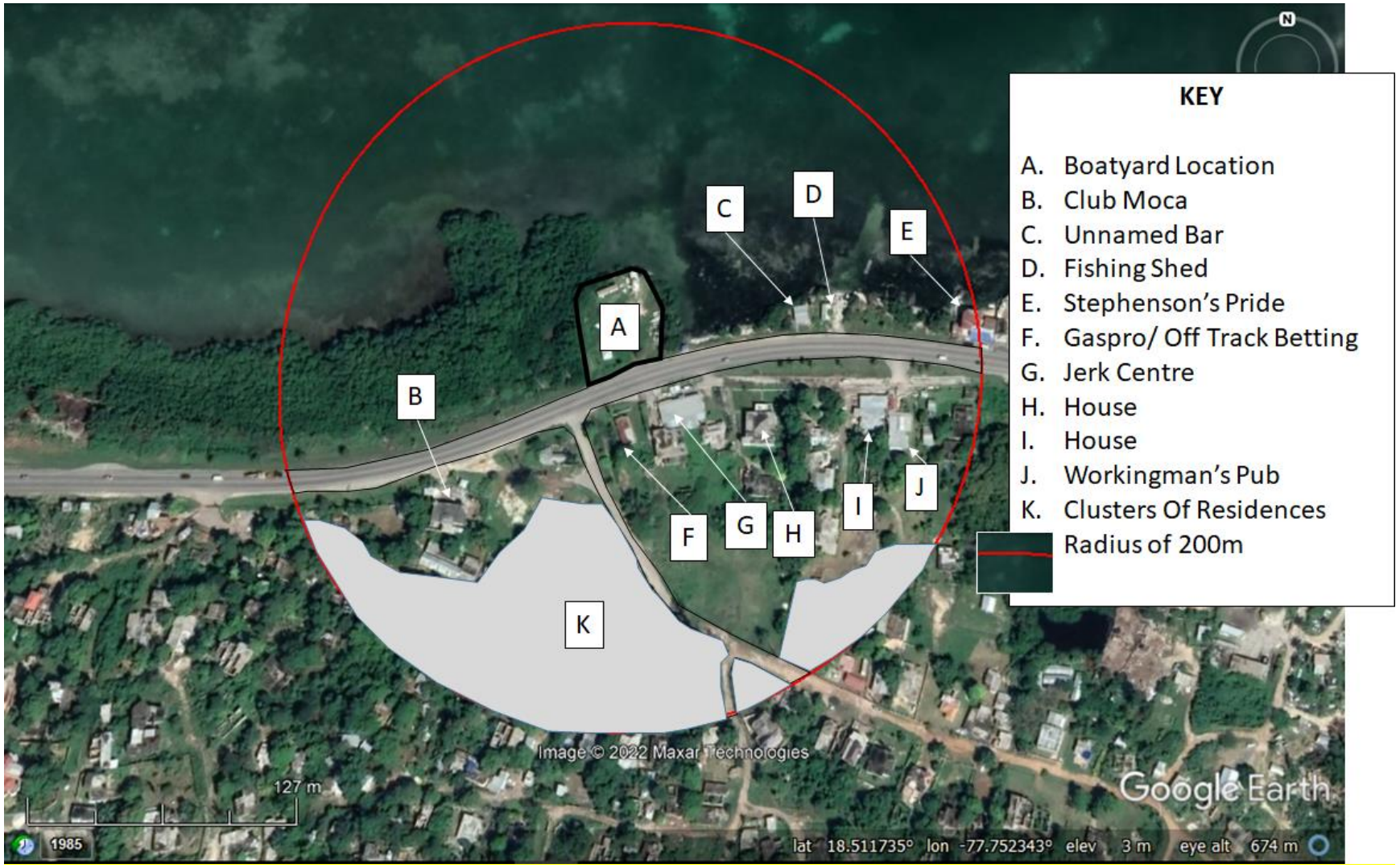


Figure 6P-9: Land use Delineations for Boatyard Study Area.

7.0 PUBLIC PARTICIPATION

The public perception survey had the objectives of A: informing the selected relevant parties of what was intended and how it was that the intend project would be implemented and B: incorporating any concerns that might be raised into the Impact Identification and Analysis component of this technical document. **Plates 10A** and **10B** were submitted to the Iberostar Hotel (for the Hotel interest) and at the Grange Pen Fishing beach (for the fishing interest) along with Sections 1.0 – 5.2 of the current document. Reviews of these correspondences lead to the groups requesting consultations, which were held consecutively on the 7th of January 2020 at the Iberostar Hotel (for the Hotel interest) and at the Grange Pen Fishing beach (for the fishing interest).

A number of questions were raised by both hotel and fishing parties during the consultations, and these are listed below:

1. There were questions raised about the manner in which solid and liquid wastes would be managed, both during and after construction. Both parties were concerned owing to the fact that the overwater bar would be located upwind/upcurrent of their locations. The thought was that improperly managed wastes could end up being carried by the currents to their shorelines. Further, it was surmised that improperly managed wastes could impact on the quality of the marine environment used by both the fishers and the hotel for their trades.
2. The fishers surmised that there would likely be interactions between the construction staff and the beach during the construction process, particularly where the staging of equipment, supplies and solid wastes were concerned, as well as traffic to and from the beach area during construction.
3. The hotel had questions about noise impacts, particularly during the pile driving phase of the construction and how it could impact on the hotel's activities.
4. The fishers raised questions about opportunities to interact with the development, particularly where the provision of over-water transportation services was concerned.

Preliminary answers were provided, however, it was made clear that a completed document would have to be reviewed and there would have to be another round of presentations to outline, in detail, what the study findings are and such a presentation would be guided by input from the Regulating Agencies. Nevertheless, both groups sought to respond to the letters by submitting the attached **Plates 10C, 10D** and **10E**.

Offshore Oasis

November 27, 2019.

The Manager,
Iberostar Rosehall Beach and Spa Resort,
Branch Developments, Rose Hall Main Road,
Little River,
St. James.

Dear Sir/Madam,

Re: Application to the National Environment and Planning Agency (NEPA) in respect of Beach Licences for the Proposed Construction and Maintenance of Overwater Structures at Montego Bay and Lilliput, St. James. Reference Number 2018-08017-BL00060

I am writing to inform you that my company has applied to NEPA for Beach Licences for a proposed overwater bar facility, to be deployed at two locations in St. James. These locations are depicted as **Figures 1, 2 and 3** on the attached. An artist's impression, as well as an elevation view of the proposed structure are also included as **Figures 4 and 5**.

NEPA has required that notifications be submitted to relevant agencies and private entities, yours included, in order to obtain comments. Could you kindly submit same to the e-mail address outlined below.

Yours sincerely,

Nigel Knowles

Director
Offshore Oasis Ltd
876 431 7074
Nigel.knowles@offshoreoasis .com

Plate 10A: Public Perception Letter Sent to the Management of the Iberostar Resort Hotel

November 27, 2019.

The President,
Lilliput Fishers Cooperative,
Lilliput,
St. James.

Dear Sir/Madam,

Re: Application to the National Environment and Planning Agency (NEPA) in respect of Beach Licences for the Proposed Construction and Maintenance of Overwater Structures at Montego Bay and Lilliput, St. James. Reference Number 2018-08017-BL00060

I am writing to inform you that my company has applied to NEPA for Beach Licences for a proposed overwater bar facility, to be deployed at two locations in St. James. These locations are depicted as **Figures 1, 2 and 3** on the attached. An artist's impression, as well as an elevation view of the proposed structure are also included as **Figures 4 and 5**.

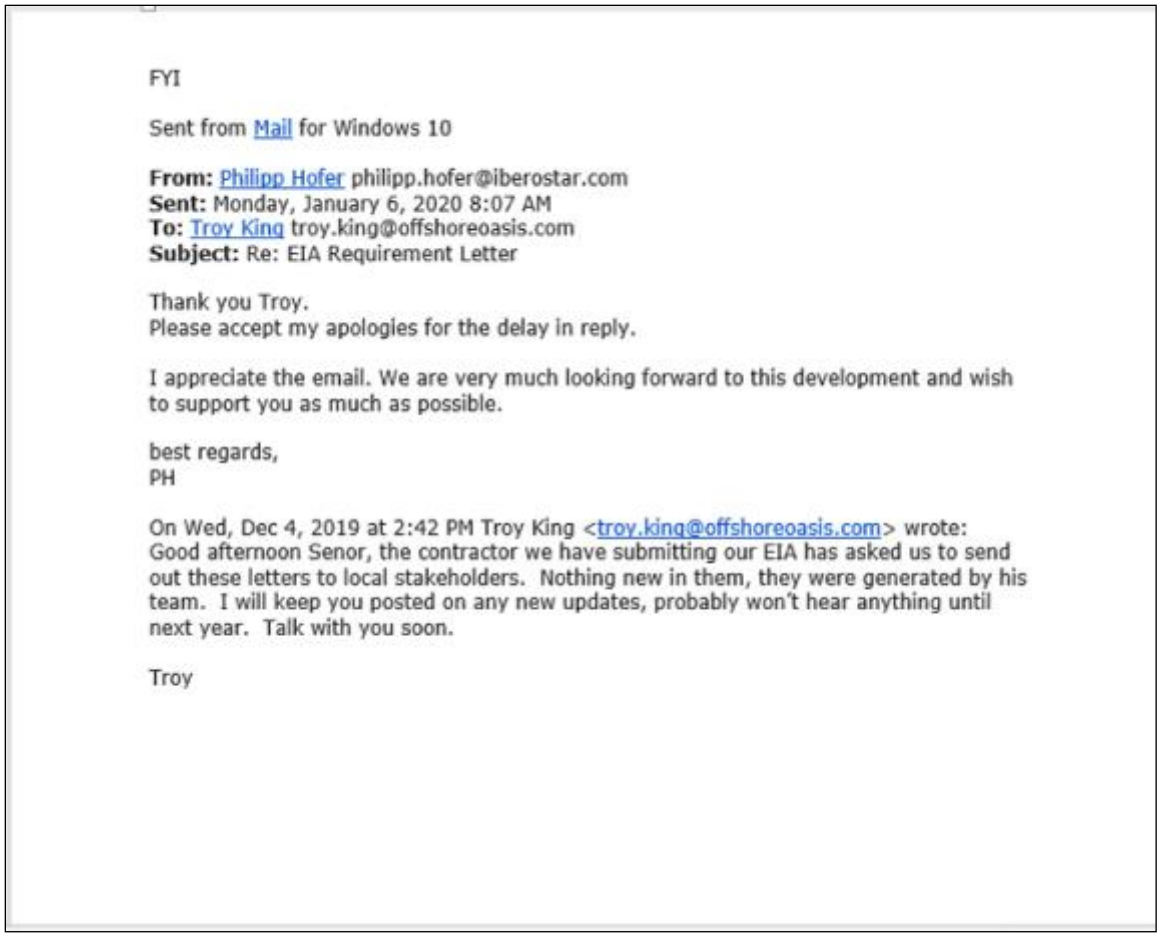
NEPA has required that notifications be submitted to relevant agencies and private entities, yours included, in order to obtain comments. Could you kindly submit same to the e-mail address outlined below.

Yours sincerely,

Nigel Knowles

Director
Offshore Oasis Ltd
876 431 7074
Nigel.knowles@offshoreoasis .com

Plate 10B: Public Perception Letter Sent to the Management of the Grange Pen Fishing Beach spence@jamaicashipsw.com



FYI

Sent from Mail for Windows 10

From: Philipp Hofer philipp.hofer@iberostar.com
Sent: Monday, January 6, 2020 8:07 AM
To: Troy King troy.king@offshoreoasis.com
Subject: Re: EIA Requirement Letter

Thank you Troy.
Please accept my apologies for the delay in reply.

I appreciate the email. We are very much looking forward to this development and wish to support you as much as possible.

best regards,
PH

On Wed, Dec 4, 2019 at 2:42 PM Troy King <troy.king@offshoreoasis.com> wrote:
Good afternoon Senor, the contractor we have submitting our EIA has asked us to send out these letters to local stakeholders. Nothing new in them, they were generated by his team. I will keep you posted on any new updates, probably won't hear anything until next year. Talk with you soon.

Troy

Plate 10C: Response from Management of the Iberostar Resort Hotel Pertaining to Public Perception Letter Sent and Consultation held on the 7th of January 2020

IBEROSTAR
HOTELS & RESORTS

Director of Operations
Folio No. 0214

July 31, 2020

Mr. Troy King
Offshore Oasis Ltd.
40 Paradise Pen
Montego Bay, Jamaica

Re: Lease Proposal

Dear Mr. King:

In addition to our recent letter dated June 2, 2020 we would be able to assist in the use of our service entrance in order to facilitate launching of small equipment and all supplies during the construction phase of Offshore Oasis. There would be sufficient room on our dock as well as beach space closest to the fishing village to support your needs. We would require you to provide security in order to protect both your inventory and an additional safeguard for our guests.

Upon final approval of a NEPA Beach License we will then write a detailed lease listing all of the conditions that apply.

Thank you and please feel free to reach out to me with any questions or concerns.

Sincerely,

IBEROSTAR ROSE HALL BEACH & SPA RESORT

Philipp Hofer
Director of Operations
Iberostar Jamaica

Rose Hall Main Road, Little River P.O. St. James Jamaica
Tel. (876) 680 0000 Fax (876) 680 0007

iberostar.com

Plate 10D: Letter from Management of the Iberostar Resort Hotel Dated July 31, 2020, Pertaining to a Lease Proposal to Facilitate the Movement of Equipment and Personnel from the Hotel's Jetty During Construction Phase.

January 7, 2020

Mr. Nigel Knowles,
Director,
Offshore Oasis Ltd.,
c/o Nigel,knowles@offshoreoasis.com

Dear Mr. Knowles,
Re: Offshore Oasis Ltd Proposed Overwater Bar at Lilliput, St. James

We the Fishers of the Lilliput Fishers Cooperative write to acknowledge receiving your letter of introduction about the project as well as to acknowledge our meeting with you this morning at the beach about the project.

We wish to inform you that you have the full support of the Lilliput Fishers Association where this project is concerned. As you have explained, we see where the fishers of Lilliput can be integrally involved in the facilitation of transportation to and from your facility once the Lilliput project is approved. Additionally, we are convinced that the operation of the bar will not impact on our ability to conduct or normal fishing trade.

We wish you every success.

Yours sincerely,

Lilliput Fishers Cooperative.

Joseph Davidson

Sian Patterson

Samuel Whyte

Richard Wallace

Renford Minto

Everett Wallace

N. Morgan

Henry Lewis

Henry Sinclair

Desmond Whyte

Dayton Bucknor

Adrian Tomlinson

Plate 10E: Response from Management of the Grange Pen Fishing Beach Pertaining to Public Perception Letter Sent and Consultation held on the 7th of January 2020

Letters of information and inquiry were also sent to the following Government Agencies for their comments:

1. The National Fisheries Authority
2. The Port Authority of Jamaica (Harbour and Port Services)
3. The National Land Agency
4. The St. James Municipal Corporation
5. The Maritime Authority of Jamaica
6. The Jamaica Civil Aviation Authority

Responses are depicted below:

Example 1: NATIONAL FISHERIES AUTHORITY RESPONSE (copied from e-mail):

Fr: Junior C. Squire

To: nigel.knowles@offshoreoasis.com;

Cc: Stephen G. Smikle

Mon 12/9/2019 6:25 PM

Good Evening Mr Knowles
As per telephone conversation, am writing to request any documentary evidence that indicates that key stakeholders; particularly Fisherfolks, support the proposed development of the Over-water structures in Montego Bay and Lilliput, St James.

This information will help to guide the National Fisheries Authority (NFA) in providing comments to the National Environment Planning Agency.

Note however, that The Fisheries Act 2018 which replaces the Fishing Industry Act of 1975, is in full effect as of June 2019. Based on my understanding form your letter dated November 12, 2019, there will be elements in your proposal that will require 'authorisations' from the National Fisheries Authority.
I would recommend that you engage the NFA with a view of presenting your proposal and initiate the process of Licences and or Permits as may be required.

I am not the Legal Officer for the NFA, so my advice is an attempt to inform you of the new requirements for water-based developments under this Act.
Kind regards

Junior Squire
Senior Fisheries Officer
2c New Port East
Marcus Garvey Drive
Kingston 15

Office: 876 923 8811-13; 948 9014/6933
Mobile: 876-298-5631
Fax: 876-924-9182

Example 2: PORT AUTHORITY OF JAMAICA (HARBOUR AND PORT SERVICES) RESPONSE:

The Port Authority of Jamaica
15-17 Duke Street, Kingston, Jamaica, W.I.
Telephone: (876) 922-0290-9, (876) 922-0940-5
Fax: (876) 924-9437
E-mail: paj@portjam.com

June 3, 2020

Mr. Nigel Knowles
Director
Offshore Oasis Ltd.

Dear Mr. Knowles:

Re: Offshore Oasis Ltd – Overwater Bar Concept at Lilliput, St. James – Reference Number 2018-08017-BL00060

Reference is made to your letter of October 14, 2019 regarding the establishment of an Overwater Bar at Lilliput, St. James.

The details pertaining to this proposal were reviewed by myself, in my capacity as Harbour Master and all factors relating to the safe movement of vessel traffic have been considered.

Given the proposed location of the facility I see no plausible reasons why this development would have an unsafe effect on vessel movement and in this regard, I offer no objection to the proposal.

Yours sincerely,
THE PORT AUTHORITY OF JAMAICA

Captain Hopeton Delisser
VICE PRESIDENT -
HARBOURS AND PORT SERVICES

HD/lr

Copy: Mr. Peter Wilson-Kelly

Example 3: NATIONAL LAND AGENCY RESPONSE:

NATIONAL LAND AGENCY
20 North Street, Kingston, Jamaica
Tel: (876) 946-5263 / 750-5263 • Fax (876) 948-9382
Website: www.nla.gov.jm

Ref. No.: SZ/263F

January 15, 2020

Mr. Nigel Knowles
Director
Offshore Oasis Limited
Unit 33 Montego Bay Trade Centre
Catherine Hall
Montego Bay
St. James

Dear Mr. Knowles

Re: Request for Lease to Facilitate Proposed Construction and Maintenance of Overwater Structure at Montego Bay and Lilliput, St. James

I refer to yours of November 12, 2019 regarding the subject matter and wish to advise that the following documents are required:

- Location Plan on the relevant Admiralty Chart showing the location of the site relative to the identifiable coastline areas;
- Site Plan with boundary coordinates of the site to facilitate calculations of the area to be leased;
- Detailed drawing showing the coordinates, length and breadth of the overwater bar so that the area can be calculated.

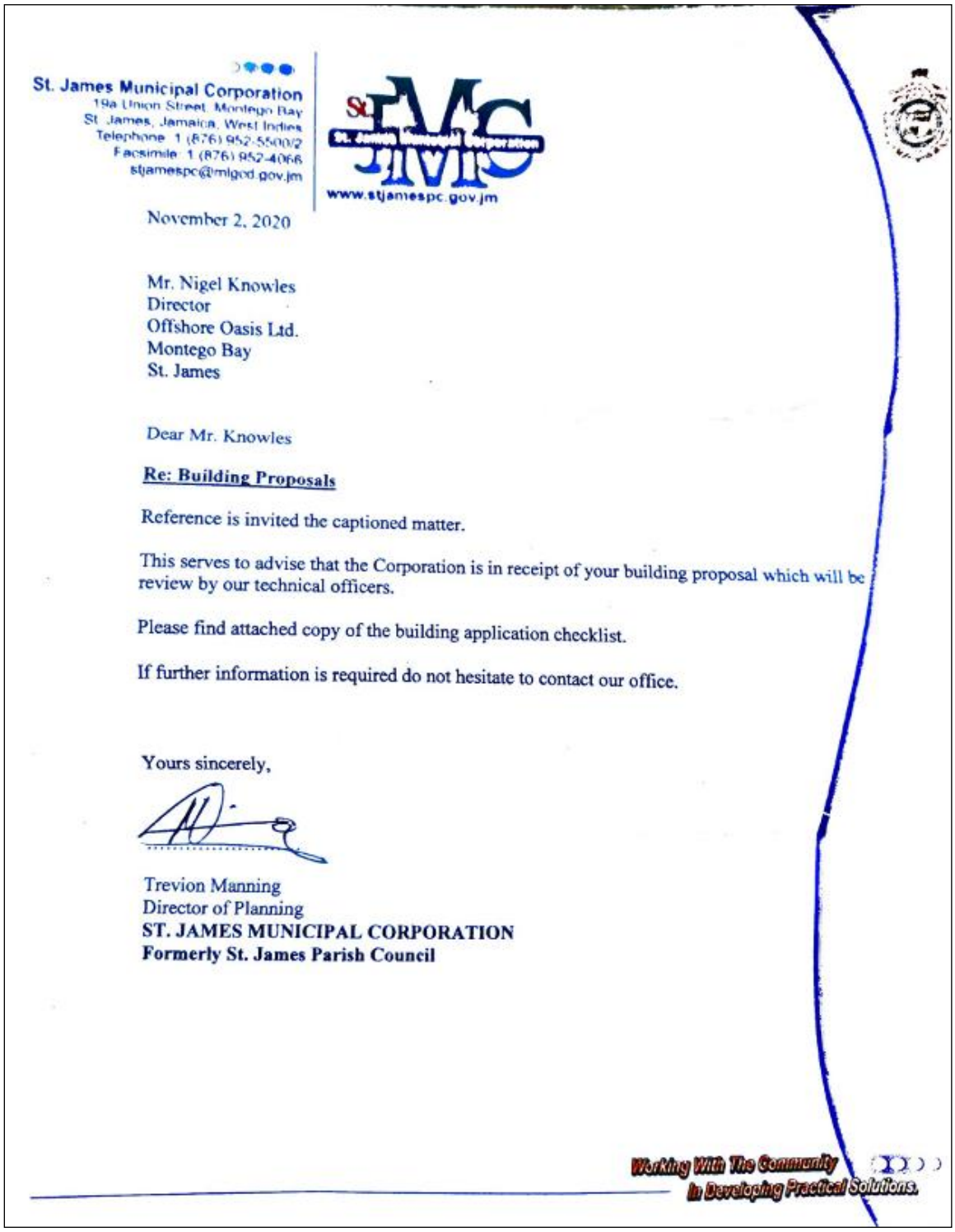
Upon receipt of the above, the comments of the relevant stakeholders will be solicited, a valuation will be commissioned to determine the rental payable after which a recommendation will be made to the Land Divestment and Advisory Committee (LDAC) and thereafter the approval for the Honorable Minister sought.

If you require further clarification or information, kindly contact the undersigned.

Donovan Hayden
Senior Director, Estate Management
for Commissioner of Lands

DH/js

Example 4: ST JAMES MUNICIPAL CORPORATION RESPONSE:



St. James Municipal Corporation
19a Union Street, Montego Bay
St. James, Jamaica, West Indies
Telephone: 1 (876) 952-5500/2
Facsimile: 1 (876) 952-4066
stjamespc@mlgcd.gov.jm

www.stjamespc.gov.jm

November 2, 2020

Mr. Nigel Knowles
Director
Offshore Oasis Ltd.
Montego Bay
St. James

Dear Mr. Knowles

Re: Building Proposals

Reference is invited the captioned matter.

This serves to advise that the Corporation is in receipt of your building proposal which will be review by our technical officers.

Please find attached copy of the building application checklist.

If further information is required do not hesitate to contact our office.

Yours sincerely,

Trevion Manning
Director of Planning
ST. JAMES MUNICIPAL CORPORATION
Formerly St. James Parish Council

Working With The Community In Developing Practical Solutions.

Example 5: MARITIME AUTHORITY OF JAMAICA RESPONSE (copied from e-mail):

From: Peter Wilson-Kelly <pwilsonkelly@gmail.com>
Sent: Monday, November 23, 2020 12:39 PM
To: Steven Spence <sspence@jamaicaships.com>
Subject: Offshore Oasis Ltd Overwater Bar Proposal - Lilliput St. James.

Capt. Spence

Further to our telephone conversation earlier, be advised that my requests of the Maritime Authority of Jamaica are:

1. A determination as to whether or not the MAJ has objections to the development, as summarized in my client's e-mail correspondence to your agency dated May 19, 2020.
2. A determination as to whether or not the concept of using local fishers for transportation to and from the bar facility is a doable option or if the clients should consider equipping their own registered boat for transportation.

PW-K

--
P. Wilson-Kelly (Lt. sg., MPhil)
Cell-423-3821 (Digicel)
-821-8731 (Flow)

Steven Spence 1:17 PM (15 minutes ago)
to me

Dear Mr Kelly:

The Offshore Oasis Ltd Overwater Bar proposal has been reviewed by the technical department of the Maritime Authority of Jamaica.

We admire the concept and offer no objection to the development.

Operationally, we are of the opinion that using fishers for transportation of guests to and from the bar may not be sustainable. These "passenger-carrying" fishing vessels will be required to be licensed by TPDCo and will require insurance and licenced coxswains.
It is our recommendation that the owner of the establishment acquires or leases an approved, registered, passenger carrying vessel for the transportation of guests.

The Maritime Authority of Jamaica would be pleased to visit the site on completion to see how safety may be further enhanced.

Regards,
Steven Spence
Director of Safety Environment and Certification.

Example 6: JAMAICA CIVIL AVIATION AUTHORITY:

JAMAICA CIVIL AVIATION AUTHORITY

4 WINCHESTER ROAD,
KINGSTON 10.
MAILING ADDRESS:
P.O. BOX 8998,
C.S.O., KINGSTON.

ANY REPLY OR SUBSEQUENT REFERENCE TO THIS COMMUNICATION SHOULD BE ADDRESSED TO THE DIRECTOR GENERAL OF CIVIL AVIATION AND NOT TO ANY OFFICER BY NAME AND THE FOLLOWING REFERENCE QUOTED –

June 23, 2022

Mr. Nigel Knowles
Offshore Oasis Limited

Dear Mr. Knowles,

Re: Request for Comments EIA For Beach Licences for the Proposed Construction and Maintenance of Overwater Structures at Lilliput, St. James. NEPA Reference Number 2018-08017-BL00060

Reference is made to correspondence dated January 31, 2022. Please be advised that the Aeronautical Information Management Department of the Jamaica Civil Aviation Authority (JCAA) has reviewed the *Draft Environment Impact Assessment Report for the Proposed Construction of an Over-Water Bar at Lilliput, St James.*

The document was examined and an assessment conducted to ascertain the impact to aviation. Following assessment, the proposed structure will be located within a ten nautical miles radius of the geographical centre of the Sangster International Airport. Since the height of the proposed structure will be 6.4m from the waterline, with the base floor of the bar being 2.0 meters above sea level, the proposed development will have no substantial impact on the safety of air navigation.

Therefore, the Jamaica Civil Aviation Authority has no objection with the granting for Beach Licences for the proposed construction and maintenance of over-water structures at Lilliput, St James.

Sincerely,
JAMAICA CIVIL AVIATION AUTHORITY

C. Chambers
.....
Christopher Chambers,
Director- Aeronautical Information Management

Attchs.

Copy: Mr. Nari Williams-Singh, Director General, JCAA
Mr. Howard Greaves, Deputy Director General, Air Navigation Services
Mr. Noel Ellis, Director, Flight Safety

Tele: 876.960.3965 Fax: 876.920.0194 WEB PAGE: www.jcaa.gov.jm EMAIL:jcivav@cwjamaica.com

Example 7: OFFICE OF DISASTER PREPAREDNESS & EMERGENCY MANAGEMENT:

OFFICE OF DISASTER PREPAREDNESS & EMERGENCY MANAGEMENT
2-4 Haining Road, Kingston 5, Jamaica, W.I. Tel: (876) 906-9674-5, (876) 754-9077-8
Tel. /Fax: (876) 754-3229, E-mail: odpem@cwjamaica.com, Website: www.odpem.org.jm

August 5, 2022

Mr. Peter Knight
Chief Executive Officer
National Environment and Planning Agency
10 Caledonia Avenue
Kingston 5

Dear Mr. Knight,

RE: SUB-DIVISION REPORT

Please see attached Subdivision Report:

SUBDIVISION REF: #	LOCATION	APPLICANT
2018-08017-BL00060	Part of Lilliput, **St. James**	Nigel Knowles, Offshore Oasis Ltd

Sincerely yours,

Richard Thompson (Mr.)
DIRECTOR GENERAL (Acting)

The Office of Disaster Preparedness and Emergency Management

HAZARD VULNERABILITY ASSESSMENT

Reference Number	**2018-08017-BL00060**
Location	**Part of Lilliput, St. James**
Applicant Name	**Nigel Knowles, Offshore Oasis Ltd**
Lots	One (1)
Proposed Use	Commercial/Recreational
Review Date	August 4, 2022

BACKGROUND

The proposed site is located at Lilliput, St. James. The proposed site is approximately 800m north of the Grange Pen Fishing Beach in the Lilliput community. The proposed site is underlain with marine sand with fringing reefs being present approximately 100m to the north of the site. The proposed structure will serve as an Overwater Bar Attraction. The site is 1.3km NE from the Iberostar Hotel in Lilliput. The bar will not be physically connected to the shoreline and therefore will be accessed by the way of boats. The site is within the Tsunami Inundation Zone and is vulnerable to hurricanes, storm surges and high tides. The site consists of Upper Coastal Group formation making it susceptible to high erodibility.

PART OF LILLIPUT, ST. JAMES

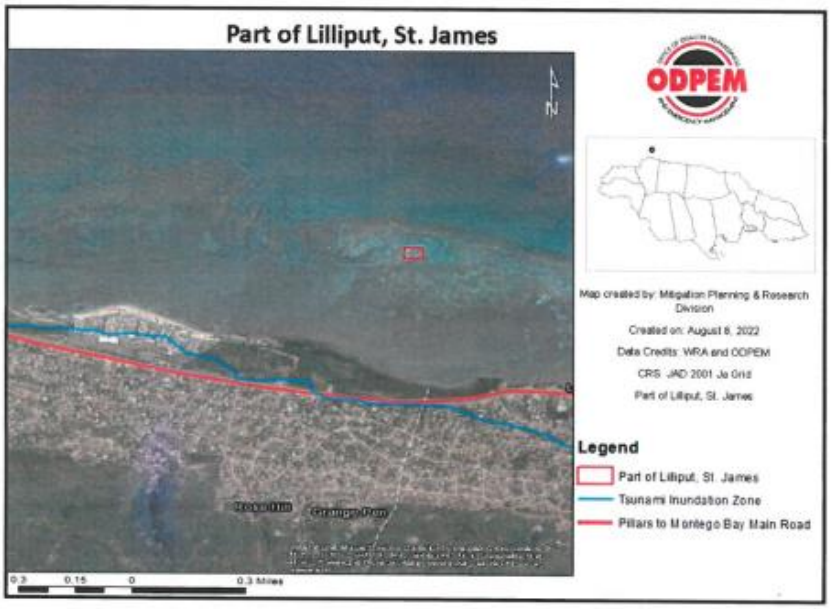


Figure 1. Map of Lilliput, St. James showing hazard features within proximity of the site.

HAZARD VULNERABILITY & RISK ASSESSMENT	
ELEMENTS	**DESCRIPTION**
Geographical Features	**Topography:** The proposed site is underlain with marine sand with fringing reefs being present approximately 100m to the north of the site. The site is easily accessible by boat from the shores of the mainland/north coast. The area is surrounded by seagrass beds that provide nursery support to marine fauna. The site's 2021 EIA Report states that water depths at the are approximately 1.4m existing to the south of the site and 0.3m existing at the fringing reef to the north. The Pillar to Montego Bay Main Road is the main route to the Iberostar Hotel where there will be water taxis to transport persons from the shoreline/mainland to the site.
	Geology: The proposed site sits on geological formation, which forms a part of the upper coastal group. Hard reef limestones with subordinate often interbedded rubbly and chalky or marly limestones dominates this formation. Soil development is shallow and generally insignificant. Permeability is considered variable, usually low in marls but may be moderate in vuggy limestones. Presumed bearing capacity is considered reasonable and may be estimated at 600 – 2000 KN/m^2. Possible construction problems associated with this geological formation may include: • High erodibility Coastal erosion from hydraulic action and abrasion may impact the overwater structure. Wave processes can overtime erode the structure's foundation.
Hazard/Threat(s)	**Hurricane/Tropical Storms:** Noting the pre-existing conditions on and around the site, exposure to high tides and strong winds may impact the site. Structures to be erected may be impacted by strong winds associated with hurricanes and storms. Additionally, there is no natural protection from wind exposure; therefore, the site is highly susceptible to Tropical Cyclones and the secondary effects associated with this hazard. The area has been affected by the passage of hurricanes, the most recent of which was Hurricane Allen in 1980.
Amenities	**Critical Facilities:**

	There are no critical facilities in close proximity to the site. Lilliput SDA Basic School, a designated emergency shelter is the closest to the site, being 30km away.

Risk Factors	DRM/CCA Considerations
1) Due to the site's geological location, it renders it vulnerable to the impact of high tide, storm surges, and tsunami inundation. It is important to consider these factors in the development of the site.	a) The drainage design must be in keeping with stipulations of the National Works Agency (NWA) and the Guidelines for Preparing Hydrologic and Hydraulic Design Reports for Drainage Systems of Proposed Developments must be utilized in the drainage design process. b) Materials to be used on site should be able to withstand water process and erosion.
2) During the construction and operational phases of the proposed development, there may be sewage and solid waste impacts from the site that must be taken into consideration.	c) It is important to also note that stormwater, wastewater, and sewerage from the site should be treated to adequate levels to reduce potential negative impacts to the Caribbean Sea, marine life and existing ecosystems. Solid waste must be properly disposed of and to the satisfaction of the Ministry of Health and Wellness and the National Solid Waste Management Agency. d) The proposed development and possible impacts on the environment should be made available spatially. Impacts on the proposed site itself and the change in environmental conditions given the replacement of the natural with hard infrastructure, should be mapped and modelled to reflect on-site and off-site implication to the natural environment.

3) The site within the Caribbean Sea, so depending on the design and stability of structure, damages may be incurred from strong winds associated with hurricanes and other phenomena.	e) Hurricane straps should be incorporated to prevent wind damage on structure.
4) Noting the distance from the proposed bar to the shore, safety measures to and from the site should be considered. In addition, the distance from the site to critical facilities in land.	f) A facility emergency response plan should be developed for emergency response. An emergency Evacuation Plan is to be developed for use in the event of an incident during operations. An Evacuation Plan is to be developed for the property. A vessel should be always readily available for evacuation purposes.

REFERENCES

Climate Studies Group, Mona (CSGM), 2017: State of the Jamaican Climate 2015

Jamaica roads – ODPEM Geodatabase (Source NWA)

Jamaica River tributaries – ODPEM Geodatabase (Source WRA)

Jamaica 1:12,500 Topographic Map Series

Jamaica 1:50,000 Topographic Map Series

Jamaica Geology - ODPEM Geodatabase

Jamaica Geology Erosion WMU – ODPEM Geodatabase (Source MGD)

ODPEM Disaster Catalogue of historical impacts

Office of Disaster Preparedness and Emergency Management. 2007. "Hazard Mitigation Guidelines for Development in High Risk Areas"

O'Hara and Bryce. 1983. "A Geotechnical Classification of Jamaican Rocks 1983."

National Works Agency NWA, (2015). Guidelines for Preparing Hydrologic and Hydraulic Design Reports for Drainage Systems of Proposed Developments.

8.0 IMPACT IDENTIFICATION AND ANALYSIS

The following potential impacts have been identified:

8.1 CONSTRUCTION IMPACTS:

8.1.1 BOAT ACCESS:

8.1.1.1 WORK BARGE ACCESS:

The proposed work site is a shallow work environment, with depths ranging from 1.4m to 1.8m existing within the vicinity of the proposed over-water bar location. Grounding of the work equipment during transport to and from the construction site is therefore a potential issue that could occur, with both reef and seagrass impacts being possible.

8.1.1.2 SUPPORT BOAT ACCESS:

The heaviest components that will have to be transported to the proposed work site are as follows:

1. Metal I-beams for pilings.
2. PVC pipe sleeves
3. Bulk concrete
4. Lumber for superstructure construction

The risk of grounding of the vessels that will be tasked to supply these components to the vicinity of the work barge is present if the vessel draughts, once loaded, are deeper than that of the waters over which they will have to operate.

8.1.2 CONSTRUCTION IMPACTS

8.1.2.1 PILE DRIVING IMPACTS

Table 4 above depicts impact and vibratory pile driving as being the loudest construction equipment noises that can be generated at a construction site (101 decibels). Note that noises above 70 decibels over a prolonged period of time can cause damage to hearing while noises above 120 decibels can cause immediate damage to hearing. Construction workers at the site will have to utilize hearing protection while pile driving operations are underway.

8.1.2.2 CONCRETE POURING IMPACTS:

Turbidity impacts on marine water quality as well as the pouring of concrete onto the seafloor could occur during the process of casting concrete between the I-beam piles and PVC sleeves. The turbidity impacts are likely to progress in a direction dictated by the prevailing currents (as depicted on **Figure 5G** above) while concrete spillages are likely to impact on the seafloor within the immediate vicinity of the piles. Both impacts are likely to result in smothering impacts on natural resources on the seafloor near to the footprints of the piles.

8.1.2.3 PILING EROSION IMPACTS:

Scouring of the sediments at the interface between a piling and the seafloor can occur when there is movement of water past the structure. The piling causes changes in the movement of water around it causing swirling, which ultimately removes sediments.

8.1.2.4 CONSTRUCTION SOLID WASTE IMPACTS:

8.1.2.4.1 CONSTRUCTION PROCESS SOLID WASTE IMPACTS:

Extensive lumber cutting will be required for the construction of the superstructure for the proposed bar. Wood cutting, as well as fastening (using nails, screws or bolts) will result in the generation of falling or air-mobile solid wastes that could contaminate the seafloor or water surface. Also, construction packaging and even tools could end up falling into the marine environment.

8.1.2.4.2 CONSTRUCTION STAFF SOLID WASTE IMPACTS:

The solid waste considered here are packaging materials and food/drink containers. Inadequate management of packaging wastes can result in these components becoming thrown or blown into the marine environment.

8.1.2.4.3 CONSTRUCTION STAFF SEWAGE WASTE IMPACTS:

The management of sewage at a construction site is a perennial concern. This concern will be magnified by the fact that the proposed construction site is both over water and a minimum of 800 meters from shore. Improperly facilitated sewage disposal will result in sewage contaminating the marine environment within the immediate vicinity of the construction site.

Additionally, vessels being used to support the construction process may be equipped with "heads"[45] for sanitation purposes. These may have internal storage facilities for the containment of black and grey water. Inadequate management of contained black and grey water onboard the tending construction boats could lead to localized sewage contamination of the marine environment.

8.1.2.5 CONSTRUCTION EQUIPMENT POLLUTION IMPACTS:

It is likely that the following hydrocarbon product-utilizing items will be on the construction site (**Table 10**):

Table 10: Equipment and Potential Hydrocarbon Sources

Equipment	Use	Hydrocarbon Type Used
Portable Generators	Generation of power for power tools/welding plants	Gasoline/Diesel
Crane	Supporting pile driving/lifting heavy construction components	Diesel/Hydraulic Fluid
Pile Driver	Driving of I-beams into hard seafloor substrate	Diesel
Vibrating Driver	Driving of I-beams into soft seafloor substrate	Hydraulic fluid
Work Boats	Towing and positioning of barge, transport of workers to and from worksite, transport of construction materials and other support components to the worksite	Diesel/Gasoline
-	Wood staining and painting	Paints and varnishes

These units will require periodical re-fuelling or top-ups, and, in the process of replenishment, accidental spills could occur. Storage of hydrocarbon products at the construction site adds its potential where spills are concerned.

8.1.2.6 OTHER CONSTRUCTION/EQUIPMENT ISSUES:

The proposed bar will be located offshore in a sea body that may be traversed by fishing or other types of surface craft. The project site will be visible during the daytime (barring low visibility periods associated with poor weather). However, if the structures and associated support craft at the site are not properly lit at night, then the construction rig will become a navigation hazard. A collision with the structures or support vessels could result in environmental issues related to fuel/other contaminant spillages.

[45] "Heads" are the maritime name given to a bathroom on board a vessel.

8.1.2.7 WORKER/PATRON SAFETY IMPACTS:

The proposed location is removed from shore, which will complicate emergency responses. The Jamaica Fire Brigade cannot respond to a fire or a medical emergency at the site owing to the remoteness of the site. Simultaneously, the remoteness of the site could play a factor in hindering the evacuation of persons from the site in the event of an emergency.

Additionally, access to the site can only be facilitated with the use of a boat. If there is an incident at the site, then a boat will be required to assist in a response. Also, incidents could occur while operating boats between the shore and the worksite.

Finally, even though the developers do not intend to actively promote water sports at the location, it is likely that patrons may elect to engage in such activities from the platforms that they will use to access the location. This, plus complications associated with the consumption of alcohol at the site, could create a condition favourable for the making of improper decisions while patrons are entertaining themselves.

8.1.2.8 SOCIO-ECONOMIC IMPACTS:

It is not anticipated that the majority of the populace present within the 5 km socio-economic study area examined within this document will be economically influenced or affected by the proposed development. However, being a water-based project, it is highly likely that the proposed construction activities can have an impact on the livelihood and welfare of the fishers and hotel interests present within the vicinity of the development.

The location of the proposed over water bar is not in an area fished by members of both the Grange Pen and Long Bay fishing beaches. Thus, the development does not represent an impact on fishable resources. However, if there is a pollution incident at the site, there is a possibility that contamination issues could manifest themselves on the Grange Pen and/or the Iberostar Hotel beach areas.

9.0 MITIGATIONS

The following potential impacts have been identified:

9.1 CONSTRUCTION IMPACT MITIGATIONS:

9.1.1 BOAT ACCESS:

Boat access areas have been chosen with sea areas deep enough to accommodate loaded vessels moving between the worksite and land-based staging areas. Three such areas are described below.

9.1.1.1 WORK BARGE ACCESS:

Figure 6Q illustrates a proposed access path for a work barge being towed to the work site, with the path accessing the back-reef area at the site through a naturally occurring channel in the fringing reef. Both the barge and the tow vessel will have to possess draughts of less than a meter to ensure that manoeuvring does not result in grounding when at the work site. No ship channels exist at or near to this location.

Figure 6Q: Proposed Access Path for A Work Barge Being Towed To The Work Site (A: approach pathway, B: access through reef, C: worksite location).

Once a suitable work barge and tow vessel have been identified for the project, a thorough mapping of the proposed routes between the reef channel to the worksite will be required to ensure that navigation depths are compatible with the draughts of the proposed vessels.

9.1.1.2 SUPPORT BOAT ACCESS:

Two locations have been proposed for the staging and transport of the construction items listed above, and from which vessels will ply to and from the construction site. The first is the jetty of the Iberostar Hotel, from which personnel and all man-portable construction components will be transported. **Figure 6R-1** shows the location of the jetty and the route from which a loaded boat will ply to and from the construction site, ensuring that risks of grounding are eliminated.

Figure 6R-1: Boat Path from The Iberostar Work Staging Area (A) Overwater (B) to the worksite (C).

The second location is proposed to be from the Greenwood Boatyard area. It is proposed that all bulky materials that will require lifting equipment, as well as materials for disposal, be supplied and received from this location. **Figure 6R-2** depicts the path along with work boats would ply between the boatyard area and the work site.

Figure 6R-2: Boat Path from The Greenwood Boatyard Work Staging Area (A) Overwater (B) to the worksite (C).

The water depth at the shoreline of the boatyard area is approximately 1 meter in depth. It is suggested that concrete be supplied by concrete mixer trucks, with the gap between the mixer truck and the nearshore work boat being bridged by a concrete boom truck, an example of which is depicted on **Plate 11A** below. This deployment would allow the work boat to remain in navigable waters while being loaded with concrete. This deployment will also facilitate a tidy transfer of concrete from land to sea and will eliminate the risk of concrete spillage into the sea during the transfer process.

Plate 11A: Example of a Concrete Boom Truck[46]

[46] Example taken from http://www.all-concrete-cement.com/concrete-pump.html

9.1.2.1 PILE DRIVING IMPACTS

Where neighbouring populations are concerned (refer to the noise level sampling sites on **Figure 4G**) the distances between the potential pile driving sound sources and the locations vary between 800m (Grange Pen Fishing Beach to 1200 meters (Iberostar Hotel). Referring to the depiction on the Inverse Square Law **Figure 4H** above, it is expected that noise attenuation over distance would reduce the noise levels.

Using a sound attenuation calculator[47] the following levels to which attenuation would reduce noise impacts to were determined for the three sites at which sound evaluations were conducted:

Table 11: Sound Attenuator Calculator Results for Distances Between Noise Sources and Sound Monitoring Locations.

Location	Distance from Sound Source	Attenuation
Iberostar Hotel	1200m	39.4dB
Grange Pen Fishing Beach	800m	42.9dB
Long Bay Fishing Beach	1000m	41.0dB

Superimposing the results of Table **11** onto **Figure 6S** below, it can be seen that the attenuated noise levels are either less than or within the decibel ranges measured.

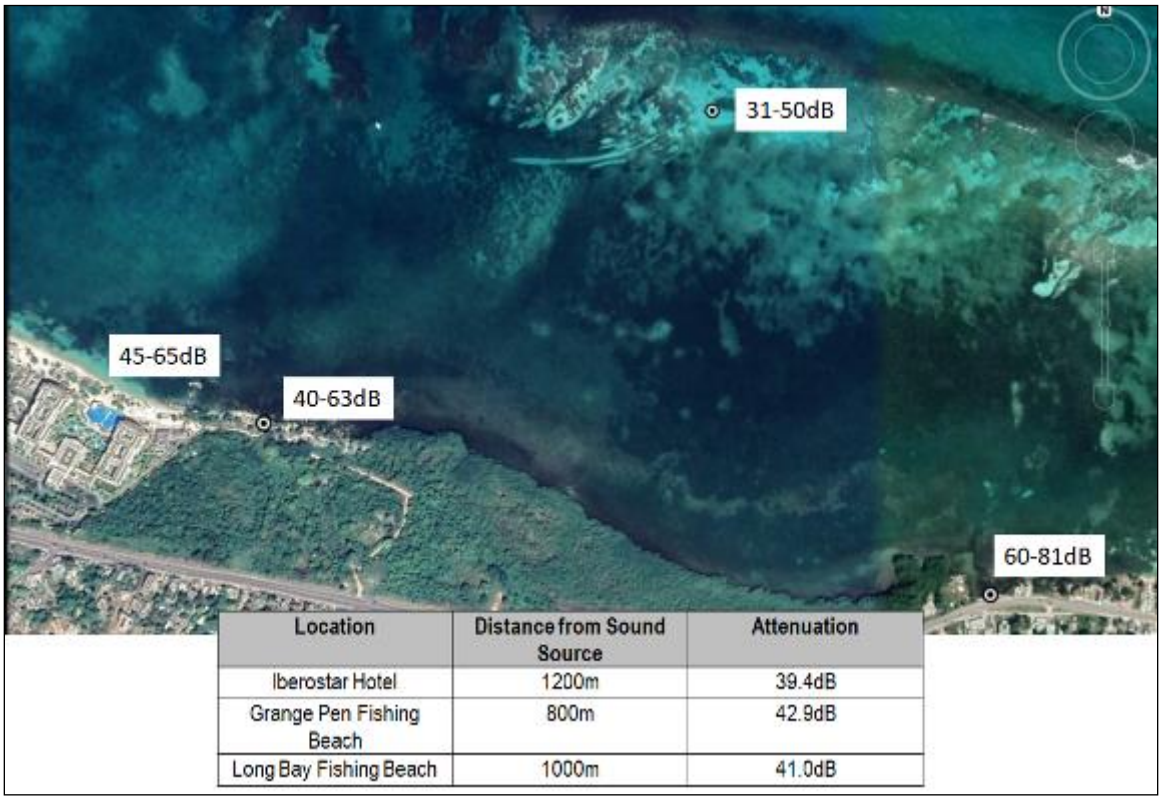


Figure 6S: Comparison of Ambient Noise Levels With Expected Attenuations Over Distance.

The conclusion here is that the construction site location is removed enough from population areas in order to attenuate sounds to levels less than or within ambient noise levels measured at the sound evaluation sites.

[47] https://www.wkcgroup.com/tools-room/inverse-square-law-sound-calculator/

9.1.2.2 CONCRETE POURING IMPACTS:

Section 2.0 spoke to the use of a Tremie Method to facilitate the pouring of concrete into the PVC sleeves. The application of the tremie with its hopper will ensure that poured concrete goes directly into the PVC sleeve with no over-spill making its way directly into the marine environment. Secondly, the positioning of the PVC sleeve firmly into the sand substrate will be vital to ensuring that concrete poured into the sleeve does not creep out from a space between the sleeve and the seafloor substrate. Thirdly, it is recommended that the seawater trapped between the PVC sleeve and the I-beam should be pumped out prior to the application of the concrete. This will allow concrete to be poured into a dry receival area, additionally so that no turbidity-bearing water will be displaced from the piling area into the marine environment.

9.1.2.3 PILING EROSION IMPACTS:

Plate 11B[48] shows an experimental modelling of scouring around a modelled piling while **Plate 11C** shows an example of an actual piling in the field that is being subjected to scouring. Excessive scouring could result in localized erosion of the seafloor and a compromising of the piling that might be exposed to the saltwater elements if the base of the PVC sleeve is exposed.

Plates 11D to **11E** were taken from a SlideShare presentation on piling scour mitigation[49] and illustrate two kinds of scour protection that can be implemented around the piling. These mitigations area of interest not just because of the erosion protection but also because of the possibility of using components that could support marine fauna. Thus the protection would also serve as an artificial reef structure.

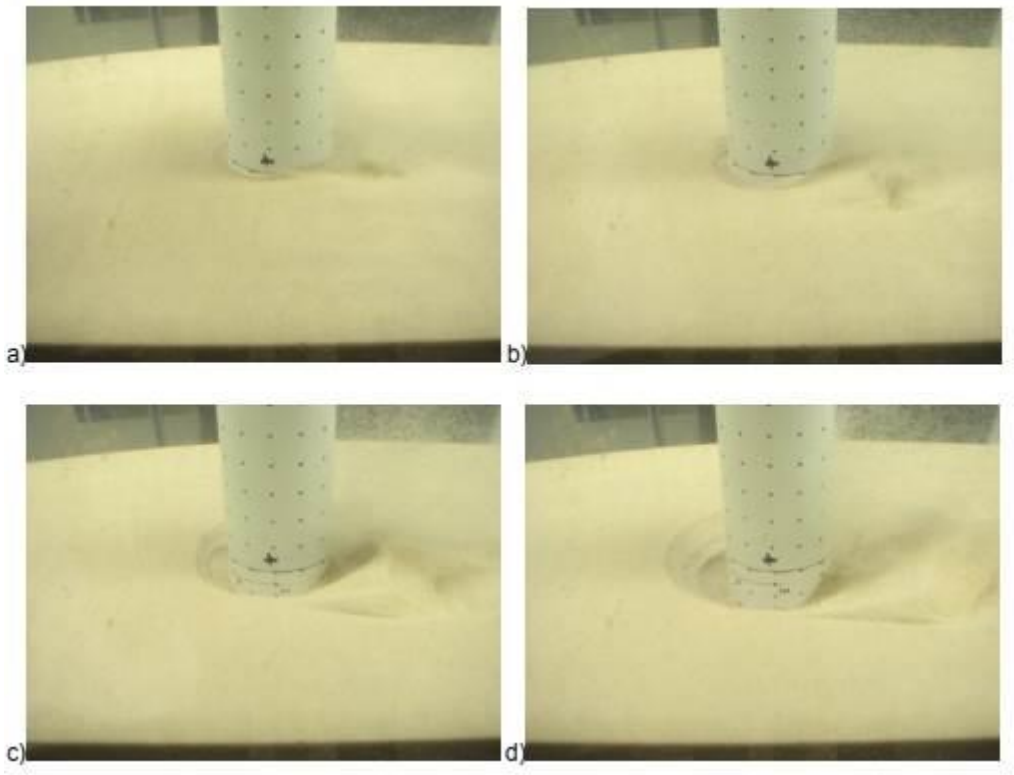


Plate 11B: A Depiction of An Experimental Modelling Of Scouring Around A Modelled Piling

[48] Extracted from - K.E. Porter, R. R. Simons and J.M Harris Laboratory Investigation of Scour Development Through a Spring-neap Tidal Cycle -2014: Conference: 7th International Conference on Scour and Erosion, At Perth, Australia, Volume: Scour and Erosion CRC Press (ISBN: 978-1-138-02732-9)

[49] www.slideshare.net/TimRaaijmakers/offshore-scour-and-scour-protection-lecture29nov2010-tu-delft

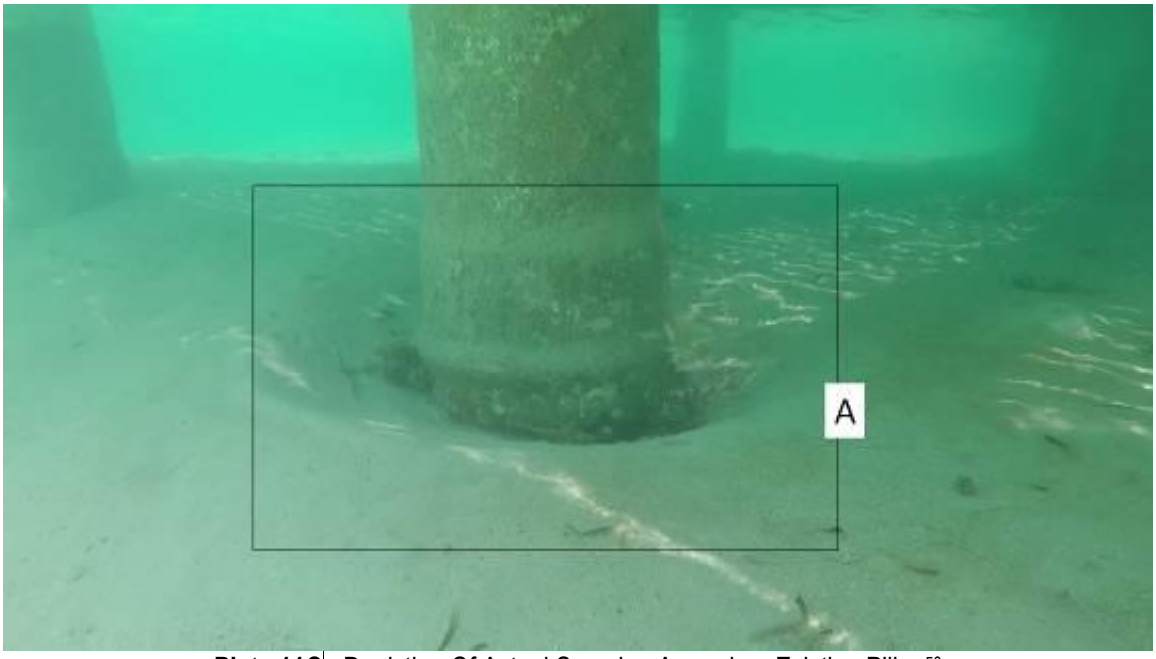


Plate 11C. Depiction Of Actual Scouring Around an Existing Piling[50]

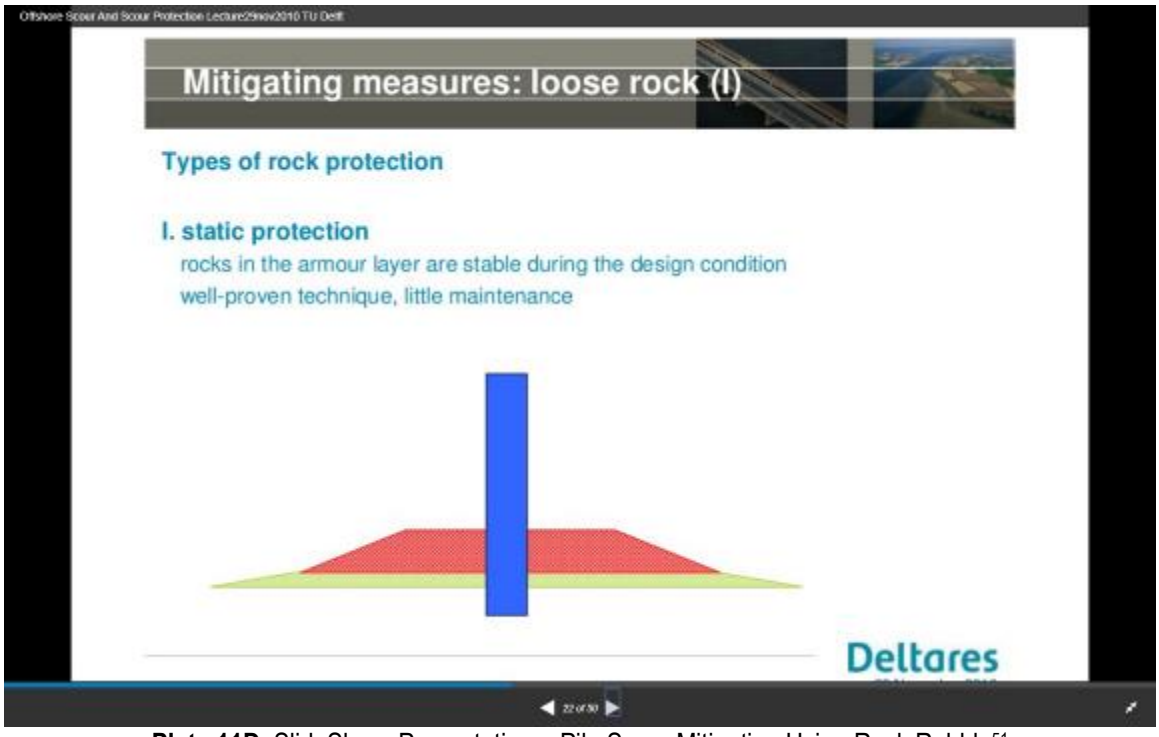


Plate 11D: SlideShare Presentation – Pile Scour Mitigation Using Rock Rubble[51]

[50] Image captured by the Author.

[51] https://www.slideshare.net/TimRaaijmakers/offshore-scour-and-scour-protection-lecture29nov2010-tu-delft

Plate 11E: SlideShare Presentation – Pile Scour Mitigation Using Rock-Packed Bags

Plate 11F, extracted from **http://www.reefball.org/technicalspecs.htm**, depicts an artificial reef structure that can also provide wave attenuating functions. This structure, or one fitting a similar description, could be deployed around the base of a pile to help to reduce wave actions at the pile base as well as providing a sheltering habitat for marine life. Thus, the supports of the overwater bar will serve as fish aggregating devices.

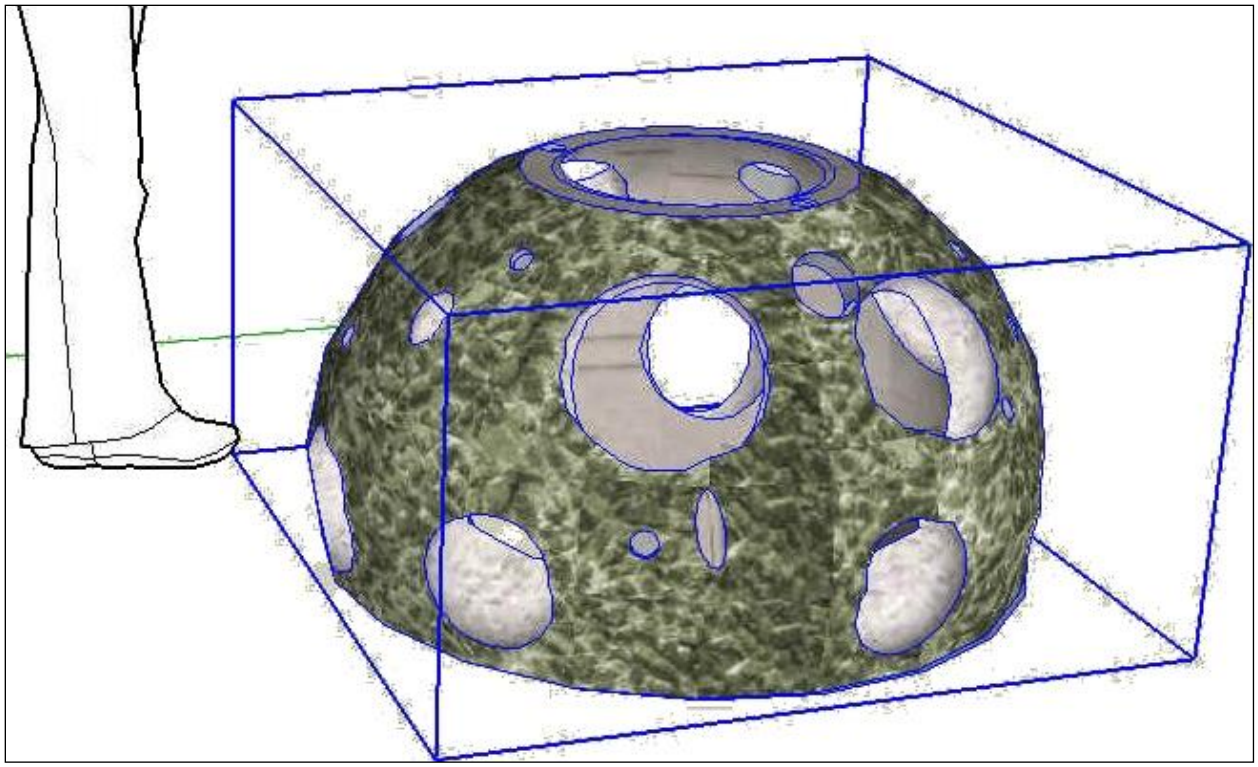


Plate 11F: Example of An Artificial Reef Structure That Can Also Provide Wave Attenuating Functions (**http://www.reefball.org/technicalspecs.htm)**

9.1.2.4 Construction Solid Waste Impacts:
9.1.2.4.1 Construction Process Solid Waste Impacts:

Plate 11G depicts a nylon mesh deployed around a building recently constructed in the Kingston area. The mesh ensured that construction particulates and other items that could fall from the structure were contained within the mesh area. In the case of the proposed over-water bar, this mesh would be deployed initially below the base of the superstructure to prevent solid wastes, tools, and construction materials from falling into the sea (depicted on **Figure 6T-1** and **6T-2** below). Once the superstructure construction process is initiated a similar application of the mesh will be done along the building sides to help prevent items from falling from the sides.

The mesh deployment would prevent the accidental loss of construction materials to the marine environment. It will be critical for the construction staff to manage their building processes so that major pre-cutting work for lumber can be done over a solid surface, such as at a prepared site on land or at a screened location on the barge where prevailing winds will not create a dust nuisance. Cuttings that cannot be used in the construction process would be collected from the staging area or from the containment mesh and then placed in covered containers for transport to land, where the containers can then be offloaded onto vehicles for transport to an approved solid waste disposal site. Nails, screws, and bolts that will inevitably fall from the construction area will be collected, re-sorted and re-used.

Plate 11G[52]**:** Construction Containment Nylon Mesh Deployed Around a Construction Site In Kingston.

Figure 6T-1: Elevation Illustration of Mesh Mechanism To be Deployed Below Base Of Overwater Bar Superstructure To Trap Falling Debris.

[52] http://www.jamaicaobserver.com/sunday-finance/more-residential-approvals-for-kingston_125549

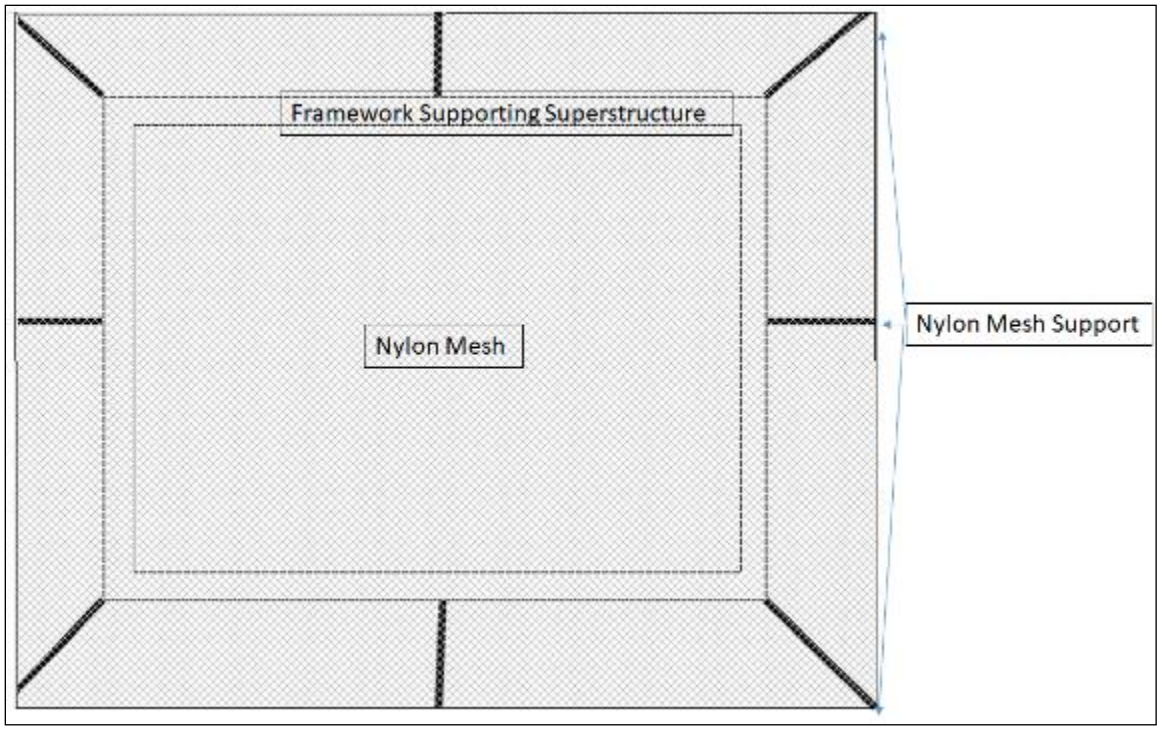


Figure 6T-2: Plan Illustration of Mesh Mechanism To Be Deployed Below Base Of Overwater bar Superstructure To Trap Falling Debris.

9.1.2.4.2 CONSTRUCTION STAFF SOLID WASTE IMPACTS:

The provision of solid waste receptacles at the construction/barge site will be critical as a means of eliminating the temptation to simply throw items overboard. No general aspersions are being cast here but experience has shown that construction workers tend to be inconsiderate where the handling of wastes are concerned. The containment mesh mechanism outlined in **Section 6.1.2.4** will also help to contain solid waste that has been idly thrown from the site.

The following will apply for both process solid waste and worker-generated solid waste management:

1. Both passive (protective nylon mesh) and active (direct disposal to waste receptacles) collection mechanisms will have to be employed to prevent solid waste disposal to the marine environment.
2. All receptacles will have covers to prevent mobilization of solid waste materials by wind.
3. The work barge supporting the construction process will serve as the final staging area for solid waste materials before they are transported in a containerized form to land for disposal.
4. Unskilled members of the construction staff will be assigned the task of:
    - Maintaining/clearing the solid waste receptacles
    - Collecting and re-cycling tools, nails, bolts, nuts and screws trapped by the containment mechanism.
    - Preparing and staging containerized solid waste for transport to land
5. Solid waste items will be stored in a solid waste skip to await transport to the solid waste disposal site.
6. If the consumption of food is to be permitted on the construction site, the waste products generated by their consumption should be separated from construction and other packaging items and handled as organic waste.
7. Related to point number 6, separation of generated solid wastes into organic waste (as distinct from biological organic waste e.g., sewage), metals, glass, plastics and wood/paper products. Every effort will be made to re-use or recycle components that can be managed in such a fashion.

9.1.2.5 CONSTRUCTION STAFF SEWAGE WASTE IMPACTS:

Again, the construction barge supporting the construction process will have to act as a support for temporary bathroom facilities. These facilities, commonly called "Porta Potties" will be positioned on the barge and secured so that they will not be upset by wind or wave action. The ideal potty choice will be one that will allow the sewage receptacle component of the device to be removed from the porta potty when emptying is required. A contracted provider would only have to switch an empty receptacle for a full one. Disposal of the contents would be done by the contracted provider at an approved sewage treatment facility.

Figure 6U shows an example of a Porta Potty with a sewage receptacle that is sealable upon removal from the unit. The sealed receptacle would be transported from the site back to land by way of a boat with no risk of spillage. For added protection, the sealed receptacle can be placed in a screw-on container with an O-ring sealer on the cover prior to loading it onto the service vessel en route to disposal.

Figure 6U: An Example of A Porta Potty With A Sewage Receptacle That Can Be Sealed.[53]

The porta potty would be supported with portable hand sanitizer dispensers, such as the example shown on **Plate 6O** below. Both the porta potty and the portable hand sanitizer dispensers will eliminate the need to provide water for sanitization purposes, thus eliminating volumes of both grey and black water that would have to be handled at and transported from the construction site.

[53] https://inspectapedia.com/septic/ThetfordPortAPotti010.jpg

Plate 11H: Example Of A Portable Hand Sanitizer Dispenser[54].

If the vessels being used to support the construction process have on-board heads, then these should only be used provided that A: the black/grey water generated by these heads empty into sealed tanks on board and B: there are authorized pump-out facilities that can safely remove the contents of the tanks. Otherwise, the porta-potties should be used. Recommended numbers of porta-potties for the worker population have been calculated at 2 units per 10 employees[55]

[54] https://www.allsafetyproducts.com/portable-hand-sanitizer-dispensers.html

[55] Calculated using https://www.portapottyrental.com/help/porta-potty-calculator/

9.1.2.6 CONSTRUCTION EQUIPMENT POLLUTION IMPACTS:

The Occupational Safety and Health Administration (OSHA) has recommended that "Containers that have a capacity of 25 gallons or more have to be stored in a custom cabinet that is reinforced with an inch of thick plywood on all sides. The cabinet should also be covered with a fire-resistant paint....[56]". This recommendation therefore suggests that, unless the work barge is large and stable enough to accommodate such a structure on board, storage of fuel, hydraulic fluids or lubricants should not occur at the offshore location. Such products should be delivered as needed in approved containers for transport. Not storing products at sea will also deter theft, which could present a spill risk.

If products are to be transferred while at the construction site, they should be transferred over/on containment platforms or trays, such as depicted on **Plate 9l** below. Additional spill mitigation will involve the deployment of spill/turbidity mitigation curtains around both the construction site and any work platforms associated with the construction project.

The maintenance of the curtain, along with keeping spill response clean-up and temporary storage kits, such as the example depicted on **Plate 9l** below, will serve as clean-up measures. These pre-packed containers have absorbent materials packed within to facilitate spill clean-up. Additionally, the container serves as temporary storage for absorbent materials so that they can be safely transported to shore for disposal.

It is recommended that a minimum of two such packs be maintained at the site. Further, fire suppression equipment, in the form of Class A-C fire extinguishers will be mandatory at the site. It is also recommended that the work crew be briefed on spill mitigation and response procedures, which will be governed by a Spill and Fire Mitigation and Response Plan. This plan will be prepared once a full understanding of the equipment to be used at the site is known.

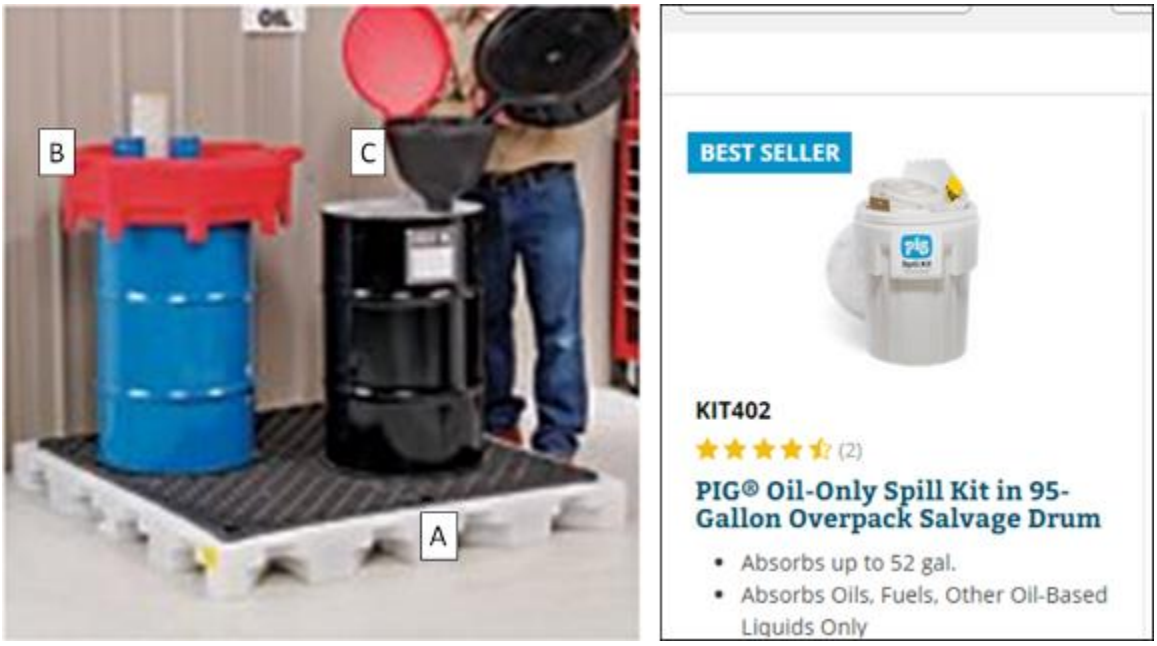


Plate 11l[57][58]: Spill Mitigation Equipment **A**: spill containment platform, **B**: spill collar for drums, **C**: oversized funnel.

[56] https://www.360training.com/blog/osha-portable-fuel-tank-regulations/

[57] Example taken from https://www.newpig.com/oil-fuels-gas-spill-kits/c/5021

[58] Example taken from https://www.newpig.com/spill-containment-trays-drip-pans/c/5037

Finally, spills and splashes from paints and varnishes could occur during the treatment of wood used for construction at the site. In **Section 2.0** above, it was outlined that the initial deck of the superstructure would be constructed from pre-stained/painted wood. This will serve to A: prevent product splashing or being spilled into the marine environment at a point in time when it would be difficult to deploy screening equipment to prevent spillage. However, with the deck deployed, protective sheets can then be placed on it to prevent spillage through the deck into the sea while the superstructure is being prepared. Additionally, paint/stain containers should be kept on spill retaining trays to prevent spills from overturned containers getting onto the floor.

The area of land described for the supply of concrete in **Figure 6B-3** is also being recomended for the storing of contained solid waste in preparation for transport to a solid waste disposal facility.

9.1.2.7 OTHER CONSTRUCTION/EQUIPMENT ISSUES:

Lighting of the structures and equip at night will be required so as to allow them to be visible. The International Regulations for Preventing Collisions at Sea (COLREGS[59]) advances the following standards for navigation light visibility distances for vessels:

Table 12: Navigation Light Requirements for Various Vessel Sizes

Lights	Range Vessel length 50m or more	Range Vessel length 12m - 50m	Range Vessel length less than 12m
Masthead Light	6 miles	5 or 3 miles	2 miles
Side Light	3 miles	2 miles	1 mile
Stern Light	3 miles	2 miles	2 miles
Towing Light	3 miles	2 miles	2 miles
All-round Light	3 miles	2 miles	2 miles

The Centre column of **Table 12** has been highlighted because the dimensions of the proposed bar and supporting barge will probably be within these dimensions. Thus, provided that the intensities of lights positioned on the construction/support vessel structures meet the distance requirements outlined then the structure should be adequately illuminated for night visibility.

9.1.2.8 SOCIO-ECONOMIC IMPACTS:

All of the mitigations outlined under **Sections 9.1.2.2 - 9.1.2.7** will apply.

It is highly likely that the fishers from both beaches will benefit during the construction process through the use of their small boats for construction support. Construction workers and their tools will have to be transported to and from the site and the fishing canoes used by the fishers may be chartered for these movements.

Additionally, if the Grange Pen fishers equip themselves with the necessary qualifications to safely transport patrons to and from the bar site, then this will position the fishers to gain financially from providing transport services for guests.

9.1.3 Operational Impacts:

Impacts and mitigations related to the operation of the over-water bar have similarities to those treated with under construction impacts. Thus, a number of expected impacts and mitigations have been repeated below.

9.1.3.1 OPERATION STAFF/PATRON SOLID WASTE IMPACT MITIGATION:

The provision of solid waste receptacles at the bar counter and within the enclosed section of the bar will be critical as a means of eliminating the temptation to simply throw items overboard.

[59] http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/COLREG.aspx

All receptacles will have covers to prevent mobilization of solid waste materials by wind. Members of the bar staff will be assigned the task of maintaining and clearing the solid waste receptacles, with sorted garbage being packaged in sealed containers for transport to shore for disposal at an approved solid waste disposal site.

9.1.3.2. OPERATION STAFF /PATRON SEWAGE WASTE IMPACT MITIGATION:

The sewage management and water conservation methods outlined on **Figure 6U** and **Plate 11H** above will be implemented in an aesthetically designed head facility. Sealed porta potty receptacles would be transported from the site back to land by way of a boat to be managed by an authorized porta potty provider with no risk of spillage.

Hand sanitizer dispensers will be positioned at the bar's heads as well as behind the bar counter, as dictated by health authorities that will be required to provide approval input on the facility's operation.

Water for utensil washing will be stored in water containers outlined on the engineering drawings, as well as reservoirs designed for rainwater harvesting from the bar's roof. Harvested rainwater will be filtered and disinfected with the use of a packaged treatment mechanism to ensure that the harvested water being used is potable. Grey water will be contained in a grey water tank built into the framework of the bar and emptied into sealable containers for transport to land for proper disposal.

9.1.3.3. Fuel Spill and Fire Impact Mitigations.

All of the bar's energy requirements will be satisfied by solar generated electricity. The only hydrocarbon-based fuel that will be stored at the site is a Propane gas cylinder for a portable generator configured for that fuel.

Fire suppression equipment, in the form of Class A-C fire extinguishers will be mandatory at the site, with extinguishers being positioned at each entrance, as well as behind the bar counter (see recommended extinguisher locations on **Figure 6V** below. Additionally, Class A-C extinguishers will be mandatory on any support vessels used at the site. It is also recommended that the bar staff be briefed on fire mitigation and response procedures. This will be governed under an annex to a Spill and Fire Mitigation and Response Plan.

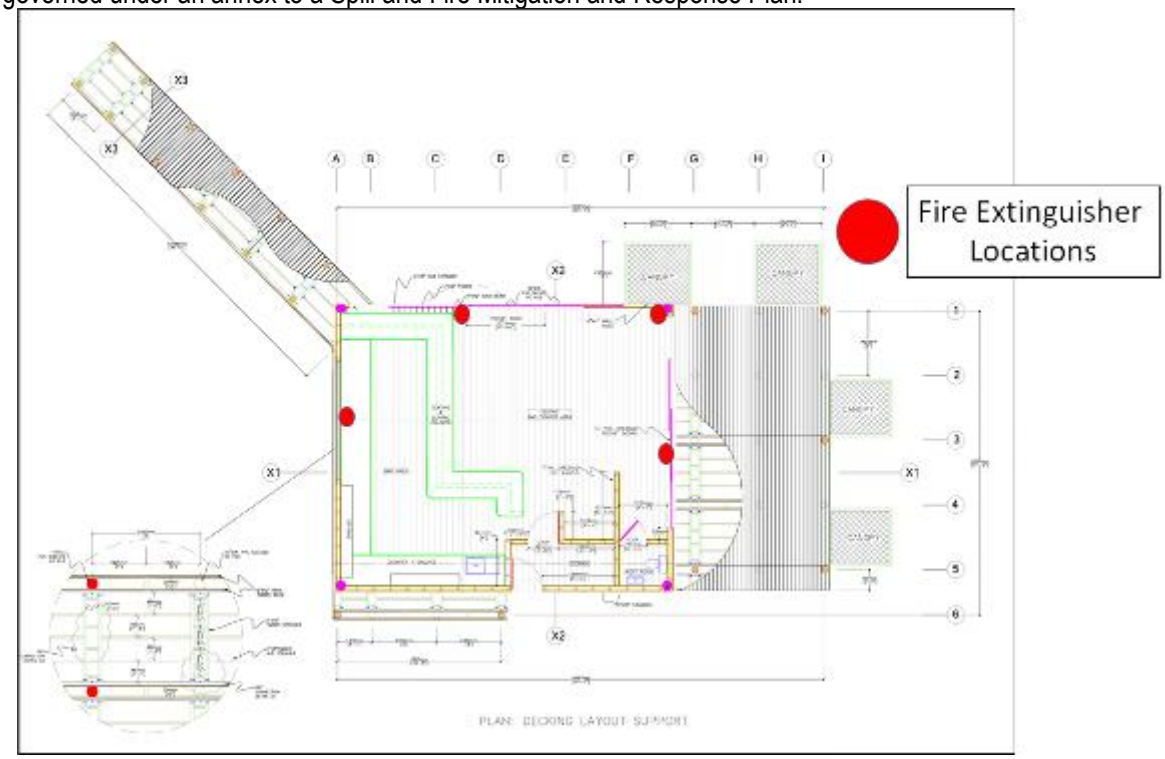


Figure 6V: Proposed Fire Extinguisher Locations

9.1.3.4 NAVIGATION LIGHTING:

The lighting requirements stipulated for the construction phase of the project will also be applicable for the operational phase of the project. The recommendations of the Regulating Agencies with responsibility for maritime safety at sea will also apply for what will be a "permanent" structure.

9.1.3.5 Patron Safety Impact Mitigations.

An Emergency Response Plan template is presented on **Appendix 5.** The intention with the development of a template is that, once specific details on construction methods and equipment are obtained, then the plan will be updated with these details. The plan will then be used to guide emergency responses during both construction and implementation phases of the project.

The location will maintain a vessel dedicated solely to the purpose of providing emergency transport and evacuation and will act in support of patron's The proposed location is removed from shore, which will complicate emergency responses. The Jamaica Fire Brigade cannot respond to a fire or a medical emergency at the site owing to the remoteness of the site. Simultaneously, the remoteness of the site could play a factor in hindering the evacuation of persons from the site in the event of an emergency.

Additionally, access to the site can only be facilitated with the use of a boat. If there is an incident at the site, then a boat will be required to assist in a response. Also, incidents could occur while operating boats between the shore and the worksite.

Finally, the developers do not intend to actively promote water sports at the location. However, since it is possible that patrons may elect to engage in such activities from either the bar or the platforms that they will use to access the location, some form of rescue capability will be maintained at the site for such an eventuality.

9.1.3.6 SOCIO-ECONOMIC IMPACTS:

Based on the inputs given by the management of both the Iberostar Hotel and the Grange Pen fishing beaches, it is very likely that both entities will benefit significantly from the presence of the over-water bar, once implemented. The bar will represent an additional attraction for the hotel's patrons to patronize. The fishers will have the opportunity to transport patrons to and from bar using their boats as water taxis, having satisfied the relevant regulating agencies that their vessels and skill sets meet the requirements for such an operation.

The bar operation will also benefit from the boat services that the fishers can provide since supplies and staff transport to and from the bar will be necessary.

10.0 ANALYSIS OF ALTERNATIVES

There are three forms of development that could be considered where the proposed project is concerned. These are listed below:

1. Implementation of the development as is.
2. Implementation of the development in a lesser form
3. No development.

The EIA has evaluated the development in its proposed form, therefore the second and third options will be examined:

Option 2 – Implementation in A Lesser Form:

The developer's concept of a lesser form of the development would be the utilization of the most stable floating platform to function as the bar. A structure deployed on a barge (see **Plate 11J**) would represent a pre-made object with pre-established facilities. A local example that approximates the likes of option 2 is that of the House Boat Grill in Montego Bay, St. James (depicted on **Figure 6W** below).

Nothing would have to be constructed on the seafloor at the site. It is not known if the cost of the purchase and preparation the barge to ensure its continued integrity in the marine environment, as well as the construction of the bar structure would somewhat equate to the cost of constructing a fixed piled structure. The only components that would have to be implemented on the seafloor at the site would be to deploy four manta ray sediment moorings on the seafloor to accommodate mooring lines for positional stability. **Plate 11K** depicts what a manta ray mooring device looks like.

All of the environmental management attributes outlined for the piled structure (sewage, solid waste etc) would apply for an anchored facility. The issue that the developer had with the use of a mobile support structure, such as a barge was that both structures would roll, yaw and pitch in the sea. The proposed bar location does not have the kind of shelter that a location like the House Boat Grill has. Not all patrons may have the "sea legs" to tolerate this kind of boat movement and enjoy the entertainment being sought. Additionally, floating structures may be more sensitive to the risks associated with the passage of severe weather, having a greater wetted surface area for waves to exert force against. Line handling and anchorage may become critical under these conditions, with demobilization and transportation to sheltered anchorage being required in some instances.

Option 3 – No Implementation:
No implementation represents the best option for the preservation of the natural environment **in its current state**. There will be no ecological risks associated with construction or operation. The location would, however, be deprived of the potential for favourable socio-economic impacts, through the provision of a catalyst for diversification of livelihood options for the Fishers who access the marine environment adjoining the proposed site to ply their trade. Also, if appropriately designed, the bar support structure could function as an artificial area of nursery support for fish and other mobile lifeforms in the area, potentially leading to an enhancement of the mobile marine life population in the area.

Plate 11J: Example of a Barge-Mounted Entertainment Facility[60]

[60] https://inhabitat.com/surreal-tikki-beach-barge-completed-with-huts-and-palms-is-up-for-rent/debra-dawson-miami-style-tikki-beach-barge-1

Plate 11K: Example of a Manta Ray Mooring System[61]

[61] http://www.mauimoorings.com/Docs/manta-system.pdf

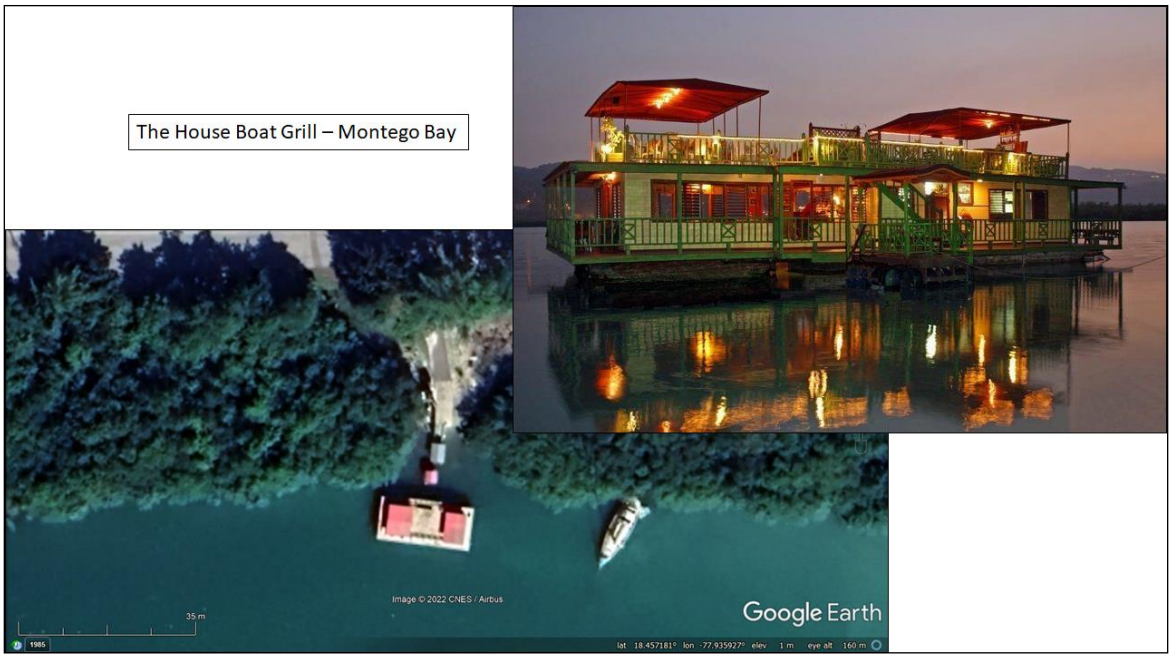


Figure 6W: Aerial View and Configuration Of The House Boat Grill In Montego Bay.

11.0 ENVIRONMENTAL MANAGEMENT AND MONITORING

The development of an Environmental Management and Monitoring plan would typically be informed by specific conditions prepared for permits/licences issued for a project. The following is offered as a preliminary representation of data components that might be required for the preparation of components of the plan. This will be amended once specific conditions and other relevant information are obtained:

11.1 PRE-CONSTRUCTION DATA COLLECTION ACTIVITIES:

The following data components will be required from the developer in advance of commencing construction works:

1. Barge type, size and draught
2. Tow Boat characteristics
3. Tow Boat/Barge crew compliment
4. Crane type, fuel and hydraulic fluid capacities
5. Shallow Draught Work Boat characteristics and crew compliment
6. Support Boat/s compliment
7. Bar construction crew compliment
8. Fire suppression/oil spill management equipment suppliers and types.

This information will allow for a detailed preparation of plans for sewage, solid waste and oil spill/fire management. Information on vessel draught will allow for the plotting of accurate navigation routes for larger boats that might be depth sensitive considering the shallow nature of the site.

11.2 CONSTRUCTION ACTIVITIES:

11.2.1 CONSTRUCTION PLAN:

The expected duration of the construction process is known and the basic steps to be taken in the construction process have been outlined under **Section 2.0** above. However, a detailed construction plan, covering both the piling and the superstructure construction processes, will be required from the prospective marine and building contractors to facilitate the preparation of a step-by-step construction monitoring process. This process would be further tracked with the use of **Table 13** below, which depicts a template of a compliance sheet that will be used as a means of tracking adherence with the specific conditions prepared for the development.

It is expected that **Table 13** will cover conditions that will relate to the management of:

1. Construction waste contamination mitigation
2. Construction waste collection and disposal
3. Construction staff solid waste collection and disposal
4. Construction staff black and grey water collection and disposal

11.2.2 CONSTRUCTION SITE LAYOUT:

Though a proposed staging area for mobile equipment and solid waste stockpiling is known (refer to **Figure 6B-3** above) it is not yet known the types of mobile equipment that will have to be accommodated at this site. Once this has been identified, a layout diagram can then be prepared to indicate how the site will be used and the preparations that might be required to facilitate its use - particularly where load bearing is concerned.

TABLE 13- ENVIRONMENTAL MONITORING REPORT COMPLIANCE TEMPLATE
CONSTRUCTION OF OVER-WATER BAR AT LILLIPUT ST JAMES

CONDITION	COMPLIANCE		ACTION
	YES	NO	

11.3 OPERATIONAL ACTIVITIES[62]:

www.successful barsecrets.com outlines a draft bar operating plan as being a "**collection of important documents, checklists, guidelines, systems, and any other information that every employee needs to know....**

An operations manual includes the following (but is not limited to):

- **Bar operating procedures (systems for the bar)**
  - **Opening procedures**
  - **Closing procedures**
  - **Par levels for ordering wet and dry stock**
  - **Daily/weekly/monthly cleaning tasks**
  - **Standard uniform and equipment needed for a shift**
  - **Necessary tasks for each shift**
  - **Order of service**
- **Floor operating procedures (systems for your restaurant or dining area)**
  - **Opening procedures**
  - **Closing procedures**
  - **Cleaning tasks**
  - **Standard uniform and equipment needed for a shift**
  - **Necessary tasks for each shift**
  - **Order of service**
- **Induction procedures/the recruitment process**
- **Staff training resources**
- **Procedures for miscellaneous tasks**
- **Backups of any forms or templates used regularly**
- **Emergency contact telephone numbers/email addresses**
- **Resources for commonly asked questions"**

11.4 DEMOBILIZATION

In the event that the structure has to be demobilized, whether due to closure of the business or catastrophic damage due to a wind/wave event, the following steps will be taken:

1. The interior components (chairs, tables, counters, cabinets etc) will be disassembled and packed into containers for deployment to shore by way of boats.
2. The most sensitive interior components will be the porta potties and the internal grey water tank. The potties will have to be sealed and removed by boat. The contents of the internal tank will have to be emptied into containers for transport to land, after which, the tank will have to be dismantled and transported to shore.
3. The solid waste catchment device outlined on **Figures 6D-1** and **6D-2** as well as the nylon mesh protection for the sides of the building will then be re-erected to ensure that no demolition materials are dropped into the marine environment.
4. Scaffolding equipment will be installed on the interior of the structure and the roof will be dismantled from within, followed by the dismantling of the wooden sides of the structure.
5. Once the superstructure has been removed, the remaining deck support will be dismantled, leaving the support pilings.
6. A barge and crane will be required for the removal of the support pilings. A section of the outer PVC pipe and concrete casing will be cut away at the seafloor with rotary hydraulic tools to expose

[62] https://successfulbarsecrets.com/components-of-a-bar-or-restaurant-operations-manual/

the internal metal I-beam. Each I-beam will then be cut at the seafloor using an oxygen/electrode torch and hoisted onto the barge for transport to land.

Dismantling will be conducted in such a manner that the construction materials can be collected and sorted according to material composition. Items that can be recycled will be sold while un-recyclable items will be transported to an authorized landfill for disposal.

If site preparation works were done at the staging area outlined on **Figure 6B-3** above, then these works will have to be removed in order to restore the location to its pre-existing condition.

12.0 CONCLUSIONS AND RECOMMENDATIONS

It is the Author's opinion that the structure, as proposed, will not have a negative impact on the seafloor environment based on:

a) Its position on marine sands devoid of sensitive benthic structures.
b) Mitigations proposed to deal with potential seafloor erosion issues that could occur within the vicinity of the support piles.

During the process of construction, solid and liquid waste contamination is a foreseeable risk. Additionally, there is a risk of contamination due to the introduction of paints or fuel/oils during the construction process. Similar risks are foreseeable during the operation of the facility. These risks can be mitigated against with the mitigations proposed.

The project has the potential for benefiting the fishing population during the process of construction due to the fact that boat services will be required to facilitate the movement of personnel and equipment to and from the project site. Additionally, both the fishing and tourism interests in the immediate vicinity of the proposed project area stand to benefit from the presence of the project due to the addition of a diversification to the activities that can be participated in and through the provision of water taxi services to and from the facility.

13.0 APPENDICES

Appendix 1A Terms of References

NATIONAL ENVIRONMENT & PLANNING AGENCY

10 & 11 Caledonia Avenue, Kingston 5, Jamaica W.I. Tel: (876) 754-7540/3 Fax: (876) 754-7595-6 Tollfree: 1-888-991-5005
E-mail: ceo@nepa.gov.jm, Website: http://www.nepa.gov.jm

Reference Number: 2018-08017-BL00060

2 November 2018

Nigel Knowles
Director
Offshore Oasis Ltd.
P.O. Box 233
Freeport
Montego Bay
St. James

Dear Mr. Knowles,

Re: Application in respect of Beach Licences for the Proposed Construction and Maintenance of Overwater Structure (a Bar Attraction) at Montego Bay, St. James

Reference is made to the captioned application and meeting held at the offices of the National Environment and Planning Agency on 18 October 2018. As outlined at said meeting the Agency hereby requires that an Environmental Impact Assessment (EIA) be conducted for the proposed project and an EIA Report submitted to the Agency in support of the application.

The scope of works to be undertaken in the Environmental Impact Assessment must address all the concerns pertaining to the proposed development. Enclosed is a document titled "TERMS OF REFERENCE for an Environmental Impact Assessment for the Proposed Construction and Maintenance of Overwater Structures (a Bar Attraction) at Montego Bay, St. James by Nigel Knowles of Offshore Oasis Limited", which has been developed by the Agency for your use.

The Terms of Reference (TOR) provided are to be reviewed and amended accordingly to ensure that it is specific to the proposed development and that any issues/concerns which may exist are addressed. Please be further advised that the TOR must be approved by the Agency, in writing, prior to the commencement of the EIA study. The Guidelines for Conducting Environmental Impact Assessments can be found on the Agency's website at http://www.nepa.gov.jm/business/guidelines/general/EIA-Guidelines-and-Public-presentaion-2007.pdf.

Your prompt response is anticipated and should you have any queries or require further clarification, please do not hesitate to contact the undersigned at 754-7540 ext. 2162 or by email at abedasse@nepa.gov.jm or Mr. Donavan Sankey at 754-7540 ext. 218 or by email at donavan.sankey@nepa.gov.jm. Please note that all correspondences pertaining to the application must quote the reference number stated above.

Sincerely,
National Environment and Planning Agency

Aisha Bedasse Jureidini
Manager, Applications Processing Branch,
for **Chief Executive Officer/Government Town Planner**

Any reply or subsequent reference to this communication should be addressed to the Chief Executive Officer, to the attention of the officer dealing with the matter, and the reference quoted where applicable.

Managing and protecting Jamaica's land, wood and water
A Government of Jamaica Agency

TERMS OF REFERENCE

for an

Environmental Impact Assessment

for the

Proposed Construction and Maintenance of Overwater Structures (a Bar Attraction)

at

Lilliput, St. James

By

Nigel Knowles of Offshore Oasis Limited

Submitted by:
Prepared by: <Include Name of Consultant>
Date:

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The purpose of this document is to establish the Terms of Reference (TOR) for the Environmental Impact Assessment (EIA) for the Proposed Construction and Maintenance of Overwater Structures (a Bar Attraction) at Lilliput, St. James. An EIA seeks to identify the impacts the proposed project is likely to have on the area in which the physical development will be carried out as well as the impact of the environment on the proposed development. It also outlines mitigation measures necessary to reduce the negative impacts of the project. The EIA will be prepared using a participatory approach involving key stakeholders. This TOR is specific to works that is to be conducted within the marine environment.

The EIA report must be produced in accordance with the agreed TORs issued by the National Environment and Planning Agency (NEPA) to Nigel Knowles of Offshore Oasis Limited.

Where the need arises to modify the TOR, the required amendments/modifications are to be made and submitted to the Agency. Approval for the TOR must be obtained from the Agency, in writing, prior to the commencement of the EIA study.

The National Environment and Planning Agency and the Natural Resources Conservation Authority (NRCA) reserves the right to reproduce, transfer and disclose any and all contents contained in the submitted environmental impact assessment report without the written consent of the proponent, consultants and/or its agents.

The Terms of Reference to conduct the Environmental Impact Assessment (EIA) are as follows:

1) EXECUTIVE SUMMARY

Provide a brief statement on the content of the EIA report. The Executive Summary should provide a comprehensive overview and objectives of the project proposal, natural resources, justification for the project, etc. In addition, it should include relevant background information and provide a summary of the main findings, including but not limited to main impacts and mitigation measures, analyses and conclusions in the report.

2) INTRODUCTION

The Introduction should provide a background and seek to explain the need for and the context of the project and the EIA. It should also provide the delineation and justification of the boundary of the study area, general methodology, assumptions and constraints of the study. Additionally, a profile of the project proponent, implementing organization, project consultants, etc. should also be provided. The study area shall include at least the area within a 1km radius of the boundaries of the proposed project area.

3) POLICY, LEGISLATION AND REGULATORY CONSIDERATION

This section should provide details of the pertinent regulations, standards, policies and legislations governing environmental quality, safety and health, cultural significant finds, protection of sensitive areas, protection of endangered species, tourism enterprises, siting and land use control at the local and national levels. The examination of the legislation should include at a minimum the Natural Resources Conservation Authority Act 1991, Natural Resources Conservation Regulations 1996, amended 2015, Natural Resources Conservation (Wastewater and Sludge) Regulations, 2013, Beach

Control Act, Jamaica National Heritage Trust Act, Wild Life Protection Act, the Fishing Industry Act, National Solid Waste Management Authority Act, the Town and Country Planning Act, Building Act and Codes and Standards promulgated there under, Planning Guidelines – Overwater Structures, Development Orders and Plans and all appropriate international convention/protocol/treaty where applicable. Describe traditional land use and advise of any prescriptive rights including public access rights.

It is also recommended that consultation be had with key stakeholders

4) METHODOLOGY & APPROACH

Clearly outline the methodologies and approaches in conducting the study including collecting and analyzing data, stakeholder consultation, dates on which surveys were conducted etc.

5) PROJECT DESCRIPTION

This section should provide a comprehensive description of the overall project concept and specify the different components. It should include the following:

- History and background of the project.
- A location map at a scale not exceeding 1:12,500 (or an appropriate scale).
- The total area of the site.
- Existing site and its characteristics (landward & seaward).
- Description of the surrounding areas.
- Site maps illustrating areas to be impacted and areas to be preserved in their existing state.
- A master site layout plan showing the various components and design elements of the proposed development
- Detailed description of the project, project objectives and phases (where applicable), including all applicable timelines for the various aspects of the project (from pre to post development). This should include any supplementary and environmental projects to be undertaken following the construction of this structure including but not limited to public education, coral nursery construction and recreational activities. The description should also provide details of the design concept, design components, material(s) to be used, total number, size, return period for structure, design height of structures above sea level; and supporting services to serve the proposed development including means of transportation (*water taxis*), security etc. and details regarding the landing area and other supporting land-based operations. This should be supported by the use of maps, diagrams and other visual aids where appropriate.
- Management details for the proposed 250m radius buffer zone including designated egress/exit routes for approaching/leaving watercrafts, design details and coordinates for moorings and marker buoys, a comprehensive list of all allowed and prohibited activities within the zone.
- Detailed description of all activities and features which will introduce risks or generate an impact (positive or negative) on the environment including but not limited to seagrass and/or coral removal, relocation and shading; collection, transfer, and disposal of waste (solid waste, trade effluent and sewage); provision of potable water and electricity; and dredging or other such works.

- Details of the methods, equipment and machinery to be employed to undertake each aspect of the project including coral/seagrass relocation, dredging, transportation of material, disposal of spoils (if applicable), storage of material, installation of pylons, construction of units, installation of required infrastructure and secondary activities such as refueling of vessels, proposed location(s) for equipment storage (staging area) and establishment of a site office.
- Details regarding access points and accessibility to the proposed work site(s).
- Estimated duration of the project for construction.
- Details of any required decommissioning of the works and/or facilities and estimated timeline for decommissioning.
- Details of any agreements made with other agencies/entities regarding the construction, operation and maintenance of the structure and any other general management agreements.
- An outline of the emergency response plan which categorizes the probable emergencies which can occur based on severity and describes the relevant emergency procedures.

6) DESCRIPTION OF THE ENVIRONMENT

A survey of the proposed development site should be conducted; taking into account the types of resources located in this area and the magnitude of the associated impacts. The study area should be large enough to include all valued resources that might be significantly affected by the project. The study area should be clearly delineated and referenced and the survey should be conducted for both the wet and dry seasons. This information will form the basis upon which impacts of the project will be assessed. The following aspects should be described in this section:

6.1 Physical Environment

This section should provide a complete description of the study area including geographical boundaries and methodologies used for the collection of baseline data. The description should include the following aspects of the environment:

A. *Water Quality*

i. Baseline water quality should include study areas and associated environs and control sites. These should be accurately mapped and a spatial comparison of the data should be done in order to determine any possible source(s) of pollutants (*the data should be geo-referenced*).

ii. Water quality should include but not be limited to the following parameters:
   a) Turbidity
   b) Nutrients (nitrates and phosphates)
   c) Faecal Coliform
   d) BOD
   e) Oil and grease

iii. Results from the water quality sampling should be compared to local and international water quality standards.

iv. Historical data should be used for comparisons where possible.

B. *Hydrodynamics*

i. Existing and proposed final bathymetry and/or elevation profiles of the site including areas to be dredged, reclaimed or used as temporary storage.
ii. Baseline sediment transport and circulation patterns.

C. Noise levels of undeveloped site and the ambient noise in the area of influence.
D. Sources of existing pollution (coastal, surface, and ground water) and extent of contamination.

6.2 Biological Environment

Description of habitats, existing vegetation, flora and fauna surveys inclusive of a species list; commentary on the ecological health, function and value in the project area, threats and conservation significance. This should include:

Coastal/Terrestrial Assessment

i. Benthic surveys should be conducted with emphasis placed on those areas (seafloor) which will be impacted by the proposed development and should including areas to be used including areas to be used for research, recreational use and water craft pathways.
ii. Coastal surveys should be conducted in order to describe the plant and animal community present within the project/impact areas - including temporary staging, equipment and material storage areas. The ecosystems and habitats identified within the impact areas should be described and mapped. This should include but not be limited to the seagrass beds, corals and other ecologically important habitats and or species.
iii. A species list should be generated with special emphasis on those species considered rare, threatened, endangered, endemic, protected, invasive and economically or nationally important. Identification and description of the different ecosystem types and structure including species dominance, species dependence, habitats/niche specificity, community structure and diversity, possible biological loss or habitat fragmentation ought to be considered. The assessment must be done according to internationally (scientific) acceptable standards and the provision of photographic inventory is preferred.
iv. Habitat map of the area

6.3 Carrying Capacity

The ecological carrying capacity of the site should be assessed.

6.4 Natural Hazards

A risk assessment of the development in relation to the following must be undertaken:

i. Tropical Storms, Hurricanes, Tsunamis; and
ii. Climate change projections.

6.5 Socio-economic Environment

This section should provide details on the demography, regional setting, location assessment, current and potential land-use patterns (of neighbouring properties); description of existing infrastructure such as should be explored; and other material assets of the area. There should also be an assessment of the present and proposed uses of the site and surrounding areas including any land acquisition needs, any prescriptive or public access rights, and impacts on current users of the area during and post development. Effects on socio-economic status such as changes to public access and recreational use, impacts on existing and potential economic activities, public perception,

contribution of development to national economy and development of surrounding communities.

A socio-economic survey to determine public perception of the project (both negative and positive) should also be completed and this should include but not be limited to potential impacts on social, aesthetic and historical/cultural values. This assessment may vary with community structure and may take multiple forms such as public meetings or questionnaires. The methodology for conducting the survey should be included as the EIA report.

7) PUBLIC PARTICIPATION

This section should detail the results public perception surveys conducted. It should summarize the issues identified during the public participation process and how these have been addressed or incorporated in the EIA report.

It should describe the public participation methods, timing, type of information provided and collected from public and stakeholder target groups. The sampling methodology employed must be appropriate for the population size and distribution, and must be weighted towards the communities/interest groups in closest proximity to the proposed development. The instrument used to collect the information must be included in the Appendix. Stakeholder meetings should also be held to inform the public of the proposed development and the possible impacts and gauge the feeling/response of the public toward the development.

It is also recommended that consultation be had with key stakeholders inclusive of the National Land Agency, Jamaica Civil Aviation Authority, Port Authority of Jamaica, Ministry of Industry, Commerce, Agriculture and Fisheries, St. James Municipal Corporation and the Maritime Authority of Jamaica.

The issues identified during the public participation process should be summarized and public input that has been incorporated or addressed in the EIA should be outlined.

Public Meeting(s) should be held in accordance with the Guidelines for Conducting Public Presentation at a time and location signed off by the National Environment and Planning Agency (NEPA). A Public Meeting will be held to present the findings of the EIA once completed and submitted for consideration. All relevant documents are required to be made available to the public. In addition, any material change to the design of the project will require a further public meeting to be undertaken by the developer and all changes made to the document and project should be clearly outlined to the public.

8) IMPACT IDENTIFICATION AND ANALYSIS

A detailed analysis of the project components should be done in order to identify major potential environmental, health and safety impacts of the project. This section shall seek to distinguish between levels of impact, significance of impact (a ranking from major to minor/significant to insignificant should be developed), positive and negative impacts, duration of impacts (long term or short term or immediate), direct and indirect and impacts, reversible or irreversible impacts, long term and immediate impacts and identify avoidable impacts.

Cumulative impacts should also be evaluated taking into account previous developments and any proposed development immediately adjacent to the subject development. The major concerns

surrounding environmental, health, and safety issues should be noted and their relative importance to the design and implementation of the project indicated.

The extent and quality of the available data should be characterized, explaining significant information deficiencies and any uncertainties associated with the predictions of impacts. A major environmental issue is determined after examining the impact (positive and negative) on the environment and having the negative impact significantly outweigh the positive. It is also determined by the number and magnitude of mitigation strategies which need to be employed to reduce the risk(s) introduced to the environment. Project activities and impacts should then be ranked as major, moderate or minor, and presented in separate matrices for all the phases of the project (i.e. preconstruction, construction, operational, and decommissioning/closure). The potential impacts may be subdivided into Physical Impacts, Biological Impacts and Socio-economic and Cultural Impacts.

All impacts should be listed, ranked and assessed, preferably in a single table.

The impacts to be assessed should include but not be limited to the following:

8.1 Physical Environment

- Impacts of coastal modification such as construction activities such as:
  - Dredging relating impacts;
  - Shoreline modification;
  - Removal of seagrass and corals, relocation of seagrass and corals, shading;
  - Sediment plume dispersal;
  - Reef modification;
  - Modification of waves and current patterns;
  - Water quality (pollution of potable, coastal, surface, and ground water);
  - Geotechnical and engineering requirements; and
  - Spoil disposal.
- Impacts of construction activities such as:
  - Encroachments
  - Occupational health and safety
  - Beach access
- Impacts of potential spills (such as oil and chemical spills)
- Impacts on water quality (during construction and operation)
- Impacts of climate change
- Noise
- Operation and maintenance – provision of and demand requirements for potable water and electricity, waste disposal, sewage treatment and disposal, communication and other utility requirements
- Impacts on aesthetics, landscape and seascape

8.2 Biological Environment

This should include an assessment of the direct and indirect impacts of the project on the ecology of the marine habitats/environment with emphasis being placed on rare, endemic, threatened,

protected, endangered, invasive, and economically important species found. This should include habitat loss and fragmentation, loss of species and natural features, and the impact of noise and vibration on fauna.

8.3 Natural Hazards
Potential impact of natural hazards including tropical storms, hurricanes and tsunamis.

8.4 Socio-economic Environment
This should include effects on socio-economic status including changes in resource use, public access, prescriptive rights, existing recreational use, impacts on existing and potential economic activities; public perception; and the contribution of development to the national economy and development of surrounding communities.

9) MITIGATION

This section should provide mitigation measures which should endeavour to avoid, reduce or remedy the potential negative impacts identified, while enhancing the positive impacts identified. Mitigation and abatement measures should be developed for each potential negative impact identified. Full details of the methods proposed to be employed in the implementation of these measures should be provided, including details on the scheduling/timelines, source of materials, location and responsible parties, where appropriate. Maps and diagrams should also be used to illustrate areas where mitigation measures are proposed to be implemented.

10) IDENTIFICATION AND ANAYSIS OF ALTERNATIVES

Alternatives to the proposed development or specific components and the potential environmental consequences of each proposed alternative, including the no-action alternative should be examined. These should be assessed according to the physical, ecological and socio-economic parameters of the site including the effects of climate change.

11) ENVIRONMENTAL MANAGEMENT AND MONITORING

11.1 Environmental Management Plan
An Environmental Management Plan should be developed which will detail the requirements for the construction and operational phases of the project. This should include, but not be limited to methodology, training for construction and operation staff, recommendations to ensure that the implementation of mitigation measures and long term minimization of negative impacts. Special emphasis should be placed on the preparation of Coral Management Plan, Seagrass Management Plan, Dredge Management Plan and Beach Nourishment Management Plan if applicable.

11.2 Environmental Monitoring Plan
A draft Environmental Monitoring Plan should be included in the EIA. At the minimum the draft monitoring plan should include:

i. The locations selected for monitoring.
ii. The mitigation measures to be implemented and the parameters and activities which will be monitored for each activity.
iii. The proposed methodology to be employed for the monitoring of the various parameters.

iv. The frequency of the monitoring.
v. The proposed format that the monitoring reports should take.
vi. The frequency of the submission of the monitoring reports.
vii. The responsible parties for the monitoring.
viii. Details for special monitoring of sea turtles, birds and crocodiles during and after the proposed works.

12) CONCLUSION AND RECOMMENDATIONS

13) LIST OF REFERENCES

14) APPENDICES

The Appendices should include but not be limited to the following documents:

i. Reference documents
ii. Photographs/ maps
iii. Data Tables
iv. Glossary of Technical Terms used
v. Final Terms of Reference
vi. Profile of the project proponent and implementing organization
vii. Composition of the consulting team, team that undertook the study/assessment, including name, qualification and roles of team members
viii. Notes of Public Consultation sessions
ix. Instruments used in community surveys

All findings must be presented in the EIA report and must reflect the headings in the body of the TORs, as well as, references. GIS references should be provided where applicable. Two hard copies and an electronic copy must be submitted to NEPA for review after which the Agency will indicate the number of hard copies along with an electronic copy of the report to be submitted. One copy of the document should be perfect bound.

The report should include appendices with items such as maps, site plans, the study team and their individual qualifications, photographs, and other relevant information. All of the foregoing should be properly sourced and credited.

Appendix 2A Water Quality Results – 2022.

ESL QUALITY & ENVIRONMENTAL HEALTH LABORATORY

A division of

ISO 17025
ACCREDITED LABORATORY

7 Hillview Avenue,
Kingston 10, Jamaica
Tel: (876) 978-9519, 978-6297, 978-5902
Fax: (876) 946-3745
E-mail: envirsol@cwjamaica.com

Certificate of Sample Analysis

CSA#: PWK 20012821-22

Attention:
Mr. Peter Wilson-Kelly
Offshore Oasis

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This report only pertains to samples mentioned herein. ESL-QEHL bears no responsibility for any decisions taken by the client as a result of the data reported.

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The ISO/IEC 17025 accreditation only applies to the tests identified in the Results of Sample Analysis.

The data presented in this report does not imply certification, approval, or endorsement of the client's services by ESL-QEHL or the accreditation body.

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Sample(s) Information

Job Number:	**22022460-64**
Date of Report:	21/03/2022
Revision Date:	**Not Applicable**
Sample(s) Collected:	24/02/2022
Sample(s) Submitted:	24/02/2022
Temperature on Arrival:	2.2°C & 1.3°C
Number of Samples:	5
Analysis Started:	24/02/2022
Analysis Completed:	13/03/2022
Prepared By:	**Tara-Lee Hylton, Technical Assistant**

Verified By ..... M Brown.
Mychalia Brown,
Analyst

Approved By..... S. Ellis
Shadain Ellis,
Senior Analyst

Results of Sample Analysis

Sample ID (Matrix) - Qualifier: Oasis-1 (Marine Water) **-☐C(B) ☒C(C) ☐C(L)**

Parameters (units)	Test Method	Results	Qualifier	NRCA Ambient Marine Water Standard
Biochemical Oxygen Demand (mg O_2/L)	H-8043	0.4	-	0.0 - 1.16
Total Suspended Solids (mg/L)	SM-2540 D	5.2	-	-
Nitrate and Nitrite (mg NO_3^-+ NO_2^-/L)	H-8192	0.09	E(M1), P(P), P(1)	-
Nitrate and Nitrite as Nitrogen (mg NO_3^-+ NO_2^--N/L)		0.02		0.007 - 0.014
Orthophosphate (mg PO_4^{3-}/L)	H-8048	<0.02	BDL	-
Orthophosphate as Phosphorus (mg PO_4^{3-}-P/L)		<0.01	BDL	0.001-0.003
Faecal Coliform (MPN/100ml)	SM-9221	<1.8	-	<2-13

***Blue shaded parameters are ISO/IEC 17025 accredited.**

Please note that the data presented in the table are determined to be compliant or non-compliant based on the value provided without the incorporation of the measurement uncertainty.

Sample ID (Matrix) - Qualifier: Oasis-2 (Marine Water) **-☐C(B) ☒C(C) ☐C(L)**

Parameters (units)	Test Method	Results	Qualifier	NRCA Ambient Marine Water Standard
Biochemical Oxygen Demand (mg O_2/L)	H-8043	0.5	-	**0.0 - 1.16**
Total Suspended Solids (mg/L)	SM-2540 D	4.1	-	-
Nitrate and Nitrite (mg NO_3^-+ NO_2^-/L)	H-8192	0.09	E(M1), P(P), P(1)	-
Nitrate and Nitrite as Nitrogen (mg NO_3^-+ NO_2^--N/L)		0.02		**0.007 - 0.014**
Orthophosphate (mg PO_4^{3-}/L)	H-8048	<0.02	BDL	-
Orthophosphate as Phosphorus (mg PO_4^{3-}-P/L)		<0.01	BDL	**0.001-0.003**
Faecal Coliform (MPN/100ml)	SM-9221	<1.8	-	**<2-13**

***Blue shaded parameters are ISO/IEC 17025 accredited.**

Please note that the data presented in the table are determined to be compliant or non-compliant based on the value provided without the incorporation of the measurement uncertainty.

Sample ID (Matrix) - Qualifier: Oasis-3 (Marine Water) **-☐C(B) ☒C(C) ☐C(L)**

Parameters (units)	Test Method	Results	Qualifier	NRCA Ambient Marine Water Standard
Biochemical Oxygen Demand (mg O_2/L)	H-8043	0.1	-	**0.0 - 1.16**
Total Suspended Solids (mg/L)	SM-2540 D	6.0	-	-
Nitrate and Nitrite (mg NO_3^-+ NO_2^-/L)	H-8192	0.09	E(M1), P(P), P(1)	-
Nitrate and Nitrite as Nitrogen (mg NO_3^-+ NO_2^--N/L)		0.02		**0.007 - 0.014**
Orthophosphate (mg PO_4^{3-}/L)	H-8048	<0.02	BDL	-
Orthophosphate as Phosphorus (mg PO_4^{3-}-P/L)		<0.01	BDL	**0.001-0.003**
Faecal Coliform (MPN/100ml)	SM-9221	<1.8	-	**<2-13**

***Blue shaded parameters are ISO/IEC 17025 accredited.**

Please note that the data presented in the table are determined to be compliant or non-compliant based on the value provided without the incorporation of the measurement uncertainty.

Sample ID (Matrix) - Qualifier: Oasis-4 (Marine Water) **-☐C(B) ☒C(C) ☐C(L)**

Parameters (units)	Test Method	Results	Qualifier	NRCA Ambient Marine Water Standard
Biochemical Oxygen Demand (mg O_2/L)	H-8043	0.2	-	**0.0 - 1.16**
Total Suspended Solids (mg/L)	SM-2540 D	3.6	-	-
Nitrate and Nitrite (mg NO_3^-+ NO_2^-/L)	H-8192	0.09	E(M1), P(P), P(1)	-
Nitrate and Nitrite as Nitrogen (mg NO_3^-+ NO_2^--N/L)		0.02		**0.007 - 0.014**
Orthophosphate (mg PO_4^{3-}/L)	H-8048	0.02	-	-
Orthophosphate as Phosphorus (mg PO_4^{3-}-P/L)		0.01	-	**0.001-0.003**
Faecal Coliform (MPN/100ml)	SM-9221	<1.8	-	**<2-13**

***Blue shaded parameters are ISO/IEC 17025 accredited.**

Please note that the data presented in the table are determined to be compliant or non-compliant based on the value provided without the incorporation of the measurement uncertainty.

Sample ID (Matrix) - Qualifier: Oasis-5 (Marine Water) **-☐C(B) ☒C(C) ☐C(L)**

Parameters (units)	Test Method	Results	Qualifier	NRCA Ambient Marine Water Standard
Biochemical Oxygen Demand (mg O_2/L)	H-8043	0.7	-	**0.0 - 1.16**
Total Suspended Solids (mg/L)	SM-2540 D	5.6	-	-
Nitrate and Nitrite (mg NO_3^-+ NO_2^-/L)	H-8192	0.09	E(M1), P(P), P(1)	-
Nitrate and Nitrite as Nitrogen (mg NO_3^-+ NO_2^--N/L)		0.02		**0.007 - 0.014**
Orthophosphate (mg PO_4^{3-}/L)	H-8048	<0.02	BDL	-
Orthophosphate as Phosphorus (mg PO_4^{3-}-P/L)		<0.01	BDL	**0.001-0.003**
Faecal Coliform (MPN/100ml)	SM-9221	2.0	-	**<2-13**

***Blue shaded parameters are ISO/IEC 17025 accredited.**

Please note that the data presented in the table are determined to be compliant or non-compliant based on the value provided without the incorporation of the measurement uncertainty.

Certificate of Quality

Parameter: LR Nitrate (H-8192)

QEHL Personnel: J. Webster **Date of Analysis: 13/03/2022**

	Standard Concentration (mg NO_3^--N/L)	Determined Concentration (mg NO_3^--N/L)	RPD (%)
RB		0.01	
BD		0.02	0.0
		0.02	
SRS	0.35 – 0.45	0.42	

Parameter: Total Suspended Solids (SM-2540 D)

QEHL Personnel: N. McCalla, S. Robinson **Date of Analysis: 01/03/2022**

	Standard Concentration (mg/L)	Determined Concentration (mg/L)	RPD (%)
MB		<1.6	
BD		33.2	1.2
		32.8	
SRS	46.1-57.7	51.0	

Parameter: Orthophosphates (H-8048)

QEHL Personnel: M. Brown, T. Thompson **Date of Analysis: 25/02/2022**

	Standard Concentration (mg PO_4^{3-}/L)	Determined Concentration (mg PO_4^{3-}/L)	RPD (%)
MB		0.02	
RB		<0.02	
BD		7.80	5.3*
		7.40	
SRS	1.94-2.02	1.98	

***Duplicates accepted based on the sensitivity of the analytical method used.**

Parameter: Biochemical Oxygen Demand (H-8043)

QEHL Personnel: T. Thompson, J. Webster-Jones **Date of Analysis: 25/02/2022**

Parameter: Faecal Coliform (SM-9221)

QEHL Personnel: E. Terrelonge **Date of Analysis: 24/02/2022**

Media/Test Item (Batch#)	SS LTB (23/02/2022)	DS LTB (17/02/2022)	EC Broth (18/02/2022)
Sterile (Yes/No)	Yes	Yes	Yes
Media performance (Typical, not typical)	Typical	Typical	Typical

Glossary

%	Percentage
µg/L	microgram per litre
µS/cm	microsiemens per centimetre
a	Parameter subcontracted
ADB	Azide Dextrose Broth
AIM	The Aquaculture, Inland & Marine Products & By-Products Act (Regulations)
AOAC	American Organization of Analytical Chemists
b (1)	Parameter analysed outside of hold-time; samples submitted outside of the analysis hold-time
b (2)	Parameter analysed outside of hold-time; analysis authorised by Client
BAM	Bacteriological Analytical Manual
BD	Batch Duplicate
BDL	Analyte concentration below laboratory determined limit of detection
BDLS	Analyte detected below method detection limit (MDL). MDL greater than standard value.
BEA	Bile Esculin Azide Agar
BG	Brilliant Green Bile Broth
BGSA	Brilliant Green Sulfa Agar
BHI	Brain Heart Infusion Broth
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BSA	Bismuth Sulfite Agar
c	parameter analysed in the field
C(B)	Samples collected by the client and picked up by an ESL bearer
C(C)	Samples collected by the client and delivered to ESL
C(H)	Analytical sample submitted in incorrect container. This may affect data quality.
C(L)	Samples collected by ESL
C(S)	Sample collected by the client then sub-sampled and delivered by ESL.
cfu	Colony Forming Units
CMMEF	Compendium of Methods for the Microbiological Examination of Foods
Col	Colourimetry
CVAAS	Cold Vapour Atomic Absorption Spectroscopy
D(I)	Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference
D(C)	Sample diluted due to high concentration of target analyte
DR	Direct Reading
DS ADB	Double Strength azide dextrose broth
DS LTB	Double Strength Lauryl Tryptose Broth
DS PAB	Double Strength Pseudomonas Asparagine Broth
EB	Equipment Blank
E(E1)	Estimated Value. Data acquisition affected by equipment malfunction.
E(L1)	Estimated Value. Analyte recovery in the laboratory control sample (LCS) was outside of QC limits. Results for this may be affected by same bias.
E(L2)	Estimated Value due to the nature of the sample matrix.
E(M1)	Estimated Value. Result calculated using calibration curve.
E(M2)	Estimated Value. Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
E(M3)	Estimated Value. Sample performance indicate presence of interference
E(R)	Estimated Value. RPD value was outside control limits.
EC	*E. coli* Media
E(V)	Estimated Value. Count(s) obtained is/are outside of the method counting range.
EC-MUG	*E. coli* Media with 4-**m**ethylu**m**belliferyl-β-D-**g**lucuronide
EHU	Environmental Health Unit
EPA	(US) Environmental Protection Agency
FAAS	Flame Atomic Absorption Spectroscopy
FAES	Flame Atomic Emission Spectroscopy
FB	Field Blank
FD	Field Duplicate
FL-PRO	Florida Petroleum Range Organic Method
GC-MS	Gas Chromatography Mass Spectrometry
H	Hach Water Analysis Workbook
H(A)	Off-scale high data obtained. Actual value may be greater than value given.

ICP	Inductively Coupled Plasma
ISE	Ion Selective Electrode
LCA	Listeria Chromogenic Agar
LE	Data not available due to laboratory error
LIA	Lysine Iron Agar
MAC	MacConkey Agar
MB	Method Blank
mEndo	mEndo Agar/Broth
MFHPB	Microbiology Food Health Protection Branch, Government of Canada
mmhos/cm	Millimhos per centimetre
mg/kg	milligram per kilogram
mg/L	milligrams per litre
MPN	Most Probable Number
mS/cm	millisiemens per centimetre
N/A (1)	Data not yet Available. Analysis not complete.
N/A (2)	Data not Available. Sample matrix interferences prevented data acquisition.
N/A (3)	Data not Available. Insufficient sample submitted.
N/A (4)	Data not Available. Equipment malfunction prevented data acquisition.
N/A (5)	Data not Available. Analysis not complete due to force majeure.
NA	Nutrient Agar
NB	Nutrient Broth
NEPA	National Environment and Planning Agency
NRCA	Natural Resources Conservation Authority
NTU	Nephelometric Turbidity Units
NWC	National Water Commission (Jamaica)
NST	No Time given for collection of samples
P(P)	Sample preserved prior to analysis
P(1)	Non-routine sample pre-treatment required
PAB	Pseudomonas Asparagine Broth
PCA	Plate Count Agar
PDA + C	Potato Dextrose Agar with Chloramphenicol
Pep Water	Peptone Water
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
RED	Parameter Non-compliant
RPD	Relative Percentage Difference
SM	Standard Methods for the Examination of Water and Wastewater 23rd Edition
SRS	Standard Reference Solution
SS	Sample Submerged on receival at laboratory
SS ADB	Single Strength Azide dextrose broth
SS LTB	Single Strength Lauryl Tryptose Broth
SS PAB	Single Strength Pseudomonas Asparagine Broth
T(H)	Samples arrived at ESL-QEHL outside holding temperature (≤4.0°C).
TIT	Titrimetry
TPH	Total Petroleum Hydrocarbon
TSA	Tryptic Soy Agar
TSB	Tryptic Soy Broth
TSA+YE	Tryptic Soy Agar + Yeast Extract
TTC	Triphenyl Tetrazolium Chloride
UMR	Analyte detection was below the measuring range of instrument. This is indicative of possible matrix interference within the sample.
WHO	World Health Organization
XLD	Xylose Lysine Deoxycholate

End of Report

Appendix 2B Water Quality Results – NEPA.

LOCATION	Sample Date	PO4 (mg/l)	NO_3 (mg/l)	BOD (mg/l)	Faecal Coliform (MPN/100ml)	TSS (mg/l)
Greenwood Beach	29-May-18	0.0978	0.398	0.60	14.0	312.0
Greenwood Beach	23-Jan-18	0.0267	0.113	0.97	26.0	342.0
Greenwood Beach	24-Oct-17	0.1100	0.836	0.00	1.8	0.0
Greenwood Beach	28-Aug-17	0.0288	1.757	0.00	17.0	0.0
Greenwood Beach	29-May-17	0.0003	1.535	0.56	1.8	0.0
Greenwood Beach	1-Sep-15	0.2424	0.359	0.61	1.8	16.0
Greenwood Beach	27-Jan-15	0.0300	0.070	1.35	33.0	44.0
Greenwood Beach	25-Aug-14	0.0030	0.224	3.85	14.0	286.0
Greenwood Beach	25-Nov-13	0.0371	0.112	0.36	7.8	354.0
Greenwood Beach	6-Mar-13	0.2289	0.224	0.52	11.0	398.0
Greenwood Beach	22-Jan-13	0.0030	0.744	1.89	7.8	392.0
Greenwood Beach	12-Apr-11	0.1155	1.023	0.79	1.8	304.0
Greenwood Beach	20-Apr-10	0.0030	0.405	0.57	49.0	0.0
Greenwood Beach	30-Nov-09	0.1030	0.159	0.99	22.0	298.0
Greenwood Beach	19-May-09	0.0290	4.394	1.55	2.0	0.0
Greenwood Beach	20-Jan-09	0.0030	1.437	0.96	11.0	116.0
Greenwood Beach	24-Sep-08	0.0230	5.738	0.70	13.0	182.0
Greenwood Beach	7-Apr-08	0.0120	3.558	1.14	2.0	130.0
Greenwood Beach	19-Sep-06	0.0031	4.224	1.32	34.0	0.0
Greenwood Beach	7-Dec-05	0.0092	0.471	5.57	1600.0	0.0
Greenwood Beach	22-Feb-03	0.0215	0.356	0.81	300.0	10.0
Greenwood Beach	6-Dec-02	0.9040	0.043	1.02	1600.0	10.0
Greenwood Beach	29-Jun-02	0.0031	0.163	3.74	2.0	10.0
Lilliput	1-Sep-15	0.0696	0.345	0.63	4.5	43.0
Lilliput	25-Nov-13	0.0030	0.082	0.47	39.0	270.0
Lilliput	20-Apr-10	0.0030	2.154	0.91	13.0	0.0
Lilliput	30-Nov-09	0.0370	0.178	2.07	4.5	320.0
Lilliput	19-May-09	0.0460	3.522	2.09	7.8	308.0
Lilliput	20-Jan-09	0.0030	1.251	1.13	2.0	26.0
Lilliput	24-Sep-08	0.4661	4.949	1.28	8.0	302.0
Lilliput	7-Apr-08	0.0030	3.774	0.65	2.0	178.0
Lilliput	27-Jan-15	0.0349	1.173	0.97	170.0	66.0
Lilliput	25-Aug-14	0.0030	0.441	0.58	2.0	280.0
Lilliput	6-Mar-13	0.3520	0.522	1.04	240.0	544.0
Lilliput	22-Jan-13	0.0432	0.397	1.36	1.8	450.0
Lilliput	12-Apr-11	0.0211	0.233	0.88	2.0	302.0

Long Bay-TRLY	25-Aug-14	0.0030	0.004	3.53	46.0	288.0
Long Bay-TRLY	10-Mar-14	0.0030	0.670	0.93	2.0	180.0
Long Bay-TRLY	25-Nov-13	3.8714	0.092	0.82	17.0	412.0
Long Bay-TRLY	20-Apr-10	0.0030	0.139	0.92	17.0	0.0
Long Bay-TRLY	30-Nov-09	0.0030	0.400	0.65	13.0	298.0
Long Bay-TRLY	19-May-09	0.0030	0.664	2.93	27.0	282.0
Long Bay-TRLY	20-Jan-09	0.0030	0.309	1.04	2.0	12.0
Long Bay-TRLY	30-Sep-08	0.0120	1.229	0.22	13.0	222.0
Long Bay-TRLY	24-Sep-08	0.0748	1.430	1.75	2.0	262.0
Long Bay-TRLY	25-Aug-08	0.0120	3.897	0.61	2.0	216.0
Long Bay-TRLY	29-Jul-08	0.0030	0.177	0.41	2.0	172.0
Long Bay-TRLY	30-Jun-08	0.0230	0.266	0.40	2.0	144.0
Long Bay-TRLY	7-Apr-08	0.0170	0.413	1.22	8.0	124.0
Long Bay-TRLY	1-Sep-15	0.0251	0.329	0.61	79.0	30.0
Long Bay-TRLY	27-Jan-15	0.0144	0.004	2.25	70.0	46.0
Rosehall Resort & Country Club	1-Sep-15	0.0766	0.274	0.74	4.5	83.0
Rosehall Resort & Country Club	27-Jan-15	0.0030	0.004	1.41	49.0	432.0
Rosehall Resort & Country Club	25-Aug-14	0.0030	0.439	2.36	22.0	320.0
Rosehall Resort & Country Club	10-Mar-14	0.0030	0.093	5.38	4.5	176.0
Rosehall Resort & Country Club	25-Nov-13	0.0030	0.083	1.46	11.0	1108.0
Rosehall Resort & Country Club	6-Mar-13	0.2970	0.011	0.49	4.5	2632.0
Rosehall Resort & Country Club	22-Jan-13	0.0030	0.131	0.48	14.0	1012.0
Rosehall Resort & Country Club	12-Apr-11	0.3680	0.000	0.80	1.8	276.0
Rosehall Resort & Country Club	20-Apr-10	0.0030	0.158	0.53	17.0	0.0
Rosehall Resort & Country Club	30-Nov-09	0.0030	0.303	0.58	350.0	346.0
Rosehall Resort & Country Club	19-May-09	0.0750	0.414	1.94	70.0	374.0
Rosehall Resort & Country Club	20-Jan-09	0.0030	0.929	0.84	2.0	18.0
Rosehall Resort & Country Club	24-Sep-08	0.2072	2.335	1.35	14.0	304.0
Rosehall Resort & Country Club	7-Apr-08	0.0030	0.180	1.15	300.0	202.0
Rosehall Resort & Country Club	14-Jan-08	0.0830	0.261	0.87	4.0	318.0
Rosehall Resort & Country Club	13-Feb-07	0.0320	0.039	0.58	2.0	0.0
Rosehall Resort & Country Club	11-Oct-05	0.0000	0.000	0.55	2.0	0.0

Rosehall Resort & Country Club	24-May-05	0.0000	0.000	1.48	2.0	0.0
Rosehall Resort & Country Club	17-Jul-03	0.0215	0.253	0.67	4.0	10.0
Rosehall Resort & Country Club	6-Mar-03	0.0000	0.026	1.11	2.0	10.0
Rosehall Resort & Country Club	8-Oct-02	0.0061	0.043	2.14	50.0	10.0

Appendix 3A Permission Letter – Boatyard Use by Damian and Clifford Stephenson.

Stephenson,
Long Bay,
Rose Hall PO,
St James, Jamaica

April 15, 2021

Dear Sirs,

Reference Beach Licence application 2018-0817-BL00088

For your interest:

We, Damian and Clifford Stephenson, the owners of the property known and registered at Volume _957__ Folio _217___ of the register book of titles, hereby give permission for Offshore Oasis Ltd. to use the said property for the purposes of moving construction materials, supplies, and equipment to apply for an Environmental Permit/Environmental Licence/Beach Licence from the Natural Resources Conservation Authority for the said purposes.

Yours sincerely,

Damian Stephenson

Clifford Stephenson

S## 661

April 22, 2021

Appendix 3B Boatyard Land Title.

VOL 957 FOL 217

ORIGINAL

DO NOT FOLD AND DO NOT REMOVE FROM TITLES OFFICE

A. 42785

REGISTER BOOK

VOLUME	FOLIO
957	217

JAMAICA

Certificate of Title under the Registration of Titles Law, Chapter 340

LESTER KEITH RUSSELL

of Hampden in the parish of Trelawny, Planter

is now the proprietor of an estate **in fee simple**

subject to the incumbrances notified hereunder in ALL THAT **parcel of land called "LONG BAY" part of [redacted]** in the parish of **SAINT JAMES** containing by survey Three Roods Seven Perches and Nine-tenths of a perch of the shape and dimensions and butting as appears by the plan thereof hereunto annexed.

Dated the Fourth day of May One Thousand Nine Hundred and Sixty.

Registrar of Titles

Transmission Application No. 11643 entered 23rd April, 1979 all estate of LESTER KEITH RUSSELL to JOYCE MILLICENT RUSSELL of Irwin Tower, Falmouth, Trelawny, Widow on the [redacted] day of January, 1977.

Actg. Dep. Registrar of Titles.

Transfer No. 405851 registered 3rd of September 1982 to JOYCE MILLICENT RUSSELL abovenamed KOLLEEN ANN BOWMAN RUSSELL FORRESTER and KEITH EDWARD BOWMAN RUSSELL both of Irwin Tower, Trelawny, Housewife and Businessman respectively as tenants-in-common. Consideration in pursuance of the devise contained in the will of LESTER KEITH RUSSELL deceased. For Transfer see [illegible]

Actg. Dep. Registrar of Titles

Transfer No. 434301 registered the 21st day of January 1985 to WILLIAM GEORGE STEPHENSON of Long Bay, Saint James, Businessman. Consideration money Forty Five Thousand Dollars.

Registrar of Titles.

Mortgage No. 437430 registered in duplicate on the 15th day of May, 1985. To WORKERS SAVINGS AND LOAN BANK, 134 Tower Street, Kingston. To secure the monies mentioned in the mortgage stamped to cover Forty-Six Thousand Dollars with interest.

DISCHARGED

for Registrar of Titles.

Miscellaneous No. 102132 The abovementioned mortgage No. 437430 has been upstamped to cover a further indebtedness of Fifty Four Thousand Dollars. Entered hereon the 30th of November, 1988.

for Registrar of Titles.

Mortgage No. 662081 registered in duplicate on the 9th of April 1991, to WORKERS SAVINGS AND LOAN BANK, at 134 Tower Street, Kingston, to secure the money mentioned in the Mortgage stamped to cover Fifty Thousand Dollars with interest.

DISCHARGED

Appendix 4 Initial Wave Analysis Over Water Structures.

Initial Analysis of Incident Waves on Over-Water Structures (Bars)

St. James

By

SEA CONTROL OCEANOGRAPHY
UNIT 23, 2 SEYMOUR AVE.
KINGSTON 10

August 4th, 2019

by

Ping Wang, Ph.D.
Professor
Director, Coastal Research Laboratory
School of Geosciences
University of South Florida
4202 E. Fowler Ave.
Tampa, FL 33620
USA

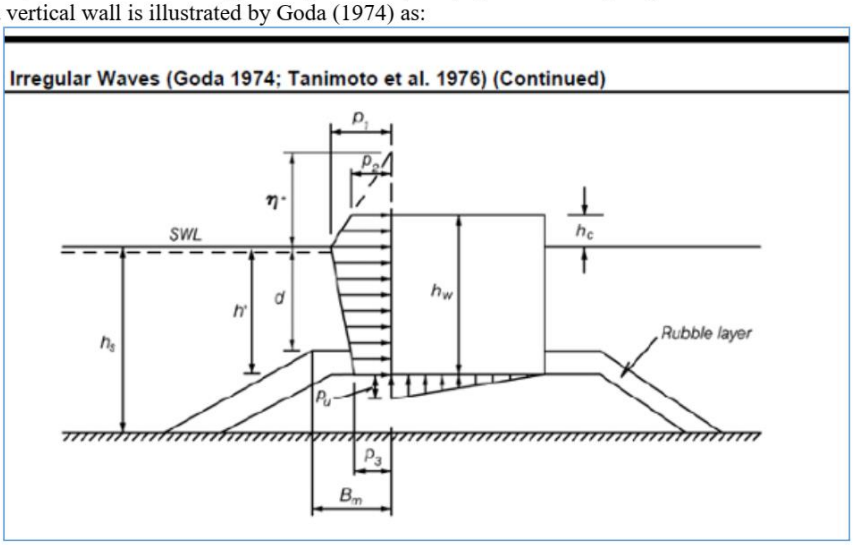
Pierre Diaz (Phys.Oce)
Director Sea Control
Oceanography

The wave condition landward of the reef is largely controlled by the water depth over the reef and the width of the reef. The shallow reef will induce depth-limited wave breaking. The common criteria used in estimating wave breaking, also referred to as the *breaker index*, confirms that waves break when the wave height is about 80% of the water depth. Therefore, the wave height landward of a wide reef should not be higher than 80% of the water depth over the reef.

The water depth over the reef at the Lilliput Oasis site can be as shallow at 0.5 m. This means that waves higher than 0.4 m will break over the reef. However, based on the aerial photo and the initial bathymetry collected at the project site, the reef is quite irregular with a large gap to the west.

It is therefore recommended that the over-water bar be placed landward of the widest and shallowest part of the reef to maximize the wave-energy reduction by the reef system. Gaps within the reef should also be considered. Additional wave energy may reach the over-water bar location through wave diffraction.

In the following the forcing of waves, including breaking waves, is analyzed to provide data to ensure that the pilings that support the over-water bar is designed to be strong enough to withstand the horizontal forcing (or pressure) from the wave. The pilings should not be tilted by the forcing. Since the pilings will be driven into the bedrock, scouring by wave-induced current is not a concern.
The most commonly used and relevant analyses of wave forcing on impermeable wall or piling are developed by Goda (1974). Various equations were developed by Goda to calculate the distribution of pressure induced by non-breaking and breaking waves. The Goda equations are adopted in the Coastal Engineering Manual (2006) by the USACE, the pressure distribution at a vertical wall is illustrated by Goda (1974) as:



The following characteristics can be summarized from Goda pressure analysis:

1) The pressure is the highest at the mean sea level (p_1);

2) The pressure decreased both upward (p_2) and downward linearly from the mean sea level (p_3).
3) The pressure on the wall creates an upward pressure (p_u) on the bottom.

The Goda's analyses focus on the stability of the structure to ensure that it will not be turned over by wave forcing. In the case here, the pilings that support the over-water bar should be properly designed and constructed so that they will not be tilted by the wave forcing. Goda developed the following equations, as also listed in the USACE's Coastal Engineering Manual, to calculate the pressure distribution on vertical wall or piling.

$$\eta^* = 0.75(1+cos\beta)\,\lambda_1 H_{design} \qquad \text{(VI-5-147)}$$

$$p_1 = 0.5(1+cos\beta)(\lambda_1\alpha_1 + \lambda_2\alpha_* cos^2\beta)\,\rho_w\, g\, H_{design} \qquad \text{(VI-5-148)}$$

$$p_2 = \begin{cases} \left(1 - \frac{h_c}{\eta^*}\right) p_1 & \text{for } \eta^* > h_c \\ 0 & \text{for } \eta^* \le h_c \end{cases} \qquad \text{(VI-5-149)}$$

$$p_3 = \alpha_3\, p_1 \qquad \text{(VI-5-150)}$$

$$p_u = 0.5(1+cos\beta)\lambda_3\alpha_1\alpha_3\rho_w g\, H_{design} \qquad \text{(VI-5-151)}$$

For the Lilliput Oasis case, the maximum wave height is estimated to be 1.0 m as controlled by the water depth over the reef. A storm surge of about 0.5 superimposed on a high tide is assumed. This will give a water depth over the reef of nearly 1 m, and therefore a maximum 1.0 m wave to impact the pilings. The value β = 0 is used here to give the maximum pressure. The water depth h_c = 1.0 m for the energetic case here. The incident wave period corresponding to the maximum wave height is estimated to be 11.0 s based on previous studies in this area.

The rest of the parameters in the Goda equations are calculated as:

$$\alpha_* = \alpha_2$$

$$\alpha_1 = 0.6 + 0.5\left[\frac{4\pi h_s/L}{sinh\,(4\pi h_s/L)}\right]^2$$

$$\alpha_2 = \text{the smallest of } \frac{h_b - d}{3h_b}\left(\frac{H_{design}}{d}\right)^2 \text{ and } \frac{2d}{H_{design}}$$

$$\alpha_3 = 1 - \frac{h_w - h_c}{h_s}\left[1 - \frac{1}{cosh\,(2\pi h_s/L)}\right]$$

L Wavelength at water depth h_b corresponding to that of the significant wave $T_s \simeq 1.1T_m$, where T_m is the average period.

where $\lambda_1 = \lambda_2 = 1$ to produce the maximum forcing.

In summary, the following input parameters are used in the forcing/pressure calculations at the Lilliput Oasis site:

H_{design} = 1.0 m (incident wave height)
T_{design} = 11.0 s (incident wave period)
L_{design} = 34.26 m (incident wave length)
β = 0 (incident wave angle)
ρ_w = 1025 km/m^3 (density of seawater)
g = 9.81 m/s^2 (gravitational acceleration)
h_c = 1.5 m (the height of the piling above sea level)
$h_s = h' = d$ = 1.0 m
h_w = 2.5 m (height of the piling from the seabed)
B_m = 0 m
$\lambda_1 = \lambda_2 = 1$

Based on the above input the parameters, the forcing on the pilings are listed in the following table. It is necessary that the pilings be designed to withstand the following pressure from the breaking waves. However, the calculated pressures are not very high. It should not be a difficult task to design the pilings to sustain the wave forcing.

calculated parameters for Lilliput Oasis site		
eta_*	1.5	m
p1	10841.46	pascal
p2	0	pascal
p3	10643.88	pascal
Pu	10422.93	pascal
alpha_*	0	
alpha_1	1.078189	
alpha_2	0	
alpha_3	0.981775	
L	34.26	
Hb	1	
lamda_3	0.979241	

EMERGENCY PREPAREDNESS PLAN – TEMPLATE
PROPOSED CONSTRUCTION OF AN OVER-WATER BAR
AT
LILLIPUT, ST JAMES

(REF NO. 2018-08017-BL00060)

PREPARED FOR OFFSHORE OASIS LTD
BY
PETER WILSON-KELLY (MPHIL) & ASSOCIATES

NOVEMBER 2020

1.0 Project Description

Location and Basic Description:

Offshore Oasis Ltd. Intends to construct and operate an over-water bar attraction at a location offshore of the Lilliput area in the Parish of St. James. **Figure 1** shows the proposed location of the bar attraction. **Figure 2** shows an artist's impression of what the bar will look like.

Figure 1: Close-up of Location of Over-water Bar at Lilliput, St. James

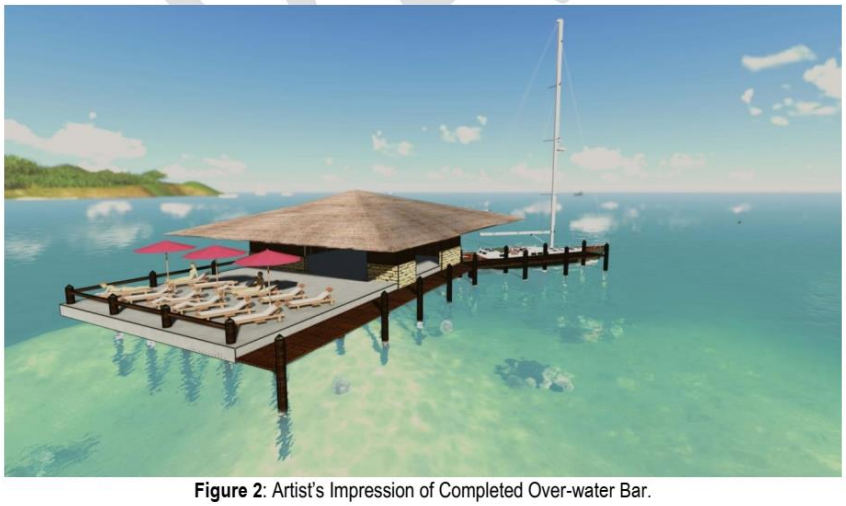


Figure 2: Artist's Impression of Completed Over-water Bar.

The proposed bar will act as a typical bar, with comparable opening and closing hours. The client anticipates being able to accommodate a maximum of 125 persons at any one setting for up to two hours. Thus, for a 10 hour opening period, it is anticipated that the bar could have a through-put of 625 persons.

The bar is not connected physically to the shoreline and will be serviced by way of boat access from the adjoining Iberostar Hotel area, arrangements for which have been agreed to by way of a written agreement between Offshore Oasis ltd and Iberostar Resorts.

2.0 Emergency Response Plan:
2.1 Authority:

2.2 Listing Of Responsible Business Management/Response Personnel And Contact Numbers:
2.2.1 Construction Phase:

- Company Manager
- Construction Manager
- Safety Manager
- Foreman
- Vessel Captains
- Lifeguards and trained First Aiders
- Vehicle Drivers

2.2.2 Construction Phase:

- Company Manager
- Bar Operations Manager
- Bar Safety Officer
- Lifeguards and trained First Aiders
- Vehicle Drivers

2.3 Listing Of Responsible National Emergency Response Entities That Will Be Liaised With, Along With Contact Numbers:

- Cornwall Regional Hospital – medical treatment
- Jamaica Fire Brigade Montego Bay Station – emergency response/fire response.
- Jamaica Defence Force Coast Guard Station Montego Bay – maritime emergency response.
- Jamaica Constabulary Force Barrett Town Police Station – law enforcement response.
- Port Authority of Jamaica – navigation emergencies.

2.4 Layouts of Construction/Support Sites:

- Construction Site – Offshore Lilliput
- Support Site – Iberostar Hotel Jetty
- Support Site – Greenwood Boat yard

2.5 Listing of foreseeable response incidences:
Construction Site:

- Injury to /illness with workers/patrons/staff
- Construction/loading damage
- Fire
- Severe weather
- Marine incident
- Environmental incident/spillage

Iberostar Jetty Site:

- Injury to /illness with workers/patrons/staff
- Construction/loading damage
- Fire
- Severe weather
- Marine incident
- Environmental incident/spillage

Greenwood Boatyard Site:

- Injury to /illness with workers/patrons/staff
- Construction/loading damage
- Fire
- Severe weather
- Marine incident
- Environmental incident/spillage

2.6 Safety Equipment per site:

- VHF radio/cell phone base communications
- First Aid Kit
- Fire extinguishers
- Emergency lighting/flashlights
- Burns kit
- Eye wash station
- Stretcher/spine board
- Life vests/work vests
- Life Buoys Rings
- Throw lines
- Jason's cradle
- Telescopic rescue pole
- Spill kits and booms
- Safety Boat

2.7 Controls and Precautions

2.7.1 Fall Prevention:

Wherever possible the risk of falling into water should be eliminated as much as possible. Preventative measures will include the installation of one or more of the following:

- Edge protection
- Handrailing
- Safety nets
- Safety harnesses and personal flotation devices (PFD's)

2.7.2 Emergency Rescue Arrangements:

All employees will be made familiar with the emergency procedures and will be made to understand the actions they must take in an emergency **PRIOR TO** assuming working duties. The locations of emergency equipment will be made known through drills and through the placement of equipment in easily located areas.

2.7.2.1 Rescue Boat

A manned power driven boat will be provided and equipped with the following safety equipment:

1. Lifebuoy with buoyant rope
2. Trailing loops to facilitate grabbing by victims in the water
3. A length of rope to secure the person rescued to the side of the boat,
4. A boat hook,
5. A Jason's cradle to lift unresponsive victims in the water onto the boat.
6. Boat to shore communications.

The boat must be operated by a competent boatman who is also a qualified lifeguard/first aider.

2.7.2.2 Man Overboard

Any person witnessing a 'Man Overboard' will act according to the following list:

1. Shout and continue to shout 'man overboard'.
2. Throw a life buoy close to the person in the water.
3. Maintain constant visual contact, only moving to maintain visual contact.

The Construction/Bar Operations Manager will ensure all work stops and that the safety boat crew is alerted to the situation. The safety boat personnel, with the equipment listed above in **Section 2.6**. will be used to locate and remove any casualty from the water and take the victim to land for transportation to emergency care, if necessary.

Initial man overboard drills, using a dummy as the victim, prior to commencing works at the site, along with regular follow-up drills, will be compulsory to ensure that the response mechanism is engrained in the employees.

2.7.3 Fire Emergency Procedure

Fire emergency If a person discovers a fire they will:

1. Raise the alarm immediately by shouting "Fire! Fire!" followed by an identification of the location of the fire.
2. If they are adequately trained, they should obtain and use the nearest suitable fire-fighting equipment.
3. The assigned "Fire Team", a designated listing of persons with training in the use of fire extinguishers, will grab the nearest fire extinguisher and will respond to the alarm.
4. Non-responding personnel will evacuate from the vicinity of the fire to designated evacuation areas pre-selected for both the Construction and Operation phases of the development.
5. If the fire threatens to escalate beyond the capabilities of the designated Fire Team, calls will be made to the nearest Fire Services, with the Rescue Boat being put on stand-by to transport the responding team to the scene.

2.7.4 Collision/Sinking/Boat Emergency Procedures

All boating operations related to the project, whether during construction (barge, tow boat, work boats etc) will come under the governance of the Maritime Authority of Jamaica (MAJ). The Agency has the responsibility for the registration and certification of all watercraft and, as a result, the Construction and Bar Manager will have to ensure that all watercraft being used in conjunction with the construction and operation of the bar, conforms to the seaworthiness and safety standards of the country.

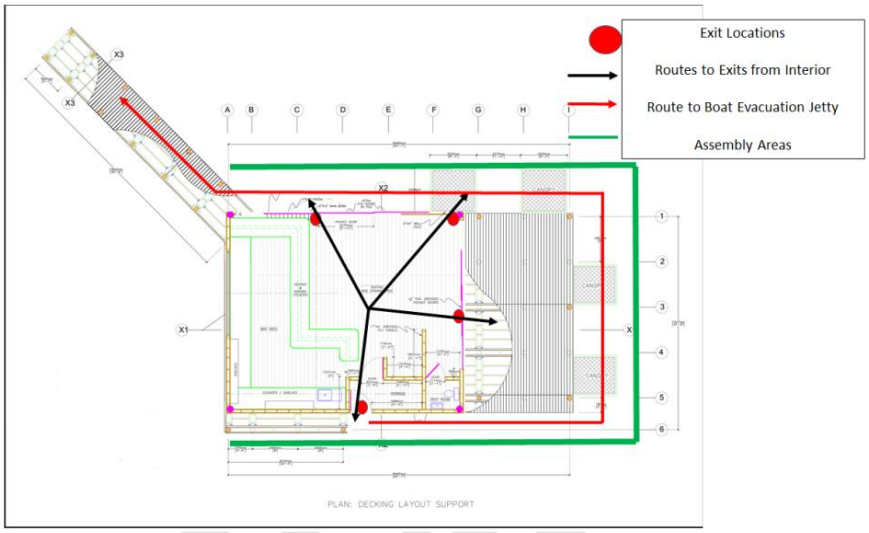
The MAJ also issues licences of competency for boat operators, which will include preparations for safety and collision avoidance at sea. All operators of vessels to be associated with either the construction or operation of the Bar facility will have to demonstrate their competency by way of an MAJ authority.

The Occupational Safety and Health Administration (OSHA) Deck Barge Safety guidelines (**see Appendix X**) will serve as a guide for vessel emergency situation management but will also have overlapping guidance for response components outlined in the previous sections. Note that the guidelines are presented to specifically cover operations that will occur on work barges.

2.7.5 Emergency Evacuation

In the event that an evacuation of a worker, patron or employee at the bar is required, access through one of the designated exits at the site (as illustrated on the figure below) to the exterior assembly area will be required. From there, the person/s will be directed to a safety boat that will be kept moored at the site during times that the bar site is occupied.

If all in attendance at the site have to be evacuated for whatever reason (fire, accident etc) a public address (PA) system, incorporated into the construction/operations mechanism, will be used to allert persons to assemble at the designated exterior assembly areas at either the construction or operational facility. Workboats used at the site will then be used to evacuate persions from the location OR, communications will be made with registered water taxi operators present at the Grange Pen Fishing Beach for assistance in evacuating persons from the location.



2.7.6 Severe Weather

Severe weather is, for the most part, predictable. Construction/operation staff will be required to pay close attention to the local meterological service's inshore and offshore seastate reports, since these reports will determine whether or not it will be safe for boating operations to occur.

The Consultant

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