



Environmental Impact Assessment Addendum 4M Harbour Island Ltd. Project Revision 2



Submitted to:

The Department of Environmental Planning and Protection
Charlotte House, Charlotte & Shirley Streets,
Nassau, The Bahamas

Submitted by:

Caribbean Coastal Services Limited
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P. O. Box CB-11524
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On Behalf of:

4M Harbour Island 2 Ltd.
Harbour Island, The Bahamas

Originally submitted: 3 December 2020
Revision 2 submitted: 22 February 2021

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1 EXECUTIVE SUMMARY

4M Harbour Island Ltd. (4M) and 4M Harbour Island 2 Ltd. (4M2) own 27 acres on Harbour Island, Bahamas. An Environmental Impact Assessment (EIA) for the 5.6 acres owned by 4M was approved by the Bahamas Environment, Science & Technology (BEST) Commission in 2017 which allowed modification of the former Harbour Island Marina and the development of the land owned by 4M. In March of 2019, 4M2 acquired 21.4 acres, resulting in a combined project area of 27 acres. The Back of House area shown on the site owned by 4M was relocated to 1.65 acres of land owned by 4M2. An Impact Assessment related to the Utility Corridor and Back of House area (BOH Impact Assessment) was submitted in November 2020 and is pending approval by the Department of Environmental Planning and Protection (DEPP).

This document (EIA Addendum) is an addendum to the previously approved EIA and the BOH Impact Assessment, and it discusses, among other things, the environmental and social impacts related to the development of land owned by 4M2 not previously reviewed and approved by DEPP. The scope of this Addendum is restricted to the development and activity on such land area, referred to herein as the Phase 2 Area.

Baseline conditions were assessed on the additional acreage by Caribbean Coastal Services Ltd. (CCS) and other technical consultants and are described in this EIA Addendum. Incorporating appropriate mitigation ensures the development's impacts are sufficiently mitigated throughout the construction and operation phases. For example, the installation of turbidity controls near Dunmore Harbour will help to prevent sedimentation in the harbour during construction. Replacing invasive species with native vegetation near Harbour Island's famous Pink Sands Beach will help maintain the integrity of the dune and improve the aesthetics of the coast.

While some mitigation and environmental management is briefly discussed in this EIA Addendum, the Environmental Management Plan Addendum (EMP Addendum) will describe the mitigation and management plan in detail. The EMP Addendum will be submitted to DEPP for approval, and thereafter used to apply for a Certificate of Environmental Clearance.

The development described in this EIA Addendum is certain to improve the socioeconomic benefits described in the previously approved EIA. The economic activity generated from additional development will create significant opportunities for Bahamian construction companies, employees of those companies, and additional employment and training opportunities during the operational phase of the development (e.g., landscape, housekeeping, food and beverage, building maintenance, swimming pool maintenance, information technology, and related work).

This EIA Addendum was prepared by CCS on behalf of 4M and 4M2 in accordance the standards and regulations established by the DEPP and the international environmental community.

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2 INTRODUCTION & OBJECTIVES

Caribbean Coastal Services Ltd. (CCS) was engaged by 4M Harbour Island Ltd. (4M) and 4M Harbour Island 2 Ltd. (4M2) (collectively, the Developer) to produce an Addendum to the previously approved Environmental Impact Assessment (EIA) and the BOH Impact Assessment and Environmental Management Plan (EMP). The combined project area which is the subject of the EIA, the BOH Impact Assessment, and this EIA Addendum is 27 acres (the Project) and is located south of the settlement Dunmore Town in Harbor Island, Bahamas.

2.1 Background

The initial EIA and EMP discussed environmental and socioeconomic impacts and relevant mitigation activities related to expanding the marina and associated property previously known as Harbour Island Marina, and construction of the upland development on the adjacent 5.6 acres (Phase 1 Area). 4M received the environmental clearance from the Bahamas Environment Sciences & Technology Commission (BEST) on December 11, 2017 to proceed with the expansion of the marina and construction of the land owned by 4M.

In March of 2019, 4M2 acquired 21.4 acres, resulting in a combined project area of 27 acres. [Appendix A](#) shows the permit issued by the Investments Board on March 27, 2019. On May 5, 2019, BEST communicated an addendum would be required to supplement the previously approved EIA and EMP to address the environmental issues and provide information on the potential impacts associated with developing the land acquired by 4M2. An Impact Assessment related to the Utility Corridor and Back of House (BOH Impact Assessment), an area of 1.65 acres, was submitted to the Department of Environmental Planning and Protection (DEPP) in November 2020 and is pending approval.

2.2 Scope of the EIA

This EIA Addendum seeks to present environmental and social impacts of the development and relevant mitigation activities on 19.75 terrestrial acres owned by 4M2, and 4.85 acres of seabed in Dunmore Harbour. This EIA Addendum includes a description of the terrestrial and marine sites and the proposed development. Information presented in this EIA Addendum was compiled after a Reconnaissance Site Visit by a CCS team on January 27 – 29, 2020, a review of the previously approved EIA and EMP produced by Coastal Systems International Inc. in association with Innovative Solutions Group, and surveys by Dr. Ancilleno Davis and Ms. Janeen Bullard. Curriculum Vitae of technical persons involved are included in the Appendices. This assessment of the proposed development site is a preliminary step in the environmental compliance process, in accordance with the standard EIA regulations managed by the Department of Environmental Planning and Protection (DEPP).

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3 GEOGRAPHIC SETTING

3.1 Location

The Bahamas is an archipelago in the North Atlantic Ocean that stretches along a north to south axis. The northern islands are east of Florida, USA and the southern islands are northwest of Hispaniola. The proposed Project is located in Harbour Island, The Bahamas. Harbour Island is 3 ½ miles long by 1 ½ miles wide and is located at 25°29'22.51"N and 76°38'1.86"W. The main settlement on the island is Dunmore Town with a population of 1,762¹. Figure 1 shows a satellite image of Harbour Island relative to other islands in The Bahamas and Eleuthera Island.

Figure 1. Site location relative to other islands in The Bahamas and North Eleuthera. (Google Earth, 2020)



3.2 Site Description

The terrestrial project site referenced in this report is 19.75 acres and is divided by Queen’s Highway. Three (3) acres are located east of Queen’s Highway and sit along the popular Harbour Island Pink Sands Beach. The remainder of the property is located west of Queen’s Highway and abuts Dunmore Harbour. This portion of land extends from Queen’s Highway to the southwest coast of Harbour Island. Figure 2 shows the Project on Harbour Island.

¹ http://www.bahamas.gov.bs/wps/wcm/connect/3fb5e66d-3690-4203-91c3-eaf0f3eb5629/HARBOUR+ISLAND+POPULATION+BY+SETTLEMENT_2010+CENSUS.pdf?MOD=AJPERES

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Figure 2. The Project on Harbour Island, Bahamas (Google Earth, 2020)



This EIA Addendum refers to portions of the acreage owned by 4M2 which is adjacent to the acreage owned by 4M and the Utility Corridor and BOH area owned by 4M2. The table below shows the breakdown of the acreage of the Project.

Table 1. Breakdown of the Project

Description of Site	Size (Acres)
TERRESTRIAL	
Initial EIA and EMP	5.61
Utility Corridor and Back of House Area	1.65
EIA Addendum	19.75
Total	27.01
MARINE	
Seabed Lease #1	11.82
Seabed Lease #2	4.85
Total	16.67

3.3 Areas of Influence

The ecological area of influence includes Harbour Island and North Eleuthera. Harbour Island's terrestrial ecology will be influenced primarily by the land clearing required to construct roads and buildings. Removing invasive species and replacing them with native species will also have a positive ecological impact on the site and the surrounding habitats. For instance, removing invasive species will prevent seeds of the invasive species from spreading beyond the boundary of the Phase 2 Area. Cleaning debris and household waste from the Phase 2 Area will have a positive influence on the nearshore and marine area in Dunmore Harbour by reducing the potential for pollutants to flow into the Harbour during rain events. North Eleuthera may be influenced by the development because the North Eleuthera Dump will experience an increase

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in solid waste, as solid waste from the development will be transported to the North Eleuthera Dump. Dredging is not anticipated in the new seabed lease site. The potential shading of the area from the creation of a floating dock will reduce available sunlight for photosynthesizing species during certain times of the day. Water movement and marine life will not be impacted by the floating dock because the dock will not be attached to the substrate.

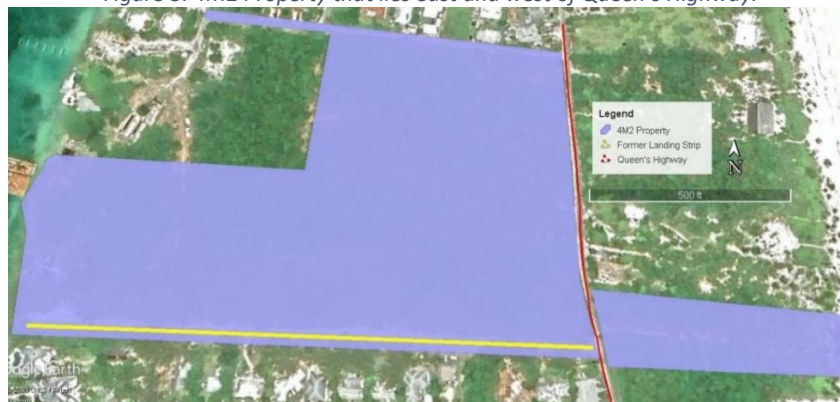
Socioeconomics of the island will be positively impacted by the increase in jobs during construction and operation activities in the Phase 2 Area. Once complete, the development will attract visitors that would likely venture beyond the property boundary in both the marine and terrestrial environment. It is highly likely that guests will visit other establishments on Harbour Island during their stay and a program will be developed for local boat captains to take visitors to experience the aquatic areas surrounding Harbour Island.

4 EXISTING OWNERSHIP AND LAND USE

4.1 Ownership

4M2 was issued the permit to hold property in Harbour Island, Bahamas for the development as a mixed use resort as shown in Appendix A on March 27, 2019. The property includes five (5) parcels of land approximately ½ mile south of Dunmore Town near Mastic Point. The sum of all parcels under 4M2 is 21.4 acres. Two parcels are east of Queen’s Highway and face the eastern coastline of the island. The sum of these two parcels is three (3) acres according to the Survey & Contour Plan shown in Appendix B. The remaining three (3) parcels are located west of Queen’s Highway, the sum of which is 18.4 acres. The most northern parcel includes a 25 foot wide right of way road west of Queen’s Highway and the most southern parcel on the west of Queen’s Highway includes a former landing strip. Figure 3 shows the combined parcels in a Google Earth Image to provide documentation related to the ownership of the site. While Figure 3 shows the full acreage secured by 4M2, the purpose of this EIA Addendum is to discuss the 19.75 acres of additional acreage shown in green in Figure 2 and the blue area also shown in Figure 2. The proposed seabed lease for the blue area follows Figure 3.

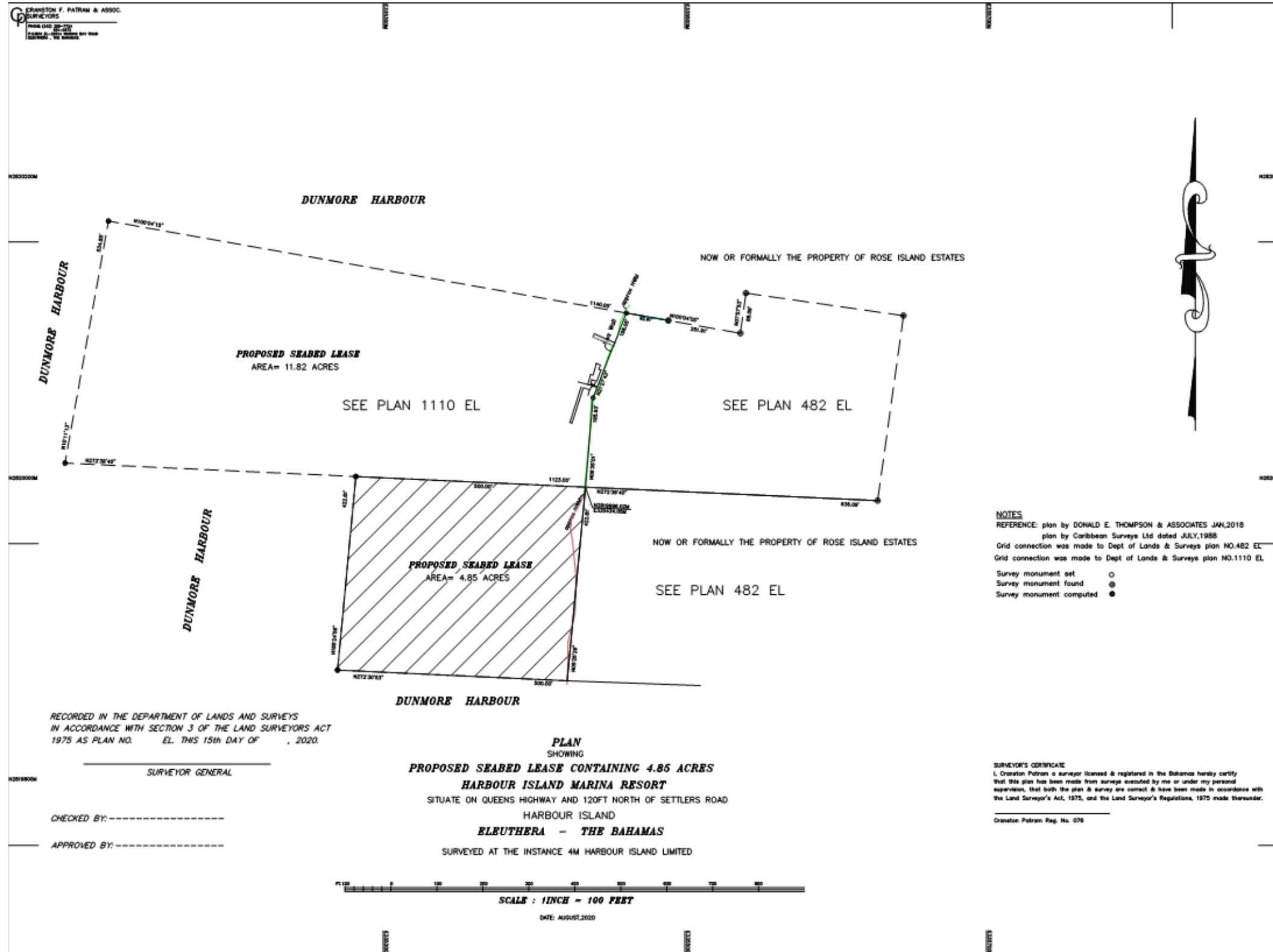
Figure 3. 4M2 Property that lies east and west of Queen’s Highway.



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Figure 4. Seabed Lease for 4.85 acres in Dunmore Harbour



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4.2 Land Use

The 4M2 property is adjacent to the former Harbour Island Marina located on the west coast of Harbour Island. The 4M2 property is south and east of the 4M property and includes the former landing strip for Harbour Island. No buildings were observed on the property surveyed east and west of Queen's Highway, but there was evidence that locals and residents use the area. For example, a coconut grove is located behind the dune ridge on the 3-acre property east of Queen's Highway. Figure 5 shows evidence of coconut harvesting on site. Indiscriminate dumping was also evident on site. Figure 6 shows garbage bags filled with debris.

Figure 5. Evidence of coconut harvesting on site



Figure 6. Garbage bags filled with solid waste on site



Indiscriminate dumping was also observed on portions of the property on the west of Queen's Highway. Vehicles, tires, car batteries, plastic and glass bottles, clothing and appliances were observed throughout the property. See Figures 7, 8, 9, and 10.

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Figure 10 shows extracted fuel storage tanks labelled with ‘Metal Products Company’. 4M engaged Mr. Keith Bishop of Islands By Design to perform a site inspection related to such fuel storage tanks. Following the recommendations of Mr. Bishop and his subsequent report, the fuel tanks were drained, capped and removed from the fuel tank area. The old fuel tanks were removed and “closed” using best practices under the direction of Mr. Bishop prior to their relocation to the southwest corner of the property. The storage tanks were disposed at the North Eluthera Dump.

Figure 7. Indiscriminate dumping on portions of the property



Figure 8. Indiscriminate dumping on portions of the property continued



Figure 9 (A-D). Trash on the southwest corner of the property



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Figure 10. Empty fuel tanks prior to transport to the North Eleuthera dump.



There is evidence of fishing in the area as a small conch midden and fish skeletons were observed in the former landing strip area. Figure 11 show the conch midden and fish skeletons. Residents adjacent to the northern and southern boundary of the property on the west of Queen’s Highway appear to be using the area near the landing strip property to park vehicles, boats, store equipment, and to access their properties. Figures 12 and 13 show vehicles parked within the northern boundary of the property. Figure 14 shows vehicles, boats and trailers stored within the southern boundary of the property. Figure 15 shows abandoned vehicles located along the southern boundary of the property.

The former landing strip is used to access the rocky shore beach in Dunmore Harbour. A bench is affixed to two large Casuarina trees growing on the coast. During the surveys by CCS, residents were observed using the area recreationally and a fishing line was observed near the bench.

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Figure 11. Midden of knocked conch shells (Left) and Fish skeletons observed at the landing strip area (Right).



Figure 12. Island Breeze Rentals use the northern boundary to park golf carts.

Figure 13. Vehicles parked on northern boundary of the 4M2 property



Figure 14. Boats, boat trailers, containers and container trailers stored within southern boundary of the property



Figure 15. Abandoned vehicles within southern boundary of the property



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5 PROJECT DESCRIPTION

5.1 Project Details

The proposed infrastructure and utilities for Phase 2 Area (including the previously submitted Utility Corridor and BOH Area Impact Assessment) will complement the project which was the subject of the previously approved EIA. In summary, that project included a marina, residences, and commercial space. The Phase 2 Area will include additional residences, a nature trail, fitness facilities, employee housing, and parking for golf carts. Figure 16 shows the site plan for the Project. Figure 17 shows the site plan for the area included in the second seabed lease.

Various utilities will be provided to the Project. For example, (1) potable water will be provided via a combination of Water and Sewerage Corporation and onsite standby Reverse Osmosis (RO) Plant, (2) a sanitary sewer system will be constructed on site to treat all wastewater produced by the development, (3) “stormwater from roads and buildings will be collected in drainage swales, drainage wells and conveyed to dry stormwater retention areas throughout the site”², and (4) Bahamas Power and Light (BPL) will provide electricity for the full property and hospital grade sound attenuating fully enclosed diesel generators will be installed to provide backup power supply to the site. [Section 5.3](#) further describes the utilities for the property in detail.

The Back of House (BOH) area described in the “Utility Corridor and BOH Impact Assessment” submitted to DEPP in November 2020 will also be used for the Phase 2 Area. The BOH will be located in the northeast corner of the property west of Queen’s Highway. The wastewater treatment plant, standby generators, RO plant and water storage tanks will be located in the BOH.

A 592.7 m² aluminum fixed dock is proposed for the area shown in the proposed Seabed Lease area in Figure 4. The dock will be affixed to the southwest corner of the western parcel of the property and will be able to support a maximum of fourteen 45’ vessels at one time. Figure 17A shows the site plan for this area.

² October 2017 “Environmental Impact Assessment Harbour Island Marina and Resort” prepared by Coastal Systems International Inc. in association with Innovative Solutions Group.

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5.2 Site Plan

Figure 16. Site Plan for the 27 acre property, including the 5.61 acres and the BOH area.



Harbour Island
Eleuthera, BAHAMAS

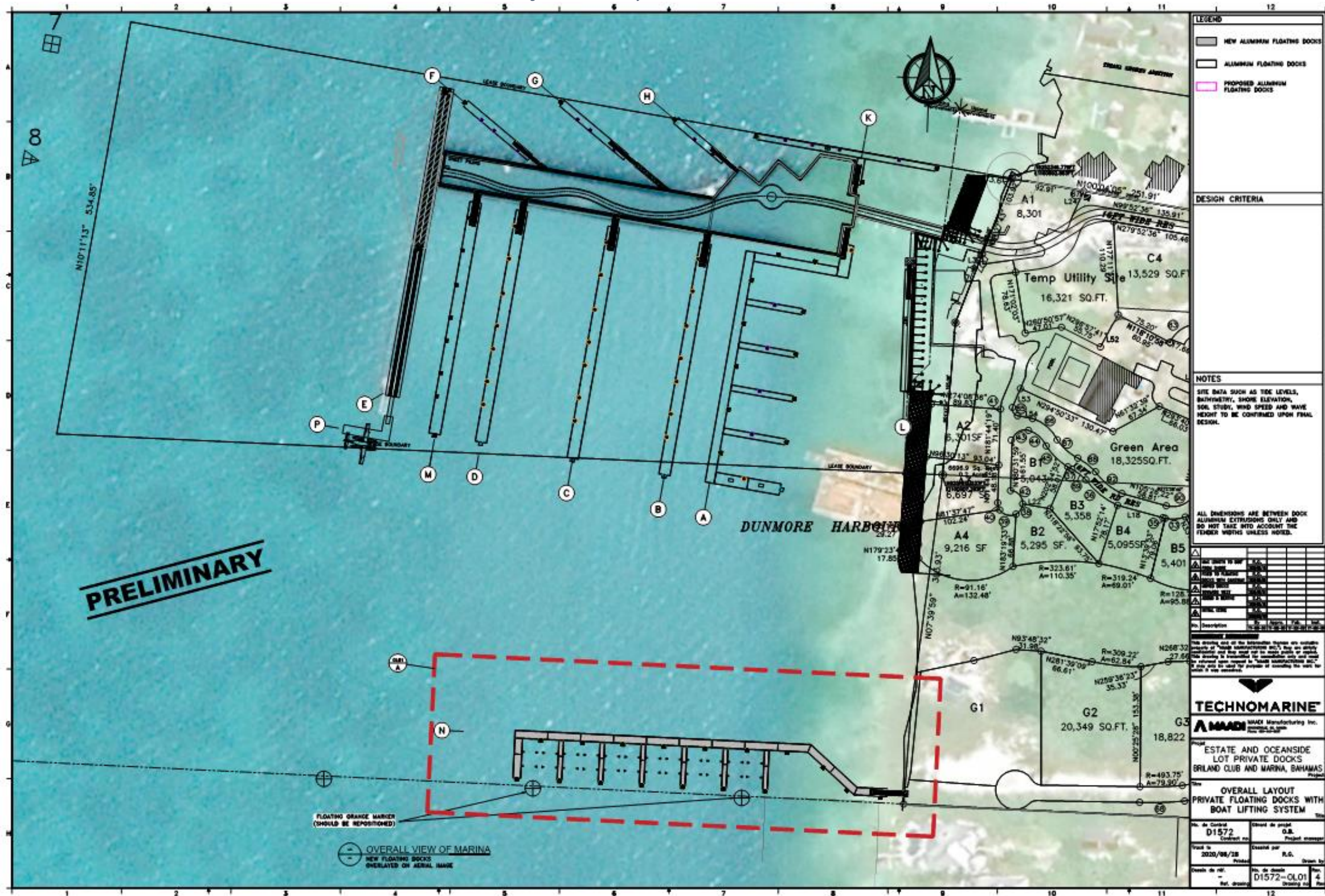
OVERALL SITE PLAN SCALE: 1/64"=1'-0"
Schematic Design May 2018

CMA Design Studio, Inc.
ARCHITECTURE PLANNING INTERIOR DESIGN
232 Andalusia Avenue • Suite 101 • Coral Gables, Florida 33134 • T: 305.448.4200

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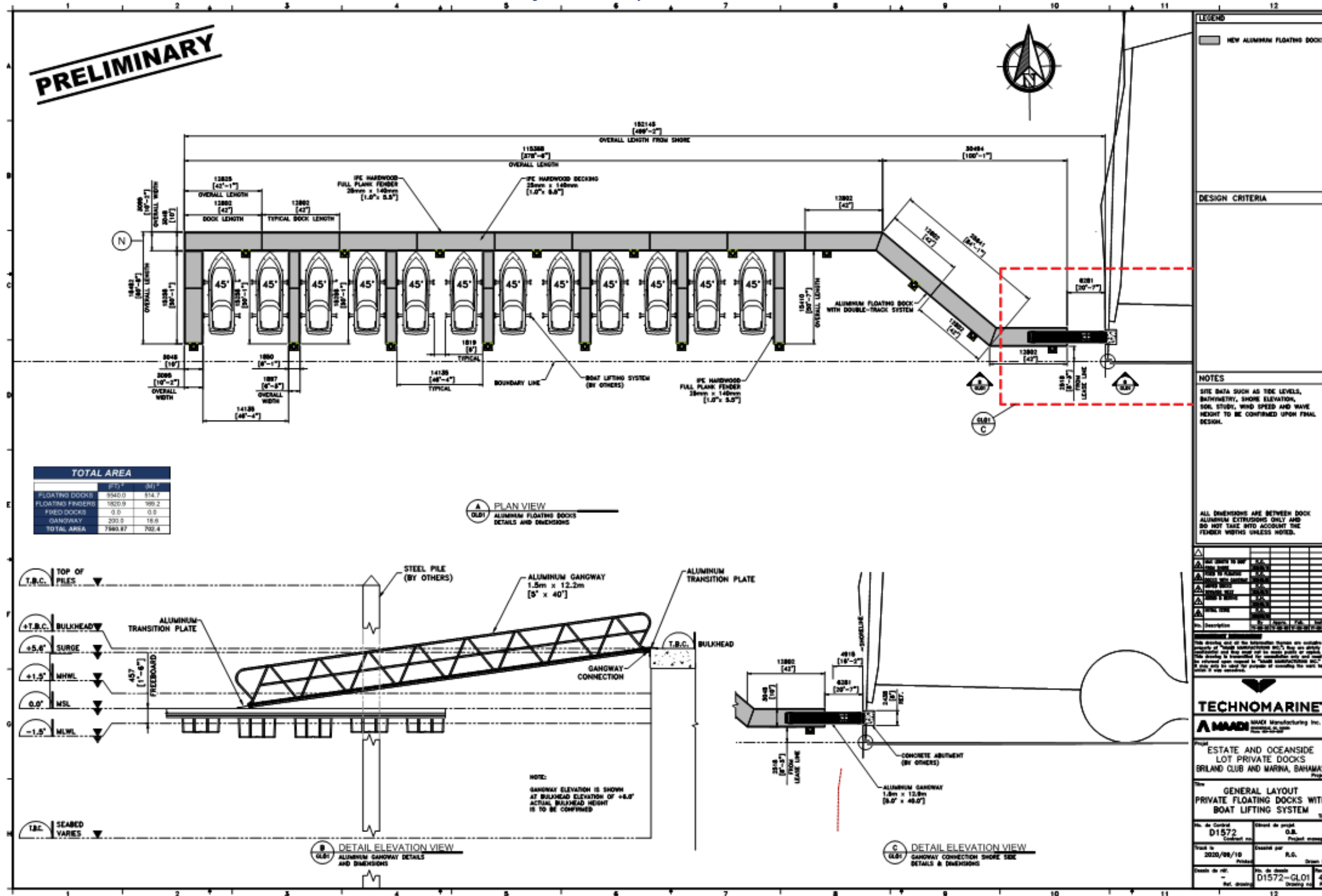
Figure 17A. Site Plan for the Seabed Area in Lease #2.



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Figure 17B. Site Plan for the Seabed Area in Lease #2.



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5.3 Utilities Description

5.3.1 Roads & Drainage

A total of twelve (12) roads will be constructed throughout the Project to provide access to the lots and buildings. Road and path material will be a locally sourced. Roads intended for vehicle use will be twenty (20) feet wide with a maximum vertical slope of 10%. Appendix C shows the Road Layout, Drainage Plan, Road Profiles, Road Cross Sections, Utility Sections, and Road Detail Sheet. The Road Layout Sheet shows the location of the stop signs and roundabouts and the following Road Profiles in the Appendix show the location of the Roads compared to the lots. A native material will also be used in the parking area and is shown on the Road 5 Profile and the Queen's Highway profile is included as Road 13.

A request to waive the road reservation widths was made, as the Project is meant to be a golf cart community. In a letter dated May 17, 2019, the Civil Design Section of the Department of Physical Planning communicated their support of this waiver request with the stipulation that the Engineer of Record submits the design for approval. The letter also stated the Developer is responsible for "installing all traffic regulatory signs, be they stop signs (octagonal shape), street name signs and pavement markings." The Developer acknowledges this responsibility and agrees to install such signs as shown in Appendix C on the various Road Profile pages.

An appropriate drainage system will be installed to direct water flow from the ground surface to drainage swales. Roads will be crowned with a 2% cross-slope to facilitate drainage. The Drainage Plan developed by Island Dimension Development Company is shown in Appendix C. The Road Detail Sheet B-15 in Appendix C shows the Typical Pipe Trench Detail and Typical Catchpit / Well Detail.

5.3.2 Potable Water

As described in the previously approved EIA, a Reverse Osmosis (RO) System will be constructed in the BOH area for standby use. The revised Water Consumption Table shown in Table 2 includes data for the upland development and shows the RO systems will produce 40,000 USGPD initially with a second system, based on demand, for a total of 80,000 USGPD of potable water per day.

Detailed plans for the RO unit and water distribution system have been submitted to the Water and Sewerage Corporation (WSC) for review and approval. Once approved all information will be submitted to the DEPP.

Utilities for the project have received the required approvals.

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Table 2. Water Consumption Table for the 4M Harbour Island Project. The total values also include numbers from the BOH area.

4M Harbour Island Project WATER CONSUMPTION TABLE

BUILDING TYPE	DESCRIPTION	# LOTS	PER CAPITA/LOT	CONSUMPTION	ADF (GPD)	PF (GPD)	DF (GPD)	DF (GPM)	DF (CFS)
A	2BDRM VILLA	4	4	100	1600	3200	6400	4.4444	0.0099
B	1BDRM STUDIO	7	2	100	1400	2800	5600	3.8889	0.0087
C	MULTI	4	16	100	6400	12800	25600	17.7778	0.0396
D	MULTI	4	16	100	6400	12800	25600	17.7778	0.0396
D3	BACK HOUSE				4500	9000	18000	12.5000	0.0278
E	ESTATE LOTS	24	5	100	12000	24000	48000	33.3333	0.0743
F	ESTATE LOTS	3	5	100	1500	3000	6000	4.1667	0.0093
G	GREEN SPACE LOTS	8	5	100	4000	8000	16000	11.1111	0.0248
G9		2	7	100	1400	2800	5600	3.8889	0.0087
G10		3	2	100	600	1200	2400	1.6667	0.0037
P	BEACH CLUB	1			3600	7200	14400	10.0000	0.0223
J	RESTAURANT	1	128	24	3072	6144	12288	8.5333	0.0190
K	RETAIL SHOP	1			300	600	1200	0.8333	0.0019
L	LIGHTHOUSE	1			500	1000	2000	1.3889	0.0031
M	HAUNTED HOUSE	1	150	24	3600	7200	14400	10.0000	0.0223
	LAUNDRY	1			2800	5600	11200	7.7778	0.0173
	RO/WWTP	1			1000	2000	4000	2.7778	0.0062
	STAFF FACILITY	1			350	700	1400	0.9722	0.0022
MARINA		1			10000	20000	40000	27.7778	0.0619
					65022	130044	260088	180.6167	0.4023

ROUNDED TOTAL			300000	20.8333	0.0464
5 DAY STORAGE			150000	104.1667	0.2320
WWTP			65000	34.7222	0.0773
FUTURE UPGRADE			25000	17.3611	0.0387
			225000	156.2500	0.3480

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5.3.3 Energy

BPL will supply the electrical power to the property during construction and operation. The initial load is estimated at 2.5 MW once in operation. Standby diesel generators will be installed in the BOH area to act as an emergency power supply for the Project. Diesel will be stored on site for the generator to ensure the generators will be operational in the event of a BPL power loss. Fuel storage is described in the previous EIA in section 5.5 *Fuel Storage Facility*.

Understanding the goals set in the document “The Bahamas National Energy Policy; 2013 -2033” and subsequent guidelines in regard to the stated goal of 30% renewables over the life of the project, the design professionals have incorporated the following measures in the design:

1. During the construction process, contractors will be strongly encouraged to employ energy efficient construction methodologies. The use of electricity and water for construction will be monitored and measured to ensure resources are not being wasted.
2. The project intends to utilize to the greatest extent possible electrical vehicles for the use of the staff and operational members.
3. All residential units will be strongly encouraged to use electrical vehicles while on property and on the community as a policy of the project.
4. Treated wastewater will be used to the extent possible for irrigation, greatly reducing the need for potable water for irrigation. It is well known that water produced via Reverse Osmosis desalination is a large energy consumer.
5. LED light bulbs will be used throughout the project
6. WIFI based thermostats will be used in all air-conditioned spaces, this allows the staff to manage the temperatures and the use of energy in spaces not occupied.
7. Each residential unit will have sensors placed on the exterior doors such that if doors are open the air conditioning system will not operate saving energy.
8. The building design incorporates the latest in efficient lighting (LED bulbs) and energy efficient building standards.
9. Building design encourages the use of open windows and patio doors to use the natural breezes and outdoor living whenever possible.
10. In regard to the goal towards waste reduction, solid waste refuse from the project will be sorted and where possible either repurposed, as in the case of organic material for compost or in the case of inorganic materials, a compactor will be used to compact the solid waste prior to disposal.
11. All plumbing fixtures are “low flow” devices to reduce the water demand and the water wasted in sanitary applications. All toilets will be dual flush to conserve potable water.
12. Electrical installations will be checked for energy efficiency by use of infrared cameras to ensure proper use.
13. A program of repurposing the lawn and landscaping clippings as mulch and compost is intended.

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14. Path and area lighting will, to the extent possible, be solar powered to reduce the electrical demand. Path and area lighting will be designed to “aim low” to reduce the effect on the night.
15. Lighting systems on the docks will be solar lights to reduce electrical demand.
16. All residential units will use solar hot water heaters to reduce the electrical demand.
17. In the commercial kitchens, the project intends to use propane for cooking due to energy efficiency and the reduction in electrical demand.
18. Appliances in both the residential spaces and the commercial spaces will be the latest technology in energy efficiency to promote energy conservation.
19. As a part of the project orientation packages for guests and homeowners, educational information will identify the concepts of energy and water conservation and efficiency in all aspects of the guest experience.
20. As technology advances, the project intends to look at the use of Photovoltaic systems for electrical sustainability. The design professionals have identified areas where the use of photovoltaics would be utilized once the efficiency increases and energy storage systems advance.

4M Harbour Island is committed to the goals as stated in the policy “The Bahamas National Energy Policy, 2013 -2033”. The existing design and the future provide for meeting or exceeding that goal as it relates to the project over the course of the project life. This commitment is both good policy, but as the Owner/Operator of the project, it is good business.

5.3.4 Solid Waste

Clearly identified designated solid waste collection sites will be located on the property during construction and operation. Construction waste will be collected daily around the property and disposed of in larger skips. The covered skips will be transported to the North Eleuthera dump site. Figure 18 shows an example of a covered skip. Solid waste generated during operation of the upland development will be collected from around the property by landscaping and maintenance personnel and taken to the BOH area where it will be sorted, and to the extent possible, then compacted for disposal. Because the project is near the coast, marine grade covered containers will be secured in areas closer to the Harbour and beaches. These solid waste containers will be emptied into larger skips, which will be removed from the property once full. The debris will be barged to the North Eleuthera Dump site. During transport, the debris will be covered to prevent debris from falling in the ocean. The barge will not operate under windy conditions to help prevent debris from blowing off of the barge into Dunmore Harbour. Marine grade solid waste collection containers will also be located along the marina. These will be emptied daily or once full. Solid Waste from the marina will also be barged to the North Eleuthera Dump. An example of a covered solid waste container / trash receptacle is shown in Figure 18.

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Figure 18. Left³. A 30 gallon commercial concrete all weather trash receptacle. The receptacles at the Project site may look different, but will also be all weather in the marine areas of the development. Right⁴ Example of covered skip.



5.3.5 Wastewater

As a part of dust suppression during construction, the site will be watered as necessary. The water generated on site from this activity will be allowed to evaporate naturally from the site or percolate into the groundwater. The water for dust suppression will be sourced from the Water and Sewerage Corporation pipeline into the project. Existing operational restrooms located on the 4M property will be made available for construction personnel, thus reducing the need for portable toilets on site. Wash water generated from rinsing construction equipment will be limited and collected in a specific location and prevented from polluting the property by environmentally sound practices. These locations will be further identified in the EMP Addendum.

The wastewater collection system during operation will be incorporated in the onsite sanitary sewer system constructed in the BOH area. Information from the previous EIA states, “The proposed conceptual design implements a gravity flow system, a grinder pump system, and a septic tank effluent pressure system that will discharge into a Sewage Treatment Plant (STP). The STP will support the required demand of approximately 120,000 gallons per day with primary (physical) and secondary (biological) treatment.” Subsequent design considerations, taking into account water saving features and population projections have indicated that a 65,000 average daily flow wastewater treatment plant sized for 90,000 USGPD peak flow will be required. This wastewater treatment plant will be a tertiary treatment process such that the treated wastewater effluent will be used on landscape irrigation on the property, greatly reducing the

³ <https://www.furnitureleisure.com/30-gallon-commercial-concrete-square-trash-receptacle-with-push-door-top>

⁴ <https://owipex.ch/en/skip/city-skip-covered-skip/>

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need for potable water from the WSC or the onsite standby RO units for landscape irrigation. By using the treated wastewater for irrigation, an estimated 58,000 gallons of water per day will be saved. Island Dimensions Development CO. LTD. prepared Sewer Profile and Sewer Flow Calculations for the property shown in Appendix D. The Design Parameters for the Sewer Flow Calculations are shown in Table 3.

Table 3. Design Parameters

Design Parameters	Units	Quantity
Population	Persons per lot	5
Average Flowrate	GPD	75
Peaking Factor	Constant	2
Mannings #	Constant	0.013
Minimum Soil Cover to pipe crown	Feet	3.5
Manhole Diameter	Feet	4.00
Thickness of Manhole Wall	Inches	6.00
Drop across the Manhole	Feet	0.10

6 ALTERNATIVES

6.1 Other Considerations

The location of the 4M2 site is best suited for expansion of the upland development in the Phase 1 Area and described in section [5 Project Description](#). As a result, other sites were not considered for the described upland development. There are no other site plans under consideration at this time for the Project.

Figure 19 on the following page is under consideration for the design of the east lot portion of the property near the popular Harbour Island Pink Sands Beach. This design increases the use of native vegetation on the site with a coconut grove vegetation screen along with other native species plantings. The final design is subject to review and approval of the various agencies responsible, as well as the final design team product.

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Figure 19. Village Concept for East Lot of the Project site.



6.2 Specify “No Action” Alternative

In the event that the Project is not implemented as planned, it is likely that the land will continue to be used as an informal dump site by the community due to its proximity to the residential areas and the historical use. Without mitigation it is likely the debris on the land will trap rainwater, which may act as a vector for mosquitoes. It is also likely the debris could wash into Dunmore Harbour impacting the water quality.

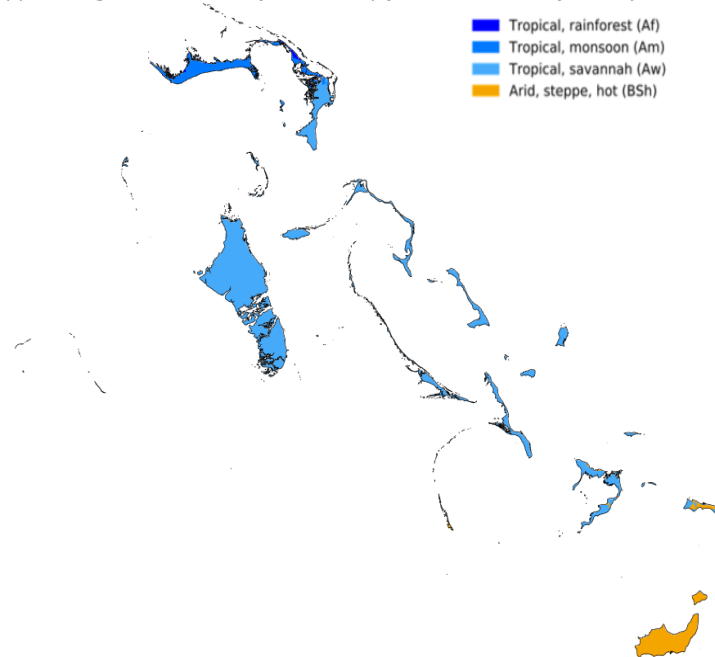
Invasive species will persist on the property and continue to disperse seeds to adjacent areas. The beach on the east coast of the property will continue to erode in front of the property with the presence of the Casuarina and Hawaiian Inkberry. As this dune helps to maintain a part of the historic and culturally important Pink Sands Harbour Island Beach, it is imperative these invasive species are removed to help preserve this beach. Plantings of local non-invasive species will help stabilize and support the dune structure.

7 PHYSICAL AND BIOLOGICAL BASELINE

7.1 Climate & Weather

General climate in The Bahamas is described as tropical savannah, but there are nuances along the island chain according to the Köppen-Geiger climate classification. Figure 20 shows a classification map of the archipelago. Harbour Island is classified as tropical savannah (Aw). The average weather conditions in Dunmore Town shown in Figures 21 - 24 reflect this classification⁵.

Figure 20. Köppen-Geiger climate classification map for The Bahamas for the years 1980-2016.



Source: Beck et al.: Present and future Köppen-Geiger climate classification maps at 1-km resolution, Scientific Data 5:180214, doi:10.1038/sdata.2018.214 (2018)

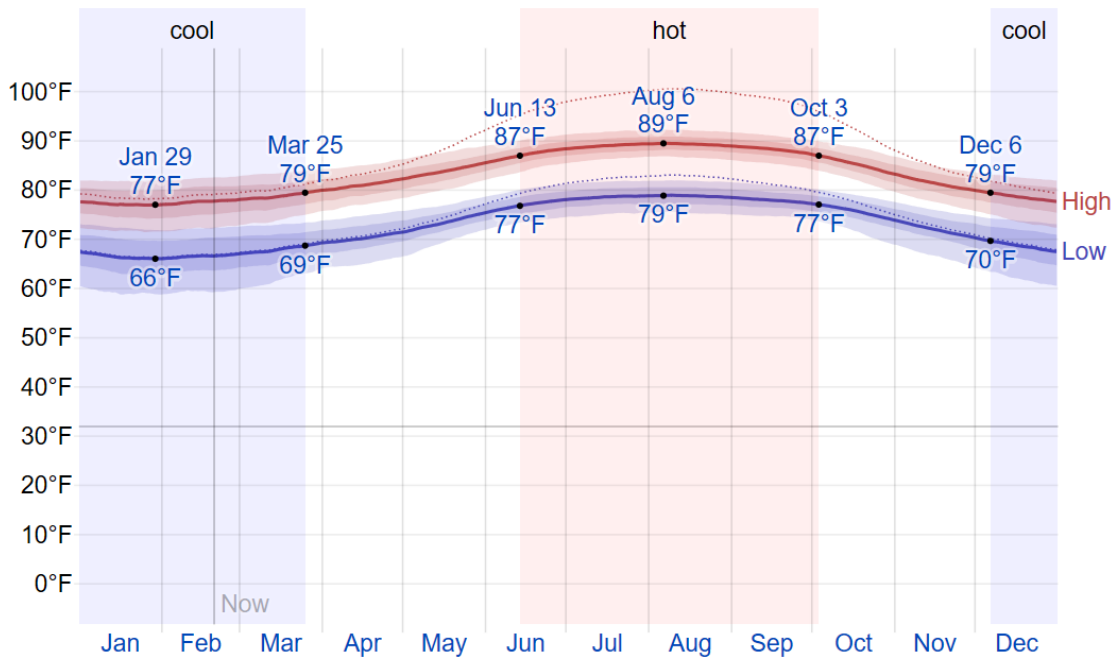
⁵ <https://weatherspark.com/y/21621/Average-Weather-in-Dunmore-Town-Bahamas-Year-Round>

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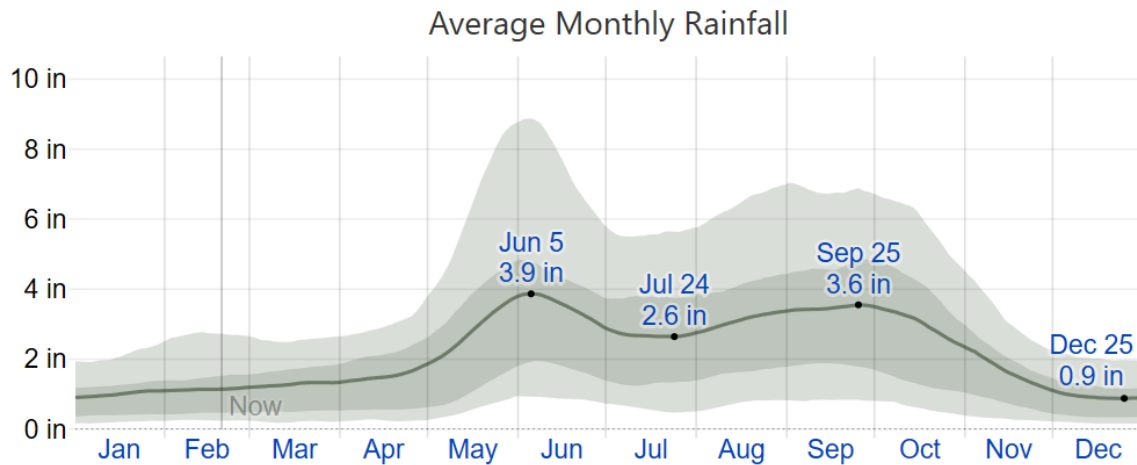
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Figure 21. Average temperatures in Dunmore Town



The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.

Figure 22. Average Monthly Rainfall in Dunmore Town

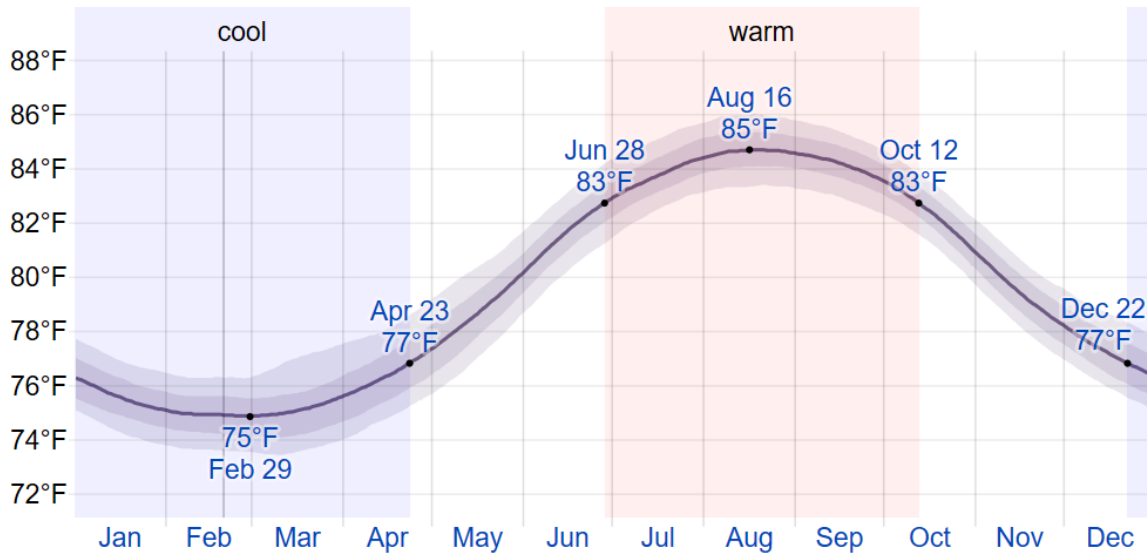


The average rainfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands. The thin dotted line is the corresponding average liquid-equivalent snowfall.

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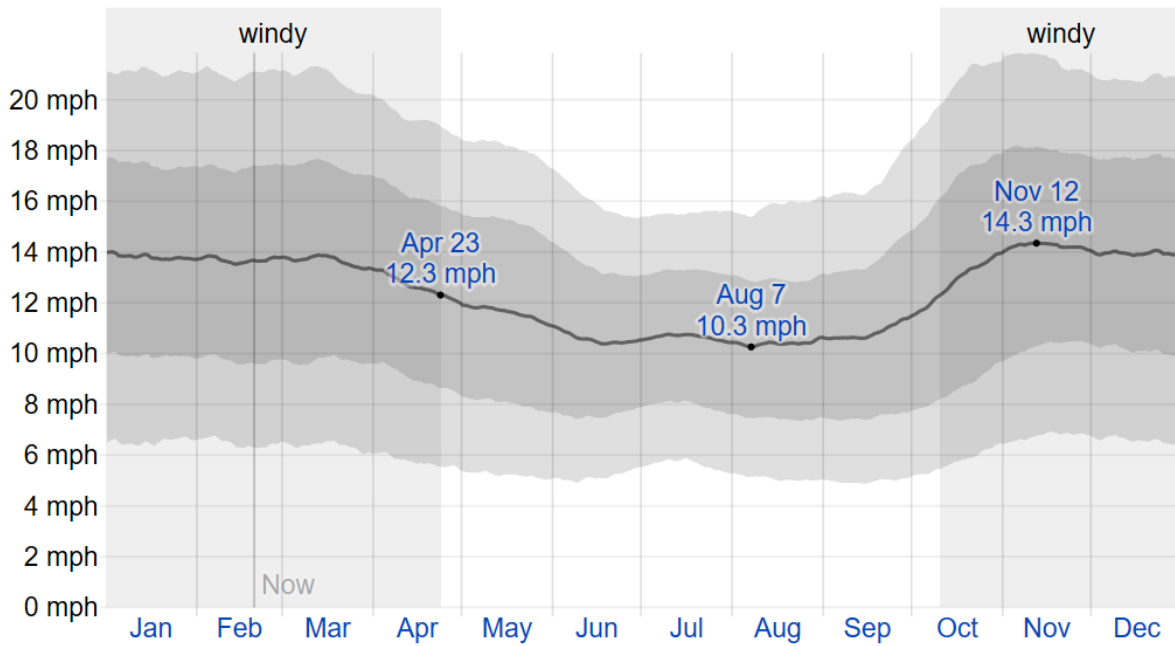
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Figure 23. Average Water Temperature in Dunmore Town



The daily average water temperature (purple line), with 25th to 75th and 10th to 90th percentile bands.

Figure 24. Average Wind Speed in Dunmore Town



The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile bands.

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7.2 Topography

The Survey & Contour Plan shown in Appendix B was produced by Island Dimensions Development Company, the project's Civil Engineer of Record. It shows the topography of the 27 acres is generally flat with no water bodies or inland wetlands. The sandy beach on the eastern coast of the property gently slopes toward the sea. After the 5 feet contour line on the beach, the dune ridge increases sharply from the 5 feet to 25 feet. There is a gradual decrease in elevation to 20 feet behind the dune ridge. Elevation continue to decrease to 15 feet towards Queen's Highway. The average elevation on the property west of Queen's Highway is 20 feet. There are a few areas that are lower in elevation. For example, the area along Queen's Highway in the north decreases to 10 feet. The rocky shoreline on the west coast of the property generally slopes towards Dunmore Harbor. The south west corner of the property is the former landing strip and this area slopes toward Dunmore Harbour.

The elevation on site is comparable with the general elevation on the surrounding properties. Site grading is planned during the construction phase, but this will not significantly alter the elevations on site. As a result, the project's activities should not create a higher elevation on site that would lead to increased run-off to the surrounding properties. Site drainage and retention areas for stormwater are included in the site design.

7.3 Sediment analysis

The Geotechnical Investigation Report was completed by Engineering & Technical Services Consulting Engineers (ETS) for the 27 acres. Twelve (12) standard penetration borings approximately 30 feet below the existing grade were sampled. Groundwater was observed in each boring. The detailed description of the Standard Penetration Test (SPT) results and a map of the boring locations are shown in Appendix E. The SPT results show the upland site elevation ranges from ± 10 to ± 25 feet above mean sea level based on the observed ground water level. This aligns with the results of the Survey & Contour Plan in Appendix B.

Ten (10) of the 12 samples were taken from the 21.4 acres that lies within the scope of the additional upland acreage. One boring (B4-25FT) was taken from the eastern property that abuts the Pink Sands Beach in the Coastal Coppice Habitat. Borings B11-25FT, B3-25FT, B6-25FT were sampled near Queen's Highway, but only the borings B11-25FT, B3-25FT were sampled from the Interior Broadleaf Coppice Habitat. Boring B6-25FT along with boring B5-25FT were sampled from the Invasive Species Dominated Shrubland. Boring B8-30FT was sampled in the landing strip area located in the southwest corner of the property. B10-30FT and B1-30FT were also sampled from the Interior Broadleaf Coppice Habitat but were located near the Rocky Shoreline Habitat.

Generally, the SPT results show the site is suitable for the proposed upland structures with shallow foundations used as conventional spread footing foundations and located at an average

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depth of 2 to 3 feet below the existing grade. It was recommended that Augered Cast-In-Piles (ACIP) are used for deep foundations. ACIP is described in detail in section 3.2 in Appendix E.

Special Notes from ETS Report: Well screens and casing were installed at Borings B6, B8, B9, and B12 to facilitate monitoring of groundwater during construction. Fluctuations of the groundwater table should be expected to occur both seasonally and annually due to variations in rainfall, evaporation, construction activities and other site-specific factors.

In preparation of constructing the building pads, ETS recommends removing and disposing of all surface vegetation, organic matter, and construction debris including all roots, debris, stumps, rubbish, and other material that is considered unsuitable. The building pad area should be 5 feet beyond the edges of the building footings.

It was also recommended that imported clean and organic free limestone should be used for all engineered fill material under the building’s footprint.

7.4 Hurricane History

Harbour Island, Bahamas sits within the active hurricane belt in the North Atlantic Ocean. The earliest documented impact of a storm impacting the Island is in the 1800s. In September/October 1866, “The Great Bahama Hurricane” damaged all the homes, farm crops were completely destroyed, and every vessel was wrecked or driven ashore on Harbour Island, the largest out island settlement at the time⁶.

Eleuthera Island is the largest island near Harbour Island where average Hurricane and Tropical Storm data is collated. It is likely when a storm impacts Eleuthera, mainly north Eleuthera, the storm will impact Harbor Island. As a result, Eleuthera’s Hurricane History is discussed in the current section.

Eleuthera is impacted by a hurricane or tropical storm on an average of every 2.10 years and the longest gap between storms is 18 years, for the time period of 1973-1992⁷. Eleuthera was last impacted by a hurricane in 2019 when Hurricane Dorian passed approximately 60 miles north of the island with 180 mph winds. Table 4 summarizes the impact of the last 5 storms to impact Eleuthera using information from Hurricane City and the National Hurricane Center.

Table 4. The last 5 storms to impact Eleuthera Island

Date of Impact	Hurricane Name and Observed Impacts
October 25, 2012	Hurricane Sandy hits from the south while moving NNW with 90mph.
August 25, 2011	Hurricane Irene hits with 105 mph winds while moving NW right over the island causing moderate damage over several part of the island.

⁶ The Story of The Bahamas” by Paul Albury, 1975. Page 155

⁷ <http://hurricanecity.com/city/eleutheraisland.htm>

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Sept 3, 2004	Hurricane Frances hits with 115 mph winds. The Eye lasted 90 minutes in Governor’s Harbour. Maximum sustained wind reported from a land station was 87 kt at North Eleuthera. North Eleuthera reported a minimum pressure of 958.6 mb ⁸ .
Sept 14, 1999	Hurricane Floyd hits with 155 mph winds snapping palm trees and ripping off many roofs. A 20 ft. storm surge inundated the island. Approximately 25% of homes suffered damage.
Nov 5, 2001	Hurricane Michelle hits with 80mph winds while moving quickly NE from the SW pressure 28.87.Hurricane Bertha

7.5 Air and Noise Quality

Air Quality

Air quality on Harbour Island is considered good because there are no factories producing greenhouse gases on the island and emissions from vehicular traffic is limited as golf carts are the main mode of transportation. The air quality is influenced by the prevailing trade winds originating from the east. In situ air quality parameters measured on January 27th, 2020 along Queen’s Highway and within the Interior Broadleaf Coppice are shown in Table 5. The measurements indicate the air quality at both sites are similar. The measured air temperature converts to ~ 75 °F, which falls within the expected range shown in section 7.1. The measured wind speed 0.2 m/s converts to ~ 0.447 mph which is lower than the expected wind speed for January shown in [section 7.1](#).

Table 5 Air Quality parameters measured in the Interior Broadleaf Coppice Habitat and on Queen's Highway.

January 27, 2020	Road	Within Coppice
Temperature (Celsius)	24.2	24.6
Rel. Hum. (%)	73.4	77.1
Baro. (mb)	1013.1	1013.1
Heat Index (Celsius)	24.9	25.5
Hum. Ratio (g/kg)	13.9	14.9
Rel. Air Dens. (%)	96.1	95.9
Air Flow (m³/sec)	0.1	0
Air Speed (m/s)	0.9	0
Wind Chill (Celsius)	24.1	24.5
Air Density (kg/m³)	1.2	1.2

Noise

Noise is sound which is unwelcome and can cause distress to unwilling listeners caused by industry or traffic⁹. Because there are no factories or significant vehicular traffic on Harbor Island ambient noise levels were not measured on site. During the site visit sporadic sound events were

⁸ https://www.nhc.noaa.gov/data/tcr/AL062004_Frances.pdf

⁹ <https://www.nidirect.gov.uk/articles/general-noise-nuisance>

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noted but these events were not classified as abnormally loud as to be classified as “noise”. These include but were not limited to bird sounds, trees rustling, passing vehicles and aircraft. Noise on site was not considered at nuisance level.

7.6 Terrestrial Resource Survey

7.6.1 Methodology

Flora and fauna were observed during walking relevé surveys within the 4M2 property by CCS on January 27 through 29 2020. Protected and or rare plants were identified and marked via GPS. Invasive species were also identified in the different habitats on the property owned by 4M2. A species list was compiled and photo documented where possible. [Section 7.6.3](#) shows the species identified during the site visit in each habitat identified. Appendix F shows the photos of the observed species.

A Habitat Assessment Report prepared at the request of the Developer by the previous Environmental Consultant, Franklin Hall, in conjunction with the project’s Landscape Architect, Tyler Nielson, lists additional faunal species observed during that assessment. Species identified in the Habitat Assessment Report that were not observed by the CCS team are included in Table 11.

7.6.2 Habitat Types

Five (5) habitat types were identified during the site visit in January 2020 by the CCS team. Each habitat is identified by color in the habitat map shown in Figure 23. The five habitat types are Beach and Dune Ridge, Coastal Coppice, Interior Broadleaf Coppice, Rocky Shoreline and Invasive Species Dominated Shrubland. The map also shows the Former Landing Strip. Surveys began in the Beach and Dune Ridge habitat, then progressed in the Coastal Coppice Habitat. The walking relevé surveys continued along the Former Landing Strip and the Invasive Species Dominated Shrubland. The Rocky Shoreline was then surveyed followed by the Interior Broadleaf Coppice. The 4M2 property also includes a 25 feet wide right of way road located along the northern boundary of the property. The right of way road is paved and no species were observed in this area. As a result, it was not included in the habitat map in Figure 25. The 25 feet wide right of way road is included in Figure 3 4M2 Property that lies east and west of Queen’s Highway. Figures 26 through 30 show general habitat photos. Appendix F shows photos of observed species.

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Figure 25. Five (5) different habitats and the Former Landing Strip observed on the 4M2 property

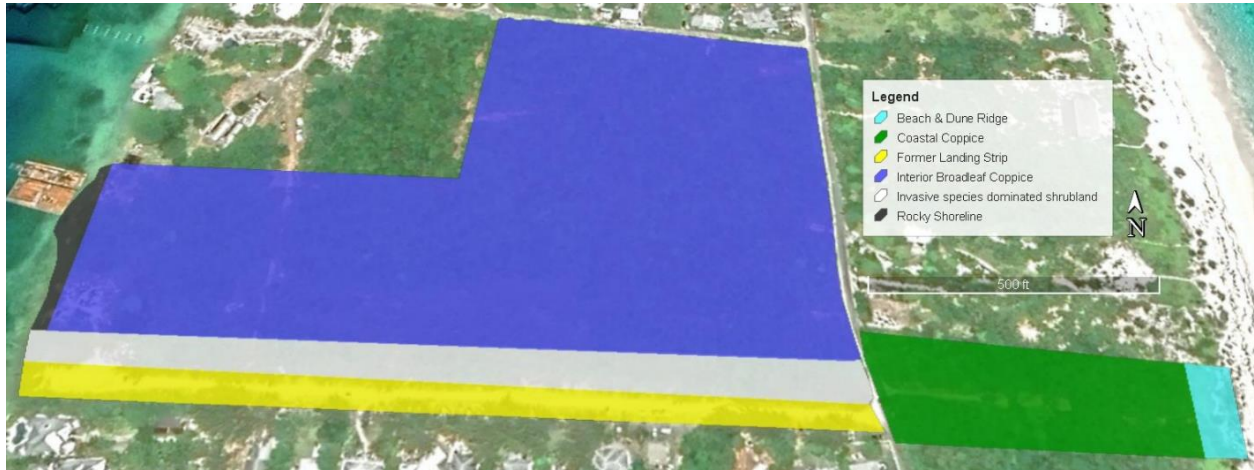


Figure 26. Beach and Dune Ridge Habitat



Figure 27. Coastal Coppice along eastern shoreline of property



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Figure 28. Interior Broadleaf Coppice



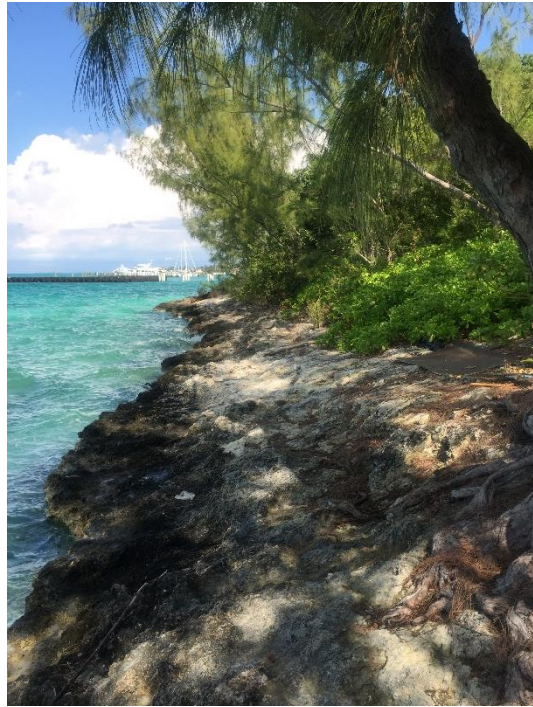
Figure 29. *Casuarina equisetifolia* (invasive) Dominated Shrubland along Former Landing Strip



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Figure 30. Rocky Shoreline along western shoreline of property



7.6.3 Species Lists

Species observed on site are listed in tables below and shown in Appendix F. Several species were observed in multiple habitats which are identified in the table as well.

Table 6. Flora observed in during site visit in January 2020 in Beach Habitat. * indicates invasive species.

No.	Common Name	Scientific Name
Beach		
1	Hawaiian inkberry *	<i>Scaevola taccada</i>
2	Australian pine, Casuarina *	<i>Casuarina equisetifolia</i>
3	Love vine	<i>Cassytha filiformis</i>
4	Coconut	<i>Cocos nucifera</i>
5	Sea grape	<i>Coccoloba uvifera</i>
6	Sea Rocket	<i>Cakile lanceolata</i>
7	Bay lavender	<i>Tournefortia gnaphalodes</i>
8	Sea purslane	<i>Sesuvium portulacastrum</i>

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Table 7. Flora observed in during site visit in January 2020 in Dune Ridge Habitat. * indicates invasive species.

No.	Common Name	Scientific Name
Dune Ridge		
9	Beach Pea	<i>Canavalia rosea</i>
10	7 year apple	<i>Casasia clusiifolia</i>
11	Hawaiian Lettuce*	<i>Scaevola taccada</i>
12	Spider Lily	<i>Hymenocallis arenicola</i>
13	Railroad Vine	<i>Ipomoea pes caprae</i>
14	Poor Man's Orchid	<i>Bauhinia variegata</i>
15	Black Torch	<i>Erithalis fruticosa</i>
16	Caper Tree	<i>Capparis cynophallophora</i>
17	Silver Top Palm	<i>Coccothrinax argentata</i>
18	Gum elemi	<i>Bursera simaruba</i>
19	Wild Lime	<i>Zanthoxylum fagara</i>
20	Sawgrass	<i>Cladium jamaicense</i>
21	Seagrape	<i>Coccoloba uvifera</i>
22	Jasmine Vine	<i>Jasminum fluminense</i>
23	Thatch Palm	<i>Thrinax morrissii</i>
24	Egypt Grass	<i>Dactyloctenium aegyptium</i>
25	Jumbey*	<i>Leuceana leucocephala</i>

Table 8. Flora observed in during site visit in January 2020 in Coastal Coppice Habitat.

No.	Common Name	Scientific Name
Coastal Coppice		
26	Stopper	<i>Eugenia axillaris</i>
27	Mastic	<i>Sideroxylon foetidissimum</i>
28	Sapodilly	<i>Manilkara zapota</i>
29	n/a	<i>Coccoloba sp.</i>
30	Moses in the basket	<i>Tradescantia spathacea</i>
31	Ram's Horn	<i>Pithecellobium keyense</i>
32	Jamaican dogwood	<i>Piscidia piscipula</i>
33	Wireweed	<i>Sida acuta</i>
34	Pigeon Plum	<i>Coccoloba diversifolia</i>
35	Butter Bough	<i>Exothea paniculata</i>
36	Morning glory*	<i>Ipomoea purpurea</i>
37	Stopper	<i>Eugenia foetida</i>
38	Bamboo Grass	<i>Lasiacis divaricata</i>
39	Boxwood	<i>Randia aculeata</i>
40	Shepherd's Needle	<i>Bidens alba</i>

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41	Pencil Flower	<i>Stylosanthes hamada</i>
42	Papaya	<i>Carica papaya</i>
43	Wooly Booger	<i>Corchorus hirsutus</i>
44	Florida Boxwood	<i>Schaefferia frutescens</i>
45	Wild Coffee	<i>Psychotria nervosa</i>
46	Razor Vine	<i>Smilax havanensis</i>
47	n/a	<i>Ateleia popenoei</i>
48	Wild Tobacco	<i>Solanum erianthum</i>
49	Sweet coastal Indian mallow	<i>Abutilon permolle</i>
50	Tamarind	<i>Tamarindus indica</i>
51	Narrow Leaved Blolly	<i>Guapira discolor</i> (protected)
52	Strongback	<i>Borreria succulenta</i>
53	Wild tantan	<i>Desmanthus virgatus</i>
54	Yellow elder	<i>Tecoma stans</i>
55	Darling Plum	<i>Reynosia septentrionalis</i>
56	Broad Leaf Blolly	<i>Guapira obtusata</i>
57	Candlewood	<i>Phialanthus myrtilloides</i>
59	Cinnecord	<i>Vachelia choriophylla</i>
60	Poison wood	<i>Metopium toxiferum</i>
61	Snowberry	<i>Chiococca alba</i>

Table 9 Flora observed in during site visit in January 2020 in the Invasive Species Dominated Shrubland. * indicates invasive species.

No.	Common Name	Scientific Name
Invasive Species Dominated Shrubland		
62	Casuarina*	<i>Casuarina equisetifolia</i>
63	Brazilian pepper*	<i>Schinus terebinthifolius</i>
64	Seagrape	<i>Coccoloba uvifera</i>
65	Blolly	<i>Guapira discolor</i>
66	Poinciana	<i>Delonix regiae</i>
67	Snake plant	<i>Sansevieria hyacinthoides</i>
68	Goat weed	<i>Capraria biflora</i>
69	Castor bean	<i>Ricinus communis</i>

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Table 10 Fauna observed during site visit.

No.	Common Name	Scientific Name	Habitat
1	White Crown Pigeon (nearly threatened)	<i>Patagioenas leucocephala</i>	IBC, CC
2	Bahamas Swallowtail butterfly	<i>Papilio andraemon</i>	IBC
3	Bananaquit	<i>Coereba flaveola</i>	IBC
4	Sap Sucker Woodpecker	<i>Sphyrapicus varius</i>	IBC
5	Chicken	<i>Gallus domesticus</i>	IBC, CC
6	Greater Antillean Bullfinch (male and female)	<i>Pyrrhulagra violacea</i>	IBC
7	Palm warbler	<i>Setophaga palmarum</i>	IBC
8	Ladybug	Coccinellidae	IBC
9	Paper Wasp	Subfamily Polistinae	IBC,CC
10	Hermit Crab	<i>Coenobita clypeatus</i>	IBC,CC
11	Beaded Periwinkle	<i>Tectarius muricatus</i>	RS
12	Brown Anole	<i>Anolis sagrei</i>	IBC,INV
13	Saw scaled curly tail lizard	<i>Leiocephalus carinatus</i>	IBC, INV
14	Spider	unkn	IBC,CC, INV,

Table 11 Flora & Fauna documented in Habitat Assessment Report.

Scientific Name	Common Names	Status
<i>Inagua ameiva</i>	Blue-tailed lizard	
<i>Margarops fuscatus</i>	Pearly-eyed thrasher	
<i>Columbina passerina</i>	Tobacco Dove	Protected
<i>Epicrates striatus</i>	Fowl snake	
<i>Dardanus calidus</i>	Hermit crab	
<i>Lepidoptera</i>	Butterfly	
<i>Gnaphosidae</i>	Ground spider	

7.6.3.1 Protected Species

Two protected plants, the Lignum Vitae [*Guaiacum sanctum*] and the Narrow Leaved Blolly [*Guapira discolor*], were identified during the surveys by the CCS team. There were several individual Narrow Leaved Blolly plants throughout the Coastal Coppice habitat near Queen's Highway and the Interior Broadleaf Coppice Habitat. A single Lignum Vitae plant was identified in the Interior Broadleaf Coppice near the northern boundary of the property. Figure 31 show the Narrow Leaved Blolly and Figure 32 shows the Lignum Vitae.

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Wild birds are fully protected by law under the Wild Birds Protection Act. Absolutely no hunting is allowed¹⁰. Dr. Ancilleno Davis conducted Avian Survey on site and identified species on island and species on site. The Avian Survey report is shown in Appendix G.

Figure 31. Narrow Leaved Blolly



Figure 32. Lignum Vitae



7.6.3.2 Species of Interest

Other species of interest identified on site include the national flower of The Bahamas, the Yellow Elder [*Tecoma stans*], and the White-Crowned Pigeon [*Patagioenas leucocephala*]. The Yellow Elder is not an endangered species but adds to the unique features of the property and may add aesthetic value to the site when maintained on the property. The White-Crowned Pigeon is listed as a nearly threatened species according to the International Union for Conservation of Nature (IUCN). The population, though resident in The Bahamas, is decreasing in trend¹¹. It is a popular game species with an annual hunting season from September 29 to March 1¹². Additional avian species are described in the Avian Survey Report in Appendix G.

¹⁰ <https://rollingharbour.files.wordpress.com/2013/10/huntersguide.pdf>

¹¹ <https://www.iucnredlist.org/species/22690229/95214927>

¹² <https://rollingharbour.files.wordpress.com/2014/08/wcp-bnt-hunters-guide.jpg>

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7.6.3.3 Invasive Species

Six (6) invasive species were identified on the property. Along both coasts of the property, Casuarina [*Casuarina equisetifolia*] and Hawaiian Inkberry [*Scaevola taccada*] were observed. Casuarina and Brazilian Bird Pepper [*Schinus terebinthifolia*] were observed along the former landing strip within the southern boundary of the property. Figures 33 through 35 show these invasive species. The fourth invasive is the Snake Plant which was observed in the Interior Broadleaf Coppice Habitat and is shown in Figure 36. Castor bean [*Ricinus communis*], Morning glory [*Ipomoea purpurea*] and Jumbey [*Leuceana leucocephala*] were also identified on site.

Figure 33. *Casuarina equisetifolia* (Australian Pine)



Figure 34. *Scaevola taccada* (Hawaiian Inkberry, right)



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Figure 35. *Schinus terebinthifolius* (Brazilian Pepper)



Figure 36. Bow Hemp, Snake Plant



7.7 Marine Resource Survey

7.7.1 Methodology

The benthic assessment of the area of impact within the new seabed lease site was conducted by Janeen Bullard. Ms. Bullard's CV is included in the Appendices. General benthic habitat status and species presences and abundance were identified during a transect surveys parallel and perpendicular to the shoreline. The following information was produced by Ms. Bullard.

“A record was taken of all flora and fauna species as well as substrate type encountered. Species abundance was recorded using the abundance categories Single, Few (2-10) and Many (10+).

General Observations

The assessed area is located off a rocky shoreline that was previously human altered. There are marinas on either side of the site. At the time of the investigation, active construction works was ongoing. The weather conditions were slightly overcast, with winds at 12 to 13 knots. Visibility varied in different areas from six (6) to four (4); based

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on a range of one (1) to ten (10) with one (1) being zero visibility and ten (10) being transparent. Depth ranged between approximately two and fifteen feet (2-15 ft).



Photo 1: Rocky shoreline of the site with construction activities (view facing north)



Photo 2: Shoreline with marina adjacent to the site (view facing south)

Historical Aerial imagery indicates that the seabed in the survey area was previously disturbed between 2002 and 2004.

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Figure 1: Google Earth image 2002



Figure 2: Google Earth image 2004



Figure 3: Google Earth image 2010

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Benthic Community Observations

Hard Bottom

Immediately off from the rocky shore was hardbottom with a thin layer of sand and rubble. The substrate was present along the entire shoreline of the survey area and extended less than five (5) feet seawards. Flora cover included a variety of green and brown algae. Other biota observed in this area was low and included a school of Pilchers (*Ablennes hians*) and a single individual of Cushion Sea Star (*Oreaster reticulatus*).



Photo 3: Hardbottom area with green and brown algae.

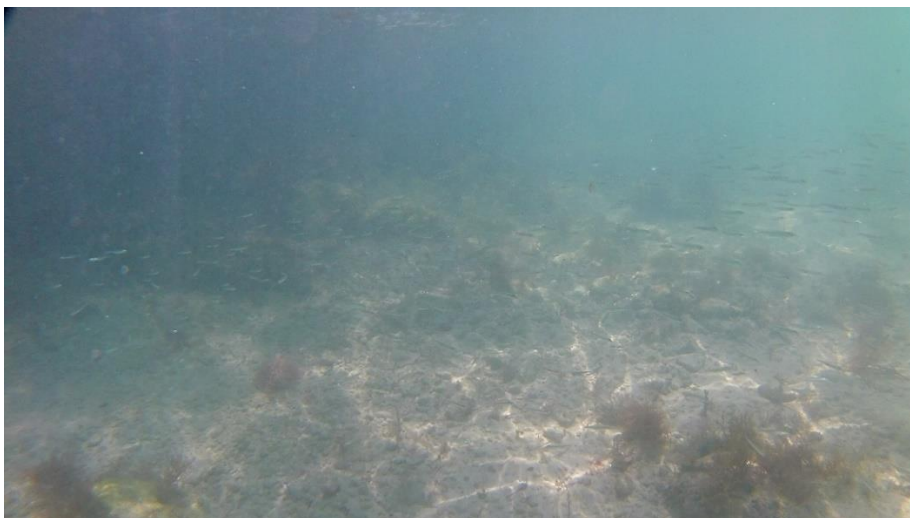


Photo 4: Hardbottom with a school of Pilchers (*Ablennes hians*) in the background

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Photo 5: Cushion Sea Star (*Oreaster reticulatus*) on hardbottom with rubble
Sandy Bottom

The majority of the substrate in the survey area was sandy bottom. There were large sections with no vegetation and sections dominated by Turtle Grass (*Thalassia testudinum*) and various alga type. The seagrass beds ranged from medium to dense and the grass itself was thick and lush.



Photo 6: Medium density Turtle Grass (*Thalassia testudinum*)

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Photo 7: Turtle Grass (*Thalassia testudinum*) bed with scattered algae

7.7.2 Benthic Map



Figure 4: Benthic Map

Species Diversity

Biota observations were low, in particular fauna species. A total of eleven (11) species was recorded during the survey: nine (9) flora, one (1) epifuna and one (1) fish.

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Table 1: *Biota observed during benthic assessment.*

Scientific Name	Common Name
Flora	
<i>Acetabularia crenulata</i>	Mermaid’s Wine Glass
<i>Caulerpa cupressoides</i>	Cactus Tree Algae
<i>Dasycladus vermicularis</i>	Fuzzy Finger
<i>Dictyota spp.</i>	Dictyota
<i>Halimeda spp.</i>	Green Algae
<i>Penicillus sp.</i>	Mermaid’s Shaving Brushes
<i>Phaeophyta</i>	Turf Algae
<i>Thalassia testudinum</i>	Turtle Grass
<i>Rhipocephalus phoenix</i>	Pinecone Algae
Epifauna	
<i>Oreaster reticulatus</i>	Cushion Sea Star (Single)
Fish	
<i>Ablennes hians</i>	Pilcher (Many)

Commercial, Endangered and Protected Species

There were no commercially important, endangered or protected species observed.

Discussion

Species Diversity

The assessed area had low abundance and diversity of fauna and epifauna including fish, however, mobile species may move in and out of the area as needed. There was also no coral species or evidence of coral recruitment present.

Activities at and surrounding the area suggests significant human influence including high boat traffic and marine debris such as ropes, pipes, bottles, toilettes; scattered throughout the site. These factors may contribute to the low species abundance observed.”

7.8 Aesthetics

While the property is currently undeveloped, the current aesthetics of the environment is negatively impacted by the refuse and debris observed on site.

7.9 National Parks and Marine Reserves

There are no known National Parks or Marine Reserves located on Harbour Island. The nearest protected area with infrastructure is the Leon Levy Native Plant Preserve managed by the Bahamas National Trust (BNT). The BNT also manages property on Man Island, which is a small

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island north of Harbour Island. There is no infrastructure on the Man Island National Park to date.

7.10 Socioeconomics

Information in the current section was summarized from the Socio-economic Report 2008-2012¹³ and the Tourism Today statistics¹⁴. The total population of Harbour Island is 1,762¹⁵, comprising eight hundred seventy three (873) males and eight hundred eighty nine (889) females. Five hundred ninety-seven (597) households were occupied in 2010 and the average household size was 3.0.

Tourism is the main economic driver on Harbour Island. The availability of hotel rooms remained relatively constant over a four-year period. There were sixteen (16) hotels operating on the island from 2008 to 2010. In each of those years two hundred sixty-seven (267) hotel rooms were available. In 2011 there were fifteen (15) operating with 267 rooms and in 2012, thirteen (13) hotels were operating with a total of two hundred fifty-four (254) hotel rooms available. The Ministry of Tourism's Research and Statistics Department 2014 Eleuthera Report highlighted the importance of hotel rooms to the Harbour Island economy, with eighty seven percent (87%) of stopover visitors staying in hotels and 4% in apartments or villas.

Despite availability of rooms, during the slower months for stopover visitors, September and October, some hotel properties close. The busiest month for stopover visitors is March.

7.11 Cultural Resources

Historical Overview

Harbour Island was the original capital of The Bahamas and is one of the oldest settlements in the country¹⁶. It was inhabited by the Eleutheran Adventurers in 1648. Captain William Sayle, a former governor of Bermuda, was granted a special charter to settle the island of Eleuthera. He led the Eleutheran Adventurers to The Bahamas in search of religious freedom. The population in 1720 grew to one hundred seventy-five (175). It then doubled to three hundred fifty (350) in 1768 and increased to five hundred (500) in 1782.

Piracy and wrecking were the main source of income in the early years but this gradually shifted to ship building and farming. Wrecking was a legal occupation that permitted the salvaging of a distressed ship. The "...distressed ship's cargo was then auctioned off. Eventually rumors of piracy spread with claims that "Wreckers" were purposely luring ships into reefs, murdering any

¹³ <http://www.bahamas.gov.bs/wps/wcm/connect/d5899539-d31b-4234-af37-88a3cbf8dbe5/Socio-Economic+Report+2008-2012.pdf?MOD=AJPERES>

¹⁴ http://www.tourismtoday.com/sites/default/files/eleuthera_brochure_2014.pdf

¹⁵ <https://www.bahamas.gov.bs/wps/wcm/connect/205511d5-d671-4345-b62d-a72de7ed555e/HARBOUR+ISLAND+2010+CENSUS+REPORT.pdf?MOD=AJPERES>

¹⁶ 2010 Bahamas Census of Population and Housing for Harbour Island.

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survivors and keeping most of the cargo for themselves.”¹⁷ In 1876 pineapple canning factories were opened on the Harbour Island and the population increased to 2,500 in the 1870’s¹⁸. “Dunmore Town became a respectable ship building and sugar refinement center and went into full production refining sugar and producing rum”¹⁵.

Bahamas Airways travelled to the island in 1941 for the first time. This was the beginning of tourism sector for the island. Since then, tourism grew to become the main industry not only on the island but also throughout The Bahamas.

Dunmore Town is the main settlement on the island and is named after Lord Dunmore, former Governor General of The Bahamas. Lord Dunmore enhanced the defense of the country’s capital, Nassau, by constructing Fort Charlotte and Fort Fincastle on New Providence. While his work was in New Providence, the Governor General had a summer residence on Harbour Island.

Historical, Archaeological and Paleontological Resources

There are no known historical archaeological or paleontological resources located on the additional 21.4 acres. In the event that a suspected historical, archaeological, and or paleontological resource is found, the Environmental Monitor will notify AMMC and DEPP. The Environmental Monitor will seek guidance from both agencies to ensure best practices are followed. The Harbour Island Haunted House is discussed in the original EIA as it is located on the initial property boundary.

Tourist and Recreational Areas

Bahamas Air Tours¹⁹ and the Ministry of Tourism describes a few tourist and recreation areas on their respective websites. The information is quoted below.

*Pink Sands Beach*²⁰ - “The almost indescribable pale pink color of the sand comes from microscopic coral insects, known as Foraminifera, which have a bright pink or red shell full of holes through which it extends pseudopodia, footings that it uses to attach itself and feed. Foraminifera are among the most abundant single cell organisms in the ocean and play a significant role in the environment. These animals live on the underside of reefs, like the nearby Devil's Backbone, on the sea floors, beneath rocks, and in caves. After the insect dies, the wave action crushes the bodies and washes the remains ashore and mixes it in with the sand and bits of coral. The pink stands out more in the wet sand at the water's edge. Unlike other parts of the world, the sand here is always cool, so you can walk about freely with bare feet. Snorkeling and swimming are made safe and easy by outlying reefs,

¹⁷ <https://officialharbourisland.com/harbour-island-history/>

¹⁸ Paul Albury. 1975. The Story of The Bahamas

¹⁹ <https://www.bahamasairtours.com/destination/harbour-island-bahamas-tour/>

²⁰ <https://www.bahamas.com/vendor/pink-sand-beach>

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which provide large areas of relatively calm and shallow water. Horseback riding on the beach is a popular activity, especially for honeymooners.”

[The Lone Tree](#)²¹ & ²² – A large piece of driftwood lodged upright in the sand bank known as “Girl’s Bank” on Bay Street. The tree can be accessed on the sand bar at low tide.

[Wall of License Plates](#)¹⁹ - “This quirky feature is a wall of license plates on the corner of Clarence Street and Dunmore Street.”

[Fishermen and Farmers Dock](#)²³ - “This dock provides a haven for both the fishermen and farmers of Harbour Island. At the foot of the dock is a recreation building, where people congregate for chats and occasional cook outs”.

[Historical Sites](#)²⁴– “The historical sites on this street are a testament to many of the individuals and families who were instrumental in the development of Harbour Island:

Sir George W.K. Roberts Library / Museum - The site was dedicated in 1968, with the cornerstone laid by the late Sir Etienne Dupuch. Sir George was born in Dunmore Town 1904. He served on the Legislative Council, the Executive Council and House of Assembly. He was appointed the first President of The Senate in January 1964. The late Noel Roberts, M.P., LLB, was his son. He represented St. John's for more than ten years.

Dundas Monument - This monument is dedicated to Lady Dundas, wife of former Governor C.C. Dundas, who visited here in 1939.

Roundhead 1939 - During the time of Cromwell, the military was made up of the round heads and the cavaliers. Around the mid 1600's a contingent of round heads was stationed here to protect this area from threats of invasion by the Spaniards. They fortified this area with cannons that were directed at the entrance to the Harbour. This land was granted to one Howland Spencer, a resident, in 1939. In the 1960's, a home was erected on the site.

The Administrator's Residence - This historic building has accommodated commissioners (Island Administrators) from 1900 to the present day. Governor Dunmore also resided on this site from 1786 to 1797 in an English Manor. The

²¹ <https://www.bahamas.com/vendor/lone-tree>

²² <https://www.bahamasairtours.com/destination/harbour-island-bahamas-tour/>

²³ <https://www.bahamas.com/vendor/fishermen-farmers-dock>

²⁴ <https://www.bahamas.com/vendor/dunmore-street>

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building was once used for formal receptions of colonial Governors and other prominent events, and consideration is currently being given to making it a museum.”

7.12 Transportation

Transportation to Harbour Island - The closest airport to Harbour Island is the North Eleuthera Airport, airport code MELH. After flying to the North Eleuthera Airport, visitors must use a water taxi or another boat to travel to Harbour Island. Water taxis are readily available as they operate daily several times a day. Visitors may travel directly to the island via sailboat or other marine vessel. There are multiple four (4) official ports of entry listed on the Ministry of Tourism’s website. They are listed below²⁵.

1. Harbour Island Public Dock
2. Harbour Island Marina (to be known Briland Club)
3. Romora Bay Marina
4. Valentines Marina

Transportation on Harbour Island - Once on island, golf carts are the main mode of transportation though other vehicles are permitted on the island.

7.13 Utilities Description

7.13.1 Roads

There are two paved roads and five unpaved roads related to the project. Figure 37 shows the paved roads with a red line and the unpaved roads with a purple line. The first paved road is Queen’s Highway, a main road on Harbour Island. It runs north to south on the island and divides the property in two. The second paved road is an access road that runs along the northern boundary of the property as shown in Appendix A. The first unpaved road is the former landing strip that falls within the southern boundary of the property east of Queen’s Highway. The remaining unpaved roads are paths that appear to facilitate access to the property for trash dumping.

²⁵ <https://www.bahamas.com/faq/official-ports-entry>

Figure 37. Paved and unpaved roads related to the project site (Google Earth, 2020).



7.13.2 Potable Water

There is no potable water supply on the Phase 2 Area but potable water is currently supplied by the Water and Sewerage Corporation (WSC) for the Phase 1 Area.

7.13.3 Energy

There is no energy supply on the Phase 2 Area but energy is currently supplied by the Bahamas Power and Light (BPL) for the Phase 1 Area.

7.13.4 Solid Waste

There is no current solid waste management on the Phase 2 Area. There is evidence of indiscriminate dumping throughout the project site indicating the need for easily accessible waste disposal for the community.

7.13.5 Wastewater

Wastewater is not currently generated on the site. Wastewater generated on the Phase 1 Area site is managed through the on-site septic tanks.

8 RELEVANT GOVERNMENT AGENCIES, ENVIRONMENTAL LAWS, AND INTERNATIONAL CONVENTIONS

8.1 Relevant Government Agencies

Office of the Prime Minister - coordinates ministries, government and parliamentary business. Specific related departments and agencies are listed below.

Department of Lands and Surveys - This department is responsible for planning, mapping and monitoring of crown land (i.e., where beaches begin and end, high water marks etc.).

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National Emergency Management Agency (NEMA) - NEMA aims to reduce life and property loss in the event of a natural disaster.

Antiquities Monuments and Museum Corporation (AMMC) - The mission of AMMC is “to protect, preserve, and promote the Historic Cultural Resources of The Bahamas, and to be the number one conservation Agency in the world. We will do this while protecting our environment, encouraging research and archaeology, and by protecting, preserving, and promoting our Historical Sites.”

Ministry of Transport and Local Government – “Ministry responsible for matters related to road traffic, port department, and inter-island mailboats, the Bahamas Maritime Authority and Local Government.”

Port Department – “It is headed by a Port Controller, who carries out the daily administrative functions that are enacted under the Port Authorities Act of 1961; the Boat Registration Act of 1961 and the Water Skiing and Motor Boat Control Act, of 1970. Under these Acts, this Department is mandated to:

- Inspection and licensing of boats and boat masters, under the Boat Registration Act, 1961. (commercial registration)
- Salvaging of wrecks
- Control of shipping traffic and the logging of shipping data through radio communications from its Harbour Control Office
- Collection of all revenue from commercial and private docks, mooring, groins, causeway, etc.
- Patrol of the harbor and outlying Cays
Registration of boats under the Water Skiing and Motor Boat Control Act, 1970. (private registration)”

Ministry of Agriculture, Marine Resources and Local Government - The Ministry is responsible for the implementation, monitoring and evaluation of policies related to agricultural lands and marine resources. The Ministry serves as the Management and Scientific Authority for the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in The Bahamas.

Department of Marine Resources (DMR) - DMR is primarily responsible for the administration, management, and development of fisheries in The Bahamas. The department was created to administer, manage, and develop the fisheries sector as stipulated by the Fisheries Resources (Jurisdiction and Conservation) Act. The department is also tasked with enforcement of Fisheries

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Regulations, Marine Mammal Regulations and the Seafood Processing and Inspection Regulations.

Ministry of Public Works - maintains the physical infrastructure and natural environment of The Bahamas by providing quality services to its client agencies.

Department of Public Works - The Department of Public Works maintains public infrastructure inclusive of government buildings, roads, docks, bridges and cemeteries.

Department of Physical Planning - The Department of Physical Planning manages town, physical, country and land use planning, zoning, private roads and subdivisions for New Providence and the Family Islands.

Water and Sewerage Corporation - The Water and Sewerage Corporation is entrusted with managing, maintaining, distributing and developing the water resources of The Bahamas.

Ministry of Environment & Housing - serves to protect, conserve and manage the environment of The Bahamas. This ministry focuses on environmental control, solid waste management, public sanitation and the beautification of public areas such as parks and beaches.

Department of Environmental Planning and Protection – “The functions of the Department are to provide for and ensure the integrated protection of the environment of The Bahamas and ensure the sustainable management of its natural resources.” DEPP is responsible for the evaluation of EIAs and EMPs and managing international environmental conventions.

Department of Environmental Health Services (DEHS) - DEHS manages the disposal of all wastes and management of environmental pollution (on land or in water). This department also promotes planning and approves various measures designed to ensure wise use of the environment.

Forestry Unit - The Forestry Unit’s mandate is “to develop the forest resources of The Bahamas to their maximum potential by applying sound, scientific and sustained yield forest management principles and concepts.”

Bahamas National Trust (BNT) - The mission of the BNT is “Conserving and protecting the natural resources of The Bahamas, through stewardship and education, for present and future generations.”

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Bahamas Public Parks and Public Beaches Authority (see Bahamas Public Parks and Public Beaches Authority Act, 2014)

Ministry of Labour - The Ministry of Labour oversees and regulates labour relations within The Bahamas.

Department of Labour - The Mission of the Department of Labour promotes good industrial relations between employer and employee, while promoting a high level of employment.

8.2 Environmental Laws, Regulations, and Policies

Disaster Preparedness and Response Act, 2006 (Ch. 34A) - “An Act to provide for a more effective organization of the mitigation of, preparedness for, response to and recovery from emergencies and disasters.” This Act contains parts regarding the Director of NEMA, Advisory Committee, policy review and plan; emergency operation centers and shelters; obligations of other public officers; specifically, vulnerable areas; disaster alerts and emergencies; and miscellaneous entries.

Antiquities, Monuments and Museum Act, 1998 (Ch. 51) - “An Act to provide for the preservation, conservation, restoration, documentation, study and presentation of sites and objects of historical, anthropological, archaeological and paleontological interest, to establish a National Museum, and for matters ancillary thereto or connected therewith”, where section 3 speaks to the declaration of a monument by reason of its historical, anthropological, archaeological or paleontological significance.

Ports Authorities Act, 1962 – “An Act to provide for the constitution and appointment of port authorities for New Providence and the Out Islands whereby the various ports and harbours of The Bahamas and the pilots and pilotage thereof and therein may be better regulated and controlled. The Ports Authorities will be responsible for the use of dredgers, tugs, and other vessels operating in the harbor and issuing licenses and certificates.”

Road Traffic Act, 1958 – “An Act to declare, amend and codify the law relating to motor vehicles, and to provide for the regulation of traffic on roads and of motor vehicles; to provide for the establishment of a Road Traffic Authority; to provide for the protection of third parties against risks arising out of the use of motor vehicles; to amend the law with respect to the licensing of motor vehicles plying for hire or reward, and to provide for the regulation of public transport services; and to make provision for matters connected with the matters aforesaid.” Where Part VII speaks Street and Traffic Regulation.

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Road Traffic Regulations, Section 92, 1959 – (further to Sections 2, 3 & 4) with reference to road closures.

Agriculture and Fisheries Act, 1964 - “An Act to provide for the supervision and development of agriculture and fisheries in The Bahamas,” where section 4. The Minister may make rules for all or any of the following purposes, (a) to define areas hereinafter called “protected areas” within which it shall be unlawful for any person except a licensee especially licensed in that behalf to plant, propagate, take, uproot or destroy any species of plant...”.

Fisheries Resources (Jurisdiction and Conservation) Act – “An Act to make provision with respect to the conservation and management of the fishery resources of The Bahamas and to extend the limits of the jurisdiction of The Bahamas over such fishery resources and for matters connected therewith or incidental thereto.”

Buildings Regulation, 1971 (Ch. 200) - “An Act to regulate the construction, alteration and repair of buildings, to provide for the re-instatement or removal of dangerous or dilapidated buildings, to authorize the publication of a building code and for purposes connected therewith.”

Section 2. (c) speaks to the interpretation of ‘building’ including “any dock, bulkhead, pier and any works for the protection of land against encroachment by, or for the recovery of land from, fresh or salt water;” and Section 17 speaks to the Building Code.

Water and Sewerage Corporation Act, 1976 - “An Act to establish a Water and Sewerage Corporation for the grant and control of water rights, the protection of water resources, regulating the extraction, use and supply of water, the disposal of sewage and for connected purposes.” where, section 3 speaks to government control of the production, extraction and use of water in the public interest.

Buildings Regulation (General) Rules, 1971 - (further to Section 19 of Ch. 200) and Section 9 speaks to the execution of permitted works.

Environmental Planning and Protection, 2019 - An Act to establish the department of environmental planning and protection; to provide for the prevention or control of pollution, the regulation of activities, and the administration, conservation and sustainable use of the environment; and for connected purposes.

Environmental Planning and Protection (Extension of Application) Order, 2020– An Order to extend the Environmental Planning and Protection Act, 2019 throughout the territory of The

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Bahamas including every island and cay and to define procedures for proposed projects, monitoring and compliance, and the certificate of environmental clearance.

Environmental Impact Assessment Regulations, 2020 - The Regulations describes the procedure for proposed projects and requirements to apply and receive a Certificate of Environmental Clearance from the Department of Environmental Planning and Protection. Monitoring and compliance is also described in the Regulations.

Bahamas Public Parks and Public Beaches Authority Act, 2014 – An Act to establish the public parks and public beaches authority, to provide for the property rights and liabilities of the public parks and public beaches authority and to identify, regulate, maintain, develop and conserve public parks and public beaches and for connected purposes.” Where section 5 speaks to functions of the Authority.

Environmental Health Service Act, 1987 (Ch. 232)- “An Act to promote the conservation and maintenance of the environment in the interest of health, for proper sanitation in matters of food and drinks and generally, for the provision and control of services, activities and other matters connected therewith or incidental thereto”, where, section 5 speaks to functions of the Department of Environmental Health.

Environmental Health Services (Collection and Disposal of Waste) Regulations, 2004 (Ch. 232) - “These Regulations may be cited as the Environmental Health Services (Collection and Disposal of Waste) Regulations, 2004”, where, section 18 speaks to removal of construction waste and section 19 speaks to industrial waste disposal.

Coast Protection Act, 1968 (Ch. 204) - “An Act to make provision for the protection of the coast against erosion and encroachment by the sea and for purposes connected therewith”, where, section 8 speaks to approval for coastal protection work and section 9 speaks to the excavation of materials that compose of the seashore.

Conservation and Protection of the Physical Landscape of The Bahamas Act, 1997 (Ch. 260)- “An Act to make provision for the conservation and protection of the physical landscape of The Bahamas. The Act contains parts regarding administration, regulation of excavation and landfill operations, provisions governing dangerous excavations, landfill operations, quarries or mines, zoning of The Bahamas for the purposes of quarrying and mining operations, protected trees, and general entries.

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Conservation and Protection of the Physical Landscape of The Bahamas Regulations, 1997 - (further to Section 27 of Ch. 260). The Act contains parts regarding applications, permits and licenses, appeals, fees, offences and penalties.

Forestry Act, 2010 – An Act to provide the conservation and control of forests and for matter related thereto.

Forestry Regulations, 2014 – “5. Application for Permit to harvest protected tree. An application for the grant of a permit under section 12 of the Act to harvest a protected tree, shall be made to the Director and shall contain all the relevant particulars set out in Form No. 3 (A) in the First Schedule including the payment of the prescribed fee as set out in the Second Schedule.”

and

“6. Permit to harvest protected tree. A permit granted under section 11 of the Act to harvest a protected tree shall be made in the manner set out in Form No. 3 (B) in the First Schedule, shall be accompanied by the payment of the prescribed fee as specified in the Second Schedule and shall be valid for six months from the date of the grant unless otherwise prescribed in the permit.”

and

“Construction or modification of road in a forest estate. A person shall not construct or modify a road or trail in a forest estate unless the construction or modification has been authorized by the Director of Forestry in writing, and the road, - a) or trail has been identified in an approved forest management plan; and b) layout has been approved by the Director of Forestry.”

Health and Safety Work Act, 2002 (Ch. 321C) - “An Act to make provisions relating to health and safety at work and for connected purposes.” where, Section 4 speaks to general duties of employers to their employees and where, Section 7 speaks to general duties of employees at work.

Health and Safety at Work (Amendment) Act, 2015 (repeal and replacement of Section 17 of Ch. 321C) Contains parts regarding applications, permits and licenses, appeals, fees, offences and penalties.

8.3 International Conventions

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Stockholm Convention on Persistent Organic Pollutants - “As set out in Article 1, the objective of the Stockholm Convention is to protect human health and the environment from persistent organic pollutants.”

<http://www.pops.int/TheConvention/Overview/tabid/3351/Default.aspx>

Commission on Sustainable Development - “The United Nations Commission on Sustainable Development (CSD) was established by the UN General Assembly in December 1992 to ensure effective follow-up of United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit.”

<https://sustainabledevelopment.un.org/intergovernmental/csd>

Kyoto Protocol - The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding emission reduction targets. The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005.

http://unfccc.int/kyoto_protocol/items/2830.php

Basel Convention on the Control of Transboundary Movement of Hazardous Wastes – “The Basel Convention is a global agreement between countries to protect human health and the environment against the adverse effects of hazardous wastes.” <http://www.basel.int/>

Ramsar Convention on Wetlands – “the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. The Convention was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975.” <https://www.ramsar.org/>

Minamata Convention - “The Minamata Convention on Mercury is a global treaty to protect human health and the environment from the adverse effects of mercury. The Convention draws attention to a global and ubiquitous metal that, while naturally occurring, has broad uses in everyday objects and is released to the atmosphere, soil and water from a variety of sources. Major highlights of the Minamata Convention include a ban on new mercury mines, the phase-out of existing ones, the phase out and phase down of mercury use in a number of products and processes, control measures on emissions to air and on releases to land and water, and the regulation of the informal sector of artisanal and small-scale gold mining. The Convention also addresses interim storage of mercury and its disposal once it becomes waste, sites contaminated by mercury as well as health issues.” <http://www.mercuryconvention.org/>

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9. ENVIRONMENTAL IMPACT ANALYSIS

9.1 Methodology for the EIA

The impact analysis is a critical component of the EIA process, as it evaluates the potential impacts resulting from the interaction between project related activities and the surrounding environment during the construction and operation phase of the project. Impacts are described as changes brought about to the surrounding environment as a result of project related activities. The surrounding environment for this EIA Addendum is inclusive of the physical, biological and socioeconomic environment within the Project’s area of influence.

Identifying the environment that may be impacted was the first step in the impact analysis process. It involved the identification of the habitats and species in the project’s immediate area of impact by consulting the site plan, master plan, and comparing those plans to Harbor Island maps. The previously approved EIA and EMP , and supporting studies for the Phase 2 Area, such as the Topographical Survey and Habitat Assessment Report, were reviewed. A terrestrial survey was conducted within the area of impact in January 2020. Subsequent desktop research was conducted to supplement the information collected during the site visit.

Once the current environment was identified and assessed, the impacts were identified and assessed in [sections 9.2](#) through [9.11](#). Impacts were identified and assessed based on their significance. Significance is a function of the impact’s magnitude and its likelihood as shown in Table 11. The magnitude was determined by the combination of the project activity’s Extent, Duration, Intensity and Likelihood. A summary of impacts related to the Phase 2 Area will be provided in the EMP Addendum. A draft Terms of Reference for the EMP Addendum is shown in [section 11](#).

Table 12. Impact Significance Classification System used to identify and assess impacts.

SIGNIFICANCE			
MAGNITUDE			LIKELIHOOD
Extent	Duration	Intensity	
On Site (O)	Temporary (T)	Negligible (N)	Unlikely (U)
Local (L)	Short-Term (ST)	Low (LW)	Likely (LK)
Regional (R)	Long-Term (LT)	Medium (M)	Definite (D)
National (N)	Permanent (P)	High (H)	

Extent refers to the area and distance influenced by the project activity. Restricted on site to the immediate project area (O), locally within a 10-mile radius (L), regionally to include the island of New Providence (R), and Nationally to include the extent of the Bahamian Archipelago (N).

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Duration reflects the timeframe the project activity will be influencing the project area. The duration of the impact relates to the temporal scale which is required for changes in the host environment to return to baseline conditions or undetectable levels. Temporary (T) impacts persist for a short duration and occur occasionally and/or intermittently. Short Term (ST) impacts are expected to persist for the duration of the project activities related to the construction phase of the Project. Long Term (LT) impacts extend beyond the duration of the construction period and exist throughout the life of the Project. Permanent (P) impacts persist far beyond the life of the Project and are irreversible changes to the host environment due to project related activities.

Intensity The intensity of an impact can be considered as Negligible (N), Low (L), Medium (M) or High (H). A Negligible impact is one which has no detectable change on the host environment. A low intensity impact does not affect the host environment in such a manner to alter natural flows and processes. Medium intensity impacts alter the natural flows and process of the host environment while allowing the flows and process to retain their natural functions. High intensity impacts alter natural flows and processes to the extent where natural functions are totally inhibited for a temporary or permanent period of time.

Likelihood The likelihood of an impact evaluates the likely potential for an impact to occur, with typical rating categories being Unlikely to occur (U), Likely to occur under most conditions (L), and definitely will occur (D).

After the individual impact significance was determined, the Summary Table of Potential Environmental Impacts was prepared in [Section 10](#).

9.2 Land Use Impact

The current land use will be altered by the construction and development of the Project. Indiscriminate dumping as has been practiced by the local community throughout the site and in the former landing strip area will not be permitted. This is a general benefit for the community and the environment as it removes the amount of debris that can harbor nuisance species such as rodents and mosquitoes. Coconut harvesting on the property near the Pink Sands Beach in the Coastal Coppice Habitat will be permitted occasionally with permission from the developer. Vehicles parked along the northern property boundary will no longer be permitted to park on site and will be temporarily relocated while the Utility Corridor is constructed. Property owners neighboring the property will be notified before construction begins to allow sufficient time for other arrangements to be made for their vehicles.

There was evidence of fishing on site near the south west corner of the property. With the installation of the floating dock this area will no longer be accessible for fishing.

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9.3 Aesthetic Impact

Removing debris from the site and replacing invasive species with native vegetation will have a positive impact on the site.

Native vegetation screens will be used where possible in the landscaping design of the property to maintain the aesthetics on the site. Native vegetation screens have a demonstrated ability to lessen visual impact of buildings²⁶. Additionally, the green spaces included in the landscaping design will include native vegetation that will act as a biological corridor for avian species known to utilize the area.

9.4 Impacts to Physical Environment

9.4.1 Erosion and Sediment Impact

Removing foliage and land clearing during construction will expose the top soil which may lead to elevated rates of erosion. Plants act as a natural barrier to reduce the rate of erosion by slowing down surface water movement. If they are removed, surface water could wash the top soil away. The area along the northern boundary of the property will be cleared in preparation of the installation of the utility corridor and the area along the former landing strip will be cleared for the construction laydown area. Both areas slope gently towards Dunmore Harbour and are directly connected to the Harbour. Should erosion increase, the sedimentation in Dunmore Harbour may increase as the soil washes into the Harbour.

To prevent increased erosion and sedimentation, industry standard protocol for prevention of soil erosion and stabilization will be followed. The proposed riprap design in the original EIA along the rocky shoreline may be extended south along the coast. The riprap will also function as a planter for red mangroves. Once the habitat is established, the riprap will also trap sediment moving from land to sea and provide habitat for seabirds and marine life.

9.4.2 Beach Impact

The Pink Sands Beach on Harbour Island will benefit from the development because the invasive species presently eroding the dune will be removed and replaced with native dune stabilizing vegetation. The native vegetation on the dune will contribute to the habitat of avian species known to utilize this area of the property.

9.4.3 Hydrological Impact

Without the use of the proposed erosion control methods, removal of vegetation during construction may reduce the rate of groundwater recharge on site during rain events, and increase the likelihood of surface runoff into other areas on and offsite.

²⁶ Velarde, J., 2019. 'Using Native Vegetation Screens to Lessen the Visual Impact of Rural Buildings in the Sierras de Béjar and Francia Biosphere Reserve: Case Studies and Public Survey". doi:10.3390/su11092595

The crushed aggregate roadways and landscaping utilized in the project will allow surface water to percolate into the ground. Surface water will be collected within site drainage systems

The floating dock will reduce the amount of available sunlight on photosynthesizing species but will not completely shade the species within the area of impact. As the sun moves throughout the day and the angle of sunlight changes, some sunlight will be available for these species. This impact will be negligible.

9.4.4 Air Quality Impacts

Air quality may be impacted during construction but it is not anticipated that air quality will be significantly impacted during operation.

Dust suppression on site will be used to mitigate impact of increased dust production on site during construction. The site will be watered as needed.

9.4.5 Noise Impacts

A few occupied homes and businesses line the northern and southern boundary of the project site. As a result, construction noise will be a negative, though temporary impact, in the community. During operations noise impacts may result from the BOH processes including the generator operation.

Hospital grade hush kit enclosures installed on the standby generators coupled with a sound barrier wall and dense landscape planting will mitigate most of the sound associated with BOH processes.

9.5 Biological Impacts

9.5.1 Habitat Fragmentation

The white crowned pigeon is the main species of interest observed in the area that may be impacted negatively by habitat fragmentation. Their population is decreasing in trend due to habitat loss. All About Birds by The Cornell Lab state, “Loss of breeding and feeding habitats remain a concern throughout the range of the species.”²⁷

To reduce the habitat fragmentation impact on this species, common foraging plants used by the species will be included in the landscape design of the property in the green space areas shown in the site plan to create a biological corridor. Some examples of trees commonly used by the white crown pigeon is Pigeon Plum (*Coccoloba diversifolia*), Gum Elemi (*Bursera simaruba*), Mastic (*Sideroxylon foetidissimum*), small figs and bolly fruits²⁸.

²⁷ https://www.allaboutbirds.org/guide/White-crowned_Pigeon/lifehistory#

²⁸ <https://bnt.bs/wp-content/uploads/2019/06/whitecrownedpigeon.pdf>

9.5.2 Habitat Loss and Degradation Impact

Land clearing required for the construction of the project will lead to a negative impact on all of the habitats described in [section 7](#). The net impact on the beach habitat will be positive as the invasive species will be replaced with native vegetation that will help rebuild and maintain the dune.

Natural vegetation will be incorporated in the landscaping design of the site. Native vegetation is adapted to the conditions of the island and will require less maintenance and water. This landscaping will also include the protected trees on site. If it is necessary to remove the protected trees from the site, the developer is committed to relocation the species in accordance with the Department of Environmental Planning and Protection and Department of Forestry requirements.

9.5.3 Impacts to Special Ecological Features and Biodiversity

Protected species of Lignum vitae and Narrow Leaved Bolly identified onsite will be incorporated into the site design and highlighted as specimen trees. In the event the removal of any protected species is required, it will be executed in conjunction with the Department of Forestry by way of obtaining a Protected Tree Removal Permit.

The removal of invasive Casuarina and Scaevola from the dune system will aid in preserving this important ecological feature on the property resulting in a net positive benefit to the environment.

9.5.4 Wildlife Impacts

Bird populations which utilize the project site include the White Crown Pigeon, which feed heavily on the fruits of Gum Elemi, Poison Wood and Pigeon Plum trees found on the property. The broadleaf coppice habitat on the project site is important to local bird populations, as this habitat type is reducing on the island. Efforts to maintain areas of coppice forest onsite will assist in sustaining food supplies for bird populations visiting and resident to the project site. Green space as indicated in Appendix I will act as a biological corridor for the White Crown Pigeon and other avian species identified in the Avian Survey Report.

9.6 Fire, Flood and Hurricane Risk

Fire

A fire break will be maintained inclusive of the old airstrip and the roads surrounding the property to reduce the potential for fire to impact the property and adjacent areas. The removal of trash and litter dumped along the old airstrip will reduce the risk of volatile and flammable materials from combusting onsite.

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Flood

Coastal areas on the site are at higher risk of flooding during storm surge events, whereas areas interior to the property are better sheltered and have a higher topography. The rip rap shoreline and mangrove buffer will reduce wave energy during storm events and aide in protecting coastal areas on the property.

Hurricanes

The site will be exposed to hurricanes annually during the hurricane season. Hurricane resistant building material and techniques will be used during construction where possible. The hurricane preparedness plan will be described in the EMP.

9.7 Solid, Liquid & Hazardous Waste Impact

There will be increased solid and liquid waste during construction and operation of the project. Waste will be increased as the land is cleared of debris and vegetation in the initial construction steps. This waste, mostly made up of plant materials, will be ground up with the on-site “chipper” to the extent possible for use as mulch and to reduce the volume of materials going to the landfill.

Solid waste will continue to increase as construction gains momentum. To prevent the accumulation of waste on site, waste will be collected regularly and transported via barge to the North Eleuthera dump site. Additionally, all contractors will be instructed to use waste minimization during the construction of the project by recycling, reusing or repurposing materials where possible.

9.8 Energy Impacts

Increased electrical demand on the Bahamas Power and Light local station is anticipated. According to anecdotal evidence the island experiences power outages at random intervals. Increasing the demand on the power supply may lead to increased occurrences of power outages. To maintain power supply of the property during operation, the Developer will install standby generators on property.

To help alleviate the demand on the local power station during resort operation, LED bulbs will be installed throughout the property, timed sensors on outdoor lighting will be installed, and lighting used in landscaping will be mostly solar powered. Further, solar hot water heaters will be used for all residential areas. Programmable Thermostats with internet interface will be used in all residential areas to control temperatures in unoccupied rooms/spaces to prevent wastage of electricity.

9.9 Water and Wastewater Impact

During construction there will be an increase in demand on the Water and Sewerage Corporation (WSC) initially as the site will need to be watered to help with dust suppression. However, as the

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standby RO system comes on-stream the demand on the WSC system will be reduced. An onsite sanitary sewer system will manage the wastewater on site during operation.

Native vegetation adapted to the arid climate on Harbour Island will be used during landscaping, where possible, to help reduce the demand.

9.10 Socioeconomic Impact

The proposed development will provide jobs for residents on the island. One hundred fifty (150) plus jobs will be created during construction and seventy-two (72) to seventy-five (75) full time positions once operational. The Owner also intends to create a training program to enhance the existing skills of the staff employed and to benefit the community at large.

9.11 Cultural Impacts

9.11.1 Community Service Impacts

The Developer has committed to supporting local nonprofits working in the Harbour Island community in the amount of \$100,000.00 US per year over a five (5) year period. In addition, the Developer has committed \$100,000 to Briland Aid (a non-profit which has employed local youth to clean the island during the COVID-19 pandemic), and has made the former airstrip available to Briland Aid.

In addition, after Hurricane Dorian hit The Bahamas, the Developer donated over three hundred (300) large construction trash bags, three hundred (300) pairs of gloves, one hundred and five (105) rolls of duct tape and one hundred twenty (120) large tote bags to the community to aid in clean up. Further, with the COVID-19 crisis fully in force in The Bahamas, but in particular in Harbour Island, the Developer was made aware of the potential for food poverty as many residents are out of work due to the closing of restaurants, bars and hotels which are the main source of employment on Harbour Island and has donated a large quantity of non-perishable food stuffs to the island to be distributed by the Faith leaders on Harbour Island.

9.11.2 Recreational Impacts

During construction recreation impacts will be negative as the former landing strip area will be closed for use as the construction lay down area. This area is currently used to access Dunmore Harbour where evidence of fishing was observed. During operation, the Project will have a net positive benefit on the recreational activities on the island. While the project includes amenities for its residents and visitors, it is likely they will also patronize local businesses.

9.11.3 Transportation Impacts

Residents may perceive an increase in traffic during construction and operation. During construction heavy equipment and increased shipping will be required. Another perception may be that during operation an increase in visitors and residents on the island may lead to traffic congestion.

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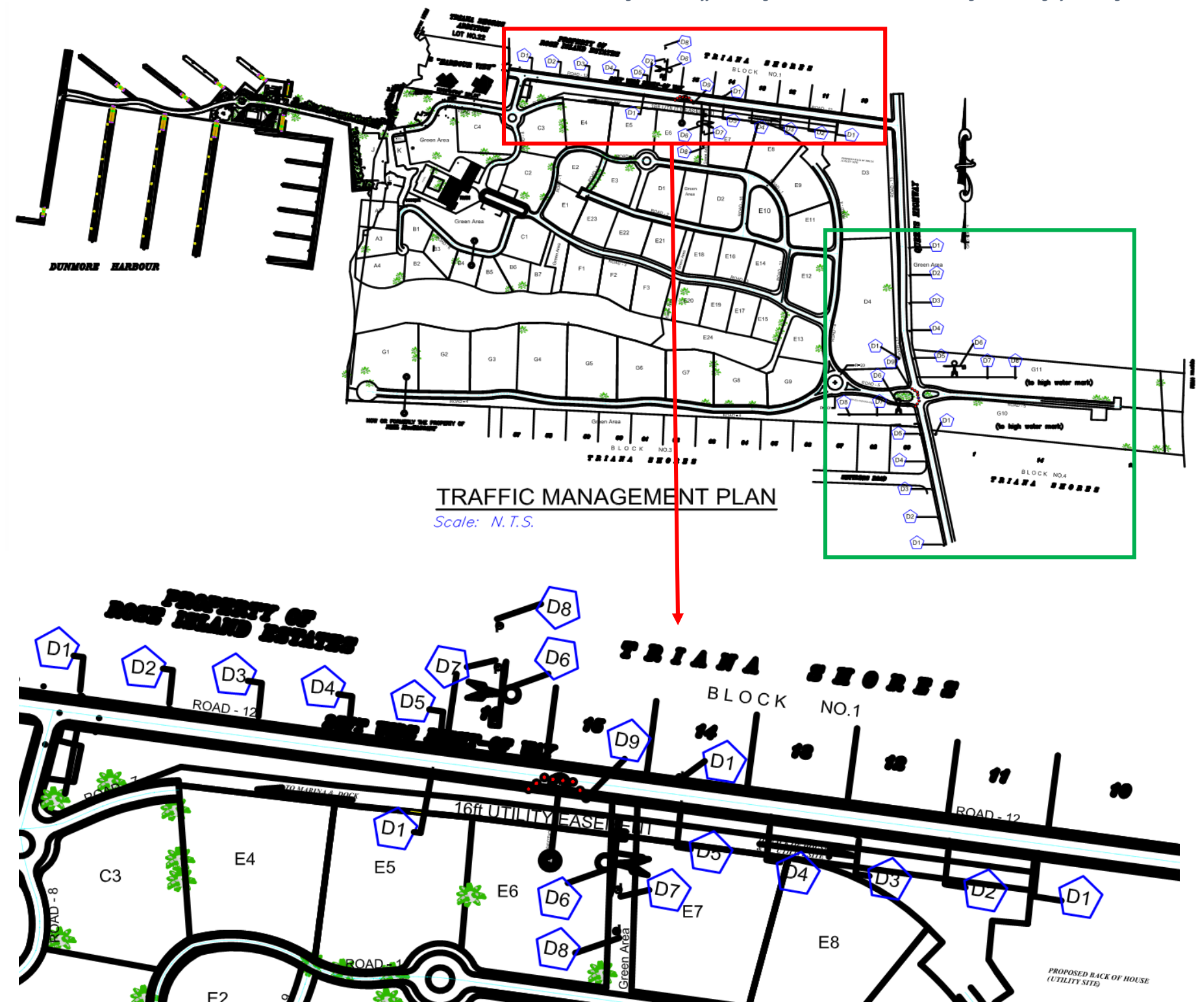
EIA Addendum · 4M Harbour Island Project · 22 February 2021

To mitigate the impact of increased construction and shipping traffic, the Developer has worked with the shipping company to “land” the supplies, materials and equipment directly to the site as permitted by the local authorities. The government dock will continue to operate without impediment of increased demand related to the construction of the project. Harbour Island is golf cart community and the development will strongly encourage the use of golf carts during operation therefore mitigating negative impacts related to increased transportation on island. A Traffic Impact Study was conducted and the results are included in the original EMP. A Traffic Management Plan is shown on the following pages.

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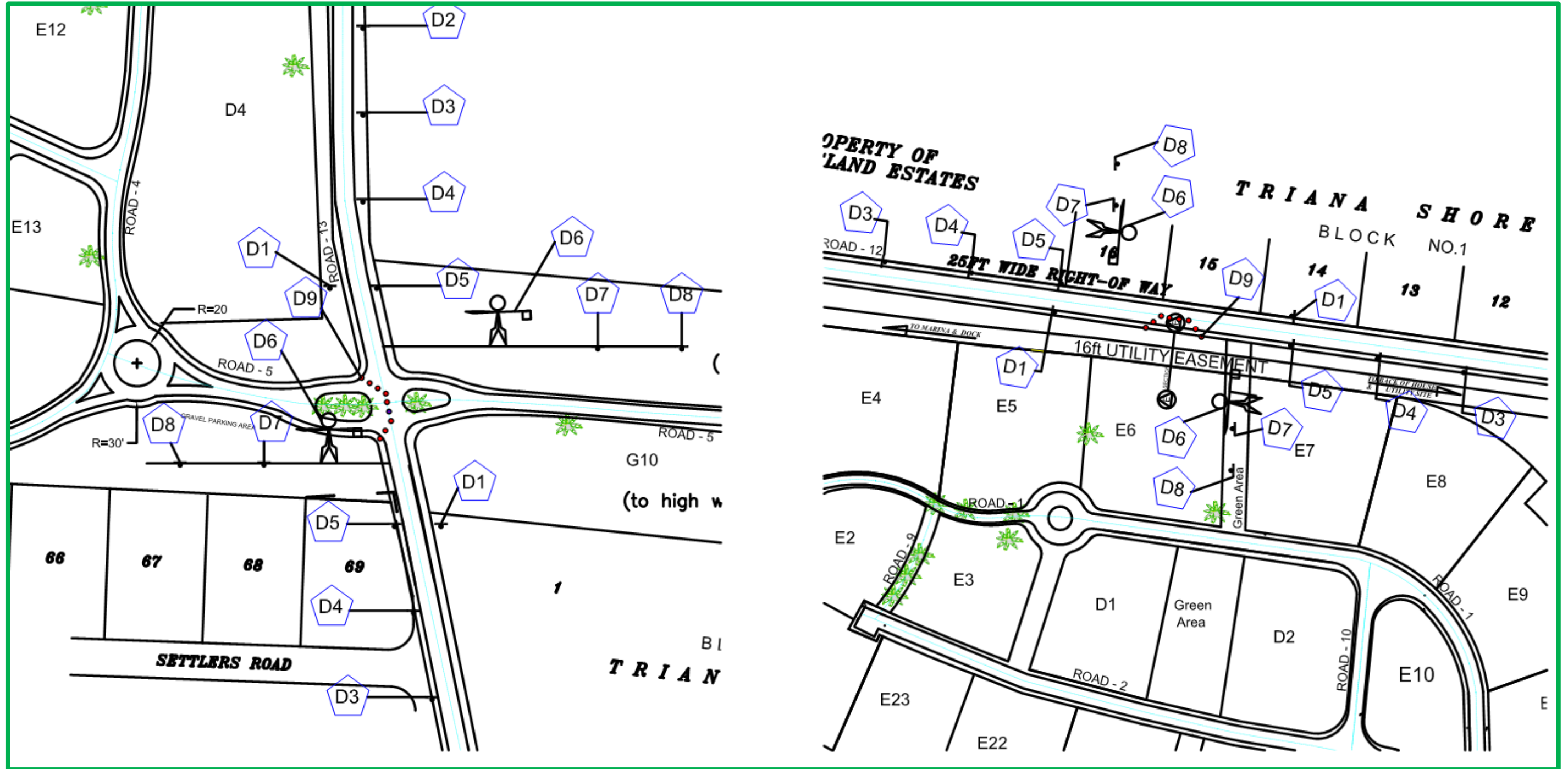
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Figure 38. Traffic Management Plan. The area shown in green is magnified in Figure 39.



- | | | | |
|---|--|---|--|
| | | | |
| D-1: "WORKFORCE IN ROAD SLOW" SIGN
T.S.M. CH. 8 Pt. 1 (7001,3) | D-1: "ROAD WORKS" SIGN
T.S.M. CH. 8 Pt. 1 (7001) | D-2: "TRAFFIC CONTROL AHEAD" SIGN
T.S.M. CH. 8 Pt. 1 (7010,1) | |
| | | | |
| D-6: SIGN MAN
T.S.M. CH. 8 Pt. 1 (554) | D-7: STOP SIGN
T.S.M. CH. 8 Pt. 1 (7023) | D-8: GO SIGN
T.S.M. CH. 8 Pt. 1 (7024) | D-9: TRAFFIC CONES
T.S.M. CH. 8 Pt. 1 (554) |
| | | | |
| D-3: "ROAD NARROWS" SIGN
T.S.M. CH. 8 Pt. 1 (517) | D-4: "MAXIMUM SPEED LIMIT IN MILES PER HOUR"
T.S.M. CH. 8 Pt. 1 (670) | D-5: "WHEN STOP SIGN SHOWS WAIT HERE" SIGN
T.S.M. CH. 8 Pt. 1 (7011) | |
| | | | |
| D-10: "TURN LEFT/RIGHT" SIGN
T.S.M. CH. 8 Pt. 1 (606) | D-11: "ROAD NARROWS" SIGN
T.S.M. CH. 8 Pt. 1 (516) | D-11: "FLOOD" SIGN
T.S.M. CH. 8 Pt. 1 (554) | D-12: "PRIORITY" SIGN
(GIVE WAY TO ONCOMING VEHICLES)
T.S.M. CH. 8 Pt. 1 (615) |

Figure 39. Traffic Management Plan



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10. SUMMARY TABLE OF POTENTIAL ENVIRONMENTAL IMPACTS

Impacting Factor	Aspect															
	Physical					Biological					Soc-Econ			Cultural		
	Hydrological	Air Quality	Noise	Erosion & Sedimentation	Beach	Terrestrial Habitats	Birds	Terrestrial Flora	Marine Resources	Neighboring Communities	Relocation	Traffic	Economic	Archaeological, Historic & Paleontological Resources	Hunting	Fishing
Land Clearing		Minor	Moderate	Moderate	Minor	Severe	Severe	Severe		Minor	Minor	Minor			Minor	Minor
Invasive Species Removal					Beneficial	Beneficial	Beneficial									
Laydown Area Setup		Minor	Minor	Minor												
Solid Waste Collection					Beneficial	Beneficial	Beneficial		Minor			Beneficial				
Building Foundation and Pool Excavation			Moderate	Minor		Severe	Moderate	Severe								
Roads & Drain Construction			Moderate			Moderate	Moderate	Moderate		Beneficial						
Dock Installation (New Seabed Lease site)			Minor						Minor	Moderate		Beneficial				Severe
Green Space & Landscaping (Biological Corridor)		Minor	Minor			Minor	Beneficial	Beneficial		Minor	Moderate				Minor	
Solid Waste Disposal		Moderate				Beneficial			Beneficial	Minor						
Liquid & Hazardous Waste																
Discharges & Emissions		Moderate	Moderate							Moderate						
Noise							Minor			Moderate						

IMPACT SIGNIFICANCE KEY				
NEGLIGIBLE/NONE	MINOR	MODERATE	SEVERE	BENEFICIAL