ENVIRONMENTAL IMPACT STATEMENT (EIS)

SEFAMM TCI GRACE BAY HOTEL DEVELOPMENT PR: 16016 - 60905/16 & 204 - GRACE BAY BEACH, PROVIDENCIALES, TURKS AND CAICOS

SEFAMM TCI LIMITED

SEPTEMBER 2023

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DRAFT ENVIRONMENTAL IMPACT STATEMENT, SEFAMM GRACE BAY HOTEL DEVELOPMENT - PR. 16016 - 60905 16 & 204, GRACE BAY BEACH, PROVIDENCIALES, TURKS AND CAICOS ISLANDS - FOR SEFAMM TCI LIMITED.

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SECTION V

List of Acronyms

AGRRA	Atlantic and Gulf Rapid Reef Assessment
AR6	IPCC Sixth Assessment Report
BCI	Business/Commercial/Industry
CEC	Certificate of Environmental Clearance
CEDA	Caribbean Environmental Design Associates
CITES	Convention on International Trade of Endangered Species
CVI	Coastal Vulnerability Index
DDP	Detailed Development Permission
DECR	Department of Environmental and Coastal Resources
DHI	Danish Hydraulic Institute
DoP	Department of Planning
DSAS	Digital Shoreline Analysis System
EBA	Ecosystem-Based Approach
EHD	Environmental Health Department
EIA	Environmental Impact Assessment
EM	Environmental Monitoring
EMP	Environmental Management Plan
ENGOS	Environmental NGOs
EPA	Environmental Protection Agency
ESA	Environmental Sensitive Area
GDP	Gross Domestic Product
GPS	Global Positioning System
GIS	Geographic Information Systems
GSLR	Global Sea Level Rise
ICZM	Integrated Coastal Zone Management
IMA	Institute of Marine Affairs
IUCN	International Union for Conservation of Nature
LiDAR	Light Detection and Ranging
LPG	Liquefied Petroleum Gas
MCA	Multi-criteria Analysis

MSL	Mean Sea Level
NHC	National Hurricane Center
NEC	National Electrical Code
NOAA	National Oceanic and Atmospheric Administration (of the United States)
NPDP	National Physical Development Plan
NRCS	Nature Resources Conservation Services
ODP	Outline Development Permission
ODPM	Office of Disaster Preparedness and Management
PANP	Princess Alexandra National Park
PDP	Progressive Democratic Patriots
PWC	Provo Water Company
ROP	Reverse Osmosis Plant
SDB	Satellite-Derived Bathymetry
SIDA	Small Island Developing States
SLR	Sea Level Rise
SMP	Shoreline Management Plan
SWI	Smith Warner International Ltd.
SWOT	Strengths-Weaknesses-Opportunities-Threats
TCIG	Turks and Caicos Islands Government
UTM	Universal Transverse Mercator
UAV	Unmanned Aerial Vehicle

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9.0 APPENDICES

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SECTION I

Non-Technical Summary

A new luxury hotel development is being proposed for a beachfront property located in Grace Bay on Providenciales, Turks and Caicos. The development will have multiple rooms of different sizes, a gym, beach access, conference/meeting rooms, and parking areas. The hotel will also have an innovative stepped design that will provide more rooms with seaside views.

This EIS report for the SEFAMM Grace Bay Hotel project is prepared by Caribbean Environmental Design Associates (CEDA). The sub-consultants include, Smith Warner International, JSS Consulting (Environmental Consulting Services) and Environmental-All.

1. The development which consists of 106 luxury one-bedroom units arranged over 7 floors, with large wrap-around terraces that maximize ocean views and full-height living spaces, is located on the world-renowned Grace Bay Beach, Providenciales received a grant of Outline Development Permission on December 24, 2018, Detailed Development Permission on September 29, 2022. The development will sit on a 2.12-acre plot (60905/16 & 204). Amenities of the proposed development include swimming pools.

2. The project is being developed by SEFAMM TCI Limited a Turks and Caicos-based company.

3. There are 90 car parking spaces on the lower ground floor. The development also provides a vehicle hiring/sharing scheme for guests. There are also dedicated electric vehicle charging points to be provided. Both schemes would optimize the impact on traffic, reduce carbon footprint, and improve air quality.

4. The property under previous ownership has been heavily impacted by human activities. Some areas of the site consist of buildings, view pavilions, undeveloped walkways, and an undeveloped car parking area. Approximately 50% (1.06 of the total 2.12 acres) of the site was heavily degraded by previous human activities.

5. The topography of the project site has a general elevation of approximately ten-(10) feet above mean sea level and dips seaward down to an elevation of approximately six-(6) feet above mean sea level.

6. Soil in the study area is predominantly sandy. The soil has low fertility and low water-holding capacity, which can result in waterlogging and erosion in areas with poor vegetation cover.

7. The hotel site is in a low-lying area that is susceptible to flooding during extreme rainfall events. During an extreme event the combination of high rainfall intensity, low infiltration rates in the built-up areas, and high run-off coefficients can produce substantial run-off.

8. The vegetative community observed on the site of the proposed development (60905/16 & 204) was given a low rating for its environmental value and quality, particularly because of previous human impacts. The site had been disturbed throughout most of the area and most of it was void of vegetation.

9. Overall, the benthic habitats appeared healthy and consisted of typical flora and fauna populations. Although human activity was observed during the assessments there was minimal human-related debris observed. There was no evidence of degraded water quality.

10. Most of the offshore benthic habitat was dominated by a variation of sandy bottom habitat, which included bare sand, and seagrass. The least amount of activity was observed in the bare sand and consisted of mainly fish species moving from one area to the next.

11. There was no flora and little fauna observed in these patches. Fish species observed in this habitat were moving from one area to the next. There were no coral colonies observed in the nearshore seagrass beds.

12. There were twenty-eight (28) marine species observed during this assessment that are listed on the Convention on International Trade of Endangered Species (CITES) list and/or the International Union for Conservation of Nature (IUCN) Red List.

13. The aesthetic quality of the Grace Bay area is dominated by a mixture of imported North American, and European architectural characters, that are not unique to Providenciales or the Turks and Caicos Islands. The most dominant

aesthetic characters within the baseline aesthetic study area are the 12-Ritz Carlton Turks and Caicos, the 7-story Seven Stars Hotel, The Grand Regent, Blanca Sands on Grace Bay, The Mason, Point Grace, La Vale Resort, and The Somerset on Grace Bay.

14. Key results of coastal analysis show that the existing dune is at an elevation of 3m above mean sea level, and it provides protection under swell waves. The property boundary is set back far enough to not be heavily impacted by erosion after a swell event. However, hurricane simulations showed vulnerability during hurricane events. Two storms were tested that represented a 50-year and 100-year storm. In both cases, there was inundation on the property up to 40m inland from the property line.

15. Vulnerability to hurricanes was an issue when considering that climate change projections show stronger, more frequent hurricanes. It was therefore proposed that the dune crest elevation be increased to an elevation of 4m to provide protection against storm surges. The dune would also be vegetated with suitable plants to maintain the overall aesthetic of the existing landscape and reduce the potential for erosion of the dune.

16. Sourcing sand will be an important component of the project's success. Sand must be sourced from an approved supplier with a land-based source preferred. The pricing of this activity is highly unpredictable. To deal with this market volatility, multiple sand source options were provided.

17. Results of the impact assessment showed that almost all negative impacts would occur during the construction phase and will be confined to within the concept footprint. Following construction, the positive impacts in the operational phase were reduced inundation from hurricanes and restored dune vegetation from the mitigation measure of dune replanting.

18. Overall, the assessment shows that the implementation of the concept would increase the resilience of the property's coastal zone. As climate change brings more natural hazards to the shores of Grace Bay, this concept will provide protection for the assets on the property and reduce downtime after a storm.

19. Values for total dissolved solids would classify the water as hypersaline compared to the USGS classification system (USGS, 2018). The turbidity values were quite low, which suggests very clear water in the area. The parameters of ammonia, nitrate/nitrite N, and soluble phosphorus were all tested but not

detected by the testing apparatus. This indicates a negligible amount of these nutrients in the water.

20. The construction phase of the Grace Bay Hotel project is expected to take approximately two years and it will generate approximately 150 construction jobs for the TCI economy during this phase of the development.

21. Approximately 15 million dollars will be injected annually into the local economy in wages and salaries. Approximately 123 or 75% of the labour force employed during the construction phase will be Blungers and 37 or 25% expatriates. Approximately 160 or 80% of the jobs created during the operational phase will be entry-level, 25 or 12.5% mid-level, 15 or 7.5% management level, and 10 or 5% executive level.

22. Solid waste from the various waste-generated entities on the property would be collected and sorted for recycling, those waste items that are not recyclable would be stored and transported to the public solid waste disposal site by a private solid waste disposal company.

23. The project's site drainage plan is designed to provide a sufficient stormwater drainage system for the conveyance of stormwater runoff from the subject property, with due allowance to avoid runoff to adjacent properties.

24. To provide a safe swim zone for hotel guests, the marine area immediately in front of the hotel property will be zoned for swimming and other water-related recreational activities. The swim zone and boat access lane will be marked off by a demarcation of buoys and motorized boats will be prohibited from entering the swim zone.

25. Potable water requirements during the operational phase of the development are estimated at approximately 15,900 gallons per day, calculated from the suggested minimum daily potable water consumption rate from the TCI Building Code.

26. Rainwater will be harvested, treated, and stored in specially constructed water storage cisterns and used in the event of a fire emergency and for irrigation and landscaping purposes.

27. Hotel management will utilize water preservation, conservation, and Best Management Practices to reduce water consumption rates on the property.

28. The development will utilize predominantly native vegetation and incorporate the like of sedum roof systems in its landscape design so the landscape aspect of the development can cost effective, adapt to local climatic conditions, prevent soil erosion and more effectively filter storm water, SEFAMM Grace Bay hotel project landscape maintenance will be cost-effective because native plants adapt to local climatic conditions, and use no fertilizers in the maintenance of landscaping.

29. Due to the small size of the site, limited space would be available for the safe storage of construction materials, therefore, off-site storage of construction materials and equipment would be adopted by the developers as an alternative to on-site storage of materials.

30. Also, to avoid increased traffic in the area, construction workers would be bused into the area. Their personal vehicles would be parked off-site on property owned by the developers.

31. The project will generate several point sources of air pollution during the construction phase, including exhaust from hauling equipment, booster pump engines, concrete trucks, and other devices used in the construction of the facility. However, these will be short-term. These Impacts may result in a temporary reduction in ambient air quality that would adversely affect the aesthetic quality of the physical environment. Because of the nature of the proposed development long-term air quality is not expected to be impacted.

32. There are no planned on-site activities that would require the use of or on-site storage of hazardous materials because of the nature, scale, and scope of the proposed development do not require their daily use in the operation of the facility.

33. To ensure the health and safety of workers during the construction of the project, all workers will be given an orientation of the perils associated with working in a construction environment. For each work activity, potential risks will be identified and proportionately addressed with risk-mitigation strategies. Appropriate protective gear will be used by all workers. Gear will include earplugs, steel-toed boots, hard hats, high-visibility vests, and gloves.

34. In the unfortunate event of a worker being injured on site, work along his or her section will be stopped, and emergency response teams called to quickly aid the

worker. The cause of the incident will be investigated to prevent further injury on site and safety procedures will be reiterated.

35. The assessment noted that the potential impact on marine water quality due to construction activities is the possible release/spill of fuels and oils into the environment. This can occur from improper handling and storage of fuel or oil on-site or via leakage from construction machinery and improper fueling practices on-site.

36. Furthermore, the marine ecosystem is not expected to be disturbed as there is no direct development occurring in the marine or coastal environments.

37. The public beach access adjacent to the site of the proposed development is the only fully developed beach access on Grace Bay Beach. The development includes facilities such as a change room, restrooms, freshwater showers, and car parking facilities. The beach access facility was developed by the proponents of the proposed development under a land lease agreement between the Government of the TCI and the developers.

38. The assessment suggested that financial resources injected into the local economy by increased tourist spending can be used by the government to help develop and protect historic and cultural sites throughout the islands. Historical sites like the "Cheshire Hall Ruins" can benefit from tourists visiting the site and entrance fees collected can be used to restore the site.

39. The assessment suggested that four major fields should be monitored including the beach/site topography and terrestrial vegetation monitoring.

40. Water quality testing is strongly advised as a monitoring activity. It is of the utmost importance that the water quality remains like baseline conditions. If the water quality is negatively affected there could be an impact on the touristic value of the property and nearby lots. Water quality testing should be done for typical nutrients and bacteria.

41. The assessment recommended that there should also be follow-up assessments to determine if there have been any unexpected long-term impacts from the works (such as damage from more tourists snorkeling).

42. An Environmental Monitor (EM) will be hired during the project's construction and will be responsible for ensuring that the project complies with the design of the Sand Dune Restoration, Swim Zone, Boat Access Lane, and environmental mitigation requirements.

43. The study recommended that the height of the sand dune system be increased. The sand was preferred as a fill material because it would maintain the natural aesthetic of the coastline and provide an opportunity for replanting of native species such as salt-resistant and drought-resistant shrubs.
44. Negative impacts identified were mainly temporary and occurred during the construction works. Positive impacts were based on the reduced inundation and asset protection during major storms.
45. Vulnerability to hurricanes was an issue when considering that climate change projections show stronger, more frequent hurricanes. It was therefore proposed that the dune crest elevation be increased to an elevation of 4m to provide protection against storm surges. The dune would also be vegetated with suitable plants to maintain the overall aesthetic of the existing landscape and reduce the potential for erosion of the dune.
46. Sourcing sand will be an important component of the project's success. Sand must be sourced from an approved supplier with a land-based source preferred. The pricing of this activity is highly unpredictable. To deal with this market volatility, multiple sand source options were provided.
47. Overall, the assessment shows that the implementation of the concept would increase the resilience of the property's coastal zone. As climate change brings more natural hazards to the shores of Grace Bay, this concept will provide protection for the assets on the property and reduce downtime after a storm.

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1.0 Introduction and Overview

This Document constitutes an Environmental Impact Statement (EIS) for the SEFAMM Grace Bay Hotel Project on Providenciales, Turks and Caicos. The Grace Bay Hotel Development is in Grace Bay, Providenciales. The Project site consists of 2.12 acres of land that will be developed into a hotel and other tourist amenities.

Section 44 (1) b of the Physical Planning Ordinance (2020) requires that an Environmental Impact Assessment (EIA) be undertaken for all coastal developments. This document describes the marine, terrestrial, and socio-cultural areas that are directly affected by the proposed development and the considerations that must be given during the construction and operation phases of the proposed works to monitor and mitigate the impacts. This document is in support of the planning application reference number PR16016 and is in accordance with the Terms of Reference (ToR) issued by the Department of Environment and Coastal Resources (DECR).

1.1 The Study

This study assesses the potential environmental impacts of a proposed 106-room hotel development configured around a 7-story hotel complex with appropriate amenities on block and parcel numbers 60509/16 and 204 at Grace Bay Beach, Providenciales, Turks and Caicos Islands. The Grants of Outline Development Permission and Detailed Development Permission (GDP) for the proposed development dated September 29, 2022, issued by the Physical Planning Board, set in motion the process for issuing the Terms of Reference (ToR) for this study.

1.2 Aims and objectives of the assessment.

The overarching objective of the study is to ensure that any proposed intervention does not negatively impact the existing environment. This will be done by considering the following sub-objectives. The sleek, modern lines of the 7-story development with set-back terraces optimize on the beach and nearby developments.

The assessment examined the terrestrial, benthic, coastal, and cultural heritage environment of the areas and identified the potential impacts of the proposed works. The purpose of the EIA is to assess and document the existing environment of the project area and the potential impacts associated with the proposed project. recommendations to avoid, negate, minimize, or mitigate potential impacts.
The broad objectives of the assessment are:

For baseline assessment:

- To provide an understanding of terrestrial environment of the property and how the environment was impacted by previous activities. and how the proposed development will impact the remaining terrestrial communities on the site.
- To provide description of the geological and hydrogeological environment of the site.
- To assess the existing marine environment of the project area and the potential impacts associated with the proposed project. It provides recommendations to avoid, negate, minimize, or mitigate potential impacts.
- To define the coastal hazards related to storm surges (winds, waves, and water levels) and simulate how the property withstands the hazards.

For impacts:

- To determine possible impacts related to construction works and how they can be mitigated.
- To determine how the proposed development will impact the remaining terrestrial communities on the site.
- To identify potential of the proposed development to recommend measures to avoid, negate, minimize, or mitigate potential impacts.
- To provide an Emergency Mitigation Plan that summarises the impacts and details the mitigation measures.

1.3 Organization of EIA Report

This Environmental Impact Statement (EIS) report is organized in accordance with the guidelines provided in the detailed Terms of Reference (TOR) issued by the Department of Environment and Coastal Resources (DECR) and the Department of Planning (DoP) in the Ministry of Tourism, Environment, Heritage, Maritime, Disaster Management and Gaming, Turks and Caicos Islands Government on September 29, 2022.

The first section provides an overview of the study, including the aims and objectives of the assessment, an overview of areas/topics to be addressed, an analysis of the methods and a brief description of the project.

Section two offers a detailed historical overview of the site and existing development and gives a detailed baseline assessment of the site and surrounding environment, including the terrestrial, marine, and physical environments. This section also detailed various modelling scenarios that detailed current wave conditions and how the project would respond.

Section three reviews the existing and appropriate legislative and regulatory framework under which the proposed hotel project will be constructed and operated.

Section four gives a detailed description of the various components of the proposed development, including design, construction, and operational infrastructural components. Here construction activities and programs, including a detailed description and timeframes for all construction and related activities are outlined. Construction phasing is also laid out in this section. Socio-economic parameters like demographic, employment and safety and security concerns are also discussed in this section. Safety and security measures during the construction and operational phases of the development are evaluated.

Impact assessment is the focus of Section five. Here potential environmental impacts associated with the proposed development are identified using computer modelling and other methodologies.

Mitigation and Monitoring measures are detailed in Section Six, which includes proposed actions and schedules to mitigate against identified environmental impacts. A outline brief of the Environmental Management Plan (EMP) is also included in this section.

Recommendations and conclusions can be found in section seven.

A Statement of the understanding of the Environmental Charter (2010 and the Climate Change Charter (2022) and the proponent's declaration of intent to guide the development by the recommendations of the EIA consultants, with updated declaration following response to public or TCIG commentary requesting or requiring alterations to any part of the EIA report are listed in section eight.

Appendices are included in section nine. These include the Terms of Reference (ToR), Resumes detailing the qualifications and experiences of the EIA Team, and Government permits.

1,4 Names and contact information of the developers and EIA Team

SEFAMM (TCI) Limited is a company incorporated in the Turks and Caicos Islands under the Companies Ordinance 1981, to develop a hotel/condominium development on Grace Bay, Providenciales, Turks and Caicos Islands.

The company's Registered members and shareholders are listed in Table 1.0 below:

Table 1.0: SEFAMM TCI Ltd registered members and shareholders

Shareholder Name	Nationality	Address	Contact Information
M & S Nominees Ltd	TCI Company	Providenciales	
Fio Firat Mayil	British	Coopers Lane, Northaw, Porters Bar ENG 4DJ United Kingdom	+4477-5757-5777
Mehmet Kocakerim	British	Coopers Lane, Northaw, Porters Bar ENG 4DJ United Kingdom	+4477-5757-5777
John Williams	TCI	The Bight, Providenciales	649-231-1916

SEFAMM (TCI) Limited Certificate of Incorporation can be found in Appendix L.

The EIA team and their contact information are provided in Table 2.0

Table 2.0: EIA Team and their contact information

Team Member	Study Area	Nationality	Contact Information	
			Phone	Email
Philip Warner Smith Warner International Ltd	Coastal & Terrestrial	Jamaican	1876-9788-8950	philip@smithwarner.com
Janeen Bullard JSS Consulting (Environmental)	Marine	Bahamian	242-357-9262	Janeen2JSS Consultants.com
Ezekiel Hall EnvironmentalALL	Geology	TCI	649-246-8263	Hallenvironment1@gmail.com
Oswald R. Williams Caribbean Environmental Design Associates	Socio-economic/ Terrestrial	TCI	649-231-0371	oswaldwilliams51@gmail.com
Oswald R. Williams	Projector Coordinator	TCI	649-231-0371	oswaldwilliams51@gmail.com

1.5 Brief description of the proposed development

The SEFAMM Grace Bay Hotel project is the latest addition to the luxury hotel resort development along the famous Grace Bay Strip, Providenciales, Turks and Caicos Islands.

1.5.1 The Developers

The project is being developed by SEFAMM TCI Limited a Turks and Caicos-based company. The main principles are Fio Firat Mayil, Ibrahim Surensoy, and John Alexander Williams.

1.5.2 Project Location

The project site is located along the Grace Bay beach area with a small headland/salient feature to the west, as shown in the following photos. The property is sandwiched between three already-developed lots and a beach access lane. To the west is an avenue for beach access and the luxury residential condominiums that make up the Mansions on Grace Bay. To the east is the Villa Renaissance and to the north is the Atlantic Ocean. To the south is an access road and the South Fleetwood Villas Figure 1.0.

Figure 1.0: Project Location

The 2018 grant of Outline Development permission, PR. 13961 for the initial hotel development scheme was on block and parcel number 60905/16 comprising 78 hotel rooms on a 1.57-acre site. However, following successful negotiations with the Government, a 0.55-acre portion of the beach access lane adjacent to the development site was leased from the Crown and Turks and Caicos Government. This agreement with the government increased the overall site area to 2.12 acres and allowed the capacity of the hotel development to be increased from 78 hotel rooms to 106 units. Figure 2.0 is a drone image of the property and nearby shoreline features.

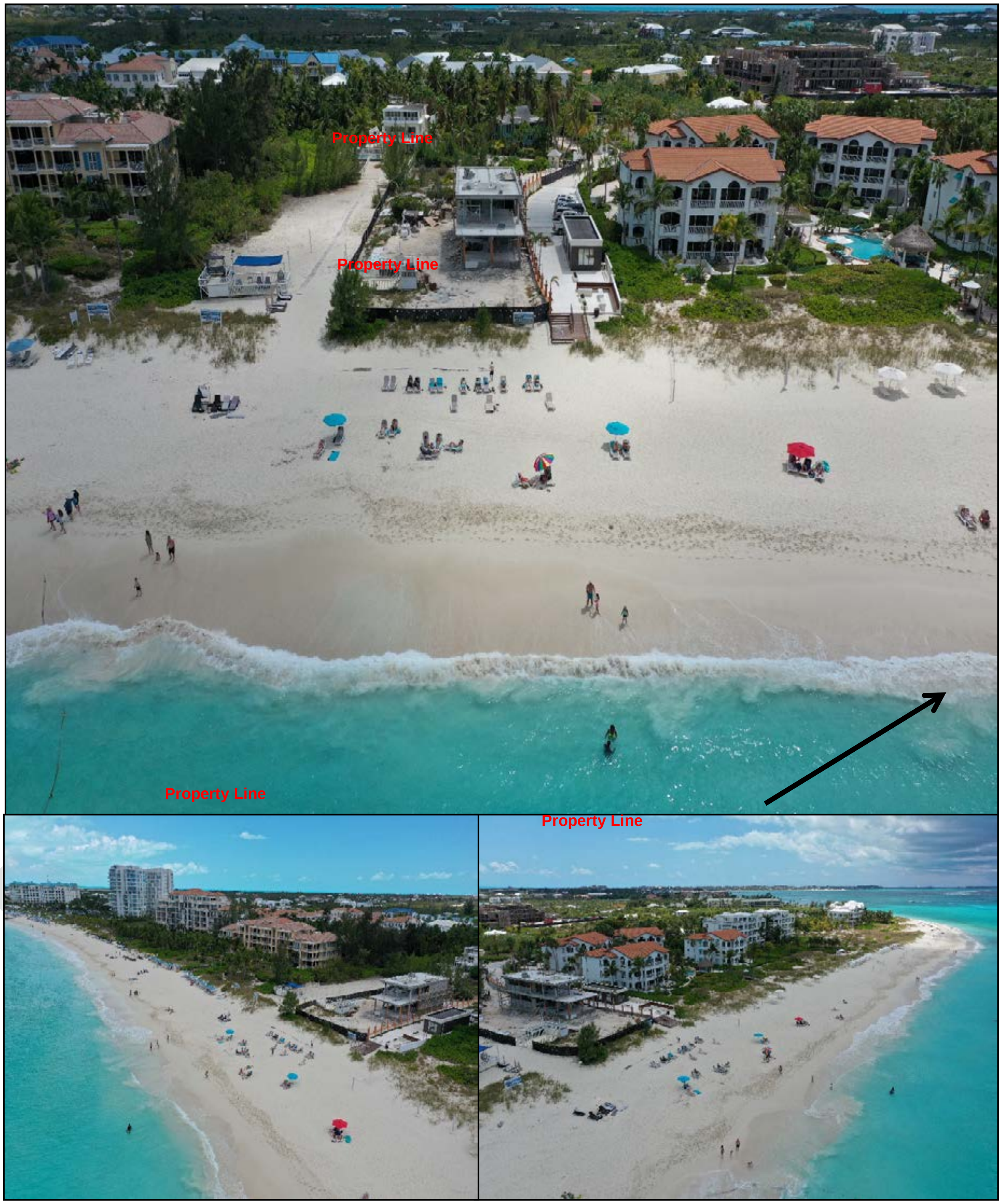

Figure 2.0 Drone photos of the property and nearby shoreline features

The proposed plans for the lots are shown in the following images Figures 3.0 and 4.0.

Figure 3.0 Architectural rendering of the proposed hotel at SEFAMM in Grace Bay

Figure 4.0 Architectural rendering of the proposed hotel at SEFAMM in Grace Bay

1.5.3 Project Concept and Description

The proposed development consists of 106 units of hotel and condominium units on approximately 2,12 acres of beachfront property on Grace Bay, Providenciales, Turks and Caicos Islands. The design concept consists of the sleek, modern lines of the 7-story development with set-back terraces that optimize the impact on the beach and the nearby developments. The building's efficient passive form, double aspect units, facing north, is designed to reduce the need for mechanical cooling during the hot summer months.

The development comprises 106 luxury one-bedroom units, arranged over 7 floors, some of which are double-height spaces. The development also provides multi-exclusive and shared pools, a fitness center, kids' play areas, meeting rooms, and high-end beachfront restaurant and bar, secure car parking, and a double-height entrance lobby. Each hotel room and condo unit are designed to maximize ocean views and all features have generous full height living spaces. Large wrap-around terraces dissolve the boundary between inside and outside taking advantage of Grace Bay Beach's exceptional climate and encouraging an outdoor lifestyle.

There are 90 car parking spaces on the lower ground floor. The development also provides a vehicle hiring/sharing scheme for guests. There are also dedicated electric vehicle charging points to be provided. Both schemes would optimize the impact on traffic, reduce carbon footprint and improve air quality.

1.5.4 Development relationship with other developments in the area

SEFAMM TCI Grace Hotel development project is the latest addition to the stretch of luxury condominiums, resort hotels, and commercial developments along the world-famous Grace Bay Beach strip in Providenciales, Turks and Caicos Islands. The sleek, modern lines 7-story development.

The development is sandwiched between the Villa Renaissance development to the east and a villa development to the west. A few lots to the east is the 12-story Ritz Carlton Hotel and the 7-Stars Hotel. Photos 1.0 and 2.0 show the development in relation to neighbouring developments.

Photo 1.0: The site of the proposed development in relation to the adjoining developments

Photo 2.0: Rendering of the proposed development showing the relationship with the adjoining developments.

Shadow studies commissioned by the developers from 8 am to 4 pm during the day clearly show that there are no consistent shadows cast on any neighbouring properties. The setbacks of the development from the beach access, the beach, as well as the property to the east fully optimizes the impact of the proposed development. Figures 5.0 below shows shadows of the proposed development.

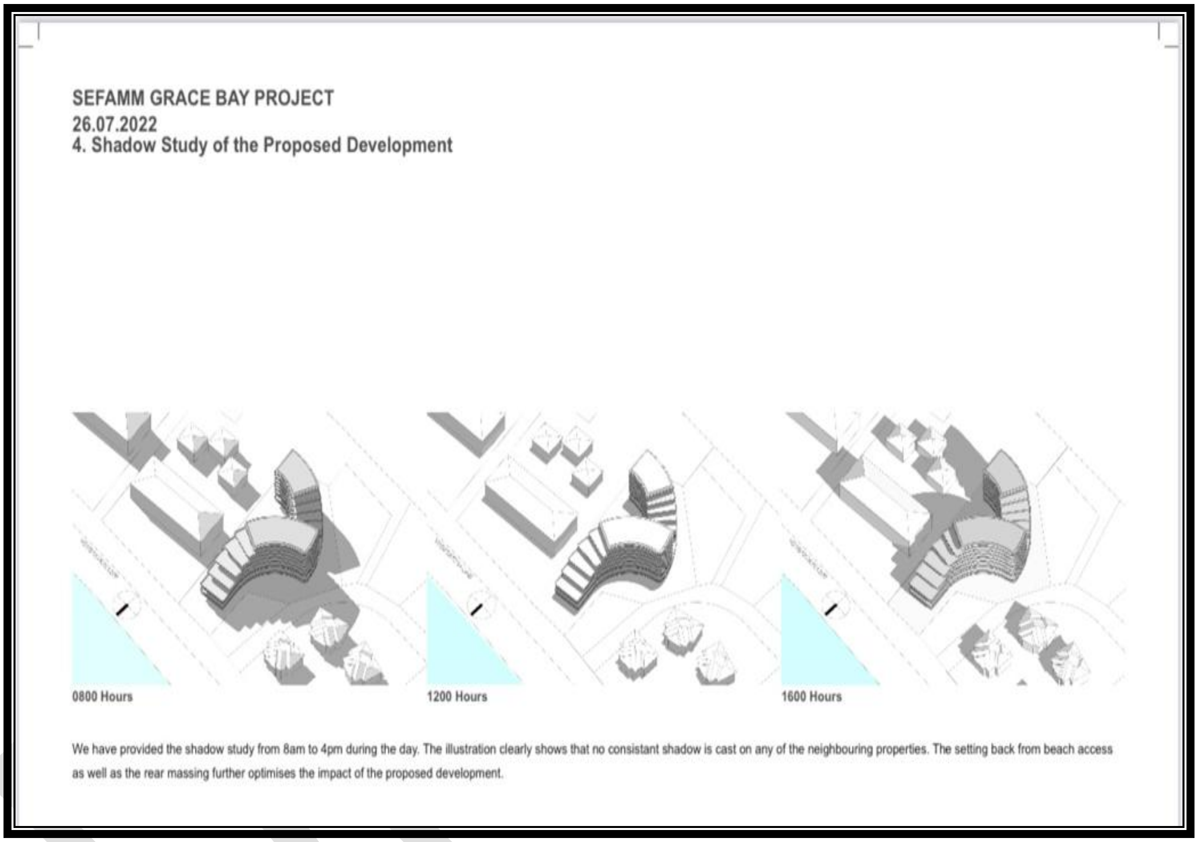

Figure 5.0 - Shadow plans of the proposed hotel at SEFAMM in Grace Bay

1.6 Overview of the area/topics to be addressed.

This report follows the areas/topics to be addressed as detailed Terms of Reference (ToR) dated May 22, 2020, and issued by the Department of Environment and Coastal Resources. Other topics discussed were identified following a scoping exercise.

This report describes the coastal zone and its features to develop baseline conditions. The results indicate that the property is vulnerable to storm surges. Increasing the crest height of the dune has been proposed to provide protection in hurricane events. The effectiveness of the concept was tested with numerical models, which showed negligible impacts within a wider study area of 5km.

1.7 Impact assessment methods/analysis

Quantitative and qualitative analysis is commonly used in Environmental Impact Assessment studies to evaluate the environmental, socioeconomic, and cultural heritage dimensions of developments, particularly, developments that have economic and social development aims. Quantitative methods seek to separate and simplify indicators and impact processes to measure them, while qualitative methods seek to understand complexity as a more accurate reflection or reality.

The main methods of Qualitative assessment employed in this Environmental Impact Assessment study included – informal interviews, case studies, and direct observations.

They help increase understanding of:

- Complex and sensitive impacts and processes.
- Differential impacts between stakeholders and the reasons for the impacts, and
- Potential consequences of any practical recommendations.

1.7.1 Conducting literature search.

A general note of the biological features, based on a desktop study, is also presented.

1.7.2 Field surveys

The field assessments involved visual inspections of terrestrial, shoreline, and marine areas within the footprint of the proposed development. Landside field terrestrial assessment involved direct visual observation of the condition along the northern coastal boundary, along the beach access, along the eastern and southern boundaries, and the interior of the site.

A Mavic-3 digital drone camera and a Canon EOS Rebel SLT digital camera were used to photograph representative and notable flora and fauna. Six (6) terrestrial transects were marked out on the site and the terrestrial ecosystem was assessed (Figure 9.0).

Coastal existing conditions on the site were assessed first to provide a baseline. Impacts were then evaluated by assessing the differences between baseline conditions and proposed conditions. The baseline and proposed conditions were simulated in a numerical model that simulates wave height and water levels under certain events. The events included hurricanes, swell waves, and average wave conditions. The events are generally described statistically, based on return period or exceedance probability. For each event listed the wave climate is compared in one of two ways:

- A side-by-side comparison of wave parameters during and after the implementation of coastal structures, which compares both magnitude and patterns; or
- A difference calculation at a location to indicate zones of increased/decreased activity.

Impacts associated with construction works are categorized based on their area of impact and duration. The likelihood of the impact is also incorporated to determine the significance of the impacts on the project.

The marine ecosystem at the Grace Bay Hotel site was assessed using snorkel gear and drones. Digital photographs of the representative and/or notable conditions were taken using two (2) Olympus TG-6 cameras and Power Dolphin by Power Vision Surface Drone. Two (2) transects were conducted within the survey area (See Table 3.0 for transect coordinates). The benthic ecosystem was assessed in areas that may be directly and indirectly impacted by the proposed construction footprint. The transects were approximately 500 meters in length and approximately 150 meters apart Figure 6.0.

Areas with coral colonies and seagrass beds in the assessed area were noted. Coral health was visually observed during the assessment for the presence of diseases such as Stony Coral Tissue Loss Disease (SCTLD), and coral bleaching. Representation photos were taken.

Benthic habitats were classified as hard bottom, sandy bottom, and seagrass cover. A record was taken of flora, fauna species, and substrate types. General observations were made for the surveyed areas. There were random spot checks at the seagrass areas for epifauna present. Data was collected underwater on slates and transcribed at the end of the day. Photographs were taken. Species abundance was recorded as Single (1), Few (2-10), Many (11 -100), and Abundant (100+). Species identification was confirmed using Humann et al. 2013, Reef Coral Identification, Humann et al. 2013, Reef Fish Identification, and Humann et al. 2013, Reef Creature Identification.

It is highly unlikely that this assessment identifies all the marine species, but it provides a representation of those present on the site.

Figure 6.0: Grace Bay Hotel Marine Transect Map

Table 3.0: Grace Bay Hotel Transect GPS Points and Measurements

	Start		End		Measurement (M)
	Latitude	Longitude	Latitude	Longitude	
Transect 1	21°48.'N	072°11.'W	21°48.'N	072°11.'W	568
Transect 2	21°48.'N	072°11.'W	21°48.'N	072°11.'W	530

SECTIOON II

2.0 Baseline Studies

This section gives a historical overview of the site and existing development, including historical ownership and land use of the proposed development. A baseline assessment of the biological environs, including physical, terrestrial, marine, and coastal. Socio-economic parameters are also discussed in this section.

Baseline investigations were done to quantify the conditions on the site before the construction of the hotel. The findings were used to determine whether there has been a lasting impact on the area after construction. Under the scope of the project, terrestrial, geological, marine, coastal, and socio-economic and cultural conditions were investigated.

A qualified survey team knowledgeable in marine benthic types and biota snorkeled along the transects covering five feet on either side of the transect line. Data was collected to identify sensitive marine habitats and commercially and ecologically important species utilizing the area. Data from diver surveys, satellite imagery, and a review of underwater drone images were used to assist in the creation of a GIS benthic habitat map of the survey area.

The coastal investigations included erosion and accretion on the site, general wave climate, sediment classification, and water quality information. A general note of the biological features, based on a desktop study, is also presented.

2.1 Historical overview of the site and existing development

The site of the proposed SEFAMM Grace Bay Hotel Development (60905/16 & 204) has its origin as part of the original Provident Limited Master Plan for Grace Bay, Providenciales, Turks and Caicos Islands. The land remained vacant over the years, whilst hotel/condominium developments like Point Grace Hotel, Villa Renaissance, and The Sands were developed on neighbouring parcels of land.

2.1.1 Historical ownership and land use of the site, proposed development, and surrounding areas

Parcel 60509/16 was originally owned by Grace Bay Limited, Third Turtle Inn, Providenciales, and was subsequently under the ownership of private individuals. It was purchased by SEFAMM TCI Limited in 2018.

The beach access (60905/24), like all beach accesses within the Grace Bay subdivision was owned by Provident Limited as part of the original 4,000 acres of land granted to Provident Limited under the Development Agreement of 1966. All beach accesses within the Grace Bay area were later transferred to TCIG.

A portion of the beach access (60905/24) to the west of the site for the proposed development (60905/204 – 0.22 acres) was leased by SEFAMM TCI Limited from the Crown and the Government of the Turks and Caicos Islands to facilitate the proposed SEFAMM Grace Bay Hotel Development. (See Figure 7.0 and Appendix J).

Figure 7.0: Area of leased Crown Land

The original Grace Bay Master Plan zoned most of the beachfront lands as low residential development. The Providenciales Master Plan 1987 changed the designated land use zoning for lands along the Grace Bay strip from low-density to high-density tourism-related development.

Outline Development Permission was granted on the 24th. December 2018 for the hotel development and associated amenities (PR. 13961), and Detailed Development Permission on 29th. September 2022 (PR. 16016), and Grant of Building Permit (PR.

15532) for the display house and sales office was granted on 17th. March 2022 (Appendices A, B and C).

2.2 Biological Environmental Baseline Assessment

A desktop study was done to determine what ecological assets are present on the island of Providenciales. The scope of the construction is confined to the property boundary, which is about 30m away from the sea. It, therefore, stands to reason that most impacts would be within the property and set back from the waterline. The following sections present possible ecological features and potential threats during construction.

2.2.1 Baseline terrestrial environment

Habitats on the island of Providenciales include coastal habitats, wetlands, and the marine environment. The coastal zone provides habitats for various species of plants and animals. The wetlands are primarily composed of mangrove forests, which provide habitats for various species of birds, reptiles, and marine organisms. The island's marine environment is home to various species of coral reefs and fish (SWA et al., 2013).

Based on the field investigation, which included qualitative and quantitative investigation in six 3m square plots, only one (Sand Strand) of the nine naturally occurring vegetation communities identified by Correll and Correll was found on the site. Vegetative communities on most of the property were highly disturbed by previous human activities.

Field assessment and ground truthing were conducted on April 14, 2023. During these site investigations, vegetative communities were assessed qualitatively and quantitatively, and a list was compiled of the flora and fauna identified in in Table 5.0. This list provides a sample of the native flora and fauna, but it is not intended to be a complete inventory of all the species present on the site.

Whilst most of the site was heavily impacted by previous human activities, the focus of the investigations was on those areas that were not so impacted. Figure 8.0 shows the areas that were impacted by previous human activities and those area that were not.

Assessment of the site's vegetative communities was conducted by establishing six 3-meter square temporary vegetative assessment plots along six west-east oriented transects (Figure 9.0). The coordinates of these transects are listed below in Table 4.0)

Table 4.0 - Transects Coordinators for terrestrial assessment.

Transects	Point A		Point B	
	North Coordinator	West Coordinator	North Coordinator	West Coordinator
Number 1	21.475103	72.105706	21.475091	72.105565
Number 2	21.475058	72.105707	21.475051	72.105572
Number 3	21.474999	72.105709	21.474994	72.105580
Number 4	21.474932	72.105710	21.474932	72.105720
Number 5	21.474873	72.105733	21.474859	72.105588
Number 6	21.474813	72.105749	21.474788	72.105598

The percentage cover of individual ground cover species and vines was recorded. The presence of fauna observed within the plot in the vicinity was recorded. Evidence of impacts was recorded to assist in determining the quality of the vegetative community in each plot. Observations show that the site has been heavily impacted by previous human activities and temporary development by the developers'' (Figure 8.0), including viewing pavilions and a model villa unit.

By overlaying the site development plans of the proposed hotel development over the site the estimated potential environmental impacts that could occur because of the proposed development was determined. The footprint of the proposed development covers most of the site.

Each community was evaluated from a qualitative perspective, based on the following categories and descriptions:

Excellent*:* Natural floral and faunal communities are intact; little or no adverse impacts from non-native species; natural hydrological conditions exist; free of adverse human-related (e.g., debris, previous construction) and/or natural (hurricane) impacts. Species designated as Endangered or Endemic are present in sustainable populations.

Good: Natural floral and faunal communities are present, but communities are not meeting optimal conditions due to adverse impacts from hydrological, human-related, or natural causes. Species designated as Endangered or Endemic may be present, but long-term population sustainability is questionable.

Fair: Natural conditions are substantially impaired because of hydrological, human-related, or natural causes. Species designated as Endangered or Endemic are absent or minimally present, and long-term population sustainability is tenuous.

Poor: Native floral and faunal communities are absent or minimally present due to previous hydrological, human-related, or natural impacts. Species designated as Endangered or Endemic are either not present or are not present in sustainable populations.

No wetlands were present on the property.

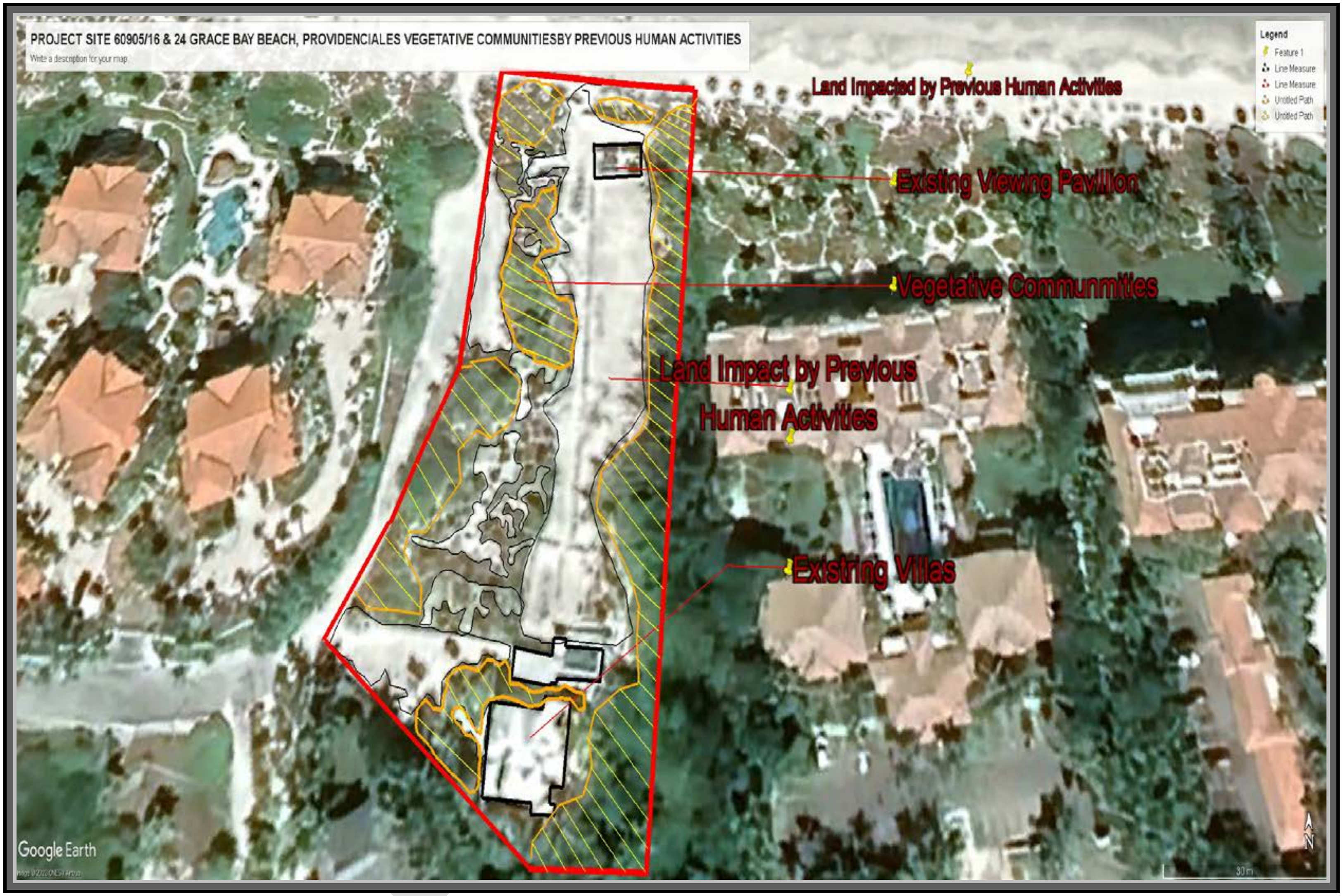

Figure 8.0: Project Site Vegetative Communities (Site Heavily Impacted by Previous Human Activities)

Figure 9.0: Location of transects terrestrial assessment 60906/16 & 2, GRACE Bay, Providenciales

Sub-canopy (both shrubs and ground covers) species were also primary weedy species. Native shrubs were also present on site including Jumbie bean (Photo 3.0). Other native species present included horse-grass (Desmmodium glabrum), bladderpod (Herissantia crispa), goatweed (Capraria biflora), woodly Corchorus (Corchorus walcotti) and marsh fleabane (Pluchea ordorata). Ornamental shrubs included bougainvilla (Bougainvillea spectabillis), hibiscus (Hibiscus rosa-sinensis) and tattoo bush (Jatropha gossypilofolia).

Groundcover species also included a combination of weedy native species, including burragrass (Cenchrus spp), hogweed (Boerhavia diffusa), sweet weed (Stylosanthes hamata) and blue rat-tail (Stachytarphaera frruiticosa). Vines on the site included least snoutbean (Rhynchosia minima) and woe-vine (Cassytha filiformis).

Photo 3.0: Typically disturbed sub-canopy dominated by cow bush. (Date of photo April 14, 2023)

Photo 4.0: Typical dominant opportunistic species
(Date of photo April 14, 2023)

Photo 5.0: Typical dune system
(Date of photo April 14, 2023)

Wildlife species observed on the site included the Turks and Caicos anoles (Anolis scriptus) and curly-tailed lizards (Leiocephalus psammodromus). One species of land snails was observed on site.

The site is heavily Impacted by previous human activities.

The property under previous ownership has been heavily impacted by human activities. Existing physical impacts on the site consist of a building, view pavilions, undeveloped walkways, and an undeveloped car parking area. Approximately 50% (1.06 of the total 2.12 acres) of the site was heavily degraded by previous human activities Figure 8.0. Some opportunistic vegetation community was present on the site, including weedy upland that is typical of disturbed areas (Photo 4.0). Cow bush (Leucaena leucocephala) (Photo 3.0) was found on the site.

A model building is constructed on-site, which is to be used as temporary offices, temporary toilet facilities, and workshops during the construction phase of the development. When the proposed development is completed, this building will be used as the beach bar and restaurant. Also on the site is a specially constructed viewing pavilion (Photo 6.0).

Photo 6.0: Viewing Pavilion. (Date of photo April 14, 2023)

Photo 7.0: Property boundary enclosure. (Date of photo April 14, 2023)

Photo 8.0: Area impacted by human activity (Date of photo April 14, 2023)

Photo 9.0: Man-made walkway. (Date of photo April 14, 2023)

2.2.1.1 Qualitative Description of Flora and Fauna

Providenciales has a diverse range of flora and fauna. The terrestrial flora and fauna of Providenciales include various endemic species and some that are introduced. A total of two-hundred and sixty-seven (267) species of plants have been reported in Providenciales. The vegetation is primarily composed of scrublands, coastal strand vegetation, and mangroves. Some of the plant species found on the island include buttonwood (*Conocarpus erectus*), sea grape (*Coccoloba uvifera*), and coconut palm (*Cocos nucifera*) (VTCI, 2023).

The vegetative community observed on the site of the proposed development (60905/16 & 204) was given a low rating for its environmental value and quality, particularly because of previous human impacts. The site had been disturbed throughout most of the area and most of it was void of vegetation. No birds' nests or other evidence of significant wildlife value was observed. No wetlands were present.

Sand Strand, including beach dune.

The west coastal area of the property consisted of a sand stand and beach community. Portion of this sand dune was damaged by human activities and must be restored Photo 10.0.

Photo 10.0: Damaged sand dune system to be restored. (Date of photo April 14, 2023

The fore-dune community of the site was typical of dune communities in the TCI and the Bahama. Sea oats (Uniola paniculate) and other dune species were present in varying abundances in the transition zone between the unvegetated sandy beach to the north and less densely vegetated areas further inland.

Inland other native salt-tolerant and drought-tolerant species were present including, burr grass (Censhrus sp.) sweet bay (Ambroosia hispida) and bay hops (Ipomsea pes-caprae). Shrubs included both native inkberry (Scaevola plumini) and non-native ornamental candlewood (aka beach naupaka). Vines in the foredune were primary woe-vine (Cassythia filiformis) and wild apicot (Passiflora pectinate). The Australian pine (Cassuarina equesitifolia) trees on the site will be removed and the DECR will be consulted prior to removal.

Photo 11.0: Primary dune system (Date of Photo April 14, 2023).

2.2.1.2 Quantitative Description of Flora and Fauna

A total of 18 plant species were observed in the six 3-meter square vegetation plots. To provide more information than species richness (number of species present) the data collected was subjected to a Shannon-Weiner Diversity Index calculation which resulted in a value of 1.28. The index is a mathematical measure of the diversity of Diversity of species in this community. This comparatively low value corroborates the observation in the field that floral diversity on the subject property is low. The diversity of native species is even smaller, as fewer of the species observed on the property were native.

Rare, Threatened, and Endangered Species

Providenciales is home to various species that are either rare, threatened, or endangered. The Turks and Caicos Rock Iguana (*Cyclura carinat*a) is an endangered species endemic to the island and found nowhere else in the world. The iguana population on Providenciales has declined significantly due to habitat loss and predation by introduced species (IUCN, 2021). The Brown Pelican (*Pelecanus occidentalis*) is a threatened species listed as vulnerable, and the Hawksbill Turtle

(*Eretmochelys imbricata*) is an endangered species protected under the Endangered Species Act. The Hawksbill Turtle population in TCI has declined significantly, with an estimated 70% reduction in nesting females from 1980 to 2010 (VTCI, 2023). However, none of these species were observed on the property.

In summary, the various landside communities present on the site were evaluated from a qualitative perspective based on the results of the ground-truthing conducted on April 14, 2023. Each community was evaluated based on the extent to which the naturally occurring floral communities were intact.

The project site has been heavily impacted by previous human activities. For example, more than 50% of the site has been impacted by physical development, including two viewing pavilions, a model building to be used for temporary offices, temporary toilet facilities, and warehousing during the construction of the development (Building Permit PR16016). Other developments on the site are concrete footpaths, boundary walls, and car parking. The undisturbed portion of the site includes a 30-foot belt along the eastern boundary of the site.

Plant species observed and identified on the site during the habitat assessment carried out on April 14, 2023, are included in the following (Table 5.0). The list should be considered preliminary, and additional species could be identified if additional surveys were to be conducted during different times of the year. Nomenclature follows "Flora of the Bahamas Archipelago" by D.S. Correl and H.B Correll and/or Flowers of the Bahamas and the Turks and Caicos Islands by K McNary Wood.

Table 5.0: Plant List - SEFAMM Hotel Project Site Grace Bay, Providenciales, TCI.

Familyt/Scientific Name	Common Name	Type	Native	Habitat	Abundance
MONOCOTS AGAVACEAE Sanaservieria lryacinthoides	Africa Bowstring Hemp	Shrub		Coppices	Occasional
AMARYLLIDACEAE Hymenocallis arennicola	Dune Spider Lily	Herb	✓	Grassy dunes along coast	Occasional
COMMELINACEAE Commelina	Creeping			Disturbed	

diffusa	Dayflower	Herb		Area	Occasional
Tradescantia pallida	Purple Queen	Herb		Ornamental – Cultivated areas	Occasional
POACEAE (GRAMINEAE)					
Cenchrus sp.	Burr Grass	Herb	✓	Beach foredune	Common
Dactyloctenium aegyptium	Crowfoot Grass	Herb		Disturbed areas	Occasional
POACEAE					
Eleusine indica	Goosegrass	Herb	✓	Disturbed areas, sandy soils	Occasional
Eustachys petraea	Finger Grass	Herb	✓	Beach mid-dune, Coppice edges	Occasional
Uniola paniculata	Sea Oats	Herb	✓	Beach foredune	Common
ASTERACEAE					
Ambrosia hispida	Sweet Bay, Bay tansy		✓	Beach foredune	Occasional
Conyza Canadens	Smooth Horseweed	Shurb	✓	Disturbed area	Occasional
Iva imbricata	Beach Iva	Herb	✓	Dunes	Occasional
Luctuca	Wild Lettuce	Herb	✓	Disturbed	Occasional
BIGNONACEAE					
Tabebuia	Cedar	Tree	✓	Thickets, Coppices	Common
CASUARINACEAE					
Casuarina equisetifolia	Beefwood, Australian	Tree		Sandy shores, Disturbed	Common

	Pine			areas	
GOODENACEAE Scaevola plumieri	Inkberry, Black soap	Shrub	✓	Coastal dunes	Common
LAURACEAE Cassytha filiformis	WOE-VINE, Love Vine	Vine	✓	Beach backdune	Common
LEGUMINOSAE Desmodium glabrum Leucaena luecocephala Macroptilium lathyroides	 Horse-grass Jumbie Bean Wild Bush Bean	 Shrub Tree Herb	 ✓ ✓	Disturbed	 Common Common Occasional
MALVACEAE **Hibiscus rosa-sinenis**	Hibiscus	Shurb		Cultivated	Occasional
NYCTAGINACEAE Bougainvillea spectabilis	Bougainvillea	Shurb		Cultivated	Occasional
PORTULACACEAE Portulaca oleracea	Purslane		✓	Disturbed areas	Occasional

Invasive species and other disturbances

Three species of plants that are designated as invasive were found to be present on the property, including Casuarina equisetifolia, and Leucaena leucocephala. Each species' degree of infestation is listed in Table 6.0 below.

Table 6.0 - Degree of infestation of invasion plants

Scientific Name	Common Name	Degree of Infestation
Cassuarina equisetifolia	Austrilian Pine, Causarina	Moderate
Leucaena leucocephala	Jumbie, Cow Bush	Low
Pennisetum alopecuroides	Plume grass, Foxtail grass	High
Scaevola taccada	Beach Cabbage, Beach Naupaka	Moderate

2.2.2 Baseline marine environment

The purpose of the baseline marine investigation was to record the existing conditions within the survey area including habitat characterization, habitat mapping, species diversity and habitat utilization.

The benthic surveyed area was divided into two areas, nearshore and offshore. The Nearshore environment consisted of the beach shoreline up to 250m seawards and the offshore environment consisted of 250m to 500m seaward Figure 10.0. The nearshore environment would be directly impacted by construction activities, whereas the offshore environment would be indirectly impacted by construction activities.

A qualitative analysis was completed for the offshore environments as the areas are expected to be indirectly impacted and a quantitative analysis was completed for nearshore environments as the area may be directly impacted.

Figure 10.0: Marine Benthic Survey Area

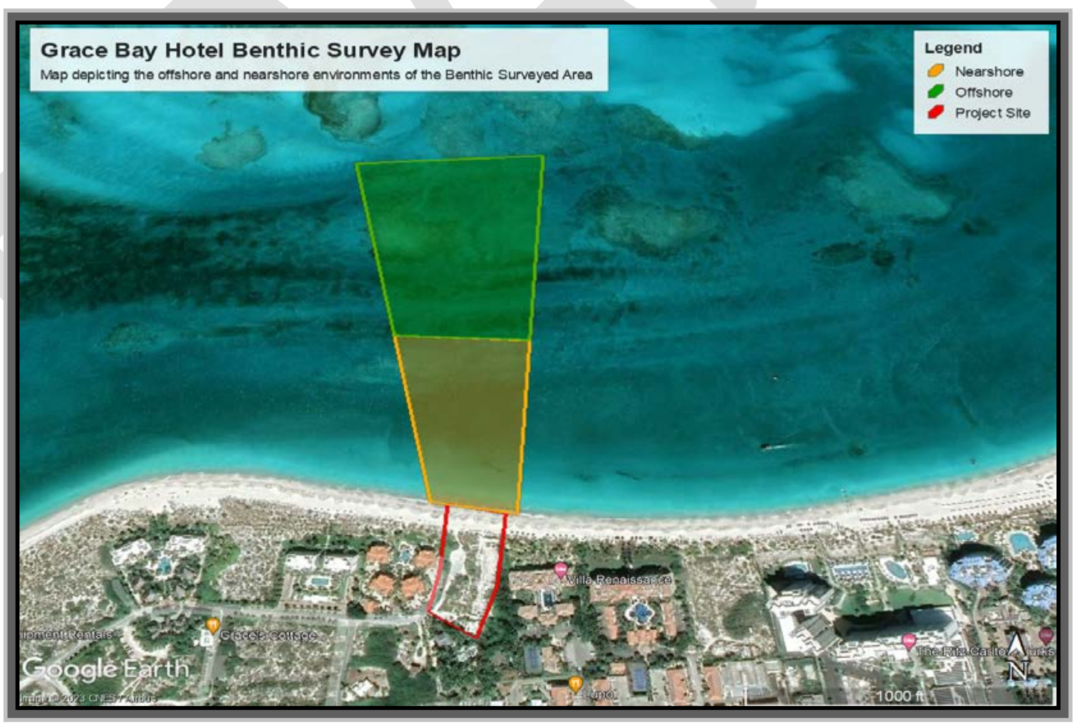

Figure 11.0: Marine Benthic Survey Area Depicting Nearshore and Offshore Surveyed Areas

2.2.2.1 Qualitative Analysis of the marine ecology

A qualitative analysis of the benthic habitat offshore was completed. Changes in benthic habitats were noted during the survey and the benthic description is listed below in the following sections.

2.2.2.1.1 Offshore Benthic Description

The following sections provide descriptions of the benthic habitats offshore of the surveyed area Figure 11.0. The habitats encountered were separated into two (2) generalized categories and three (3) variations.

Due to the similarity in benthic habitat along transects, the habitats encountered are separated into three (3) generalized categories:

- Algal dominated Hard bottom
- Sandy bottom
- Sand with rubble
- Seagrass
- Bare Sand

Overall, the benthic habitats appeared healthy and consisted of typical flora and fauna populations. Although human activity was observed during the assessments there was minimal human-related debris observed. There was no evidence of degraded water quality.

2.2.2.1.1.1 Algal dominated hard bottom

The northwestern side of the offshore surveyed area consisted of hardbottom dominated by corals and algae. Water depths were relatively low (0.3 to 1.5 meters) and moderate rugosity (Photo 12.0 and 13.0). The area was once a reef but now it's dominated by algae with a few live coral heads.

Photo 12.0: Hardbottom Habitat

Photo 13.0: Depicting hardbottom rugosity

Majority of the corals observed during the assessment were observed in this area. Corals found in this area included Blade Fire Coral (*Millepora complanata*) (Photo 16.0), Branching Fire Coral (*Millepora alcicornis*), Finger Coral (*Porities porities*), Mustard Hill Coral (*Porities astreoides*), Mountainous Star Coral (*Orbicella faveolata*) (Photo 17.0), Lobed Star Coral (*Orbicella annularis*) and Massive Starlet Coral (*Siderastrea siderea*) (Photos 14 and 15.0). Soft corals observed along the hardbottom included Slit-pore Sea Rods (*Plexaurella spp.*), Angular Sea Whips (*Pterogorgia anceps*) and Common Sea Fans (*Gorgonia ventalina*). A complete list of corals observed can be seen in the Species List in Section 2.2.2.2.3.1.2 Corals in the area appear to be in good health. No Stony Coral Tissue Loss Disease (SCTLD) or bleaching was observed on the corals.

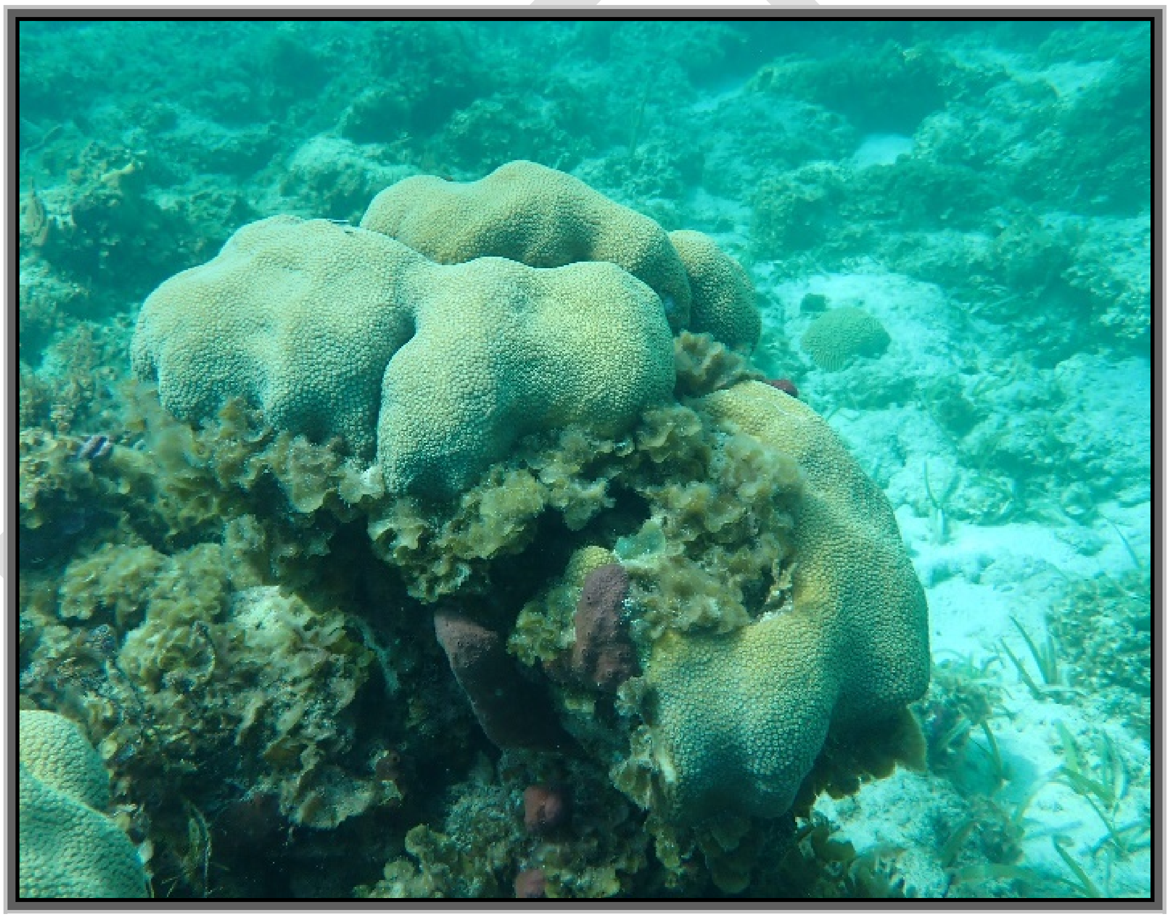

Photo 14.0: Lobed Star Coral (Oribella annularis)

Photo 15.0: Massive Starlet Coral (Siderastrea siderea)

Photo 16.0: Blade Fire Coral (Millepora complanate)

Photo 17.0: Mountainous Star Coral (Orbicella faveolata)

Fish abundance was moderate, and diversity was overall low; however, most fish species in the area were observed in this benthic habitat. Species include, Bar Jacks (*Carangoides ruber*), Slippery Dicks (*Halichoeres bivittatus*), Spot fin Butterflyfish (*Chaetodon ocellatus*), Blue Tangs (*Acanthurus coeruleus*), Yellowtail Damselfish (*Microspathodon chrysurus*), Coney (*Cephalopholis fulva*), French Grunts (*Haemulon flavolineatum*), Lane Snapper (*Lutjanus synagris*), Stoplight Parrotfish (*Sparisoma viride)*, Princess Parrotfish (*Scarus taeniopterus*), Blue Chromis (*Chromis cyanea*), and Puddingwife (*Halichoeres garnoti*).

Some of the algae observed in this area included *Dictyota spp*. and Fuzzy Finger Algae (*Dasycladus vermicularis*), Fan leaf algae (*Lobophora variegate*), and Sargassum (Sargassum fluitan).

2.2.2.1.1.2 Sandy bottom

Majority of the offshore benthic habitat was dominated by a variation of sandy bottom habitat, which included bare sand, and seagrass. The least amount of activity was observed in the bare sand and consisted of mainly fish species moving from one area to the next.

2.2.2.1.1.3 Seagrass

Most of the sandy bottom of the offshore area was dominated by seagrass beds. The areas are mainly Turtle grass (*Thalassia testudinum*), with Manatee grass (*Syringodium* *filiforme*) and moderate algae (Photos 18.0 and 19.0). Seagrass diversity was low, but the abundance varied from patches of Turtle grass beds with little to no Manatee Grass and vice versa but most of the seagrass beds were dominated by turtle grass. In some cases, each species was monotypic. The seagrass beds still appear to be healthy and consist of floral and faunal populations that depict a healthy seagrass ecosystem. The seagrass ranged from sparse to moderate across the site.

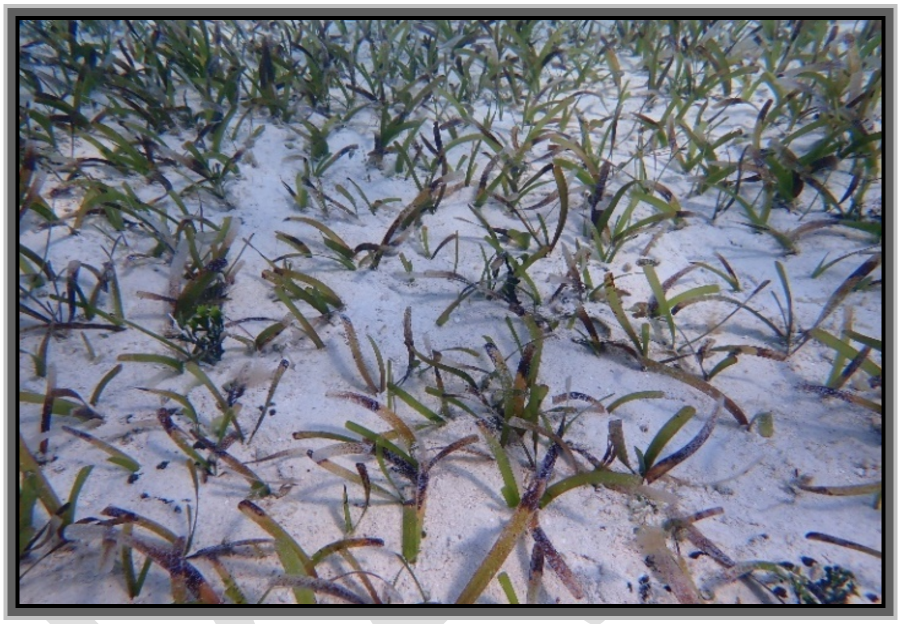

Photo 18.0: Sandy bottom with Turtle Grass (Thalassia testudinum)

Photo 19.0: Sandy bottom with Manatee Grass (Syringodium filiforme)

Small singular colonies of stony corals Finger Coral (*Porites porites*) were observed in the seagrass (Photo 20.0). Common macroalgae observed in the seagrass beds include Mermaid's Shaving Brush (*Penicillus sp.*), and Three Finger Leaf Algae (*Halimeda incrassata*).

Photo 20.0: Finger Coral (Porites porites) colonies in the seagrass beds

2.2.2.1.1.4 Bare sand

Bare sand patches were observed amongst the seagrass beds (Photo 21.0). There was no flora and little fauna observed in these patches. Fish species observed in this habitat were moving from one area to the next.

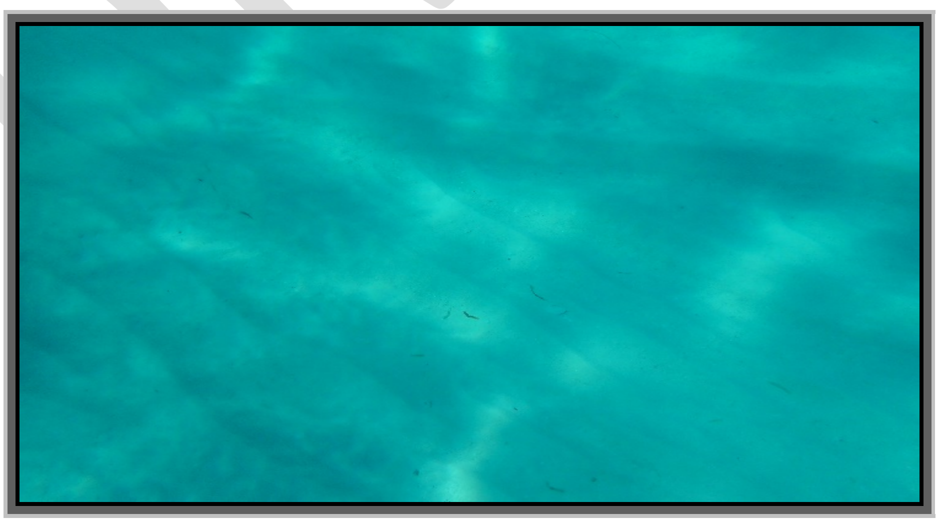

Photo 21.0: Bare sand

2.2.2.1.1.5 Sand with rubble

Two locations during the assessment were observed to be sand bottom with rubble (Photo 22.0). Broken conch shells and other rubble was observed in these areas. No flora and little fauna were observed in this habitat. The fauna observed appeared to be fish species moving from one area to the next.

Photo 22.0: Sandy bottom with rubble

2.2.2.2 Quantitative Analysis of the marine ecology

A quantitative analysis was completed for nearshore environments as the area may to be directly impacted by construction activities. Benthic habitats were noted, and GPS points (See Appendix U) were recorded. Percent Cover was used to analysis the nearshore benthic environment.

2.2.2.2.1 Nearshore benthic analysis

The following sections provide descriptions of the benthic habitats of the benthic surveyed area.

Due to the similarity in benthic habitat along transects, the habitats encountered are separated into one (1) category with two (2) variations:

- Sandy bottom
- Seagrass
- Bare Sand

2.2.2.2.1.1 Sandy bottom

The entire nearshore benthic habitat was dominated by a variation of sandy bottom habitat, that included bare sand, and seagrass dominated. The nearshore environment had very little activity which consisted of mainly fish species moving from one area to the next. This was to be expected as the area had high human activity (beach goers and boating traffic).

2.2.2.2.1.2 Bare sand

Approximately 98% of the nearshore sandy bottom benthic habitat was bare sand. No flora was observed in this area and the only fauna observed in the area were mainly fish species moving from one area to the next. The fish species observed included the Southern Stingray (*Hypanus americanus*) and bar jacks (*Carangoides ruber*) (Photo 23.0).

No corals were observed in this area.

Photo 23.0: Southern Stingray in the bare sand of the nearshore environment

2.2.2.2.1.3 Seagrass

Approximately 2% of the nearshore sandy bottom benthic habitat was seagrass patches (Photo 24.0). The seagrass patches consisted of Turtle grass (*Thalassia testudinum*), moderate macroalgae. The seagrass beds still appear to be healthy and consist of floral and faunal populations that depict a healthy seagrass ecosystem. The seagrass ranged from sparse to moderate across the site.

There were no coral colonies observed in the nearshore seagrass beds. Common macroalgae observed in the seagrass beds include Mermaid's Shaving Brush (*Penicillus sp*.), and Three Finger Leaf Algae (*Halimeda incrassata*).

Photo 24.0: Seagrass patch in the sandy bottom of the nearshore environment

2.2.2.2.3 Species List

The following is a list of the species observed and identified.

2.2.2.2.3.1 Fauna

Roving Diver visual fish surveys were conducted using a modified Atlantic and Gulf Rapid Reef Assessment (AGRRA) Protocol Fish observed were identified and given a frequency rating (based on occurrence) of Single (1 individual), Few (2-10 individuals), Many (11-100 individuals), or Abundant (<100 individuals).

2.2.2.2.3.1.1 Fish species

There were seventeen (17) species of fish observed during the assessment. Significant fish activity was observed mainly around the hardbottom/patch reef systems with little to no activity being observed in the nearshore bare sand habitat. The reef fish observed were typical of a reef system and varied in size classes from 5cm up to 25cm Table 7.0 below.

Table 7.0: Fish Species observed during the assessment.

Scientific Name	Common Name	Abundance	
		Nearshore	Offshore
Ocyurus chrysurus	Yellowtail snapper	None	Many
Stegastes adustus	Dusky damselfish	None	Few
Sparisoma viride	Stoplight parrotfish	None	Few
Acanthurus bahianus	Ocean Surgeonfish	None	Many
Acanthurus coeruleus	Blue Tang	None	Many
Chaetodon ocellatus	Spotfin Butterflyfish	None	Few
Microspathodon chrysurus	Yellowtail damselfish	None	Few
Cephalopholis fulva	Coney	None	Few
Haemulon flavolineatum	French Grunt	None	Many
Lutjanus synagris	Lane Snapper	None	Few
Halichoeres bivittatus	Slippery dick	None	Many
Halichoeres garnoti	Yellowhead wrasse	None	Few
Balistes vetula	Queen triggerfish	None	Single
Chromis cyanea	Blue Chromis	None	Few
Gobiidae spp.	Goby	None	Single
Halichoeres radiatus	Puddingwife	None	Few
Scarus taeniopterus	Princess Parrotfish	None	Few
Family: Scaridae	Parrotfish		Few
Carangoides ruber	Bar Jack	Few	

Photo 25.0: Ocean Surgeonfish (Acanthurus bahianus) in the hardbottom benthic habitat

Photo 26.0: Spotfin Butterflyfish (Chaetodon ocellatus) in the hardbottom benthic habitat

Photo 27.0: Yellowfin Dusky Damselfish (Microspathodon chrysurus) in the hardbottom benthic habitat

Photo 28.0: Puddingwife (Halichoeres radiatus) in the hardbottom benthic habitat

2.2.2.2.3.1.2 Coral species

Divers' observations were made by snorkeling along transects, capturing photographs, to confirm conditions. Species diversity, general abundance and overall health were observed. Most coral species were observed on the algal hardbottom of the patch reef. However, a few colonies of Finger Coral (*Porities porites*) were observed in the seagrass habitat. There were eleven (11) species of coral observed. The most dominant were the *Porities asteriodes* (Mustard Hill Coral) Table 8.0 below.

Table 8.0 : Coral species observed during the assessment.

Scientific Name	Common Name	Abundance	
		Nearshore	Offshore
Millepora alcicornis	Fire Coral	None	Many
Millepora Complanata	Blade Fire Coral	None	Many
Gorgonia ventalina	Common Sea Fan	None	Many
Siderastrea siderea	Massive Starlet Coral	None	Few
Plexaurella spp.	Sea Rod	None	Many
Psuedopterogoria spp.	Sea plumes	None	Many
Pterogorgia anceps	Angular Sea Whips	None	Many
Porites porites	Finger Coral	None	Many
Orbicella faveolate	Mountainous Star Coral	None	Many
Porites astreoides	Mustard Hill	None	Many
Orbicella annularis	Lobed Star Coral	None	Few

Photo 29.0: Split-pore Sea rod (Plexaurella spp.) (Foreground) and Mustard Hill Coral (Porites asteroides) (Background)

Photo 30.0: Mountainous Star Coral (Oribicella faveolata)

Photo 31.0: Common Sea Fan (Gorgonia ventalina)

Photo 32.0: Sea Plumes (Antillogorgia spp.)

2.2.2.2.3.1.3 Other Fauna and Epifauna

Majority of the epifauna species were found either on the sea floor or on rocks that sat on the seafloor and fauna species were found in the surrounding area. Majority of other fauna and epifauna were observed in the offshore benthic habitat. There were nine (9) other fauna and epifauna observed during the assessment Table 9.0 below.

Table 9.0: Other Fauna and Epifauna observed during the assessment.

Scientific Name	Common Name	Abundance	
		Nearshore	Offshore
Svenzea zeai	Dark Volcano Sponge	None	Many
Condylactis gigantea	Giant Anemone	None	Few
Ircinia felix	Stinker Sponge	None	Many
Ircinia strobilina	Black Ball Sponge	None	Many
Aplysina sp.	Rope Sponge	None	Many
Aplysina fistularis	Yellow Tube Sponge	None	Many
Dasyatis americana	Loggerhead Sea Turtle	None	Single
Caretta caretta	Southern Stingray	Single	None
Pinna carnea	Amber Penshell	None	Single

Photo 33.0: Giant Sea Anemone (Condylactis gigantea)

Photo 34.0: Amber Pen Shell (Pinna carnea)

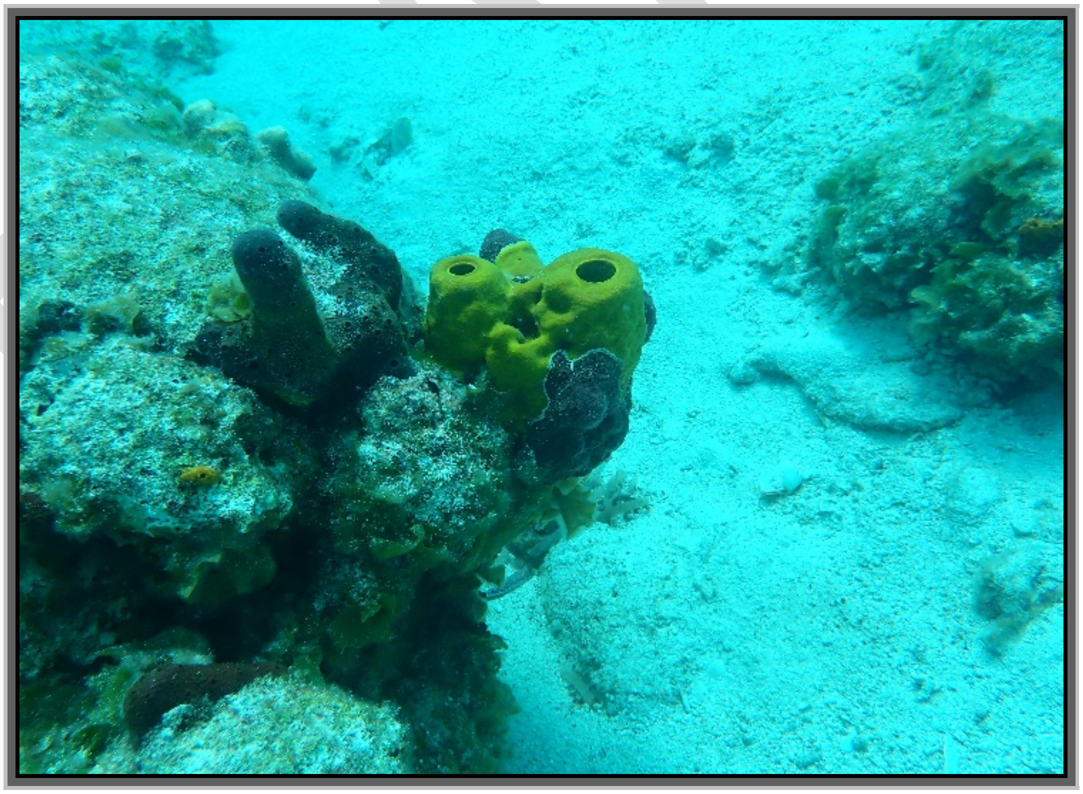

Photo 35.0: Yellow Tube Sponge (Aplysina fistularis) and Dark Volcanic Sponge (Svenzea zeai)

2.2.2.2.3.1.3.1 Flora algae, seagrass, and seaweeds species

Flora species were observed throughout the surveyed area. There were twelve (12) flora species observed Table 10.0 below.

Table 10.0: Flora Species observed during the assessment.

Scientific Name	Common Name
Thalassia testudinum	Turtle Grass
Syringodium filiforme	Manatee Grass
Halimeda spp.	Green Algae
Halimeda incrassata	Three-finger Leaf Alga
Penicillus capitatus	Mermaid Shaving Brush Algae
Penicillus dumetosus	Bristle Ball Brush
Sargassum fluitans	Sargassum
Dicotya spp.	Dicotya
Padina sanctae crucis	White Scroll Algae
Udotea sp.	Mermaid's Fan
dictyosphaeria cavernosa	Green Algae sp
Neomeris annulate	Fuzzy Finger algae
Lobophora variegata	Fan leaf Algae

Photo 36.0: Sargassum (Sargassum fluitans)

Photo 37.0: Fan Leaf Algae (Lobophora variegate)

2.2.2.2.3.1.3.2 Commercially Important, Endangered, and Protected Species

There were twenty-eight (28) marine species observed during this assessment that are listed on the Convention on International Trade of Endangered Species (CITES) list and/or the International Union for Conservation of Nature (IUCN) Red List (see table 11.0).

The development is located within the Princess Alexandra National Park (PANP), as such, the developer is cognizant and concerned about the overall environmental value of the project, and therefore will continue monitoring of the site to minimize the effects of construction and development activities.

The Princess Alexander National Park (PANP) is a protected area consisting of both coastal and marine waters, as well as the coastline of the northern coast of Providenciales, Turks and Caicos. This protected area includes Grace Bay Beach, The Bight Beach, The Bight Reef (Coral Gardens), Leeward Beach, Smith's Reef, and a large portion of the northern barrier reef off Providenciales. PANP was declared a national park in 1992 and covers a total area of 6,532 acres of coastal and marine waters.

Due to the natural resources of Turks and Caicos contributing an estimated economic value of 45.5 million USD per year to the tourism industry (Wolf's Company, 2016), it is important to have protected areas, such as the PANP, established to safeguard TCI's biodiversity. In addition to this, the effective management of the PANP also plays a crucial part in maintaining ecosystem balance and preserving important habitats in Turks and Caicos as the extensive mangroves and fringe reefs found within and around the reserve act as a nursery for fish species as well as protect the surrounding coastline of Providenciales from storm surges in the event of a natural disaster (Pienkowski, n.d.).

Table 11.0: Commercially Important, Endangered, and Protected Species

Table 7 Key

LC = Least Concern (Conservation - IUCN)

NT = Near-Threatened (Conservation- IUCN)

CE = Critically Endangered (Conservation- IUCN)

DD = Data Deficient (Conservation-IUCN)

V = Vulnerable (Conservation- IUCN)

Scientific Name	*Common Name*	*CITES Listing*	*IUCN Listing*
Fish Species			
Ocyurus chrysurus	Yellowtail snapper	N/A	DD
Stegastes adustus	Dusky damselfish	N/A	LC
Sparisoma viride	Stoplight parrotfish	N/A	LC
Acanthurus bahianus	Ocean Surgeonfish	N/A	LC
Acanthurus coeruleus	Blue Tang	N/A	LC
Chaetodon ocellatus	Spotfin Butterflyfish	N/A	LC
Microspathodon chrysurus	Yellowtail damselfish	N/A	LC
Cephalopholis fulva	Coney	N/A	LC
Haemulon flavolineatum	French Grunt	N/A	LC
Lutjanus synagris	Lane Snapper	N/A	NT
Halichoeres bivittatus	Slippery dick	N/A	LC
Halichoeres garnoti	Yellowhead wrasse	N/A	LC
Balistes vetula	Queen triggerfish	N/A	NT
Chromis cyanea	Blue Chromis	N/A	LC
Halichoeres radiatus	Puddingwife	N/A	LC
Scarus taeniopterus	Princess Parrotfish	N/A	LC
Carangoides ruber	Bare Jack	N/A	LC
Corals			

Millepora alcicornis	Fire Coral	Appendix II	VU
Millepora Complanata	Blade Fire Coral	Appendix II	CR
Siderastrea siderea	Massive Starlet Coral	Appendix II	CR
Porites porites	Finger Coral	Appendix II	LC
Orbicella faveolata	Mountainous Star Coral	Appendix II	EN
Porites astreoides	Mustard Hill	Appendix II	LC
Orbicella annularis	Lobed Star Coral	Appendix II	EN
Other Flora and Epifauna			
Dasyatis americana	Southern Stingray	N/A	NT
Caretta caretta	Loggerhead Sea Turtle	Appendix I	VU
Marine Algae			
Thalassia testudinum	Turtle Grass	N/A	LC
Syringodium filiforme	Manatee Grass	N/A	LC

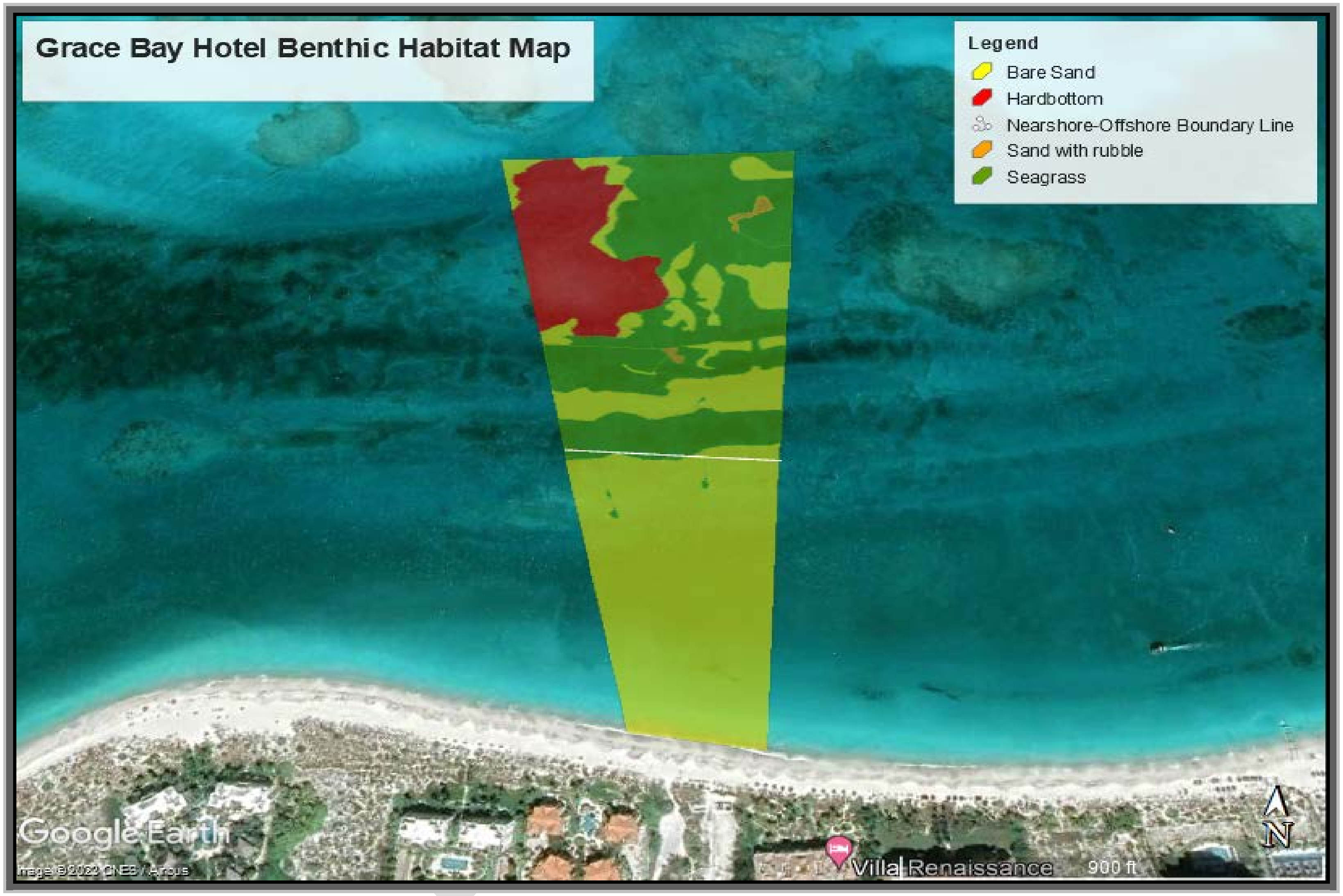

Figure 12 - Benthic Habitat Map

2.3 Physical environment baseline assessment

Investigations were done to determine the bathymetry, sediment type and water quality in the nearshore of the site. The physically collected data and statistical wave extracts were used to simulate the wave climate in the wider area of Grace Bay. The results (described in Sections 2.3.2; 2.3.5 and 2.5.5) were used to determine the design criteria for any proposed coastal works.

2.3.1 Topography of the area

The topography of the project site has a general elevation of approximately ten-(10) feet above mean sea level and dips seaward down to an elevation of approximately six-(6) feet above mean sea level, Figure 13.0. The higher elevation area appears to have been physically altered with the manual accretion of earth materials.

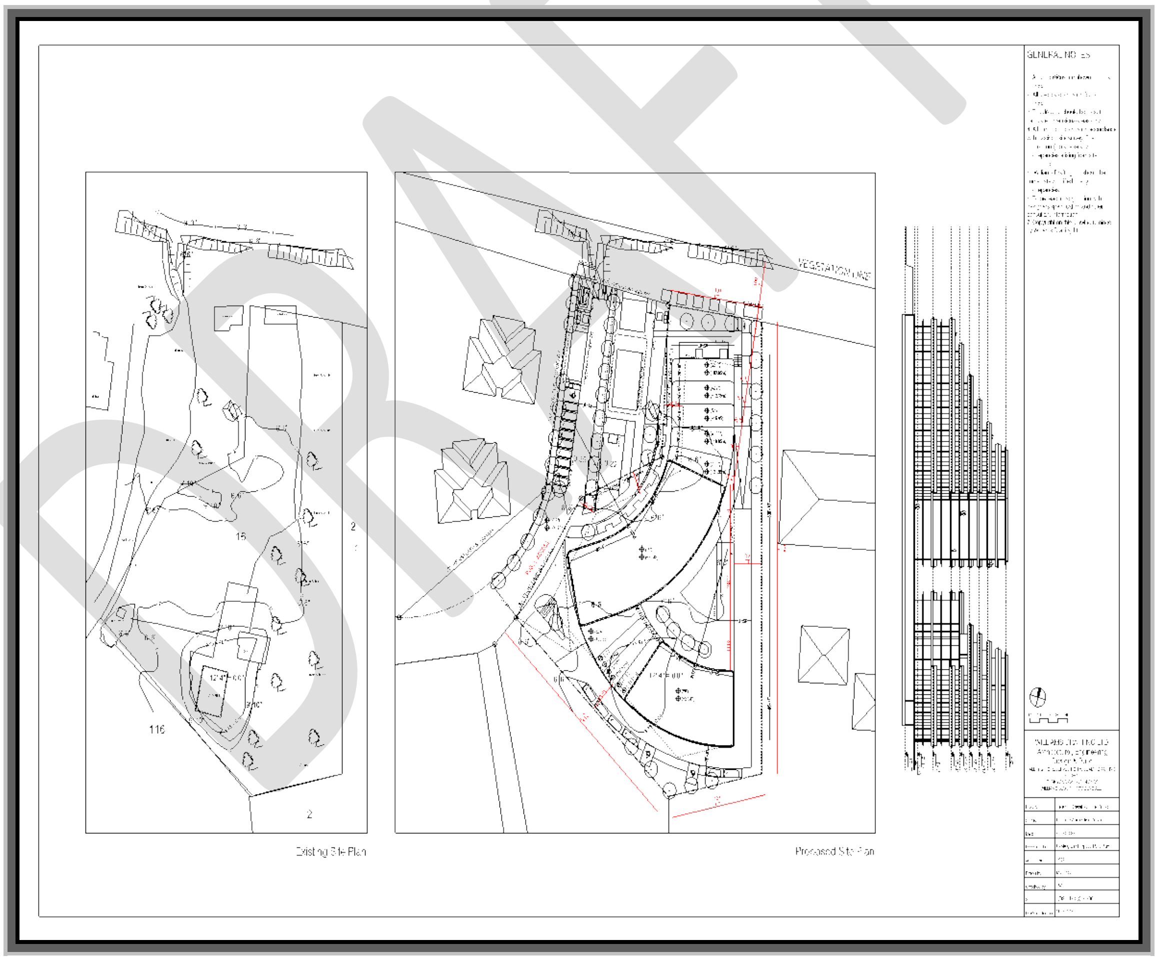

Figure 13.0: Topographic Map of Development Property

2.3.2 Bathymetry for the site shoreline

The Turks and Caicos Islands are located on a shallow bank with a fringing reef along the northern and western islands. To capture the bathymetry, satellite-based and physically surveyed data was used. Satellite elevation data was obtained from three sources: (i) the GEBCO global bathymetry dataset for depths greater than 2000m offshore of the islands (ii) the DHI Bathymetry Service, which provided large-scale bathymetry for the island of Providenciales and (iii) satellite-derived bathymetry from EOMAP for areas shallower than about 20m in depth. All offshore data was collated and is shown in Figure 14.0.

A physical bathymetric survey was also carried out. An echo sounder fixed to a boat was used to detect seafloor depths. The methodology consisted of using the boat to traverse the nearshore zone making a series of tracks from just inside the reef in towards the shoreline. Horizontal positioning was measured using GPS equipment, and an echo sounder provided the water depth information along the tracks. The area covered by the bathymetric tracks was about 1200m wide and 800m long.

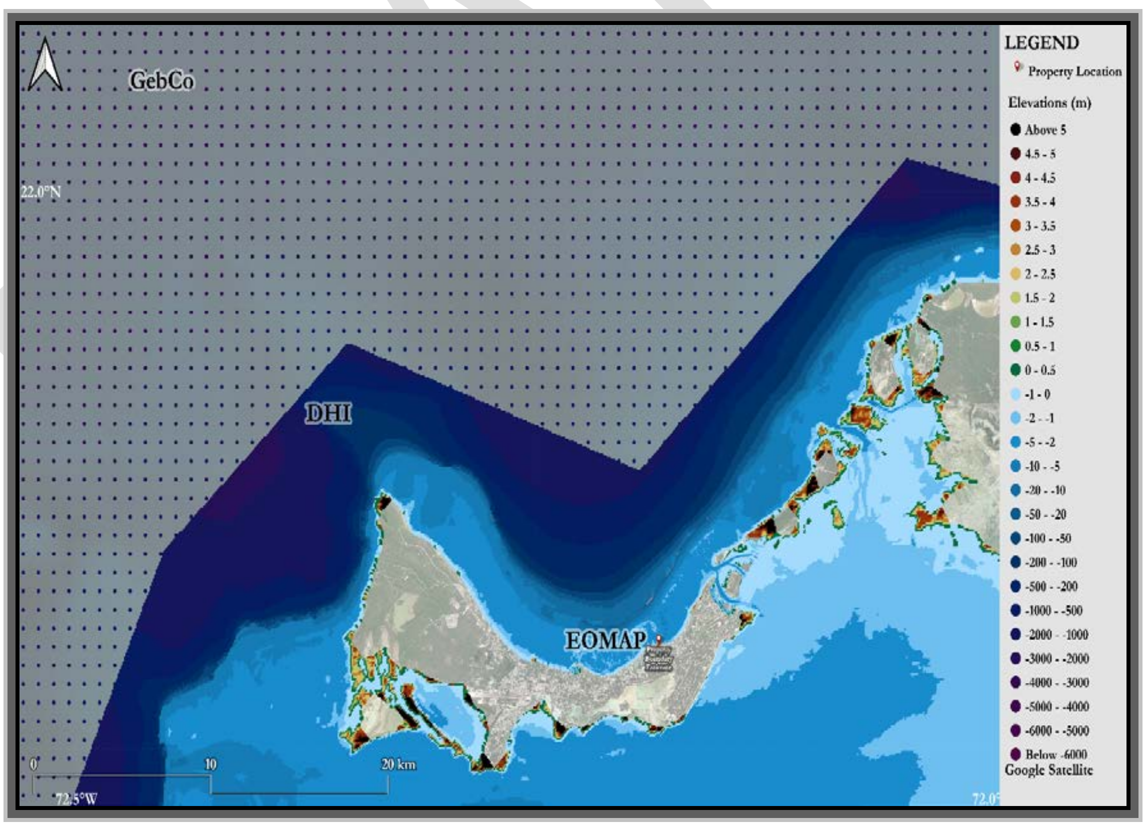

Figure 14.0 Deepwater and shelf bathymetry points used for modelling of Providenciales.

Topographic data was collected through beach profile and topographic surveys. Real-time Kinematic GPS survey equipment was used to measure profile points in an arbitrary 3-dimensional space. Following the physical survey, data was processed to vertically rectify the data to mean sea level (MSL) and to horizontally rectify the data to the Universal Transverse Mercator (UTM)18 coordinate system.

Physically measured bathymetric and topographic data points are shown in Figure 15.0.

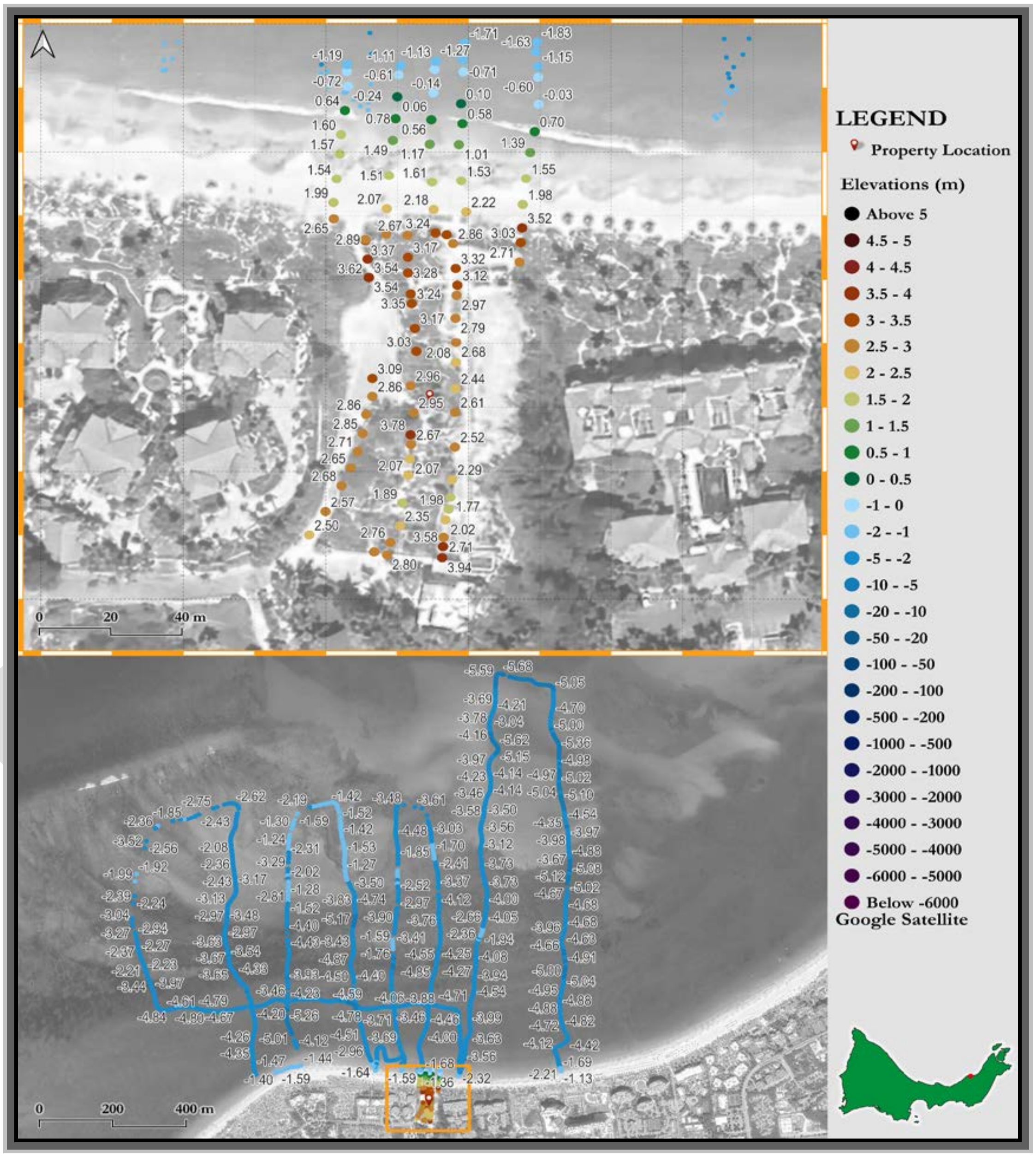

Figure 15.0 Topography (top) and bathymetry (bottom) points recorded during the data collection.

2.3.3 Geology

A Carbonate formation dominates the geology of the proposed development site. Lithological descriptions of the subsurface geology to an average depth of twelve-(12) feet below ground level revealed a relative thin layer of loosely compacted Holocene sand that transitioned to well compacted and well cemented Limestone formation. Paleo soil zones were not observed in the excavated test pit.

A soil penetrometer was used to measure soil bearing capacity at the test pit location (21.79731°N / 72.18233°W). The measured soil bearing capacity was 1420 kN/m^2

2.3.4 Hydrology

The hydrological regime of Providenciales is primarily controlled by rainfall, evapotranspiration, and ocean tides. The basin receives most of its water from rainfall, which infiltrates into the sandy soils and recharges the groundwater. The groundwater then discharges into the ocean or surface water bodies such as ponds and wetlands. The property area is low-lying and susceptible to pluvial flooding during periods of heavy rainfall.

Soil in the study area is predominantly sandy (Department of Agriculture, 2021). The soil has low fertility and low water-holding capacity, which can result in waterlogging and erosion in areas with poor vegetation cover. Land use in the area is predominantly tourist-related, with several hotels and resorts located nearby. The high imperviousness due to urbanization increases the potential for flooding during extreme rainfall events.

The hydrogeology of the project site is characteristic of a classical Ghybeh-Hertzberg lens that is situated within the upper Lucayan formation. A thin freshwater lens approximately 6 feet thick was measured in the test pit. The average depth to the water table was measured at 6 feet 2 inches. Recharge to the freshwater lens is derived from local rainfall. A loosely compacted sandy layer of approximately 22 inches overlaid a well-cemented limestone layer, Figure 16.0. Groundwater flow is generally outward towards the coastline and is subjected to a swirling motion that is directly impacted by the semi-diurnal tides where two high tide and two low tide episodes occur over a 1-day period. Karst geology, surface water, and fluvial features were not observed within the project site or the immediate and surrounding areas.

Figure 16.0: Excavated Test Pit

Rainfall

In an average year, TCI has 350 days of sunshine and very little rainfall. Rainfall data for the years 1981 to 2021 were obtained from the NASA Langley Research Center (LaRC) website. Higher levels of precipitation occur during the months of September, October, and November. These months coincide with the end of the hurricane season.

Over the 40 years, the mean annual precipitation is 1.54mm/day (varying from 1.09 mm/day to 2.66 mm/day). The highest rainfall was recorded in 1999 with an annual average of 2.66mm/day, while the lowest rainfall was recorded in 1991 (annual average of 1.14mm/day). The lower half of Figure 18.0 shows the rainfall anomalies, which show whether a particular year's rainfall was higher or lower than the 40-year average. In keeping with the annual precipitation values, rainfall anomalies ranged from -0.44mm/day in 2003 to 1.13mm/day in 1999. The highest rainfall anomaly in the past decade occurred in 2017 and was related to the passage of two major hurricanes in September.

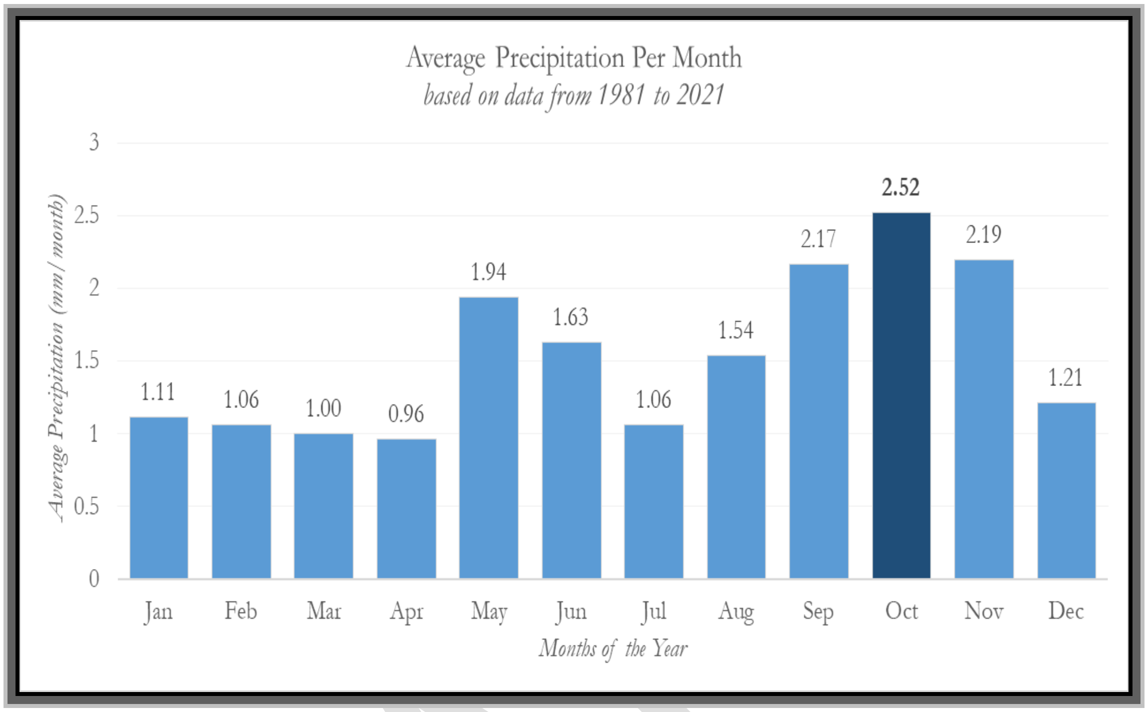

Figure 17.0: Average monthly precipitation for rainfall data extracted from 1981 to 2021

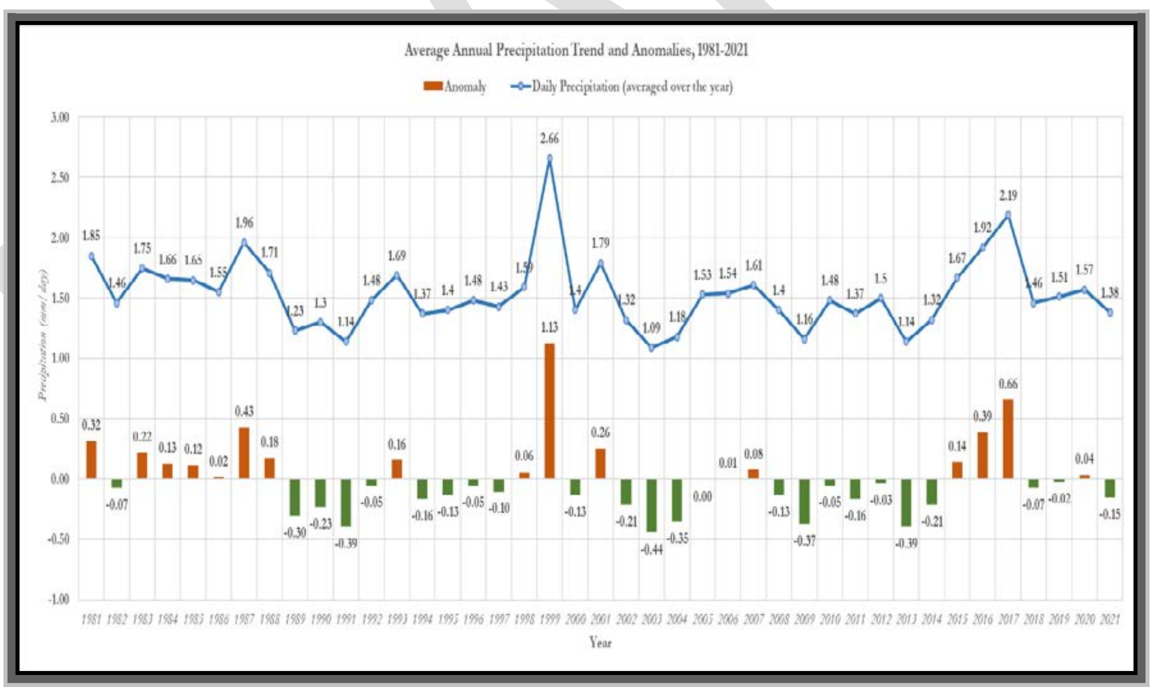

Figure 18.0: Annual precipitation trends and anomalies (1981 to 2021)

The hotel site is in a low-lying area that is susceptible to flooding during extreme rainfall events. During an extreme event the combination of high rainfall intensity, low infiltration rates in the built-up areas, and high run-off coefficients can produce substantial run-off. The rational method was used to estimate the possible run-off that enters the site and flows towards the sea. The area of the catchment was 0.59km². The catchment area included the property and the neighbouring lots of Figure 19.0.

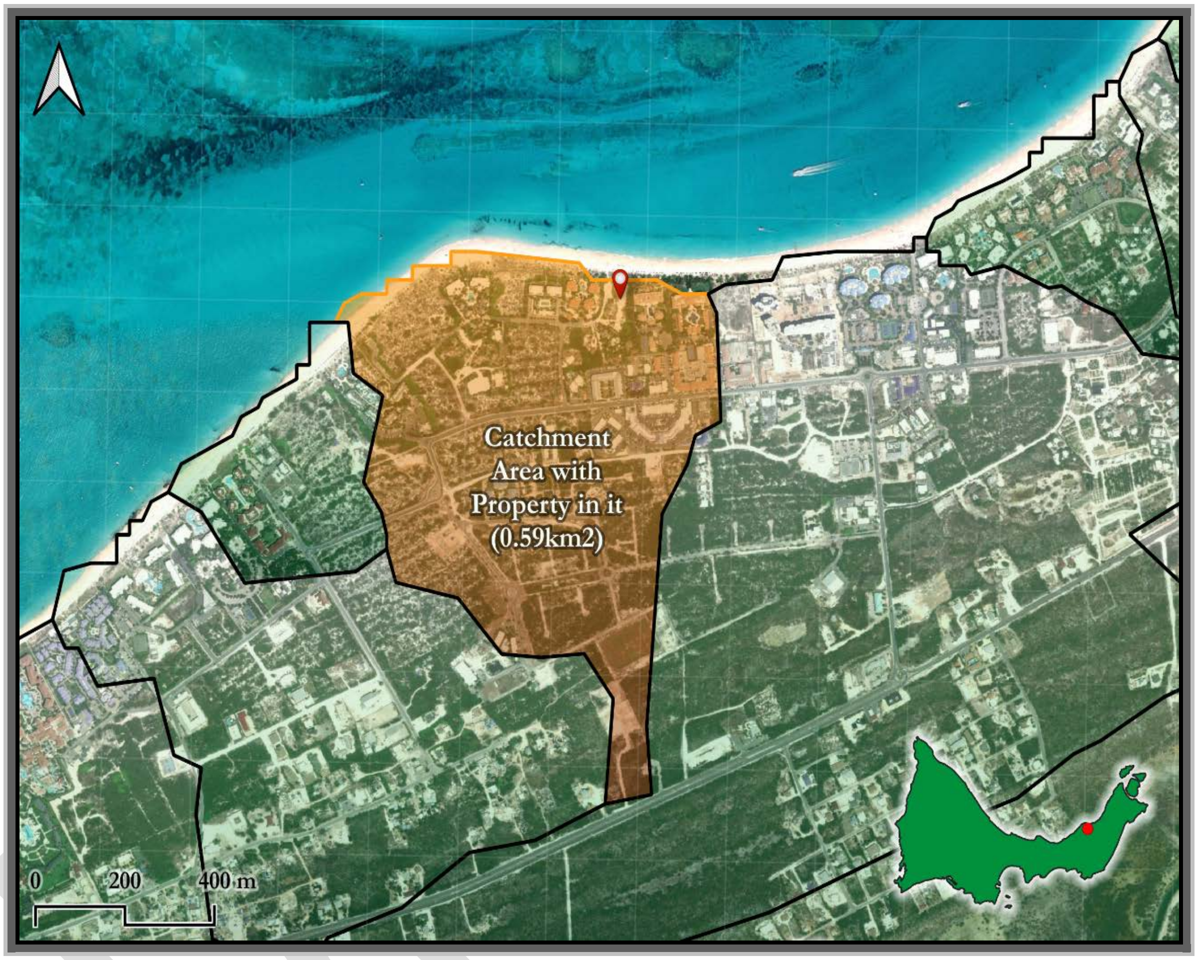

Figure 19.0 - General catchment area of with the property in it

From the "Urban Hydrology for Small Watersheds," Technical Release 55 (TR-55) by the Natural Resources Conservation Service (NRCS), a runoff coefficient of 0.77 was used, which represents sandy soils and a mix of commercial and residential land use.

A 24-hour rainfall duration was used for the analysis. The rainfall intensity used extremal statistics for the 40 years of modelled rainfall data. The 24-hour rainfall intensity for a 25-year event is 99mm, for a 50-year event is 118mm, and for a 100-year event is 138mm. A summary of the calculations is given in Table 12.0 below.

Table 12.0 - Calculated 24-hour rainfall run-off rate.

Rainfall Event	Rainfall intensity (mm/day)	Peak runoff rate (m^3/s)
10-year	56	7.1
25-year	82	10.3
50-year	101	12.7
100-year	121	15.1

These results are based on publicly available data. It is assumed that under the previous EIA study detailed drainage analyses were done to size internal storm drains and other water percolation or conveyance features.

2.3.5 Sediment Analysis

The sediment on a coast can provide insights into coastal processes and is an important component of the aesthetics and comfort of the beach or coastal zone. To classify the sediment, two samples were taken at the property. Sample 1 (SS1) was taken at the back of the beach and Sample 2 (SS2) was taken from the swash zone. These samples were sent to a geotechnical lab at the University of the West Indies (UWI), Mona to be visually inspected, air-dried, and subjected to a standard dry sieve analysis to determine their grain size distribution as well as other characteristic parameters. The results are summarized in **Figure** 20.0 and Table 13.0.

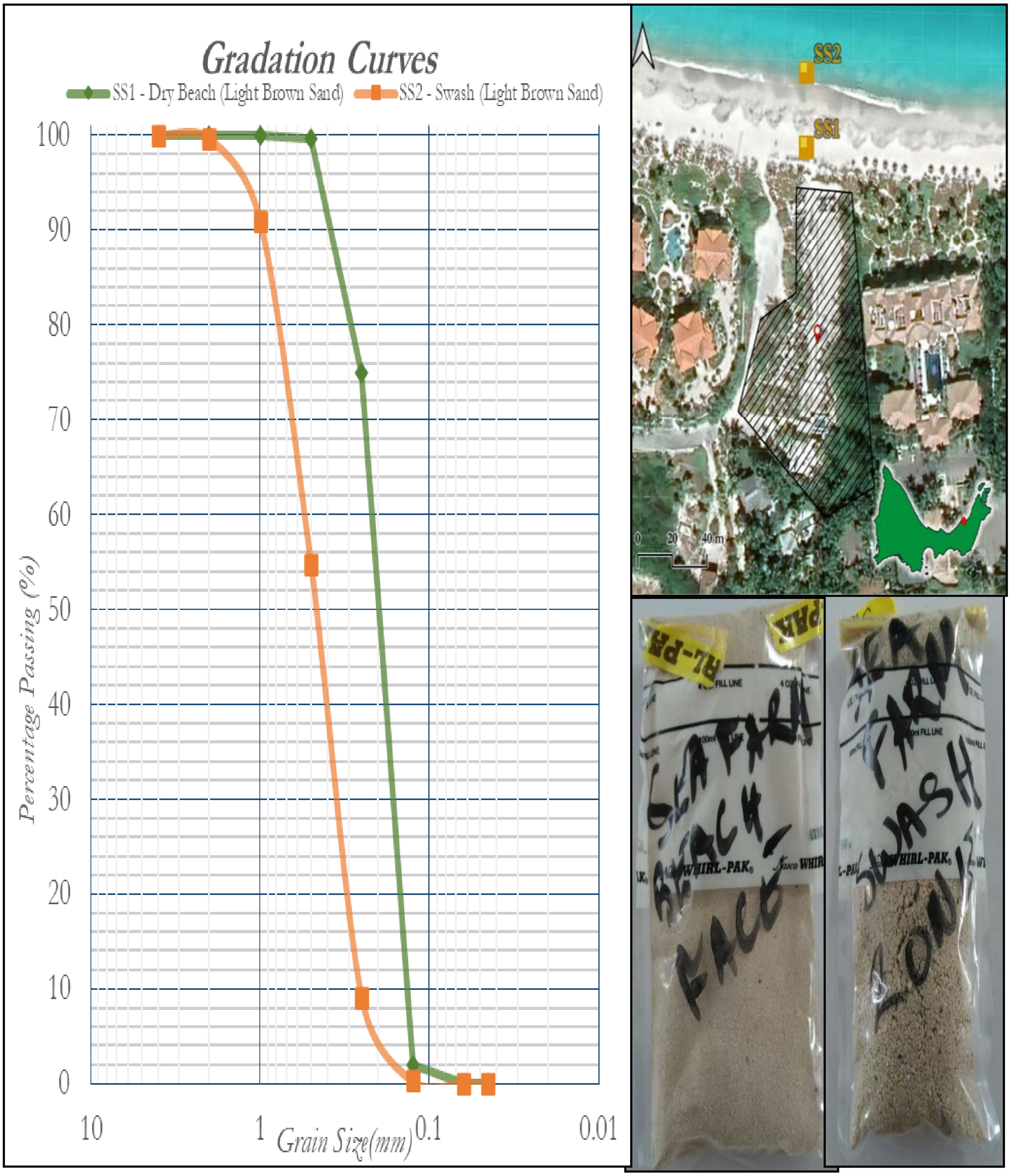

Figure 20.0 - Sediment distribution, sampling locations and pictures of samples

Table 13.0: Sediment samples key diameters and sediment type percentages

Specimen	*Type*	*Diameter (mm)*				*% Gravel*	*% Sand*	*% Silt*	*% Clay*
		D_{50}	D_{60}	D_{30}	D_{10}				
SS1	**Light Brown Sand**	**0.194**	0.211	0.166	0.140	0	100	0	
SS2		**0.461**	0.547	0.351	0.256	0.4	99.6	0	

Results indicate that sediment Sample 1 (SS1), the sediment at the back of beach, is fine. This has been seen in previous projects on the island. In the back of beach area, sediment is generally transported by wind, which carries finer sediment than a water environment. Sediment Sample (SS2) was taken where waves break and churn up the most sediment. There is more energy in this area, which washes out the finer sediment. As a result, the sediment in this area is typically larger than that at the back of beach area.

2.3.6 Climate and Meteorology

The hydrogeological environment of Providenciales can be described as a semi-arid tropical region, Figure 21.0. The climate conditions are characteristically long hot summers contrast with relatively cooler winter seasons. On average rainfall is relatively low (20 inches per year) and occurs mostly from August to December.

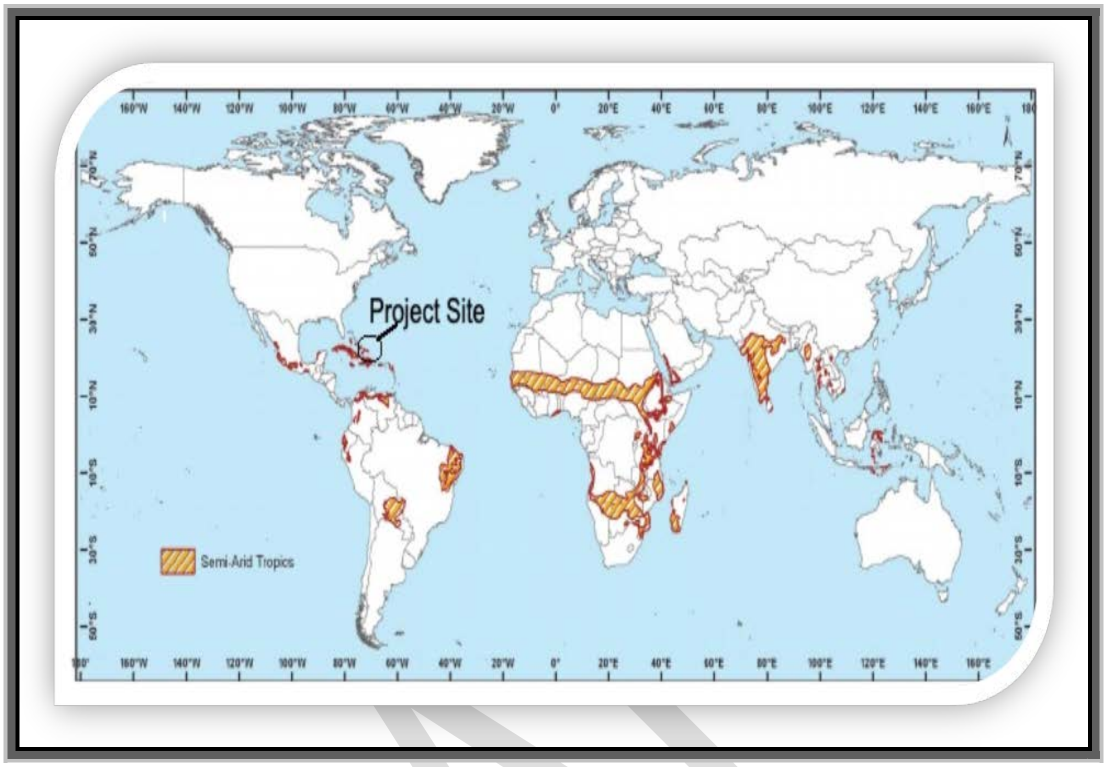

Figure 21.0: Semi-Arid Regions

(Source: http://www.fao.org/sd/EIdirect/climate/EIsp0002.htm)

Climate and meteorological data for the Turks and Caicos Islands are not directly monitored in real-time, instead, data is extrapolated from the southeastern Bahamas region that is monitored by the Bahamas Meteorological Department. Limited data suggests that a wet season extends from May to October and a dry season extends from November to April of each year. The hurricane season that extends from June through November directly impacts the rainfall amount that is derived from passing tropical depressions, tropical storms, and hurricanes. The summer season is characterized by predominant southeasterly winds and rainfall accumulation affected by intense events associated with the passage of tropical waves, tropical storms, and hurricanes.

Historical meteorological data from the southeast Bahamas and Grand Turk **(Bahamas Meteorological Department – Bahamas Government)** suggests an average annual rainfall of approximately 28 inches with the greatest amount of rainfall occurring during the months of May and October each year. Temperatures average 29°C (85°F) in summer and 21°C (70°F) in winter. Maximum and minimum temperatures seldom exceed 32°C (90°F) or 16°C (60°F). Historical model data ***(source: Meteoblue)*** from 2009 to 2021 is illustrated below in Figure 22.0.

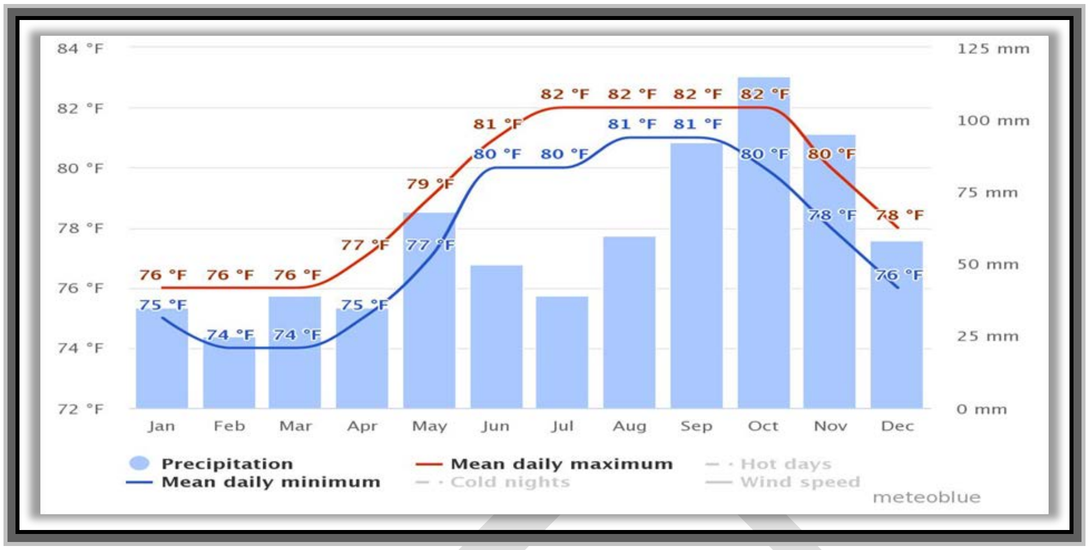

Figure 22.0: Climate Data

2.4 Baseline aesthetics

Aesthetics is a branch of philosophy dealing with the nature of beauty, art, and taste and with creation and appreciation of beauty. The aesthetic value of an area is based on the visual character and quality of the natural and human-made features of the area.

The study area, for the baseline aesthetic assessment, is defined as the immediate surrounding areas within the vicinity of the proposed development – bordered by Grace Bay Beach to the south, Village Road (South of Grace Bay Road) to the east, Grace Bay Beach Access, and Car Parking to the west, and Princess Drive to the north as defined in Figure 23.0.

According to the National Physical Development Plan (2020), this area, Grace Bay is the hub of Providenciales' tourism, clearly the most developed area of the island. It is a modern strip of development with a heavy emphasis on tourism, including hotel resorts, condominiums, restaurants, and retail stores.

The aesthetic quality of the Grace Bay area is dominated by a mixture of imported North American, and European architecture characters, that are not unique to Providenciales or the Turks and Caicos Islands. The most dominant aesthetic characters within the baseline aesthetic study area are the 12- Ritz Carlton Turks and Caicos, the 7 – story Seven Stars Hotel, The Grand Regent, Blanca Sands on Grace Bay, The Mason, Point Grace, La Vale Resort, and The Somerset on Grace Bay. These baseline architectural characteristics of the Grace Bay area are depicted in photographs 38.0 through 43.0.

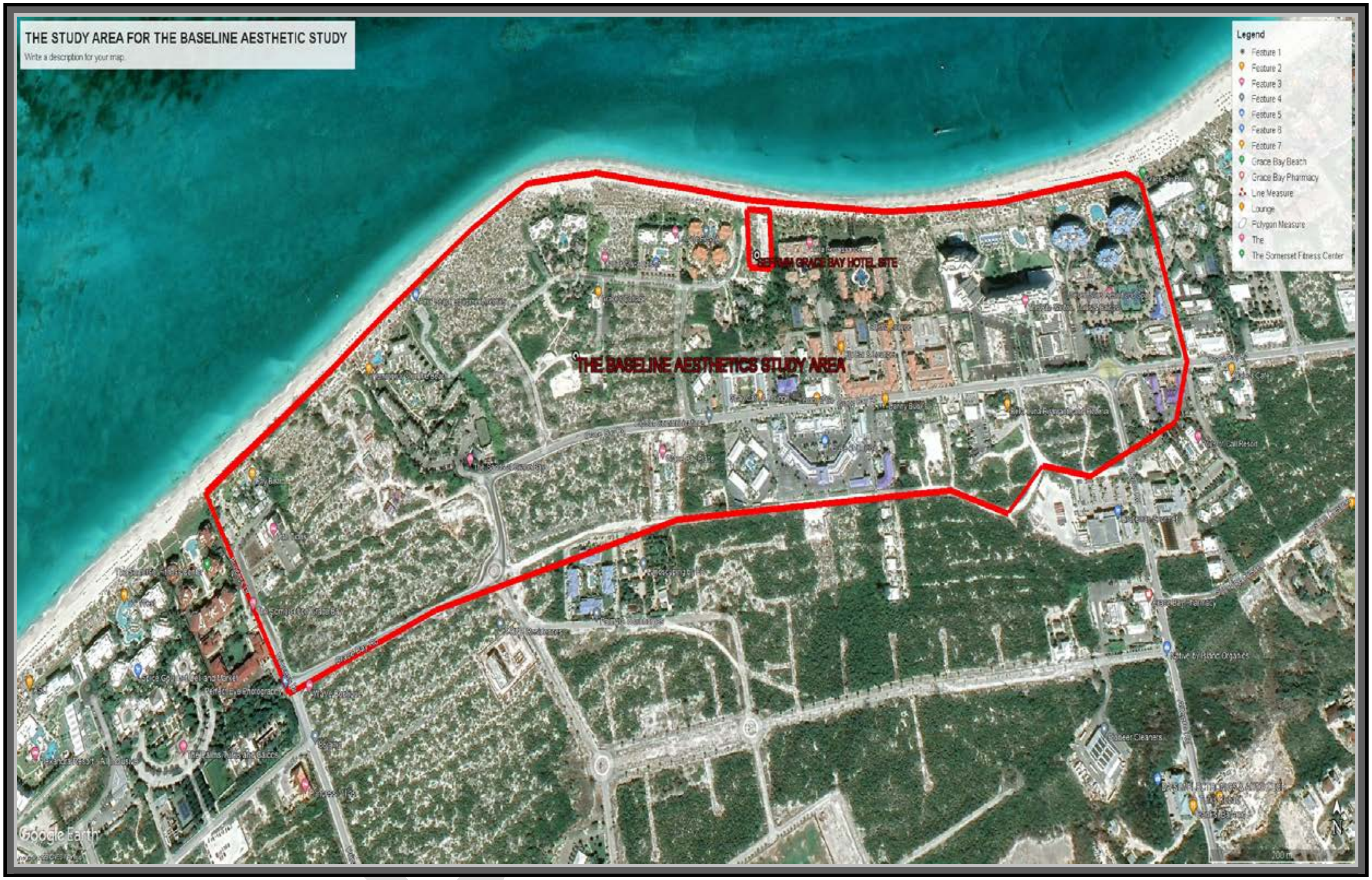

Figure 23.0: The Baseline aesthetic assessment study area Grace Bay

Photo 38.0: The Ritz Carlton Turks and Caicos architecture character

Photo 39.0: The 7-stars Hotel and Sap architecture character

Photo 40.0: The Renaissance Ville architecture character

Photo 41.0: Architecture character adjacent development

Photo 42.0: Street Scape within aesthetic Grace Bay Road

Photo 43.0: Street Scape within aesthetic 7-Stars Round-about

2.5 Baseline coastal processes and dynamics

A beach environment is dynamic as is responds to wave events. To describe the wave processes at the coast a few scenarios were investigated. The first is a look at general conditions at the property's beach, which helps to determine the long-term processes on the beach. After, erosive events were assessed by simulating a swell event in the area. Finally, severe events were examined by considering the hurricane wave climate and impacts on the property.

Daily wave climate

The operational wave climate at the project site is characterized by day-to-day, relatively calm conditions and seasonal winter swells (December to May). The day-to-day conditions are created by the northeast Trade Winds. The seasonal swells, however, are generated by North Atlantic cold fronts and typically approach from the north to the northwest. The waves then aim directly for the northern shoreline of Providenciales. Swell waves have longer periods thus leading to more aggressive wave conditions that can erode beaches and damage structures. It is these conditions that have the more profound impact on the site, even though, as a percentage of the year, their occurrence is relatively small.

The deep-water operational wave climate was established using the Reanalysis v5 (ERA5) produced by the European Centre for Medium-range Weather Forecast (ECMWF). The ERA5 model reanalyses wave parameters including significant wave height, wave period, and mean wave direction as well as the wind speed and direction every hour from January 1979 to September 2022. More than 383,000 timesteps of data can be extracted at an enhanced resolution of ~31x31km (or ~0.25 degrees) over the Caribbean.

Model data showed that waves offshore of Providenciales are predominantly from the northeast to east (80%). The average wave height of the easterly waves is 1.5m with an average wave period 6.8s. The ERA5 database was also searched for wind data, which was comparable to the resulting wave data.

Figure 24.0 shows the wave height distribution and the location of the node that was selected for the project. The wind data extracted from the selected node indicate that winds tend to come from the east with an average speed of 7m/s most of the year. Model wind directions agree with the literature review naming the easterly Trade Winds as the predominant winds in the area with an average magnitude of 7 m/s (Jury, 2013).

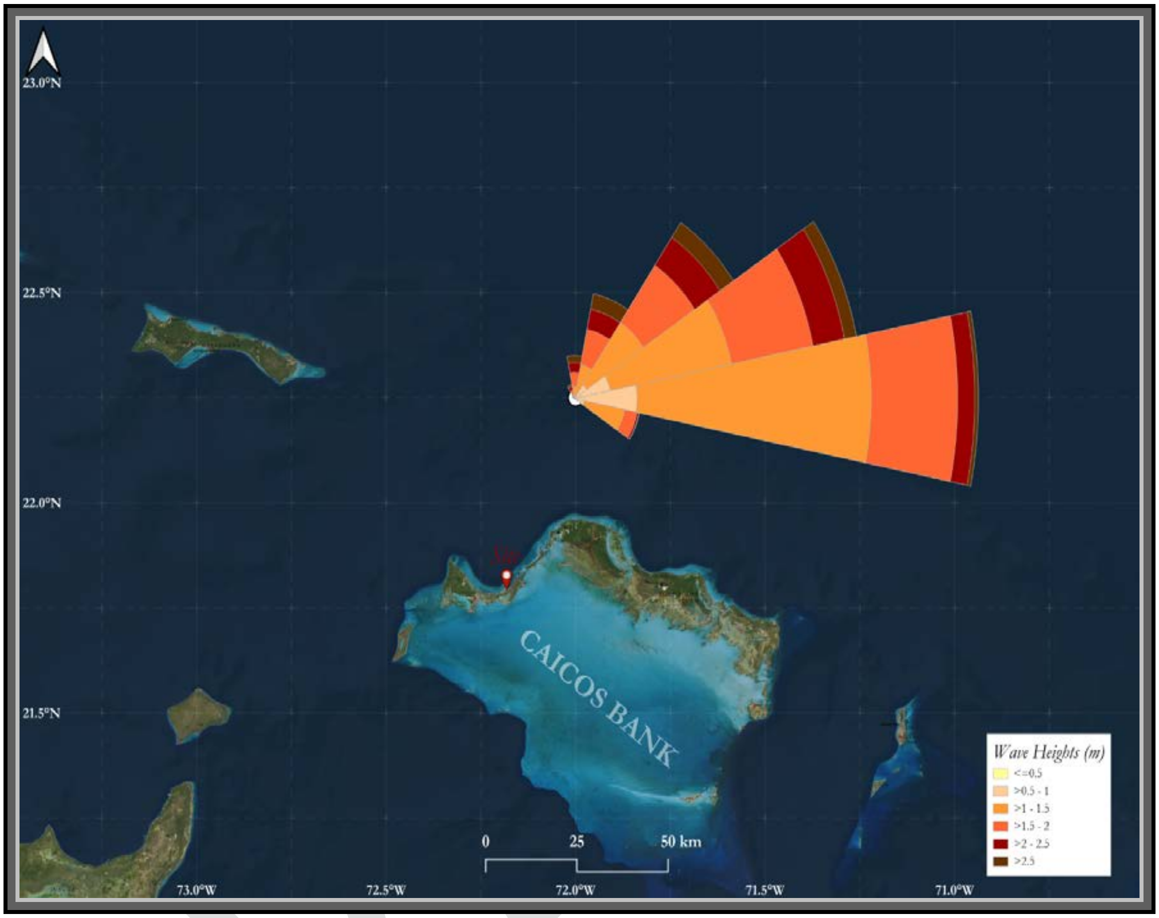

Figure 24.0: Offshore location where ERA5 data was extracted to describe the wave climate.

The 43 years of wave data were averaged to determine how the offshore wave height data varies throughout the year. The results are shown in Figure 25.0. July through to November have the widest range of wave heights with September recording the highest outliers of wave conditions (grey circles showing the top 1% of waves). This is to be expected as this period coincides with the hurricane season. Average monthly wave heights were between 1.2m and 1.7m across all the months. June had the lowest average wave height and the lowest range of values.

Typically, the tourism season in the Caribbean falls between November and April. At that time the average wave heights are higher than the rest of the year (about 1.7m), however the outlier conditions are less severe. The maximum wave height in the period was about 6.5m in the month of November. The maximum condition overall was 9.7m, which was related to the passage of Hurricane Irma in September 2017.

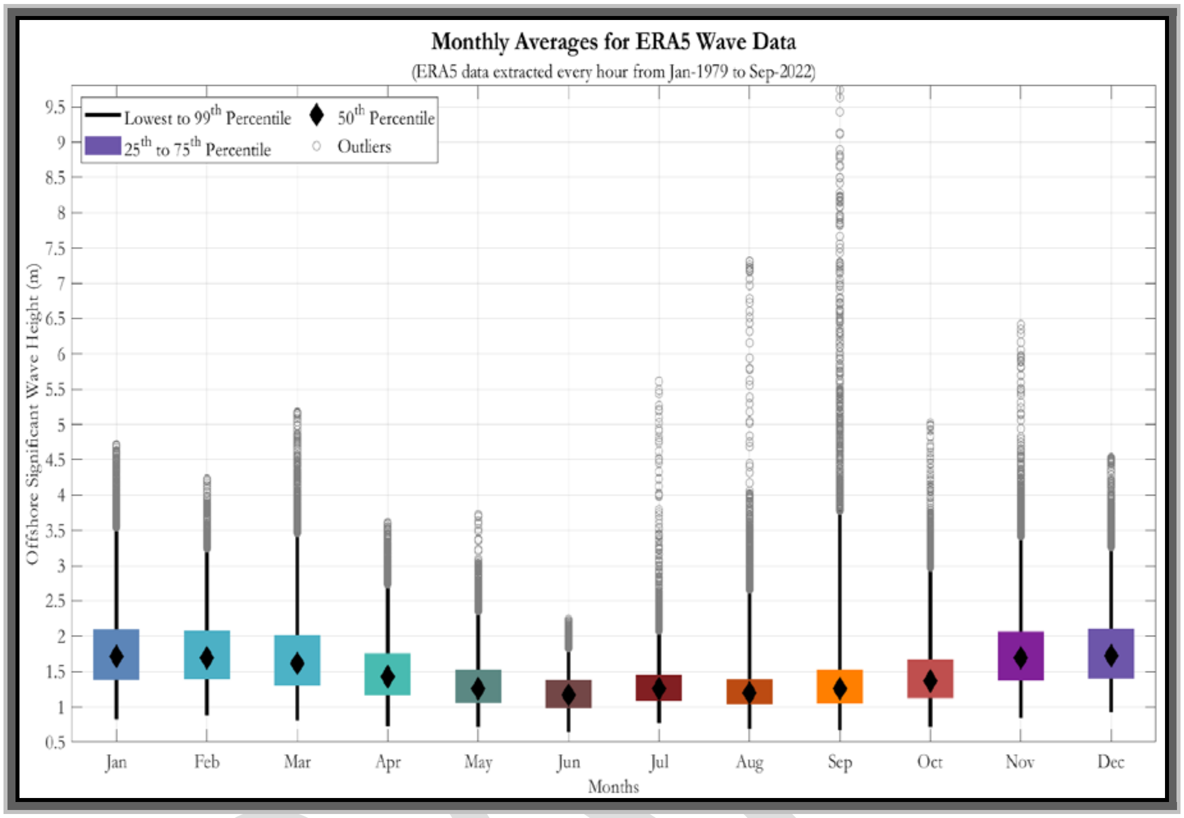

Figure 25.0 - Monthly statistics of the data extracted from the ERA5 node

The wave data obtained from the ERA5 node were categorized using a tri-variate frequency analysis of wave height, period and direction, a process also known as "binning". This frequency analysis resulted in 498 different conditions or "events" representing a combination of wave height, peak period, and direction, each with a specific duration related to the number of occurrences over the 43-year period.

The ERA5 model is usually applied on spatial scales (grid increments) larger than 30km and outside the surf zone. As a result, the model alone is not at a sufficiently detailed scale to provide accurate nearshore wave data for the property. The project area's nearshore wave climate was therefore developed using a spectral wave model MIKE 21 SW (described in Appendix V) to simulate waves as they approach from the directions extracted and then move over the offshore bathymetry of the island to reach the project shoreline. The model was run in a semi-stationary mode with inputs of the wave heights, periods, and directions along the boundaries of the model domain. Boundary locations are shown in Appendix V.

The resulting nearshore wave climate data are plotted in Figure 26.0 as wave roses that show how wave heights vary across wave directions.

Figure 26.0: Nearshore wave roses extracted from statistical binning simulations.

Wave conditions were extracted at five locations in the nearshore of the project site and neighbouring properties. The points were in similar water depths of about 2.5m. The wave roses give a representation of the annual wave climate inclusive of swells. Overall results indicate that the wave directions vary within the bay. For each point there are one or two directional sectors in which larger waves are seen while the other sectors typically have waves lower than 0.2m in height.

The reef formation induces the partial breaking of waves to the west of the project area. The most westerly wave rose (W1) shows that waves typically approach from the north-north-west with waves up to 0.45m. At this wave rose the reef is parallel to the shoreline, which refracts the waves into one dominant direction. The waves approach the shoreline at an angle, which impacts the movement of sediment in that area. At the headland, a wave rose W2 shows a variety of wave directions from northwest to northeast. Typically, the larger waves (mainly up to 0.45m) come directly from the north. The waves from the north-north-west are below 0.3m and other sectors are below 0.1m. The variation in wave direction is linked to the shape of the reef changing to be more oblique to the shoreline.

A wave rose was extracted just in front of the project site and shows that waves mainly approach from the north with wave heights typically ranging from 0.1 to 0.5m. At this point along the bay, there is a break in the reef that results in deeper water and larger waves. As a result, the waves diffract through the break or gap, which leads to a spreading outward of the wave directions. This is seen where the dominant wave direction changes from W3 to W4 and W5.

At W4 the dominant wave direction is from the north-north-west while the dominant wave direction at W5 is from the north-west. Waves at W5 were higher than the other wave roses with values above 0.5m in some cases. This is to be expected as this section of shoreline is more exposed to offshore waves than the other areas.

Key wave climate results are plotted in Figure 27.0 as areal plots. The figure shows the median annual wave climate to the left and the 99.86th percentile waves to the right. The 99.86th percentile wave represents the conditions exceeded 0.14% of the time, equivalent to 12 hours per year. This gives a representation of a more extreme wave climate inclusive of swells.

The median annual climate shows that waves typically come from the north onto the project site. Towards the west, the mean wave direction outside of the reef and inside of the reef are quite similar. To the east however, the effects of diffraction through the gap in the reef can be seen as the offshore northern direction becomes north-north-east and north-west at the shoreline. Average wave heights outside of the reef were about 0.4m. In the shallower nearshore region, the average wave height was 0.1m, which would reflect a generally calm beach area.

The simulation of 99.86th percentile waves represent a possible strong swell event. Since the wave directions can be different for various wave heights, only the wave heights are plotted in the results. Generally, a perpendicular wave direction at the shoreline would produce the most erosion and may be assumed in this scenario. The 99.86th percentile waves show the effects of the gap in the reef. West of the shoreline there is more breaking of the 2.5m offshore waves to 0.8m in lee of the reef. Near the gap, there is less breaking of waves and the wave heights are about 1.7m nearby. Fortunately, the project site is sheltered from the larger waves that come through the gap. At the project shoreline, the waves were 0.2m while the wave heights were up to 0.6m at properties 800m to the east.

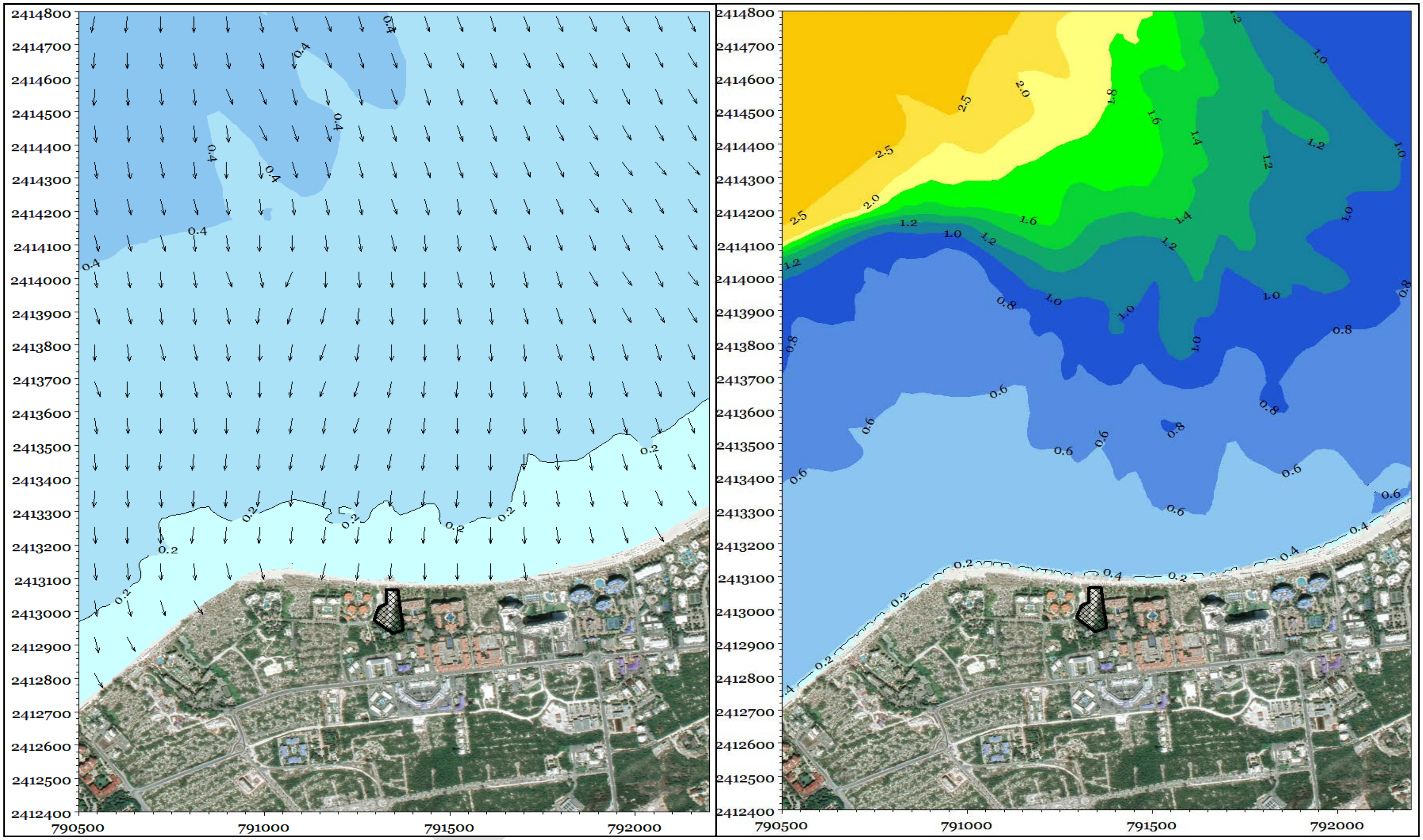

Figure 27.0: Daily wave conditions (left) and 99.86th percentile conditions (right) under baseline conditions.

2.5.1 Currents and tides

A review of the literature indicates that the main current stream around Turks and Caicos Islands is the Antilles Current to the east. This current is a branch of the North Equatorial Current that runs along The Bahamas and Turks and Caicos then towards the north-west. Afterwards, it merges with the Gulf Stream closer to the continent of North America. This current is said to be highly variable in magnitude, nutrient-rich, and rich in fish species such as Mahi.

The Antilles Current and surrounding streams are shown in Figure 28.0. The current is not studied as often as the stronger nearby Gulf Stream. In 2019, the variability of the ocean current was assessed for a period of over 10 years, which was measured with five different methodologies. Results indicated that there was no immediate seasonal link to the flow of the current with a key finding being that the flow was predominantly to the north-west in August to September (Meinen et al., 2019).

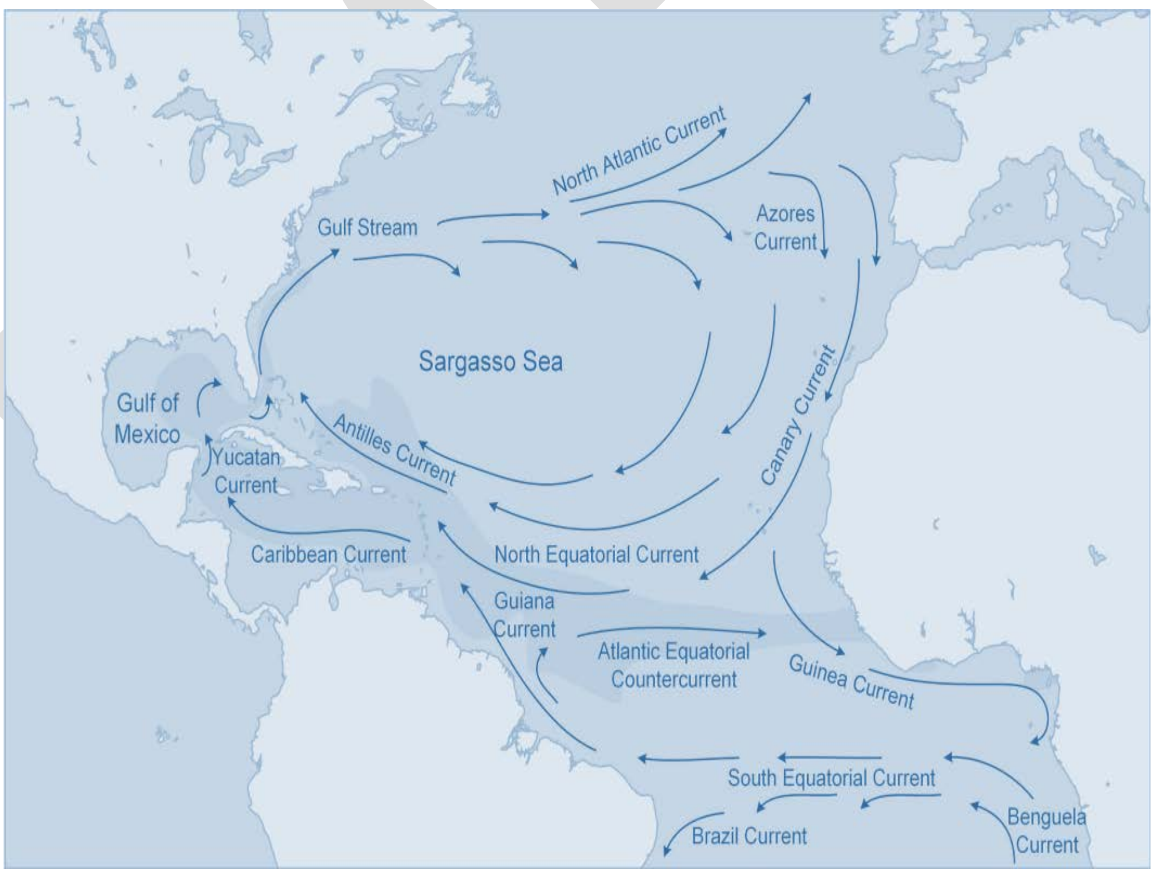

Figure 28.0: Dominant Ocean currents in the Northern Atlantic Ocean

Global Tide Model

Global tide models exist and are generally accepted as sufficiently accurate for investigations of this scale. Typically, these tide models are based on harmonic analyses of measured tide gauge data, or from processed satellite observations. An example of a month's worth of tidal data is shown in Figure 29.0. The tidal signal has an unequal semi-diurnal pattern. This means that over a day there are two high tides of different magnitudes and two low tides, also with different magnitudes. The signal and magnitude match the general literature on the area, which designates the regime as a micro-tidal (Sealey et al., 2019).

The tidal signal over a month highlights the presence of spring and neap tides. During spring tides there is a larger difference between the high tide levels in a day; while in a neap tide, the higher tide levels are closer in magnitude and generally half the magnitude of the neap tides. The tide signal changes from Spring to Neap every two weeks. Typically, the spring tides in the area vary between -0.42m and +0.55m (tidal range of 0.97m). Neap tidal levels are between 0.27m and -0.2m (0.47m tidal range).

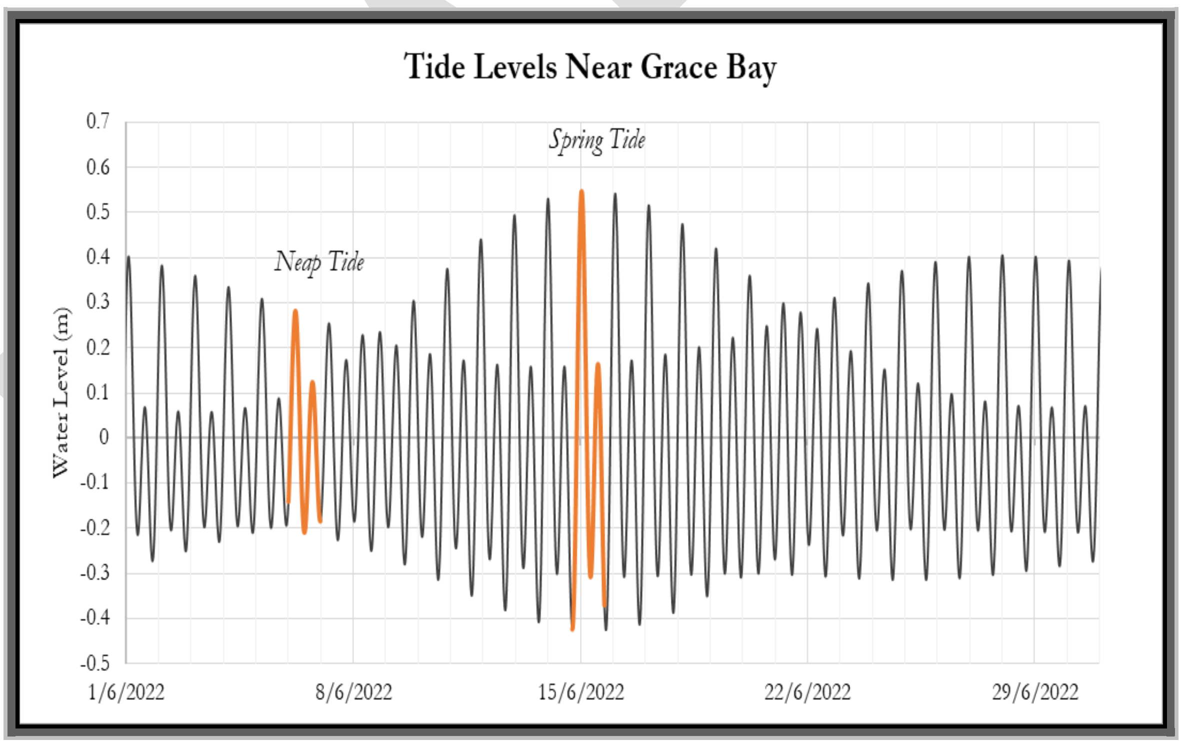

Figure 29.0: Predicted tide levels near to Grace Bay in June of 2022

Water levels from the DTU global tide model were used as inputs to force the numerical model and derive daily currents around the project area. Unfortunately, the global model may not adequately capture the long-term fluctuations of the Antilles Current.

That level of modelling would require a long-term measurement program of currents in the nearshore of the property. Such an exercise is outside the scope of this project.

Nearshore Tidal Currents

Operational hydrodynamics were modelled over a 40-day simulation period to include both spring and neap tides throughout a monthly cycle. The simulation ran from 1-15 June 2023. The inputs to the model were spatially varying water levels and current forcing from the DTU tide model. Tidal water surface elevation ranged from a maximum of 0.52m in the spring signal to 0.25m in the neap signal. This combination was used to represent typical conditions in the bay.

The inputs to the model were real time wave data from the ERA 5 deep water wave model coupled with spatially varying water level forcing from the DTU tide model. June was chosen because the wave data shows that this month typically has lower energy waves. This would better isolate the possible tidal effects on the Grace Bay area. Deep water wave heights were an average of 1.2m and approached from the north- east and east sectors. The wave conditions near to the project site were like the average wave climate conditions, with wave heights between 0.2 and 0.25m in the nearshore of Grace Bay.

Current speeds and directions were extracted and are plotted in Figure 30.0 and Figure

31 for different stages of the tide (ebb/falling tide and flood/rising tide) throughout the 40-day simulation period.

During a typical spring cycle (Figure) the following is noted:

- Current directions were similar for the falling and rising tide. Outside of the reef, the currents flowed in an east to west direction. In both instances, there was a circular current (gyre) at the reef crest. During the falling tide the gyre was within the gap of the reef while during the rising tide the gyre shifted to the west and was closer to the reef's edge. Along the shoreline, the currents flowed from east to west in both instances.
- Current speeds were similar in both the falling and rising tides. The highest currents were at the reef and likely related to waves breaking there; the speeds in this location were up to 0.15m/s. At the shoreline, the current speeds were highest at the western headland and quite low at the project site. During falling tides, current speeds were about 0.05m/s and during rising tides the speeds were about 0.1m/s at the project shoreline.

During a typical neap cycle (Figure 31).

- Current directions were like those for the spring tides. The dominant offshore current direction was east to west. A gyre was present for both instances with the rising tide having a more concentrated gyre than the falling tide. Within the coastal zone, the currents flowed from east to west for both the falling and the rising tide.
- Current speeds were lower in the falling tide than the rising tide. During the falling tide, the current speeds were generally lower than 0.05m/s in the bay. During the rising tide, the current speeds were highest at the reef crest with a speed of 0.2m/s. Within the bay, the speeds were between 0.1 and 0.15m/s by the headland and lower than 0.05m/s to the east. Along the shore, the current speeds were highest at the headland and very slow at the project site. For both instances, the current speeds were minimal with values between 0.05 and 0.1m/s.

Generally, the presence of a similar current pattern at the different stages of the tide shows that the tidal regime in the wider study area is governed by wave breaking and has a smaller impact from tidal currents.

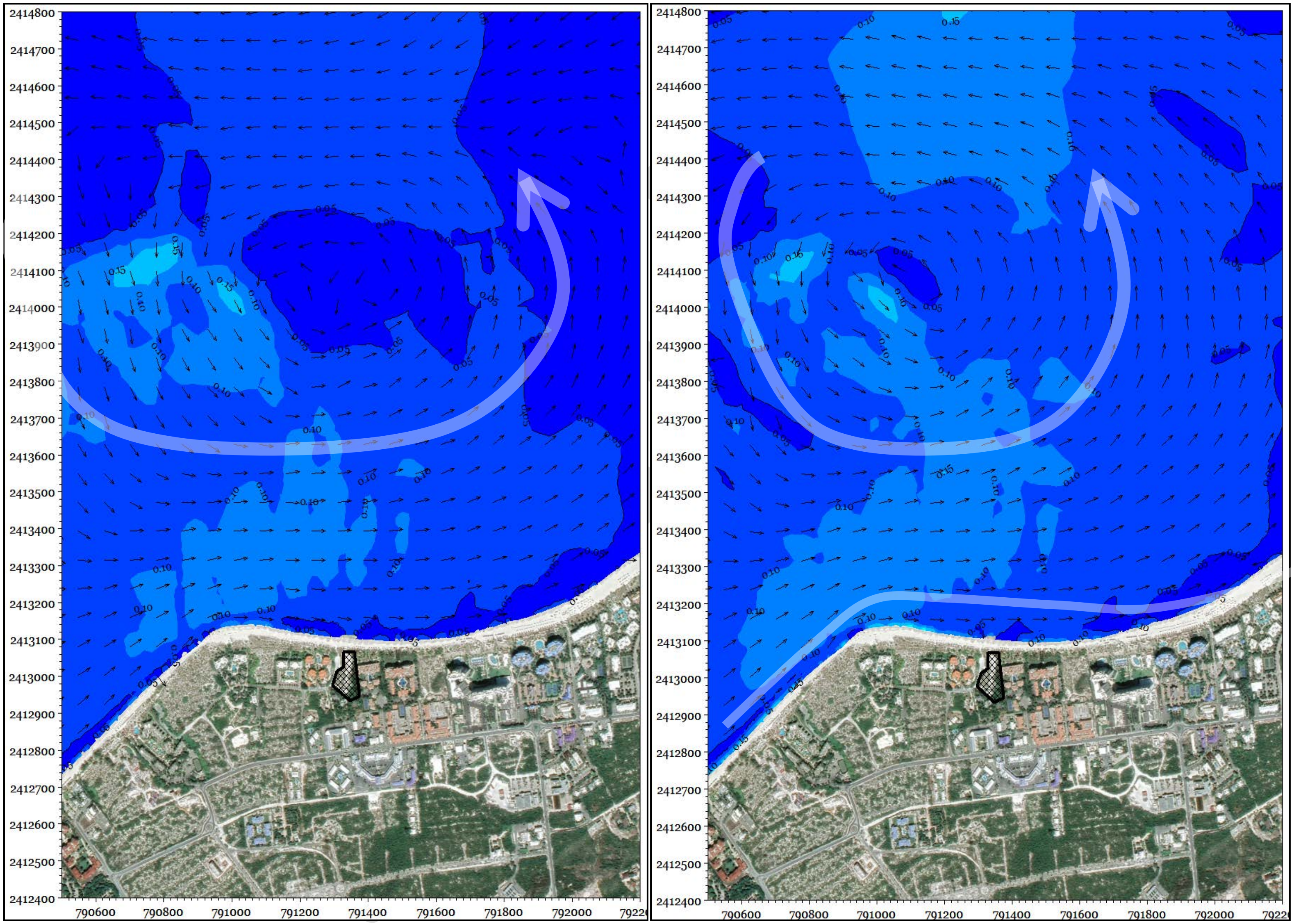

Figure 30.0: Tidal currents under spring tides in falling (left) and rising (right) under baseline conditions

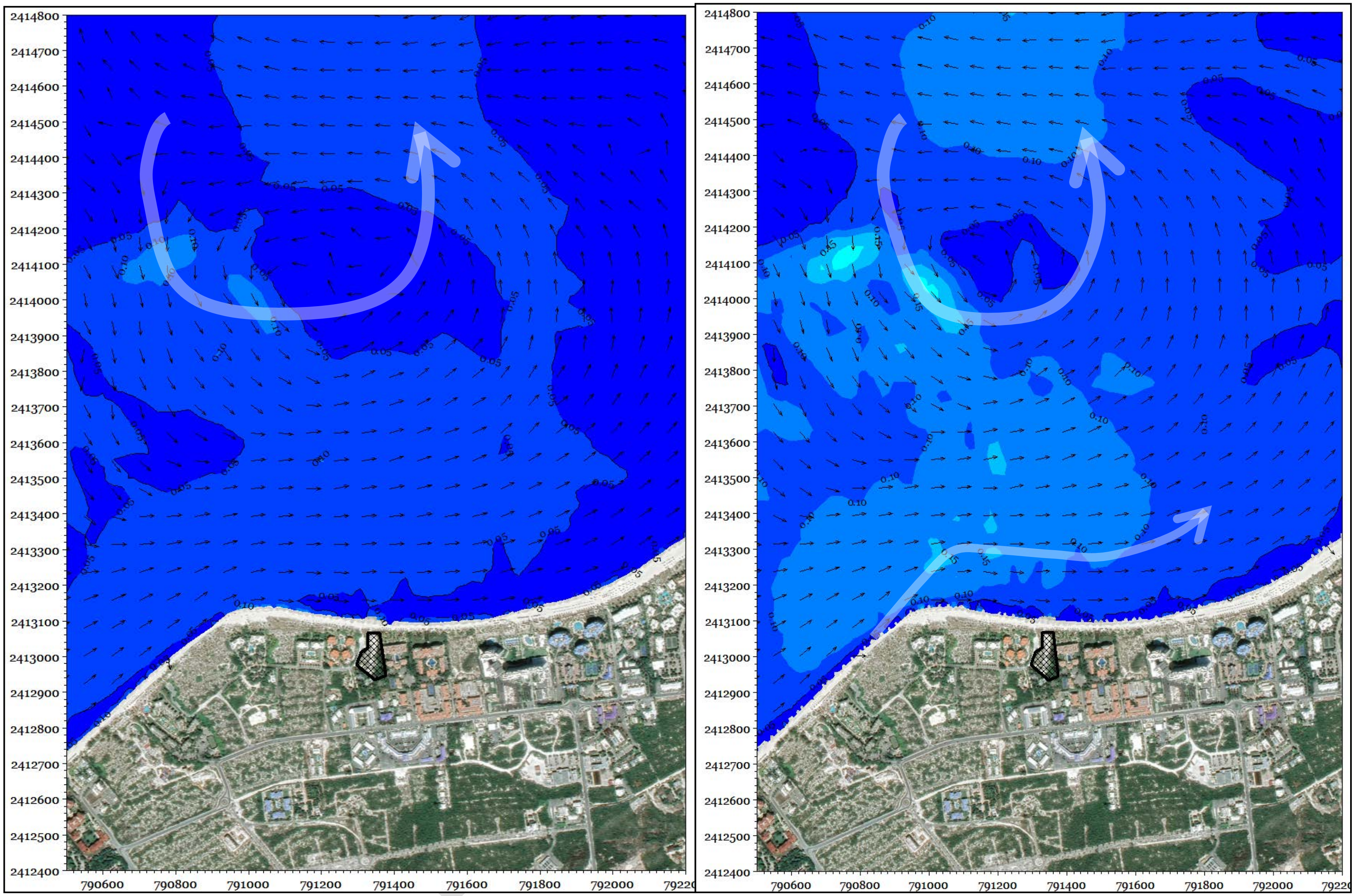

Figure 31.0: Tidal currents under neap tides in falling (left) and rising (right) under baseline conditions

From the previous results, there are slow currents in the bay during a low wave simulation with tidal currents. The balance between tides and wave effects determine which phenomenon governs on a coast (Davis & Hayes, 1984). The graph below can be used to discern the dominant feature. Using the Total Tide Tool, the mean tidal range for Turks and Caicos is calculated as 0.5m. The daily wave climate shows that nearshore waves are about 0.3m (30cm) in the bay. This would produce a mixed energy – wave dominated regime.

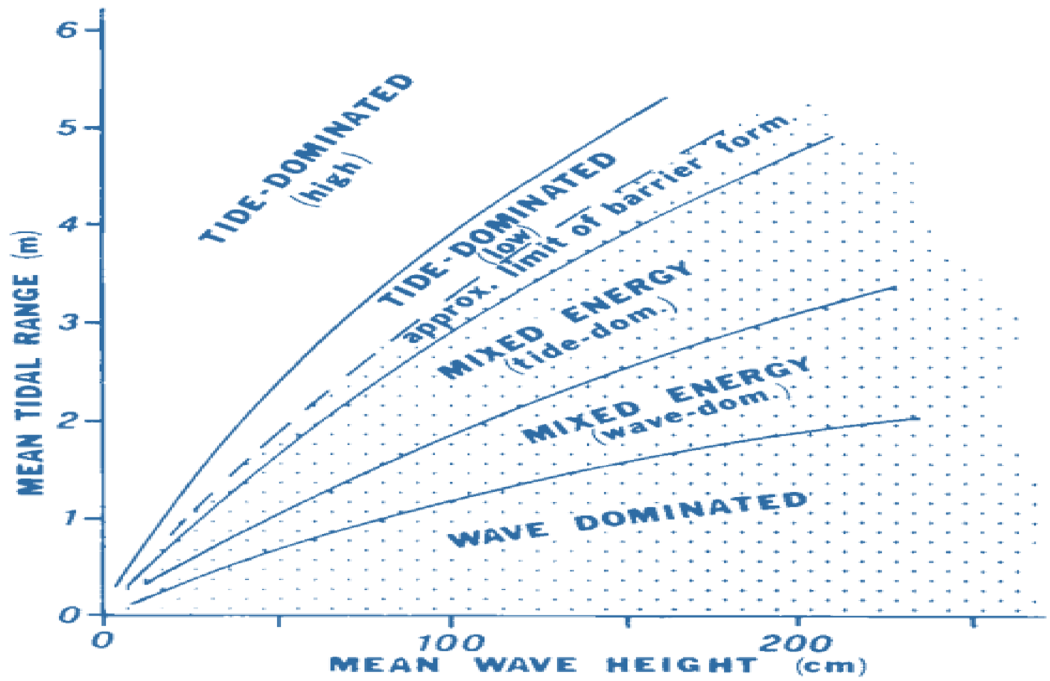

Figure 32.0: Curves used to determine whether the coast is wave dominated or tide dominated adapted from Davis & Hayes, 1984

To further investigate these effects, the binned conditions described prior were run in a coupled mode to determine the wave-generated currents for each case. The results for the mean wave-generated currents and the 99.86th percentile currents are shown in Figure 32.0. The mean wave-generated currents show a different current pattern in the nearshore of the property, with currents flowing in an east to west direction. The current speeds are still quite low with 0.05 to 0.1m/s in the nearshore of the project site.

The more severe condition of 99.86th wave-generated currents show much higher current speeds over the entire bay, particularly at the reef, where there were currents speeds of about 0.9m/s. In the nearshore, the currents were an average 0.3m/s. Close to the project site the wave heights were up to 0.2m/s.

The overall speed of these currents provides further support that the area is wave-dominated. Wave-dominated regimes are typical of the Caribbean, where most mean tidal ranges are below 0.8m (Kjerfve, 1981).

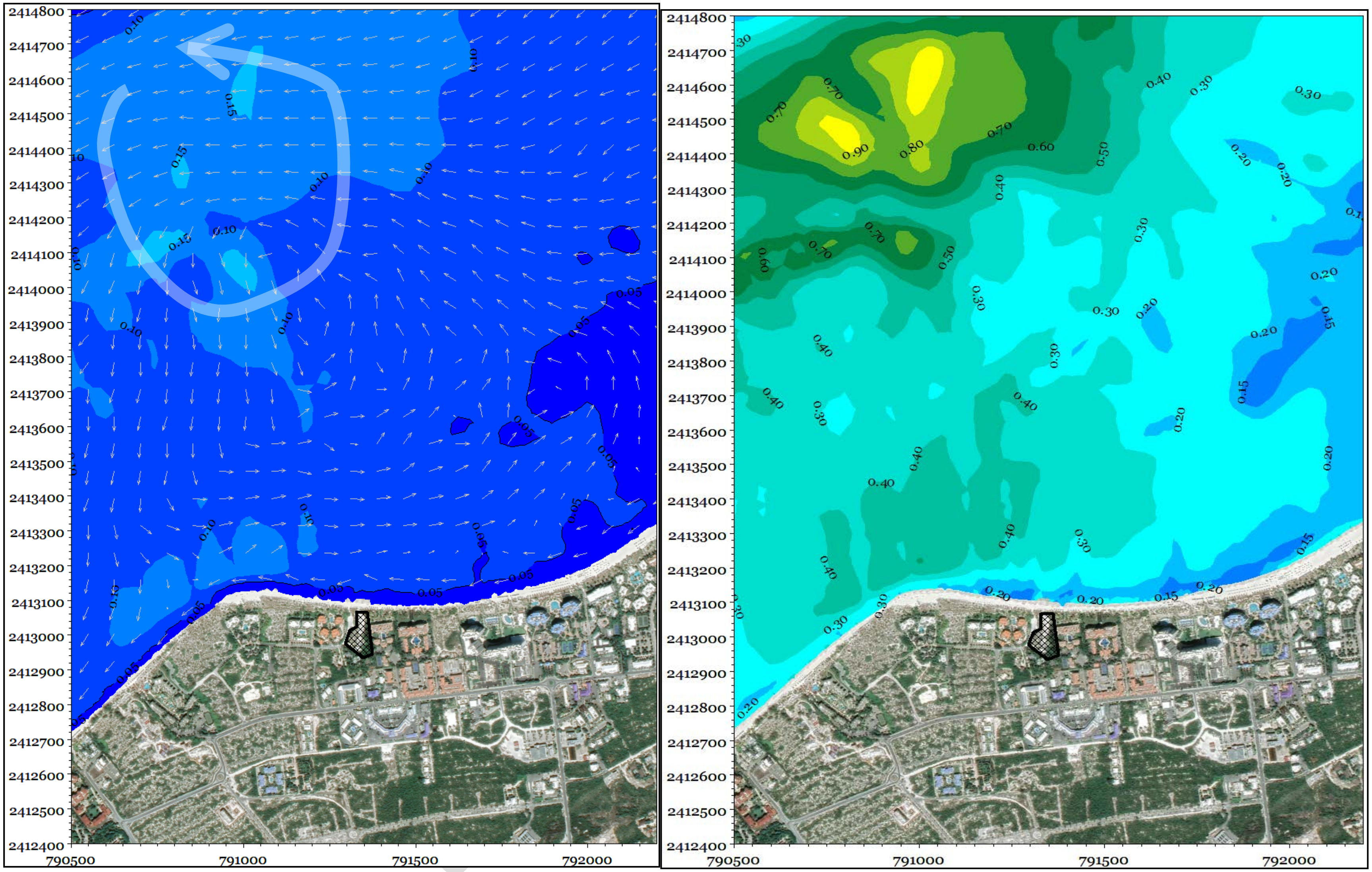

Figure 33.0: Wave generated currents for the mean conditions (left) and the 99.86th percentile (right) under baseline conditions.

The predominant currents in the bay will influence the long-term sediment transport in the bay. This topic is explored further in the following section.

2.5.2 Sediment transport

Sediment transport occurs on multiple scales that affect the stability of a beach. In the long term (multiple years) it is typical to have net transport along the shoreline. As the name transport suggests, sand grains move along the nearshore depending on the dominant drift direction. To maintain a beach, the sand flowing into a beach area and the sand flowing out should be in equilibrium. If there is an imbalance, there will either be accretion or erosion.

In the short-term (a few days) high energy swells can erode beaches. These long period waves churn up sediment in the water column and deposit the sediment further offshore. Fortunately, the erosion that is seen after a swell event is typically not permanent as the long-term patterns of sediment transport would slowly move the offshore sediment back onto the beach area.

Two methods have been used to assess sediment transport in the study area. The first method assesses long term transport parallel to the shoreline and the other simulates a swell event.

Long Term Sediment Transport Patterns

Sediment transport along the shoreline was analysed by performing sediment transport modelling for a profile line that ran through the property. The profile end was within the bay so that the effects of the reef were already considered. The program LitDrift was used to calculate the longshore sediment drift in the area. The inputs to the program were annualised wave conditions at the end of the profile, the depths along the profile and the sediment grain size properties.

Figure 34.0 shows the profile location and wave conditions at the end of the profile as a wave rose. The results indicate that over a typical year there is about 123,500m^3 of transport to the west and 2,000m^3 to the east. The higher transport to the west is related to more waves approaching from the north-eastern sector. Additionally, mean currents were previously shown to move in an east to west direction, which would drive westerly transport.

The highest frequency of waves came from the north, which is almost perpendicular to the coastline. Perpendicular waves are more likely to generate movement across the profile, for instance moving from the back of the beach to the shallow nearshore. The LitDrift program does not consider this mode of transport in its calculations. To overcome this limitation, a perpendicular swell event was also modelled to investigate how the sediment would move perpendicular to the shore.

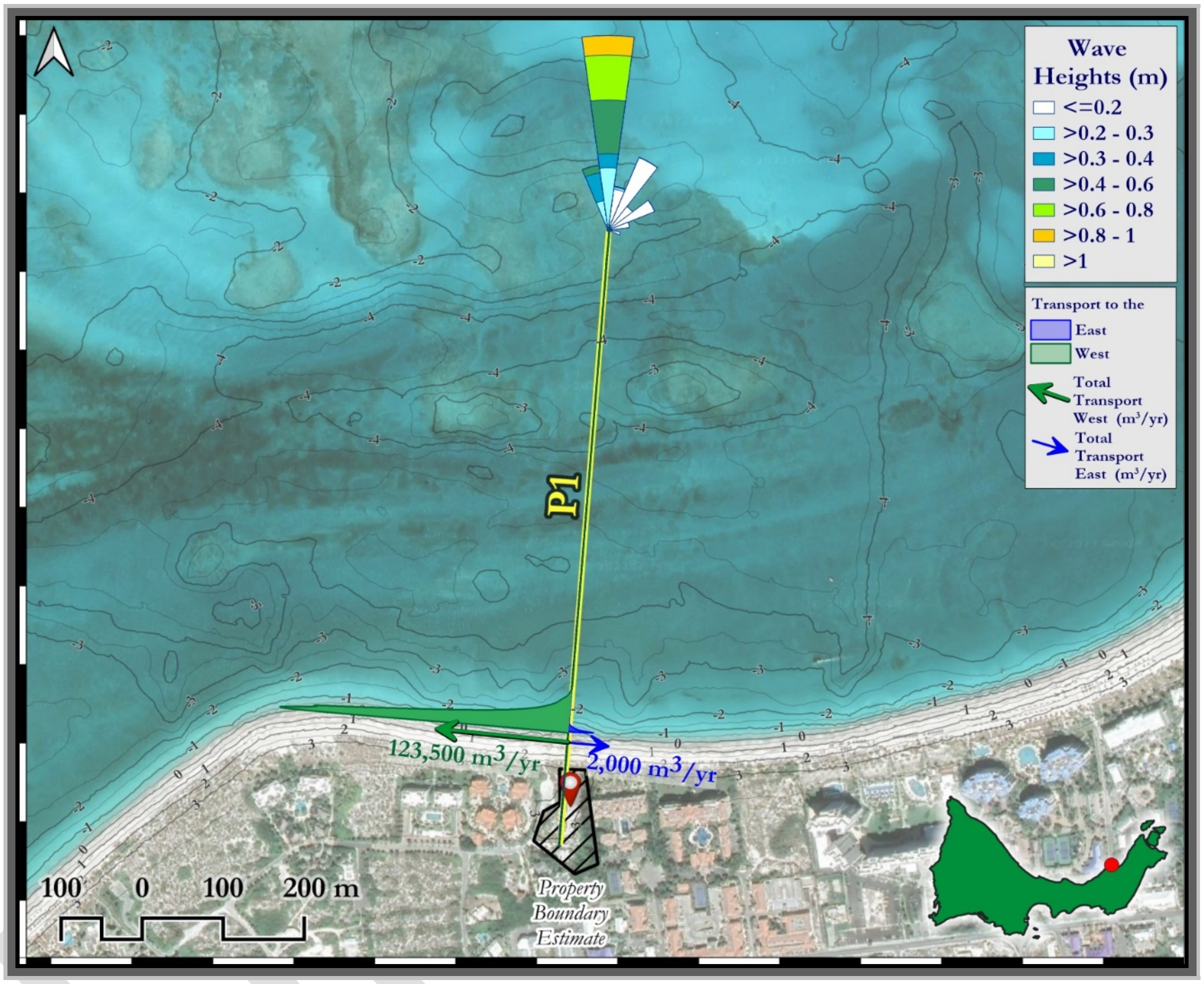

Figure 34.0: LitDrift results along the profile showing sediment drift to the west and to the east.

The cross-shore profile results (shown to the left of Figure 35.0) indicate that most transport happens within 50m of the waterline. This area has a maximum depth of about 3m. The most active section of the profile is between the waterline and 15m seaward. This is where waves would break (at an angle) and move sediment in either a westward or eastward direction. The wave condition results show that wave conditions from the north-north-east with wave heights lower than 0.5m (at the profile end) are most frequent and generate the most transport.

The wave conditions that generate 80% of the sediment transport in the nearshore are highlighted in the right side of Figure 35.0.

The wave height and wave direction plots also show their duration each year. Only the first five conditions have a duration over 2% however, they are not responsible for most of the transport. The conditions that follow are less frequent, but they move more sediment to the west or east. From this figure one can see that the larger sediment movement events come from less frequent events such as northern winter swells.

Overall, the results support the formulation of the headland to the west and are typical for a bay experiencing wave diffraction from a reef gap offshore.

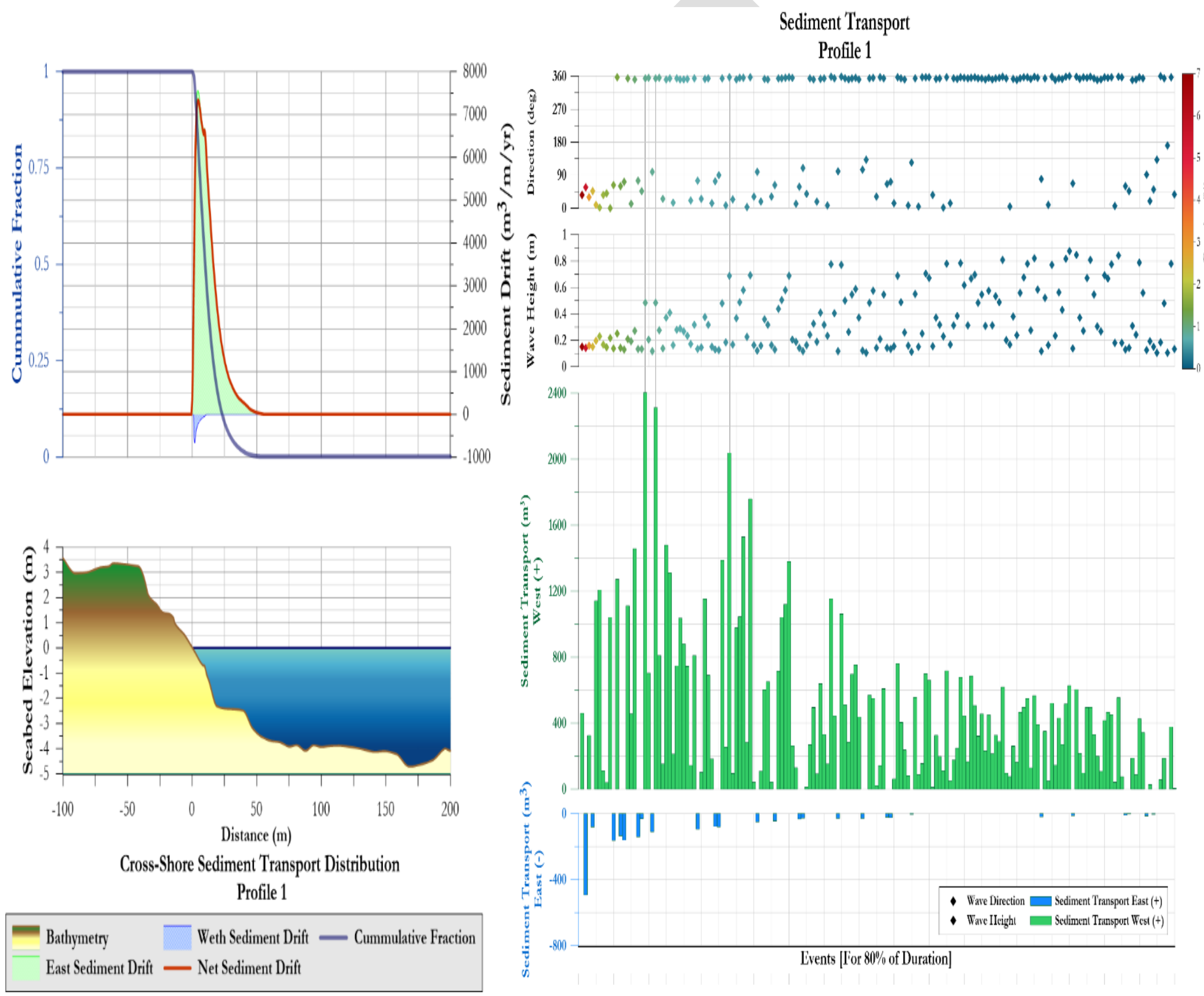

Figure 35.0: Cross-shore results to show where transport occurs and wave conditions to show what wave properties generate sediment movement.

Swell Event

During the months of November to April the Turks and Caicos Islands and the wider Caribbean are subject to swell waves. Swell waves originate from storms in the northern Atlantic Ocean and propagate to the islands. Swells can cause significant erosion and approach from a direction (north) that is not typical for the coast in question. Grace Bay is susceptible to these effects because the orientation of the shoreline is perpendicular to swells, which cause the most severe impact.

To assess the impacts associated with swells, an energetic wave event was simulated. This process began by filtering the ERA5 database to find swell events. The results showed that one of the top events occurred from 4-7 March 2018. This event had wave heights between 3m and 5m offshore, peak wave periods of about 14s and approached from the north for most of the event. The time series of the event has been graphed below in Figure 36.0.

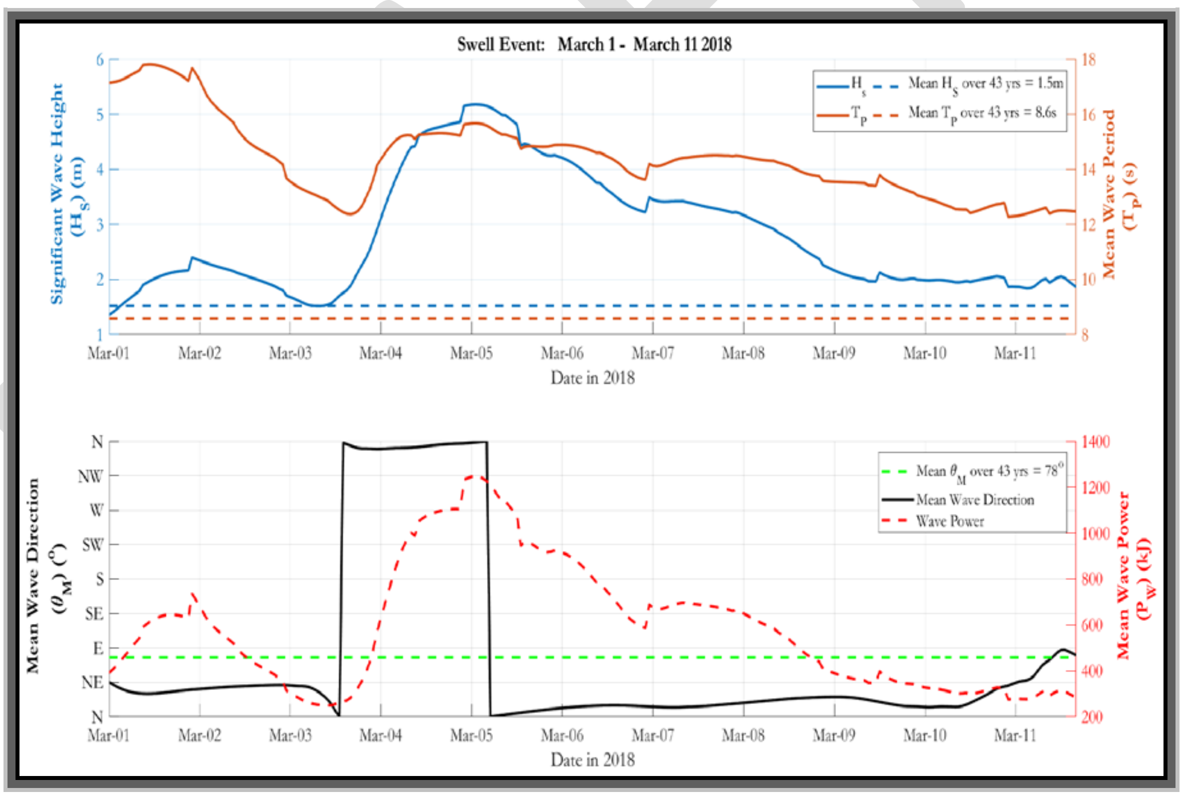

Figure 36.0: Swell event of March 2018 wave conditions

The wave conditions described above were run across the island of Providenciales using a coupled MIKE 21 model. The model included hydrodynamic (water surface), waves and sediment transport modules. The results of the simulation are shown in Figure 37.0 and Figure 38.0. The wave height and current results were taken from the peak of the event and the sediment transport results were extracted at the end of the simulation.

The current speeds were largest over the reef with speeds between 0.7m/s and 0.9m/s. Within the bay the current speeds were up to 0.4m/s at the headland and 0.3m/s in the nearshore of the project site. Current speeds along the shoreline of the project site were slow (below 0.1m/s). In the bay, the currents flowed from west to east. The current direction pattern was like the typical tidal current direction, with the magnitudes being significantly greater.

Waves outside of the reef were about 3m high. As seen in previous model results, the effect of the reef was seen to the west of the project site where the offshore waves rapidly decrease as they interact with the reef system. The gap in the reef to the east allowed for higher waves to enter the bay. In the figure, this can be seen with the wider spread of colours representing waves between 1m and 3m on the eastern side. Wave heights were up to 0.3m at the project shoreline. The offshore wave direction was from the north-west at this timestep. Around the property shoreline, the waves approached from the north, which would be almost perpendicular to the shoreline and generate the most sediment movement.

The sediment movement at the end of simulation (Figure 35.0) shows areas of erosion (yellow to red) and areas of accretion (green to blue). Generally, sand was eroded from the back of the beach and deposited at the base of the swash zone. There was erosion of up to 0.3m at the waterline near to the property. Results of the simulation also show erosion along neighbouring properties of up to 0.3m.

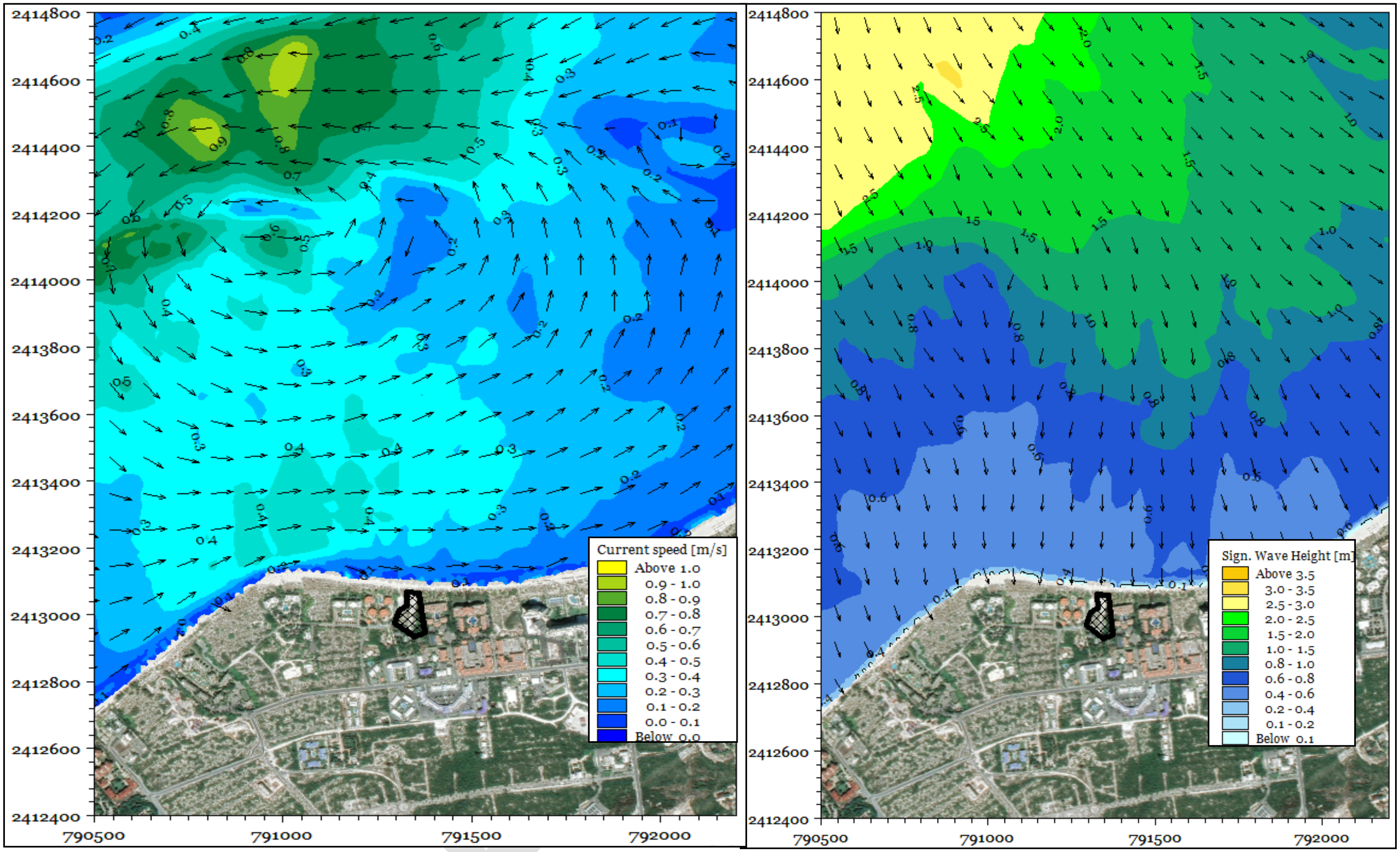

Figure 37.0: Swell event simulation results at the worst timestep

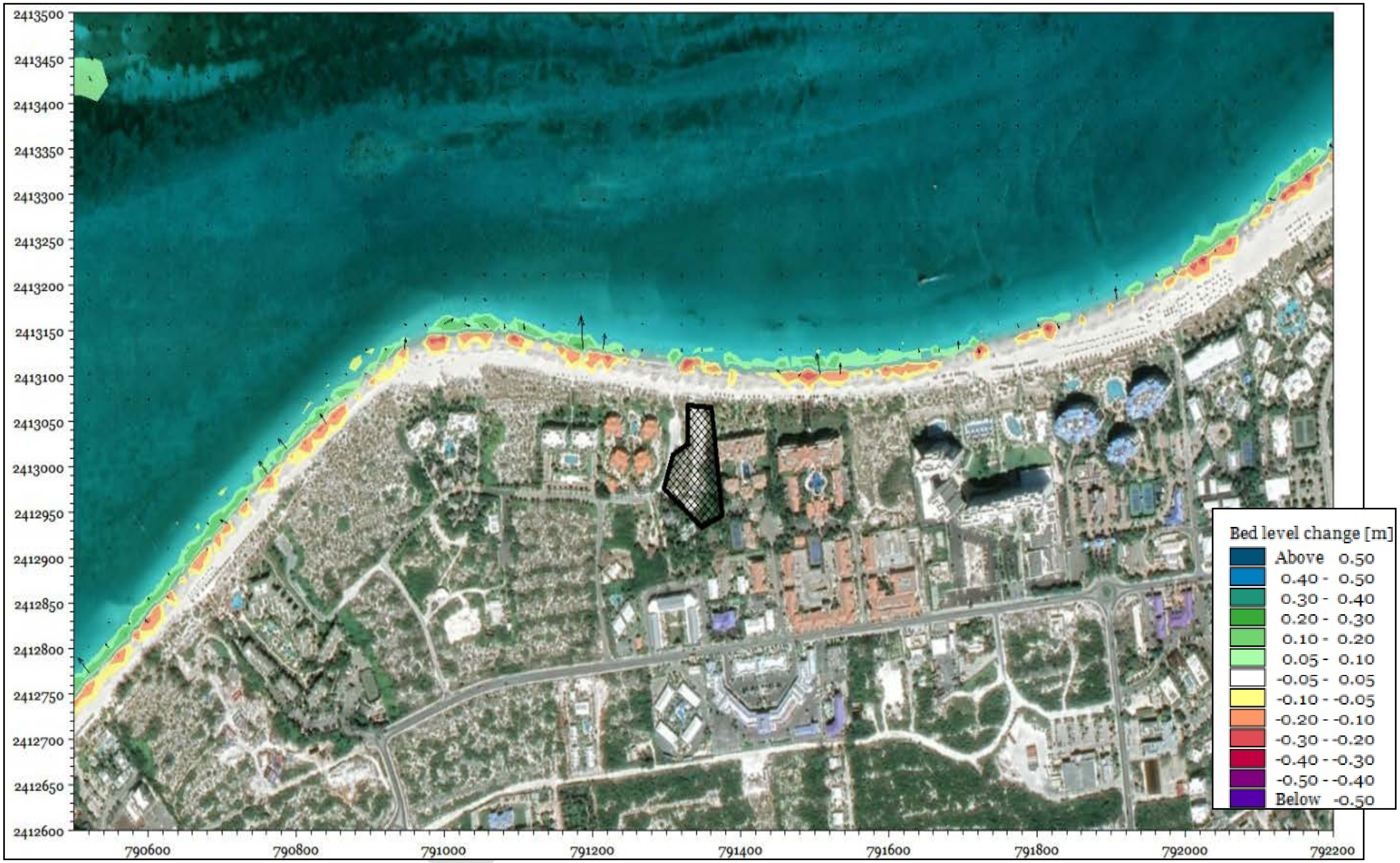

Figure 38.0: Swell event simulation results for bed level change at the last timestep

The swell simulated represents a very severe event that has been exceeded only a few times in the dataset. This event was chosen to simulate an almost worst-case scenario for swells, which is necessary as climate change impacts increase. Soon, hotel patrons and owners are likely to experience smaller magnitude swells and thus smaller impacts.

Wave Run-up on Beach Slopes

An important consideration during swell events is wave run-up on the site. Wave run-up occurs when a wave breaks, and a portion of the remaining wave energy runs up the face of the shoreline. The elevation of the run-up is dependent on the surface characteristics of the "swash zone". If this area is a smooth impermeable beach, a higher run-up can occur. Conversely if a rough armour stone slope or a vegetated surface is encountered, the run-up would be reduced.

Due to the localized variability of wave run-up and the fact that it is a dynamic component, storm surge computations do not typically include wave run-up. It is, however, calculated and used in the design of coastal structures. Figure 39.0 shows both static and dynamic components of the storm surge which, when added together, produce the final inundation levels for consideration.

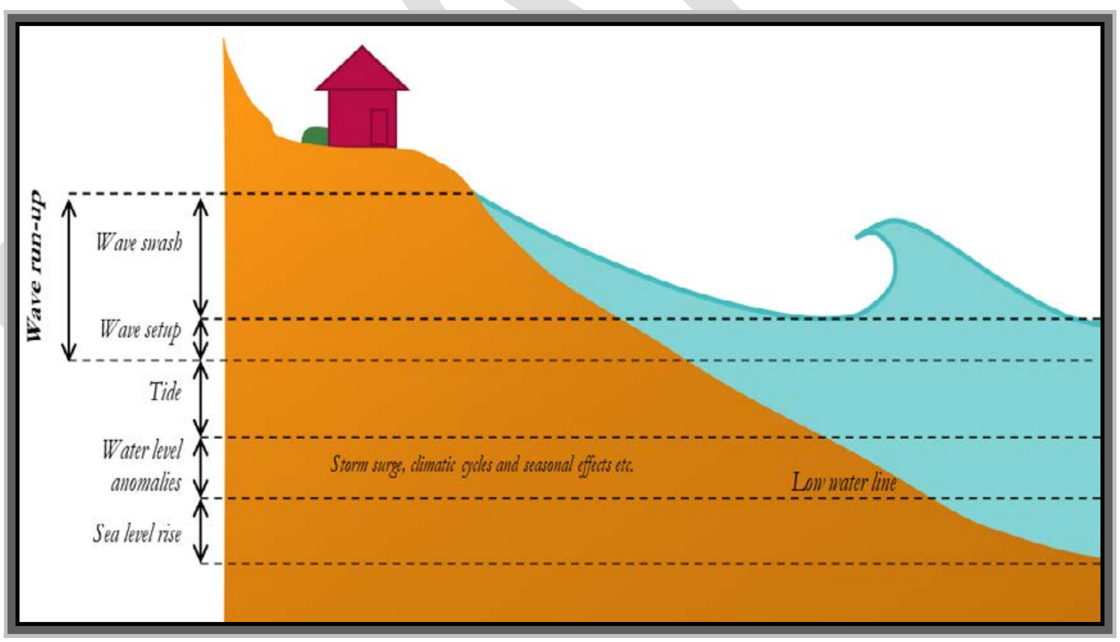

Figure 39.0: The water level components that contribute to coastal flooding adapted from (Vitousek, et al., 2017)

The SEFAMM beach area has moderate slopes of about 1(V):12(H), which would increase the likelihood of waves running further up onto the slopes. The beach profiles show that there is a dune present with elevations up to 3m near the property boundary.

Moving inland, the topography has a lower area on the property with elevations of around 2.5m. It is important to check wave run-up and overtopping on this property to properly quantify the highest run-up level and possible inundated areas on the site.

XBeach (Roelvink, 2009) was applied in a one-dimensional format to simulate the storm-induced water level changes for the design events detailed in the prior sections. One profile was taken within the property boundary of the site (Figure 40.0). The profiles were extracted using a simple routine in GIS software that merged the topographic data, bathymetric tracks and EOMAP satellite-derived bathymetry. The data was interpolated to provide a one-dimensional profile that extend perpendicularly from the shoreline to about the 3m depth contour along the project site and input to the XBeach model.

Wind and wave parameters were extracted from the MIKE 21 swell model at a location near the end of the profile. The parameters were then formatted and used as input for the model. The model uses a non-hydrostatic formulation for the water surface that makes it suitable for modelling beach and dune erosion. The sediment characteristics (shown previously in Table 13.0) were also used in the model to properly predict sediment movement.

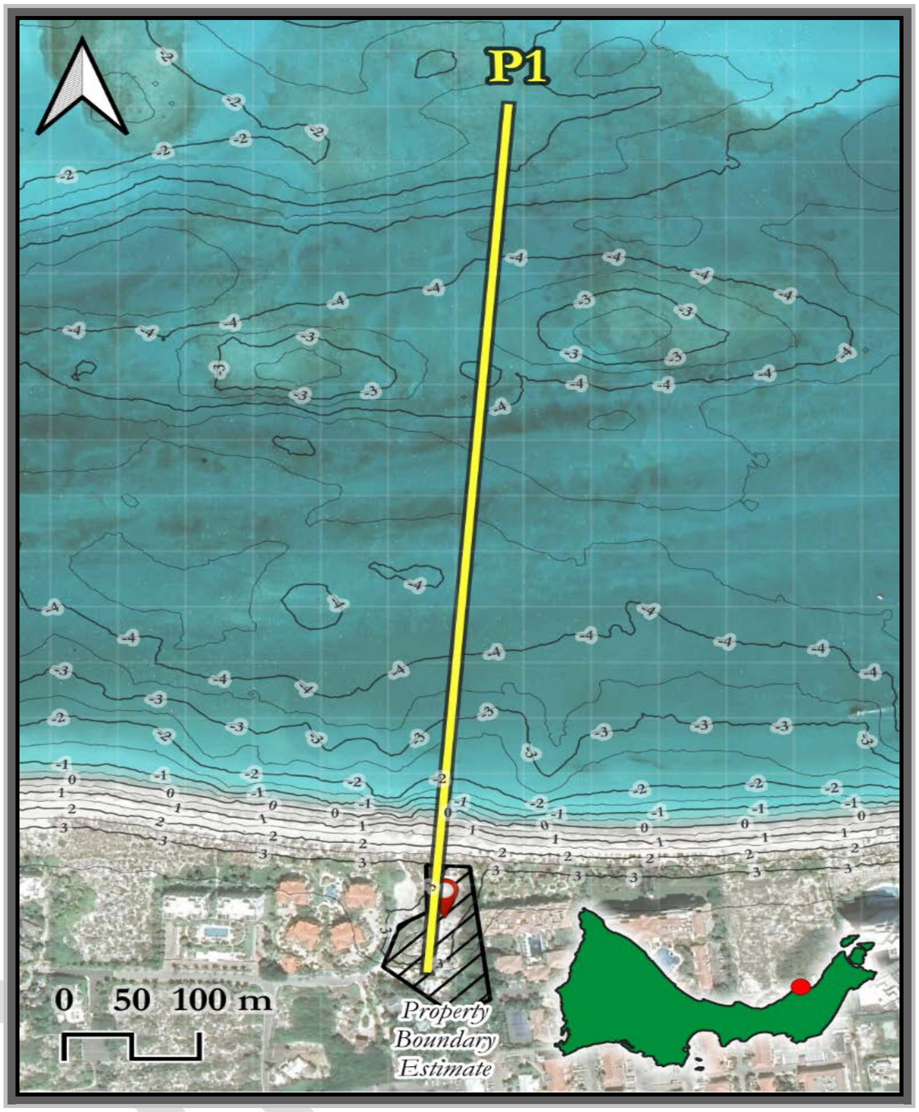

Figure 40.0: XBeach profile used to assess wave run-up on the SEFAMM property.

The results of swell event testing in XBeach are presented in Figure 41.0. The results highlight that most sediment movement occurs around the waterline. The scour pattern and depths were like the MIKE21 model which adds some confidence to the model results. The dynamic component of wave run-up indicates a run-up level of 1.1m and a maximum scour of 0.5m. The maximum scour was at the back of beach area. The eroded sediment was deposited at the base of the beach slope at depths between 1m and 3m. The beach width was reduced by about 8m at the end of the event. Fortunately, the property has adequate setback from the waterline. As a result, the property was not affected by the swell event.

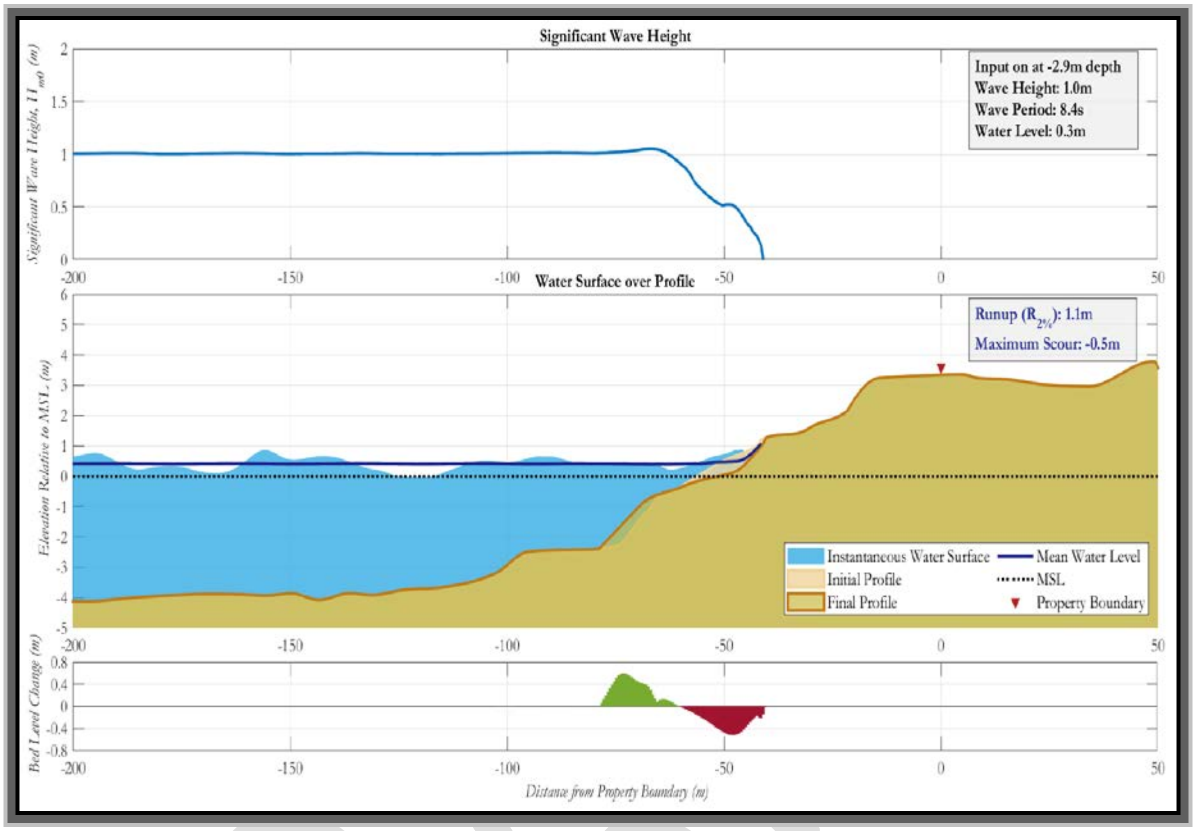

Figure 41.0: Wave run-up and scour results for the swell event of March 2018 run in XBeach.

2.5.3 Erosion and Accretion

Long-term erosion and accretion patterns were estimated by performing a historical shoreline analysis along the property's beach front and along neighbouring shorelines. This process involves retrieving as many years as possible of satellite data for the location and having those images georeferenced to the same horizontal coordinate system. Afterward, each shoreline is digitised by considering where the blue water changes to light sand. Since the line digitised may be considered as always wet, these lines are used to represent the progression of the low water mark over time. The beach profiles (sections) show that the average slope is 1(V):12(H). Over the tidal signal there may be up 12m shift in the waterline, which is considered as the error range for analysis.

It is important to note that this analysis highlights a few instances of a dynamic process and generalises periods of sediment transport. The analysis used publicly available satellite imagery that had an irregular frequency in the time between images. The satellite images were from 2012, 2013, 2015, 2017, 2018 and 2021. Three satellite images

(2013, 2018 and 2021) were taken in the typical swell season between November and February. At this time there are typically higher energy waves, which may result in a narrower beach. The 2017 image was taken a few days after the passage of Hurricane Maria to the south of Providenciales. The other images were taken under calmer summer conditions. The results of the analysis are shown in Figure 42.0.

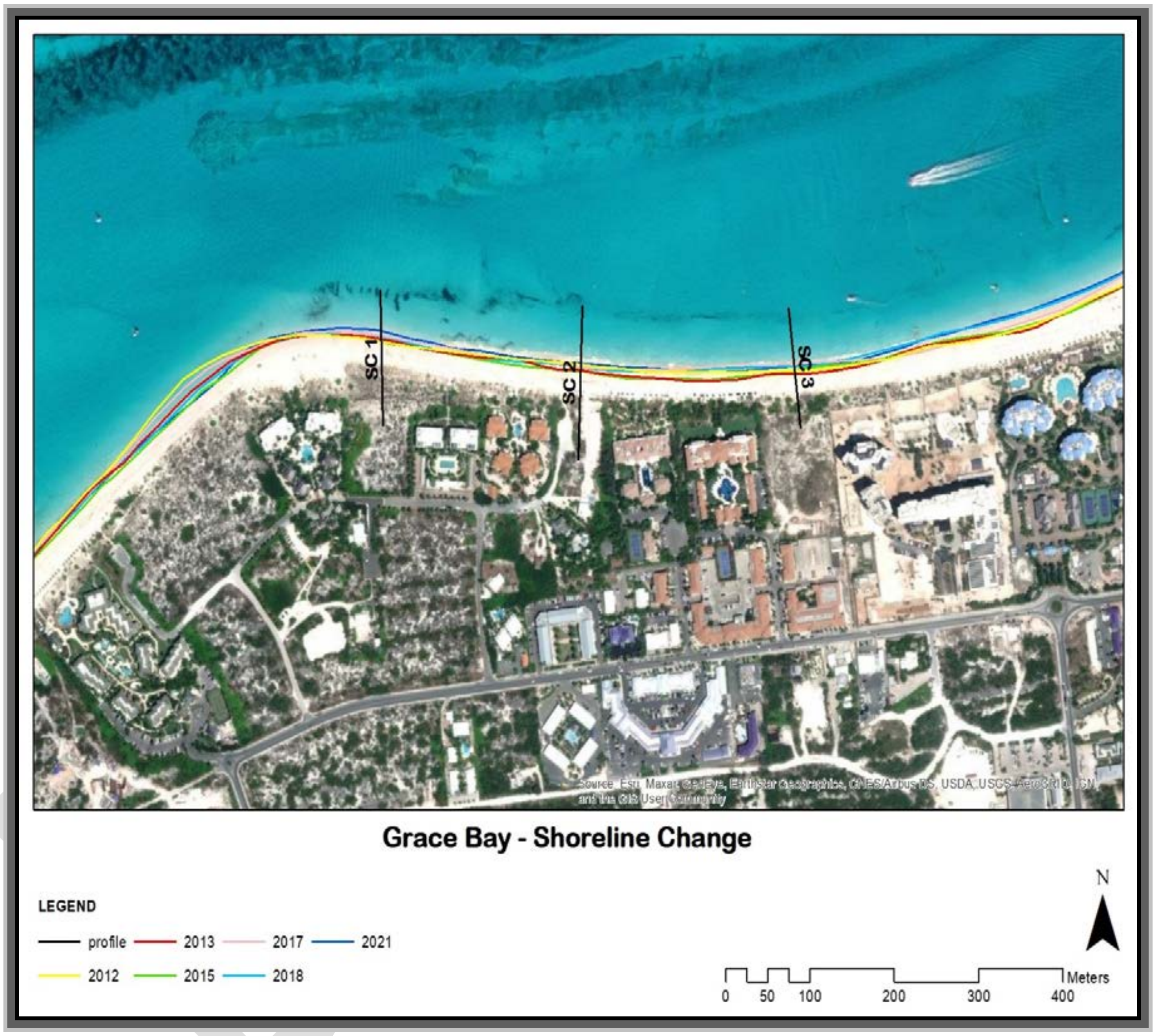

Figure 42.0: Shoreline change analysis for SEFAMM property from 2012 to 2021 (overlain on 2022 ESRI imagery)

Three profiles were extracted to show localised changes around the property over the period. The first profile was taken 200m west of the property, the second was taken through the middle of the property and the third taken 200m east of the property. For each profile the beach width at an instance (date of imagery used) is measured and compared to the following imagery date. To normalise the data, the change in beach width is divided by the amount of time that has passed, which then provides a rate of erosion or accretion over that period. The results of the profile analysis are shown in Figure 43.0.

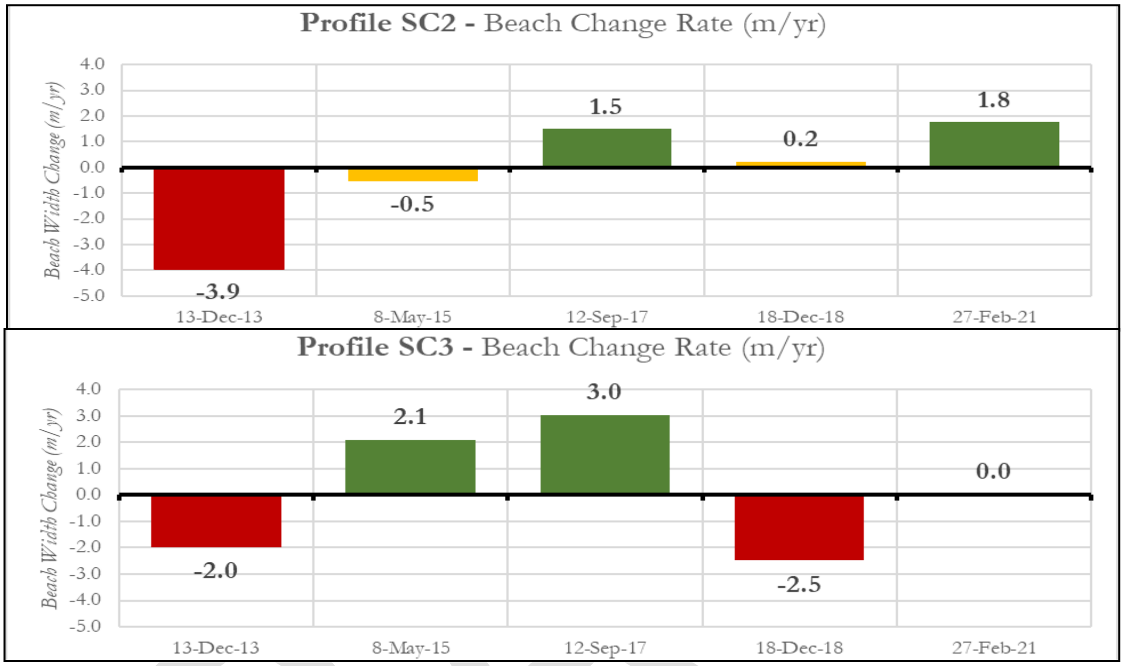

Figure 43.0: Profile analysis done to show possible erosion and accretion around the project site.

Generally, the fluctuations along the profile range from an erosion rate of (-)3.9m/year to an accretion rate of (+)3m/yr. These results are typical of a beach environment where there will be varying beach widths within any given year.

Profile SC1 had an undulating pattern of erosion and accretion. However, the accretion rates were higher than the erosion rates, which led to a wider beach in 2021 than at the start of the analysis (2012). The average rate along this profile was 1.3m of accretion over the 9-year analysis.

Profile SC2 had a large erosion rate between 2012 and 2013, which may reflect the direct hit of a tropical storm in August 2013. After that period, the changes in beach width were quite small, ranging between eroding at (-)0.5m/year and accreting at (+)1.8m/yr. The small fluctuations that were calculated for Profile SC2 fall within the error limits of analysis and, as such, the beach can be considered as stable. The average rate of beach width change was 0.2m/year of accretion.

Profile SC3 results showed a period of erosion, accretion and then erosion once again. At the end of the 9-year period the beach width was like the beginning period in 2012. This profile may experience erosion and accretion on longer scales, but this would need to be investigated with more satellite images. The average rate of beach change was 0.5m/year (accretion).

This analysis shows the beach section to the west is slowly accreting, which may be related to protection from the reef. The reef likely shelters this area, which causes the building out of a salient between Grace Bay and The Bight. This is supported by the wave climate analysis (described in Section 2.5). The beach sections in front of the property and to the east have naturally varying beach widths that show a generally stable beach.

As was alluded to before, this analysis examines instances over a dynamic period. There are a few limitations associated with this process that are listed below:

- Seasonality issues – sandy beaches have seasonal cycles of erosion and accretion. The number of images collected could not fully capture intra-annual changes in beach width and, as such, it is important to consider the averages presented for each profile in conjunction with the individual shorelines that are digitised.
- Tidal fluctuation error – the tidal levels in Grace Bay could not be estimated because the satellite images did not have a timestamp associated with their retrieval. Using an estimation of the beach profile and the tidal range it can be assumed that the waterline can be ± 6m of the shoreline.
- Digitizing error – There is human error associated with digitizing the shoreline.
- Pixel error - The pixel size in orthorectified images is 1.1m, which means any feature smaller than 1.1m cannot be resolved.
- Rectification error – Satellite images are rectified to reduce displacements caused by lens distortions, earth's curvature, light refraction, camera tilt, and terrain relief. This rectification is done by the eye and is affected by the shadows in an image.

2.5.4 Coastal dynamics

Although the northern coast of Providenciales is exposed to the Atlantic Ocean, the reef system generally protects the shoreline from high energy waves. There is a gap in the reef that leaves lots to the east of the project site more exposed than lots to the west.

Even with the varying reef heights, the average wave climate in the Grace Bay area is calm.

Stronger swells can approach from the north-west, north, or north-east and cause some erosion on the site. These events typically erode sand from the back of beach area and deposit sand in the nearshore. Outside of swells, the typical sediment regime shows sediment moving towards the west, which is supported by the growth of the headland to the west.

At the time of the beach profile survey (March 2023) the beach slope was moderate at 1(V):12(H). The sediment is a finer sand, which provides a luxurious beach experience for patrons. However, this finer sand can be more susceptible to erosion during high energy events that churn up sand.

Based on the physical investigations done, the overall state of the beach area is stable.

2.5.5 Water quality

Baseline water quality conditions were assessed by testing for multiple indicative parameters in the area. Sampling was undertaken with planning and shipping assistance from Provo Water company in Providenciales, and testing done at ALS Global in Pennsylvania. Two samples were taken, one in front of the property (WQ1) and one about 200m west of the property to represent the downdrift water quality (WQ2) Figure 44.0.

Figure 44.0: Water quality sampling locations for the study

The samples were collected in the middle of March 2023 from the centre of the water column (about 0.7m above the seabed). At this point in time, the tidal range was 0.56m with the tidal height approximately 0.26m below mean sea level during the sampling. After the bottles were collected, the bottles were put on ice to maintain the temperature as they travelled. The results of the testing are summarised in Table 14.0 below.

Table 14.0: Water quality data collected for the project site

Parameter	*Unit*	*Measurement Method Limits*	*Value*	
			WQ1	*WQ2*
Total Coliform	MPN/100ml	1	>200.5	>200.5
Dissolved Oxygen	mg/L	1.0	10.3	10.3
pH	pH units	-	7.84	7.9
Specific Conductance	μmhos/cm	250	74800	75300
Total Dissolved Solids	mg/L	25	32400	32500
Turbidity	NTU	0.3	0.5	0.65
Ammonia-N	mg/L	0.10	ND	ND
Nitrate/Nitrite-N	mg/L	0.10	ND	ND
Phosphorus, Soluble	mg/L	0.10	ND	ND

Generally, parameters for the downdrift water sample (WQ2) tested slightly higher than the results for the water sample taken in front of the property. Values for total coliform were greater than 200MPN/100ml. This value is quite high for recreational waters. There are a few standards that describe a safe environment for recreational swimming and this result would exceed the Florida Surface Water code and EPA standard, which is 200MPN/100ml. However, USEPA also stipulates that the monthly geometric mean of readings may be up to 1000MPN/100ml (EPA, 2012). This value should be monitored closely during the construction and operational periods.

The specific conductance was higher than the typical value, which is 50,000 μmhos/cm (Boyd, 2017). This parameter may also be used as a proxy for salinity as it also shows the presence of ions in the water. These values being so much higher than the typical conductance may highlight possible interference from anthropogenic sources. This is further supported by the high values of total coliform.

Values for total dissolved solids would classify the water as hyper saline compared to the USGS classification system (USGS, 2018). The turbidity values were quite low, which suggests very clear water in the area. Finally, the parameters of ammonia, nitrate/nitrite-N and soluble phosphorus were all tested but not detected by the testing apparatus. This indicates a negligible amount of these nutrients in the water.

2.6 Socio-economic

Since the collapsed of the salt industry in the late 1960s, for the past five-decades tourism has been the main industry that drove the economy of the Turks and Caicos Islands. The section offers an overview of the socio-economic aspects of tourism development in the TCI and the role it plays in providing an economic livelihood for the government and people of the islands. An analysis of the present baseline population, employment and economic activities is provided.

2.6.1 Demographic

The 2022 population of the Turks and Caicos Islands is estimated at around 47,720. However, it is believed that the actual population is much higher than this. The on-going (2023) population census would provide a more adequate population count. According to the 2012 population census the islands population was 31,458.

In 1970 the TCI population was 5,558 (Census 1970). However, during the past decades the islands have experienced explosive population growth. The 1980 population increased by 33.4% over the 1970 figures and the 1990 population increased by 54.17% over the 1980 figures. The island's population continued to grow over the preceding years, the 2001 population by 73.4% over the 1990 figures and the 2012 population by 58.2% over the 2001 figures. Table 15.0 below shows the population distribution by islands and population growth during the past five decades.

Table 15.0 - Population Distribution by Island 1960 -2012

Island	1960	1970	1980	1990	2001	2012
Salt Cay	448	334	284	208	120	108
Grand Turk	2,180	2,287	3,089	3,691	3,976	4,831
South Caicos	840	1,018	1,380	1,198	1,063	1,139
Middle Caicos	532	362	396	272	301	168
North Caicos	1,150	99	1,278	1,275	1,347	1,312
Parrot Cay	-	-	-	-	58	131
Providenciales	518	558	977	4,821	13,021	23,769
Total Population	**5,668**	**5,558**	**7,404**	**11,465**	**19,886**	**31,458**
Growth of Population (%)	0	-1.9	33.4	54.17	73.4	58.2

Source: Statistical Office, Department of Economic Planning and Statistics

The TCI 2012 population census also revealed that the population of the islands was relatively young, with the age group of 0-14 years old accounting for 20.97% of the population and 15 years and over making up approximately 74.84% of the population, while 65 years old and over representing just 4.87% of the population. The Male-Female Ratio of the 2012 population of the TCI stood at 99.1%. The island's young population has implications for future growth and development. Table 16.0 below shows population by status, sex and age and table 17.00 shows the distribution of population by labour force participation and unemployment by islands in 1999.

Table 16.0 Population by Status, Sex and Age

Category	1960	1970	1980	1990	2001	2012
Total Population	**5,668**	**5,558**	**7,413**	**11,465**	**19,886**	**31,458**
By Sex						
Male	2,552	2,635	3,580	5,837	9,897	15,230
Female	3,116	2,923	3,833	5,628	9,989	15,372
Male-Female Ratio	**81.9**	**90.1**	**93.4**	**103.7**	**99.1**	**99.1**
By Age Group						
0-14 Years Old	2,557	2,618	3,067	3,687	5,692	6,698
15 Years Old & Over	2,782	2,597	3,871	7,204	13,436	23,904
65 Years Old & Over	329	343	475	574	575	1,337
Age Dependency Ratio	**103.7**	**114.0**	**91.5**	**59.1**	**48.0**	**33.6**

Source: Statistical Office, Department of Economic Planning and Statistics

Table 17.0 - Distribution of Population Labour Force Participation & Unemployment by Islands, 1999

Description	Population		Labour Force Participants		Unemployment		Under-employment Rate
	No	%	No	%	No	%	
Grand Turk	4,198	24.4	2,133	22.9	237	20.3	11.1
Middle Caicos	408	2.4	178	1.9	40	3.4	22.5
North Caicos	1,562	9.1	647	6.9	54	4.6	8.4
Providenciales	9,780	56.9	5,723	61.5	690	58.9	12.0
Salt Cay			77	0.8	15	1.3	20.0

	131	0.8					
South Caicos	1,115	6.5	555	6.0	134	11.4	24.1
Total	17,19 4	100	9,312	100	1,170	100	12.6

Source: Survey of Living Conditions 1999

2.6.2 Employment

The rapid growth and development of the TCI during the past three decades, led by tourism, has resulted in increased employment opportunities, particularly in the hospitality and construction industries, however, the unemployment was 9% in 2022 (Statistical Department). In 2017, there was a total of approximately 23,027 jobs available throughout the TCI and a local contingent of only 8,589 local workers (National Skills Audit Report). This meant that there were more jobs available than there were qualified and experienced locals available to fill those jobs. The report concluded that the labour-force participation rate is higher among non-islanders than TCI Islanders.

Based on the Turks and Caicos Islands present population composition, the various industries that make up the local economy have a relatively young labour force pool to draw from. Table 18.0 below provides a snapshot of the labour for characteristics of the Turks and Caicos Islands in 2014.

Table 18.0 - Labour force characteristics, 2014

Description	Male	Female	Total	Belonger	Other
Total population	15,127	15,429	30,556	13,424	17,131
Population 15 years & over	11,909	12,206	24,115	9,432	14,683
Labour Force	9,613	8,820	18,433	6,879	11,554
Employed Labour Force (LF)	7,826	7,203	15,029	5,909	9,120
Unemployed Labour Force (LF)	1,787	1,617	3,404	970	2,434
Outside the Labour Force (LF)	1,410	2,457	3,867	1,680	2,187
Employment Rate	81.41	81.67	81.53	85.90	78.93
Job Seeking Rate (%)	18.59	18.33	18.47	14.10	21.07
% age of population under 14 years	21.27	20.89	21.08	29.74	14.29
% age of population under 14 years &	78.73	79.11	78.92	70.26	85.71

% age of population under 14 + - outside the LF	9.32	15.92	12.66	12.51	12.77
LF as % of total population	63.55	57.17	60.33	51.24	67.44
LF as % of total population 14 +	80.72	72.26	76.44	72.93	78.69

The National Skill Audit Report 2017 noted that Turks and Caicos Islanders dominated the public administration and the security sectors of the economy, whereas non-islanders are largely engaged in hospitality and construction sectors. Table 19.0 shows the labour force by industry/sector, 2014. The islands rely heavily on expatriate works to service the growing local economy.

Table 19.0 - Labour Force by Industry/Sector, 2014

Industry	Male	Female	Total	Belonger	Other
Agriculture, Hunting, Forestry & Fishing	154	57	211	55	156
Mining & Quarrying	7	5	12	5	7
Manufacturing	200	169	369	95	274
Electricity, Gas & Water Supply	205	55	260	148	112
Construction	1,097	129	1,226	307	919
Wholesale & Retail, Repairs of Motor Vehicle	766	788	1,554	666	888
Hotels & Restaurant Services	2,345	2,228	4,573	1,526	3,047
Transport, Storage & Communication	567	355	922	586	336
Financial Intermediation	138	287	425	324	101
Real Estate, Renting & Business Activities	574	370	944	425	519
Public Administration, Defense etc	863	846	1,709	1,097	612
Education	154	415	569	191	378
Health & Social Work	97	274	371	136	235
Other Community, Social & Personal Service	298	342	640	186	454
Private Households with Employed Persons	160	633	793	34	759
Industry not specified	201	250	451	128	323
Total Employed Labour Force	7,826	7,203	15,029	5,909	9,120
Unemployed	1,787	1,617	3,404	970	2,434
Total Labour Force	**9,613**	**8,820**	**18,433**	**6,879**	**11,554**

2.6.2.1 Labour and skills demand construction phase

The construction phase of the SEFAMM Grace Bay Hotel project is expected to take approximately two-years and it will generate approximately 150 construction jobs to the TCI economy during this phase of the development. Generating approximately 15 million dollars to local economy in wages and salaries.

Approximately 123 or 75% of the labour force employed during the construction phase will be Belongers and 37 04 25% expatriates Figure 45.0 below.

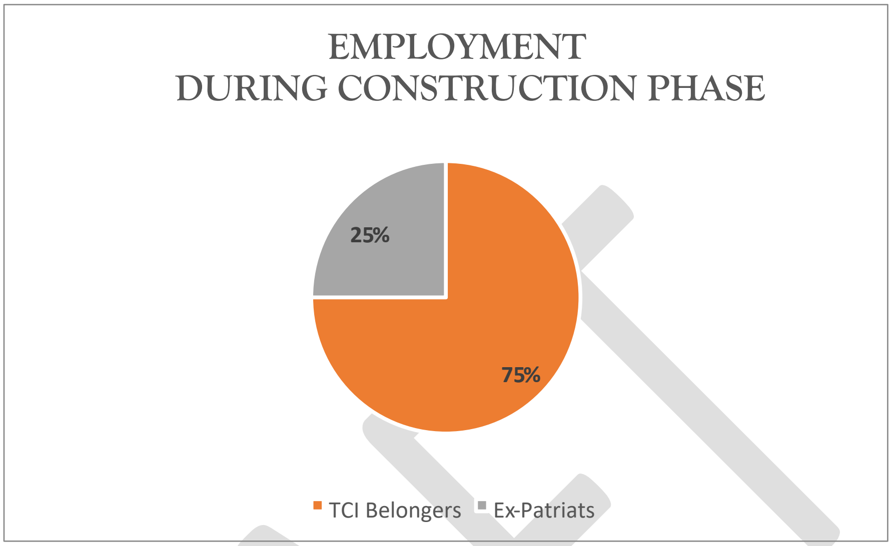

Figure 45.0: Employment during the construction phase

2.6.2.2 Labour and skills demand operational phase.

The SEFAMM Grace Bay Hotel and Condominium resort will be managed and operated by an international renowned brand that would bring its international management experience and flavour to the operation. Some 200 persons will be employed across all management and non-management levels during the operation of the hotel facility. During the operation of the facility a minimum of 75% of the staff compliment will be Belongers and 25% expatriates.

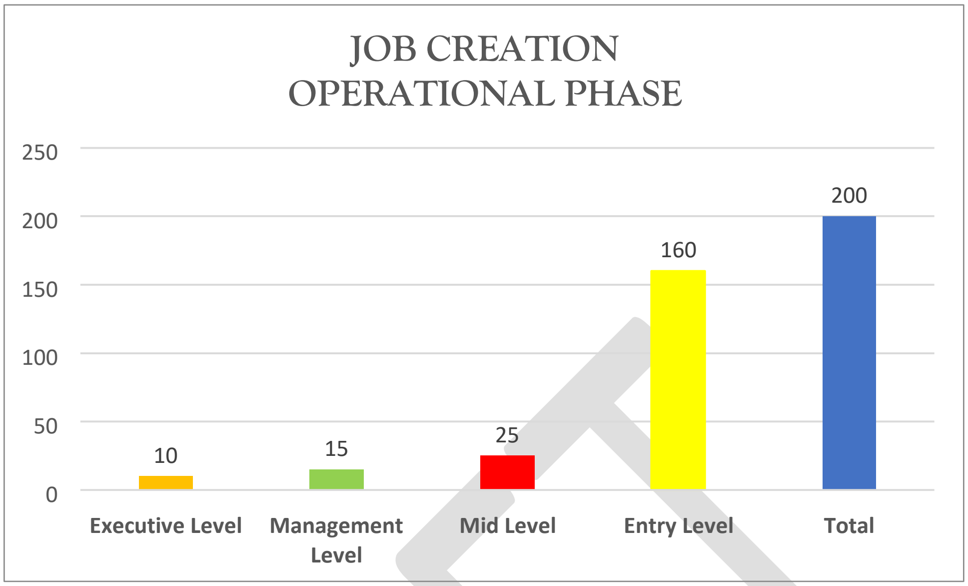

Figure 46.0: Job Creation during the operation phase

Approximately 160 or 80% of the jobs created during the operational phase will be entry level, 25 or 12.5% mid-level, 15 or 7.5% management level and 10 or 5% executive level, Figure 46.0 above.

2.6.3 Safety and security concerns within the Community

The recent spike in violent crime in the TCI, particularly on Providenciales has sent shock waves through the local, regional, and international communities, in particular those tourist destinations where most of TCI visitors come from. The increase crime rates on Providenciales are a major source of concern for all stakeholders, the Tourist Destination Management Officer (Formerly the Tourist Board), government, the local police, and local, regional, and international tourism promotion agencies.

The once safe, peaceful, and tranquil environment that tourists and locals were once accustomed to is in jeopardy of been seriously destroyed.

The adoption of stringent security measures to ensure the safety of hotel guests and staff will be major consideration throughout the design, construction, and operational phases of the hotel facility.

2.6.4 The local economy

During the past decade the economy of the Turks and Caicos Islands has been performing at an exceptionally hight level. In 2022, the economy has grown at a rate of 9 percent. The government's annual budget for the fiscal year 2023/204 is estimated at 424 million dollars, which aimed at achieving the social, economic, and environmental objectives of government.

2.6.5 Others

The proposed SEFAMM hotel development is like to impact other sectors of the TCI economy and administration of the islands including housing, health care and education. The proponents of the development will consider these sectors during the construction and operational phases of the development.

2.7 Other relevant parameters identified during the scoping exercise.

Table 20.0 below summarises some of the key coastal parameter as a results of baseline assessment of coastal processes and dynamics in the nearshore environment of the project site.

Table 20.0 - summarises the key coastal parameter results in the nearshore of the project site.

Parameter	Value	Unit
Average Wave Height	0.1 to 0.2	m
99.86th Percentile Wave	0.4	m
Average Wave Generated Currents	0.05 to 0.1	m/s
99.86th Wave Generated Currents	0.2 to 0.3	m/s
Low Tidal Current (Neap)	0.05	m/s
Low Tidal Current (Spring)	0.1	m/s
Net Sediment Drift	Westward	
Swell Wave Height	0.5	m
Swell Current Speeds	0.2	m/s
Swell Erosion on Beach Face	0.5	m

SECTION III

3.0 Legislative and regulative context

To address the rapid rate of physical development in the islands over the past three decades, government has enacted several planning and environmental legislation that aimed at ensuring resilient development and to strike the wright balance between realizing the full potential of tourism sector to the national economic development, without causing serious impacts on the islands' fragile environment.

This section of the report examines relevant laws and regulations that are appropriate to ensure that the proposed SEFAMM Grace Bay Hotel development is constructed and operated at an acceptable local and international standard. These include those listed below.

3.1 TCI Development Plan/Master Plan

The National Physical Development Plan (NPDP) 2020 for the Turks and Caicos Islands is the legal document that regulates physical development in the Islands and the Department of Planning is the government agency that is responsible for the management of physical development. Guided by the recent approved NPDP (2020), the Planning Department takes a pro-active approach to developmental planning. Development proposals and applications for development permission are assess based on their compliance with the NPDP (2020).

The NPDP (2020) noted that Providenciales which has experienced an extensive building boom in the last two decades, is known for its numerous developments, specifically along Grace Bay. Providenciales is the densest and most populous island in the Turks and Caicos archipelago and is famous for its high-end resorts and white sandy beaches and is seen as the most 'urban' and developed, Figure 47.0 is an Area Concept Plan for Grace Bay (NPDP 2020). Grace Bay is uniquely a tourist destination and should be maintained and infilled as such. The SEFAMM Grace Bay Hotel development is an example of that infilled development the NPDP 2020 recommended for the Grace Bay area.

The NPDP 2020 reported that there is currently very limited brand hotel presence in the TCI as compared to other competing destinations. The proposed SEFAMM Grace Bay hotel is a branded hotel project and branded hotels like the Ritz Carlton will increase the number of branded hotel rooms in the TCI, thereby diversifying the hotel room category in the TCI.

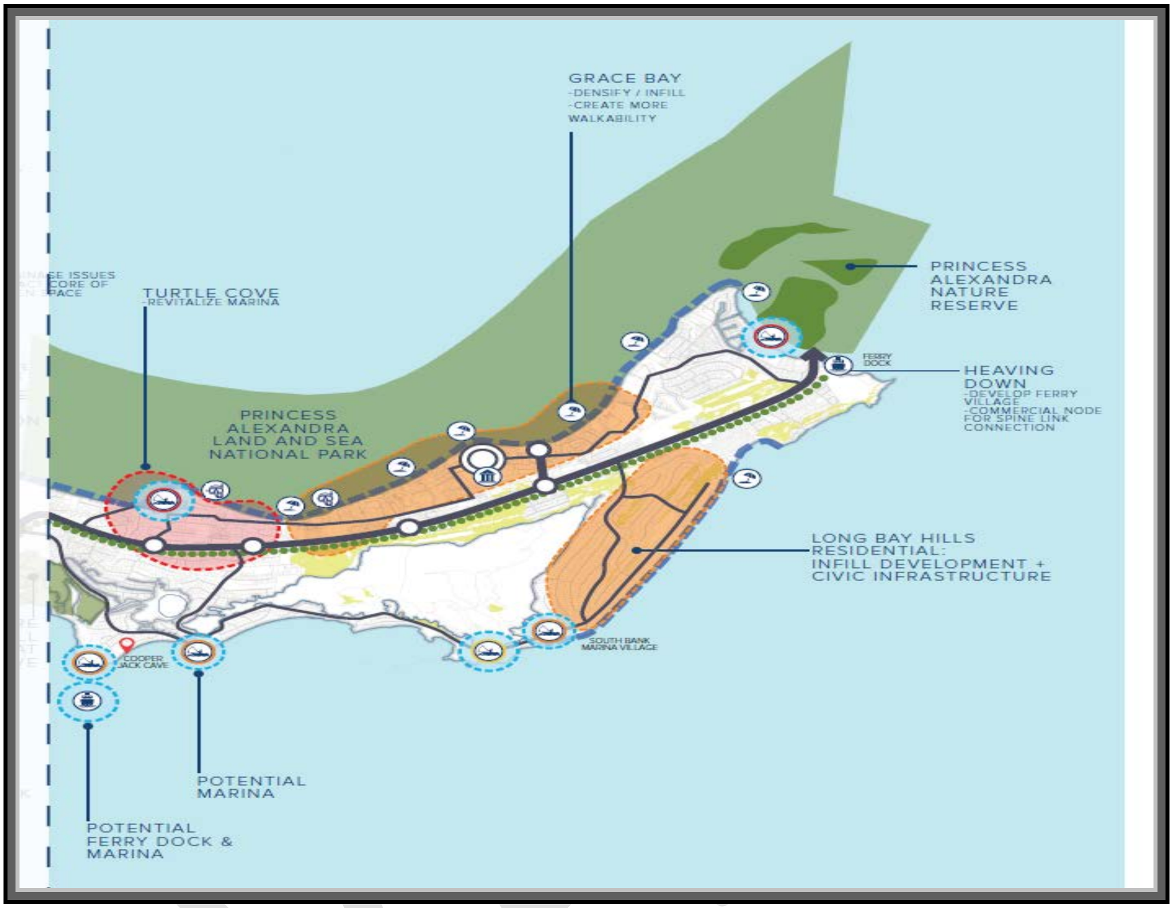

Figure 47.0 – Island Framework Plan, Grace Bay, Providenciales (NPDP 2020)

3.2 TCI Physical Planning Ordinance

Section 34 (1) of the Physical Planning Ordinance of the Turks and Caicos Islands (2014) authorizes the Physical Planning Board while considering an application for hotel development to consider several factors to make a proper decision on the application. These factors include inter alia:

- The impact of the proposed development on the ecology of the island where it is to take place.
- The impact of the proposed development on the natural or built environment and the uses of the adjacent land, and,
- The benefits likely to accrue to and the disadvantages that may be imposed on the economic, social and welfare facilities, including prospects of employment and the effect on the infrastructure of the islands, because of the proposed development.

The SEFAMM Grace Bay hotel project's Terms of Reference (ToR) for this Environmental Impact Assessment Study was prepared in accordance with Section 32 (10b) of the Physical Planning Ordinance (2014) and conditions 3 and 4 of the Grant of Detailed Development Permission (PR 16016, dated September 29,2022).

3.3 TCI Development Manual

The Turks and Caicos Development Manual specifies planning and development standards for development in the Turks and Caicos Islands. It provides guidelines for developers wishing to carry out development in the islands, including erection of buildings or structures, or carry out building operations, as defined under the Physical Planning Ordinance.

The Manual provides for the following:

- A logical approach to understanding the planning and development process.
- A guide to the process – the task involved, the sequences and the decision making.
- A description of relevant techniques and standards which should guide development.

The planers, architects, engineers for the SEFAMM Grace Bay hotel project referenced the TCI Development Manual throughout the design and planning stage in the design process and it was a useful source of design standards and requirements for development in the TCI.

3.4 TCI Building Code

The Physical Planning (Building) Regulations made under the Physical Planning Ordinance 2014 require any person wishing to erect a building or structure or carry out building operations as defined in the Physical Planning Ordinance, to comply with such building standards as may from time to time be contained in and published by the Department of Planning, such as the Turks and Caicos Islands Building Code.

The proposed SEFAMM Grace Bay hotel project is designed to meet the requirements of the latest edition of the Turks and Caicos Building Code. The Code sets out the requirements for use of materials and construction methods to conform to the minimum standard provided by the Code. The project is designed to take into consideration the use of sustainable and resilient construction methods and materials to conform to the minimum requirements of the Code. The building is designed to be resilient to fire hazards, hurricanes, and earthquake loads.

3.5 Coastal Protection ordinance and Subsidiary Legislations

Developments within the coastal environment in the Turks and Caicos are governed directly under the Coast Protection Ordinance (2014). But there are also other laws that may also control developments within the coastal zone, they include – the Fisheries Protection Ordinance (2014), National Parks Ordinance (2014), Marine Pollution Ordinance (2014), Mineral (Exploration and Exploitation) Ordinance (2014) and the Maritime Ordinance.

Coastal areas are important, not only environmentally, but are the protection zones for inland areas. Some of the coastal zone and environmental issues considered in the project design, construction and operational phases in the design process include:

- Adequate building line setbacks from the primary sand dune system.
- Protection of the coastal environment, including the dune system.
- Protection against coastal inundation in large storm surge during tropical storms or hurricanes.
- Coastal management strategies, including beach protection and replanting of vegetation to protect sand dune systems.
- Installation of boat access lanes and swim zones.

3.6 Mineral (Exploration and Exploitations) Ordinance and Subsidiary Legislations

Mineral Resources are the most precious assets of the nation which need to be protected and subjected to reasonable use with the aim of satisfying the short-term needs for mineral materials and the long-term goals of social and economic development. The Minerals (Exploration and Exploitation) Ordinance and Subsidiary Legislation 2014 of the Turks and Caicos Islands make provisions in relation to the management and protection of mineral resources in terms of geological exploration, mineral exploitation, and protection of untapped mineral resources.

During the construction phase of the proposed development the requirements of the Mineral (Exploration and Exploitation) Ordinance of the TCI would be adhered to.

However, the project would not be directly or indirectly involved in any mineral exploration or exploitations activities.

3.7 Marine Pollution Ordinance and Subsidiary Legislation

The Marine Pollution Ordinance (2010) is an Ordinance to protect the marine environment by minimising intentional or negligent discharges of pollutants into it. According to the Ordinance, Marine environment consists of the coastal environment, the territorial water, and the Exclusive Economic Zone of the islands, including all marinas, ports, and canals.

The Ordinance defined pollutant, as any substance which, if introduced into the sea, is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or interfere with other legitimate uses of the sea, and includes sewage, and any substance control by the International Convention for the Prevention of Pollution from ships (MARPOL).

The Proposed SEFAMM Grace Bay hotel project has been designed to have minimum direct impact on the marine environment. However, as the marine environment, particularly, the beaches, coastal zone and crystal-clear waters are one of TCI's major attraction, hotel guests would utilize these attractions. Hotel management will educate guests through environmental educational programs on ways to minimize their impact on the environment.

3.8 Fisheries Protection Ordinance and Subsidiary Legislation

Destructive fishing practices such as the use of explosive, toxic substances, electricity; dredging, suction and trawling devices for fishing are detrimental to fisheries and the marine ecosystem and are prohibited under the Fisheries Protection Ordinance. The construction and operation of the proposed SEFAMM Grace Bay hotel development will conform to all requirements under the Fisheries Protection Ordinance (2014).

Management of the hotel facilities would not engage directly in activities such as fishing excursions, scuba diving or snorkeling, these activities would be outsourced to third party vendors.

During the operation of the hotel facility management would adhere to the requirements of the Fisheries Protection Ordinance (2014), particularly as they relate to sourcing, preparation and serving of seafood.

3.9 International Treaties and Conventions

International Treaties and Conventions are laws and agreements that governed international maritime affairs and the prevention of pollution from ships. The three main categories that international conventions address include – Maritime Safety, Prevention of Maritime Pollution, and liability and compensation especially in relationship to damage caused by pollution.

The SEFAMM Grace Bay hotel development project during its design, construction and operational phases would abide by any appropriate international treaties and conventions, particularly as they relate to operational standards and practices.

3.10 Others

Other appropriate laws and regulations that planners, architects, engineers, and managers have considered during the design and would consider during the construction and management of the SEFAMM Grace Bay hotel facility are the Fire Services and Prevention Ordinance, the Crown Land Ordinance, the National Parks Ordinance and Public and Environmental Health Ordinance.

The Fire Service and Prevention Ordinance come into play during the design, construction, and operational phases of the hotel facility, to ensure that the facility adheres to both local and international fire code requirements.

The Crown Land Ordinance is appropriate because Crown land is involved with the proposed development. Portion of the site (60905/204) is leased from the Crown and the Government of the TCI under a special lease agreement.

SECTION IV

4.0 Project and Description of Construction and Operation and Alternatives

The SEFAMM Grace Bay Hotel Development will be constructed on the northern coast of Providenciales on the famous Grace Bay Beach. The property is located withing the Grace Bay Settlement and is bounded by the Princess Alexander National Park (PANP) on the northern side.

The parcel of land dedicated to the project is approximately 2.12 acres and is owned by the SEFAMM TCI Limited. The proposed work includes construction of a hotel and tourist amenities. There are no proposed marine works scheduled for the project, but due to the nearby protected area (PANP), construction works should be monitored to ensure impacts to the environment are avoided or reduced.

The new development aims to provide a luxury hotel experience for patrons and to maintain public beach access for the neighbouring lots and the public. To achieve these goals, it is important that the design criteria are outlined with possible natural hazards considered. The design criteria can then be used to outline possible concepts that are technically feasible for the area. Finally, other factors such as costs and possible impacts should be used to produce an optimal concept for the project area.

Under the scope of works set out for this Environmental Impact Statement, the focus of concept development is within the coastal zone. Other factors such as building layouts and landscaping design are addressed in other sections of this report.

4.1 Description of the proposed project/components

The SEFAMM Grace Bay hotel development project comprises 106 luxury one bedroom hotel units, arranged over 7 floors, some of which are double height spaces. The major component of the development comprises:

- Hotel rooms and condo units.
- Multiple exclusive and shared pools.
- Fitness centre
- Kids play areas.
- Meeting rooms
- High-end beach restaurant and bar.

- Secure carparking, and double heigh entrance lobby,

The ground floor is elevated 2 feet above the road level, partially enabling a tranquil natural landscape of native planting, grasses to form the landscape. Arriving guests arrived at an exclusive drop-off area and enter an open air, double heigh atrium connecting the courtyard. From here, light colour travertine stone paving direct guests to specially located lifts that serve up to 2 units only, on each floor. The beach front high ceiling units are also accessible directly from the carpark via exclusive lifts.

The upper levels, 5 feet wide external walkway is used as main circulation. In principle each core serves up to approximately 2 units at each floor. This creates a more private rear terrace for guests. The double aspect units with large entrance halls, high ceilings and natural daylight with the fully glazed living area will catch the light breeze while facing the Grace Bay beach. Each condo unit is designed to maximise ocean views and all features generous full-heigh living spaces. Large wrap-around terraces dissolve the boundary between inside and outside taking advantage of Grace Bay Beach's exceptional climate and encourage an outdoor lifestyle. The exclusive resting pools of the ground floor units also help to cool down the temperature at ground floor level.

There are 90 car parking spaces at the lower ground floor. The development also provides a vehicle hiring/sharing scheme for the guests. There are also dedicated electric vehicle charging points provided. Both schemes would optimise the impact on traffic, reduce carbon footprint and improve air quality.

4.2 Project Justifications

Justifications for the proposed SEFAMM Grace Bay hotel development were examined under two areas – socio-economic and ecological justifications.

4.2.1 Project Justification socio-economic

Unlike several hotel/condominiums developments on Providenciales, the proposed European-type SEFAMM Grace Bay hotel project would bring must more socio-economic benefits to the economy of the Turks and Caicos Islands. Direct and indirect economic benefits to the government of the TCI in the form of duties, hotel bed tax and hotel fees. Direct and indirect benefits to the community in the form of employment opportunities. The residents of Providenciales will have additional hotel facilities, like bars and restaurants and other hotel amenities for their enjoyment. The development will generate direct and indirect economic benefits to the patrons.

4.2.2 Project Justification ecological

The physical surveys and baseline modelling results were used to frame what would be required by the proposed solutions. The general considerations are:

- Overall sediment transport regime being towards the west.
- Property has adequate setback and land elevation to provide protection in swell events.
- Property experienced flooding in the 50-year and 100-year storm.
- Beach access should be maintained during construction works.
- Applicable laws and permits that go with applying to do construction works in a national park; and
- Coastal works should be contained within the property boundary as much as practical.

With these environmental and physical concerns as a framework for the design, the objectives for the concepts developed are.

- Reduce inundation on site during severe events.
- Maintain a small structure/concept footprint so that the existing construction works are not negatively impacted.
- Place solution close to the northern property boundary to avoid fixed buildings in the development; and
- Maintain the overall natural aesthetic of the coast.

The justification for the coastal works is based on the increasing threats of climate change. Climate change impacts include slow moving threats like sea level rise. However, a more pressing threat is the projected increase in the frequency and ferocity of hurricanes within a given hurricane season (IPCC, 2021) . This may lead to multiple major storms passing within a year as was the case in 2017.

Implementing preventative coastal works provides resilience along a coastline. Resilience is often defined as the ability to "bounce back" or "adapt". With properly designed coastal works in place there would be less coastal inundation on the property. This would reduce the amount of downtime needed to recover after a hurricane's passage and provide a safe location for patrons or other guests.

4.3 How the proposed project will affect erosion or accretion.

Studying the erosion and accretion patterns showed that the beach is dynamically stable. The beach width varied within a band of ±5m over the 9-year analysis. The net sediment transport is to the west, which is supported by the formation of a western headland. High energy swells and hurricane modelling showed erosion of up to 0.5m at the back of beach area. Within the property boundary, there was some sediment erosion at the northern property boundary during the modelled hurricane.

The proposed design will be mainly within the property boundary. This means that the dominant sediment regime will not be permanently altered by any nearshore structures such as groynes or breakwaters. With the concept in place, there will be less erosion on the property during hurricane events while other wave events will have a similar erosion/accretion pattern. The calculated differences in erosion/accretion on the property is explored in Section 2.5.3.

4.4 Describe the coastal engineering plans, including modeling of how these plans (for example engineering structures) will affect the flow of currents and transport of sediments both within the area of work and including potential areas of impact.

The project site has a maximum elevation of 3m and is setback more than 30m from the waterline. At this location, there are few impacts from daily waves or swell waves. However, the design storms simulations showed inundation up to 3.6m above the MSL which could impact the hotel building. Consequently, the previously described design criteria were used to develop a concept that would fit the overall aesthetic of the shoreline and provide protection against coastal inundation in large storms such as a Hurricane Irma.

Features of the design concept include:

- Increasing the dune crest elevation to 4m above MSL.
- Re-planting suitable vegetation to compensate for any habitat loss; and
- Extending the dune protection to the public access lot to provide additional protection to the public recreational area.

Design plans and sections are shown in

Figure and Figure 48.0. The dashed red line represents an estimate of the property boundary based on plans shared. The footprint of the works was generally aligned with the northern boundary. At the widest section of the dune addition (highlighted in

Section 4) the footprint is just within the property boundary so that there is no construction on the neighbouring property. About a quarter of the dune extension is on the public access lot. This section of the dune would be implemented to protect the crown land lot from inundation.

Figure 48.0: Proposed concept plan and typical section for the property

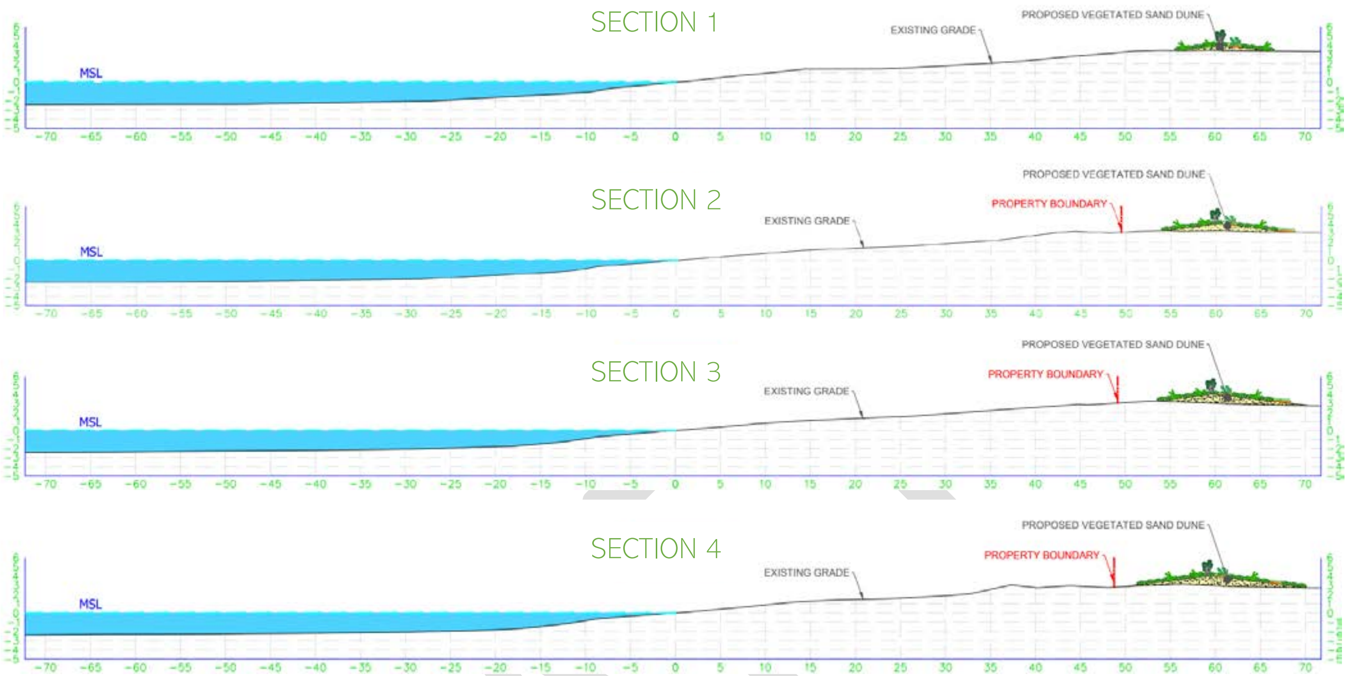

Figure 49.0: Concept sections for the proposed dune addition with section header matching section lines drawn in the plan

The dune addition will require 480m³ of sand. This volume is smaller than typical beach restoration projects, however the purchase of sand is typically the most expensive line item for a project. With the variability in the sand market, the prices and sand source may vary depending on when the project gains approval and is implemented. A preliminary project cost estimate using locally available sand is provided in Table 21.0 below.

Table 21.0 - Cost estimate for dune addition along the property front

Item	Cost Range (USD)	
	Low	High
Mobilization and Demobilization	5,500	7,500
Sand Supply	78,000	104,000
Sand Placement	9,000	13,000
Total (USD)	**92,500**	**124,500**

Impact Modelling

Given that the concept does not interact with the nearshore of the property there are few to no impacts under most wave events after the concept has been implemented. Under the guidelines of the Terms of Reference for the EIA submission, impact modelling results within a 5km radius of the site should be presented. The following table 22.0 summarizes the events tested and the results under baseline conditions and with the proposed concept in place.

Table 22.0: Wave event impacts after the concept implementation

Wave Event	Area of Impact	Impact
Daily Wave	5km radius of site	Negligible
Tidal Currents	5km radius of site	Negligible
Swell Event Currents	5km radius of site	Negligible
Swell Event Waves	5km radius of site	Negligible
Hurricane Event Surges	5km radius of site	Negligible
Hurricane Event Inundation	Property Boundary	Positive
Hurricane Event Waves	5km radius of site	Negligible

Areal plots are presented in the following figures that show various modelling scenarios for existing and proposed conditions. These results are shown for daily waves (Figure 50.0), 99.86th percentile waves (Figure 51.0), average wave generated currents (Figure 52.0), and 99.86th percentile wave-generated currents (Figure 53.0). The results show that there is no appreciable change in conditions from before to after the concept is put in place.

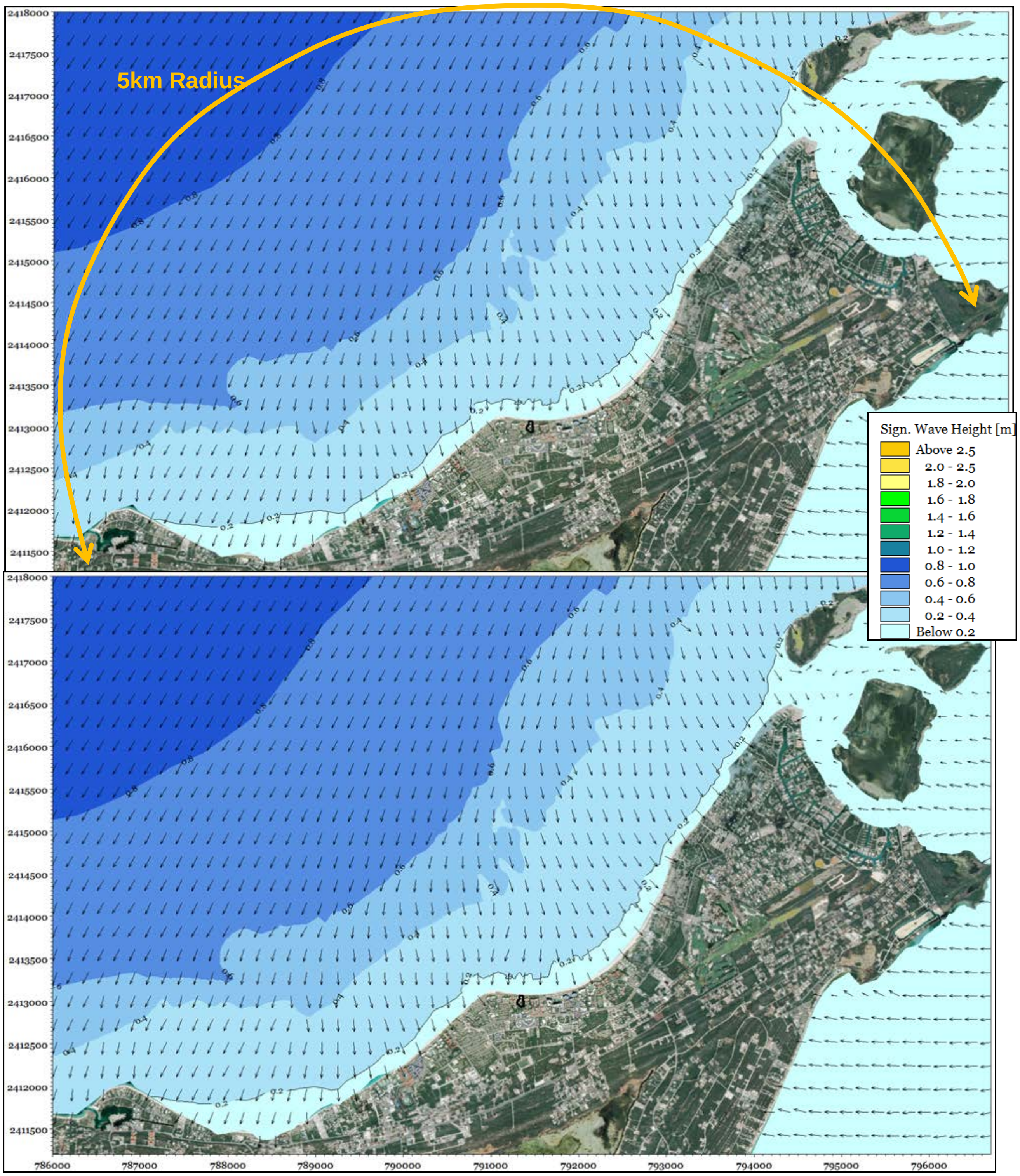

Figure 50.0: Daily waves modelling of existing (baseline) and proposed conditions within a 5km radius.

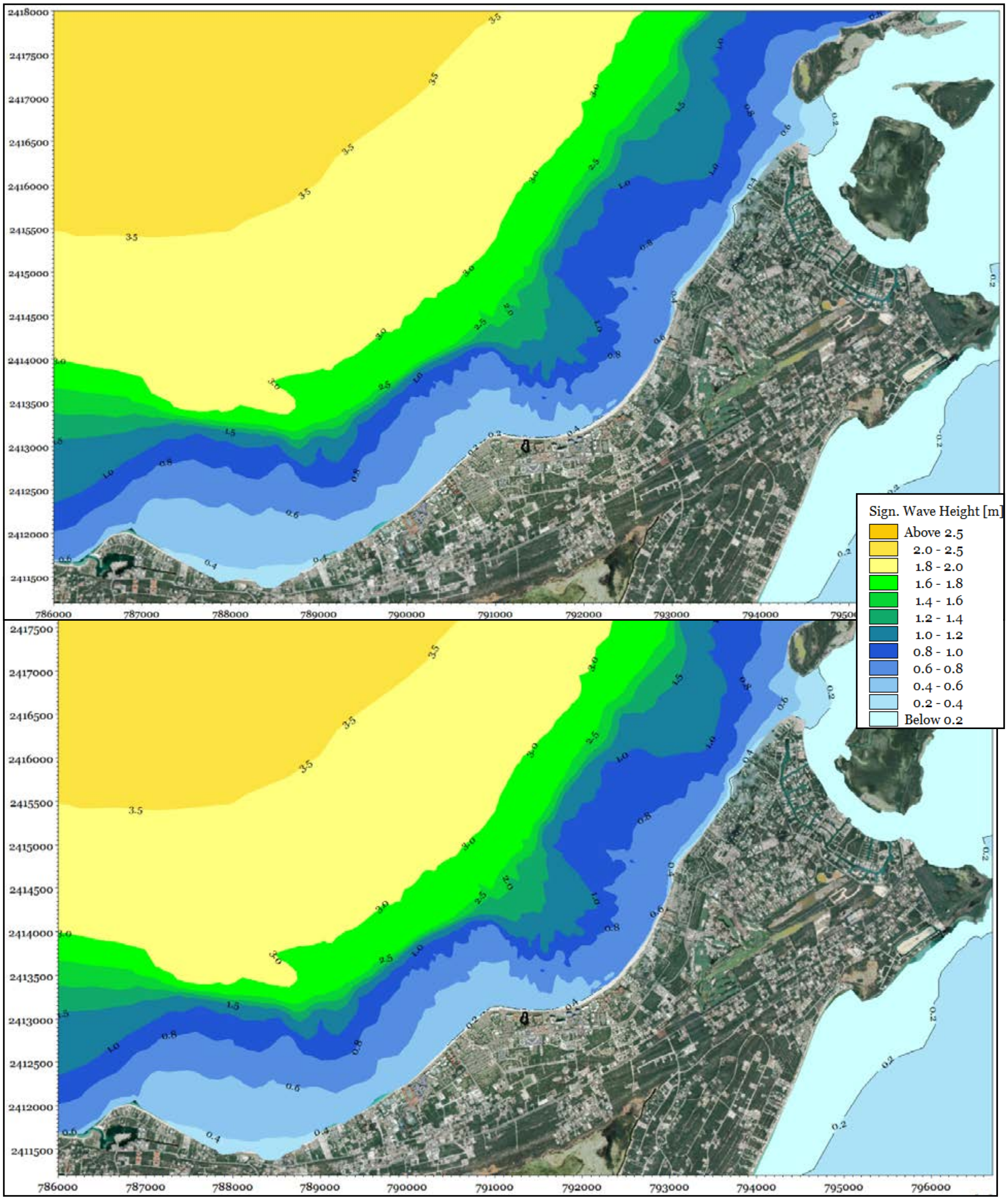

Figure 51.0: 99.86th. percentile waves under existing (baseline) and proposed conditions within a 5km radius

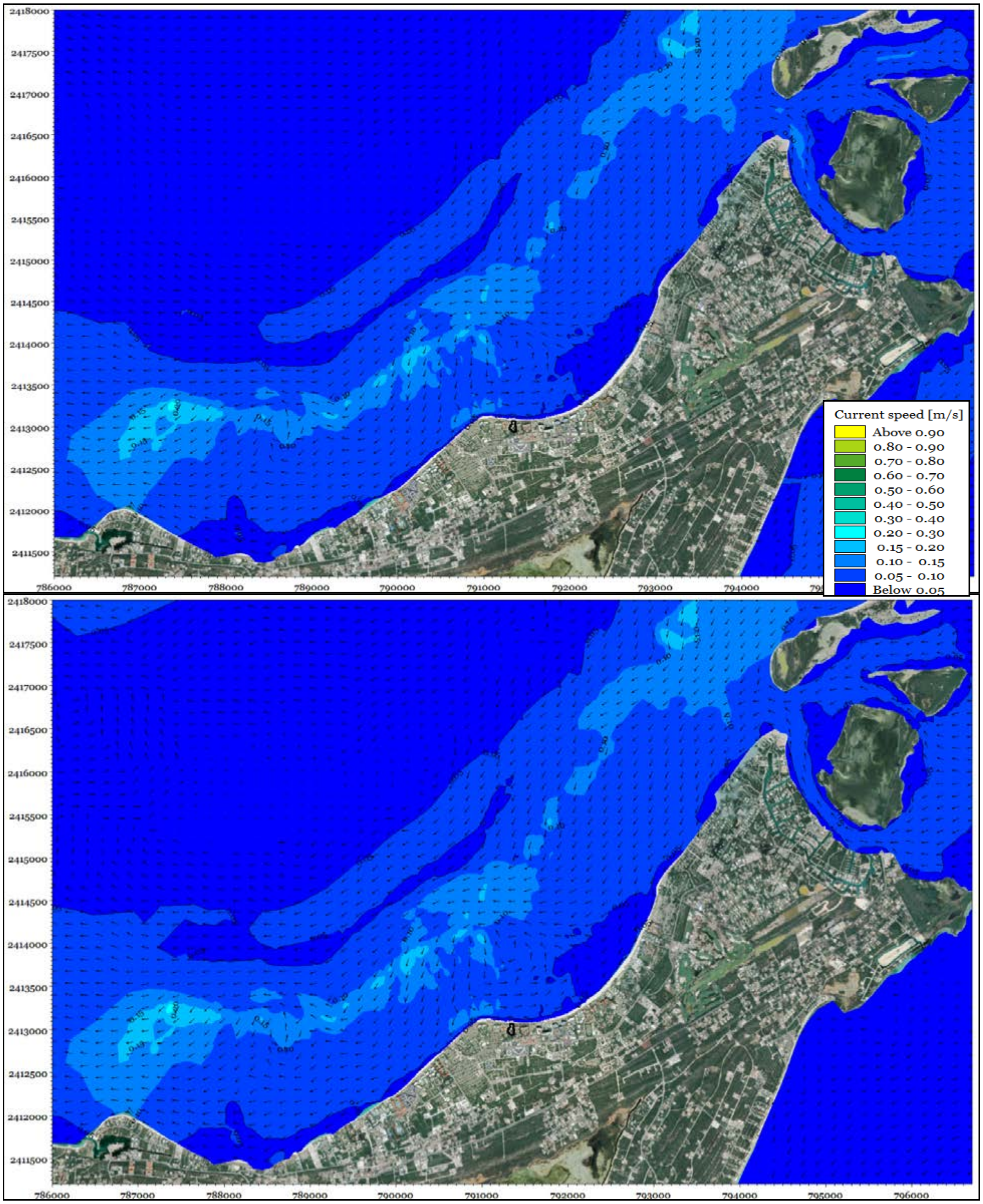

Figure 52.0: Average wave generated currents under existing (baseline) and proposed conditions within a 5km radius.

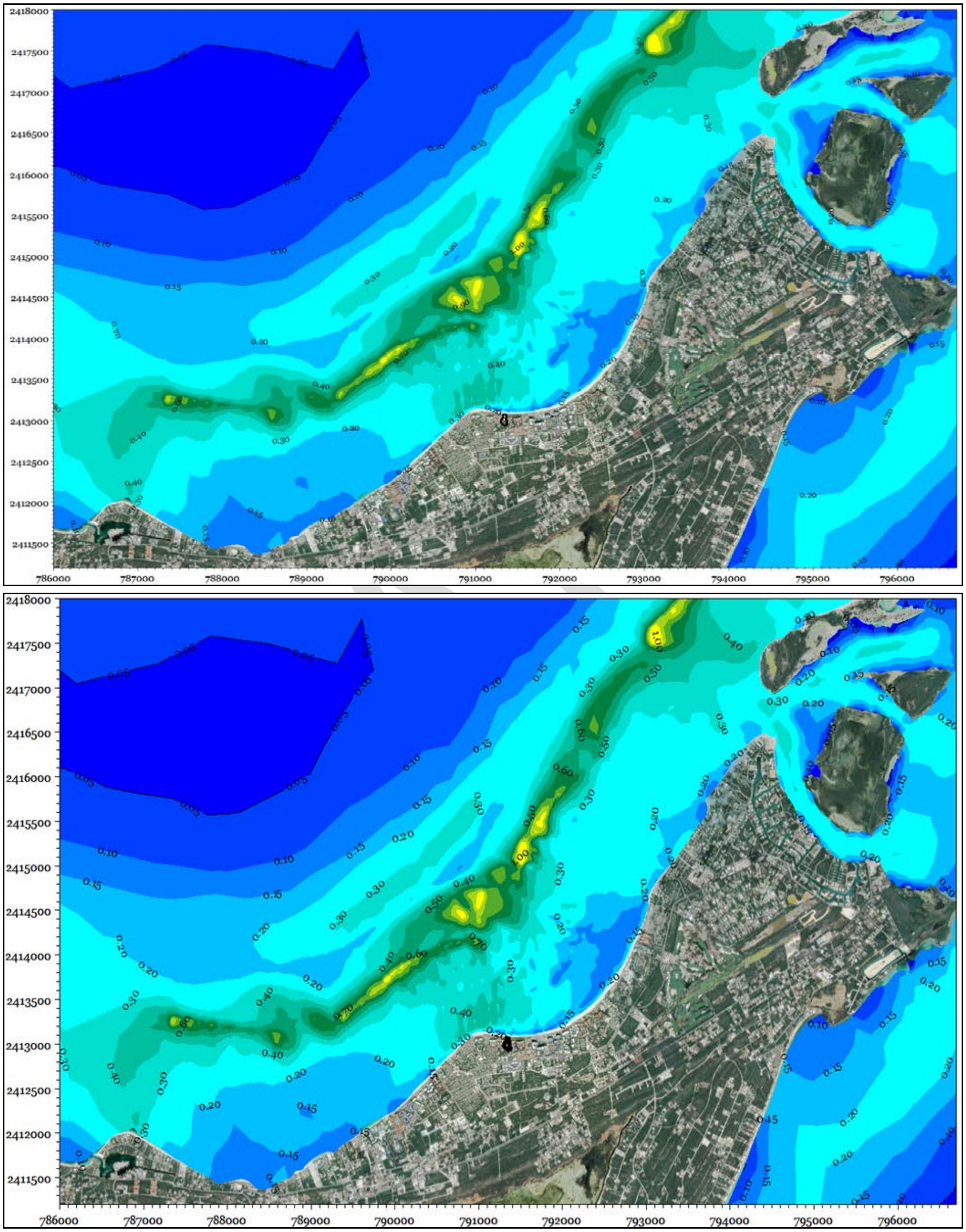

Figure 53.0: 99.86th percentile wave-generated currents under baseline and proposed conditions within a 5km radius

4.5 Coastal/beach development and management - beach access

The length of time needed for the construction activities in relation to coastal beach access development is estimated at four weeks. The longest part of construction would be the supply of sand. The sand would be stockpiled on the property and then spread by a loader or bobcat to the appropriate grade. During construction within the property boundaries, the crown land lot to the west will be the primary beach access.

The protection works proposed for the beach access lot should not take longer than a week. During this time there will be signs posted to warn patrons about the works and the duration of the works. An alternative route for beach access is through the crown land between lot 155 (east neighbour) and lot 206. A schematic diagram of the alternative route is provided Figure 54.0 below.

Figure 54.0 - Alternative public beach access route during construction

4.6 Source and quality of beach sand, fill and other materials.

Sand sourcing is an ever-changing issue on the island of Providenciales. Based on market research there are a few sources of sand that may be available for coastal works. However, suitable quality beach sand will be source from an approved and licensed sand suppliers on Providenciales or elsewhere in the TCI.

The sourced sand should be tested for its median grain size, sediment classification, contaminants, and chemicals. Before the sand is stockpiled, it should be tested to make sure it is free from contaminants or chemicals. Additionally, the sand must have a low silt content (less than 10%).

4.7 Solid waste management

Solid waste management means the collection, treatment and disposal of solid materials that are discarded because it has served its purpose and is no longer useful. Improper disposal of solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector borne disease – that is diseases spread by rodents and insects.

The Environmental Health Department regulates the collection, treatment and disposal of solid waste and sewage in the Turks and Caicos Islands. It does so, within the framework of the Public Health Ordinance and Regulations (2014).

4.7.1 Solid waste management construction phase

During the construction of SEFAMM Grace Bay hotel facility solid waste would be collected on a daily basis and stored in garbage disposal containers and carried to the public waste disposal site. During the operational phase of the facility garbage bins will be placed at strategic locations for the disposal of sold waste.

4.7.2 Solid waste management operational; phase

During the operational phase of the hotel facility garbage bins will be placed at strategic locations for the disposal of sold waste. Solid waste from the various waste generated entities on the property would be collected and sorted for recyclying, those waste items that are not recyclable would be stored and transported to the public solid waste disposal by a private solid waste disposal company.

The existing solid waste dump on Providenciales has presented environmental management challenges to government during the past decade, particularly the outbreakes uncontrable fires that have caused public health concerns to residents in the area. Whilst there are studies underway to develop proper and safe options to the present open landfill arangements. The proposed SEFAMM Grace Bay hotel facility will increase the volume of solid waste going to the public dump, thereby constributing to the island-wide solid waste management problems.

What is urgently needed to properly, efficently and safely addressed the present solid waste management challenges on Provideciales is a proper solid waste management policy that makes provision for proper sanitary landfill. The goal of the sanitary landfill should be to prevent environmental contamination and to protect public health.

Recovery and recycling

Recycling is the process of converting waste products into new products to reduce energy usage and consumption of fresh raw materials. Recycling is the third component of Reduce, Reuse and Recycle waste hierarchy. The idea behind recycling is to reduce energy usage, reduce volume of soild waste that goes to the landfill, reduce air and water pollution, reduce greenhouse gas emissions and preserve natural resources for future use. Recycling is widely used around the world, with plastic, paper and metal leading the list of the most recyclable items.

The volume of waste going to the landfill from the SEFAMM hotel facility during the operational phase could be substantially reduced if waste management recycling programs like the separation of cans, bottles and paper is done and send to a recycling plant.

The SEFAMM Grace Bay hotel facility's management goal is to maintain and preserve the natural beauty of the TCI, by reducing the volume of waste that goes into the landfill. It will join the many hotel resorts on Providenciales that utilize eisting solid waste management services and facilities on the islands.

4.8 Surface-run-off management/Stormwater run-off and treatment

The TCI Physical Planning Ordinance (2014) requires that a "storm water" drainage plan be submitted along with applications for infrastructure development permission. A good storm water drainage plan makes it possible to collect and manage storm water runoff (rain) to minimize flooding, take water away from the property and protect human health.

SEFAMM Grace Bay hotel project's site drainage plan is designed to provide sufficient storm water drainage system for the conveyance of storm water runoff from the subject property, with due allowance to avoid runoff to adjacent properties. Figure 55.0 is a stormwater drainage plan for the site.

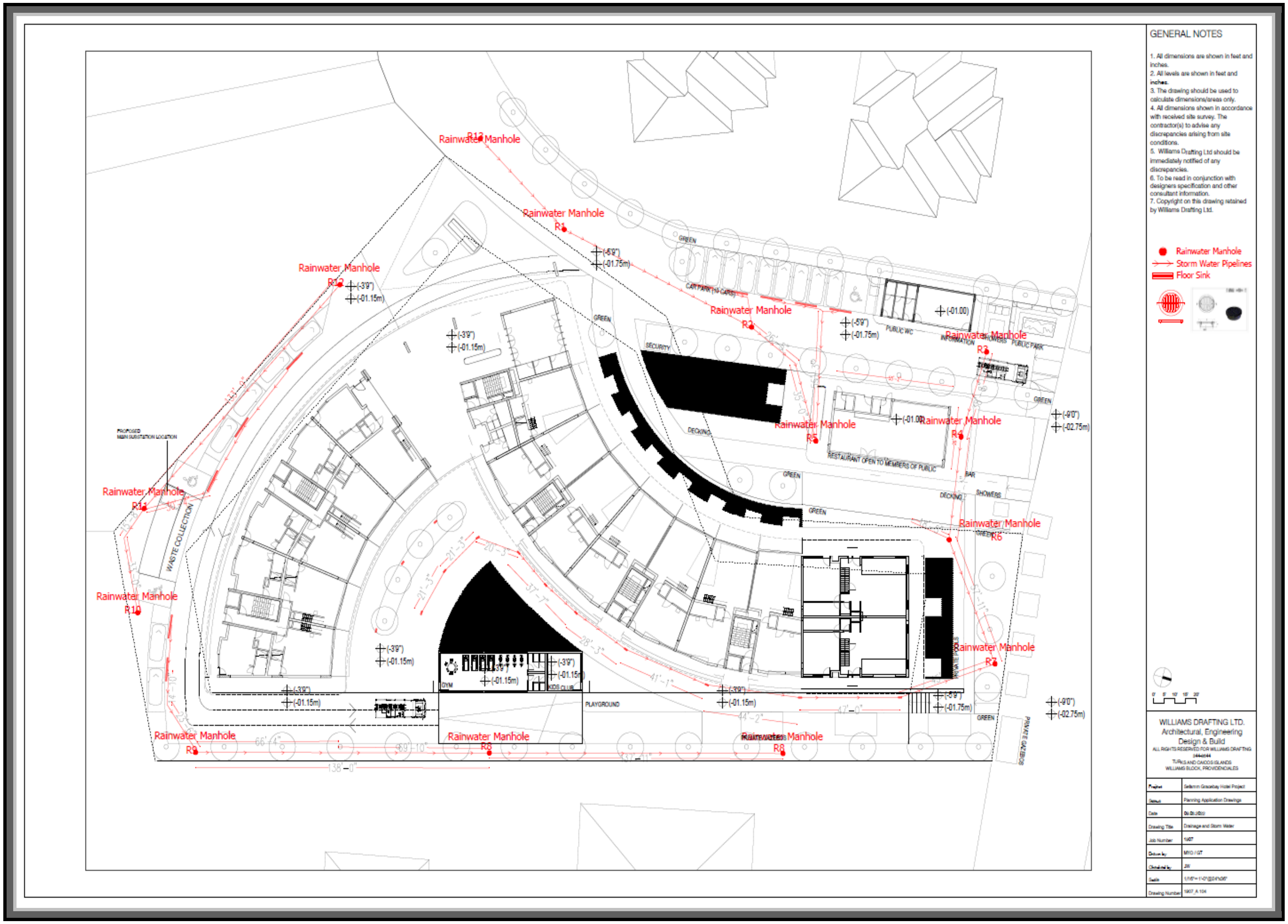

Figure 55.0: Stormwater Drainage Plan

4.9 Traffic flow and safety (marine and coastal)

The safety and security of patrons, snorkelers, swimmers, sun-bathers, and boat operators is of paramount importance to hotel management. To ensure a safe environment for marine activities within the near shore coastal area it is important that the various recreational activities within the coastal marine environment be properly planned and layout by zones. For example, designating areas as swim only zones and providing boat access lanes where appropriate. Demarking this area with buoys is the most common way of dealing with the conflict between swimmers and motorized boats.

To provide a safe swim-zone for SEFAMM Grace Bay hotel guests, the marine area immediately in front of the hotel property will be zoned for recreational activities. A swim zone and boat access lane will be marked off by demarcation of buoys. Motorized boats will be prohibited from entering the swim zone. The existing swim zone in front of the property will be removed and replaced with a better demarcated one Photo 44.0.

Photo 44.0: Existing swim zone in front of the SEFAMM Grace Bay Hotel property's site.

4.10 Water and electrical demand and sources

An international day to celebrate freshwater was recommended at the 1992 United Nations Conference on Environment and Development (UNCED), and since then World Water Day has been held annually on 22nd March of each year. The day aims to focus attention on the importance of freshwater and advocating for the sustainable management of freshwater resources. Water scarcity is a globally recognized problem, with demand for water projected to exceed supply by 40% by 2030. By the same year, half the world's population will be living in areas of high-water stress.

Hotel companies have both a strong commercial and moral imperative for addressing water use. Cost is a clear factor. Water accounts make up approximately 10% of utility bills in many hotels. According to the UK's Environment Agency, depending on their water efficiency, hotels can reduce the amount of water consumed per guest per night by up to 50%, compared with establishments with poor performance in water consumption. The moral reasons are equally compelling - water is a scare resource in many resorts around the world, so hotels have a responsibility not to use more than necessary.

Historically, potable water supply in the TCI was provided by the collection and storage of rainwater in water cisterns. On Providenciales, and to some extend the Caicos Islands, potable water was provided by wells. But due to limited rainfall in most of the islands, government invested substantial sums of money in the development and installation of Reverse Osmosis Plants (ROP) on Grand Turk, Salt Cay, and South Caicos.

On Providenciales, the supply of potable water has been privatized, where potable water supply is provided by Provo Water Company (PWC). Approximately, 1.5 million U.S. gallons of water per day is processed by PWC and distributed to its customers via a network of pipes or by water trucks to customers not presently on the network (PWC).

4.10.1 Water and electrical demand and sources - Construction

During the construction and operational phases, the proposed SEFAMM Grace Bay hotel project would need a reliable and sustainable sources of water supply and electricity, which would place additional demands on the service providers, namely Provo Water Company and Fortis TCI Limited respectively.

4.10.2 Water and electrical demand and sources – Operational

Water

On Providenciales, the supply of potable water has been privatized, where potable water supply is provided by Provo Water Company (PWC). Approximately, 1.5 million U.S. gallons of water per day is processed by PWC and distributed to its customers via a network of pipes or by water trucks to customers not presently on the network (PWC 2020). SEFAMM Grace Bay hotel resort facility would source its water from Provo Water Company.

Total Potable water requirements during the operational phase of the SEFAMM Grace Bay hotel facility is estimated at approximately 15,900 gallons per day, calculate from the suggested minimum daily potable water consumption rate of 150 gallons/day/room from Section 702.1, TCI Building Code (Based on the 106 rooms hotel facility) Table 23.0 and Table 24.0.

Table 23.0 Minimum daily water consumption rates

No.	Building Type	Water Rates
1	Dwelling House	40 gallons/person/day
2	Hotels	150 gallons/room/day
3	Offices	15 gallons/employee/day
4	Condominium/Apartments	100 gallons/bedroom/day
5	Schools	15 gallons/student/day
6	Airports	5 gallons/passenger/day

Source: Turks and Caicos Building Code

Table 24.0 SEFAMM Grace Bay hotel daily water consumption rates

No	Building Type	Total Rooms/Beds	Water Rates	Totals
1	Hotel Rooms – 106 rooms	106	150 g/d	15,900
2	Restaurant/Bar	•	5,800 g/d	5,800
3	Swimming Pool	135,000 gals	13,500 p/d	13,500 g/d
4	Recreational Facilities			
5	Landscaping	12 g/sq/foot	130,000 p/d	130,000g/d

Rainwater will be harvested, treated, and stored in specially constructed water storage cisterns. This water source will also be available in the event of a fire emergency.

Additionally, irrigation water storage cistern will be constructed on the property. The irrigation grey water will be used for landscaping purposes.

During the operational phase of the development, hotel management will utilize water preservation, conservation, and Best Management Practices to reduce water consumption rates on the property. These Best Management Practices will include, but not limited to:

- Installation of water conservation devices in general water use areas, including bathrooms, laundry facilities, lawns, kitchen, and housekeeping.
- Water efficient systems – grey water systems enable up to 50% water to return to the hotel after treatment for landscaping purposes.
- Low-flow technology will be installed and will save large volumes of water across bathrooms and kitchens, with minimal effects on the guests experienced.
- Water meters will be installed in various sections of the property, which will help management identify areas of greatest use.
- Invest in new water conservation technology or water reduction schemes, and,
- Educate employees and guests on management commitment, objectives, and goal of water reduction.

Electricity

Energy usage in developing countries has risen more than fourfold over the past three decades and is expected to continue increasing in the future. Electricity is one of the most important ingredients for economic, infrastructural, and social development. Electricity in the TCI is generated, retailed, and distributed by Fortis TCI Limited. The Company serves almost 14,000 electricity customers in the Turks and Caicos Islands – mainly Grand Turk, Providenciales, Salt Cay, North, Middle and South Caicos (Fortis).

Fortis has a combined diesel-fired generating capacity of 82 megawatts and meets a combined peak demand of 37.6 MW in 2015 (Fortis). According to the Company's promotion materials, Fortis TCI has a strong commitment to the environment and continues to take measures by investing in infrastructure, as well as policy and procedures that are consistent with international standards. Power for the proposed SEFAMM Grace Bay hotel facility will be provided by Fortis. Electricity projection usage for the hotel facility at full capacity is estimated at 480 volts 3 phase power at 4,200 KVA.

The designers of the proposed SEFAMM Grace Bay hotel development took every effort to reduce the total energy utilization load of the development. The measures taken to reduce the total energy load and to e4nsure sustainability included:

- Layout of all aspects of internal spaces. Natural and cross ventilation is used where possible.
- Use of energy and water efficient fixtures and appliances.
- Explore solar panel power and renewable energy options,
- Use of high-level U-values on external skin to achieve the highest performance standards.
- Orientation – All ultra-exclusive residences wrapped with spacious balconies, or aleros providing necessary shading.
- Use of full height sliding windows blurs the lines between outdoors and indoors, mainly north facing units also help to optimize the natural daylight and reduce loads on cooling.
- Aground level, common areas are without an external where possible to reduce mechanically ventilated areas.
- There will be electrical charging points within the development to encourage electrical car use. Cycle parking spaces would be provided to encourage the use of bicycles by guests.
- Car sharing scheme would also be introduced to optimize the use of cars.

Backup electrical generating equipment

The National Electrical Code (NEC) makes a clear distinction between emergency power and standby power systems. The equipment involved in both is similar; the use is different. Emergency systems provide power and illumination essential for safety to life and property, where such systems are legally required. Thus, most Building Codes require emergency power for exits lighting and egress lighting in places of assembly, plus power for equipment necessary for safety such as elevators, fire alarm systems, and fire pumps and so on, and extensive systems in health-care facilities.

Stand-by systems provide power of selected loads in the event of failure of normal source. These systems are primarily intended to protect against property damage or financial loss and are not involved with safety considerations. For this reason, the few authorities, which legally require their installation do so only for water and sewage treatment plants. Private owners on the other hand do install standby systems when power interruption would cause inconveniences to guests. The T&C Building Code, which this project must conform to, makes mandatory requirements for emergencies, and stand by power.

The SEFAMM Grace Bay hotel facility will be provided with an emergency generator set, located at the maintenance building. In the event of an interruption of the public power supply, the generator will provide power for the following systems - Emergency lighting, both interior and exterior; fire alarm equipment; fire pump; Standby potable water pumps; sewage lifts stations; wastewater treatment plant; telephone exchange equipment, and office, meeting areas and the casino.

Fire safety and equipment

High-rise buildings present several unique challenges not found in traditional low-rise buildings; longer egress times and distance, evacuation strategies, fire department accessibility and fire control. High-rise buildings are not inherently dangerous structures, but they do require additional systems and features than low-rise buildings. Components of hotel fire system can include the following - Fire sprinkler system; smoke and fire detectors; duck smoke detectors; automatic alarm systems; manual alarm systems (the pull-boxes used near stairway doors and elevators); fire Department standpipes; emergency lights, the emergency egress system; exits & exit signs, smoke control systems; portable fire extinguishers, staff and guests' emergency response plan, staff training; gas Supply Shut-off Devices, and fire alarm system.

The SEFAMM Grace Bay hotel project is designed in accordance with the National Fire Association standards and Turks and Caicos Building Code.

4.11 Landscaping

Landscape planning is defined as an activity concerned with reconciling competing land uses, while protecting natural processes and significant cultural and natural resources. Landscape design architecture for resorts is a unique art form that combines beautiful public spaces with the feeling of luxurious private escapes. Landscaping is a critical element of resort planning worldwide,

4.11.1 Landscaping initial phase

The landscape design plan for the SEFAMM Grace Bay hotel project makes maximum utilization of existing native vegetation and incorporates a few foreign plant species to enhance the overall integrity of the landscape. The design conveniently incorporates a minimum of 30 feet buffer zone, landscaped with natural and local vegetation and palm trees around the development. The buffer zone also has a 16.5 feet wide service road surrounding the development enabling access for fire trucks. A centra; boardwalk would be strategically located to allow uninterrupted beach access over the fragile sand dune system.

4.11.2 Landscaping maintenance and operation

Maximum utilization of native plants in landscape design can have important benefits on the environment by fostering healthy ecosystems and enhancing biodiversity. SEFAMM Grace Bay hotel project will be landscaped with natural local vegetation and palm trees. The developers are considering using a sedum roof system in the design of the hotel facility that would withstand drought in very climates. Sedum is easy to maintain and requires little water and nutrients. Sedum is very resilient to diseases and insect pests.

Landscaping and hardscaping like sidewalls, walkways and car parking are important components of a cohesive landscape design and would help shape the SEFAMM Grace Bay hotel project's landscape design features.

By utilizing predominantly native vegetation and incorporating the like of sedum roof systems in its landscape design, SEFAMM Grace Bay hotel project landscape maintenance will be cost effective because native plants adapt to local climatic conditions, prevents soil erosion, and more effectively filter storm water. No fertilizers are required because of the use of predominantly native vegetation in landscaping the site.

4.12 Construction phase activities

The construction methodology is as follows:

- Requisite testing will be done at the sand supply site to ensure the available volume, and that the sediment is suitable.
- A surveyor will set out controls for the works.
- Equipment will be mobilised.

- An excavator and truck will be used to load and transport the sand.
- The sand will be transported to the site and stockpiled.
- Once the requisite volume has been stockpiled, a front-end loader or bobcat will be used to spread the stockpiled sand to the design grade.
- A surveyor will then survey the works to ensure that the construction was done to recommended crest height and side slopes.
- All debris will be collected, removed, and disposed of offsite at a suitable dump/landfill; and
- Equipment will be demobilised.

4.12.1 Construction methods and programs

Construction planning is a fundamental and challenging activity in the management and execution of construction projects. It involves the choice of technology, the definition of the work tasks, the estimation of the required resources and the duration of the individual tasks and the identification of any interactions among different work tasks. Developing a good construction plan is a critical task in the management of construction.

Delivering the project in a timely, cost effective and environmentally sound manner is critical to all stakeholders, particularly the principals, government, and daily users of neighbouring businesses. Achieving this objective will depend heavily on project planning, programming, and scheduling of construction activities. All pre-construction operations, construction activities and post construction activities - equipment and labour flow need to be well planned to avoid unnecessary delays in construction.

4.12.2 Site security and hoarding

Construction hoarding is temporary fencing used to secure a job site. Fencing may be required by law for safety reasons in some areas and is also used by contractors to limit theft and liability. A variety of construction hoarding products are available, ranging from webbed plastic for very temporary barriers, to solid panels used to offer security for several years on a large or complex location. Typically, construction hoarding is tall enough to be difficult to climb or jump over. If there are special security concerns, a guardhouse may be established to allow someone to monitor the location.

The site for the proposed SEFAMM Grace Bay hotel project is located within the center of the Grace Bay Tourist Strip; therefore, during construction hoarding is critical for the safety of workers and pedestrians using the Grace Bay beach and the general area. To safeguard residents and tourists and members of the public from using neighboring facilities, the construction site is enclosed with a screen Photo 45.0.

Photo 45.0: Hoarding and screening of construction site

To reduce visual intrusion from advertisements, their erection on site would be limited to the project name, name of the construction companies carrying out the works, and marketing and promotional information (Photo 46.0).

Photo 46.0: Project's advertisement sign

4.12.3 Source of sand for beach nourishment

The coastal works do not include beach face nourishment. Sand for the dune addition and reconstructed will be sourced from a licensed sand supplier.

4.12.4 Storage of materials and equipment

Safe and efficient materials storage depends on good co-operation and co-ordination between everyone involved, including clients, contractors, suppliers, and the construction trades. The planning and mobilization of raw material and equipment is an important aspect for completing the job on time. Handling and storing materials involve many different activities such as hoisting steel beams, driving a truck loaded with raw material, manually carrying bags or material, and stacking supplies. Employees can be injured by improperly lifting materials (manually and by machine), falling objects and improperly stacked supplies. It is critical that proper materials storage and handling is made a priority.

Proper materials handling practices help prevent injury and property damage. Segregating non-compatible materials during storage goes a long way in preventing fires. Getting rid of waste and other used construction materials can be a challenge. Waste debris should not be allowed to pile up on site for long periods of time. All scrap lumber, waste material, combustible scrap and rubbish will be removed from the site daily.

The only materials and equipment to be stored on the site are those that are needed for the proper and complete construction of the subject development. Heavy equipment is to be stored on site in an enclosed area.

Because of the size of the site, limited space would be available for the safe storage of construction materials, therefore, off-site storage of construction materials and equipment is an option that is been considered by the developers. Two off-site locations are under consideration, these include 60605/19 and 60605/20.

Project Management will prepare a Storm Action Plan that provides guidelines on construction site preparation in the event of a storm.

4.12.5 Beach traffic impact and safety

The project is located on the northern coastline of Providenciales and is bounded by Princess Alexander National Park and Grace Bay Beach on the Northern side of the Property.

Grace Bay Beach is a public beach, approximately 3 miles (4.8km) long and is the home to many resorts on Providenciales. Due to the clear waters, free access, prime location and shallow depth, Grace Bay Beach is a prime tourist attraction with many beach goers and boat and water sports traffic in the area. Due to development happening adjacent to Grace Bay Beach, the safety of beach goers is important.

The project's scope of works is limited to upland works, with no development being scheduled for the existing marine environment. Scope of works for the beach includes beach restoration of the damaged sand dunes, installation of beach equipment such as lounge chairs and beach umbrellas, creation of a swim zone and boat access lane.

Activities should not endanger beach goers but will affect use of a section of beach adjacent to the property. Portions of the beach may have to be sectioned off/closed for dune restoration and anchorage of the buoys for swim area and boat access lane. To ensure the safety of beach goers in the area, the following practices should be implemented:

- Nearby businesses and residents should be notified of the commencement of construction activities. This is especially important as to allow for resorts and Airbnb's in the area to warn guests to be vigilant in the area.

- Proper signage indicates active construction in the area. These can include but are not limited to signs saying, "Men at Work" "Caution" "Active Construction Site" and "No Entry".

- The site boundaries should be clearly marked. Silt fencing should be installed around the site to ensure no unauthorized entry and prevent any construction material from polluting the beach.

4.12.6 Temporary sanitary facilities

A well-planned construction site will include temporary construction facilities for site offices, workshops, sanitary facilities, and storage facilities. The on-site location of these temporary facilities can have a direct impact on productivity and safety, cost, and duration of construction. All temporary facilities must satisfy environmental and safety standards.

Regulation 4 (1) of the Turks and Caicos Permitted Development Regulations defined temporary buildings as buildings erected for temporary purposes in pursuance of a grant of Development Permission and needed temporarily in connection with those operations for the period of such operations. In complying with this requirement, temporary buildings on site are to include - site office buildings, storage buildings, toilet facilities, workshops, and staff facilities.

Temporary toilet facilities for construction workers are to be provided on site at a suitable location to minimize visual impact on the surrounding environment. These will be removed once the development is fully completed.

Permission has been sought and granted from the Planning Department for the construction of an office building, complete with sanitary facilities to be used during the construction phase. Once the construction of the hotel facility is completed this building will be converted into restaurant and bar facilities.

4.12.7 Access and staging

Managing vehicular traffic at a construction site is important in ensuring that the workplace is without risks to health and safety. Vehicles, including mobile plants and equipment moving in and around the site can pose serious threat to workers' safety. The most effective way to protect workers is to eliminate traffic hazards. This can be done by designing the construction site layout to eliminate interactions between workers and vehicles.

Access to the project site is via a secondary feeder road that leads off the busy primary Grace Bay Road. Increased vehicular traffic into this area is expected during construction and thereafter. If most of the construction's workers are brought into the area by private vehicles, this would cause additional vehicle traffic into the area. To avoid the additional traffic into the area, workers would be bused into the area. Their personal vehicles would be parked off site on block and parcel number 60713/75 that is owned by the developers (Appendix K).

4.12.8 Placement and spreading of materials (Sand)

The sand will be placed in the stockpile by dump truck working from the eastern property boundary to the western side. After most of the sand has been brought to the site, a front-end loader or small bobcat will be used to spread the sand to the design elevation and side slopes. The construction will be checked against the design by performing a post-construction land survey.

4.12.8.1 Beach replacement plan

The scope of works for the existing beach in front of the property include beach replenishment/nourishment, creation of a swim zone and boat access lane, and installation of beach equipment such as beach chairs and umbrellas.

Sand Dune Restoration

Sand dunes can also be restored using seeding/planting techniques. This involves planting dune grasses to reduce wind speed across the dune surface and thereby trapping and holding sand. Planting vegetation helps to stabilize dunes and encourages dune recovery. Selected species must be resistant to silting, wind and salinity. When the grass cover is established, it can become self-sustaining. Regular monitoring and re-planting are necessary.

Swim Zone

The swim zones total approximately 800 linear feet, and the swim zone will extend 400 ft from the shoreline with a gradual slope from the beach. The swim zone will be designated with anchored buoys to prevent boats from entering the area.

Boat Access Lane

A boat access lane will be created to the west side of the property. Buoys and/or markers will be placed on the beach and in the nearshore marine environment to indicate the swim zone from the boat access lane. Navigational markers will also be placed to assist in safe and easy movement of vessels.

Beach Equipment

Beach equipment such as chairs, beach shade and beach umbrellas will be placed on the beach to facilitate beach goers once the project is completed.

Equipment used during Beach replenishment include but are not limited to:

- Excavators 50 tons
- Tractor and trailer
- Backhoe Loader
- Dump Trucks

The proposed works are as follows:

- Mobilization of all equipment to site.
- Installation of turbidity curtains to contain any siltation.
- Placement of sand/fill onto predesignated place.
- Grading of sand for the swim zone.

Habitat restoration

The habitat nearshore is made up of 98% bare sand void of flora and epifauna and 2% seagrass patches. The seagrass patches are further offshore and consist of sparse seagrass. Measures to be taken to ensure the preservation of the seagrass include installation of turbidity and silt curtains and monitoring during beach replenishment activities to ensure sedimentation is kept to a minimum. High sedimentation can smother seagrass beds.

4.12.9 Protection of new beach sand from erosion during swells

Modelling exercises showed that the additional sand would not be heavily impacted during swell events. Most erosion occurred between the waterline (0m) and about 1m elevation. Within the property boundaries swells did not generate erosion.

4.12.10 Liquid waste management during construction

The discharge of wastewater from construction sites is a challenge in the construction industry. Construction waste can be divided into the following types – waste from construction activities, construction site surface runoff, waste from vehicles washing, waste from site toilets and plant maintenance facilities and waste from construction workers. During the construction phase of the SEFAMM Grace Bay Hotel development a building currently under construction will be used as temporary offices, workshops, and toilet facilities will be used by construction workers. These buildings are equipped with modern wastewater disposal facilities. Once construction works on the hotel facility is completed, this building will be converted into a beach bar and restaurant facilities.

4.12.11 Control of air, dust, water, and noise pollution

Ambient air quality standards define clean air and are established to protect the most sensitive individuals in our communities. An air quality standard defines the maximum amount of a pollutant that can be present in outdoor air without harm to the public health. The Environmental Protection Agency (EPA) has set National Ambient Air Quality Standards for six principal pollutants, which are call "criteria air Pollutants" – they are Carbon Monoxide, Nitrogen Dioxide, Lead, Ozone (or smog), Particulate Matter, and Sulfur Dioxide.

The agency with the responsibility for the management and control of air quality and air pollution in the TCI is the Environmental Health Department (EHD). Air quality in the TCI is relatively good and sources of air pollution are limited to air pollution generated by vehicles and burning of solid waste.

The proposed SEFAMM Grace Bay hotel project will produce several point sources of air pollution during the construction phase, including exhaust from hauling equipment, booster pump engines, concrete trucks and other devices used in the construction of the facility. Additionally, transport vehicles and dump trucks will generate some level of air pollution during the operation. The impact from transport vehicles will be short-term. These Impacts may result in a temporary reduction in ambient air quality that would adversely affect the aesthetic quality of the physical environment. Because of the nature of the proposed development long-term air quality is not expected to be impacted.

4.12.12 Control/storage of fuels and other dangerous substances

LPG (Liquefied Petroleum Gas) is the term applied to those hydrocarbons, which are vapoured at room temperature and pressure, but can be liquefied by compressing them lightly. When LPG is liquefied, its volume decreases considerably so that it requires much less storage space. LPG is composed of a mixture of mainly propane and butane (approximate ratio – 60:40 by mass) but may contain some propylene and butylene as well as traces of ethane, ethylene, pentane, and butadiene. It is colourless and odourless, but commercial LPG is usually stanched with a substance called ethyl mercaptan to give it a characteristic odour.

The site development plan for the SEFAMM Grace Bay Resort Hotel project sets aside areas for storage of liquid petroleum gas and other fuels that would be required for the daily operations of the facility.

There is a minimum distance called the "**separation distance**" between the tanks and any building, boundary line or fixed source of ignition. For security reasons "**No Smoking Signs**" and other signs will be clearly displayed and maintained around the tanks. Ignition sources, for example bonfires and barbecues will not be permitted near LPG storage tanks. The tanks will be properly fenced and screened to protect against unauthorized access to reduce the chance of intentional or accidental interference.

Due to the nature, scale and scope of the proposed development, storage of hazardous materials will not be a site activity and is therefore not an environmental concern. There are no planned on-site activities that would require the use of, or on-site storage of hazardous materials.

4.12.13 Emergency Mitigation Plan

All efforts must be made to avoid dangerous or reckless practices on the construction site. The following are recommended practices to prevent emergencies and what should be done in the unfortunate case of a site accident.

Neighbourhood Mindfulness

Construction will be inconvenient for the surrounding residents. To mitigate any accidents from lack of information, it is imperative that clear communication occur. Neighbours should be informed of construction and the possible hours of construction/disturbance. Neighbours should also be informed of the positive impacts of the works such as reducing site inundation.

Muster Points and Evacuation Routes

Muster points and evacuation routes must be chosen early in the construction and operational phases. Muster points are relatively safe locations where people can gather when an emergency occurs, to verify that everyone is accounted for and available to receive instructions. Evacuation routes will be used to move from the construction site to the appropriate muster point in each case. Muster points and evacuation routes must be clearly marked and kept unobstructed throughout the construction and operational phases.

Public Access and Recreational Use

During active construction hours (strictly 7am-5pm) notices will be strategically posted to warn the public of the on-going construction activities.

Health and Safety

All workers will be given an orientation of the perils associated with working in a marine environment. For each work activity, potential risks will be identified and proportionately addressed with risk-mitigation strategies. Appropriate protective gear will be used by all workers. Gear will include ear plugs, steel-toed boots, hard hats, high visibility vests and gloves. Neighbours and locals will be notified of the works and caution tape will be placed along the beach, stockpile area and access path for equipment.

Emergency Response

In the unfortunate event of a worker being injured on site, work along his or her section will be stopped, and emergency response teams called to quickly aid the worker. The cause of the incident will be investigated to prevent further injury on site and safety procedures will be reiterated.

On-Site Resources

In addition to best practices, equipment and materials must be provided on site to respond to emergencies. These will include:

- Buildings or open areas designated as muster points with resources listed below.
- A siren system to warn staff and nearby residents when an emergency arises.
- Fire extinguishers on site; and
- Adequately stocked first aid kits.

4.12.13.1 Hydrogeological mitigation strategies

Two basic hydrogeological mitigation strategies will be employed for this project:

- Avoidance of Risk – identify potential risk (injection /disposal well failure), plan for risk (design deep injection / disposal well) and initiate mitigation steps to avoid the risk (injection / disposal well testing prior to construction)

- Watch and Monitor – use of pressure gauges at the head works of the injection /disposal well(s) to act as early warning mechanism to alert to potential well failure. Daily monitoring schedule will provide input for routine evaluation.

Additionally, the implementation of a stormwater and site drainage plan comprised of strategically place drainage manholes will act to intercept potential flood episode and reduce site flood potential, (See Figure 55.0 Site Drainage).

4.12.13.2 Description of decommissioning activities

After completion of construction, the contractor and site manager will ensure that the site is fully clear of construction activities. These activities include:

- All chemicals, waste stored on site, and concrete washout areas will be removed.
- Oils, lubricants, or fuels will be properly disposed of by a licensed contractor.
- All equipment will be properly cleaned, dismantled, and removed by the contractor.
- All temporary buildings, trailers, and excess materials will be removed from site.
- The site will be returned to its natural state. The exception being the beaches which are permanent structures.

4.12.13.3 Beach Replenishment Plan

The scope of works for the existing beach in front of the property include sand dune restoration, creation of a swim zone and boat access lane, and installation of beach equipment such as beach chairs and umbrellas.

4.12.13.3.1 Sand dune restoration

Sand dune restoration would be completed by dune fencing and dune seeding/planting. Fence will be constructed along the seaward face of the dune to reduce wind speed on the surface and encourage foredune deposition of transported sediment by acting as a barrier against wave impacts. Fences are often constructed of wood but can be formed using other materials such as fishing nets. Dune fencing can also increase the deposit of organic matter and the resulting growth of grasses and other plants. Fences would be stable, and monitoring should be done to ensure fence maintenance and effectiveness. Also, maintenance can be complex in touristic areas welcoming a lot of visitors.

Sand dunes can also be restored using seeding/planting techniques. This involves planting dune grasses to reduce wind speed across the dune surface and thereby trapping and holding sand. Planting vegetation helps to stabilize dunes and encourages dune recovery. Selected species must be resistant to silting, wind and salinity. When the grass cover is established, it can become self-sustaining. Regular monitoring and re-planting are necessary.

4.12.13.3.2 Swim Zone

The swim zones total approximately 800 linear feet, and the swim zone will extend approximately 200 ft from the shoreline with a gradual slope from the beach. The swim zone will be designated with anchored buoys to prevent boats from entering the area.

4.12.13.3.3 Boat Access Lane

A boat access lane will be created to the west side of the property. Buoys and/or markers will be placed on the beach and in the nearshore marine environment to indicate the swim zone from the boat access lane. Navigational markers will also be placed to assist in safe and easy movement of vessels.

4.12.13.3.4 Beach Equipment

Beach equipment such as chairs, beach shade and beach umbrellas will be placed on the beach to facilitate beach goers once the project is completed.

Beach Replenishment Equipment

Equipment used during Beach replenishment include but are not limited to:

- Excavators 50 tons
- Tractor and trailer
- Backhoe Loader
- Dump Trucks

The proposed works are as follows:

- Mobilization of all equipment to site.

- Installation of turbidity curtains to contain any siltation.
- Placement of sand/fill onto predesignated place.
- Grading of sand for the swim zone.

4.12.13.3.5 Habitat Preservation

The habitat nearshore is made up of 98% bare sand void of flora and epifauna and 2% seagrass patches. The seagrass patches are further offshore and consist of sparse seagrass. Measures to be taken to ensure the preservation of the seagrass include installation of turbidity and silt curtains and monitoring during beach replenishment activities to ensure sedimentation is kept to a minimum. High sedimentation can smother seagrass beds.

4.13 Safety and security concerns within the community during construction and operation

4.13.1 Construction

Providing and maintaining appropriate levels of site security during the construction of the SEFAMM Grace Bay hotel is one of the main objectives of the contractor and owners of the proposed hotel, as it will protect the site, reduce the potential for theft and restrict entry to only authorized personnel.

Some security measures to be taken during the construction phase of the development include, the development of a security plan, securing the perimeter boundaries of site to restrict access, install security lights, have limited access to the site and install surveillance systems.

4.13.2 Operations

The increasing criminal activity in the Turks and Caicos Islands, particularly, Providenciales has placed tremendous challenges on hotel owners and management to ensure the safety and security of hotel guests, workers, and patrons. Hotel security is all about the management of all aspects of a hotel operation, its property, grounds, equipment, personnel and more. Hotel security involves the establishment of effective procedures, systems, and personnel to ensure the safety and security of all guests, their belongings, and the staff.

SEFAMM Grace Bay hotel management will develop security measures to ensure that physical, financial and information threats to property and guests are reduced. This will be accomplished by providing surveillance monitoring systems throughout the hotel property, equipping employees with safety devices, ensure that all employers are trained in safety and security measures and develop a security plan for the hotel operation.

Hotel management will also work with the Royal Turks and Caicos Police Force to develop a neighbourhood policing program.

4.14 Issues raised in the public consultation.

Public involvement is a fundamental principle of the EIA process. The inclusion of the views of the affected and interested public help to ensure the decision-making process is equitable and fair and leads to more informed choice and better environmental outcomes.

Some of the issues raised at local agencies consultation level include the potential for coastal erosion, solid waste disposal methods to be employed, the use of renewable sources and sustainable and resilience construction methods and construction materials to be use in the construction of the hotel facility. Beach carry capacity is another issue raised, particularly as it relates to the use and placement of beach furniture. Safety and security of guests and visitors swimming and snorkelling in the marine area in the front of the property. Swimming zones and boat access lane will be established to separate the two users.

4.15 Impact on terrain, including methods of clearing the site.

The site of the proposed SEFAMM Grace Bay hotel project (60905/16 and 204) is relatively flat, with elevation not greater than 3 meters above sea level. This presents a few challenges for the design team. Grading and alterations to the site terrain's will be limited. The site has been previously impacted by human activity; therefore, site clearing will be limited to existing vegetation along the northern boundary. Native vegetation will be use in the site landscaping.

4.16 Potential alternatives

Multiple solutions could have been implemented to provide protection to the development. The possible alternatives are discussed below:

- **Buried Rock Revetment** – this option would implement a rock revetment covered with beach sand. This solution would include excavating to around 1.5m depth of the existing sand dune and placing a layer of large boulders. The excavated sand would then be placed back on top of the boulder revetment. This option would have a longer construction period.

- **Do nothing** – this approach would keep the existing beach profile as is. This option is the cheapest option in the short term. The option is also attractive because the property is already protected against swell wave conditions. Unfortunately, this option does not provide protection against hurricanes or future climate change impacts. In the medium to long-term this alternative would be more costly as the property becomes increasingly vulnerable to rising seas and hurricanes.

4.16.1 The "No-Action" Alternative

The "No Action" alternative would be to let the project area remain in its present condition. This alternative will preserve the natural state of the existing ecosystem and the surrounding areas. However, the positive economic impact to the country's economy and surrounding community would not be realized.

4.16.2 Other Alternative

No other alternative is given due to the project being privately owned, relatively small and due to the project having no proposed marine works.

SECTION V

5.0 Impact Assessment

With any new project there will be impacts to the society and environment. The impacts may be positive or negative, direct, or indirect. The impacts will also have varying durations such as temporary or long lasting. This section highlights the possible impacts associated with the proposed development.

5.1 Impact Identification

Possible impacts during the project life are categorised as occurring during the construction phase or the operational phase. The impacts are further classified as direct or indirect based on the area of impact. For this project there are four areas of impact: (1) the physical and terrestrials; (2) marine a 500m radius from the site and (3) coastal; (4) socio-economic and heritage culture.

The impacts to the coastal environment have been quantified by assessing modelling results before and after the concept is put in place. There were few changes observed on the wider impact areas since there is no permanent interaction with the nearshore area.

The perceived potential impacts to the hydrogeological environment include:

- Depletion of existing fresh groundwater
- Degradation of groundwater quality
- Odor – wastewater treatment system operations

5.2 Description of impacts

The impacts have been tabulated so that they can be quickly viewed against each other and to show which impact area is most at risk.

5.2.1 Potential impact on the biotic environment

Long-term negative impacts to the marine resources in the area are not expected to occur because of the proposed construction work. Construction will be closely monitored to prevent contamination of the adjacent marine habitats. Generally, the potential environmental marine impacts associated with The Project include the following:

- Water quality Impacts
- Sand Dune Restoration Impacts
- Swim zone and boat access Impacts
- Solid Waste Impacts
- Social Impacts

All impacts are expected to be low as there are no marine works scheduled for the project.

5.2.2 Hydrogeological environment

Freshwater lens -the mixing of saltwater with the existing fresh groundwater that results in the contamination of the freshwater lens that renders the freshwater non-potable.

Degradation of Water Quality – Nutrient loading derived from the use of fertilizers in the landscape plant and potential wastewater leakage into the subsurface that renders the freshwater non-potable.

Odor – the inadvertent emission of Sulphur gases into the air of immediate and surrounding areas resulting in offensive odors.

5.2.3 Potential impact on the coastal environment and processes

Potential impacts to the coastal environment are generally split into two phases: construction phase and operational phase. During the construction phase, most impacts are associated with the placement of sand. Other possible impacts are discussed below.

Smothering

Smothering or trampling of terrestrial plants might occur during the construction period from the added sediment on land. Temporary smothering could also occur through the passage of heavy machinery over sensitive areas during the construction process.

Oil Pollution

There is also the potential for oil pollution stemming from fuel leaks or refuelling spills from equipment used for sand placement or grading.

Loss of habitat/ biodiversity

Terrestrial vegetation within the dune concept footprint will also be impacted during the construction works while sand is stockpiled and graded.

Debris

Any debris left on the property from the construction activities may dimmish the aesthetic appeal of the area or become an obstruction on land.

Wide Scale Coastal Processes

Impacts to the coastal environment in the operations phase were assessed based on scenarios such as daily waves, tidal currents, hurricane waves and hurricane surges. The main long-term impact was positive in this case as the dune addition reduced inundation during the hurricane scenarios tested.

5.2.4 Potential impact on the geological environment

The proposed development does not pose any potential impact on the geological environment. The intact, geological formation is homogeneous and contiguous across the project and is absent of kart geological features.

5.2.5 Potential impact on the aesthetic environment

Aesthetics is a branch of philosophy dealing with the nature of beauty, art, and taste and with creation and appreciation of beauty. The aesthetic value of an area is based on the visual character and quality of the natural and human-made features of the area.

The study area, for aesthetic purposes, is defined as the immediate areas within the vicinity of the proposed development – i.e., the Seven Stars development to the east, The Regents to the west, the beach to the north and the area to the immediate south of Grace Bay Road. The aesthetic quality of the Grace Bay area is affected by a mixture of imported Caribbean and North American and European architecture characters, nonunique to Providenciales or the Turks and Caicos Islands. The most dominant aesthetic character on Grace Bay is the 12 – story Ritz Carlton Hotel.

5.2.6 Water quality and noise pollution (Construction and Operation)

Mitigating any potential harmful effects to marine water quality is extremely important for the scope of construction. The major impact to the marine water quality due to construction activities is the potential release/spill of fuels and oils into the environment.

Oil spills can occur from improper handling and storage of fuel or oil on site or via leakage from construction machinery and improper fueling practices on site. This includes stationary machinery such as generators and tower lights or mobile machinery such as excavators and backhoe loaders.

Oil/fuel spills can have significant impacts on the environment, with impacts ranging from being short lived to being long-lasting. Oil spill can also indirectly impact society. This is especially important as Grace Bay Hotel Development is adjacent to the Princess Alexander National Park Oil spill can affect marine wildlife, marine benthic environments, tourism, and the residents.

Wildlife

Oil spills can affect marine birds, fish, and other sea life. For example, they may be coated in oil, which impacts their ability to move, thermoregulate and eat, or they become trapped in oil slicks completely. They can affect populations of marine species which can affect trophic levels within the ecosystem.

Environment

Oil has the potential to destroy habitats, particularly those that are sensitive or protected such as mangroves or coral reefs. Damage or destruction of these habitats can disrupt the natural ecosystems and the industries an. This can affect the livelihoods of locals to depends on these ecosystems in the long term.

Tourism

Tourism is Turks and Caicos primary industry. The beaches are a major tourist attraction and a source of income for many businesses. However, oil spills can decrease the overall appeal and attractiveness of the beach due to oil washing up on beaches or hitting the coast. There is also a more indirect effect as global perceptions of said destination can negatively shift after such an event.

Residents (local)

Damage of the marine environment from oil spill can affect residents (Local) who rely on those habitats as a source of income and livelihood.

5.2.6.1 Dune Restoration Impacts

Dune Restoration will impact coastal vegetation and the marine bird species that reside there. Bird species use the shoreline trees to nest and feed on marine fauna. To minimize impacts to wildlife and their habitats the following considerations should include:

- Location of sediment placement: Placement should take into consideration surrounding habitat. Dune restoration designs should ensure the placement of sediment would be stable to prevent erosion and sedimentation into the adjacent marine environment.

- Time of year: Restoration of the existing dunes should be timed to avoid shorebird nesting season.

- Vegetation density: replanting of vegetation along the new sand dune may need to be adapted to allow for successful nesting (e.g., shorebirds). This will allow for enough material to be available for birds to construct nests, and to hide the nest from predators.

- Vegetation type choice: Similar vegetation should be replanted on the new dune area. This will unintentionally prevent existing vegetation that helps to stabilize the area.

Dune restoration should be implemented according to design plan and should be stabilized. Improper dune restoration can lead to possible erosion and sedimentation into the nearby marine environment. This is important as the project is located within the Princess Alexander National Park (PANP). Sources of erosion can occur from unsterilized soils and runoff from excavated areas. Beach erosion can also occur due to high waves and wind energy. If not, properly managed erosion can introduce hazardous substances (i.e., fuel) into the marine environment and decrease the water quality due to an increase in turbidity and nutrient levels.

5.2.6.2 Swim zone and boat access lane impacts

There is potential impact of turbidity during the creation of the swim zone and boat access area due to anchorage of the buoys. Control measures and monitoring to reduce turbidity in the marine environment is extremely important as suspended sediments that cause turbidity can block light to aquatic plants such as seagrass, smother aquatic organisms, and carry contaminants and pollutants and pathogens, such as lead and bacteria. Proper monitoring efforts should be implemented to ensure sedimentation impacts do not exceed the threshold.

5.2.7 Ecosystem and economic analysis

5.2.7.1 Ecosystem analysis

Grace Bay Hotel development is located on the Northern Coastline of Providenciales along Grace Bay Beach. Grace Bay beach is a protected area within the Princess Alexander National Park and is Protected under Governmental Law. The marine ecosystem is not expected to be disturbed as there is no direct development occurring in the marine or coastal environments.

Dune Restoration is scheduled for the stretch of coastline in front of the property. Dune restoration will reduce the risk of storm damage and flooding by adding sediment to the beach and dune system. During activities coastal vegetation and marine shorebirds may be impacted due to the addition of fencing and other structures in their habitat. This impact should be minimal and short lived. Vegetation should be removed and replanted in the area where feasible and additional vegetation (of the same species or similar species) should be added to increase stability of the sand dune. The restored dune system should make for a more suitable nesting ground for marine shorebird species, increasing their population. Monitoring during activities and post activities should be done to ensure sand placement is effective.

Creation of the swim zones and boat access lane have the risk of causing sedimentation if not properly monitored. Impact to the marine ecosystem is expected to be minimal as bare sand, void of marine flora and epifauna was observed around the proposed activities.

The main impact associated with the dune addition is the loss of existing vegetation. Under the scope of this contract, a valuation analysis was not undertaken for this loss. However, it should be noted that similar vegetation is proposed for the replanting of the dune. The side slopes of the dune are like the existing beach slope, which will aid in creating a familiar environment for existing vegetation to grow. After replanting, the value of lost habitat will be restored as much as was practical.

5.2.7.2 Economic analysis

The development seeks to construct a hotel on the property which provides amenities such as swimming pool, beach facilities and tennis courts. The development is along a strip that already contains numerous luxury resorts like the proposed development. The Project Seeks to contribute to tourism (ecotourism specifically) by attracting and providing accommodations for guest visiting to the island of Providenciales. The property will have direct access to Princess Alexander National Park, a protected area with a marine environment teeming with diversity that will attract ecotourist looking to explore the coral reefs or take part in the may water sport activities offered such as kayaking or paddleboarding.

Potential threats to the integrity of the existing groundwater configuration are unavoidable, negative impacts derived from the proposed development. The use of natural groundwater in the landscape plan will effectively reduce the reliance on processed water and assist in lowering operating costs.

5.2.8 Socio-economic

Grace Bay is a tourism center on the northern side of Providenciales with many resorts, upscale shopping, and dining locations. Grace Bay Beach is a hot spot for beach activities with many water sports and boating activities such as kayaking and snorkeling. The objective of the project is the development of a hotel on the site. It is expected that the development will create more job and business opportunities for locals in the community, while also increasing tourism in the area through amenities such as accommodation and access to the beach and national park.

Restoration of the dune system and creation of the swim zone and boat access lane can potentially impact beach goers as the portion Grace Bay Beach adjacent to the will be closed for the construction of these works. However, this should only be temporary and there should be no long-term impacts.

Grace Bay Beach is a part of the Princess Alexander National Park that is open for public use. Grace Bay Beach can be accessed at Central, Forbes Point, Rotary Park, Stubb's Point, Manor Street Reagent Street, Grace Bay Club, Grande Court, and Sandcastle.

5.2.8.1 Public beach access

Beach access is a universal right and necessary for the public's enjoyment of the beach. Beaches and coastal area in the Turks and Caicos are a unique resource. They provide ecological, recreational, economic, and aesthetic opportunities that are found nowhere else. To use and enjoy this resource, people must be able to get to it. Beaches in the Turks and Caicos are public. Private property ends at the edge of vegetation.

Adjacent to the site of the proposed development is public beach access (Photo 47.0). SEFAMM TCI Limited has entered into a development agreement with the Government of the Turks and Caicos Islands to develop this public access (Photo 49.0). The Grace Bay public beach access has been fully developed by the developers of SEFAMM Grace Bay hotel development. The development includes facilities such as change room, rest room, freshwater showers, and car parking facilities. Photos 48.0 and 49.0 show the completed public beach facilities.

Photo 47.0: Drone Image of developed public beach facilities.

Photo 48.0: Drone Image of developed public beach facilities.

Photo 49.0: Drone Image of developed public beach facilities

5.2.8.2 Potential impact on neighbouring developments

Urban design is an art form of designing buildings and places for people and is one of the important elements in urban planning, especially for dense and dynamic coastal areas like Grace Bay, Providenciales. It concerns the total visual effect of building masses, connections with people and places and creation of spaces for movement, urban amenities, and public realm.

The proposed 7-stories SEFAMM Grace Bay hotel development will have direct and indirect impacts on the physical and visual qualities of neighbouring developments and businesses. The proposed development is located adjacent to the Villa Renaissance to the east and The Mansions to the west. The 12-story Ritz Carlton Resort and Residences and the 7-stories Seven Stars hotel are also located on the famous Grace Bay beach and can be seen in a distance from this new development and would soften the impact of this new development on the visual quality of the general area.

The collection of architecture along Grace Bay beach various in architectural style and character and non is unique to Providenciales. The proposed SEFAMM Grace Bay hotel development will add a new form of bold architecture character to the Grace Bay beach. The architectural language of the proposed hotel facility seeks to integrate the site context whilst offering a contemporary approach. Generally, lighter colours that reflect the sunlight are proposed for all surfaces and soften the impact on the visual and aesthetic quality of the area.

5.2.8.3 Potential impact on the labour market

Tourism generates income for a variety of businesses and creates a wide range of employment opportunities for the local labour force. The SEFAMM Grace Bay hotel project will have direct and indirect impact of the growing labour market of the Turks and Caicos Islands.

5.2.8.4 Tourism

According to the Department of Economic Planning and Statistics (DEPS) August 2016 Departing Visitors Survey "the average length of stay in the TCI was about 8 nights". This represents an increase in the average length of stay from the previous 7 nights average. Taking the 2016 land-based arrival figure of 453,612 and the average length of stay per guest (453,612 x 8) equates to approximately 3.6 million visitor nights in the TCI or approximately 9,950 temporary residents on daily basis. When including the local population, the overall population in the TCI was approximately 47,852 in 2016.

5.2.8.5 Public infrastructure

Tourism is one of the fastest growing industries in the 21st. century and it has tremendous impact on the development of a country physical infrastructure like roads, airports, water, and sewage facilities. The standard of infrastructural development of the TCI is not up to standards in competitive countries in the region. Therefore, any increase in the numbers of tourists visiting the destination would have further impact on the limited infrastructure.

Significant improvements need to be made to public infrastructure like public roads, airports, and seaport, healthcare facilities, water management and distribution facilities, waste management facilities and recreational facilities. The Providenciales (Howard Hamilton) International Airport at its present size and standard cannot comfortably accommodate the number of passengers travelling through it. To upgrade the existing Howard Hamilton's International Airport Facilities to satisfactorily accommodate the increased in the annual number of visitors, government is presently seeking public/private collaboration to redevelopment that facility.

Similarly, the public road infrastructure on Providenciales is also inadequate to handle the number of daily vehicles on the roads. The traffic congestion on the roads are because of increased in the number of annual visits to the island, many of them rent motor vehicles. Water and sewage distribution facilities would also be stretched to their limits with the increased annual number visitors.

The increased annual tourists' arrivals will encourage government to increase investment in infrastructure development like public roads, airports, and seaports. Increase revenues from tourists can be used for this purpose.

Tourism can help protect and finance the preservation of historic and cultural sites. Historical site like the "Cheshire Hall Ruins" can benefits from tourists visiting the site and entrance fees collected can be used to restore the site.

5.2.8.6 Crime, safety, and security

The Government of the TCI has developed a comprehensive National Security strategy to effectively confront crime throughout the country. This multi-pronged approach will identify immediate national security threats; efficiently manage the resources currently available; procure additional tools and resources for internal and external security agencies; strengthen partnerships internally and regionally and internationally collaborating on security initiatives and will engage the Turks and Caicos community in the fight against crime.

5.2.8.7 Cultural/heritage

Whilst the proposed SEFAMM Grace Bay hotel development is expected to have minimum impact on the physical environment, potential impact on the islands fragile cultural/heritage can be both negative and positive.

People visiting cultural and historical resources are one of the largest, most pervasive, and fasting growing sectors of the tourism industry. In fact, heritage tourism appears to be growing much faster than all other forms of tourism, particularly in the developing world, and is viewed as an important potential tool for poverty alleviation and community economic development (UNWTO 2005). The TCI's cultural/heritage sites stand to benefit from the increased number of tourists that would visit the TCI because of SEFAMM Grace Bay hotel development.

Revenues generated from the proposed development can assist with the further development of cultural/heritage sites in the TCI. The residents of Providenciales would benefit from cross cultural interactions with guests visiting SEFAMM Grace Bay hotel facility. Venders selling local art and crafts souvenirs on Grace Bay and at other centers on the islands will benefit from the increased number of tourists visiting the island.

5.2.8.8 Solid Waste Impacts

The project should seek to reduce the production of waste and recycle material as much as possible. This will help to reduce and/or eliminate any solid waste from entering the marine environment. Solid waste, in particular materials that take long to degrade, can have numerous negative impacts on wildlife and ecosystem and are usually caused by improper waste management. Negative impacts to the marine ecosystem include:

- Animals becoming entangled in debris. This is most notable in animals required to resurface to breathe air such as whales, turtles, and dolphins.

- Marine wildlife such as seabirds, whales, fish, and turtles mistaking solid waste for prey and ingesting it which can cause them to starve.

- Some debris can also carry bacteria and viruses into the marine environment causing diseases in marine species.

Solid waste not only impacts marine wildlife but also tourism. Large amounts of solid waste on the beaches and in shallow water environment can reduce the aesthetic value of the beach and reduce the number of tourists that visit Providenciales. This can have a long-term impact on the country's Gross Domestic Product (GDP) and economy as tourism is the number one industry.

To help prevent solid waste impacts, waste bins should be provided and secured on site and emptied at least on a weekly basis. There is the potential for hazardous waste impacts associated with the construction and operational phases. All equipment and hazardous material will be stored in designated locations to reduce the risk of spills and pollution events. All hazardous waste should be disposed of by licensed contractors according to the manufacturer's specifications.

5.2.7.9 Others

Construction, operational managers, and the developers will consider any developmental issue or impacts that may arise during the execution and operation of the development and take the appropriate mitigation measures to address any identified issue.

5.3 Impact Assessment

A summary of potential impacts to the coastal regime and environment is presented in Table 25.0. The table is split into phases to show the impacts that apply during the construction phase and the impacts that apply during the operational phase. Three areas of concern are highlighted based on the recommendations in the Terms of Reference. The area within the concept footprint had the highest number and degree of impacts while the 500m and 5km radius areas had negligible impacts.

During the operational phase, there are potential impacts related to more people being on the beach. These may include additional debris and more human interaction with benthic resources.

Table 25.0: Potential impacts to the coastal environment and process

Phase	Potential Impact	*Area of Impact*			*Duration*	
		Concept Footprint	*500m Radius*	*5km Radius*	*Short*	*Long*
Construction	Impacts on average waves in the area					
	Impact on average tidal currents in the area					
	Impacts on erosion or accretion processes					
	Impacts on storm waves in the area				x	
	Impacts of storm inundation in the area				x	
	Impacts on terrestrial flora and fauna				x	
	Impacts on marine benthos				x	
	Noise and dust from construction				x	
	Increased turbidity in marine water					
	Potential oil spills related to machinery				x	
	Impacts on beach access				x	
	Impacts on roadway traffic				x	
Operational	Impacts on average waves in the area					
	Impact on average tidal currents in the area					
	Impacts on erosion or accretion processes					
	Impacts on storm waves in the area					x
	Impacts of storm inundation in the area					x
	Impacts on terrestrial flora and fauna					x

Phase	Potential Impact	*Area of Impact*			*Duration*	
		Concept Footprint	*500m Radius*	*5km Radius*	*Short*	*Long*
	Impacts on beach access					
	More patrons on the beach					x
	More debris on beach area and seafloor					x
	Key	*Negligible*	*Increased*	*Reduced*		

5.4 Derivation of significance

In addition to the magnitude and duration of an impact, it is also important to look at the likelihood of an impact occurring. When these three concepts are combined, the significance of each impact can be determined.

In the construction phase, the activities are generally well understood and standardised. Construction process impacts, such as the impacts in the concept footprint and property, have a high likelihood of occurring since the existing environment will need to be disturbed to implement the concept.

There is also a certain likelihood that traffic will be disturbed, however, this will not be during high traffic hours. Therefore, the increase traffic associated with construction has a medium likelihood.

The machinery and stockpile may be tucked away within the property to reduce the magnitude of the impact to beach access. There is medium likelihood that reduced beach access will be an impact since there are many avenues to the beach designated by the government of TCI.

With best practices employed, it is less likely that oil spills or other chemical spills will occur. Therefore, the potential negative impact of oil spills has a low likelihood and low significance.

In the operational phase the main impact is the reduced inundation from hurricanes. Hurricanes may be regarded as infrequent events since they may hit every year or two. When one considers climate change there is a possibility that hurricanes may become more frequent. With the varying strengths and frequency of a hurricane, it may be considered that there is a medium likelihood of a major hurricane passing over the project life. However, when the potential cost and habitat savings (that arise from implementing the concept) are considered the impact was ranked with a high significance.

SECTION VI

6.0 Mitigation and Monitoring

Impacts can be compensated for by using mitigation measures. These measures seek to reduce the potential magnitude of impacts through preventative action. Mitigation measures go hand in hand with monitoring exercises, which are undertaken to ensure that the baseline conditions have not been negatively impacted by the works.

6.1 Proposed actions and schedule to mitigate against any environmental impacts.

The mitigation measures proposed are listed below based on the construction impact being addressed.

Smothering

Large plants that can be replanted will be removed before the construction works begin. Heavy machinery will traverse on sandy areas and avoid vegetated zones as much as is practical.

Oil Pollution

Refuelling of heavy machinery should be done on land. Appropriate refuelling equipment (such as funnels) and techniques should be always used. There should be appropriate minor spill response equipment (for containment and clean up) kept on hand.

Loss of Habitat

Terrestrial vegetation will be replanted after the placement of sand to design grade. This vegetation must be salt and drought resistant to thrive. It is further recommended that the existing species of plants on the property be replanted to be in harmony with the surrounding properties.

Debris

Construction sites must be outfitted with designated disposal locations that are cleared with a regular frequency such as weekly.

Monitoring

Monitoring efforts should be undertaken to track the success of the implemented works. A monitoring plan for the operational phase should include data collection, data processing and possible maintenance works. Four major fields should be monitored including the beach/site topography, and terrestrial vegetation monitoring.

It is important to measure how the beach and dune area are progressing over time, particularly if multiple hurricanes have passed in a season or two. This can be done using a commissioned land surveyor or by using rectified photos. The photos can be taken using a drone with a GPS attached or a permanent benchmark could be set up on the site for amateur photographs to be taken. All methods provide varying levels of detail and can be used to check that the beach remains dynamically stable.

Water quality testing is a strongly advised as a monitoring activity. The water quality in recreational water is typically governed by EPA standards for parameters such as bacteria and nutrients. It is of the utmost importance that the water quality remains like baseline conditions. If the water quality is negatively affected there could be an impact on the touristic value of the property and nearby lots. Water quality testing should be done for typical nutrients and bacteria.

Benthic resources within the project nearshore should be monitored to qualitatively assess the impacts of construction and operations. There should also be follow-up assessments to determine if there have been any unexpected long-term impacts from the works (such as damage from more tourists snorkelling).

Finally, once the dune has been replanted, a trained ecologist should perform regular assessments to determine if the planted vegetation is growing as expected or if it should be replaced with another recommended plant.

A monitoring schedule is proposed to guide future monitoring works and their frequency (Table 26.0).

Table 26.0 - Proposed monitoring works after construction and their frequency

No.	Item	Category	Duration (days)	Frequency	Resources
1	**Beach/Site Topography – Drone Photos**				
1.1	Purchase and setup Drone, accessories, and software	Procurement	28	One Time Instalment	1 Surveyor, 1 Technicians
1.2	Drone Survey	Data Collection	3	Annually	1 Surveyor, 1 Technician
1.3	Convert data to DEM and Orthomosaic	Analysis and Report	2	Annually	1 Surveyor
1.4	Analyze imagery and develop *Shoreline Evolution Report*	Analysis and Report	4	Annually	1 GIS Specialist
2	**Beach/Site Topography - Beach Profiles**				
2.1	Purchase and setup traverse kit	Procurement	28	One Time Instalment	1 Surveyor, 2 Technicians

No.	Item	Category	Duration (days)	Frequency	Resources
2.2	Beach topography survey	Data Collection	12 (6)	Year 1 – quarterly After – semi-annually	1 Surveyor, 1 Technician
2.3	Analyze data and develop *Beach Evolution Report*	Analysis and Report	7	Year 1 – quarterly After – semi-annually	1 Coastal Engineer, 1 Surveyor
3	**Water Quality Testing**				
3.1	Site Visit and Sample Collection	Data Collection	4	Semi-annually	2 Technicians
3.2	Water Quality Testing	Lab Analysis	28	Semi-annually	2 Technicians, 1 Marine Biologist/Environmentalist
3.3	*Water Quality Report*	Analysis	7	Semi-annually	2 Technicians, 1 Marine Biologist/Environmentalist
4	**Benthic Resources**				
4.1	Benthic Assessment	Data Collection	12 (6)	Year 1 – quarterly After – semi-annually	2 Technicians, 1 Marine Biologist/Environmentalist
4.2	*Visual Benthic Reports*	Analysis	12 (6)	Year 1 – quarterly After – semi-annually	2 Technicians, 1 Marine Biologist/Environmentalist
5	**Terrestrial Plants Monitoring**				
5	Flora Assessment	Data Collection	12 (6)	Year 1 – quarterly After – semi-annually	2 Technicians, 1 Marine Biologist/Environmentalist
5.1	*Dune Vegetation Reports*	Analysis	12 (6)	Year 1 – quarterly After – semi-annually	2 Technicians, 1 Marine Biologist/Environmentalist

Each report produced should predict trends based on previous reports and comment on the overall successes and shortcomings of the coastal works implementation. Any anomalies should be highlighted with possible causes mentioned. For example, a beach profile survey report might show a period of erosion after a swell event. This should be noted in the report to determine whether the erosion is episodic or a constant.

6.1.1 Water Quality Mitigations

The major impact to the marine water quality due to construction activities is the release/spill of fuels and oils into the environment. Oil spills can occur from improper handling and storage of fuel or oil on site.

To help mitigate these concerns identifying the main source of potential releases during the construction phase is important. There are to be no storage of large quantities of fuel or hazardous wastes on site. The construction heavy equipment vehicles being used on and around the site should be given special attention. Oil spill kits should always be kept nearby or within heavy equipment.

During the construction phase the maintenance laydown should be located away from any open water bodies and not positioned on a hill or slope. A maintenance schedule and log will be used to ensure that if any leaks develop, the use of that vehicle is discontinued and fixed before a large volume release occurs into the environment. The Fuel Spill Prevention plan will be implemented for any spills that arise.

6.1.2 Dune Restoration Mitigations

Dune Restoration the beach has the potential to impact coastal vegetation and the marine bird species that reside there. To mitigate the loss of the vegetation ecosystem only vegetation around the footprint of the fences should be removed. If the need for more vegetation arises, the landscape palette should have included species present on the site in their natural state as well as species native to Turks and Caicos. Efforts should be made to replant various flora removed for construction in the areas selected for restoration. Native population will be sourced locally as much as reasonably possible to help maintain the native genetic plant diversity. If flora must be imported, no prohibited species will be included in the landscaping.

To mitigate impacts to shorebirds nesting in the area, the following actions should be implemented:

- All the site inductions will include guidance on how to deal with wildlife encounters, including any species at risk that may be present, and arrangements for dealing with injured or orphaned wildlife.
- Prior to clearing vegetation, the environmental personnel or wildlife specialist will schedule inspections for shorebird nests and other wildlife, to ensure all wildlife is removed from the area.
- Areas of retained vegetation should be identified and clearly marked with fencing and signage.

Special efforts should also be put in place to prevent erosion of the existing and new dune system to prevent sedimentation in the marine environment. Measures may include marking designated dune and beach areas, limiting vehicular traffic through these areas, and implementing setbacks. The setbacks allow for limiting direct erosion due to construction related impacts and preserve the vegetation that stabilizes the structures.

6.1.3 Swim zone and Boat Access Lane Mitigation

The potential impact to open water/the marine environment from creation of the swim zone and boat access lane would be turbidity caused by anchorage and buoys and navigational markers. Mitigating any potential harmful effects to the open water quality is extremely important for the scope of construction. Implementing the following measures will assist with preservation of site:

- Turbidity monitoring- Turbidity reading should not exceed 15NTU. If threshold is meet or exceeded, works should immediately halt unlevel levels return to acceptable.

No hazardous substances will be allowed to escape into the open water at the work site. To help mitigate these concerns identifying the main source of potential releases during the construction phase is important. Measures outlined in the Fuel Spill Prevention Plan will assist in prevention of water contamination.

Summary of mitigation measures

Table 27.0 summarizes the proposed mitigation measures to address identified impacts of the proposed development.

Table 27.0: Summary of mitigation measures

Impact Activity	Rating	Mitigation Measures
Terrestrial (Loss of habitat)		Landscaping using native salt-tolerant and drought-tolerant species. 100 feet building line setback from the edge of vegetation will result in most of the habitat in the dune system being preserved. Lit beach areas with low intensity lighting

		to avoid distracting adult female turtles during nesting and nest-emergence.
Damages to the sand dune system		A strategically located broad-walk is proposed to provide traffic over the dune system and avoid direct damage to it. Not to permit placement or storage of beach furniture on the dune system. The dune vegetation is important to maintain the integrity of the dune system and reduce erosion during storm events. Storage of beach furniture and water sports equipment will be limited to a specific area to minimize damage to the dunes.
Marine – flora and fauna		No mitigation measures are suggested as direct or indirect to the marine development as results of the proposed development have been identified.
Coastal water quality		Properly operated and maintained sewage treatment package plant to avoid effluent spillage. To ensure that secondary impacts to water quality do not occur, the project proposes annual follow-up water quality testing be performed in the near-shore area. Monitoring of water quality during and after development can be used to identify any potential issues relating to the development.
Chemical and fertilizers		Use of organic fertilizers in landscaping and prohibit the use of chemicals in

		landscaping.
Beach access		One pedestrian beach access are provided on the boundary. Under special agreement with TCIG the developers have developed this beach access with modern facilities and will be responsible for its upkeep and management.
Site drainage and flooding		Collect rainwater from surface and dispose of it via deep wells.
Storm surge and coastal flooding		Coastal building line-set back of 100 feet from the edge of vegetation would reduce potential storm surge and coastal flooding problems
Emergency access road		Two emergency access roads are provided within the development.
Landscaping		Maximum utilization of existing native vegetation and incorporation of new native species to enhance the overall integrity of the landscape.
Solid waste		Utilization of the 3Rs is recommended in solid waste management – reduce, reuse, and recycle to reduce the volume of solid waste that goes to the landfill.
Water supply		Use of grey water for landscaping purposes. Utilization of water preservation and conservation Best Management Practices to reduce water consumption during the

		operation of the development.
Vehicular Entrance/exits		Separation of the main entrance/exit from the service and emergency entrance.
Fire Safety and Equipment		Buildings are designed in accordance with the National Fire Standards and the Turks and Caicos Building Code. The development of an Emergency Response Plan. Utilization of minimum "separation distance" between propane gas tanks and buildings, boundary lines or fixed source of ignition.
Construction Site		To safeguard residents, tourists and members of the public using neighbouring facilities, the project site will be enclosed and screened. Most of the construction materials will be stored off-site at properties owned by the developers to reduce the number of materials stored on site. Construction workers will be encouraged to park their vehicles off-site at a location to be provided by the developers and they will bus to the job site.
Noise		Reduction of construction related noise by using enclosures or wall to surround noisy equipment, installing mufflers on engines, substituting quieter equipment or construction methods, minimizing times of operation, and locating equipment

		farther from sensitive receptors. Limit construction activities to normal working hours (7:00 am to 5:00 pm).
Dust		Screening and hoarding of construction site and watering-down of construction site daily.
Building Inspections		The quality of Building Code administration is a concern which has the potential to result in project delays waiting for inspections. This challenge can be alleviated with the appointment of a Special Inspector in accordance with the TCI Building Code.

6.2 Storm surge analysis and mitigation plan for sea level rises

The Caribbean region is vulnerable to tropical storms and hurricanes each year from June to November. Dramatic and abrupt changes to the coastline can occur because of these storms. In general, coastal protection structures are designed to withstand wave attack from these extreme storm events, e.g., the selection of armour stone size for a coastal structure, or the determination of design wave forces on critical infrastructure from extreme waves. Extreme waves occur infrequently, and decades or centuries of data must be explored to adequately describe the statistics.

For the Atlantic Ocean, detailed information on tropical cyclones, including all hurricanes from 1851 to present, is provided by the US National Oceanic and Atmospheric Administration (NOAA), specifically at the National Hurricane Center (NHC). This database of storm tracks and other parameters was the main source of information describing the individual storms. Figure 56.0 shows the extracted historical paths of major hurricanes (category 3 and higher) passing within a 300km radius of Providenciales.

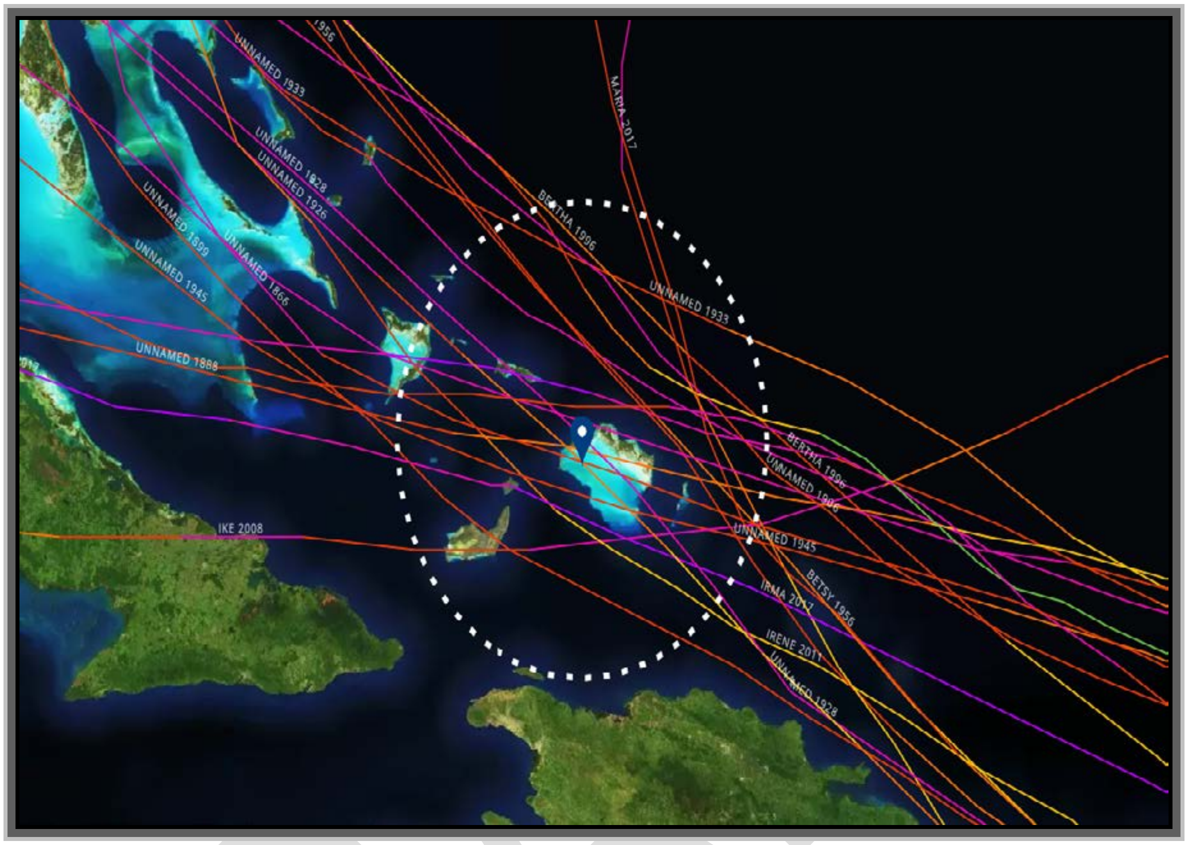

Figure 56.0: Major hurricanes passing within a 300km radius of Providenciales from 1851 to 2020 (Source: NOAA-NHC)

Turks and Caicos lies to the north of 'Hurricane Alley', an area of water in the Atlantic Ocean within which hurricanes typically form from warmer sea surface temperatures there. Historical paths of hurricanes in the North Atlantic basin tend to form between latitudes 5°N and 25°N off the west coast of Africa and then track across the Atlantic Ocean. Those formed at the lower latitudes are usually pushed on a westerly track by the north-east Trade Winds, whereas those of the higher latitudes track more to the north and north-west.

Multiple storms have impacted the Providenciales coast as it is located where many storms turn towards Florida in the north.

6.2.1 Historical Hurricane Activity

Historical hurricane information from the NOAA's National Hurricane Center (NHC) database was reviewed (for storms occurring between 1851 and 2020). All hurricanes passing within a 300km radius of the project site were extracted from the database.

The results show that since the year 1851, 156 tropical storms and hurricanes have passed within this radius of Providenciales. The total number of storms can be broken down according to the categories described by the Saffir Simpson scale (Figure 57.0).

The graph shows that the study area was more frequently hit by tropical storms (92) and was affected by hurricanes (64 count) less frequently. Of these 64 storms, 30 storms were major hurricanes. Figure 58.0 shows the temporal distribution of storms. The graph shows that many years can pass without a major hurricane. The figure also shows that over the last 40 years, there has been a significant increase in the number of storms and the strength of storms. The period between 1996 and 2010 was very active, with many years featuring more than one storm passing near the site and with 1996, 2008 and 2010 recording four storms passing within a 300km radius.

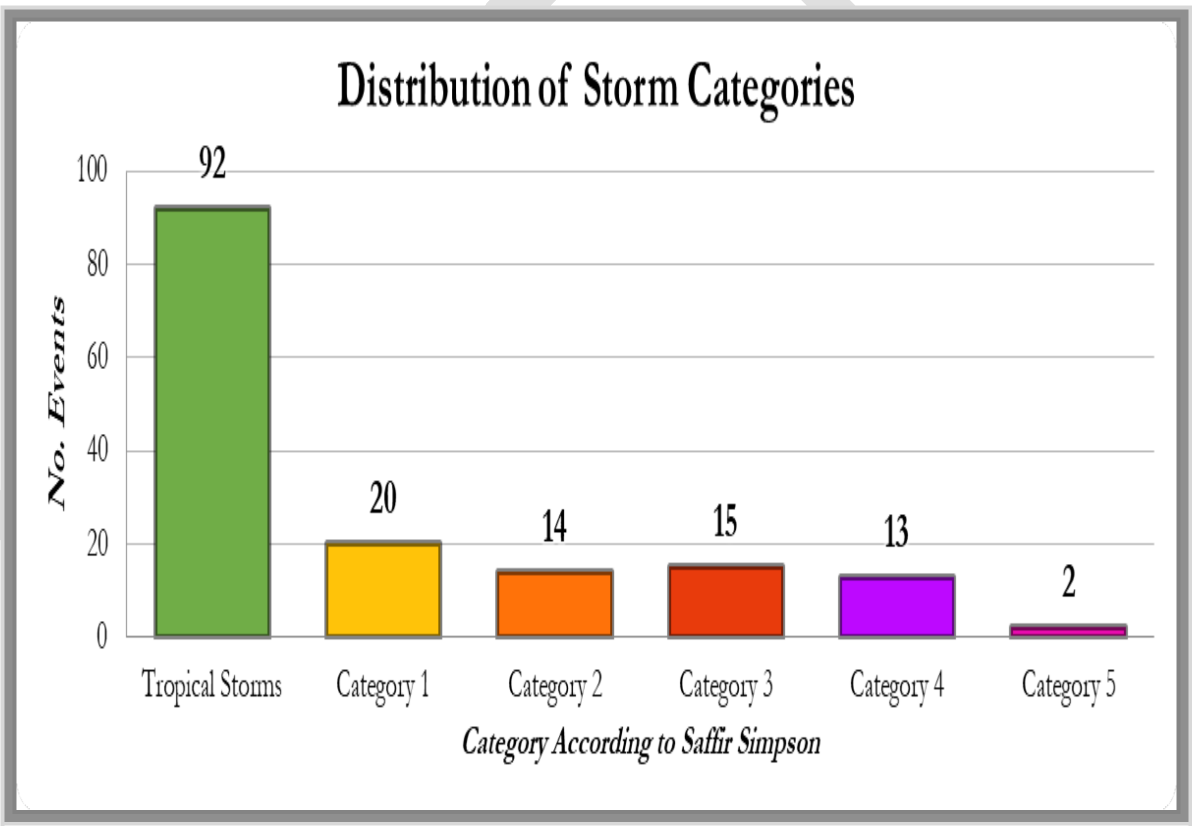

Figure 57.0 - Storm distribution, according to Saffir Simpson classification, since 1850 showing storms that have passed within a 300km radius of the project site

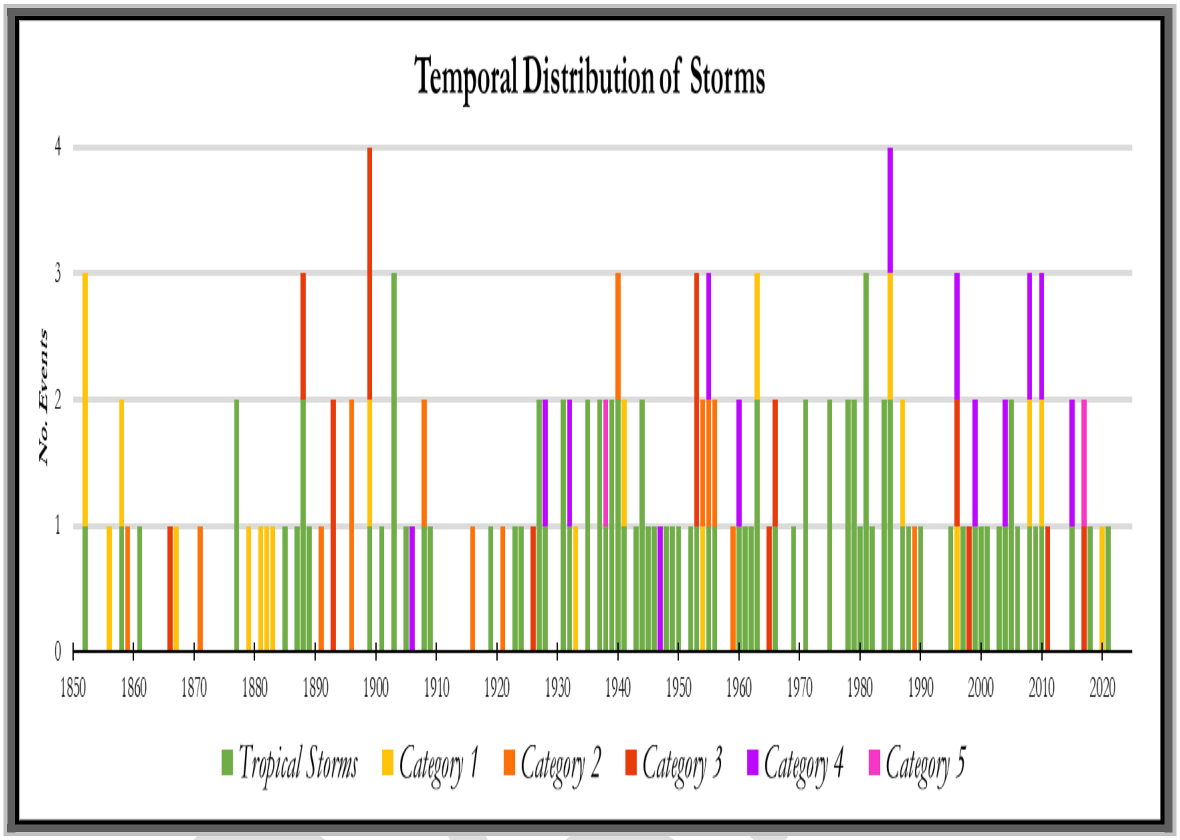

Figure 58.0: Storm distribution since 1851 showing storms that have passed within a 300km radius of the project site.

6.2.2 Hurricane Simulations

Offshore Hurricane Waves

Deep-water wave parameters were calculated for each selected tropical cyclone using parametric models (Cooper, 1988; Young and Burchell, 1996). The resulting wave conditions were segmented into directional sectors and fit to a statistical function describing their exceedance probability. The wave parameter values for 50-year and 100-year return periods were determined from the best-fit statistical distribution. Table 28.0 shows the wave heights, wind speeds, and periods for the directional sectors that would affect the project site.

As shown in the table, the highest waves come from the east with deep water wave heights of 13.8m for the 100-year storm. The highest wind conditions came from the north-east. However, the highest deep-water conditions do not necessarily translate to the highest nearshore conditions due to the complex bathymetry, which may induce breaking of waves. MIKE 21 SW and HD models were used to simulate the interaction of the deep waters with the bathymetry to ascertain the highest wave conditions in the nearshore of the project site.

Table 28.0 Boundary wave and uniform wind conditions used for all investigated return-period simulations.

Return Period	Direction	Windspeed (m/s)	Wave height (m)	Wave period (s)
50-Year Storm	West	28.6	7.8	12.0
	North-West	28.0	7.3	11.5
	North	30.4	5.1	9.3
	North-East	**38.7**	10.6	14.6
	East	34.6	**12.7**	**16.4**
100-Year Storm	West	31.8	8.8	13.0
	North-West	32.3	8.2	12.4
	North	34.4	5.8	10.0
	North-East	**42.0**	11.9	15.7
	East	37.1	**13.8**	**17.3**

Surge Levels

Water levels increase during the passage of a hurricane due to inverse barometric pressure rise (IBR), which is caused by the low atmospheric pressure in the centre of the hurricane. As with the wave heights, water levels were computed from each historical storm and the data fitted to various statistical distributions. Because of the non-directionality of the water level increase phenomenon, the analysis was not carried out on a directional basis. The best-fit distribution was selected based on correlation and goodness-of-fit to the most extreme values. In addition to the extreme eventualities, it is important to consider the expected long-term trends from global sea level rise.

Global Sea Level Rise (GSLR) has been predicted by scientists according to current rates of sea level rise and forecasting of the effects of climate change on the thermal expansion of the seas and the melting of glaciers and polar ice caps. The sea level rise component was obtained by using an averaged version of the *IPCC Summary for Policymakers* projections for sea level rise for the RCP8.5 scenarios. RCP8.5 is recommended as it is a more risk-averse estimate. Additional effects such as increased thermal expansion in shallow banks like Caicos Bank were not directly addressed in this analysis. Rather, they were assumed in GLSR projections.

Tidal variations were considered and based on the tide measurements published by the Admiralty Chart, spring high tide above MSL was determined to be 0.50m. These effects were added to the IBR and the GSLR to produce final deep-water levels for the 50-year and 100-year storm, which are shown in Table 29.0.

Table 29.0 - IBR and design deep water surface level (m) for all return periods investigated.

Parameter	Value	
	50yr	100yr
IBR - Determined through statistical hind-casting analysis (m)	0.45	0.55
Spring High Tide (m)	0.50	
Sea Level Rise Component (m)	0.43	
Rate of Sea Level Rise - RCP8.5 Scenario value from IPCC mm/yr	*8.55*	
SLR Horizon - How long structure is to last (not related to design storm)	*50yr*	
Total design deep water surface level (m)	1.38	1.48

Design Criteria

A distinction should be made between the design life and the return period of a storm. The design life describes how long a particular structure should last. The return period of a storm is based on long term statistics on storms. Further context comes from the exposure risk of a project component. This describes how likely a given return period storm is to hit over a design life. The probability for typical values is shown below in Table 30.0. For example, within the next 50 years (project life span), there is an 87% chance that the 1 in 25-year event will occur, a 64% chance that a 1 in 50-year event will occur and a 39% chance that a 1 in 100-year storm event will occur.

Table 30.0 - Exposure risks (%) over a project life span (blue) for different return periods (green)

Storm Event Return Period (years)	Design Life (years)			
	25	50	100	200
10	93%	99%	100%	100%
25	64%	87%	98%	100%
50	40%	64%	87%	98%
100	22%	39%	63%	87%
200	12%	22%	39%	63%
500	5%	10%	18%	33%

6.2.3 Nearshore wave transformation of hurricane waves

The deep-water conditions were transformed to the nearshore regions and up to the project site using MIKE21 modelling software. Conditions for the extreme wave climate as listed in Table 28.0 and the deep-water surface levels were applied to the boundary of the model and transformed to the nearshore from the five main directional sectors – west, north-west, north, north-east, and east. Also, the wind fields (magnitude and direction) were applied as a constant over the entire model domain. The wind direction in a hurricane can change rapidly, therefore, the worst-case scenario for wind direction was used, with winds approaching from the same dominant direction as the waves.

The coupling of hydrodynamics and waves in the numerical model is an important aspect of storm surge computations, particularly in areas such as the Caribbean where wave set-up is a significant component of the total storm surge. As large waves approach shallow water (like Caicos' bank reef) and break, the water level is increased, causing localized currents. These currents and changing water levels affect the waves by allowing them to travel farther inland. To capture the full extent of the possible inundation the two phenomena must be coupled.

For both storms, the maximum conditions across the five directional sectors tested were calculated and plotted. Results for the 50-year storm and 100-year storm are presented in Figure 58.0 and Figure 59.0.0. Figure 59.0 **shows the maximum static storm water elevation for both storms.** All results have the same scales to show how parameters vary across design storms.

In both cases, wave set-up of about 0.25m was seen as waves partially broke over the reef sections. For the 50-year storm the water levels were 1.5m outside of the reef and 1.7m inside the reef. At the shoreline the static surge levels were up to 1.9m near the project site. Under the 100-year storm conditions, the water level was 1.6m above MSL outside of the reef and 1.9m in the bay. At the project site the static surge levels were up to 2.1m above MSL.

Storm wave heights and direction results are shown in

Figure 60.0. The maximum hurricane sector was the north-west when looking at offshore conditions. Wave refraction led to the highest waves within the bay coming from the north with some focussing of wave heights at the headland. In the 50-year storm, the wave heights offshore were 4.7m outside of the reef and 1m at the shoreline.

100-year storm wave results show wave heights offshore were 5m outside of the reef and 1.2m at the shoreline of the SEFAMM property.

The storm surge derived from the MIKE 21 models represents the static water level that will occur close to the shoreline. However, wave run-up needs to be investigated to properly define the total surge levels.

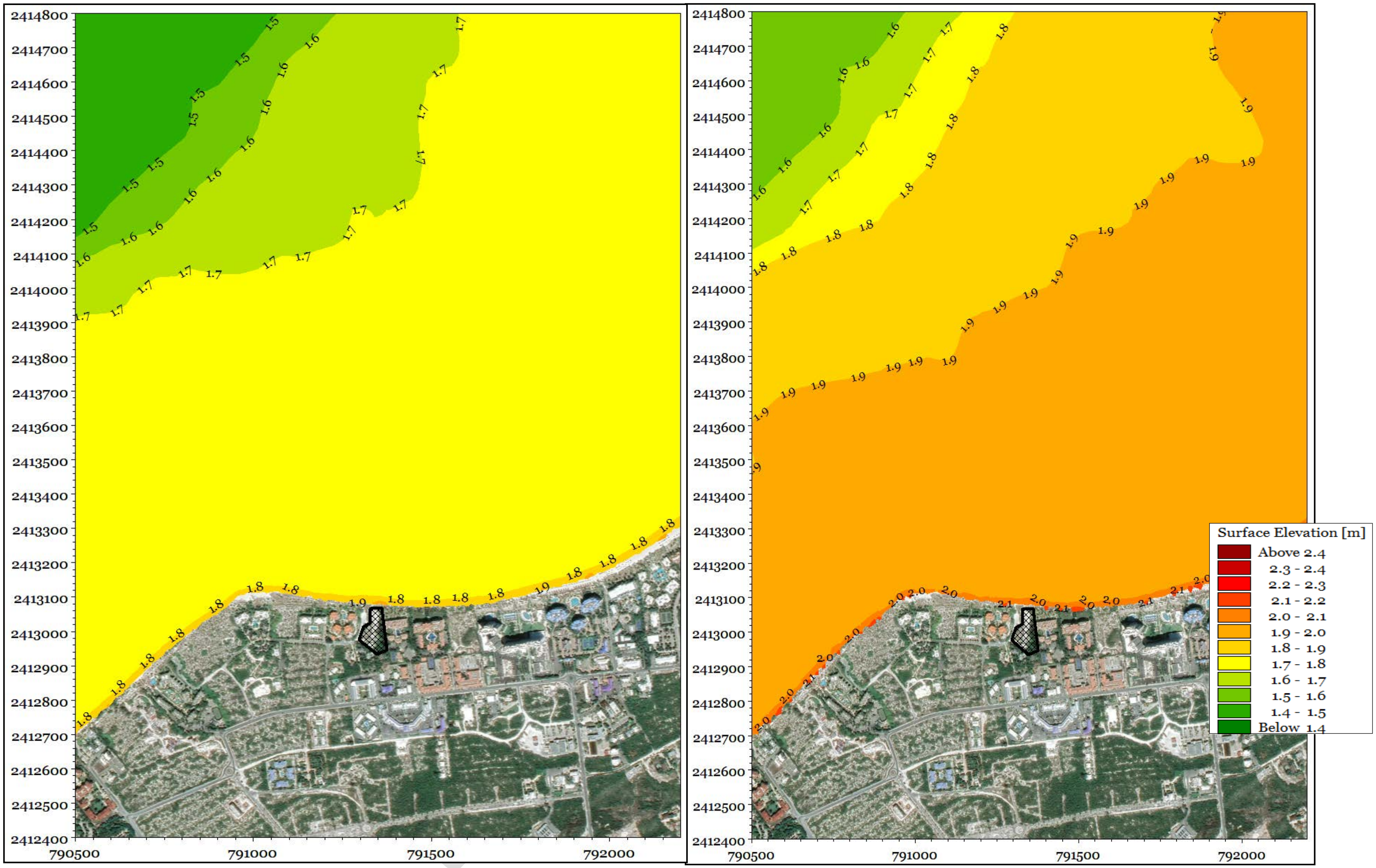

Figure 59.0: Storm surge results for the 50-year (left) and 100-year (right) storm with a sea level rise design horizon to 2070

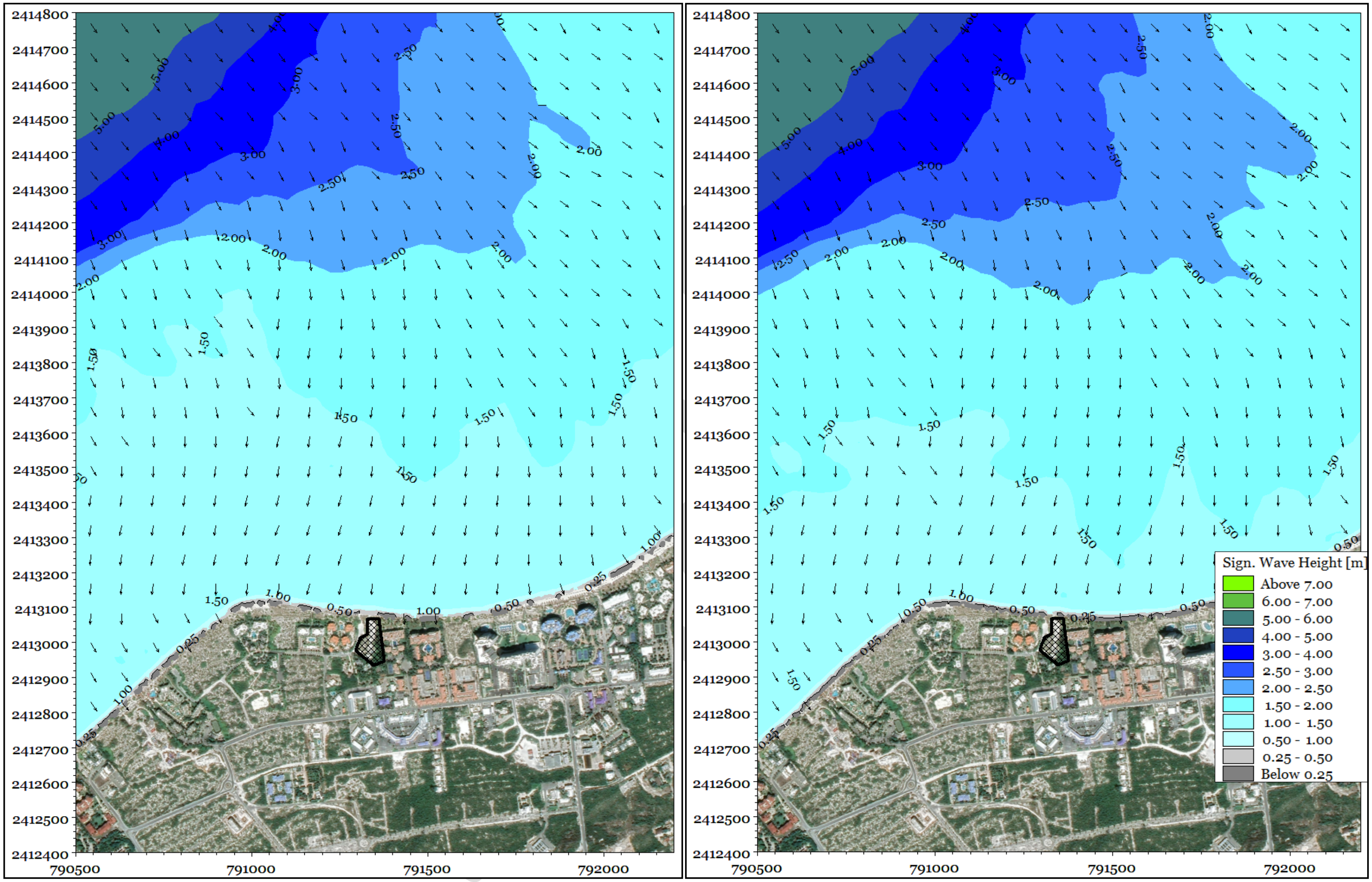

Figure 60.0: Storm waves results for the 50-year (left) and 100-year (right) storm with a sea level rise design horizon to 2070

Wave heights, wave periods, wind speeds and water level set-up from the 50-year and 100-year storm events were extracted at the seaward end of the profiles from the domain of the MIKE21 results. The data was then input to the previously described XBeach model with a direction perpendicular to the shore (representative of the worst-case scenario). The XBeach model was run in a non-hydrostatic mode to properly capture the water surface. The representative sediment grain sizes (as shown Table 28.0) were input to the model to show possible erosion and accretion zones along the profile.

Figure 61.0 shows the XBeach results for the profile under a 50-year storm. The maximum wave run-up was 3.1m above MSL. This wave run-up height is 1.2m higher than the static surge calculated in MIKE21. The wave height was about 1m before shoaling and breaking along the beach face. The results show erosion of the face of the dune and deposition of sediment at the base of beach slope (about 2m depth). There was inundation up to 40m from the property boundary. However, the water depths were quite low (below 0.1m).

The profile results for the 100-year event are shown in Figure 62.0. The maximum surge level with wave run-up incorporated was 3.6m above MSL. This value is 1.5m above the static surge in the area. The wave height of 1.2m at the shoreline created significant inundation once the waves broke. There was overtopping of the dune and erosion of the dune face of up to 0.4m. The valley behind the dune was inundated, with water depths up to 0.4m.

The wave run-up elevations are useful when considering the finished floor elevations of the properties. Based on the results, a finished floor level of 4m above MSL would be adequate to combat surges from large storm events like a 100-year storm.

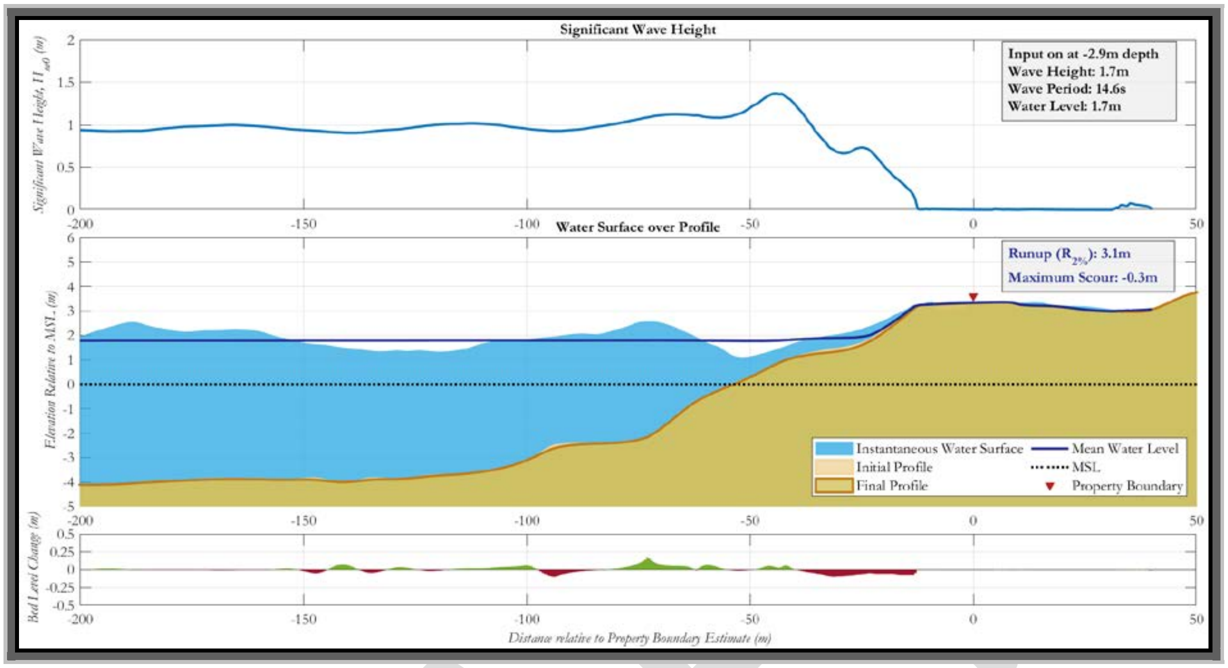

Figure 61.0: XBeach non-hydrostatic model results along P1 (profile 1) for 50-year storm event

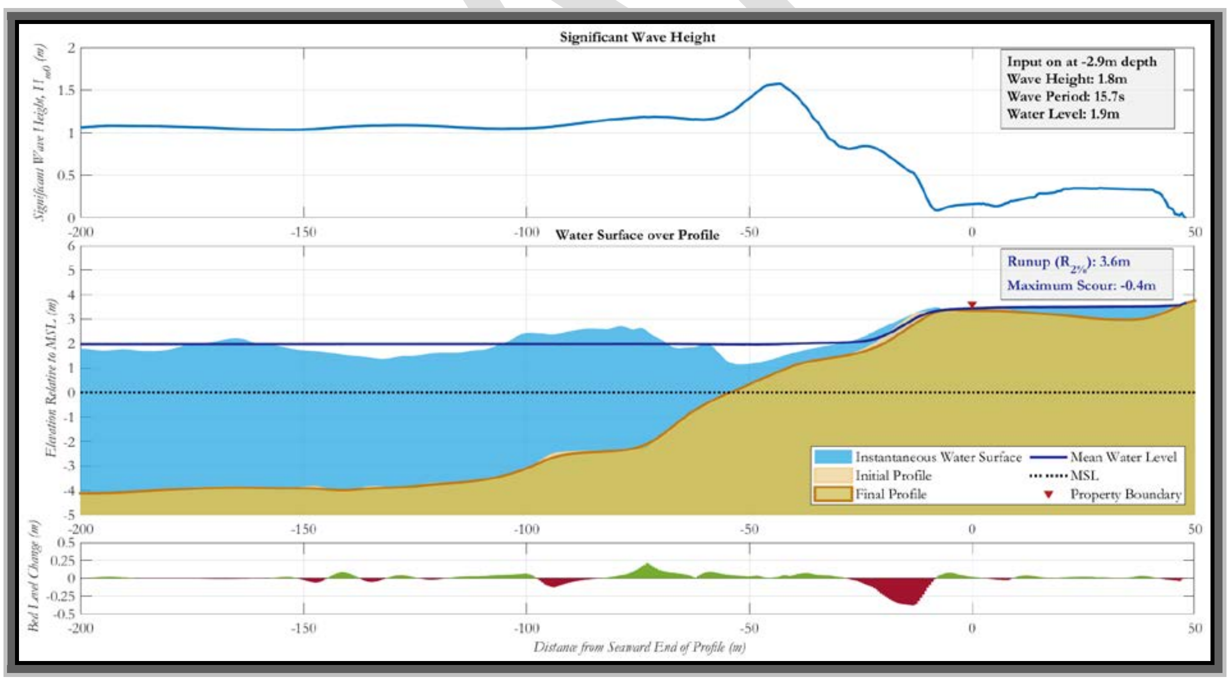

Figure 62.0: XBeach non-hydrostatic model results along P1 (profile 1) for 100-year storm event

Impact Assessment

The proposed concept will provide protection against wave run-up and overtopping by heightening the dune crest. The levels for this addition to the dune were specified based on the hurricane surge conditions. To ensure that the concept provided adequate protection the proposed concept was also studied using XBeach to find the maximum surge levels and inundation. The results for the 50-year storm are shown in Figure 63.0 while the results for 100-year storm are shown in Figure 64.0.

Under the 50-year design storm there was no inundation on the property, compared to a 40m extent of inundation under baseline conditions. The highest surge level was on the dune face at 3.1m above mean sea level. The erosion on the beach was not significantly changed between existing and proposed conditions.

Under the 100-year design storm, there was also no inundation within the property boundary. The highest run-up level was 3.5m above MSL. This level was reached on the dune face as opposed to at the back of the property, which was the case under existing conditions. The maximum erosion was still at 0.4m of scour along the beach face under proposed conditions. The small amounts of erosion and accretion that were seen under existing conditions were not present with the concept in place.

Generally, the dune addition within the property boundary provided valuable protection against inundation in extreme events on the property.

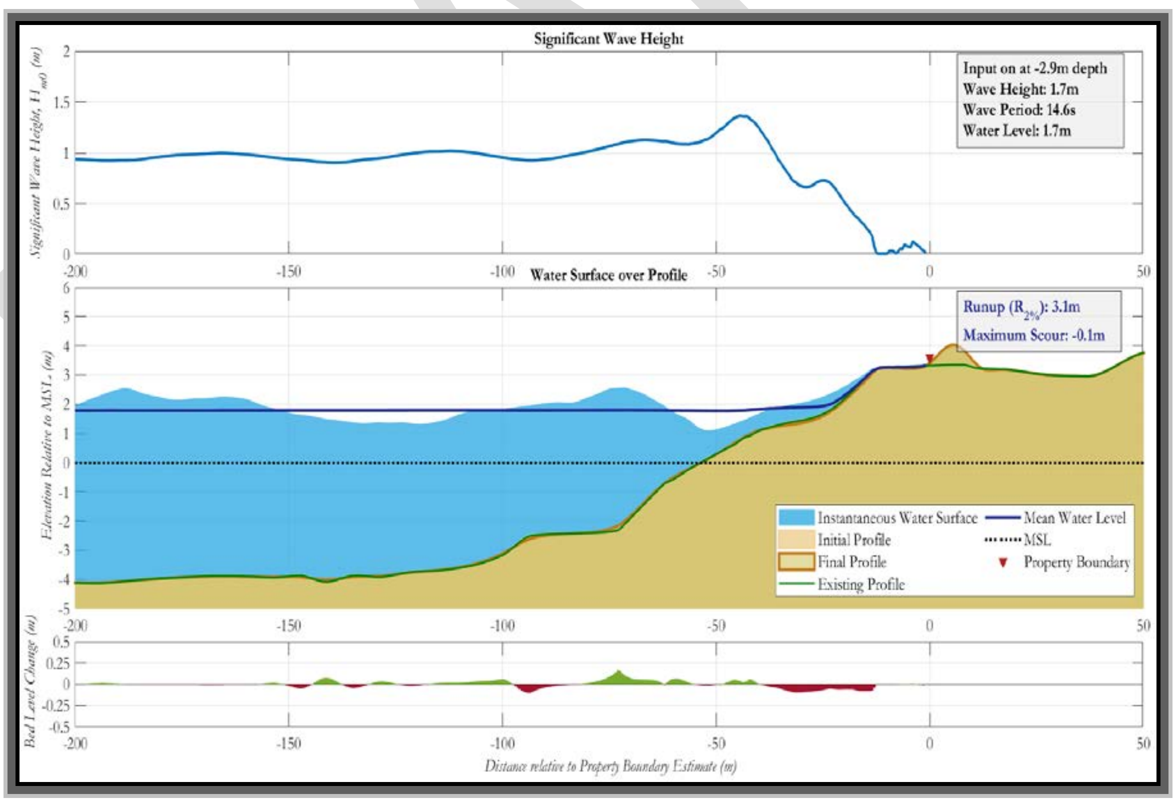

Figure 63.0: XBeach non-hydrostatic model results along P1 (profile 1) for 50-year storm event under proposed conditions

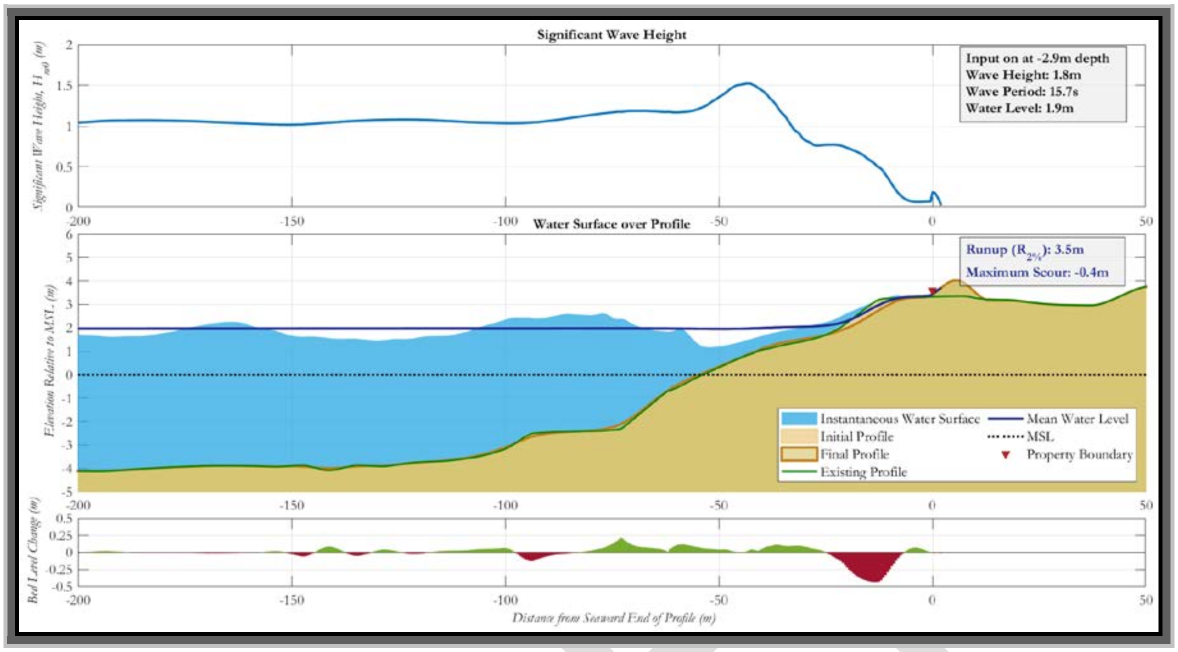

Figure 64.0: XBeach non-hydrostatic model results along P1 (profile 1) for 100-year storm event under proposed conditions

6.3 Building around, or rescue and removal of rare, threatened, and endangered species of plants where possible.

Based on the scope of works, no specific terrestrial counts were done. It is anticipated that the previously submitted document had a detailed study of endangered plant species to be avoided as much as is practical.

6.4 Landscaping/ replanting plan utilizing native species

Once the sand has been placed and graded, replanting of native plant species will be done. Based on previous studies, the plants should be shrubs or cacti that are salt-resistant coastal varieties or drought-resistant low brush.

6.5 Financial resources for mitigation

The project is privately funded, and this would extend to mitigation measures.

6.6 Environmental monitoring and financial requirements

It is anticipated that the monitoring works such as water quality, turbidity and sediment testing will be privately funded by the owners. An environmental specialist will undertake the environmental monitoring and provide reports to the Planning Department and Department of Environmental Resources

6.6.1 Environmental monitoring

Monitoring activities during construction post construction will be carried out to eliminate or reduce any adverse environmental impacts.

6.6.1.1 Construction Phase Monitoring

The Grace Bay Hotel Developer will hire an Environmental Monitor (EM) who will be responsible for ensuring that the project complies with the design of the Sand Dune Restoration, Swim Zone, Boat Access Lane, and environmental mitigation requirements. Monitoring during the construction phase of the project will include the following methods:

- The EM will convene a preconstruction meeting with the Site Inspector and Contractor to review approved plans for the Sand Dune Restoration, Swim zone and Boat Access Lane, and outline compliance with environmental requirements.
- The EM and Contractor will be required to inform their workers on the environmental mitigation requirements.
- The Site Inspector and EM will have the authority to halt any activity that is noncompliant with or damaging to the environment.
- During construction, the EM will conduct weekly monitoring meetings, and a site visit every week and record all observations, including digital photo documentation. This information will be submitted to the Development Control Officer, Department of Planning.
- Pre-construction surveys should be conducted to establish a baseline for subsequent surveys, both during construction and post-construction events.
- During construction of the new sand dune system, swim zone and boat access lane; the EM will organize to have the original qualitative assessments repeated.
- An inspection of the benthic features within 250 meters of the project site will be carried out. Any changes to seagrass beds, fish counts, sediment levels or substrate will be documented.

6.6.1.2 Post Construction Phase Monitoring

Due to activities occurring adjacent to the Princess Alexander National Park post-construction monitoring will be required to be conducted by the EM to assess the stability of the beach environment, surrounding marine life and water quality.

Monitoring during the post-construction phase of the project will include the following methods:

- Topographic surveys of the beach will be performed every two months to monitor the stability of the new sand dune system.
- Coastal assessment should be repeated to see if sand placement was maintained, vegetation is thriving and if wildlife has reinhabited the area and document how they are using the sand dune (e.g. Nesting).

6.6.2 Financial requirements for Environmental monitoring

Table 31.0: Financial requirements for environmental monitoring

Recommended Monitoring Measures	*Approximate Cost*
Signs should be erected to inform guests of the National Park designation and discourage the harvesting/removal of organisms and to educate guests about the presence of sensitive organisms and encourage them not to impact them negatively by causing physical damage.	$5,000.00
Properly operated and maintained sewage treatment package plant to avoid effluent spillage.	Included in operation budget.
Annual follow-up testing of water quality in the near-shore area, to ensure that secondary impacts on water quality do not occur.	Estimated at $5,000.00.
Reduce, reuse and recycle components of solid waste to reduce the volume of solid waste that goes to the landfill.	Included in operational budget.
Use of grey water for landscaping purposes.	Including in landscaping budget.
Routine wastewater quality monitoring protocol to	$10,000.00

collect, test and record wastewater quality results to ensure that any water disposed of is free from contaminants.	
Enclosure and screening of Construction site.	Included in hoarding budget.
Reduction of construction related noises by installing mufflers on engines, substituting quieter equipment of construction methods.	Included in construction budget.
Avoid project delays due the availability of building inspectors for timely inspections, but the appointment of Special Inspector.	Estimated at $90,000.00 annually.

6.7 Public Consultation/social listening/monitoring

Public Consultation with relevant stakeholders is important in helping decision makers to understand the views, values, interests, issues, and concerns about the proposed development and to incorporate them into decisions. A public consultation meeting on the draft EIA will be held to present the purpose of the project, the objective of the project, the scope of works, findings of the baseline data, monitoring programmes and outline the possible impacts and mitigation of works. The meeting should be in a public location during a designated time and include stakeholders such as tourist, surrounding businesses, water sport operators, native residents, relevant Government Agencies, Non-Governmental Agencies, and any other groups that has a stake in the project.

Once the logistics of the meeting are determined, the public should be made aware of when and where the meeting is taking place. Adds should be placed in media sources such as the newspaper, on television, on the radio and on social media platforms at least 14 days in advance.

During the meeting minutes should be taken and a form and/or email should be provided where stakeholders can submit their comments, questions, and concerns about the project. The project should incorporate the answers to these comments and concerns in the final draft of the EIA.

6.8 An Environmental Management Plan (EMP)

An Environmental Management Plan has been compiled to summarise the works and their impacts to the surrounding environment. The plan is provided as a separate document as per the ToR.

SECTION VII

7.0 Recommendations and Conclusions

Most of the vegetative community on the site of the proposed development was disturbed by previous human activities, for this reason it was concluded that most of the site had a low rating for its environmental value and quality. The site had been disturbed throughout most of the area and most of it was void of vegetation. No birds' nests or other evidence of significant wildlife value was observed. No wetlands were present.

The proposed development does not pose any potential impact on the geological environment. The intact, geological formation is homogeneous and contiguous across the project and is absent of kart geological features.

No coastal or marine infrastructural work proposed. The potential impact to the marine environment would be turbidity caused by anchorage of the buoys and navigational markers for the swim zone and boat access lane. During construction, necessary mitigation measures will be implemented around the project site and near the shoreline to reduce turbidity.

The marine ecosystem is not expected to be disturbed in any substantial way as there is no direct development occurring in the marine or coastal environments.

The baseline turbidity reading will be taken closer to project commencement. The construction activities are not expected to exceed 15NTU, which is a holding point for activities. Daily environmental management and monitoring will be conducted by the Environmental Monitor. Turbidity monitoring will be conducted during activities to ensure that turbidity does not exceed 15NTUs. Turbidity monitoring should be conducted upstream (500m from work area) and downstream (500m from work area) or in any visible turbidity plume area.

Emphasis will be placed on observing the presence and management of all wildlife on site and any marine epifauna populations. Prior to anchorage of buoys of the swim zone and boat access label the area will be assessed to ensure that there are no epifauna present within the footprint. Any epifauna observed will be removed and placed outside the work area.

According to the National Physical Development Plan (2020), this area, Grace Bay is the hub of Providenciales' tourism, clearly the most developed area of the island. It is a modern strip of development with a heavy emphasis on tourism, including hotel resorts, condominiums, restaurants, and retail stores. The proposed hotel development meets the requirements of the approved Master Plan for the Grace Bay area of Providenciales.

Baseline results of the modelling showed there was room to improve the resilience of the property against hurricane inundation. Hurricane inundation is a major concern as hurricanes grow in intensity and pass more frequently under the impacts of climate change.

After the baseline conditions were understood a few concepts were proposed for the site with the optimal concept being increasing the height of the sand dune with sand. Sand was preferred as fill material because it would maintain the natural aesthetic of the coastline and provide an opportunity for replanting of native species such as salt-resistant and drought-resistant shrubs.

With the proposed concept, the most unpredictable component will be the sourcing of suitable sand for the dune. Multiple sources were reviewed in the study and the most typical practice detailed to assess impacts. If any of the alternative options for sand supply are available at the time of construction, they should be investigated as a possible source to reduce environmental impacts and construction costs.

Impact assessments were done to be cognizant of possible impacts during the construction and operational phases. Negative impacts were mainly temporary and occurred during the construction works. Positive impacts were based on the reduced inundation and asset protection during major storms.

The construction phase of the SEFAMM Grace Bay Hotel project is expected to take approximately two-years and it will generate approximately 150 construction jobs to the TCI economy during this phase of the development. Generating approximately 15 million dollars to local economy in wages and salaries. Some 200 persons will be employed across all management and non-management levels during the operation of the hotel facility.

The once safe, peaceful, and tranquil environment that tourists and locals were once accustomed to is in jeopardy of been seriously destroyed. The adoption of stringent security measures to ensure the safety of hotel guests and staff will be major consideration throughout the design, construction, and operational phase of the hotel facility.

Unlike several hotel/condominiums developments on Providenciales, the proposed European-type SEFAMM Grace Bay hotel project would bring must more socio-economic benefits to the economy of the Turks and Caicos Islands.

Properly designed coastal works would reduce the potential of coastal inundation on the property.

Mitigation measures were proposed to reduce the magnitude of impacts identified in the impact assessment. Most measures are related to performing construction works with best practices in mind so that impacts such as oil pollution or turbidity are avoided or contained. One important mitigation measure is the dune replanting. The works will disturb existing vegetation on the dune whether by smothering or equipment movement.

Overall, this EIS report recommended proper mitigation and monitoring measures to properly address the potential environmental impacts that were identified as a result of the proposed development. Considering these measures proposed the project should proceed without any major direct or indirect on the environment.

SECTION VIII

8.0 Statement of Understanding of the Environment Charter (2001) and Climate Change Charter (2022)

8.1 Statement of Understanding of the Environment Charter (2001) from the Proponents

The proponents of the development support the Environmental Charter 2001-TCI and agree to be in full compliance with protected area management strategies. To this end an Environmental Management Plan was created and calls for the routine monitoring and testing of marine water quality, groundwater quality and ambient air quality.

The data collected and test results will be routinely shared with TCIG.

8.2 Statement of Understanding of the Terms of the Charter (2022) from the Proponents

While the Turks and Caicos Islands are not one of the top ten countries impacted by climate change, the proponents of the development keenly support the initiatives outlined in the TCI National Physical Sustainable Development Plan as it relates to the physical development of the Turks and Caicos Islands.

To this end the proponents of the development agree to provide funding for the employment of a Special Inspector (Environmental) to monitor the phases of development and provide updated reports on the progress of work to TCIG.

8.3 Proponents Declaration of intent to guide the development by the recommendations of the EIA consultants, with an updated Declaration following response to public or TCIG requesting or requiring alteration to any part of the EIA.

I/We, the undersigned proponents of the development, hereby declare our intentions to fully comply with the conditions set out under the grant of Detailed Development Permission and comments made by TCIG government departments.

SECTION IX

9.0 Appendices

9.1 Appendix A - Grant of Outline Development Permission

FORM DOP 10

TURKS AND CAICOS ISLANDS

THE PHYSICAL PLANNING ORDINANCE 1989
(No. 10 of 1989)
THE PHYSICAL PLANNING (DEVELOPMENT PERMISSION) REGULATIONS 1990

GRANT OF OUTLINE DEVELOPMENT PERMISSION
(Section 30)

APPLICATION NO: PR 13961 **BLOCK & PARCEL NO:** 60905 / 16

To: SEFAMM TCI LTD

In pursuance of powers conferred under the above mentioned Ordinance, the Board hereby GRANTS in accordance with the terms and conditions authorised by the Ordinance, approval in principle to undertake the following development:

Hotel Development

as described in your application for a grant of outline development permission dated 24/Dec/2018 and in the plans and drawings attached thereto, subject to compliance with the relevant statutory provisions and with the following conditions:

1. The submission to and approval by the Board of full details of the development.
2. See Notes 1 and 2
3. The Planning common practice is not considering basements as part of the total number of stories of the buildings if those areas are located underground and they are not proposed for residential or commercial use, but for other uses like parking, cisterns, electrical rooms, plumbing rooms, etc. In this specific case, the basement is proposed for other activities more than just an underground parking area, including storage rooms and a spa. The maximum number of floors of the development shall be seven stories, therefore the spa which is considered commercial activity shall be removed from the basement. Otherwise, the development shall be considered as an eight stories, which is not be allowed on the subject parcels considering that the acreage (1.57 acres) is less than the minimum required acreage for an eight story building (3.5 acres). Revised drawings shall be submitted for consideration and determination.

3.According to the acreage of the subject parcel (1.57 acres), the maximum number of hotel bedrooms allowed is 78, so the proposed number of bedrooms shall be downscaled to a maximum of 78. Revised drawings shall be submitted for consideration and determination.

4.Three (3) bedrooms shall be provided for use for handicapped persons and shall be located on the ground floor. Revised drawings shall be submitted for consideration and determination.

5.It is the assumption of the Physical Planning Board that the proposed fourteen (14) offices could be used as potential hotel bedrooms, therefore the office spaces shall be re-designed to show clearly the intended use as offices, or they shall be removed from the plans. Revised drawings shall be submitted for consideration and determination.

6.The 20 feet setback distance on the South and South Southwest boundaries of the parcel are insufficient and shall be increased to 30 feet. The rest of the setback distances shall be as per the approved site plan. Setback distance shall be a minimum of 100 feet to the vegetation line (as long as the number of levels at that point is less than five stories), 20 feet along the left side of the property adjacent to the road parcel and 30 feet in all the rest of the areas. The setback distances shall be measured from the furthest projection of the building, including any roof overhang, stairway, balcony, window projection or verandah. Revised drawings shall be submitted for consideration and determination.

7.The minimum setback distances for the proposed development shall be approved by the Development Control Engineer on site.

8.In accordance with the Development Manual - Table 3-2, the hotel should consider 1 parking space for each 3 guest

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GRANT OF OUTLINE DEVELOPMENT PERMISSION

(Section 30)

bed-rooms plus 1 for each 50 sq. ft. of public dining room area. Three (3) of the parking spaces shall be reserved for handicapped persons and shall be sited within easy reach of an exit of the proposed building. Revised drawings shall be submitted for consideration and determination.

9.No parking within the beach access lane shall be allowed at any time.

10.The pavement of the parking areas and the vehicular access could be of native stone or of concrete or of asphalt properly sealed.

11.Parking shall be provided with concrete kerbs and clearly defined. Parking spaces shall be 8 feet in width by 16 feet in length and painted with white or yellow florescent paint. The aisle for maneuvering shall be a minimum width of 18 feet.

12.All parking and vehicular access areas shall be constructed of well-compacted fill and asphalt surfaced.

13.Lighting shall be provided and strategically located in parking areas.

14.Fire lane shall be provided for the proposed development to ensure access for fire trucks around the full perimeter of the building.

15.Fire hydrant(s) shall be provided for the proposed development to the satisfaction of the Director of Planning and the Chief Fire Officer.

16.The site coverage shall comply with the required 60 %. Revised drawings shall be submitted for consideration and determination.

17.The dimensions and design of the proposed cistern shall be submitted. Revised drawings shall be submitted for consideration and determination.

18.A comprehensive Environmental Impact Assessment (EIA) shall be conducted by qualified, experience and independent professionals. The Terms of Reference shall be prepared by concerned government departments such as the DECR, Planning Department, DDME, etc., and shall be reviewed by the same departments.

19.The Environmental Impact Statement (EIS)/EIA report should be made available to the public (printed and digital copy) for review and scrutiny, and then be presented to the public (Public Consultation) by the developer and EIA consultancy team. Prior to the public meeting, all stakeholders should be properly notified ahead of time. The developer and EIA consultants must properly respond to all relevant questions (written representations or verbal comments made during the consultation period).

20.The applicant shall submit for consideration and determination a design statement outlining the design methodology and how the proposal was derived also what consideration was given to the surrounding development and environmental that help to dictate the strategy.

21.The concept of "green technology" in the design and operation is highly recommended.

22.The established beach access and parking lot (for public usage) should not be affected at all times by this development.

23.This development should ensure that the beach access and amenities thereof, are enhanced and upgraded.

24.The sand dunes should be protected and enhanced but not diminished neither destroyed. If necessary, a suitable boardwalk must be constructed to ensure that the dunes and wildlife thereof are not disturbed.

25.Rain water harvesting and sewage treatment plant must be included in the design of the proposed project.

GRANT OF OUTLINE DEVELOPMENT PERMISSION

(Section 30)

26.The use of input-dependent plants for landscaping is discouraged. Native species that does not require excessive watering, fertilization and pest and disease control are recommended. A Biosecurity Plan is required to ensure that unwanted plants and animals are not introduced which may have threatened the environmental integrity of the area.

27.The Department of Agriculture (DoA) and Environmental Health Department (EHD) should be consulted to ensure that their concerns are properly addressed at the early stage of the planning and development of this proposed project.

28.An Environmental Management Plan (EMP) should be required to ensure that environmental issues identified in the EIA shall be properly addressed in advanced. It is the responsibilities of the developer that all needed supplier and technical staff are available when needed to properly implement the EMP.

29.Relevant provisions of the Physical Planning Ordinance and Development Manual that pertains to environmental protection and conservation shall be enforced to the fully possible to ensure environmental sustainability.

30.The applicant shall be financially responsible for any damage on the natural or built environment, included, but not limited to sand dunes, natural sea grasses, etc., and on uses of adjacent land.

31.In accordance with Section 46(1) of the Physical Planning Ordinance 2014, the applicant shall liaise with the Director of Planning to develop the existing beach access to the satisfaction of the Director of Planning. A formal planning application shall be submitted to the Department of Planning. The aforesaid plan shall be developed and implemented on the expense of the applicant and shall be completed prior the issuance of an Occupancy Certificate.

32.All new development, including the proposed waste water treatment plant, shall be sited within the confines of the parcel boundaries.

33.A license must be sought and obtained from the Crown Land Unit in respect of any proposed beach shade structures, boardwalks, decks and other similar structures, which may extend outside the confines of the applicant's parcel boundaries and onto lands, which are under the ownership of the Crown.

34.Building setback distances shall be strictly as per the approved site plan and there shall be no deviation whatsoever unless approved by the Director of Planning. The setback distances shall be measured from the furthest projection of the proposed building, including any roof overhang, stairway, balcony, window projection or verandah.

35.During construction, hoarding shall be erected on all parcel boundaries for safety and reduce dust nuisance.

36.During construction, measures shall be implemented to reduce dust nuisance and air pollution.

37.The proposed entrance/exit and vehicular access area shall be maintained as per the approved site plan. Parking shall be designed in a practical manner that allows vehicles to manoeuver on the parcel and leave in a forward direction.

38.Provisions shall be made for on-site garbage storage in accordance with the provisions of the latest edition of the TCI Building Code. The facility must be constructed to the satisfaction of the Director of Planning; preferably a fully enclosed structure provided with a gate and of suitable height to prevent scavenging by animals.

39.The provisions for the disposal of storm water so that the effect of run-off from the parcel will not materially affect adjoining parcels shall be strictly adhered to. All asphalt surfaces shall allow for storm water to be drained safely into wells where the percolation characteristics of the ground make this possible. Consultations shall be made with the Director, EMS, TCI Government, prior to the commencement of construction of drainage facilities.

40.Adequate back up for at least three (3) days shall be provided against the possible breakdown of the primary supply. The water cistern must be of reinforced concrete construction and must be sized consistent with the provisions of Section 702.2 (b), of the latest edition of the TCI Building Code. Any opening into the water cistern must be built not less than twenty-two (22) inches above finish grade.

41.The back-up water supply shall be connected to the proposed development prior to issuance of a certificate of occupancy.

42.Clearance of native vegetation, mechanically or by hand must be restricted to the specific area(s) for the placement of approved infrastructure (roads, buildings, placement of AC units and garbage storage facilities, etc.). Other areas on the development site, which are not approved for development, must be enclosed with a temporary fence during construction to ensure preservation of native vegetation.

43.The areas affected by construction must be properly revegetated and landscaped, preferably using native vegetation. The aforementioned must be implemented prior to the issuance of completion certificate.

44.The proposed waste treatment system must be provided with all ancillary and necessary tertiary treatment facilities and must be adequately sized to sufficiently dispose of the wastewater.

45.The wastewater plant must have the surrounding ground surface so graded to prevent surface run-off from entering the plants. The covers should not be less than twelve (12) inches above ground level.

46.The applicant shall be responsible for ensuring adequate operation and maintenance of the wastewater plant to the satisfaction of the Chief Environmental Health Officer, TCI Government.

47.The kitchen in the restaurant area must be provided with self-closing doors or fitted with spring loaded hinges in order that the doors separating these areas from other parts of the building remain closed at all times.

48.The kitchen must be connected to properly designed and functional grease trap to contain grease and oils from these areas and eliminate their disposal into the sewage system.

49.There must be both hot and cold water supplied to the bar and kitchen areas.

50.The finished ground floor level of the proposed building shall be a minimum of 22 inches above finish ground level.

51.Prior to the issuance of any occupancy certificate(s), temporary or otherwise, all freight containers, plant and machinery and all other construction related articles or materials of whatever kind shall be removed from the parcel to an authorized location.

52.During operation of the development, rubble, waste, abandoned and/or derelict machinery or articles or materials of whatever of kind shall be prohibited from being stored on the parcel.

53.The construction work schedule (6-day work week Monday to Saturday commencing at 7:00 a.m. and ending at 5:00 p.m. each work day) shall be strictly adhered to.

54.No nuisances whether by noise, dust, smoke, fumes or otherwise shall be caused to the neighbors on the adjoining parcel(s).

55.During the period of construction of the proposed development, temporary hoarding shall be erected around the construction phase of the development for public safety and amenity reasons. The hoarding shall be erected to the satisfaction of the Director of Planning.

56.The use of rubble as a mean of enclosing the property is strictly prohibited. Boundary walls or other means of enclosure shall not exceed the height of three (3) feet, six (6) inches unless approved otherwise by the Physical Planning Board in accordance with the Physical Planning Ordinance, 2014 and Regulations made thereunder.

9.2 Appendix B - Grant of Detailed Development Permission

FORM DOP 11

TURKS AND CAICOS ISLANDS

THE PHYSICAL PLANNING ORDINANCE 1989
(No. 10 of 1989)
THE PHYSICAL PLANNING (DEVELOPMENT PERMISSION) REGULATIONS 1990

GRANT OF DETAILED DEVELOPMENT PERMISSION
(Section 30)

APPLICATION NO: PR 16016 **BLOCK & PARCEL NO:** 60905 / 16,24

To: SEFAMM TCI LTD

In pursuance of powers conferred under the above mentioned Ordinance, the Board hereby GRANTS in accordance with the terms and conditions authorised by the Ordinance, detailed development permission to undertake the following development:

A Hotel Development which contemplates two (2) seven (7) storey hotel blocks containing one hundred and six (106) units in total (sixty-three (63) condos and forty-three (43) hotels units); one hundred and one (101) parking spaces in total; seventy three (73) at basement level, twenty eight (28) parking spaces at grade, kitchen and water closet, public swimming pool, private swimming pools, security/ model home and sales office and auxiliary facilities.

more particularly described in your application for a grant of detailed development permission dated 22/Mar/2022 and and in the plans and drawings attached thereto, subject to compliance with the relevant statutory provisions and with the following conditions:

1. See Notes 2, 3 and 4 below.
2. All development, including the proposed sewage treatment plant, shall be sited within the confines of the parcel boundaries.

3.A comprehensive Environmental Impact Assessment (EIA) shall be conducted by qualified, experience and independent professionals. The Terms of Reference shall be prepared by concerned government departments such as the DECR, Planning Department, DDME, etc., and shall be reviewed by the same departments.

4.The Environmental Impact Statement (EIS)/EIA report should be made available to the public (printed and digital copy) for review and scrutiny, and then be presented to the public (Public Consultation) by the developer and EIA consultancy team. Prior to the public meeting, all stakeholders should be properly notified ahead of time. The developer and EIA consultants must properly respond to all relevant questions (written representations or verbal comments made during the consultation period).

5.Due to the proximity of the proposed project to the National Park and the high rate of erosion in the area, there is a need to conduct a study to determine the best option to take in view of coastal erosion and surging sea attributed to climate change. This study shall be part of the EIA.

6.Sea level rise attributed to climate change should be factored in the design and operation of the project.

7.The coast dunes should be enhanced, not destroyed or modified where its functionality is diminished.

8.Access to the beach from the hotel and beach access should be designed in such a way to allow wildlife to freely passed through the dunes. It is recommended that suitable boardwalks will be designed and maintained, to minimize damage to the dune ecosystem.

9.Staff Housing is to be provided for the workers, indicate where these residences will be developed. Further, block and parcel 60713/75 in accordance with the application submission shall be developed for staff housing purposes. Where there is any shortfall, then SeFAMM shall commit to provide suitable housing for its staff by way of contract

Page 1 of 8

GRANT OF DETAILED DEVELOPMENT PERMISSION

(Section 30)

with residential proprietors. A copy of contract shall be submitted to the Department of Planning prior to construction of the hotel and the importation of construction labours and hotel staff.

10.Undertake a carrying capacity study of the coastline.

11.The applicant shall consider undertaking a traffic management study with a view to foresee traffic issues and propose feasible traffic management measures to and from site.

12.The concept of "green technology" in the design and operation is highly recommended.

13.The established beach access and parking lot (for public usage) should not be affected at all times by this development.

14.This development should ensure that the beach access and amenities thereof, are enhanced and upgraded.

15.The sand dunes should be protected and enhanced but not diminished neither destroyed. If necessary, a suitable boardwalk must be constructed to ensure that the dunes and wildlife thereof are not disturbed.

16.Rain water harvesting and sewage treatment plant must be included in the design of the proposed project.

17.The landscaping plan shall not introduce any invasive and non- native plants into the environment. The use of input-dependent plants for landscaping is discouraged. Native species that does not require excessive watering, fertilization and pest and disease control are recommended. A Biosecurity Plan is required to ensure that unwanted plants and animals are not introduced which may have threatened the environmental integrity of the area.

18.No discharge or deposit of any leachate to the National Park from the proposed development; be it coming from the landscaping, swimming pool, hotel and restaurant or any related components of the proposed development is not permitted.

19.The Department of Agriculture (DoA) and Environmental Health Department (EHD) should be consulted to ensure that their concerns are properly addressed at the early stage of the planning and development of this proposed project.

20.An Environmental Management Plan (EMP) should be required to ensure that environmental issues identified in the EIA shall be properly addressed in advanced. It is the responsibilities of the developer that all needed supplier and technical staff are available when needed to properly implement the EMP.

21.Relevant provisions of the Physical Planning Ordinance and Development Manual that pertains to environmental protection and conservation shall be enforced to the fully possible to ensure environmental sustainability.

22.The applicant shall be financially responsible for any damage on the natural or built environment, included, but not limited to sand dunes, natural sea grasses, etc., and on uses of adjacent land.

23.A Special Building Inspector shall be attached to the subject development and shall be approved by the Director of Planning must be employed to inspect the development and plans at the expense of the applicant.

24.In accordance with Section 46(1) of the Physical Planning Ordinance 2014, the applicant shall liaise with the Director of Planning to create any development plan applicable to the area where the proposed development is located. The aforesaid plan shall be developed and implemented on the expense of the applicant.

25.All new development, including the proposed waste water treatment plant, shall be sited within the confines of the parcel boundaries.

26.The applicant/agent must agree with the Director of Planning and Chief Environmental Health Officer the specific design code that will be followed for the design and construction of the sewage treatment plant. This is to include the

GRANT OF DETAILED DEVELOPMENT PERMISSION

(Section 30)

method of disposal of effluent. Sewage treatment plants should be designed and constructed in accordance with IPC 2009 and the associated International Private Sewage Disposal Code.

27. The applicant/agent shall submit to the Environmental Health Unit for their approval, complete data on the proposed treatment system to include (i) Engineer's Report detailing the options that have been considered for treatment and the full details of the proposed treatment system. (ii) Prints of drawings including plans, sections, elevations and details. (iii) Specifications of equipment. (iv) Data sheet giving full details of design loading i.e.: flows, hydraulic loading and organic loading. (v) Maintenance schedule. (vi) Method of disposal of effluent.

28. Any coastal defense to be introduced as a mean of protecting the hotel development in the same parcel or adjacent to this lot should be treated as a separate application and subject to separate review.

29. Prior to the issuance of an Occupancy Certificate, the applicant shall submit to DDME through the Department of Planning an Emergency Response Plan (ERP). This Emergency Response Plan should list a detailed procedure which would indicate the emergency actions to be carried out upon becoming aware of the specific emergency.

30. The Disaster Plan should identify all the required tasks that need to be performed as various stages and allocate roles and responsibilities of people (departments, individuals, staff or contractors) to perform those tasks.

31. As this proposed development is located in the coastal flood risk zone, the ERP should also address proposed mitigation measures against coastal flooding particularly for sub-level floors.

32. The organization and planning should be documented in the ERP and reviewed as necessary when changes occur throughout the operational life of the proposed development

33. It is imperative that the employer/owner/operator ensures that the emergency procedures are understood by all employees on site. Where English may not be their first language, the employer must ensure that the plans are understood, perhaps prepared in appropriate languages and, where possible, utilize pictograms to prevent confusion.

34. All staff must receive comprehensive training on the procedures for dealing with each emergency scenario stated in Plan. This training should be provided to newly recruited

35. employees on commencement of employment and regular refresher courses provided for all other employees.

36. Prior to the issuance of a Certificate of Occupancy, the DDME will assist in testing the plan and outline gaps that need to be amended.

37. A license must be sought and obtained from the Crown Land Unit in respect of any proposed beach shade structures, boardwalks, decks and other similar structures, which may extend outside the confines of the applicant's parcel boundaries and onto lands, which are under the ownership of the Crown.

38. Building setback distances shall be strictly as per the approved site plan and there shall be no deviation whatsoever unless approved by the Director of Planning. The setback distances shall be measured from the furthest projection of the proposed building, including any roof overhang, stairway, balcony, window projection or verandah.

39. During construction, hoarding shall be erected on all parcel boundaries for safety and reduce dust nuisance.

40. During construction, measures shall be implemented to reduce dust nuisance and air pollution.

41. The provision of parking spaces shall be in accordance with the rates as stipulated by Table 3-2 Schedule of Vehicle Parking Requirements within Site Boundaries. Therefore, a minimum of one hundred and ten (110) is required for this development to be accessible for both staff and guest.

42. The proposed entrance/exit and vehicular access area shall be maintained as per the approved site plan. Parking

shall be designed in a practical manner that allows vehicles to manoeuver on the parcel and leave in a forward direction.

43.The Fire Safety Special Inspector shall report to the CFO in writing every two week or on the discretion of the CFO on matters relating to Construction Site Safety and Fire Protection Equipment Design and Installations.

44.The Fire Safety Special Inspector shall be appointed from the commencement of construction to the Completion.

45.An Automatic Fire Sprinkler System shall be installed in accordance with the subparts of NFPA 101 - 9.7.1.1

46.The Automatic Fire Sprinkler system shall be Design, Installed and Maintained in accordance with NFPA 13 by an approved Fire Sprinkler Contractor.

47.Detail Plans for the Automatic Sprinkler system shall be submitted to the TCI Fire Department for review and approval prior to commence of work.

48.All plans shall be stamped by an approved Fire Sprinkler Designer.

49.Final location for Fire Department Connection (FDC) to approved by Fire Department.

50.All Fire Hydrants to be Installed in accordance with NFPA 24.

51.All Fire Hydrant Systems to be Designed, Installed and Maintained by an approved Fire Sprinkler Contractor.

52.Type and Final location of Hydrant to approved by TCI Fire Department.

53.All buildings shall be protected throughout by a Class I standpipe system in accordance with NFPA 101 Chapter 9.10.

54.Fire Sprinkler Contractors must submit Hydraulic Design Information Sheet, Hydraulic Calculation Work Sheet, Information on a permanently mounted data nameplate and Hydraulic Reference points on the Hydraulic Calculations sheet.

55.Electronic Copy of plans and cut sheets to be submitted to Fire Department.

56.A Fire Alarm System shall be installed in accordance with NFPA 101 Chapter 9.6.

57.The Fire Alarm system shall be Design, Installed and Maintained in accordance with NFPA 70 & 72 by an approved Fire Alarm Contractor.

58.Detail Plans for the Fire Alarm system shall be submitted to the Fire Department for review and approval prior to commence of work.

59.All plans shall be stamped by an approved Fire Alarm Designer.

60.Final locations of Annunciators and Fire Alarm Control Panels to be approved by Fire Department and the Contractor.

61.Fire Alarm Contractors must submit Battery Calculations, Installation Work Sheets, Electronic Copy of plans and cut sheets to Fire Department for approval.

62.Portable Fire Extinguishers shall be provided and installed in accordance with NFPA 10.

63.Portable Fire Extinguishers shall be Installed and Maintained by an Approved Portable Fire Extinguisher contractor.

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64.An Automatic Kitchen Hood Fire Suppression System Shall be provided for all grease removal devices, hood exhaust plenums, and exhaust duct systems in a commercial kitchen, as well as any cooking equipment that produces grease-laden vapours.

65.The Automatic Kitchen Hood Fire Suppression System shall be Design, Installed and Maintained in accordance with NFPA 17A & 96 by an approved Kitchen Hood System Contractor.

66.Detail Plans for The Automatic Kitchen Hood Fire Suppression System shall be submitted to the Fire Department for review and approval prior to commence of work.

67.NFPA 96 and the manufacturer's design, installation, and maintenance manual shall be consulted for system limitations and applications for which wet chemical extinguishing systems for commercial cooking operations are considered satisfactory protection.

68.Emergency Lighting shall be provided in accordance with NFPA 101, Chapter 28.

69.All means of egress shall comply with NFPA 101, Chapter 28.

70.A floor diagram reflecting the actual floor arrangement, exit locations, and room identification shall be posted in a location and manner acceptable to the authority having jurisdiction on, or immediately adjacent to, every guest room door in hotels and in every resident room in dormitories.

71.Fire safety information shall be provided to allow guests to make the decision to evacuate to the outside, to evacuate to an area of refuge, to remain in place, or to employ any combination of the three options.

72.Employees of hotels shall be instructed and drilled in the duties they are to perform in the event of fire, panic, or other emergencies.

73.Drills of the emergency organization shall be held at quarterly intervals and shall cover such points as the operation and maintenance of the available first aid fire appliances, the testing of devices to alert guests, and a study of instructions for emergency duties.

74.Fire Department Access roads need to allow adequate access to all buildings and provide adequate room to setup and perform manual suppression operations.

75.Fire Department access roads must be provided so fire apparatus can drive within 450 ft (137 m) of an exterior door that allows access to the interior of the building.

76.Fire Department access roads require 20 ft (6.1 m) of unobstructed width, 13.5 ft (4.1 m) of unobstructed vertical clearance and an appropriate radius for turns in the roads and dead ends for the vehicles apparatus to turn around.

77.Fire Department vehicles must have adequate, unobstructed access to the buildings where incidents can occur in order for them to do their job properly.

78.Developer to Contact the Chief Fire Officer to discuss the design details of access roads.

79.All Requirement of NFPA 101, Chapter 28 shall apply to this development.

80.All Fire Protection Design and Installation Contractors shall be approved by CFO.

81.CFO to be contacted for Approved Contractors List.

82.A Fire Safety Special Inspector shall be attached to the subject application.

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83.CFO to be contacted for Approved Fire Safety Special Inspectors List.

84.A Fire Safety Special Inspector approved by the Director of Planning must be employed to inspect the development and plans at the expense of the applicant. The fire inspector must report to the Development Control Engineer, Department of Planning.

85.A Fire Safety Special Inspector approved by the Director of Planning shall be employed to inspect the development from the commencement of construction to the completion at the expense of the applicant. The Fire Safety Special Inspector shall report to the Chief Fire Officer of the Turks and Caicos Fire Rescue Service and the Development Control Engineer of the Department of Planning. The Fire Safety Special Inspector shall in writing report in accordance with the approved schedule for monitoring of the development which is to be determined by the CFO prior to the commencement of construction.

86.Fire lane shall be provided for the proposed development to ensure access for fire trucks around the full perimeter of the building.

87.Fire hydrant(s) shall be provided for the proposed development to the satisfaction of the Director of Planning and the Chief Fire Officer.

88.The dimensions and design of the proposed cistern shall be submitted. Revised drawings shall be submitted for consideration and determination.

89.In accordance with section 49(4) of the Physical Planning Ordinance 2018 the applicant shall liaise with the Director of Planning to create any development plan applicable to the area where the proposed development is located. The plan shall be developed and implemented on the expense of the applicant prior to the issuance of Occupancy Permission of the Hotel.

90.Provisions shall be made for on-site garbage storage in accordance with the provisions of the latest edition of the TCI Building Code. The facility must be constructed to the satisfaction of the Director of Planning; preferably a fully enclosed structure provided with a gate and of suitable height to prevent scavenging by animals.

91.The pavement of the parking areas and the vehicular access could be of native stone or of concrete or of asphalt properly sealed.

92.Parking shall be provided with concrete kerbs and clearly defined. Parking spaces shall be 8 feet in width by 18 feet in length and painted with white or yellow florescent paint. The aisle for maneuvering shall be a minimum width of 18 feet.

93.Parking spaces at basement level shall be 10feet in width and 18ft and the aisle for maneuvering shall be a minimum width of 18 ft.

94.All parking and vehicular access areas shall be constructed of well-compacted fill and asphalt surfaced.

95.Lighting shall be provided and strategically located in parking areas.

96.Street side parking during and post construction activities is not permitted.

97.Comprehensive drainage plan is to be submitted to the Planning Department/ Public Works Department prior to commencement of development.

98.The provisions for the disposal of storm water so that the effect of run-off from the parcel will not materially affect adjoining parcels shall be strictly adhered to. All asphalt surfaces shall allow for storm water to be drained safely into wells where the percolation characteristics of the ground make this possible. Consultations shall be made with the

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Director, PWD, TCI Government, prior to the commencement of construction of drainage facilities.

99.Adequate back up for at least three (3) days shall be provided against the possible breakdown of the primary supply. The water cistern must be of reinforced concrete construction and must be sized consistent with the provisions of Section 702.2 (b), of the latest edition of the TCI Building Code. Any opening into the water cistern must be built not less than twenty-two (22) inches above finish grade.

100.The back-up water supply shall be connected to the proposed development prior to issuance of a certificate of occupancy.

101.Clearance of native vegetation, mechanically or by hand must be restricted to the specific area(s) for the placement of approved infrastructure (roads, buildings, placement of AC units and garbage storage facilities, etc.). Other areas on the development site, which are not approved for development, must be enclosed with a temporary fence during construction to ensure preservation of native vegetation.

102.The areas affected by construction must be properly revegetated and landscaped, preferably using native vegetation. The aforementioned must be implemented prior to the issuance of completion certificate.

103.The proposed waste treatment system must be provided with all ancillary and necessary tertiary treatment facilities and must be adequately sized to sufficiently dispose of the wastewater.

104.The wastewater plant must have the surrounding ground surface so graded to prevent surface run-off from entering the plants. The covers should not be less than twelve (12) inches above ground level.

105.The applicant shall be responsible for ensuring adequate operation and maintenance of the wastewater plant to the satisfaction of the Chief Environmental Health Officer, TCI Government.

106.The kitchen in the restaurant area must be provided with self-closing doors or fitted with spring loaded hinges in order that the doors separating these areas from other parts of the building remain closed at all times.

107.The kitchen must be connected to properly designed and functional grease trap to contain grease and oils from these areas and eliminate their disposal into the sewage system.

108.There must be both hot and cold water supplied to the bar and kitchen areas.

109.The finished ground floor level of the proposed building shall be a minimum of 22 inches above finish ground level.

110.Prior to the issuance of any occupancy certificate(s), temporary or otherwise, all freight containers, plant and machinery and all other construction related articles or materials of whatever kind shall be removed from the parcel to an authorized location.

111.During operation of the development, rubble, waste, abandoned and/or derelict machinery or articles or materials of whatever of kind shall be prohibited from being stored on the parcel.

112.The construction work schedule (6-day work week Monday to Saturday commencing at 7:00 a.m. and ending at 5:00 p.m. each work day) shall be strictly adhered to.

113.No nuisances whether by noise, dust, smoke, fumes or otherwise shall be caused to the neighbors on the adjoining parcel(s).

114.During the period of construction of the proposed development, temporary hoarding shall be erected around the construction phase of the development for public safety and amenity reasons. The hoarding shall be erected to the satisfaction of the Director of Planning.

GRANT OF DETAILED DEVELOPMENT PERMISSION

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115. The use of rubble as a mean of enclosing the property is strictly prohibited. Boundary walls or other means of enclosure shall not exceed the height of three (3) feet, six (6) inches unless approved otherwise by the Physical Planning Board in accordance with the Physical Planning Ordinance, 2014 and Regulations made thereunder.

116. All electrical, telecommunication, cable TV and other transmission lines shall be placed underground in conduit and to the standards and requirements of the relevant suppliers.

117. All exterior walls of the proposed development shall be of 8-inch concrete block or 6-inch reinforced concrete construction and built to standards laid down in the TCI Building Code, 2014.

118. Full compliance shall be demonstrated with all the conditions of this grant of detailed development permission prior to the issuance of any building permit(s), partial or otherwise.

The reason(s) for the imposition of the condition(s) specified (or attached) is/are:

One copy of the application and the accompanying plans and drawings are returned with this Grant.

Dated: September 29, 2022 **Signed:** Dlightbourne

DIRECTOR OF PLANNING

NOTES

1. You may appeal to the Minister against the conditions imposed on this grant of detailed development permission. Any appeal must be made on the appropriate form within 28 days of the date of notification of this grant.
2. This grant of detailed permission is valid for three years from the date of notification. If, within that period of three years, you have not commenced the development for which you have obtained this grant of detailed development permission, the grant lapses and ceases to have any effect. You may, however, before end of the period of three years, seek an extension of the period from the Board. The fee for applying for an extension is $50. See Section 37, Physical Planning Ordinance.
3. If the period of three years has passed and you wish to renew your application, you may do so by submitting a new application and paying appropriate fee for that application. Any new application will be considered on its merits as an application separate and different from any previous application and the Board will have the power to refuse the application or impose such conditions as it thinks fit on such an application irrespective of whether they were imposed on a previous application for grant of detailed development permission for the same development.
4. This grant of detailed development permission does not itself permit CONSTRUCTION to take place unless this grant of detailed development permission is accompanied by a BUILDING PERMIT issued by the Director of Planning. See Section 66 Physical Planning Ordinance 1989.

All communication relating to this decision should be addressed to:

The Director of Planning
Department of Planning
Grand Turk

9.3 Appendix C - Grant of Building Permit - Display House and Sales Office

FORM DOP 37

TURKS AND CAICOS ISLANDS

THE PHYSICAL PLANNING ORDINANCE 1989
(No. 10 of 1989)
THE PHYSICAL PLANNING (BUILDING) REGULATIONS 1990

GRANT OF BUILDING PERMIT
(Section 69)

APPLICATION NO: PR 15532 **BLOCK & PARCEL NO:** 60905 / 204

To: SEFAMM (TCI) LTD.

In pursuance of powers conferred under the above mentioned Ordinance, the Board/Director hereby GRANTS, in accordance with the terms and conditions authorised by the Ordinance a BUILDING PERMIT in respect of the following development:

Display House and Sales Office

more particularly described in your application for a grant of detailed development permission and/or a building permit dated 12/Jul/2021 and in the plans and drawings attached thereto, subject to compliance with the relevant statutory provisions and with the following conditions:

1. The conditions of the Grant of Detailed Development Permission shall be adhered to during construction.

2. All balconies and external areas shall comply with the provisions of Section 504.7 & 504.8, of the TCI Building Code, 2014, during construction.

3. The finish surface of the floor shall be a minimum of 22 inches above finish ground level. The aforementioned requirement shall be strictly adhered to during construction.

4. The electrical inspector shall approve the type and location of the electrical panel box.

5. All electrical outlets in the bathroom and on the top of the kitchen's counter shall be GFI protection type.

6. The Chief Environmental Health Officer shall approve the proposed sewage plant.

7. The proposed development shall be connected to the main water supply.

8. The full provisions of the NFPA Life Safety Code, 1981, NFPA 101, and amendments shall be adhered to during construction.

9. Provisions for fire protection and safety shall be implemented for the development. Fire extinguishers shall be installed in a visible location within the kitchen and smoke detectors shall be installed in the ceiling of each room, during construction.

10. Building permit number shall be displayed on site at all times during the construction process.

11. Approved plans, copy of the Grant Detailed Development Permission and copy of the Grant of Building Permit shall available at the construction site all times.

12. The both side of windows and doors opening shall be reinforced with a minimum of #4 bars vertically and the cells shall be poured with concrete during construction.

13. The 8" concrete masonry foundation walls shall be reinforced and poured with concrete during construction.

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GRANT OF BUILDING PERMIT

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14. All construction work shall be in accordance with the TCI Building Code, 2014.

15. Electrical installations shall be in accordance with the Electricity Supply Regulations, 1986 and the latest edition of the National Electrical Code.

The reason (s) for the imposition of the condition (s) is/are:

Dated: March 17, 2022

Signed: [signature]
DIRECTOR OF PLANNING

9.4 Appendix D - Terms of Reference (ToR)

DEPARTMENT OF ENVIRONMENT AND COASTAL RESOURCES
Ministry Tourism, Environment, Heritage, Maritime, Disaster Management and Gaming
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Terms of Reference for an Environmental Impact Assessment
SEFAMM TCI
PR16016

General: The Environmental Impact Assessment (EIA) must be conducted for this development with emphasis on the marine and terrestrial areas directly affected by the proposed project. The cumulative impact of all projects in the area must be analysed (with new data and information). All environmental studies/data prior to this application must be re-validated, in consultation with Department of Environment and Coastal Resources (DECR) and Department of Planning (DoP).

Qualification: EIA process shall be carried out by fully qualified consultants in all areas of study as per these Terms of Reference.

Scientific Research Permit: All scientific field research in Turks and Caicos Islands requires a Scientific Research Permit. This includes field research towards an Environmental Impact Assessment, to be licensed with a commercial Scientific Research Permit from the Department of Environment and Coastal Resources. The EIA consultant shall apply for this permit through the Office of the Assistant Director of Environmental Research & Development in DECR using the most current application form.

Formatting Requirements: All documents shall be submitted as digital files to the ***Department of Planning*** in **electronically shareable format**; that is, either **by email or reference to an online website from which the documents may be downloaded** (not read online only, nor password-protected). Each document, report, and appendix shall be submitted in either consistently portrait or landscape layout throughout, with all images and sections in parallel alignment and proper, upright orientation (including tables and maps); and with all sections (including text within images) clear and readable. Maps (other than aesthetic representation figures) shall be presented with conventionally representative orientation (north-up). Currently accepted zoological and botanical names shall be used adjacent to common names throughout documents; valid synonyms are acceptable but not required. All documents must be submitted with security settings to allow both internal commenting and copying of text; the use of which will be restricted to within DECR and DoP to internally share comments and extract passages for responses. Documents not submitted within these requirements may be rejected and subject to review delay.

Submission: Complete Environmental Impact Statement (EIS) must be submitted to the ***Department of Planning*** Documents shall not be submitted directly to DECR. All

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documents shall be submitted digitally in addition to the number of printed copies required by DoP. DoP may request additional or hard copies of documents.

1. Introduction and Overview

1.1 Reference page with names and contact information of development proponent and EIA contractor; Department of Planning reference number; block and parcel numbers concerned; island and general location; and date completed/ submitted.
1.2 Non-technical summary (including aims, objectives and scoping).
1.3 A brief description of the proposed development and its relationship with other development in the area; including adjacent development in the geographic area.
1.4 Aims and objectives of the assessment.
1.5 Overview of the areas/topics to be addressed in this EIA (present the results of scoping exercise).
1.6 Impact Assessment methods/analyses.

2. Baseline Studies

2.1 Historical overview of the site and existing development- use historical and current aerial maps (time-series visualization) and official TCI generated map (Block/Parcel). Describe the historical ownership and land-use of the proposed development, including the surrounding areas.
2.2 Biological environmental baseline assessment:
- 2.2.1 Baseline terrestrial environment (including areas that are cleared, bulldozed and disturbed/damaged) – to include a quantitative description of any terrestrial ecological assets (flora and fauna; habitats; rare, threatened, and endangered species) to be directly impacted by the project and a qualitative assessment of assets that may be indirectly impacted.
- 2.2.2 Baseline marine environment (including the coast, ironshore, beach and seaward) – to include a quantitative description of marine ecology, within all areas to be directly impacted by the project and a qualitative assessment of areas that may be indirectly impacted. Describe sargassum invasion in the area. Map the marine habitats in the area directly affected by the proposed development. The map should be geo-referenced.

2.3 Physical environmental baseline assessment to include topography, soil type, structure, geotechnical study, sediments and profile:
- 2.3.1 Topography of the area. It is recommended to use drone-imagery and processed by professionals.
- 2.3.2 Bathymetry for site shoreline, any other underwater areas conceivably affected by the project, extending at least 500 meters from the coast and within the entire footprint of proposed project.

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2.3.3 Geology (check previous EIA or nearby projects, if any, validate when necessary).
2.3.4 Hydrology.
2.3.5 Sediment analyses, including grain size (beach) and testing for contaminants (if any).
2.3.6 Climate and meteorology. Meteorological parameters within the area- at least for the last 10 years.

2.4 Baseline aesthetics – this should be supported by drone/UAV imageries plus ground photography and descriptions/characterizations.

2.5 Baseline coastal processes and dynamics (this should be factored in the design of the project and maintenance/operation of the beach, if applicable):
2.5.1 Currents and tides.
2.5.2 Sediment transport.
2.5.3 Erosion and accretion, as applicable.
2.5.4 Coastal dynamics.

2.5 Water quality from within the area to be directly impacted by the project (e.g. marina, nearshore areas)– parameters to include dissolved oxygen (mg/l), temperature (°C), salinity (ppt), pH, turbidity (NTU), total dissolved solids (mg/l), ammonia (as mgN/l), nitrate/nitrite (as mnN/l), nitrite (as mgN/l), total dissolved phosphorus (mg/l), total chlorophyll (µg/l), pheophytin (µg/l), active chlorophyll (µg/l) and total Coliform. Nutrient loads are to be tested to an ultra-low level.

2.6 Social-economic:
2.6.1 Demographic.
2.6.2 Employment: labor & skills demand at construction and operation; local and foreign workers needed.
2.6.3 Safety/security concerns within the community.
2.6.4 Economic impact: short-term and long-term.
2.6.5 Others.

2.7 Other relevant parameters identified during the scoping exercise by the consultants.

3. **Legislative and Regulative Context** – to include a discussion of any aspects of law, regulation and/or policy relevant to the project, such as, but not limited to the following (including limits/ zones designated under any legislation, regulations, or policy relevant to the subject area):

3.1 TCI Development Plan/Master Plan.
3.2 Physical Planning Ordinance and subsidiary legislations.
3.3 TCI Development Manual.
3.4 TCI Building Code.
3.5 Coast Protection Ordinance and subsidiary legislations.

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3.6 Mineral (Exploration and Exploitation) Ordinance and subsidiary legislations.
3.7 Marine Pollution Ordinance and subsidiary legislations.
3.8 Fisheries Protection Ordinance and subsidiary legislations.
3.9 International treaties and conventions.
3.10 Other relevant laws and regulations.

This section shall point out the section of the laws that are permissible or otherwise with this proposed development.

4. Project Description and Construction and Operation and alternatives

4.1 Description of the proposed project/components.
4.2 Project Justification – socio-economic, ecological, etc.
4.3 How the proposed project will affect erosion or accretion.
4.4 Describe the coastal engineering plans, including modeling of how these plans (for example engineering structures) will affect the flow of currents and transport of sediments both within the area of work and including potential areas of impact.
4.5 Coastal/beach development and management including beach access.
4.6 Source and quality of beach sand, fill and other materials to be used for coastal structures and terraforming, if applicable.
4.7 Solid waste management during construction and operation.
4.8 Surface-run-off management/ Storm water runoff and treatment.
4.9 Traffic flow and safety (marine, coastal).
4.10 Water and electrical demand and source (construction and operations).
4.11 Landscaping (initial phase and maintenance/operation).
4.12 Construction phase activities:
- 4.12.1 Construction methods and program, including phasing of the development.
- 4.12.2 Site security and hoarding.
- 4.12.3 Sources of sand for beach nourishment.
- 4.12.4 Storage of materials and equipment (including soil and excavated (dry) materials).
- 4.12.5 Beach traffic impact and safety.
- 4.12.6 Temporary sanitary facilities.
- 4.12.7 Access and staging.
- 4.12.8 How the minerals (sand) are placed, and spread.
- 4.12.9 How the new sand will be protected from erosion during swells.
- 4.12.10 Solid waste management- those generated during construction, if any.
- 4.12.11 Liquid waste management, including control of runoff- those generated during construction, if any.
- 4.12.12 Control of air, dust, water and noise pollution (generated by the project/heavy equipment, if any).

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4.12.13 Control/storage of fuels and other dangerous substances, if any.
4.12.14 Emergency mitigation plan.
4.13 Social-economic:
4.13.1 Demographic.
4.13.2 Employment – labor & skills demand at construction and operation; availability of local workforce and need for foreign workers.
4.13.3 Safety/security concerns within the community (construction and operation).
4.13.4 Issues raised in the public consultation (written and verbal/oral concerns).
4.13.5 Others.
4.14 Impact to terrain including method of clearing of site and quantified description of natural vegetative cover to be removed, retention of natural vegetation cover, disposal of removed vegetation and soils, and statement of understanding of limitations of wholesale land clearance as per Development Manual and Planning legislation and regulations.
4.15 Potential Alternatives.
4.16 Others.

5. Impact Assessment.

5.1 Impact identification.
5.2 Description of impact:
5.2.1 Potential impacts to the biotic environment, including predicted direct and indirect impacts coastal, and marine assets.
5.2.2 Potential impact to coastal environment and processes (beach creation, beach nourishment, etc.). In the case of coastal works, for 500 meters along coast each direction from limits of project site; with additional requirement for 5km in both directions for any site on the northern coast of Providenciales or western coast of Grand Turk.
5.2.3 Potential impact to geological environment, particularly taking into consideration any karst, cavern, cave, or solution hole/ sinkhole on site.
5.2.4 Potential impacts to the aesthetic and other built environment.
5.2.5 Water quality and noise pollution (construction and operation).
5.2.6 Ecosystem and economic analyses (may summarize above; valuation is needed) to determine the best use of the area.
5.2.7 Socio-economic impact – Socio-economic and cultural baseline (including labor, tourism, public infrastructure, crime, etc., Predicted impacts (positive and negative- influx of population/ workers, safe & security) to the above baseline, Identification and involvement of stakeholder groups:
5.2.7.1 Public beach access – considering that the beach is public in TCI.
5.2.7.2 Potential impact to neighboring developments, businesses and residential houses.
5.2.7.3 Other Impacts.
5.3 Impact assessment.

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5.4 Derivation of significance.

Note: Use computer modelling, as appropriate, for wind-wave prediction, wave energy dissipation, waves and currents and sediment transport and shoreline changes, etc. Particular attention should be given to sensitivity and vulnerability of important geomorphological features and processes; how these are likely to respond to particular impact, regardless of whether the effects are temporary, long-term, reversible or permanent. The potential cumulative impacts of and to other project components and nearby developments (as applicable) must be noted and addressed.

6. Mitigation and Monitoring

6.1 Proposed actions and schedule to mitigate against any environmental impact (including proposed monitoring activities).
6.2 Storm surge analysis and mitigation plan for sea level rises.
6.3 Building around, or rescue and removal of rare, threatened, and endangered species of plants where possible.
6.4 Landscaping/ replanting plan utilizing native species.
6.5 Financial resources for mitigation.
6.6 Environmental monitoring and financial requirements.
6.7 Public Consultation/social listening/monitoring.
6.8 An **Environmental Management Plan (EMP)** must be prepared with the following minimum components:
- 6.8.1 Summary of the potential impacts of the proposal;
- 6.8.2 Description of the recommended mitigation measures;
- 6.8.3 Statement of their compliance with relevant standards;
- 6.8.4 Allocation of resources and responsibilities for plan implementation;
- 6.8.5 Schedule of the actions to be taken;
- 6.8.6 Programme for surveillance, monitoring and auditing; and
- 6.8.7 Contingency plan when impacts are greater than expected.

The EMP Environmental management plan (EMP) for pre-, during- and post-construction phases (contents may be modified, as applicable).

7. Recommendations and Conclusions

8. Statement of Understanding of Environment Charter (2001) and Climate Change Charter (2022)

8.1 Statement of Understanding of terms of Environment Charter 2001 from proponent, with explanation of how this development approaches best practices towards the protection of biodiversity and the environment as noted in the Charter.

8.2 Statement of Understanding of terms of Climate Change Charter 2022 from proponent, with explanation of how this development approaches best practices toward mitigation, adaptation, and resilience to climate change as noted in the Charter.

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8.3 Proponent's Declaration of Intent to guide the development by the recommendations of the EIA consultant, with updated Declaration following response to public or TCIG commentary requesting or requiring alterations to any part of the EIA.

9. Appendices

9.1 The Terms of Reference (ToR) for the EIA, as issued by DoP, TCIG.
9.2 Qualifications of the EIA team of experts and the special requirements and information needed to form the team to conduct the EIA for this project. The contact information (functional phone numbers and email addresses) must be provided. Curricula vitae and résumés should be relevantly abridged to **no more than two pages for each consultant**.
9.3 Government Permits (e.g. work permit, research permit, etc., if required)
9.4 Site Plan, project plans, architectural drawing and other related documents.
9.5 Portable data format (pdf) file of the reports of independent consultants involved in the EIA.
9.6 Scientific analyses reports (pdf copy from the Laboratory that analyzed the samples, and the like), if any.
9.7 Standards or protocols and assumptions used in predicting the environmental impacts.
9.8 Public Consultative Meeting and Stakeholders meeting reports. Include evidence of advertisement for Public Consultative Meetings, the names and contact information for those who attended the meetings, issues raised and conclusions.
9.9 Photo documentations (with captions – dates, place, description of the subject of the photo).
9.10 Certification/legal document from the EIA group/company that submits the EIS, that all submitted reports/documents and etc. as part of the EIA report/EIS were first-hand information and if it taken from secondary source, the authors should be properly acknowledged or compensated.

Prepared by:

Department of Environment and Coastal Resources
Turks and Caicos Islands Government

Date:

Checklist of items for EIS	
Cover/ reference page as described in 1.1	
All images and sections in upright orientation, clear and readable	
Maps oriented conventionally, north-up	
Saved in manner to allow for text copying and comments to be inserted	

Tel. +1 (649) 338-4170/ Fax. (649) 946-4793
Email: environment@gov.tc

DEPARTMENT OF ENVIRONMENT AND COASTAL RESOURCES
Ministry Tourism, Environment, Heritage, Maritime, Disaster Management and Gaming
Turks and Caicos Islands Government
OFFICE OF THE DIRECTOR

All sections in ToR addressed by EIS	
All appendices attached (may be in separate files) as described in 9	

Tel. +1 (649) 338-4170/ Fax. (649) 946-4793
Email: environment@gov.tc

9.5 Appendix E - Approval Letter EIA Team

MINISTRY OF PHYSICAL PLANNING AND INFRASTRUCTURES DEVELOPMENT
DEPARTMENT OF PLANNING

May 22nd, 2023

Mr. Oswald Williams
CEDA
Grand Turk
Turks and Caicos Islands

Re: Request for Approval of the EIA Team Consultants – For SEFAMM Grace Bay Hotel Development – PR. 16016 - 60905/16 & 24. Grace Bay, Providenciales, Turks and Caicos Islands

Dear Mr. Williams:

Please be advised that in accordance with the Section 45 (1) (b) of the Physical Planning Ordinance, 2018, and as per your communication dated April 25th, 2023, the subject EIA team has been approved.

During the assessment, the applicant shall consult with the relevant Government Departments and agencies. The list of the Team members are as follows:

1. **Philip Warner** - Smith Warner International Ltd. - Coastal Engineers
2. **Janeen Marlo Bullard** - JSS Consultants - Marine Biologist (Nassau Bahamas)
3. **Greg Braun** - Sustainable Ecosystems International -Terrestrial Ecologist
4. **Predensa Moore** - Assistant Terrestrial Ecologist to Greg Braun - (Nassau Bahamas).
5. **Ezekiel Hall** - EnvironmentalAll - Hydrogeopgical and Archeological.
6. **Oswald R. Williams** - Caribbean Environmental Design Associates - Physical Planning Aspects, Socio-economic and Cultural.

Once Completed, five (5) hard copies and one (1) soft copy of the EIA document shall be submitted to the Department of Planning.

Please be advised and guided accordingly. Should you have any queries, please do not hesitate to contact me.

Respectfully

Mrs. Bethia Thomas
Environmental Impact Assessment Specialist For: *Director of Planning*

EIA SPECIALIST
BTHOMAS@GOV.TC
1-649-338-2208

SOUTHBASE
GRAND TURK
TCI

1

9.6 Appendix F - Consultant's Contact Information

Consultants	Address	Phone	Email
Janeen Bullard – JSS Consulting (Environmental Consulting Services – Marine	25 Turnquest Alley P.O. Box N-9816 Nassau, Bahamas	Cell: 1-242-357-9262	janeen@jssconsultants.com
Philip Warner, Coastal Engineer – Smith Warner International.	Unit 13 Seymour Park 2 Seymour Avenue Kingston, Jamaica	1-876-078-8950	philip@smithwarner.com
Ezekiel E. Hall, Hydrogeologist – HallTech Ltd TCI	Leeward Highway, Providenciales	649-244-3349	Hallenvironment1@gmail.com
Caribbean Environmental Design Associates (CEDA)	Osborne Road South Back Salina Grand Turk Turks & Caicos Is.	Cell – 649-231-0371	Oswaldwilliams51@gmail.com

9.7 Appendix G - Scientific Research/Conservation Permit

Department of Environment and Coastal Resources
Ministry of Tourism, Environment, Fisheries, Maritime Affairs, Culture & Heritage, Agriculture, and Religious Affairs.
Turks and Caicos Islands Government
Lower Bight Road, Providenciales
Turks and Caicos Islands

SCIENTIFIC RESEARCH PERMIT

SRP No.: 2023-05-26-26

Main Title of Research:	SEFAMM TCI Grace Bay Hotel Project (PR. 16016)
Principal:	Caribbean Environmental Design Associates (Oswald R. Williams)
Other applicants:	EnvironmentalAll (Ezekiel Hall), Sustainable Ecosystems International (D. Greg Braun, Smith Warner International (Philip Warner) & JSS Consulting (Janeen Marlo Bullard)
Partners/collaborators in TCI (if any):	EnvironmentalAll (Ezekiel Hall),
Type of application:	Comm
Location:	Grace Bay, Providenciales, Turks and Caicos Islands
Total duration of application:	1 year (2 month active: 1 May 2023-31 July 2023)
Period covered by this application:	1 May 2023 – 30 April 2024
Research Fee:	$500 TCIG Treasury Receipt #1534205432

Authorized Approving Officer:

LORMEKA WILLIAMS, MSc.
Director, DECR

Date: 20 June 2023

Not Valid without the Official Seal of the DECR

TURKS AND CAICOS ISLANDS
DEPARTMENT OF ENVIRONMENT AND COASTAL RESOURCES

Note:

This Permit should be presented to authorized-DECR Officers or TCIG officials when requested during monitoring activities which may be done anytime throughout the duration of the approved activities. The Application for Research Permit, Conditions of Approval and required attachments may be requested too.

9.8 Appendix H - Temporary Work Permit

EMERGENCY/TEMPORARY WORK PERMIT

(Regulation 53(4))

MINISTRY OF IMMIGRATION AND BORDER SERVICES

EMPLOYMENT SERVICES DEPARTMENT

TURKS & CAICOS ISLANDS
PROVIDENCIALES: TEL: 1 649 946 2801 Ext.81501
FAX:946-4164/946-5648/941-7794
GRAND TURK: TEL: 1 649-946-2801 Ext.# 40150/2
FAX: 1 649 946 1763

Your Ref: M23009/11TH MAY, 2023

Our Reference: EXP:M23009GT/TWP FILE

DATE: 11TH MAY, 2023

The Manager:
CARIBBEAN ENVIRONMENTAL DESIGN ASSOCIATES

NAME of Company:

CARIBBEAN ENVIRONMENTAL DESIGN ASSOCIATES

REF: M23009 **EMERGENCY/ TEMPORARY WORK PERMIT**

Permission is hereby granted for the person named below to be gainfully employed as **a ENVIRONMENTAL SPECIALIST with CARIBBEAN ENVIRONMENTAL DESIGN ASSOCIATES** for a period of Ten Days (10) days.

NAME OF EMPLOYEE:	**JANEEN MARLO BULLARD**
DATE OF BIRTH:	**04TH JANUARY, 1978**
COUNTRY OF BIRTH:	**NEW PROVIDENCE, BAHAMAS**
PASSPORT NUMBER:	**AA183799**
COMMENCING DATE:	**11TH MAY,2023**
THIS PERMISSION EXPIRES ON:	**20TH MAY, 2023**

Yours Sincerely,

Edwin Taylor
Commissioner of Labour

Cc: Director of Immigration

9.9 Appendix I - Land Certificate – 60905/16

Edition No. 1
Opened 14.2.79

TURKS & CAICOS ISLANDS

PAGE 1

LAND REGISTER

TITLE No. 60905/16

A. PROPERTY SECTION

ISLAND PROVIDENCIALES
REGISTRATION SECTION LEEWARD GOING THROUGH
TITLE CLASSIFICATION: ABSOLUTE ~~PROVISIONAL~~
BLOCK 5 PARCEL 16
DESCRIPTION OF PARCEL:
APPROX. AREA 1.57ac.

PARTICULARS OF INFORMATION RECORDED IN ADJUDICATION RECORD (PROVISIONAL TITLES ONLY):

ORIGIN OF TITLE:
FIRST REGISTRATION/MUTATION No.: 3/79
From previous Parcel(s) 60900/5
Survey Reference J1/6/171A

APPURTENANCES 1. 24.3.79 170/79 EASEMENT: As per the attached schedule and map duly signed and sealed by officers of the Company and attached hereto as Exhibit A. and Exhibit B. respectively, to benefit parcel 60907/70. (Docs. in 60907/70) stet ~~94/80~~
2. 24.3.79 171/79 EASEMENT: See docs. filed in ~~97/80~~ 60905/99.
3. 24.3.79 172/79 EASEMENT: See docs. filed in 60906/135. stet

I HEREBY CERTIFY THAT THIS IS A TRUE AND CORRECT COPY OF THE REGISTER.
REGISTER OF LANDS: K Anderson
DATE: 8/2/18

B. PROPRIETORSHIP SECTION

No.	Date of Registration	Instrument Number	Nature of Instrument	Name and Address of Proprietor(s)
1	14.2.79	59/79	MUTATION	~~GRACE BAY LIMITED, Third Turtle Inn, Providenciales.~~
2	11.9.80	502/80	CAUTION	~~Ronald Keith Hulf and Beverley Jo Hulf of 3851 Hluges Road, Battle Creek Michigan 49015 USA forbid registration of dealings and making of entries in the register relating thereto without their consent or of the Registrar.~~ stet
~~3~~	~~6.5.83~~	~~1126/83~~	~~TRANSFER~~	~~Ronald K. Hulf~~ entered in error
3	14.11.83	1693/83	TRANSFER	~~Ronald K. Hulf, 1623 Parkcrest Circle, Apartment 201 Reston, Virginia 22090 U.S.A.~~ 576/84
4	22.6.84	576/84	TRANSFER	~~JENNIE LORDEMAN and JOSEPH LORDEMAN as joint proprietors 45 Christopher Street, Apt. 4F, New York, N.Y. 10014, USA.~~ APP# 414/18
5	19.9.16	2239/16	CAUTION	~~SEFAMM (TCI) CARE OF MILLER SIMONS O'SULLIVAN, REGENT HOUSE WEST, P.O. BOX 260, REGENT VILLAGE, PROVIDENCIALES, TURKS AND CAICOS ISLANDS, CLAIM AN INTEREST IN THE LAND COMPRISED IN THE ABOVE MENTIONED PARCEL AS THE PURCHASER PURSUANT THE PROVISIONS OF AN AGREEMENT FOR SALE OF LAND BETWEEN JENNIE LORDEMAN (AS VENDOR) SEFAMM (TCI). AS PURCHASER DATED 29th DAY~~ APP# 36/18

M.M.M. LTD. 403119-1-L

9.10 Appendix J - Registered of Leased Land - 60905/204

INSTRUMENT NUMBER 1551/2021

I, REGISTRAR OF LANDS OF THE TURKS AND CAICOS ISLANDS HEREBY CERTIFY THAT THIS DOCUMENT WAS RECEIVED BY ME FOR REGISTRATION AT ___ HOURS ON THE 7 DAY OF June 20 21 AND THAT LAND REGISTRY FEES OF $ ___ HAVE BEEN PAID RELATING THERE TO.

Actg Dep REGISTRAR OF LANDS

TURKS AND CAICOS ISLANDS REGISTERED LAND ORDINANCE Cap. 9.01 COMMERCIAL LEASE

PARTICULARS

TITLE NUMBER	SECTION	ISLAND
Parcels 60905/204 pt	Leeward Going Through	Providenciales

1. DATE OF THIS DEED 9 the April day of , 2021

2. THE CROWN — NIGEL DAKIN, Governor, Turks Caicos Islands acting in the name of and on behalf of **HER MOST EXCELLENT MAJESTY QUEEN ELIZABETH THE SECOND** by the Grace of God Queen of the United Kingdom of Great Britain and Northern Ireland and of the Turks and Caicos Islands and of all of Her Other Realms and Territories.

3 THE LESSEE — **SEFAMM (TCI) LTD.** a company incorporated according to the laws of the Turks of Turks and Caicos Islands and having its office at Grace Bay, Providenciales, Turks and Caicos Islands.

4. THE LEASED PROPERTY — Part of Parcel number 60905/204 consisting of 0.22 acres as hatched in blue on the plan in schedule 1 hereto.

Sefamm (TCI) Limited

VALUATION DEPT. VERIFICATION STAMP DATE 3/6/21 their hand and seal and if a corporation to be executed by their proper officers in that behalf the day and the year first before written.

SIGNED by **Mr. Nigel Dakin**, Governor of the }
Turks and Caicos Islands, for and }
on behalf of the Crown in the presence of }

NIGEL DAKIN

Witness

The Common Seal of }
Sefamm (TCI) Ltd. }
was hereunto affixed in the presence of: }

DIRECTOR

M & S Secretaries Ltd

DIRECTOR/SECRETARY

PER: Jonathan Katan, QC
DIRECTOR

Sefamm (TCI) Limited

9.11 Appendix K - Land Certificate – 60713/75

Edition No. 1
Opened 4.3.71

TURKS & CAICOS ISLANDS

LAND REGISTER

TITLE No. 60713/75

A. PROPERTY SECTION

ISLAND PROVIDENCIALES

REGISTRATION SECTION CHESHIRE HALL & RICHMOND HILL

TITLE CLASSIFICATION: ABSOLUTE ~~PROVISIONAL~~

BLOCK 13 PARCEL 75

DESCRIPTION OF PARCEL:

APPROX. AREA 1.0 acs.

PARTICULARS OF INFORMATION RECORDED IN ADJUDICATION RECORD (PROVISIONAL TITLES ONLY):

ORIGIN OF TITLE:
~~FIRST REGISTRATION~~/MUTATION No.: 13/71
From previous Parcel(s) 60704/
Survey Reference 60713

APPURTENANCES

I hereby certify that this is a true and correct copy of the Land Register

Registrar of Lands: [signature]

Date: 23/8/19

B. PROPRIETORSHIP SECTION

No.	Date of Registration	Instrument Number	Nature of Instrument	Name and Address of Proprietor(s)
1	4.3.71	104/71	MUTATION	~~PROVIDENT LIMITED, Providenciales~~
2	23. 3. 81	243/81	TRANSFER	OUT ISLAND REALTY LTD, GRAND TURK TURKS & CAICOS ISLANDS
3	9.4.81			Land Certificate Issued. LC returned & filed in registry.

9.12 Appendix L - SEFAMM (TCI) LTD Certificate of Incorporation

TURKS AND CAICOS ISLANDS

THE COMPANIES ORDINANCE 1981

Certificate of Incorporation

SEFAMM (TCI) LTD

is this day incorporated under the Companies Ordinance 1981 as a Limited Liability Company

DATED this 22nd day of July, 2016

Registrar of Companies

Registration No.15427

I hereby certify that the within is a true copy of the original.

Date: 19/4/23

Jonathan Katan, KC
Attorney at Law / Partner , **Miller • Simons • O'Sullivan**
P.O. Box 260, Regent House West, Regent Village, Grace Bay
Providenciales, Turks & Caicos Islands, Tel. : (649) 946-4650

9.13 Appendix M – SEFAMM (TCI) LTD Certificate of Good Standing

TURKS AND CAICOS ISLANDS COMPANIES ORDINANCE 2017

CERTIFICATE OF GOOD STANDING
(Section 294)

The REGISTRAR OF COMPANIES, of the Turks and Caicos Islands HEREBY CERTIFIES that, pursuant to the Turks and Caicos Islands Companies Ordinance 2017, at the date of this certificate, the company,

SEFAMM (TCI) LTD
Company Number: TC.015427

1. Is on the Register of Companies;
2. Has paid all fees and penalties due under the Ordinance;
3. Has not filed articles of merger or consolidation that have not yet become effective;
4. Has not filed articles of arrangement that have not yet become effective;
5. Is not in voluntary liquidation;
6. Is not in liquidation under the Insolvency Ordinance 2017;
7. Is not in receivership under the Insolvency Ordinance 2017;
8. Is not in administrative receivership; and
9. Proceedings to strike the name of the company off the Register of Companies have not been instituted.

Kylee Williams
Registrar of Companies (Actg.)
19th day of April, 2023

I hereby certify that the within is a true copy of the original.
Date: 19/4/23
Jonathan Katan, KC
Attorney at Law / Partner, **Miller + Simons + O'Sullivan**
P.O. Box 260, Regent House West, Regent Village, Grace Bay
Providenciales, Turks & Caicos Islands, Tel.: (649) 946-4650

To authenticate this certificate visit https://kregistry.tcifsc.tc/kregistry/, enter the unique document number (located at the bottom left hand corner of this document), then follow the instructions displayed.

9.14 Appendix N – Register of Directors and Officers – SEFAMMM (TCI) LTD

REGISTER OF DIRECTORS AND OFFICERS

SEFAMM (TCI) LTD

REGISTERED NUMBER: **TC.015427**

REGISTERED OFFICE: c/o M & S Trust Company Limited, Regent House West, Regent Village, Grace Bay, Providenciales, Turks and Caicos Islands

NAME	ADDRESS	OCCUPATION	NATIONALITY	OFFICE HELD	DATE OF APPOINT-MENT	DATE VACATED OFFICE	REMARKS
M & S Directors Ltd	P O Box 560 Upper Floor (East Wing) The Beatrice Butterfield Bldg Butterfield Square Leeward Highway Providenciales Turks and Caicos Islands **Change of Address – 01 Jan 2018** Regent House West Regent Village Grace Bay Providenciales Turks and Caicos Islands	Management Co	TCI Company	Director Chairman	22 Jul 2016 22 Jul 2016		
M & S Secretaries Ltd	P O Box 560 Upper Floor (East Wing) The Beatrice Butterfield Bldg Butterfield Square Leeward Highway Providenciales Turks and Caicos Islands **Change of Address – 01 Jan 2018** Regent House West Regent Village Grace Bay Providenciales Turks and Caicos Islands	Management Co	TCI Company	Director Secretary	22 Jul 2016 22 Jul 2016		
Fio Firat Mayil	Woodlands Coopers Lane Road Northaw Porters Bar EN6 4DJ United Kingdom	Businessman	British	Director	22 Jul 2016		
Mehmet Kocakerim	8 Theberton Street Islington, London N1 0QS United Kingdom	Businessman	British	Director	22 Jul 2016	26 Apr 2019	

I hereby certify that the within is a true copy of the original.

Date: 19 / 4 / 23

Jonathan Katan, KC
Attorney at Law / Partner, **Miller • Simons • O'Sullivan**
P.O. Box 260, Regent House West, Regent Village, Grace Bay
Providenciales, Turks & Caicos Islands. Tel.: (649) 946-46...

\\Mso-Server\Documents\Wp51\CORPORATE FILE STRUCTURE\DOMESTIC COMPANIES (Reregistered)\SEFAMM (TCI) Ltd - FC58893\Registers\Directors And Officers . 2020-02-227.Docx
Page 1 of 1

9.15 Appendix O – SEFAMM (TCI) LTD Lease Agreement portion of Beach Access

SEFAMM (TCI) LTD.

LICENSE AND AGREEMENT

THIS LICENSE AND AGREEMENT is made this 9 day of April , 2021.

PARTIES

1) **His Excellency Mr. NIGEL DAKIN**, Governor of the Turks and Caicos Islands acting in the name of and on behalf of **HER MOST EXCELLENT MAJESTY QUEEN ELIZABETH THE SECOND** by the Grace of God Queen of the United Kingdom of Great Britain and Northern Ireland and of the Turks and Caicos Islands and of all of Her Other Realms and Territories and Her Majesty's successors and assigns ("**the Crown**").

2) The said **HE Mr. NIGEL DAKIN** in the name of and on behalf of the Government of the Turks and Caicos Islands ("**the Government**").

3) **SEFAMM** (TCI) **LTD** of Grace Bay, Providenciales, Turks and Caicos Islands ("**the Licensee**").

RECITALS

A. The Licensee is desirous of obtaining a license to use and occupy part of Parcel 60905/204 consisting of 0.33 acres located at the Leeward Going Through, on the Island of Providenciales (the "Property") for the purpose of enhancing the beach access.

B. The Crown owns the above land and has granted approval for the Licensee to use the said land for the above purpose.

NOW THIS DEED WITNESSES as follows:

1. **Interpretation.** In this License unless the context otherwise requires –

(a) **"The License"** means the license granted in Clause 3.

(b) **"The Licensor"** means the Crown and the Government.

(c)**"Property"** means part of Parcel 60905/204 depicted on the attached plan – **Annex 1**.

Legal Interest. The Licensee –

Page 1 of 10

(c) Any notices served under this License shall be served by delivery or by first class mail –

In the case of the Licensor

The Attorney General
Attorney General's Chambers
South Base
Grand Turk
Turks and Caicos Islands
British West Indies

Facsimile: (649) 946-1329

In the case of the Licensee

Sefamm (TCI) Ltd
Grace Bay
Providenciales

Tel# 649344-8644 or 44-775-757-5777

IN WITNESS WHEREOF this Deed has been executed by the parties the day and year first before written.

Signed by **HE Mr. Nigel Dakin** under the Public Seal of the Turks and Caicos Islands acting in the name of and on behalf of the Crown and in the name of and on behalf of the Government

HE Mr. Nigel Dakin
Governor

In the presence of:

Page 7 of 10

9.16 Appendix P - Sections of Terms of Reference assignment to various consultants.

Terms of Reference for Environmental Impact Assessment
SEFAMM Grace Bay Hotel Project, TCI, Grace Bay, Turks and Caicos Islands
PR. 16016

Sections Assignment to EIA Team

Smith Warner International – Coastal Engineers	JSS Consulting Janeen Bullard - Marine	Smith Warner International and Caribbean Environmental Design Associates - Terrestrial	EnvironmentAll - Hydrogeologist	Caribbean Environmental Design Associates (CEDA) – Project Coordinator
General: The Environmental Impact Assessment (EIA) must be conducted for this development with emphasis on the marine and terrestrial areas directly affected by the proposed project. The cumulative impact of all projects in the area must be analyzed (with new data and information). All environmental studies/data prior to this application must	**General:** The Environmental Impact Assessment (EIA) must be conducted for this development with emphasis on the marine and terrestrial areas directly affected by the proposed project. The cumulative impact of all projects in the area must be analysed (with new data and information). All environmental studies/data prior to this application	**General:** The Environmental Impact Assessment (EIA) must be conducted for this development with emphasis on the marine and terrestrial areas directly affected by the proposed project. The cumulative impact of all projects in the area must be analysed (with new data and information). All environmental studies/data prior to this application must be re-validated, in consultation with Department of Environment and	**General:** The Environmental Impact Assessment (EIA) must be conducted for this development with emphasis on the marine and terrestrial areas directly affected by the proposed project. The cumulative impact of all projects in the area must be analysed (with new data and information). All environmental studies/data prior to this application must be re-validated, in consultation with Department of	**General:** The Environmental Impact Assessment (EIA) must be conducted for this development with emphasis on the marine and terrestrial areas directly affected by the proposed project. The cumulative impact of all projects in the area must be analysed (with new data and information). All environmental studies/data prior to this application must be re-validated, in consultation with Department of Environment and Coastal Resources (DECR) and Department of Planning (DoP).

be re-validated, in consultation with the Department of Environment and Coastal Resources (DECR) and the Department of Planning (DoP). **1. Introduction and Overview** 1.2 Non-technical summary (Including aims, objectives, and scoping). 1.4 Aims and objectives of the assessment. 1.5 Overview of areas/topics to be addressed in this EIA	must be re-validated, in consultation with Department of Environment and Coastal Resources (DECR)and Department of Planning (DoP). **1. Introduction and Overview** 1.2 non-technical summary (including aims, objectives, and scoping). 1.4 Aims and objectives of the assessment. 1.5 Overview of the areas/topics to be addressed in this EIA (present the results of scoping exercise). 1.6 Impact	Coastal Resources (DECR) and Department of Planning (DoP). **1. Introduction and Overview** 1.2 Non-technical summary (including aims, objectives and scoping) 1.4 Aims and objectives of the assessment. 1.5 Overview of the areas/topics to be addressed in this EIA (present the results of scoping exercise). 1.6 Impact Assessment methods/analyses.	Environment and Coastal Resources (DECR) and Department of Planning (DoP). **1. Introduction and Overview** 1.2 Non-technical summary (including aims, objectives and scoping). 1.4 Aims and objectives of the assessment 4. Impact Assessment methods/analyses 1.5 Overview of the areas/topics to be addressed in this EIA (present the results of scoping exercise).	1 **Introduction and Overview** 1.2 Non-technical summary (including aims, objectives and scoping) 1.3 A brief description of the proposed development and its relationship with other development in the area; including adjacent development in the geographic area. 1.4 Aims and objectives of the assessment. 1.5 Overview of the areas/topics to be addressed in this EIA (present the results of scoping exercise). 1.6 Impact Assessment methods/analyses.

(present the results of scoping exercise). 1.6 Impact Assessment methods/analyses **2. Baseline Studies** 2.2 Biological environmental baseline assessment 2.3.2 Bathymetry for site shoreline, any other underwater areas conceivably affected by the project, extending at least 500 meters from the coast and within the entire	Assessment methods/analyses. **2.Baseline Studies** 2.2 Biological environmental baseline assessment 2.2.2 Baseline marine environment (including the coast, iron-shore, beach and seaward) – to include a quantitative description of marine ecology, within all areas to be directly impacted by the project and a qualitative assessment of areas that may be indirectly impacted. Describe sargassum invasion in the area. Map the marine habitats in the area directly	**2 Baseline Studies** 2.2. Biological environmental baseline assessment 2.2.1 Baseline terrestrial environment (including areas that are cleared, bulldozed and disturbed/damaged) – to include a quantitative description of any terrestrial ecological assets (flora and fauna; habitats; rare, threatened, and endangered species) to be directly impacted by the project and a qualitative assessment of assets that may be indirectly impacted. 2.7 Other relevant parameters identified during the scoping exercise by the consultants.	**2.Baseline Studies** 2.2 Biological environmental baseline assessment 2.3 Physical environmental baseline assessment to include topography, soil type, structure, geotechnical study, sediments and profile: 2.3.1 Topography of the area. It is recommended to use drone-imagery and processed by professionals. 2.3.3 Geology (check previous EIA or nearby projects, if any, validate when necessary). 2.3.6 Climate and meteorology. Meteorological parameters within the area- at least for the	**2.Baseline Studies** 2.1 Historical overview of the site and existing development-use historical and current aerial maps (time-series visualization) and official TCI generated map (Block/Parcel). Describe the historical ownership and land-use of the proposed development, including the surrounding areas. 2.6 Social-economic: 2.6.1 Demographic. 2.6.2 Employment: labor & skills demand at construction and operation; local and foreign workers needed. 2.6.3 Safety/security concerns within the community. 2.6.4 Economic impact: short-term and long-term. 2.6.5 Others.

footprint of proposed project. 2.3.4 Hydrology. 2.3.5 Sediment analyses, including grain size (beach) and testing for contaminants (if any). 2.5 Baseline coastal processes and dynamics (this should be factored in the design of the project and maintenance/operation of the beach, if applicable): 2.5.1 Currents and tides 2.5.2 Sediment transport. 2.5.3 Erosion and	affected by the proposed development. The map should be geo-referenced. 2.7 Other relevant parameters identified during the scoping exercise by the consultants. *4* **Project Description and Construction and Operation and alternatives** 4.2 Project Justification – ecological, etc. 4.12.5 Beach traffic impact and safety. 4.12.14 Emergency mitigation plan.	**4.Project Description and Construction and Operations and alternatives** This section will outline a detailed description of the proposed project and possible alternatives to be considered, and will include the following: 4.2 Project Justification – ecological, etc. 4.11 Landscaping (initial phase and maintenance/operation). **4.12.14 Emergency Mitigation Plan** 4.13.4 Issues raised in the public consultation (written and verbal/oral concerns). 4.13.5 Others.	last 10 years. 2.7 Other relevant parameters identified during the scoping exercise by the consultants. **4.Project Description and Construction and Operations and alternatives** **4.12.14 Emergency mitigation plan** 4.13.4 Issues raised in the public consultation (written and verbal/oral concerns). 4.13.5 Others	2.7 Other relevant parameters identified during the scoping exercise by the consultants. **3. Legislative and Regulative Context** – to include a discussion of any aspects of law, regulation and/or policy relevant to the project, such as, but not limited to the following (including limits/ zones designated under any legislation, regulations, or policy relevant to the subject area): 3.1 TCI Development Plan/Master Plan. 3.2 Physical Planning Ordinance and subsidiary legislations. 3.3 TCI Development Manual. 3.4 TCI Building Code. 3.5 Coast Protection Ordinance and subsidiary legislations. 3.6 Mineral (Exploration and

accretion, as applicable. 2.5.4 Coastal dynamics. 2.5.5 Water quality from within the area to be directly impacted by the project (e.g. marina, nearshore areas)– parameters to include dissolved oxygen (mg/l), temperature (°C), salinity (ppt), pH, turbidity (NTU), total dissolved solids (mg/l), ammonia (as mgN/l), nitrate/nitrite (as mnN/l), nitrite (as mgN/l), total dissolved phosphorus (mg/l), total chlorophyll (µg/l), pheophytin (µg/l), active chlorophyll (µg/l) and total Coliform. Nutrient loads are to be tested to an	4.13.4 Issues raised in the public consultation (written and verbal/oral concerns). 4.13.5 Others **5. Impact Assessment.** 5.1 Impact identification 5.2 Description of impact: 5.2.1 Potential impacts to the biotic environment, including predicted direct and indirect impacts coastal, and marine assets. 5.2.6 Ecosystem and economic analyses (may	4.14 Impact to terrain including method of clearing of site and quantified description of natural vegetative cover to be removed, retention of natural vegetation cover, disposal of removed vegetation and soils, and statement of understanding of limitations of wholesale land clearance as per Development Manual and Planning legislation and regulations. **5. Impact Assessment.** 5.1 Impact identification. 5.2 Description of impact: 5.2.1 Potential impacts to the biotic environment, including predicted direct and	**5. Impact Assessment.** 5.1 Impact identification. . 5.2 Description of impact: 5.2.3 Potential impact to geological environment, particularly taking into consideration any karst, cavern, cave, or solution hole/ sinkhole on site. 5.2.6 Ecosystem and economic analyses (may summarize above; valuation is needed) to determine the best use of the area. 5.3 Impact assessment. 5.4 Derivation of significance.	Exploitation) Ordinance and subsidiary legislations. 3.7 Marine Pollution Ordinance and subsidiary legislations. 3.8 Fisheries Protection Ordinance and subsidiary legislations. 3.9 International treaties and conventions. 3.10 Other relevant laws and regulations. This section shall point out the section of the laws that are permissible or otherwise with this proposed development. **4 Project Description and Construction and Operation and alternatives** 4.1 Description of the proposed project/components. 4.2 Project justification- socio-economic justifications, other justifications.

ultra-low level. 2.7 Other relevant parameters identified during the scoping exercise by the consultants. **4. Project Description and Construction and Operation and alternatives** 4.2 Project Justification – ecological, etc. 4.3 How the proposed project will affect erosion or accretion? 4.4 Describe the coastal engineering plans, including modeling of how these plans	summarize above; valuation is needed) to determine the best use of the area. 5.3 Impact assessment. 5.4 Derivation of significance. 6. **Mitigation and Monitoring** 6.1 Proposed actions and schedule to mitigate against any environmental impact (including proposed monitoring activities). 6.5 Financial resources for mitigation.	indirect impacts. 5.2.6 Ecosystem and economic analyses (may summarize above; valuation is needed) to determine the best use of the area. 5.3 Impact assessment. 5.4 Derivation of significance. 6. **Mitigation and Monitoring** 6.1 Proposed actions and schedule to mitigate against any environmental impact (including proposed monitoring activities). 6.3 Building around, or rescue and removal of rare, threatened, and endangered species of	**6. . Mitigation and Monitoring** 6.1 Proposed actions and schedule to mitigate against any environmental impact (including proposed monitoring activities). 6.5 Financial resources for mitigation. 6.6 Environmental monitoring and financial requirements. 6.7 Public Consultation/social listening/monitoring. **6.8 An Environmental Management Plan (EMP)** must be prepared with the following minimum components: 6.8.1 Summary of the potential impacts of	4.7 Solid waste management during construction and operation. 4.9 Traffic flow and safety (marine, coastal). 4.10 Water and electrical demand and source (construction and operations). 4.12 Construction phase activities: 4.12.1 Construction methods and program, including phasing of the development. 4.12.2 Site security and hoarding. 4.12.4 Storage of materials and equipment (including soil and excavated (dry) materials). 4.12.6 Temporary sanitary facilities.

(for example engineering structures) will affect the flow of currents and transport 4.5 Coastal/beach development and management including beach access. 4.6 Source and quality of beach sand, fill and other materials to be used for coastal structures and terraforming, if applicable. 4.12.3 Sources of sand for beach nourishment. 4.12.8 How the minerals (sand) are placed and spread 4.12.9 How the new sand will be protected from	6.6 Environmental monitoring and financial requirements. 6.7 Public Consultation/social listening/monitoring . **6.8 An Environmental Management Plan (EMP)** must be prepared with the following minimum components: 6.8.1 Summary of the potential impacts of the proposal. 6.8.2 Description of the recommended mitigation measures. 6.8.3 Statement of their compliance with relevant standards. 6.8.4 Allocation of resources and responsibilitie s for plan	plants where possible. 6.4 Landscaping/ replanting plan utilizing native species. 6.5 Financial resources for mitigation. 6.6 Environmental monitoring and financial requirements 6.7 Public Consultation/social listening/monitoring **6.8 An Environmental Management Plan (EMP)** must be prepared with the following minimum components: 6.8.1 Summary of the potential impacts of the proposal. 6.8.2 Description of the recommended mitigation measures. 6.8.3 Statement of their	the proposal. 6.8.2 Description of the recommended mitigation measures. 6.8.3 Statement of their compliance with relevant standards. 6.8.4 Allocation of resources and responsibilities for plan implementation. 6.8.5 Schedule of the actions to be taken. 6.8.6 Programme for surveillance, monitoring and auditing. 6.8.7 Contingency plan when impacts are greater than expected.	4.12.7 Access and staging. 4.12.10 Solid waste management- those generated during construction, if any. 4.12.11 Liquid waste management, including control of runoff- those generated during construction, if any. 4.12.12 Control of air, dust, water and noise pollution (generated by the project/heavy equipment, if any). 4.12.13 Control/storage of fuels and other dangerous substances, if any. **4.12.14 Emergency mitigation plan.** 4.13 Social-economic: 4.13.1 Demographic. 4.13.2 Employment – labor & skills demand at construction and operation; availability of local workforce and need for

erosion during swells? 4.12.14 Emergency mitigation plan. 4.15 Potential Alternatives. **5.0 Impact Assessment.** 5.1 Impact identification. 5.2 Description of impact: 5.2.2 Potential impact to coastal environment and processes (beach creation, beach nourishment, etc.). In the case of coastal works, for 500 meters along coast in each direction from the	implementation. 6.8.5 Schedule of the actions to be taken. 6.8.6 Programme for surveillance, monitoring and auditing; and Contingency plan when impacts are greater than expected. The EMP Environmental management plan (EMP) for pre-, during- and postconstruction phases (contents may be modified, as applicable).	compliance with relevant standards. 6.8.4 Allocation of resources and responsibilities for plan implementation. 6.8.5 Schedule of the actions to be taken; 6.8.6 Programme for surveillance, monitoring and auditing; and 6.8.7 Contingency plan when impacts are greater than expected. The EMP	The EMP Environmental management plan (EMP) for pre-, during- and postconstruction phases (contents may be modified, as applicable). **7.Recommendations and Conclusions** **8.Statement of Understanding of Environment Charter (2001) and Climate Change Charter (2022)** 8.1 Statement of Understanding of terms of Environment Charter 2001 from proponent, with explanation of how this development approaches best practices towards the	foreign workers. 4.13.3 Safety/security concerns within the community (construction and operation). 4.13.4 Issues raised in the public consultation (written and verbal/oral concerns). 4.13.5 Others. 4.15 Potential Alternatives. 4.16 Others. **5. Impact Assessment.** 5.1 Impact identification. 5.2 Description of impact : 5.2.6 Ecosystem and economic analyses (may summarize above ; valuation is needed) to determine the best use of the area. 5.2.7 Socio-economic impact – Socio-economic and cultural

limits of project site; with additional requirement for 5km in both directions for any site on the northern coast of Providenciales or western coast of Grand Turk. 5.2.6 Ecosystem and economic analyses (may summarize above; valuation is needed) to determine the best use of the area. 5.3 Impact assessment. 5.4 Derivation of significance. Note: Use computer modelling, as appropriate, for wind-wave prediction, wave energy dissipation, waves and currents and sediment	**7.Recommendations and Conclusions** **8.0 Statement of Understanding of Environment Charter (2001) and Climate Change Charter (2022)** 8.1 Statement of Understanding of terms of Environment Charter 2001 from proponent, with explanation of how this development approaches best practices towards the protection of the biodiversity and the environment as noted in the Charter. 8.2 Statement of Understanding of	Environmental management plan (EMP) for pre-, during- and postconstruction phases (contents may be modified, as applicable). **7. Recommendations and Conclusions** 8. **Statement of Understanding of Environment Charter (2001) and Climate Change Charter (2022)**	protection of biodiversity and the environment as noted in the Charter. 8.2 Statement of Understanding of terms of Climate Change Charter 2022 from proponent, with explanation of how this development approaches best practices toward mitigation, adaptation, and resilience to climate change as noted in the Charter. 8.3 Proponent's Declaration of Intent to guide the development by the recommendations of the EIA consultant, with updated Declaration following response to public or TCIG commentary requesting or requiring alterations to any part of the EIA.	baseline (including labor, tourism, public infrastructure, crime, etc., Predicted impacts (positive and negative- influx of population/ workers, safe & security) to the above baseline, Identification and involvement of stakeholder groups: 5.2.7.1 Public beach access – considering that the beach is public in TCI. 5.2.7.2 Potential impact to neighboring developments, businesses and residential houses. **5.2.7.3** Other Impacts. 5.3 Impact assessment. 5.4 Derivation of significance. **5 Mitigation and Monitoring** 6.1 Proposed actions and schedule to mitigate against any environmental impact (including proposed monitoring activities).

transport, shoreline changes, etc. Particular attention should be given to the sensitivity and vulnerability of important geomorphological features and processes; how these are likely to respond to particular impact, regardless of whether the effects are temporary, long-term, reversible or permanent. The potential cumulative impacts of and to other project components and nearby developments (as applicable) must be noted and addressed.	terms of Climate Change Charter 2022 from proponent, with explanation of how this development approaches best practices toward mitigation, adaptation, and resilience to climate change as noted in the Charter. 8.3 Proponent's Declaration of Intent to guide the development by the recommendations of the EIA consultant, with updated Declaration following response to public or TCIG commentary requesting or requiring alterations to any part of the EIA.			6.5 Financial resources for mitigation. 6.6 Environmental monitoring and financial requirements. 6.7 Public Consultation/social listening/monitoring. **6.8** An **Environmental Management Plan (EMP)** must be prepared with the following minimum components : 6.8.1 Summary of the potential impacts of the proposal ; 6.8.2 Description of the recommended mitigation measures ; 6.8.3 Statement of their compliance with relevant standards ; 6.8.4 Allocation of resources and responsibilities for plan implementation.

6. **Mitigation and Monitoring** 6.1 Proposed actions and schedule to mitigate against any environmental impact (including proposed monitoring activities). 6.2 Storm surge analysis and mitigation plan for sea level rises. 6.5 Financial resources for mitigation. 6.6 Environmental monitoring and financial requirements. 6.7 Public Consultation/social listening/monitoring.	**Public Consultation Meeting**			6.8.5 Schedule of the actions to be taken. 6.8.7 Programme for surveillance, monitoring and auditing. 6.8.8 Contingency plan when impacts are greater than expected. **7 . Recommendations and Conclusions** 8.1 Statement of Understanding of terms of Environment Charter 2001 from proponent, with explanation of how this development approaches best practices towards the protection of biodiversity and the environment as noted in the Charter. 8.2 Statement of Understanding of terms of Climate Change Charter 2022 from proponent, with explanation of how this development approaches best practices toward mitigation, adaptation, and resilience to

				climate change as noted in the Charter. 8.3 Proponent's Declaration of Intent to guide the development by the recommendations of the EIA consultant, with updated Declaration following response to public or TCIG commentary requesting or requiring alterations to any part of the EIA.
		8.1 Statement of Understanding of terms of Environment Charter 2001 from proponent, with explanation of how this development approaches best practices towards the protection of biodiversity and the environment as noted in the Charter. 8.2 Statement of Understanding of terms of Climate Change Charter 2022 from		

requesting or requiring alterations to any part of the EIA.				
Public Consultation Meeting	**Public Consultation Meeting**	**Public Consultation Meeting**	**Public Consultation Meeting**	**Public Consultation Meeting**

Appendices

To include the qualifications of the team of experts and the special requirements and information needed to form the team to conduct the EIA for this project.

1. The Terms of Reference (TOR) for the EIA as issued by DoP, TCIG.
2. Qualifications of the EIA team of experts and the special requirements and information needed to form the team to conduct the EIA for this project. The contact information (functional phone numbers and email addresses) must be provided. Curricula vitae and résumés should be relevantly abridged to **no more than two pages for each consultant**.
3. Government Permits (e.g. work permit, research permit, etc, if required).
4. Site Plan, project plans, architectural drawings and other related documents.
5. Portable data format (pdf) file of the reports of independent consultants involved in the EIA.

6. Scientific analyses reports (pdf copy from laboratory that analyzed the samples, and the like), if any.
7. Standards or protocols and assumptions used in predicting the environmental impacts.
8. Public Consultative Meeting and Stakeholders meeting reports. Include evidence of advertisement for Public Consultative Meetings, the names and contact information for those who attended the meetings, issues raised and conclusions.
9. Photo documentations (with captions – dates, place, description of the subject for the photo).
10. Certification/legal document from EIA group/company that submits the EIS, that all submitted reports/documents and etc. as part of the EIA report/EIS were first-hand information and if taken from secondary sources, the authors should be properly acknowledged or compensated.

NB:The EIA Report must be submitted as digital files; with all images and sections in proper, upright orientation; and with all sections [including text within images] clear and readable; in addition to the number of printed copies required by DoP.

Checklist of items for EIS	
Cover/ reference page as described in 1.1	
All images and sections in upright orientation, clear and readable	
Maps oriented conventionally, north-up	
Saved in manner to allow for text copying and comments to be inserted	
All sections in ToR addressed by EIS	
All appendices attached (may be in separate files) as described in 9	

9.17 Appendix Q - Certification/Legal Document from the EIA Consulting Team

CARIBBEAN ENVIRONMENTAL DESIGN ASSOCIATES
Architects & Planners

Certification/Legal Documents from EIA Consulting Team

Certification/Legal document from the EIA group/company that submits the EIS report that all submitted reports/documents etc. as part of the EIA/EIS report were first-hand information and if taken from secondary sources, the authors should be properly acknowledged or compensated.

TO WHOM IT CONCERN

The EIA consulting team, authors of the SEAMM TCI Grace Bay hotel development Environmental Impact Statement (EIS) report hereby certify that to the best of their knowledge the contents, including text, illustrations, and graphics of the EIS report for the SEFAMM TCI Grace Bay hotel project t are for the most part first-hand information and that in cases where secondary sources were quoted or referenced, the authors were properly acknowledged.

This 22nd. Day of August 2023, Oswald R. Williams of Caribbean Environmental Design Associates for and on behalf of the said EIA consulting.

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9.18 Appendix R – Turks and Caicos Endemic Flora List

Department of Environment and Coastal Resources (DECR)
Ministry of Tourism, Environment, Heritage and Culture (MTEHC)
Turks and Caicos Islands Government (TCIG)
Providenciales, Turks and Caicos Islands

The following flora and fauna are protected species because they are endemic, rare and endangered.

THE SCHEDULES

I. Protected Flora & Fungi

A. Turks & Caicos Endemic Plants

1. Turks & Caicos heather *Limonium bahamense*
2. Lucayan pear *Opuntia x lucayana*
3. Britton's buttonbush *Spermacoce brittonii*
4. Capillary buttonbush *Spermacoce capillaries*
5. Stipitate dog-strangle *Metastelma stipitatum*
6. Slender-stemmed peppergrass *Lepidium filicaule*
7. Caicos Encyclia orchid *Encyclia caicensis*
8. Caroline's pink *Stenandrium carolinae*
9. Silvery silverbush *Argythamnia argentea*
10. Broom bush *Evolvulus bahamensis*
11. Hatpin sedge *Eleocharis bahamensis*

B. Endemic and vital species of fungi

1. Ectomychrrhizal species in the genera *Neoboletus*, *Octaviana*, *Diplocystis*, *Melanogaster*, *Sebacinaceae*, *Tomentella*, *Thelophora*, *Thelophoraceae*, *Entoloba*, and *Inocybe*
2. Pine truffle *Rhizopogon floscorubens*
3. *Russula littoralis*
4. *Scleroderma bermudense* and other ectomycorrhizal *Scleroderma*
5. *Sullus cothurnatus*
6. *Amanita arenicola*

C. Lucayan Archipelago Endemic Plants

1. Haulbark *Thouinia discolor*
2. Inagua Encyclia orchid *Encyclia inaguensis*
3. Correll's rock orchid *Encyclia correllii* (ex *Encyclia gracilis*)
4. Rufous Encyclia *Encyclia rufa*
5. Inagua gum-elemi *Bursera inaguensis*
6. Frenning's gum-elemi *Bursera frenningae*
7. Sea sage *Lantana involucrata*
8. Inagua silver-top palm *Coccothrinax inaguensis*
9. Nakedback *Euphorbia gymnonota*

10. Wild thyme *Euphorbia inaguensis*
11. Inagua century plant *Agave inaguensis*
12. Lucayan century plant *Agave millspaughii*
13. Bahama love grass *Eragrostis bahamensis*
14. Nash's pepperwort *Marsilea nashii*
15. Inagua fimbry sedge *Fimbristylis inaguensis*
16. Caicos pine *Pinus caribaea* var. *bahamensis*
17. Brasiletto *Caesalpinia reticulata*
18. Pineyard golden creeper *Ernodea serratifolia*
19. Low ashy heliptrope *Heliotropium nanum*
20. Thyme-leaved buttonbush *Spermacoce thymifolia*
21. Lucayan lobelia *Lobelia lucayana*
22. Lucayan cocobey *Varronia lucayana*
23. Bahama cocobey *Varronia bahamensis*
24. Lucayan silverbush *Argythamnia lucayana*
25. Yellow silverbush *Argythamnia sericea*
26. Bumbo-bush *Lepidaploa arbuscula*
27. False holly *Anastraphia paucifloscula*
28. Lucayan boneset *Chromalaena lucayana*
29. Rong-bush *Wedelia bahamensis*
30. Heliotrope *Heliotropium diffusum*
31. Nash's heliotrope *Heliotropium nashii*
32. Wilson's pinweed spurge *Euphorbia lecheoides*
33. Bahama milkpea *Galactia bahamensis*
34. Swamp-bush *Pavonia bahamensis*
35. Correll's spider-grass *Aristida correlliae*
36. Catesby's lily-thorn *Catesbaea foliosa*
37. Winder *Clematis plukenetii*
38. Golden creeper *Ernodea millspaughii*
39. Savanna buttonbush *Spermacoce savannarum*
40. Big sage *Lantana balsamifera*
41. Horse pear *Consolea nashii*

D. Native Plants of Special Conservation Concern

1. Tall Encyclia orchid *Encyclia altissima*
2. Britton's shadow-witch orchid *Ponthieva brittonae*
3. Adder's mouth orchid *Malaxis spicata*
4. Spring ladies tresses *Spiranthes vernalis*
5. Green ladies tresses *Spiranthes polyantha*
6. Cuban dune mat *Guilleminea brittonii*
7. Woolly nipple cactus *Mammillaria nivosa*
8. Smooth pear *Opuntia bahamana*
9. Dildo cactus *Pilosocereus royenii*

10. West Indian mahogany *Swietenia mahagoni*
11. Holy lignum vitae *Guaiacum sanctum*
12. True lignum vitae *Guiaiacum officinale*
13. Mauby *Colubrina elliptica*
14. Brook's cereus *Harrisia brookii*
15. Monkey-fiddle *Euphorbia tithymaloides* var. *bahamensis*
16. Pork-and-doughboy *Acacia acuifera*
17. Leatherleaf casha *Acacia coriophylla*
18. Bahama savia *Savia bahamensis*
19. Brasiletto *Caesalpinia bahamensis*
20. Bloody powderpuff *Calliandra haematomma*
21. Popcorn *Chamaecrista caribaea*
22. Mistletoe *Dendropemon purpureus*
23. Wild hibiscus *Hibiscus clypeatus*
24. Taylor's jujube *Ziziphus taylori*
25. Bahama buttonbush *Spermacoce bahamensis*
26. Mahogany mistletoe *Phoradendron northropiae*
27. Pineyard rat-tail bush *Stachytarpheta fruticosa*

II. Protected Fauna

A. Turks & Caicos Endemic Fauna

1. Turks & Caicos rock iguana *Cyclura carinata*
2. Caicos pygmy trope boa *Tropidophis greenwayi (T. g. greenwayi & T. g. lathanus*)
3. Caicos barking gecko *Aristelliger hechti*
4. Turks snake-doctor *Spondylurus turksae*
5. Caicos snake-doctor *Spondylurus caicosae*
6. Turks dwarf gecko *Sphaerodactylus underwoodi*
7. Caicos dwarf gecko *Sphaerodactylus caicosensis*
8. Dwarf Greater Antillean bullfinch *Loxigilla violacea ofella*
9. Turks & Caicos thick-billed vireo *Vireo crassirostris stalagmium*
10. Cave crustacean *Deevaya spiralis*
11. Cave crustacean *Speonebilia cannoni*
12. Cave crustacean *Bahadzia stocki*
13. Cave crustacean *Lasionectes entrichoma*
14. Cave crustacean *Erebonectoides macrochaetus*
15. Cave crustacean *Fosshagenia ferrarii*
16. Cave crustacean *Pelagomacellicephala iliffei*
17. Cave crustacean *Kaloketos pilosus*
18. Cave crustacean *Godzillius robustus*
19. Cave crustacean *Bahalana caicosana*
20. Cave crustacean *Spelaeonicippe provo*

Department of Environment and Coastal Resources (DECR)
Ministry of Tourism, Environment, Heritage and Culture (MTEHC)
Turks and Caicos Islands Government (TCIG)
Providenciales, Turks and Caicos Islands

B. Protected Birds. List of Turks & Caicos Islands Native, Migratory, and Regionally Vagrant Bird Species.

Flamingos (Phoenicopteriformes)
1. Caribbean Flamingo *Phoenicopterus ruber*
Tropicbirds (Phaethontiformes)
2. White Tailed Tropicbird *Phaethon lepturus*
Petrels (Procellariiformes)
3. Herald petrel *Pterodroma arminjoniana*
4. Black-capped petrel *Pterodroma hasitata*
5. Audubon's shearwater *Puffinus lherminieri*
6. Cory's shearwater *Calonectris borealis*
7. Pelicans, Cormorants, Herons Pelecaniformes
8. Brown pelican *Pelecanus occidentalus*
9. Brown Booby *Sula leucogaster*
10. Masked booby *Sula dactylatra*
11. Northern gannet *Morus bassanus*
12. Red-footed booby *Sula sula*
13. Double Crested Cormorant *Phalacrocorax auritus*
14. Olivaceous Cormorant *Phalacrocorax olivaceus*
15. Magnificent Frigatebird *Fregata magnificens*
16. Great Blue Heron *Ardea herodias*
17. Great Egret *Casmerodius albus*
18. Snowy Egret *Egretta thula*
19. Little Blue Heron *Egretta caerulea*
20. Tricolored Heron *Egretta tricolor*
21. Reddish Egret *Egretta rufescens*
22. Cattle Egret *Bubulcus ibis*
23. Green Heron *Butorides virescens*
24. Black Crowned Night Heron *Nycticorax nycticorax*
25. Yellow Crowned Night Heron *Nyctanassa* violacea
26. American Bittern *Botaurus lentiginosus*
27. Glossy Ibis *Plegadis falcinellus*
28. White ibis *Eudocimus* albus
29. Roseate Spoonbill *Ajaia ajaja*
Rails and Cranes (Gruiformes)
30. Clapper Rail *Rallus longirostris*
31. King rail *Rallus elegans*
32. Sora Rail *Porzana carolina*
33. Purple gallinule *Porphyrio martinicus*
34. Common gallinule *Gallinula galeata*
35. American coot *Fulica americana*
36. Caribbean coot *Fulica caribaea*
37. Sandhill crane *Grus canadensis*

TCI protected species/page4 of 10 pages

A - 4

38. Limpkin *Aramus guarauna*
Geese, Swans and Ducks (Anseriformes)
39. West Indian Whistling Duck *Dendrocygna arborea*
40. Fulvous whistling duck *Dendrocygna bicolor*
41. Green Winged Teal *Anas crecca*
42. White-cheeked Pintail *Anas bahamensis*
43. Blue-winged Teal *Anas discors*
44. Ruddy Duck *Oxyura jamaicensis*
45. Least Grebe *Tachybaptus dominicus*
46. Pied-billed Grebe *Podilymbus podiceps*
47. Greater Scaup *Aythya marila*
48. Lesser scaup *Aythya affinis*
49. Ring-necked duck *Aythya collaris*
50. Hooded merganser *Lophodytes cucullatus*
51. Common merganser *Mergus merganser*
52. Red-breasted merganser *Mergus serrator*
53. Canada goose *Branta canadensis*
54. Masked Duck *Nomonyx dominicus*
55. Redhead *Aythya americana*
56. Northern shoveler *Spatula clypeata*
57. Gadwall *Mareca strepera*
58. American wigeon *Mareca americana*
59. Mallard *Anas platyrhynchos* (excludes domestic breeds)
60. American black duck *Anas rubripes*
61. Northern pintail *Anas acuta*
62. Shorebirds *Charadriiformes*
63. American Oystercatcher *Haemotopus palliatus*
64. Black-necked Stilt *Himantopus mexicanus*
65. American Avocet *Recurvirostra americana*
66. Lesser Golden Plover *Pluvialis dominica*
67. Grey plover *Pluvialus squatarola*
68. Semipalmated Plover *Charadrius semipalmatus*
69. Wilson's Plover *Charadrius wilsonia*
70. Killdeer *Charadrius vociferus*
71. Snowy Plover *Charadrius alexandrinus*
72. Piping Plover *Charadrius melodus*
73. Black-bellied Plover *Pluvialis squatarola*
74. Upland Sandpiper *Bartyramia longicauda*
75. Whimbrel *Numenius phaeopus*
76. Hudsonian Godwit *Limosa haemastica*
77. Ruddy Turnstone *Arenaria interpres*
78. Red Knot *Calidris canutus*
79. Stilt Sandpiper *Calidris himantopus*
80. Sanderling *Calidris alba*

81. Dunlin *Calidris alpina*
82. Least Sandpiper *Calidris minutilla*
83. White-rumped Sandpiper *Calidris fuscicollis*
84. Pectoral Sandpiper *Calidris melanotos*
85. Semipalmated Sandpiper *Calidris pusilla*
86. Western Sandpiper *Calidris mauri*
87. Short-billed Dowitcher *Limnodromus griseus*
88. Wilson's snipe *Gallinago delicata*
89. Common Snipe *Gallinago gallinago*
90. Spotted Sandpiper *Actitus macularia*
91. Solitary Sandpiper *Tringa solitaria*
92. Willet *Catoptrophorus semipalmatus*
93. Greater Yellowlegs *Tringa melanoleuca*
94. Lesser Yellowlegs *Tringa flavipes*
95. Wilson's phalarope *Steganopus tricolor*
96. Little auk*Alle alle*
97. Pomarine skua *Stercoriarus pomarinus*
98. Brown Noddy *Anous stolidus*
99. Black Skimmer *Rhynchops niger*
100. Bonaparte's gull *Chroicocephalus philadelphia*
101. Black-headed gull *Chroicocephalus ridibundus*
102. Laughing gull *Leucophaeus atricilla*
103. Ring-billed gull *Larus delawarensis*
104. Great black-backed gull *Larus marinus*
105. American herring gull *Larus smithsonianus*
106. Sooty Tern *Sterna fuscata*
107. Bridled Tern *Sterna anaethetus*
108. Least Tern *Sterna antillarum*
109. Gull-billed tern *Gelochelidon nilotica*
110. Caspian tern *Hydroprogne caspia*
111. Black tern *Chlidonius niger*
112. Roseate Tern *Sterna dougallii*
113. Common Tern *Sterna hirundo*
114. Forster's Tern *Sterna* forsteri
115. Sandwich Tern *Sterna sandvicencis*
116. Royal Tern *Sterna maximus*

Pigeons and doves (Columbiformes)

117. White Crowned Pigeon *Columba leucocephala*
118. White-winged Dove *Zenaida asiatica*
119. Zenaida Dove *Zenaida aurita*
120. Mourning Dove *Zenaida macroura*
121. Common Ground Dove *Columbina passerina*
122. Key West Quail Dove *Geotrygon chrysia*

Cuckoos (Cuculiformes)

123. Yellow-billed Cuckoo *Coccyzus americanus*
124. Mangrove Cuckoo *Coccyzus minor*
125. Smooth-billed Ani *Crotophaga ani*

Hawks (Accipitriformes)

126. Osprey *Pandion heliaetus*
127. Red-tailed hawk *Buteo jamaicensis*
128. Sharp-shinned hawk *Accipter striatus*
129. Northern harrier *Circus cyaneus*
130. Swallow-tailed kite *Elanoides forficatus*

Owls (Strigiformes)

131. Barn Owl *Tyto alba*
132. Short-eared Owl *Asio flammeus*

Nighthawks, swifts, hummingbirds (Caprimulgiformes)

133. Common Nighthawk *Chordeiles minor*
134. Antillean Nighthawk *Chordeiles gundlachii*
135. Chuck-will's- widow *Caprimulgus carolinensis*
136. Black Swift *Cypseloides niger*
137. Chimney Swift *Chaetura pelagica*
138. Antillean palm swift *Tachornis phoenicobia*
139. Lesser Antillean swift *Chaetura martinica*
140. Bahama Woodstar Hummingbird *Calliphlox evelynae*
141. Bee Hummingbird *Mellisuga helenae*
142. Cuban emerald hummingbird *Chlorostilbon ricordii*

Kingfishers (Coriaciiformes)

143. Belted Kingfisher *Ceryle alcyon*

Falcons (Falconiformes)

144. American kestrel *Falco sparverius*
145. Merlin *Falco columbarius*
146. Peregrine falcon *Falco peregrinus*

Woodpeckers (Piciformes)

147. Yellow Bellied Sapsucker *Sphyrapicus varius*
148. Hairy Woodpecker *Picoides villosus*

Perching birds (Passeriformes)

149. Purple Martin *Progne subis*
150. Sand martin *Riparia riparia*
151. Caribbean Martin *Progne dominicensis*
152. Bahama swallow *Tachycineta cyaneoviridis*
153. Tree Swallow *Tachycineta bicolor*
154. Cave swallow *Petrochelidon fulva*
155. Northern Rough- winged Swallow *Stelgidopteryx serripennis*
156. Bank Swallow *Riparia riparia*
157. Cliff Swalow *Hirundo pyrrhonota*
158. Barn Swallow *Hirundo rustica*
159. Eastern Wood Pewee *Contopus virens*

160. Greater Antillean Pewee *Contopus caribaeus*
161. Eastern Kingbird *Tyrannus tyrannus*
162. Gray Kingbird *Tyrannus dominicensis*
163. Giant kingbird (historical range) *Tyrannus cubensis*
164. La Sagra's flycatcher *Myriacrus sagrae*
165. Hispaniolan wood peewee *Contopus hispaniolensis*
166. Cedar waxwing *Bombycilla cedrorum*
167. Cuban Crow *Corvus nasicus*
168. Blue-gray Gnatcatcher *Polioptila caerulea*
169. Gray-cheeked Thrush *Catharus minimus*
170. American robin *Turdus migratorius*
171. Gray Catbird *Dumetella carolinensis*
172. Northern Mockingbird *Mimus polyglottus*
173. Bahama Mockingbird *Mimus gundlachii*
174. Pearly-eyed Thrasher *Margarops fuscatus*
175. Chipping sparrow *Spizella passerina*
176. White-crowned sparrow *Zonotrichia leucophrys*
177. Savannah sparrow *Passerculus sandwichensis*
178. White-eyed Vireo *Vireo griseus*
179. Thick-billed Vireo *Vireo crassirostris*
180. Yellow-throated Vireo *Vireo flavifrons*
181. Philadelphia Vireo *Vireo philadelphicus*
182. Red-eyed Vireo *Vireo olivaceus*
183. Black-whiskered Vireo *Vireo altiloquus*
184. Blue Winged Warbler *Vermivora pinus*
185. Tennessee Warbler *Vermivora peregrina*
186. Nashville Warbler *Vermivora ruficapilla*
187. Northern Parula Warbler *Parula americana*
188. Yellow Warbler *Dendroica petechia*
189. Chestnut-sided Warbler *Dendroica pensylvanica*
190. Magnolia Warbler *Dendroica magnolia*
191. Cape May Warbler *Dendroica tigrina*
192. Black-throated Blue Warbler *Dendroica caerulescens*
193. Yellow-rumped Warbler *Dendroica coronata*
194. Black-throated Green Warbler *Dendroica virens*
195. Blackburnian Warbler *Dendroica fusca*
196. Yellow-throated Warbler *Dendroica dominica*
197. Kirtland's Warbler *Dendroica kirtlandii*
198. Prairie Warbler *Dendroica discolor*
199. Palm Warbler *Dendroica palmarum*
200. Bay-breasted Warbler *Dendroica castanea*
201. Blackpoll Warbler *Dendroica striata*
202. Cerulean Warbler *Dendroica cerulea*
203. Black-and-white Warbler *Mniotilta varia*

204. American Redstart *Setophaga ruticilla*
205. Prothonotary Warbler *Protonotaria citrea*
206. Worm-eating Warbler *Helmitheros vermivorus*
207. Ovenbird *Seiurus aurocapillus*
208. Townsend's warbler *Stetophaga townsendi*
209. Northern Waterthrush *Seiurus noveboracensis*
210. Louisiana Waterthrush *Seiurus motacilla*
211. Kentucky Warbler *Oporomis formosus*
212. Connecticut Warbler *Oporomis agilis*
213. Mourning Warbler *Oporomis philadelphia*
214. Common Yellowthroat *Geothlypis trichas*
215. Hooded Warbler *Wilsonia citrina*
216. Green-tailed warbler *Microligea palustris*
217. Swainson's warbler *Limnothlypis swainsonii*
218. Bananaquit *Coereba flaveola*
219. Western spindalis *Spindalis zena*
220. Summer Tanager *Piranga rubra*
221. Scarlet Tanager *Piranga olivacea*
222. Rose Breasted Grosbeak *Pheucticus ludovicianis*
223. Blue Grosbeak *Guaraca caerulea*
224. Indigo Bunting *Passerina cyanea*
225. Painted Bunting *Passerina ciris*
226. Dickcissel *Spiza americana*
227. Black-faced Grassquit *Tiaris bicolor*
228. Greater Antillean Bullfinch *Loxigilla violacea ofella*
229. White-crowned Sparrow *Zonotrichia leucophrys*
230. Bobolink *Dolichonyx oryzivorus*
231. Brown-headed Cowbird *Molothrus ater*
232. Shiny cowbird *Molothrus bonariensis*
233. Northern Oriole *Icterus galbula*
234. Buff-bellied pipit *Anthus rubescens*

C. Protected Reptiles and Amphibians

1. Southern Bahamas rainbow boa *Chilabothrus chrysogaster*
2. Mayaguana dwarf gecko *Sphaerodactylus mariguanae*
3. Jamaican slider *Trachemys terrapen*†
4. Inagua slider *Trachemys stejnegeri*†

5. Thread snake *Typhlops platycephalus?*
6. American crocodile *Crocodylus acutus*‡
7. Green turtle *Chelonia mydas*
8. Hawksbuill turtle *Eretmochelys imbricata*
9. Loggerhead turtle *Caretta caretta*

D. Protected Mammals

1. All bats; all species in order *Chiroptera*
2. All hutias; *Geocapromys* species
3. All whales, dolphins, and porpoises, all members of order *Cetacea*
4. West Indian manatee *Trichechus manatus*
5. All other marine mammals, including vagrant species

E. Protected Terrestrial Invertebrates

1. Turks Island leafwing
2. Drury's hairstreak
3. Cave shrimp *Typhlatya garciai*
4. Cave shrimp *Barbouria cubensis*

9.19 Appendix S – Hydrogeological Data – Subsurface Sand Sample

Subsurface Sand Sample

ASTM E-11 Sieve Size (mm)	Cumulative % Weight Passing
1.8	100
1	90
0.6	6
0.3	5
0.15	0
0.075	0
Pan	0

D60	0.85714286
D30	0.71428571
D10	0.61904762

C_u =	1.38461538	value must be 4 to 6 to be well graded < 4 means uniformly graded
Cc =	0.36848073	Value must be between 1 and 3 to be well graded

9.20 Appendix T – Beach Sand Sample

Beach Sand Sample

ASTM E-11 Sieve Size (mm)	Cumulative % Weight Passing
1.8	100
1	90
0.6	7
0.3	4
0.15	0
0.075	0
Pan	0

D60	0.84941176
D30	0.70823529
D10	0.61411765

C_u =	1.38314176	value must be 4 to 6 to be well graded < 4 means uniformly graded
Cc =	0.36265063	Value must be between 1 and 3 to be well graded

9.21 Appendix U – GPS points and description of spot checks along the transect.

Table 1: GPS Coordinates and description of spot check

GPS Point	Latitude	Longitude	Description
1	21°48.107'N	072°10.968'W	Sparse Seagrass
2	21°48.165'N	072°10.933'W	Sandy bottom
3	21°48.147'N	072°10.938'W	Sandy bottom with sparse Seagrass with sparse microalgae, halimeda
4	21°48.139'N	072°10.939'W	Sandy bottom with rubble (Broken conch shells)
5	21°48.130'N	072°10.941'W	Sparse Turtle Grass
6	21°48.124'N	072°10.938'W	Ridge of Turtle grass and Manatee grass
7	21°48.119'N	072°10.933'W	Manatee Grass
8	21°48.108'N	072°10.936'W	Sandy bottom
9	21°48.108'N	072°10.933'W	Sandy bottom with bouldering rocks. Sea anemone, juvenile parrotfish and dusky damsel
10	21°48.095'N	072°10.929'W	Sandy bottom
11	21°48.093'N	072°10.930'W	Ridge of Turtle Grass and Manatee Grass
12	21°48.068'N	072°10.943'W	Sand into Turtle Grass Loggerhead turtle Observed
13	21°48.044'N	072°10.949'W	Sandy with Algae
14	21°48.035'N	072°10.949'W	Bare Sand
15	21°48.024'N	072°10.949'W	Sandy bottom with Turtle Grass and several colonies of

			Finger Coral (*Porites porites*)
16	21°47.996'N	072°10.949'W	Bare Sand
17	21°47.989'N	072°10.948'W	Patch of Turtle Grass
18	21°47.942'N	072°10.945'W	Bare Sand
19	21°47.916'N	072°10.942'W	Bare Sand
20	21°47.904'N	072°10.952'W	Bare Sand
21	21°47.912'N	072°10.956'W	Bare Sand
22	21°47.933'N	072°10.967'W	Bare Sand
23	21°47.952'N	072°10.973'W	Bare Sand Southern Stingray
24	21°47.972'N	072°10.986'W	Sparse Turtle Grass
25	21°47.976'N	072°10.993'W	Bare Sand
26	21°47.983'N	072°10.989'W	Turtle Grass
27	21°47.983'N	072°10.988'W	Bare Sand
28	21°48.006'N	072°10.971'W	Sparse to Moderate seagrass
29	21°48.016'N	072°10.960'W	Moderate Seagrass
30	21°48.034'N	072°10.950'W	Sandy bottom with seagrass
31	21°48.060'N	072°10.968'W	Sandy bottom with conch shells
32	21°48.071'N	072°10.974'W	Seagrass, Turtle Grass
33	21°48.069'N	072°10.985'W	Rock mound with anemones, yellowtail, mustard hill coral, stop light parrot fish, lane snapper, fire coral OFAV, blue tang
34	21°48.068'N	072°10.992'W	Hardbottom, yellow head wrasse, French

			Grunt
35	21°48.074'N	072°11.006'W	OFAV Patch
36	21°48.078'N	072°11.012'W	*Orbicella annularis* patch, Massive Starlet Coral
37	21°48.083'N	072°11.012'W	Hardbottom
38	21°48.097'N	072°11.010'W	Hardbottom
39	21°48.089'N	072°11.026'W	Hardbottom with sea fans and sea whips and fire corals
40	21°48.089'N	072°11.031'W	Sargassum
41	21°48.098'N	072°11.026'W	Hardbottom
42	21°48.105'N	072°11.034'W	Edge of Patch Reef
43	21°48.103'N	072°11.045'W	Sandy bottom

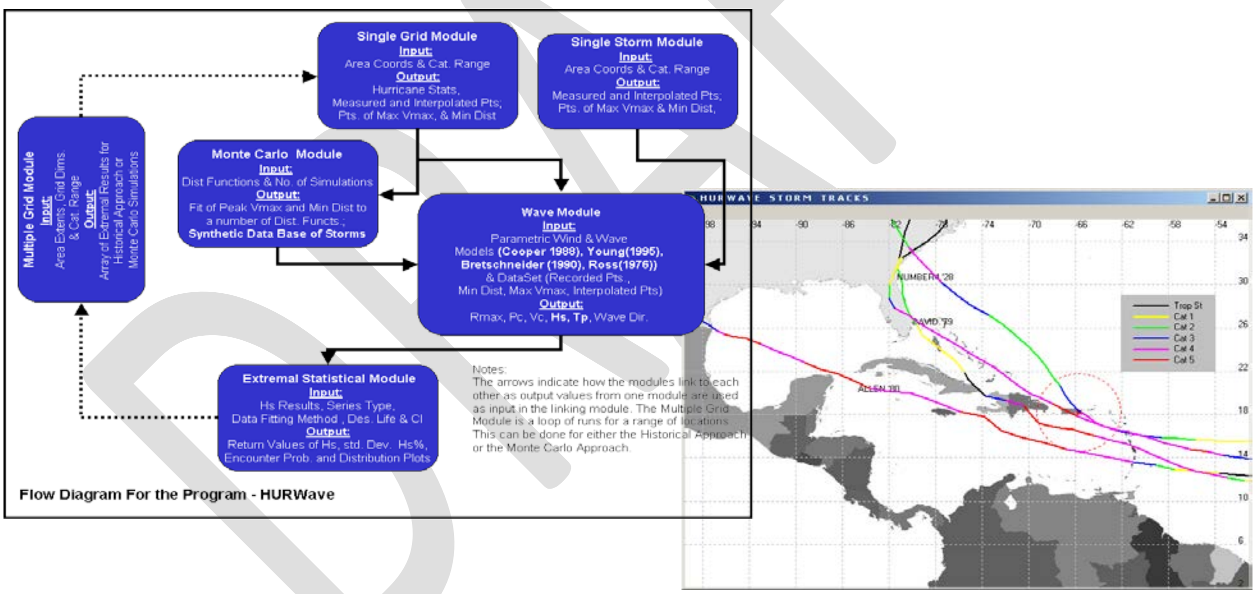
9.22 Appendix V – Numerical Modelling

Multiple modelling tools were used to develop the design wave conditions at the site. This appendix describes the tools and how they were used.

A.1 HurWave

A package of Hurricane Parametric Wave Models and Extremal Statistical Analyses by Jamel D. Banton (Banton, 2002). HURWave combines the database of the National Oceanic and Atmospheric Administration (NOAA), of hurricane tracks, with wind and wave distribution algorithms to statistically determine deep-water design wave conditions at any location within the Caribbean and the Gulf of Mexico.

The program consists of six main modules, namely: The Single Grid Module; The Single Storm Module; The Wave Module; The Extremal Statistical Module; The Monte Carlo Module; and The Multiple Grid Module. These are shown in the flow chart following.



HURWave process and a screenshot of a storm track result during analysis

The NOAA database consists of Atlantic hurricane track positions along with wind and pressure conditions at 6-hour intervals since the late 19th century. For any specified location within the North Atlantic Basin, HURWave searches this database for tropical storms and hurricanes that have passed within a specified distance from the point of interest. The program produces several statistical descriptions for this result.

Several widely used wind and wave models are applied to produce a hindcast dataset of hurricane wave conditions at the point in question. These models include Cooper (1988) and Young (1995).

The Cooper model was developed by statistically analysing the output from numerical wind and wave models for six Gulf of Mexico hurricanes. The storms covered a wide cross-section of hurricane conditions.

In the case of Young, he first developed an extensive synthetic database by running a numerical wave prediction model for a wide range of hurricane parameters. The data from these numerical experiments were then used to clarify the wave generation process within hurricanes and further to develop the parametric model suitable for wave prediction in deep water. This model was further calibrated with over 100 measurements made by the GEOSAT satellite.

With the results of these models, a range of extremal statistical analyses may be carried out in HURWave. The extremal methods applied are based on work published by Yoshima Goda in 1988 for statistically analysing extreme events such as hurricane waves. Distribution functions such as Weibull and Fischer Tippet (Type I) are fitted to the model results and the best fit chosen. The results include the values for wind, wave, and water level conditions for various return periods.

Return Wave Heights and Variations

Refresh

Return Values For The Peak Value Series

	FT - I				Weibull k = 0.75				k = 1.00				k = 1.40				k = 2.00			
Rp	Hs	σ	Hs%	EP	Hs	σ	Hs%	EP	Hs	σ	Hs	EP	Hs	σ	Hs%	EP	Hs	σ	Hs%	EP
2	4.15	0.2	4.4	100.0	3.54	0.2	3.8	100.0	3.81	0.2	4.1	100.0	4.09	0.2	4.4	100.0	4.32	0.2	4.6	100.0
5	5.92	0.3	6.2	100.0	5.52	0.4	5.8	100.0	5.82	0.4	6.1	100.0	6.02	0.4	6.3	100.0	6.11	0.3	6.4	100.0
10	7.14	0.4	7.4	99.5	7.25	0.5	7.5	99.5	7.34	0.6	7.6	99.5	7.29	0.4	7.6	99.5	7.18	0.3	7.5	99.5
20	8.33	0.5	8.6	92.3	9.16	0.7	9.5	92.3	8.87	0.8	9.2	92.3	8.47	0.5	8.8	92.3	8.11	0.4	8.4	92.3
25	8.70	0.5	9.0	87.0	9.80	0.8	10.1	87.0	9.36	0.8	9.6	87.0	8.84	0.6	9.1	87.0	8.39	0.4	8.7	87.0
50	9.87	0.6	10.2	63.6	11.89	1.0	12.2	63.6	10.88	1.0	11.2	63.6	9.93	0.6	10.2	63.6	9.20	0.5	9.5	63.6
100	11.03	0.7	11.3	39.5	14.09	1.2	14.4	39.5	12.40	1.2	12.7	39.5	10.97	0.7	11.3	39.5	9.95	0.5	10.2	39.5
CI =	95	%																		
	Cor=	0.996			Cor=	0.867			Cor=	0.951			Cor=	0.991			Cor=	0.998		

Example of resulting wave conditions for a HURWave analysis

A.2 MIKE 21

Coastal processes along the shoreline and within the nearshore of the site were modelled using coupled hydrodynamic and spectral wave modules within MIKE 21. The MIKE 21 model (developed by the Danish Hydraulic Institute) is a professional engineering software package for the simulation of tides, waves, sediments and ecology in rivers, lakes, estuaries, bays, coastal areas, and seas.

The MIKE 21 model uses various modules to simulate hydrodynamic variances in surface elevation and currents (HD) as well as spectral waves (SW). Coupling of the two modes means that the mutual interaction between waves and currents is simulated and results from one module are passed back and forth to the other module to improve the efficiency and accuracy of the simulations. The Spectral Wave (SW) module computes wave conditions throughout the model domain; the Hydrodynamic (HD) module computes water levels and current speeds and directions and is coupled with the SW module so that wave-induced currents are included. Water levels and currents affecting waves are also passed back to the SW module to improve the accuracy of the wave conditions.

Coupled Model FM

MIKE 21/3 Coupled Model FM is a truly dynamic modelling system for application within coastal and estuarine environments. It is composed of following modules:

- Hydrodynamic Module

- Spectral Wave Module
- Transport Module
- ECO Lab Module
- Mud Transport Module
- Sand Transport Module (only 2D simulations)

The Hydrodynamic Module and the Spectral Wave Module are the basic computational components of the MIKE 21/3 Flow Model FM. Using MIKE 21/3 Coupled Model FM it is possible to simulate the mutual interaction between waves and currents using a dynamic coupling between the Hydrodynamic Module and the Spectral Wave Module. The MIKE 21/3 Coupled Model FM also includes a dynamic coupling between the Mud Transport and the Sand Transport models and the Hydrodynamic Module and the Spectral Wave Module. Hence, full feedback of the bed level changes on the waves and flow calculations can be included.

Application Areas

The application areas are generally problems where flow and transport phenomena are important, with emphasis on coastal and marine applications, where the flexibility inherited in the unstructured meshes can be utilized.

MIKE 21/3 Coupled Model FM can be used for investigating the morphological evolution of the nearshore bathymetry due to the imp act of engineering works (coastal structures, dredging works etc.). The engineering works may include breakwaters (surface-piercing and submerged), groins, shoreface nourishment, harbours etc. MIKE 21/3 Coupled Model FM can also be used to study the morphological evolution of tidal inlets.

Computational features

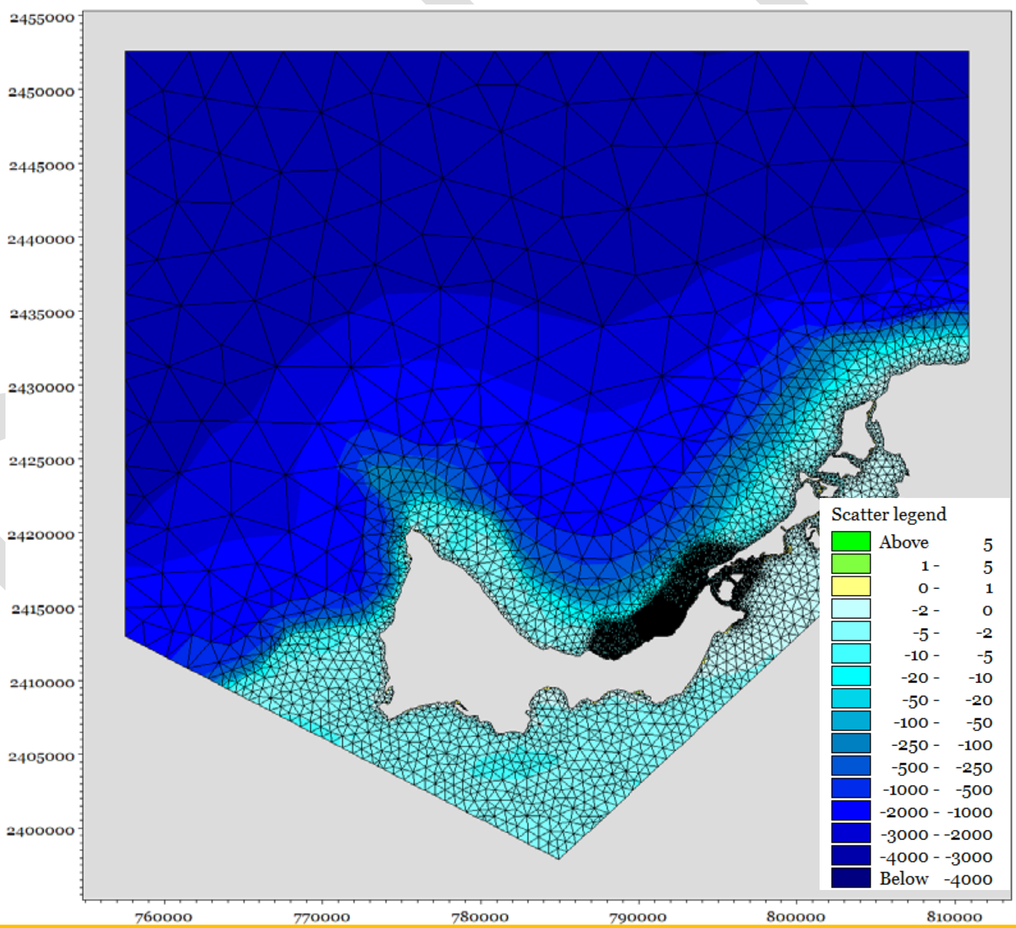
The main features of the MIKE 21 Coupled Model FM are as follows:

- Dynamic coupling of flow and wave calculations
- Full feedback of bed level changes on flow and wave calculations
- Easy switch between 2D and 3D calculations (hydrodynamic module and process modules)
- Optimal degree of flexibility in describing bathymetry and ambient flow and wave conditions
- using depth-adaptive and boundary-fitted unstructured mesh.

Flexible Mesh Development

The fundamental starting point of the model is the creation of a computational mesh where spatial variances can be determined at each simulation time step. MIKE 21 uses a flexible mesh, based on linear triangular elements that represent the seabed and land elevations (bathymetry and topography of the area). The flexible element mesh is particularly well-suited for modelling large complex areas that, at the same time, require a detailed resolution of specific features or areas.

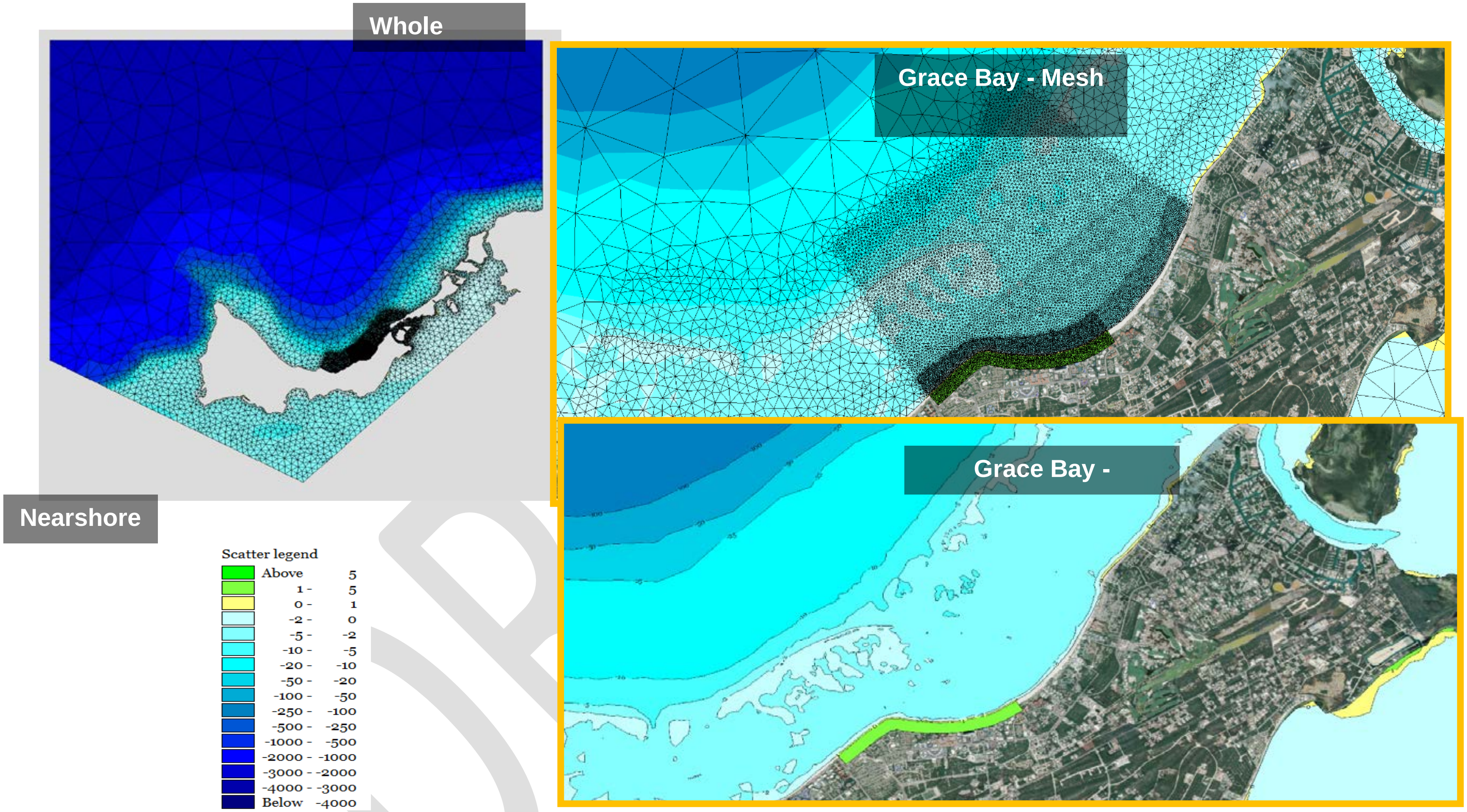
As discussed, all existing bathymetric and topographic data relevant to the area were merged and used as input to the model to define land and seabed elevations. The mesh configuration used for the coastal modelling is presented below. Within the mesh development routine, interpolation methods are used to fill data gaps thereby create a smoothed surface.



Wind and wave conditions input boundaries for Daily and Extreme Conditions

represent the existing conditions as shown below. As shown, smaller mesh elements were used in the areas closest to the project area. Additionally, smaller elements were used around the areas of significant contour change to adequately resolve wave movements and accurately represent the bathymetry with higher resolution in these areas. Smaller elements were also used along the reef face to properly capture the steep change in elevation.

The larger mesh triangles were used to represent the deep-water elements. The elements gradually reduced as the water depth decreased. The smallest mesh elements were put between elevation of 5m below mean sea level and 4m above. This was done to have proper wave transformation at sea and to properly map possible land inundation on the site.



Mesh refinement distribution for the daily waves mesh which was also mirrored in the Centre of their Hurricane

A.3 XBeach NH+

The XBeach model is an open-source model that has been constantly updating since its original inception in 2005. The program was developed under an US project with a mandate for better water surface predictions following a very devastating hurricane season in 2004. The program was developed over a series of projects published articles to be able to handle many critical coastal processes associated with high energy wave events such as hurricanes.

Some of the processes that can be simulated by XBeach include the short-wave transformation, infragravity wave transformation, wave-induced set-up, overwash and inundation. The processes listed prior are a part of the hydrodynamic model. Morphodynamic processes exist as well such as dune face avalanching however, these model components were generally not used in this research.

The XBeach model has two long wave resolving modes which have differing computational times. The first mode is the hydrostatic mode which incorporates parallel solving of long waves, currents and morphological change with short waves resolved separately. The drawback here is that the phase of the short wave is not included. The second mode is the non-hydrostatic model which couples all processes thereby providing a more realistic water surface. Instinctively, this model requires more resources. A stationary mode is also available, however long waves are not included in calculations.

Following the first major publication in 2009, Smit, et al. (2010) incorporated the processes necessary to developed the non-hydrostatic model. Another major upgrade occurred when the program was validated for the run-up process associated with the generation and dissipation of infragravity waves over coral reefs (Van Dongeren, et al., 2013). Recently the program was validated for wave run-up with laboratory data (Lashley, et al., 2018). The spread of applications of XBeach and its open source nature have led to routines like the BEWARE model (Pearson, et al., 2017) which is based on a plethora of XBeach runs.

Non-hydrostatic Formulations

The non-hydrostatic mode of XBeach is based on the concepts related to the non-linear shallow water (NLSW) equations particularly the non-hydrostatic pressure. In this mode, the pressure is depth averaged from the surface (where zero pressure is assumed) to the bed. The long wave equations are coupled with the depth-averaged pressure to create a short-wave resolver. The evasive process of wave breaking is induced when a wave exceeds a certain steepness. At this point, the non-hydrostatic pressure term is disabled. The last segment of calculations follows the momentumconserving shallow water equations. The following subsections detail the formulas used in the non-hydrostatic mode.

Computing the depth-average dynamic pressure (q) is done by first assuming that the advection and diffusive terms are negligible (zero).

$$\frac{\partial w}{\partial t} + \frac{\partial q}{\partial z} = \mathbf{0}$$ Equation A1

Where:

q	Vertical velocity
z	Vertical coordinate

The vertical velocity (ω_b) at the bed is determined by the kinematic boundary condition.

$$\boldsymbol{w_b} = u\frac{\partial(\eta - h)}{\partial x}$$ Equation A2

Where:

u	Cross shore (horizontal) velocity
η	Water surface elevation
h	Water depth

Incorporating the Keller-box method, the dynamic pressure at the bed (q_b) is found by:

$$\boldsymbol{q_b} = -\frac{\mathrm{h}}{2}\left(\left.\frac{\delta q}{\delta z}\right|_s + \left.\frac{\delta q}{\delta z}\right|_b\right)$$ Equation A3

Where:

s	Water surface term
b	Seabed term

Substituting equation A3 in equation A1 produces the vertical momentum balance at the surface ($\frac{\delta w_s}{\delta t}$):

$$\frac{\boldsymbol{\delta w_s}}{\boldsymbol{\delta \mathrm{t}}} = 2\frac{\mathrm{q_b}}{\mathrm{h}} - \frac{\delta \mathrm{w_b}}{\delta \mathrm{t}}$$ Equation A4

Finally, the dynamic pressure is found by substitution and integration to give:

$$\frac{\boldsymbol{\delta u}}{\boldsymbol{\delta \mathrm{x}}} + \frac{\mathbf{w_s} - \mathbf{w_b}}{\mathbf{h}} = \mathbf{0}$$ Equation A5

XBeach Model Benefits and Challenges

Some advantages of the non-hydrostatic model include predicting incident-band run-up and overwash which are critical for steeper slopes. The non-hydrostatic mode is also well suited for diffraction of waves since the wave direction is considered, and ship-induced waves.

The non-hydrostatic mode of XBeach does not incorporate the short-wave action balance. This saves computational time in one sense. On the other hand, however the temporal and spatial resolution required is very high which slows down the model.

XBeach Model Justification

The non-hydrostatic model was chosen in the final XBeach model setup. The justification of its use is grounded in prior validation with the model and the median computation time. The concept of run-up would require proper resolving of the water surface as is done in the non-hydrostatic mode. Additionally, a higher degree of accuracy was introduced in the non-Hydrostatic+ switch that has been incorporated in XBeach. This mode allows for better resolving over the water depth and is faster than the original non-hydrostatic mode.

9.23 Appendix W – List of Plant Photos

Additional plant species observed during the assessment

Additional plant species observed during the assessment

Additional plant species observed during the assessment

Additional plant species observed during the assessment

Additional plant species observed during the assessment

Additional plant species observed during the assessment

Additional plant species observed during the assessment

Additional plant species observed during the assessment

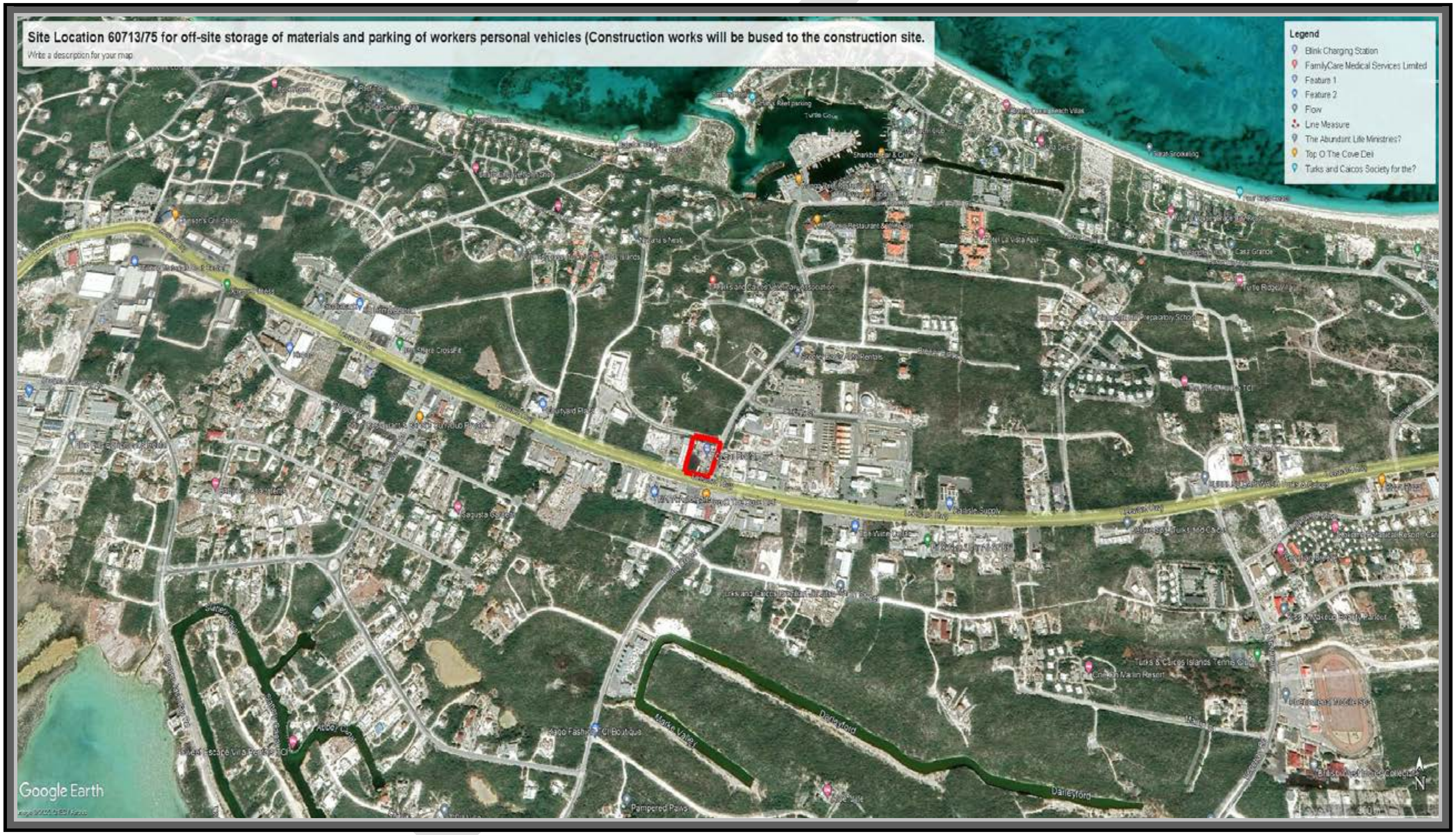
Additional plant species observed during the assessment

Additional plant species observed during the assessment

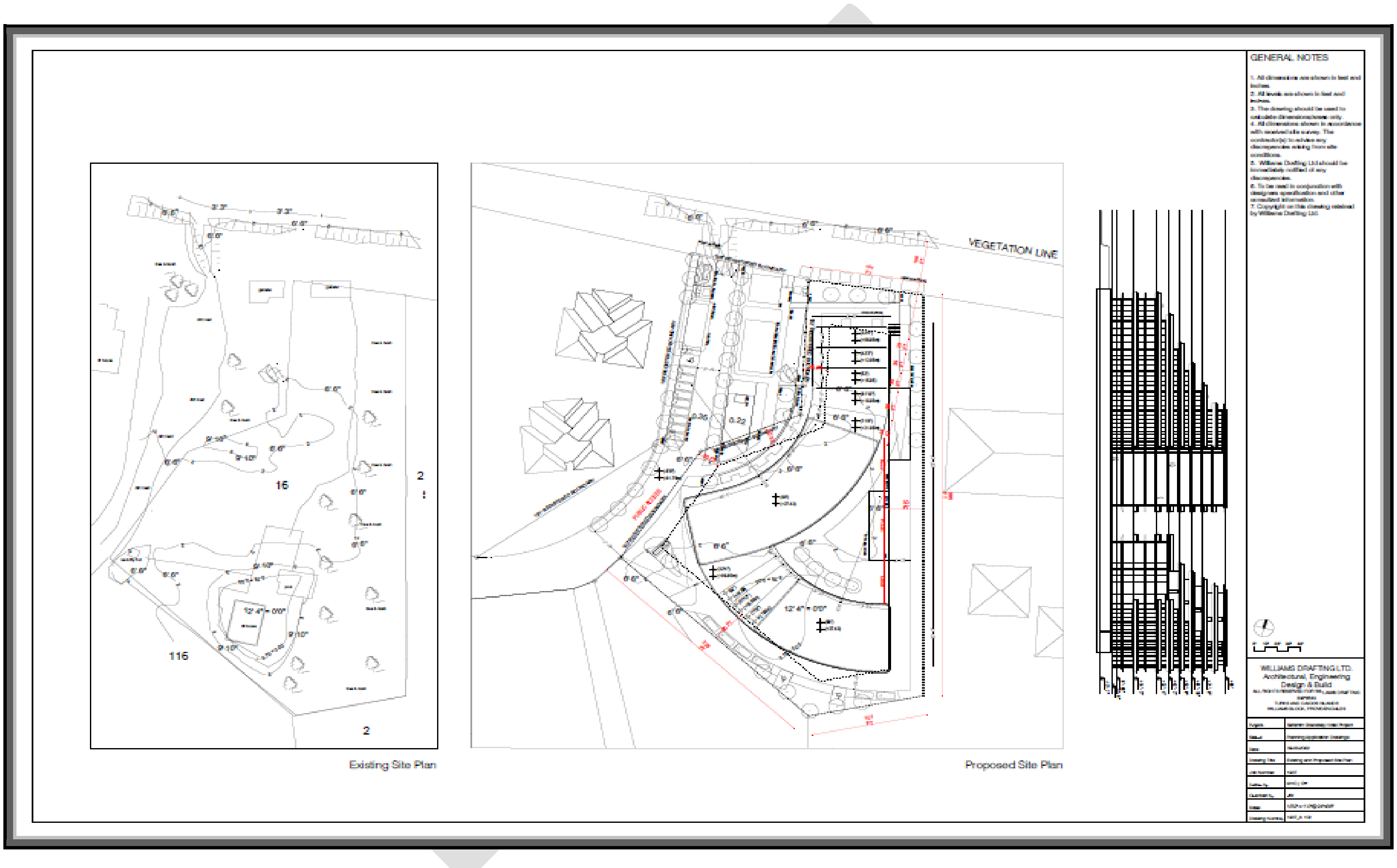
Additional plant species observed during the assessment

Additional plant species observed during the assessment

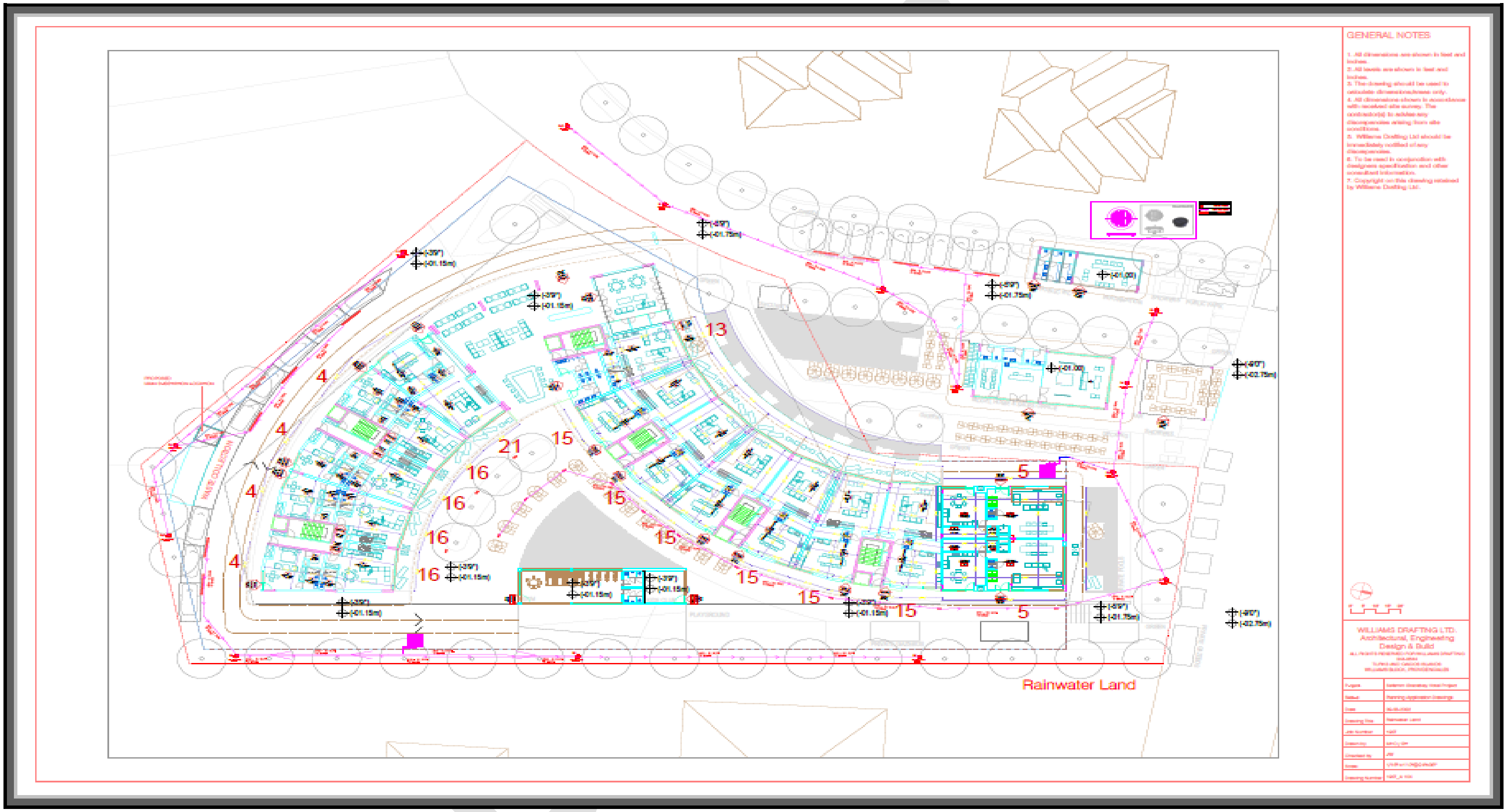
9.24 Appendix X - Site for off-site storage of construction materials and Parking of construction workers vehicles



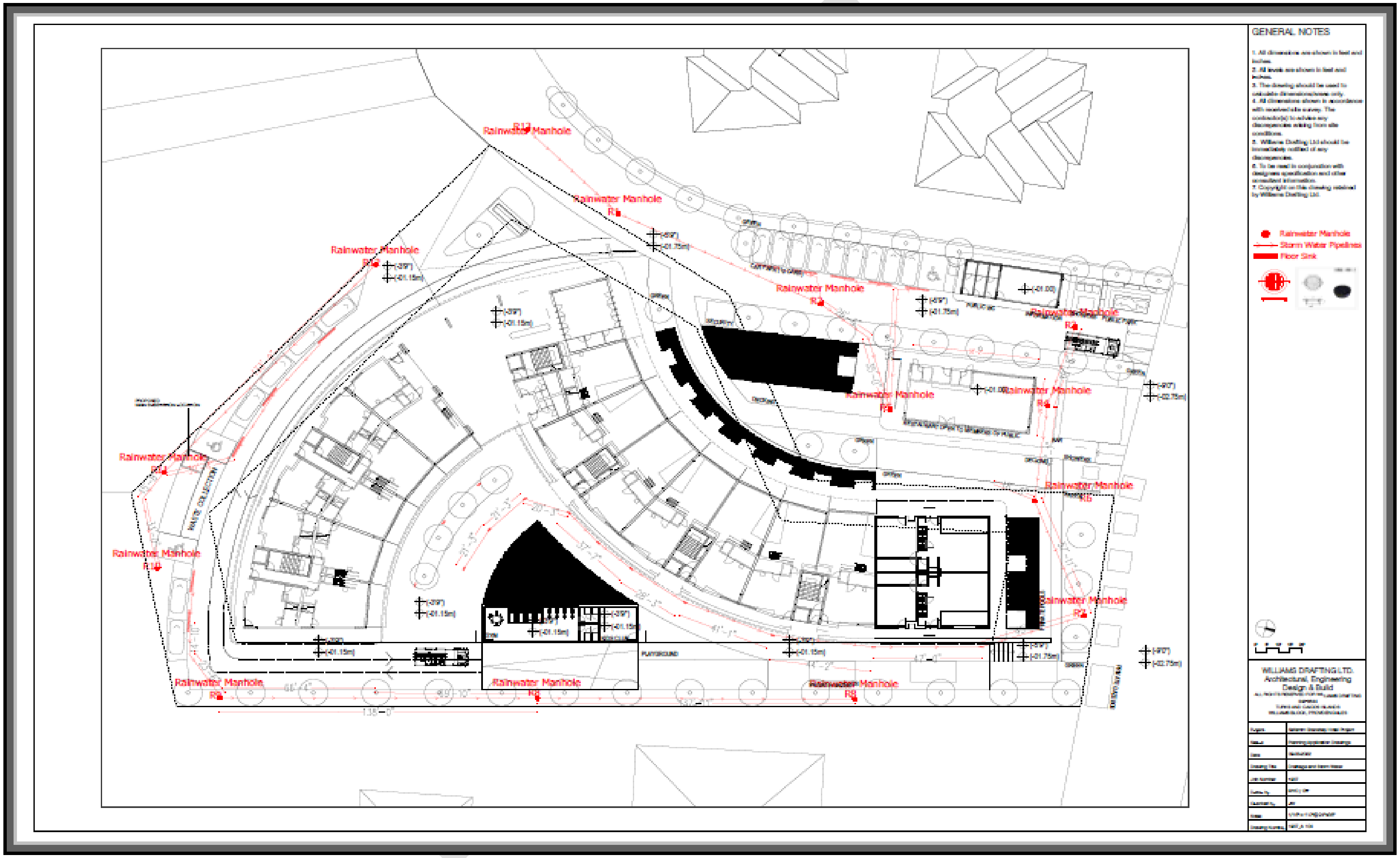
9.25 Appendix Y - Plans and Drawings - Site Location and Elevations



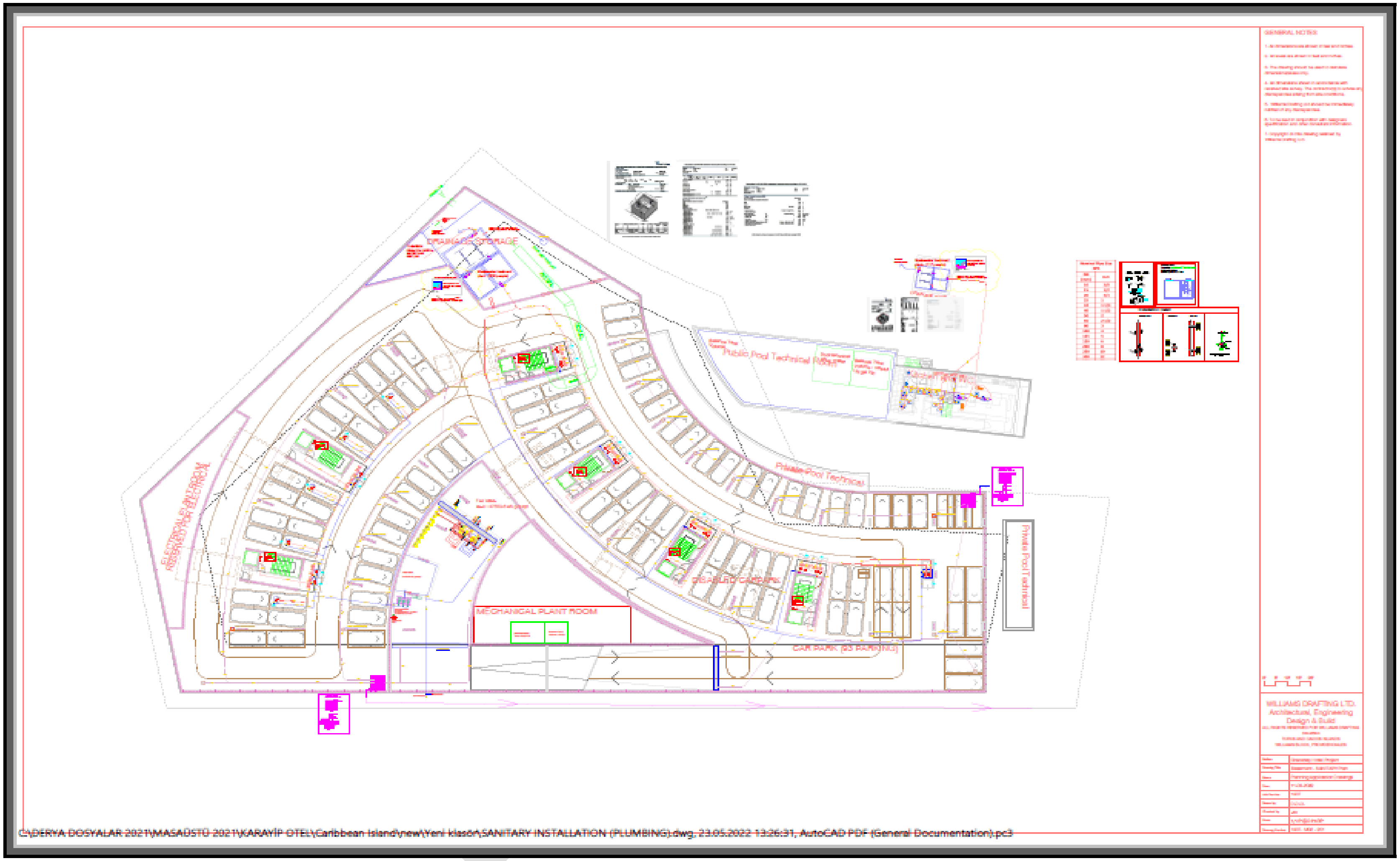
9.26 Appendix Z - Plans and Drawings - Site LAYOUT



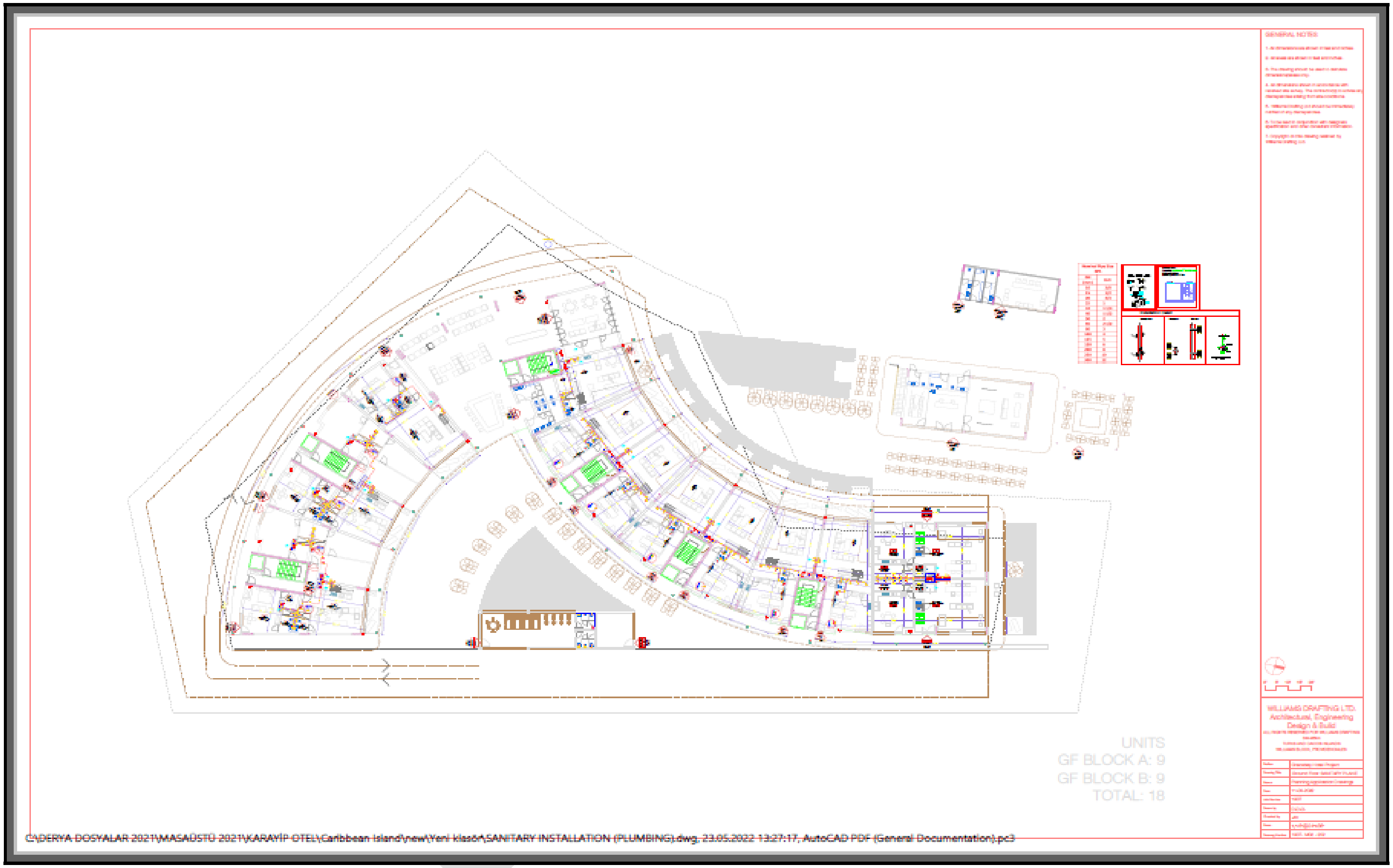
9.27 Appendix A1 - Plans and Drawings Stormwater Drainage



9.28 Appendix B1 - Plans and Drawings - Sanitary Installations



9.29 Appendix C1 - Plans and Drawings – Sanitary Installations



9.30 Appendix D1 - Plans and Drawings – Wastewater Treatment Plant

Türkiye İçin Akıllı Atıksu Çözümlerimiz
HENDL GLOBAL KLARO

Technical data sheet for KLARO-SBR wastewater treatment plant

Plant size			**117 PE**
Maximum hydraulic load		Qd	17,55 m³/d
Maximum organic load		Bd	7,02 kg/d

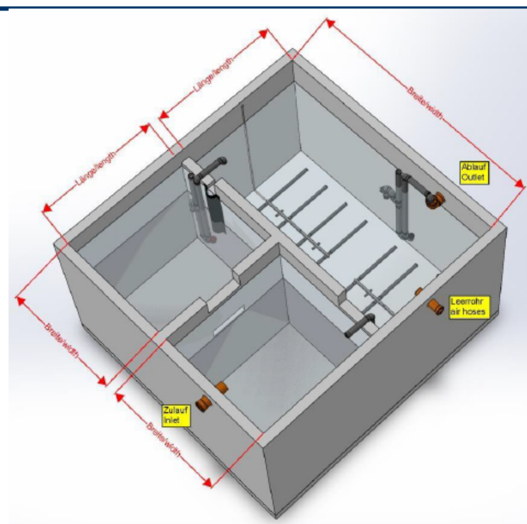
Design according to ATV-A122

Effluent values:

	BOD_5	COD	SS	NH_4N	Ntot	P	Coliforms
<	40 mg/l	150 mg/l					

Total tank capacity: 47,8 m³

Air compressor	Type: Rotary vane			DTN 41
	Installed motor power			1,50 kW
	Power consumption at 0,3 bar			1,50 kW
	Motor design	0,7 bar 50 Hz 3~		380 V
Calculated maximum daily operating time				12,4 h/d



Symbolic representation

Stage	Number	Container, material	Diameter Width [m]	Length [m]	Maximum water depth [m]	Maximum volume [m³]
SS + PT + B	2	Rectangular, Concrete	1,60	3,00	2,50	24,0
SBR	1	Rectangular, Concrete	3,40	2,80	2,50	23,8
Hoses		V1: 1x 19mm	V2: 1x 25mm	V3: 1x 19mm	V4: 1x 19mm	

HENDL Global Dış Ticaret ve Danışmanlık - KLARO Türkiye Yetkili Bayii -Karabağlar / İZMİR

Calculation for KLARO-SBR wastewater treatment plant according to ATV-A122

Basic data / project data

Customer	Michael Hendl Hotel	Date	*04.02.2022*
Project	und Restaurant	Editor	*mh*
Type of waste water:			
Particularities			

Base of calculation

Interpretation in industrial wastewater (according to ATV A 122)

Apartments	0 <50 m^2	Floor area < 50 m^2	= 2 PE	0,0 PE
Apartments	0 50-75 m^2	Floor area 50-75 m^2	= 3 PE	0,0 PE
Apartments	0 >75 m^2	Floor area > 75 m^2	= 4 PE	0,0 PE
Hotel, inn, boarding	60 Beds	1 Bed	= 1 PE	60,0 PE
Camping	0 People	2 Persons	= 1 PE	0,0 PE
Restaurant	60 Meals	3 Meals	= 1 PE	20,0 PE
Garden restaurant	200 Seating	10 Seats	= 1 PE	20,0 PE
Club	0 Users	5 Users	= 1 PE	0,0 PE
Sports facilities	0 Viewers	30 Viewers	= 1 PE	0,0 PE
Businesses	0 Employee	2 Employee	= 1 PE	0,0 PE
Office buildings	50 Employee	3 Employee	= 1 PE	16,7 PE
	0 Employee	1 Employee	= 1 PE	0,0 PE
			Overall	117 PE

	BOD_5	COD	SS	NH_4N	Ntot	P	Coliforms
Outlet	**< 40 mg/l**	**< 150 mg/l**					

Population equivalent			117	PE
Wastewater	at Q_{PE}	150 l/(PE*d)	17,6	m^3/d
Infiltration water		0 %	0,0	m^3/d
Total daily inflow	Q_d		17,6	m^3/d
Daily peak factor			10	h/d
Hourly volume of wastewater			1,8	m^3/h
Waste load BOD_5	B_d	60 g/(PE x d)	7,02	kg/d
Waste load BOD_5 After primary treatment Cleaning cycles per day	B_d	40 g/(PE x d)	4,68 4	kg/d

1. Stage: sludge storage, pre-treatment and buffer

Type of container			
Number of containers / proportion of chambers		Rectangular	
Width		200%	
Length		1,60	m
Water depth		3,00	m
Partition height		2,50	m
Total area		2,60	m
Existing volume		9,60	m^2
Sludge storage (SS)		24,00	m^3
Specific sludge storage volume			
Removal interval		250	l/(PE*a)
Required volume		6,0	months
Required water depth		14,63	m^3
Retention period	117 PE x 250 l/(PE*a) x 6 / 12 months =	1,52	m
Primary treatment (PT) Required		2,01	h
volume	(24 m^3 - 14,63 m^3 - 5,86 m^3) / 1,8 m^3/h =		
Required water depth		2,81	m^3
Overall (SS + PT) Required		0,29	m
water depth			
Selected water depth		1,81	m
Buffer (B)		1,89	m
Percentage of daily load			
Required volume		33%	
Required water depth		5,85	m^3
Selected water depth	33% x 17,55 m^3/d =	0,61	m
Selected volume		0,61	m
Overall (SS + PT + B) Required		5,86	m^3
volume	33% Total daily inflow =		
Existing total volume		23,28	m^3
Required water depth	14,6 m^3 + 2,8 m^3 + 5,9 m^3 =	24,00	m^3
	15,3 m^3 + 2,8 m^3 + 5,9 m^3 =	2,43	m

2. Stage: biological treatment (SBR)

Type of container			Rectangular	
Number of containers / proportion of chambers			100%	
Width			3,40	m
Length			2,80	m
Water depth		Wd max =	2,50	m
Total area			9,52	m³
Required volume		4,68 kg/d / 0,2 kg/(d*m³) =	23,40	m³
Required water depth			2,45	m
BOD Volume load Br		4,68 kg/d / 23,8 m³ =	0,20	kg / (m³ x d)
BOD Sludge loading B	$_{TS}$	≤	0,05	kg/(kg x d)
Sludge index	ISV		100,00	ml/g
Total solids	TS_{BB}	≤	4,00	kg/m³
Oxygen concentration	C_O	≥	2,00	mg/l
Selected water depth Before loading phase		Wd max - 33% x 17,55 m³/d =	1,88	m
Water depth After loading phase		Wd min + 25% x 17,55 m³/d =	2,34	m
Existing total volume			23,80	m³

9.31 Appendix E1 - Resumes

Ezekiel E. Hall, MSc, IAH

Consulting Hydrogeologist – Environmentalist
#6 Flame Tree Circle
Long Bay Hills, Providenciales
Turks and Caicos Islands, B.W.I.
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Email: hallenvironment1@gmail.com

Summary

Ezekiel Hall is a practicing environmentalist with over 25 years experience working in Small Oceanic Islands environments in the Bahamas and Turks and Caicos Islands. Mr. Hall's experience includes consultative services for private utility companies, government agencies, property owners and tourism developers who wish to design, construct and manage operation facilities with a focus on protection of natural resources and compliance with applicable Ordinances, Regulations and environmental best practices.

Education

1991 – 1992: Mr. Hall attended the University of Birmingham, UK and obtained a Master of Science Degree in Hydrogeology, specializing in the Hydrogeology of Small Oceanic Islands.

1981 – 1985: Mr. Hall attended St. Lawrence University, Canton, New York, USA and obtained a Bachelor of Science Degree in Geology.

Employment

December 2012 – Present: Operations Manager, Grand Bahama Utility Company[GBPA]

Mr. Hall holds management responsibility for the daily operations of the Water Company including the direct supervision of 21 members of staff, seven water plants and one sewerage plant.

April 2012 – August 2012: Deputy Permanent Secretary, Ministry of Border Control & Labour [Turks and Caicos Islands Government]

Mr. Hall held a leadership role and was responsible for establishing Policy, Guidelines and Procedures for Immigration and Labour enforcement. Mr. Hall had daily responsibility for a staff compliment of 68 Immigration Officers including Senior Officers & Line Staff. A list of responsibilities included work task planning, tracking work progress, performance evaluations, customer service management, budget preparation, public awareness program and report writing.

July 1997 – Present: Hydrogeologist-Environmentalist, EnvironmentALL TCI.

Mr. Hall is the Principal of EnvironmentALL Ltd and provides Environmental and Geotechnical Consulting Services throughout the Bahamas and Turks and Caicos Islands. The scope of services includes Environmental Impact Assessments, Geotechnical Evaluations, Drilling and Well Design, Pump Tests & Injection Well Tests, Groundwater Resources Evaluation, Water & Wastewater Quality Monitoring and Testing, Evaluation of Water & Sewerage Plant Operations, Wellfield Design, Wellfield Construction, Wellfield Management, Sewerage Disposal Well Design/Construction/Management, Stormwater Disposal Well Design/Construction/Management, Terrestrial Assessment, Marine Assessments, Socio-economic & Cultural Assessments, Hydrogeological Assessments, Hydrographic & Bathymetric Surveys, Coastal Processes Evaluation and Building Permit Processing.

1986 - 1997: Assistant Hydrologist, Bahamas Water & Sewerage Corporation, Nassau, New Providence, Bahamas.

Mr. Hall applied his hydrogeological experience and knowledge of the natural environment in support of various freshwater resources evaluations, wellfield designs, Sewerage and Stormwater deep disposal well designs and evaluations, pump tests and water & wastewater quality testing throughout all inhabited islands of the Bahamas.

CERTIFICATIONS & PROFESSIONAL MEMBERSHIP

PADI Certified SCUBA Diver: Dive Master.

Member of the International Association of Hydrogeologists.

NASTeC Certified Major Appliance Repair Technician [B981174]

GCAP Graduate Technician Certified Appliance Technician [Reg #: TC21727]

PUBLICATION(S)

"Saltwater Intrusion in the Bahamas: A case study of the Grand Lucayan Waterway, Grand Bahama, The Commonwealth of the Bahamas." *Proceedings of the AWRA Conference (1989), Puerto Rico.*

"An appraisal of the Application of Surface and Borehole Geophysical Techniques to Groundwater assessment in Wellfields in The Bahamas." *Proceedings of the WMO/IDB Conference (1995), Costa Rica.*

PROJECTS AND STUDIES

1. Water Quality Monitoring: Providenciales Hospital Project, TCI, 2009.
2. Environmental Impact Assessment: The Shore Club, Providenciales, TCI, 2008-09
3. Environmental Impact Assessment: East Bay Resort and Marina, South Caicos, TCI, 2008-09
4. Environmental Impact Assessment: Terrestrial and Hydrogeological Input into EIA for CMK Developments at South Caicos Islands, TCI 2008 to present.
5. Hydrogeological Assessment: Input into the Environmental Impact Assessment for PPC Limited Bulk Fuel Storage Facility, Providenciales, TCI 2008
6. Seawater Quality Monitoring: Carnival Cruise Lines (Grand Turks Cruise Port), Grand Turks Island, TCI 2008-2009.
7. Environmental Impact Assessment: Leeward Lake; Providenciales, TCI, 2008
8. Environmental Impact Assessment: Leeside Canals; Providernciales, TCI 2008
9. Seawater Quality Monitoring: Carnival Cruise Lines (Grand Turks Cruise Port), Grand Turks Island, TCI 2007-2008.
10. Seawater Quality Monitoring: Carnival Cruise Lines (Grand Turks Cruise Port), Grand Turks Island, TCI 2006-2007.
11. Feedwater and Disposal Wells design and construction: Beaches Resort – Italian Village, Providenciales, Turks and Caicos Islands, 2008
12. Environmental Impact Assessment: Bone Fish Point, Providenciales, TCI, 2007

13. Hyrogeological, Terrestrial and Marine Assessments: CMK Tourism Developments, South Caicos Island, Turks and Caicos Islands 2007 – ongoing.
14. Environmental Impact Assessment Update: Ritz-Carlton Hotel, West Caicos Island, TCI, 2006
15. Seawater Quality Monitoring: Carnival Cruise Lines (Grand Turks Cruise Port), Grand Turks Island, TCI 2005-2006.
16. Seawater Quality Monitoring: Leeward Marina (Johnston International Ltd.), Providenciales Island, TCI 2006.
17. Hydrogeological Assessment: EIA for the Albany House Marina [Park Ridge Securities Group], Nassau, Bahamas, 2005
18. Solid Waste Management Project: Project Coordination and Management; Hydrogeological and Legal Assessments, Turks and Caicos Islands Government, Turks and Caicos Islands, 2005.
19. Environment Impact Assessment: Royal Reef Resort, North Caicos Island, TCI, 2005.
20. Marine Assessment (Seagrass Removal for Blue Resort), Blue Hills, TCI, 2005
21. Hydrogeological Evaluation: Mare Bello Tourism Development, East Bay, TCI, 2004.
22. Environmental Impact Assessment: The Tuscany, Providenciales, TCI, 2004
23. Groundwater Resources Evaluation: New Providence Development Co., Nassau, Bahamas, 2004.
24. Environmental Impact Assessment: Ritz-Carlton Hotel, West Caicos, TCI, 2004.
25. Hydrographic Survey: Grand Turk Cruise Ship Facility, Grand Turk, TCI 2004.
26. Bathymetric Survey: Grand Turk Cargo Pier, Grand Turk, TCI, 2004.
27. Environmental Consultant: St James Development, Providenciales, 2003
28. Environmental Consultant [EIA]: Leeward Marina/Condo Development, Providenciales, TCI 2003 – ongoing.
29. Hydrogeological Assessment: Inland Marina Basin for Periclles Maillis' property, Adelaide, New Providence, Bahamas.
30. Environmental Consultant [EIA]: Beach Oasis Development, Providenciales, TCI 2002
31. Environmental Consultant [EIA]: Grand Turk Cruise Port, Grand Turk, TCI, 2002.
32. Environmental Consultant: Sand Mining and Dredging, Sand Pit, Providenciales, TCI 2002.
33. Environmental Consultant: Bahamas Electricity Corporation Cooling Water Wells Project, New Providence, Bahamas, 2002.
34. Consultant for EIA: West Caicos Island-wide Development, West Caicos, TCI, 2001- present.
35. Consultant for EIA: West Caicos Marina, West Caicos, TCI 2000-'01.

36. Consultant for EIA: Hawksbill Marine Basin, Providenciales, TCI, 2001.
37. Consultant for EIA: Somerset Hotel Development, Providenciales, TCI, 2001
38. Consultant for EIA: Leeward Canal Extension, Providenciales, TCI, 2000.
39. Consultant for EIA: Babaloo Beach Resort, Providenciales, TCI, 1999.
40. Consultant for EIA: Cooper Jack Marina, Providenciales, TCI, 1999.
41. Consultant for EIA: Grand View Condominium, Providenciales, TCI, 1999
42. Consultant for EIA: Discovery Beach Club, Providenciales, TCI, 1999
43. Consultant for EIA: Ocean Club West, Providenciales, TCI, 1999.
44. Consultant for EIA: Newport Harbour & Bulk Fuel Storage Facility, Providenciales, TCI, 1998.
45. Implementation of National Parks System: Coastal Resources Management Project/ Chief Park Warden, Providenciales, TCI, 1998-'99.
46. Rehabilitation of Deep Cooling Wells for Power Generation Plant: Bahamas Electricity Corporation, New Providence, Bahamas, 1997.
47. Design, construction and evaluation of feedwater wells for R.O. plant: Half Moon Cay, Bahamas, 1997.
48. Groundwater Resources Exploration for Bahamas Water & Sewerage Corporation: Andros Island Potable Water Supply, 1986-97Groundwater
49. Resources Exploration for Bahamas Water & Sewerage Corporation: Mayaguana Potable Water Supply, Mayaguana, Bahamas, 1997.
50. Groundwater Resources Exploration for Bahamas Water & Sewerage Corporation: Inagua Potable Water Supply, Inagua, Bahamas, 1996.
51. Groundwater Resources Exploration for Bahamas Water & Sewerage Corporation: Abaco Potable Water Supply Expansion, Abaco Bahamas, 1995.
52. Groundwater Resources Exploration for Bahamas Water & Sewerage Corporation: Exuma Potable Water Supply, Exuma, Bahamas,1986-'95
53. Groundwater Resources Exploration for Bahamas Water & Sewerage Corporation: Rehabilitation of Old Southwest Wellfield, New Providence, Bahamas, 1993.
54. Groundwater Resources Exploration for Bahamas Water & Sewerage Corporation: Long Island Potable Water Supply, Long Island, Bahamas, 1986 - '97.
55. Groundwater Resources Exploration for Bahamas Water & Sewerage Corporation: Rehabilitation of Windsor Wellfield, New Providence, Bahamas, 1993 - '97.
56. Groundwater Resources Exploration for Bahamas Water & Sewerage Corporation: Rehabilitation of Government Wellfields, Grand Bahama, Bahamas, 1986-'97.
57. Groundwater Resources Exploration for Bahamas Water & Sewerage

Corporation: Eleuthera Potable Water Supply, Eleuthera, Bahamas, 1986 - '97.

58. Groundwater Resources Exploration for Bahamas Water & Sewerage Corporation: Ragged Island Potable Water Supply, Ragged Island, Bahamas, 1986 - '97.
59. Groundwater Resources Exploration for Bahamas Water & Sewerage Corporation: Black Point, Exuma Potable Water Supply, Exuma, Bahamas, 1986 - '97.
60. Groundwater Resources Exploration for Bahamas Water & Sewerage Corporation: Bimini Water Supply, Bimini, Bahamas, 1986 - '97.
61. Rehabilitation and expansion of the Bogue Wellfield, North Eleuthera for Bahamas Water and Sewerage Corporation: Eleuthera, Bahamas, 1989.
62. Evaluation of New Providence Sewerage Treatment facility, Bahamas Water & Sewerage Corporation !995- 1997
63. Rehabilitation of Deep Sewerage Disposal Well: Pinewood Gardens, Nassau, Bahamas, 1987-'96.
64. Rehabilitation of Deep Sewerage Disposal Well: Flamingo Gardens, Nassau, Bahamas, 1993-'96.
65. Design, Construction and Evaluation of Deep Sewerage Disposal Wells: Yellow Elder Gardens, Nassau, Bahamas, 1990-'92.
66. Design, Construction and Evaluation of Deep Sewerage Disposal Well: Malcolm's Park, Nassau, Bahamas, 1990-'91.
67. Saltwater Encroachment: Grand Lucayan Waterway, Grand Bahama, Bahamas, 1987-'91.
68. Fuel Spill Assessment and Recovery: Bahamas Electricity Corporation, Nassau, Bahamas, 1987-'95.
69. Fuel Spill Assessment: Burma Oil, East End, Grand Bahama, Bahamas/ Water & Sewerage Corporation 1989.
70. Fuel Sill Assessment: Carmichael Road/BEC, Nassau, Bahamas/ Water & Sewerage Corporation, 1995.
71. Fuel Spill Assessment & Recovery: Nassau International Airport, 1988, Water & Sewerage Corporation.
72. Hydrogeological Maps of The Bahamas for inclusion the Hydrogeological Atlas of the Caribbean; UNESCO, 1986-'87.
73. Electro Magnetic Ground Conductivity Profiling: Bahamas Water & Sewerage Corporation / Groundwater Exploration Exercises. All inhabited islands of the Bahamas, 1988-'1997.

JANEEN MARLO BULLARD

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25 Turnquest Alley
Nassau, Bahamas

With over 15 years of experience in the scientific and environmental field I can bring forth a plethora of skill sets that arrange from multi-tasking, planning and coordination, management of personnel and time as well as confidential handling of sensitive information and resources. I am dedicated and hardworking, with a passion for excellence. I possess skills in project management, educational & public outreach and research & development.

EDUCATION

MS Tuskegee University, Biology (Concentration in Plant and soil Science) 2004
Thesis: The Effects of Superoptimal CO2 on the Growth, Yield, Gas Exchange, Stomatal Conductance and Starch of Sweet Potato and Peanut.

BS Tuskegee University, Marine Biology 1999

EXPERIENCE

Environmental Specialist (2011 – Present) Principal of JSS Consulting Ltd (On The Bahamas Department of Planning and Protection approved Environmental Consultant List 2019 - present)

Projects

- Disney Lighthouse Point Cruise Port Development, Eleuthera, Bahamas Environmental Management (EM)
- Adelaide Creek Development Project; Nassau, The Bahamas Environmental Impact Assessment (EIA) and Marine Assessment
- Exuma International Airport Infrastructure Project, Exuma, The Bahamas Environmental & Social Baseline Assessment (ESBA) and Environmental & Social Management Plan (ESMP)
- North Eleuthera International Airport Infrastructure Project ESBA & ESMP
- Community Based Conch Management in the Family Islands, Conch Farm Feasibility Study and Environmental Baseline Assessment (EBA)
- Rose Island Development; Rose Island, The Bahamas Marine Assessment for EIA
- Paradise Island, Royal Caribbean, The Bahamas, Marine Assessment for EIA
- Coco Cay Island Development, Coco Cay, The Bahamas Environmental Management (EM), Botanical, Marine and Avian Assessment EIA, EBA), Environmental Management Services (EMS) and EMP
- Ocean Cay, Bimini, The Bahamas; EMS, Coral Relocation Monitoring, Public Outreach, Rapid Ecological Assessment (REA)
- Big Pond National Park Development, EMP & EMS

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- The Harbor View Marina Project, Nassau, The Bahamas EBA, EMP
- The Staniard Creek Bridge and Causeway Replacement Central Andros, The Bahamas, EMP
- Briland Residence and Marina, Harbour Island, The Bahamas, and Marine Assessment for EIA
- South Andros and Cat Island Water Improvement Project, EMP, EMS
- Barbuda Airport, Antigua and Barbuda, Herpetological Assessments for EIA
- North Windermere Island, Eleuthera, The Bahamas; Marine Assessment for EIA
- The Pointe Marina Development: Nassau, The Bahamas; EMP, EMS
- The Big Pond Park Development Project, New Providence, The Bahamas EMS
- Orchid Bay; Abaco, The Bahamas; Marine Assessment for EIA
- Airport Gateway Project, New Providence, The Bahamas; EMS
- White Bay Cay, Exuma Cays, The Bahamas; Marine Assessment
- Stocking Island, Exuma Cays, The Bahamas; Botanical, Avian and Marine Assessment for EIA
- February Point, Exuma, The Bahamas; Avian and Marine Assessments for EIA
- Deep Water Cay, Grand Bahama, The Bahamas; Wetland Assessment
- Matt Lowe Cay, Abaco Cays, The Bahamas; Avian Assessment for EIA
- Governor's Harbour Amy Base, Eleuthera, The Bahamas; Avian for EIA
- Abaco Forestry, Abaco, The Bahamas; Botanical Assessment for EIA
- The Pointe, New Providence, The Bahamas; Marine Assessment for EIA
- Norman's Cay, Exuma Cays, The Bahamas; Botanical and Avian Assessment for EIA
- Ocean Cay, Bimini, The Bahamas, Avian Assessment for EIA & EMS
- LNG Pipeline, New Providence, The Bahamas; Marine Assessment for EIA
- White Bay Cay, Exuma, The Bahamas; Marine Assessment for EIA
- Old Fort Bay Town Center, New Providence, The Bahamas; Avian Assessment, EIA and EMP
- Bimini Bay, Bimini, The Bahamas, Marine Assessment for EIA
- Hurricane Hole Marina, Paradise Island, The Bahamas; Marine and Stakeholder Assessment, EBA, oral relocation and monitoring & EMS
- Sandals, Exuma, The Bahamas, Avian Assessment for EIA
- Finley Cay, New Providence, The Bahamas; Marine Assessment EIA
- Elbow Cay, Abaco, The Bahamas, Marine Assessment for EIA
- Hermitage, Exuma, The Bahamas; Botanical and Avian Assessment for EIA
- Governor's Harbour Army Base, Eleuthera, The Bahamas; Avian Assessment for EIA
- Bahamar Back of House, New Providence, The Bahamas; Botanical Assessment and Protected Trees Survey
- Witches Point, Abaco, The Bahamas, Marine Assessment for EIA
- Buttonwood Reserve, Eleuthera, The Bahamas, Botanical assessment for EIA
- Master Harbor, Exuma, The Bahamas, Botanical Assessment for EIA
- Hog Cay, Exuma, The Bahamas; Botanical and Avian Assessment for EIA
- Exuma Highway, Exuma, The Bahamas; Botanical Assessment for Highway Feasibility Study
- University of the Bahamas, New Providence, The Bahamas, Avian Assessment for EIA and EIA
- Caribbean Global Timber, Abaco and Andros, The Bahamas, EIA

Janeen Bullard - 2

Project Coordinator

- Cane Toad Eradication, Lyford Cay, Nassau, The Bahamas
- Cane Toad Eradication, Marsh Harbour, Abaco, The Bahamas

Parks Planner and Community Liaison Officer (2006-2011) Bahamas National Trust,Nassau, Bahamas Duties

- Develop proposals to government for the establishment of new National Parks.
- Grant writing
- Develop General Management Plans for existing National Parks.
- Work with surrounding communities to gain support for the importance of establishing new National Parks.
- Project Management for the establishment of the Leon Levy Native Plant Preserve, Eleuthera, The Bahamas.
- Manage all daily details and education of staff for educational programs.
- Organize all special events for the Education Department.
- Liaise with corporate sponsors to further fund educational programs.
- Develop marine education lesson plans and activities (on and off site) for grade levels K-12 and college students.
- Attendance and professional presentations at events both locally and abroad.
- Development of the National High School Marine Science Curriculum.

Research Assistant (2001-2004) Tuskegee University, Tuskegee, AL

- Developed and maintained research projects in conjunction with Tuskegee University and NASA.
- Aided in the daily maintenance and running of a greenhouse.
- Organized and taught Environmental and General Biology courses.

Marine Mammal Trainer (1999-2001) Dolphin Encounters, Blue Lagoon, Bahamas

- Trained Atlantic Bottlenose Dolphins in educational and interactive programs.
- Assisted in developing marine conservation and educational programs.

AUTHOR

Conch Farming Feasibility Study (present)

The Bahamas Sixth National Report on Biological Biodiversity to The Convention on Biological Diversity (2019)

Co-Author of the "Andros Sustainable Development Masterplan" (2014)

Author of the "Critical Situation Analysis of Invasive Alien Species for The Bahamas" (2013)

PRESENTATIONS AND INVITED LECTURES

Policies, Strategies and Best Practices for Managing Invasive Alien Species (IAS) in the Insular Caribbean March 31st – April 4th, 2014, Trinidad. Port of Spain, Trinidad & Tobago. The Cane Toad Invasion: Its Origin, Status and The Bahamas' Response to prevent spread.

Janeen Bullard - 3

Policies, Strategies and Best Practices for Managing Invasive Alien Species (IAS) in the Insular Caribbean March 31st – April 4th, 2014, Trinidad. Port of Spain, Trinidad & Tobago. Developing a National IAS Strategy focused on IAS prevention – a case study of the Bahamas' 2003 -2013 experience.

Bahamas Natural History Conference 2016 The Cane Toad Invasion: Its Origin, Status and The Bahamas' Response to prevent spread

Bahamas Natural History Conference 2018 Citizen Science and Community Involvement can help! Invasive Cane Toads (*Rhinella marina*) control in The Bahamas continues.

PROFESSIONAL TRAINING

2019 IDB Principles of the Review of Environmental Impact Assessments

2019 The Perry Institute of Marine Science, AGRRA Benthic Survey Techniques

2018 Georgia Tech Professional Education Center – OSAHA Approved Trainer

2017 Conservation Training Introduction to Resilience for Development

2017 Inter-American Development Bank Project Management Techniques for Development Professionals

2015 IICA, Efficient use of Rainwater and Runoff in Agricultural Activities, Chitre, Panama

2015 IICA, Agro-Eco Tourism Training Workshop

2014 Commercial Training Center of Department of Commerce, Hainan Province, China Climate Change on Tropical Island and Economic Development for Developing Countries

2013 The Nature Conservancy, Coral Reef Restoration

2013 The Nature Conservancy, AGRRA Coral Surveys

2010 The Bahamas National Trust, Business Writing

2010 The Bahamas National Trust, Public Presentation

2009 The Nature Conservancy, Invasive Species Management

2009 College of The Bahamas, Mangrove Forest Ecology, Management and Restoration

2008 International Fund for Animal Welfare, Certificate of Completion for Whale Watch Guide Training

2006 National Association of Interpretation, Certified Interpretive Guide 2006 Tuskegee University, 1st Place Graduate Oral Presentation Sigma Xi 2005 Tuskegee University, Certificate of Effective Leadership

Janeen Bullard - 4

1995 Auburn University, NAUI Scuba Certified

Professional Affiliations

SEEDS-Ecological Society of America

Sigma Xi Scientific Research Society

Beta Kappa Chi Honor Society

National Association for Interpretation

National Marine Educators Association Name of Organization

References

Available upon request

SWIL CVs

Philip S. Warner

Name of firm	Smith Warner International
Project position	Coastal Engineer
Name of person	Philip Warner
Email	philip@smithwarner.com
Profession	Coastal Engineer
Years of professional experience & career summary	Philip is a senior civil engineer with wide experience in coastal engineering design and oceanographic studies. He has design, inspection, and appraisal experience for coastal protection, marine structures and oceanographic studies, in addition to the development and operation of numerous civil, structural, coastal and hydraulic engineering computer programs. He also has field experience in marine structures construction supervision and inspection, hydrographic surveys and the deployment of oceanographic field equipment. His experience includes work done throughout the Caribbean region and internationally.
Date of birth	03 July, 1964
Nationality	Canadian/Jamaican
Education (state from highest achieved and include year of award)	M.Sc. Research thesis in Coastal Engineering, Queen's University at Kingston, Ontario, 1993, Thesis Topic: Measurement and Prediction of Flow Characteristics within the Swash Zone. B.Sc.(Hons) Civil Engineering, First Class Honours, Queen's University at Kingston, Ontario, 1986.
Professional licenses/key qualifications	Professional Engineers Registration Board

Membership in professional societies	Member Jamaica Institution of Engineers, Member of Professional Engineers of Ontario.				
Skills (including software and engineering codes)	MIKE 21 SW by DHI	MIKE 21 HD by DHI	MIKE 21 ST by DHI	MIKE 21 MT by DHI	MIKE 21 SM by DHI
	MIKE 3 HD by DHI				
Period of employment	1995 to Present				
Company name	Smith Warner International				
Location	Kingston, Jamaica				
Position(s)	Executive Director, Coastal Engineer				
Project description & location	Name of assignment: Regional Disaster Vulnerability Reduction Project: Georgetown Sea Defense Coastal Zone Investigations and Feasibility Studies Year: 2013-2016 Location: St Vincent Client: Government of St Vincent and the Grenadines Main Project Features: The shoreline near Georgetown has suffered significant erosion due to recent hurricanes, and severe winter swells and damaging storms exacerbate the problem. The Government of St. Vincent wishes to stabilize the area to mitigate further loss of coastal lands and protect and prepare the area for Commercial zone construction investments. Positions held: Coastal Engineer Activities Performed: Data collection (waves, currents, tides, bathymetry, topography and historical shoreline positions), wave, sediment, and hydrodynamic modeling; identify and evaluate shoreline protection options, erosion				

	control and beach accretion interventions; model and evaluate the performance of the proposed engineering interventions and identify and propose alternatives based on modeled findings and engineering experience; EIA; training of local government engineers in coastal zone analysis and exposure to the technologies and techniques involved; training workshops in coastal zone analysis and data collection, coastal zone modeling, and engineering design and feasibility analysis using modeling tools. Name of assignment or project: Grand Cayman Cruise Berth EIA Year: 2014-2015 Location: Grand Cayman Procuring Entity: Port Authority, Government of Cayman Islands Main project features: Full environmental impact assessment of a proposed cruise ship berth. Data collection, detailed assessment of impacts, including coastal, environmental, and socio-economic as well as extensive stakeholder consultation and presentation of findings to community. Positions held: Coastal Engineer, numerical modeling expert Activities performed: Coordinated data collection including several current/wave recorders, seabed probes, bathymetric and topographic surveys. Detailed analysis of shoreline change trends and positions along Seven Mile Beach using GPS-mapped data. Analysis and validation of various numerical models for waves, currents, sediment and dredging and disposal activities to determine and quantify impacts. Name of assignment or project: North Shore Integrated

	Coastal and Watershed Stabilization Project Year: 2015-2016 Location: British Virgin Islands Procuring Entity: Organization of Eastern Caribbean States Main project features: Data collection, coastal and hydrologic modeling of watersheds leading to engineering designs of shoreline protection structures and water quality improvements. Tendering, evaluation, and construction supervision currently underway. Positions held: Coastal Engineer, numerical modeling expert Activities performed: Analysis of results from wave, hydrodynamic and morphological modeling, which was done to investigate the existing and proposed shoreline. The model results helped in determining the critical spots where protection would be required. Technology transfer to government staff through data collection and modeling procedures. Engineering designs, costs, quantities, and drawings were prepared and presented to stakeholders. Name of assignment: Tsunami and Storm Surge Modeling and Mapping – British Virgin Islands Year: 2011 Location: BVI Client: UNDP R3I Administered Project for European Commission Main Project Features: As part of a wide-reaching Regional Risk Reduction Initiative SWIL and Deltares undertook the storm surge and tsunami modeling of the four main island of BVI. In conjunction with stakeholders an approach and methodology were developed and executed. Data collection activities were required,

	procured, commissioned, evaluated and approved. Results were prepared in GIS compatible formats for on-going use by the Office of Disaster Preparednesss. Positions held: Storm Surge Modeling Expert Activities Performed: Project management, oceanographic and bathymetric data review; preparation of data collection program, including procurement of LiDAR, single and multi-beam bathymetric surveys and GPS-derived topography; numerical model selection, set-up, validation, interpretation and reporting for storm surge components. Name of assignment or project: Studies for the Preparation of the Barbados Coastal Risk Assessment and Management Program Year: 2011 Location: Barbados Procuring Entity: IADB (beneficiary CZMU- Barbados) Main project features: Barbados CZMU was provided with Technical Assistance to prepare for the multi-year CRAMP. Evaluations were completed of institutions, procedures, tools and personnel to determine capabilities and needs. Assessments were done of several investment phase engineering projects. Detailed TOR's written for CRAMP components including Baseline (Coastal Zone LiDAR, Nearshore Waves, Circulation and Water Quality, Sediment Transport Geotechnical Surveys and Shoreline Change) Studies; Integrated Coastal Risk Information Platform. Procurement plans and input for IADB loan documents were also prepared. Positions held: Coastal Engineer Activities performed: Analysis, evaluation and prioritization of engineering designs for Infrastructure Program. Review of data collection monitoring and

	modeling activities; assess and prioritize needs for Baseline Surveys, updated Risk Monitoring Programs, Information Management systems and modeling capabilities. Prepare detailed TOR, budgets and schedules for baseline studies, information management system, and waterfront improvements (including eco-system based approaches).
Five main duties/ responsibilities	(1) Coastal engineering design, (2) computer modeling of waves, currents, and sediments, (3) oceanographic and nearshore data collection and survey procurement, (4) shoreline change monitoring and analysis, (5) report preparation and project management.

Philip will investigate baseline coastal processes and dynamics including currents, tides, Sediment transport and erosion/accretion. Using available information, a numerical model of the project site and environs will be developed in order to understand the existing tides, currents, wave patterns, and sediment movement. This information will be developed for a range of environmental conditions including baseline day-to-day averages as well as extreme storm/hurricane conditions.

Renée McDonald

1	Name of firm	Smith Warner International Limited
2	Project position	Marine Ecologist
3	Name of person	Renée McDonald
7	Email	renee@smithwarner.com
8	Profession	Environmental Specialist & Geologist
9	Years of professional experience & career summary (max 300 words)	5 Years experience in Earth and Marine Sciences. Career began at the Petroleum Corporation of Jamaica in the Special Projects/Oil & gas department. Continued post- graduate school with environmental consulting firms. Current role as Environmental Specialist and Geologist at SWI
10	Date of birth	11/11/1989
11	Nationality	Jamaican

12	Education (state from highest achieved and include year of award)	MSc Marine Environment and Resources (2013) BSc Geology (2010)
13	Professional licenses/key qualifications	Post-graduate diploma in Environmental Management (2016) Certificate in Principles of Project Management (2014) PADI Open Water Diver certification (2014)
14	Membership in professional societies	Geological Society of Jamaica, AAPG, SEG, Jamaica Institute of Environmental Professionals
15	Training (software, FIDIC, etc.)	International Seabed Authority At-Sea training programme (2015)
16	Seminars attended	Caribbean Coastal Conference 2016, Barbados SEG Annual Conference 2013, Houston TX, USA (presenter)
17	Skills (including software and engineering codes)	• Wordpress website development • ArcGIS
18A	Period of employment	2016-present
18B	Company name	Smith Warner International Limited
18C	Location	Kingston, Jamaica
18D	Position(s)	Environmental Specialist and Geologist
18E	Project description & location	Name of Assignment: Royalton Resorts Beach Development (Jamaica, St. Lucia) Year: 2016-2018 Location: Jamaica, St. Lucia Client: Royalton Resorts Main project features: Beach creation and enhancement along rocky and eroding coastal areas Position held: Marine Environmental Specialist Activities Performed: Marine Benthic surveys prior to construction activities. Marine benthic surveys post-construction. Relocation of sensitive organisms (coral &

		seagrass) from construction impact areas. Monitoring of relocated organisms. Supervision of electrification of artificial reef (Biorock) structures and installation of fish havens. Name of Assignment: Falmouth Cruise Ship Pier Dredging Year:2017 Location: Falmouth, Jamaica Client: Port Authority of Jamaica (PAJ) Main Project Features: SWI was contracted by the Port Authority of Jamaica (PAJ) to perform an impact analysis on the widening of the berth pocket and a section of the entrance channel of the Falmouth Cruise Ship East Berth. Of concern were the impacts on the surrounding benthos and the marine and coastal processes in the area. Position held: Marine Environmental Specialist Activities Performed: Survey of the proposed dredge site. Development of relocation plan for coral and other sensitive organisms. Name of Assignment: Magdalena Grand Beach & Golf Resort Year:2017 Location: Tobago Client: Evolving TecKnologies and Enterprise Development Company Ltd. (eTeck) Main Project Features: Project is intended to develop a comprehensive understanding of the coastal processes leading to the erosion of the Magdalena beachfront, as well as the best mechanism for curbing the erosion. Position held: Marine Environmental Specialist Activities Performed: Conducted benthic survey. Assisted with bathymetric survey.

		Name of Assignment: Paradise Found Resort Development- Baseline study and preliminary drainage plan. Year: 2016 Location: Barbuda Client: Paradise Found Development Main Project Features: Waterfront development on 400acre coastal property. The project involved preliminary environmental assessment to integrate master planning and existing ponds and wetlands, climate change risk with respect to storm surge and long term coastal erosion, inland flooding and storm water management. Scope required working with development team of master planners, architects, archeologists and sustainability consultants. Position Held : Environmental Specialist/Geologist Activities performed: Benthic surveys, Geophysical survey, Water Quality sampling, Soil sampling. Data analysis & report preparation.
18F	Five main duties/ responsibilities	• Marine benthic surveys; • Ecological surveys within the coastal zone; • Working with associates and subs in areas of environmental assessments and climate resilience; • Participation in integrated coastal environmental engineering within the coastal zone (ridge to reef); • Geophysical surveys and geological interpretation of findings; • Proposal and report preparation and project coordination

CARIBBEAN ENVIRONMENTAL DESIGN ASSOCIATES
OSWALD R. WILLIAMS, BSc. MA. MRTPI
Osborne Road, East Backsalina, Grand Turk, Turks & Caicos Islands, B.W.I
Telephone: (649) 231 0371
Email: Oswaldwilliams51@gmail.com

PROFESSIONAL PROFILE

Oswald R. Williams is an Architect/Planner and was previously Director of Planning, Turks and Caicos Government. Presently he heads his own Architectural and Planning Consultancy, operating under Caribbean Environmental Design Associates. Mr. Williams holds a bachelor's degree in architectural technology and a Master's Degree in Town Planning. He has been involved in many civic organizations and government boards. He has a passion for environmental quality.

A well tested, goal oriented, determined individual who is committed to ongoing professional development and constantly looking for new life challenges and experiences. Excellent interpersonal skills, accompanied by hands on experience at all levels of the planning, architectural and construction management sectors, as well as the business arena. An outstanding team player, efficient independent worker with a sharp eye for details who is committed to meeting organizational objectives and deadlines. Brings to the team an enthusiastic personality, dedication and leadership skills that allow him to confidently communicate at all levels and to get the task accomplished in a timely manner.

OBJECTIVE

Keenly strives to maximize all skills and experiences to serve both public and private sector clients effectively and efficiently in the areas of Architecture, Planning, Environmental Impact Assessment Studies and Property Appraisals.

EDUCATION/QUALIFICATIONS

Masters in Environmental Planning 1987-1989 - University of Nottingham, Nottingham, UK

BSc. Architectural Technology 1980-1983 – New York Institute of Technology, New York, USA – (Which included Construction Technology, Material Take-Off, Cost Estimating and Property Evaluation).

Certificate in Environmental and Sustainable Development 1992 – The Banff Centre for Management, Barbados, BWI.

Certificate in Environmental Assessment and Management 1991 – Centre for Environmental Management and Planning, University of Aberdeen, Scotland. England.

Certificate in Tourism Planning 1979 – Project Planning Center, University of Bradford, England.

Certificate in Regional Tourism Planning 1978 – Caribbean Tourism Research Center, Barbados, BWI

Diploma in Physical Planning 1972-1974 – United Nations Development Programme, Planning Training Center, Castries, St. Lucia, BWI.

EMPLOYMENT HISTORY/PROFFRDDIONAL EXPERIENCES

- **Coordinator National Physical Sustainable Development Plan for the Turks and Caicos Islands**. Coordinate commence the process of preparation of a 10 year (**2009-2019**) development plan for the Turks and Caicos Islands.

- **Deputy Chairman, Physical Planning Board 2003 – 2005 –** A statutory body of the Turks and Caicos Government with sole responsibility for reviewing and approving development applications, Master Development Plans and Environmental Impact Assessment

- **Architect/ Environmental Consultant 1995 – Present.** Operating under Caribbean Environmental Design Associates, a Turks and Caicos based company specializes in Architecture, Environmental Planning and Physical Planning.

- **1989 – 1995, Director of Planning, Turks and Caicos Government**. Responsible for the overall management and direction of Physical Development in the Turks and Caicos Islands, including the formulation of physical development policies. Advise government on development proposals and appropriate conservation policies and measures to ensure sustainable development.
- Supervised and managed a sixteen – men (16) Physical Planning Department, with headquarters in the capital island of Grand Turk and a branch office on Providenciales. Review physical planning applications and carried out periodical building inspection along with the Department's Building Engineer to ensure

compliance with the Physical Planning Ordinance and Regulations, and with the Turks and Caicos Islands Building Code. Carried out financial appraisals of planning applications to ensure that the appropriate application fees were collected.

- **1983 – 1987, Physical Planner, Turks and Caicos Government.** Prior to being appointed to the post of Director of Planning in July of 1989, I held several junior and senior positions within the Department of planning, including:

  1983 - 1985, Secretary Physical Planning Board.
  1984 - 1978, Physical Planning Officer.
  1974 -1976, Physical Planning Technician.

  During these early years a wealth of experience was gained in the wide range of physical planning related areas. This experience has later proven useful during my tenure as Director of Planning.

PROFILE ON CARIBBEAN ENVIRONMENTAL DESIGN ASSOCIATES

Caribbean Environmental Design Associates (**CEDA)** is a consulting firm established in 1995. It offers a wide range of architectural, environmental planning and project appraisal services to the public and private sectors in the Turks and Caicos Islands. The firm is staffed by Oswald R. Williams, the principal employee.

CEDA is owned and operated by a Turks and Caicos Islander. The company engages in work throughout the Turks and Caicos Islands.

PROJECT WORK EXPERIENCE

CEDA has provided architectural design, technical supervision and construction management services on the following recent projects:

Private Sector Projects

- Expansion T & C National Museum, Front Street, Grand Turk
- Two story commercial building, Church Folly, Grand Turk
- Retail stores, car wash and restaurant complex, Lighthouse Road, Grand Turk, under construction.

- Forty-eight (48) room hotel, with central facilities, Cockburn Harbour, South Caicos, under construction.
- Over 50 Dwelling houses – Grand Turk, South Caicos and Providenciales.
- Site Supervision and Management during the construction of Conch World Facility, Materson's Point, Grand Turk.
- Architectural and Construction Management and Supervision Expansion of Conch Farm, Providenciales.
- Special Inspector Leeward Canal Expansion Project - 2015

European Union Micro Projects

- Basketball courts on Grand Turk.
- Basketball court South Caicos
- Basketball Court Providenciales
- Upgrading sports track on North Caicos
- Farmer's assistance Programme North Caicos.

Caribbean Development Bank Basic Needs Trust Fund sub-projects throughout the Turks and Caicos Islands, which included -

- Day Care Center for the Handicapped, Blue Hills, Providenciales.
- Marjorie Basden High School Fencing, South Caicos.
- Repairs and Renovation of Public Library, South Caicos.
- Two-Story Classroom Block Ianthe Pratt Primary School, The Bight, Providenciales.
- Repairs & Renovations Soroptimist Day Care Center, Grand Turk.
- Renovation Disabled Center, South Caicos.
- Five Cays Primary School Fencing, Providenciales.
- Kew Clinic Extension and Renovation, North Caicos.
- Sandy Point Clinic Renovation, North Caicos.
- Multi-Purpose Outdoor Court, Raymond Gardiner High School, Bottle Creek, North Caicos.

- Improvements Christian Academic Primary School, Grand Turk.
- Improvements New Testament Day Care Center, Grand Turk.
- Repairs and renovations Day Care Center, Grand Turk.
- Canteen Building Ona Glinton Primary School, Grand Turk,
- Renovation and Remodeling to Middle Caicos Clinic in Conch Bar, Middle Caicos
- Consultant Early Childhood Center Ona Glinton Primary School, Grand Turk, TCI

- Consultant or contributing consultant on a number of Environmental Impact Assessment studies for tourism related development projects in the Turks and Caicos Islands.

- Commercial and residential property appraisals for lending institutions in the Turks and Caicos.

- Technical inspection reports on commercial and residential projects for lending institutions in the Turks and Caicos Islands.

- Site Supervision and Management during the construction of Conch World Facility, Materson's Point, Grand Turk.

Sub-projects Settlement Upgrade Grand Turk and Salt Cay

During the period 2003 – 2008 performed the role as project officer to Grand Turk Settlement Upgrade Committee, where I designed, prepared contract documents and supervised and managed some three hundred (300) sub-projects throughout settlements in Grand Turk and Salt Cay.

PLANNING AND ENVIRONMENTAL IMPACT ASSESSMENT PROJECT EXPERIENCES

CEDA has been the lead environmental consultant to government and private sector developers on many major projects throughout the Turks and Caicos Islands and ha carried has carried out environmental studies for the following projects:

- Counter Part Physical Planner, National Physical Development Plan, Turks and Caicos Islands, 1985 – 1987.

- Settlement Upgrading Study, Grand Turk, Turks and Caicos Government 1991.

- Settlement Upgrading Study, South Caicos, Turks and Caicos Government 1996.
- Environmental Impact Assessment, Greenwich Beach Development, Grace Bay, Providenciales, 1995.
- Environmental Impact Assessment, Royal Crown Colony Development, Halfway Creek, Middle Caicos, Contributing Consulting Environmental Planner/Coordinator, 1996.
- Environmental Impact Assessment, Crystal Bay Beach Resort, Northwest Point, Providenciales, 1996, Contributing Consultant Environment Planner.
- Environmental Impact Assessment, Point Grace Development, Grace Bay Providenciales, Contributing Consultant, Economic and Social Impact.
- Environmental Impact Assessment, the Sands, Grace Bay, Providenciales, Economic and Social Impact.
- Environmental Impact Assessment, Babula Beach resort and Villas, Cheshire Hall and Richmond Hill, Providenciales, 1999, Contributing Consultant/Coordinator.
- Environmental Impact Assessment, WACO Resort Development, Turtle Cove Marina, Providenciales, 1999, Contributing Consultant/Coordinator.
- Environmental Impact Assessment, Beaches Jetty, Grace Bay, Providenciales, 1999, Contributing Consultant/Coordinator.
- Environmental Impact Assessment, Leeward Temporary Floating Dock, Leeward Marina, Providenciales, 2000, Contributing Consultant/Coordinator.
- Environmental Impact Assessment, Leeward Canal Residential Development, Leeward Development, Providenciales, HallTech 2000, Contributing Consultant, Economic and Social Impact.
- Environmental Impact Assessment, the Somerset on Grace Bay, Grace Bay, Providenciales, 2001, Contributing Consultant/Coordinator.
- Environmental Impact Assessment, Grand View Hotel, Grace Bay, Providenciales, Contributing Consultant, Economic and Social Impact.
- Environmental Impact Assessment, Walkin Marine Dock Project, Leeward Going Through, Providenciales 2001, Contributing Consultant/Coordinator.

- Environmental Impact Assessment, West Caicos Development, HallTech 2001, Contributing Consultant, Economic and Social Impact.
- Environmental impact Assessment, Cruise Ship Dock, Grand Turk, HallTech 2003, Contributing Consultant.
- Environmental Impact Assessment, Cruise Ship Dock Grand Turk, Turks and Caicos Islands, Team Coordinator and Contributing Consultant February 2004.
- Environmental Impact Assessment, Leeward Beach Creation Project, Leeward Marina, Providenciales – April 2005 - Coordinator and Contributing Consultant.
- Environmental Impact Assessment, Leeward Havens Canal Project, Providenciales – December 2005 - Coordinator and Contributing Consultant.
- EIA Turtle Cove Marina Land-Infill/Reclamation Project – 2015
- Consultant/Coordinator – EIA Leeward Going-Through Channel Maintenance Dredging 2015
- Consultant/Coordinator – EIA Ritz Carlton Resort & Residence 2017

NATIONAL PHYSICAL DEVELOPMENT PLANS FOR THE TURKS & CAICOS ISLANDS

Mr. Williams, of CEDA was counterpart planner for the outdated 1987-97 National Physical Development Plans prepared by United National Development Planning for the Turk and Caicos Islands government in 1987. More recently he was coordinator for the Village Habitat Team out of Atlanta that was engaged in the process of preparing the 2010 Revised National Physical Development Plans for the Turks and Caicos Islands prior to the suspension of the constitution and imposition of direct rule by the British Government.

CEDA PROPERTY APPRAISALS AND VALUATIONS

CEDA carried out over 1,000 property appraisals throughout the Turks and Caicos Islands since 1995 for Scotia Bank, First Caribbean International Bank, Turks and Caicos Banking and Turks and Caicos Investment Agency (TCInvest), which includes:

- Residential Domestic
- Land Only Domestic
- Residential/Commercial Development
- Land Only/Commercial Development
- Commercial Office
- Commercial Mixed Use

9.31 Appendix A5 - Reference and Literature Cited

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Oswald R. Williams, 1974, - A *Guide to Tourism Development in the Turks and Caicos* Islands: United Nations Training Programme, Castries, St. Lucia.

Oswald R. Williams, 1995 - Assessment *of the Environmental Impact of Tourism Resort Development, Grace Bay, Providenciales, TCI*

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Turks and Caicos Government 1990, - The *Physical Planning Regulations*

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