Environmental Impact Assessment

South Dock Port Redevelopment
Providenciales Phase 1 and 2
Tender Reference Number TR 21/24
Contract Number TCIG 22/2020

Island Site Development

Island Site Development
Turks and Caicos Islands

September 2023

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1.0 Introduction and Overview

The Turks and Caicos Islands' Ports Authority (TCIPA) is proposing a major redevelopment and upgrading of the existing South Dock Port facility. Proposed upgrades include dredging the port approach and creating a 230-foot (ft) diameter turning basin to accommodate vessels with drafts up to 18 feet for the South Dock area in addition to upgrades of the dock facilities and upland infrastructure.

In March 2017, an Environmental Impact Assessment (EIA) for the conceptual plan was submitted to and approved by the Department of Environmental and Coastal Resources (DECR) and the Department of Planning (DoP). This study is included as Appendix A. This updated 2023 EIA is undertaken to address modifications to the plan within the current design, account for current site environmental conditions and provide additional information regarding means and methods of construction, project mitigation and a project specific Environmental Management Plan (EMP). This EIA provides an update to the approved 2017 study based on the revised Terms of Reference (ToR) outline (see Appendix B). The bulk of this 2023 EIA makes reference to the approved 2017 EIA version supplemented with new information based upon additional and recent studies and field investigations.

This study confirms the general environmental conditions identified within the 2017 study and the recommendations provided. The one major modification that has been adopted in this study is the use of hydraulic dredging as the primary means of excavation. The original 2017 plan proposed mechanical excavation, though the 2017 EIA study recommended consideration of hydraulic dredging to reduce project impacts. This recommendation has been adopted as the proposed method of excavation consistent with the 2017 recommendation. This change in construction represents a reduction in potential project environmental impacts.

1.1 Non-Technical Summary

The project is geographically located along the coast on the south side of Providenciales. Given the fact that South Dock is an active and busy port, the terrestrial and marine environments have already been exposed to anthropogenic impacts. The existing environmental baseline is consistent with the conditions described within the previously approved March 2017 EIA. It has been revised and supplemented with recent June 2023 field surveys.

In general, potential impacts will be primarily marine-related and occur during the construction and operational phases. As this is an active port facility, impacts will be similar to those that have already occurred due to initial port construction and current operational phases. Mitigations for impact to marine resources are proposed. An EMP has been developed, that includes the implementation of measures to minimize project impacts and includes monitoring. The 2017 EIA report summarizes potential construction impacts and impacts due to daily operations, as well as avoidance and recommended mitigation measures. These are echoed in this 2023 EIA report.

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Study Location:

South Dock Port facility, The Turks and Caicos Islands

Submittal Version:

Version 1. Submittal to the Department of Planning; September 2023

1.2 Project Description

This project is generally consistent with the Scope of Work described in the 2017 EIA with slight modifications. This includes dredging the port approach channel and port basin, installing new

(extended) dock piles and fenders, and constructing a rock revetment. Topside modifications include improvements to the size/capacity and traffic flow of the port yard to accommodate cargo.

1.3 Aims and Objectives of the Assessment

This project aims to improve the accessibility and therefore capacity of the South Dock Port facilities on the south side of Providenciales, Turks and Caicos Islands (TCI). This is accomplished by design and infrastructure improvements to expand and refine the yard and basin. This document is meant to assess terrestrial and marine impacts and provide protocols to avoid, minimize and mitigate for project impacts. The bulk of this 2023 EIA document significantly references the 2017 EIA (submitted and approved) and supplemented with the most current surveys from 2023. Additional detail is provided regarding the means and methods of construction consistent with the proposed plan.

1.4 Overview of the EIA

The proposed development is generally consistent within the 2017 EIA. Modifications include: port and yard improvements related to dredging, dock and berthing, wave protection, and cargo storage and efficiency. The EIAs are in response to the ToRs provided by the DoP and DECR to assess the planned development, take baseline environmental inventory, identify terrestrial and marine areas that may be impacted, and propose a strategy (proactive and reactive) to address any impacts. It is reasonable to assume that potential environmental impacts resulting from the operational phase would be similar to existing ones that have already been realized. Furthermore, impacts to socio-economic and culture would be limited since the port's utilization is maintained: The modifications do not change the port's use.

1.5 Impact Assessment Methods/Analyses

Methods for the assessment of terrestrial and marine habitats has been discussed in the 2017 EIA; this EIA follows the same methods and analyses. Recent (June 2023) terrestrial and marine field surveys have been conducted that confirm, supplement, and refine the 2017 EIA observations.

Terrestrial field studies were conducted in-person and onsite from June 26 – 30, 2023 and used standard and professionally accepted sampling plans and documentation procedures. The terrestrial surveys included an overall survey of the project area with dedicated transects to

document type and number of species. The area included the South Dock Port facility and the direct dock and yard. Flora and fauna were surveyed, classified, and recorded.

Marine environmental surveys were carried out on June 26 – 30, 2023 of the South Dock facility. The area was surveyed via snorkeling using photo quadrats ranging from the basin along shore-perpendicular transects outward to 300 meters (m) or more from the proposed construction.

Geotechnical investigations were carried out under the 2017 EIA effort, the results from which can be found in the original document. Additional geotechnical investigations were carried out in 2022. Samples were collected by Bron TCI Ltd. and sent to Golder Associates Inc. for analysis. The report provided in Appendix C provides Golder's interpretation of drilling logs and samples provided by Bron TCI Ltd. as well as conclusions and recommendations related to landside works, dredging, and wharf improvements.

2.0 Baseline Studies

2.1 Historical Overview of the Site and Existing Development

The 2017 EIA provides a review of the historical data and the existing development. The most pressing issue to South Dock is that access has been limited due to siltation and debris (via accidental offloading from dockside ships). Maintenance dredging is needed not only to re-establish the needed draft, but also deepen it for the expected deeper draft ships. Therefore, a depth of -4.8 m (sea level) is needed.

2.2 Physical Environmental Baseline Assessment

2.2.1 Coastal areas to be affected by the proposed development. The areas within reasonable distance (not less than 300 feet) should be assessed and characterized.

During the field investigations carried out in June 2023, terrestrial flora was investigated within the port facility and adjacent uplands. Within the marine environment, investigations were conducted in accessible areas and covered beyond the project footprint a minimum of 300 feet to assess direct and potentially indirect impacts.

2.2.2 Include a bathymetric survey from at least 2018 onwards of the proposed area to be developed or affected with the proposed development

Topographic and bathymetric surveys were carried out in 2016 as part of the original EIA effort (Figure 2-1). The bathymetric survey was carried out to meet/exceed the USACE standard and the raw data can be found as an appendix of the original EIA.

2.2.3 Comment on Geology and Geomorphology of Area to be affected

The Turks and Caicos Banks are interpreted to overlie continental crust that was rifted from the North American continental land mass after it separated from northwest Africa during the breakup of Pangea in the Triassic (Pindell, 1993). The Triassic sedimentary and volcanic section and earlier continental crust are interpreted to be buried beneath a cover of Jurassic, Cretaceous and Tertiary carbonate sediments.

Remains from the continental drift are buried under hundreds of metres of limestone rock that has been formed by the decomposition of skeletal remains from marine organisms and precipitation of calcium carbonate material. Precipitation is the process in which, under the right conditions, dissolved minerals in the sea water are deposited to form small particles called ooids. Ooids then

cement together to form oolite rock, which makes up most of the Turks and Caicos area. Additional rock was formed by the fossilized remains of plankton, algae, coral, shellfish, and the waste pellets of flat fish.

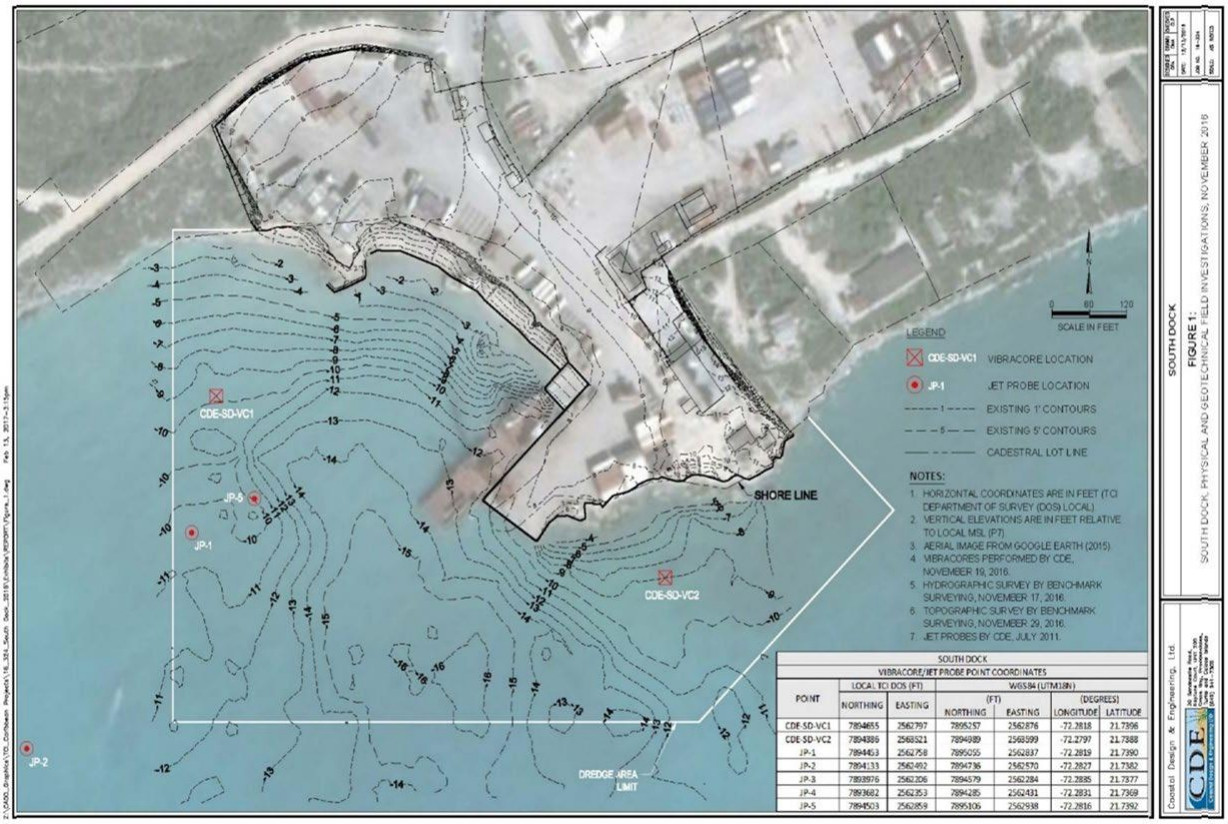


Figure 2-1. Contour Map of the Port

Caves are present on all the islands. These are formed when slightly acidic water dissolves the limestone. The caves on Middle Caicos form the largest cave network in the Lucayan Archipelago. These caves are ideal habitats for wildlife and were used by the Lucayans (original inhabitants), for whom they had religious significance. For a short while there was a guano industry, where bat droppings were collected for use in the production of fertilizer.

The porous nature of the limestone means it does not hold water well. As a result, fresh water is difficult to find and occurs where rainwater has accumulated and floats on the denser saltwater table. There are several natural wells on the Turks and Caicos Islands, but locals mainly rely on collecting rainwater. Recently, this has been done through collecting rain runoff from the roofs into large storage tanks.

The geology of the project site is predominantly composed of Pleistocene Limestone and Holocene Sands. Beyond the project footprint, the limestone outcrops as surface layers of a dark brown hardpacked sediment and weathered beach sands cap rocks.

2.2.4 Marine Substrate, Sediment Analysis in Dredge Area Supplementing Data Collected in 2017.

As can be seen in the 2017 EIA, surface and subsurface sediment samples were collected via vibracores. Figures 46 through 47 and Tables 5 and 6 from that report show the samples and the analyses. In summary, the results show the sediment is physically made up from white silty-sand with gravel and shell with some rock. The latter composes about 2-30% of the sediment, while silts were about 7-22% of the sample.

2.2.5 Climate and Meteorology

Precipitation, temperature, and winds are described in the 2017 EIA report. In summary, the climate of the TCI is tropical, with a year-round average temperature of 26.1° Celsius (C) (79° Fahrenheit) and typically varies between 21.6° C (71° Fahrenheit) and 31.7° C (89° Fahrenheit) . This resulted in a heat index ranging between 60-90%.

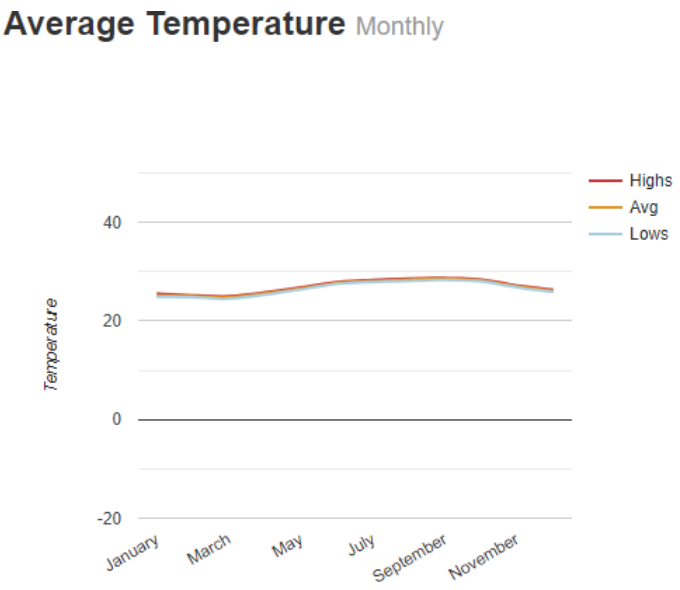


Figure 2-2. Average Monthly Temperature

The wettest months tend to occur in late summer and early autumn, and the driest months occur in the winter with an average annual precipitation of 762 mm (30 in).

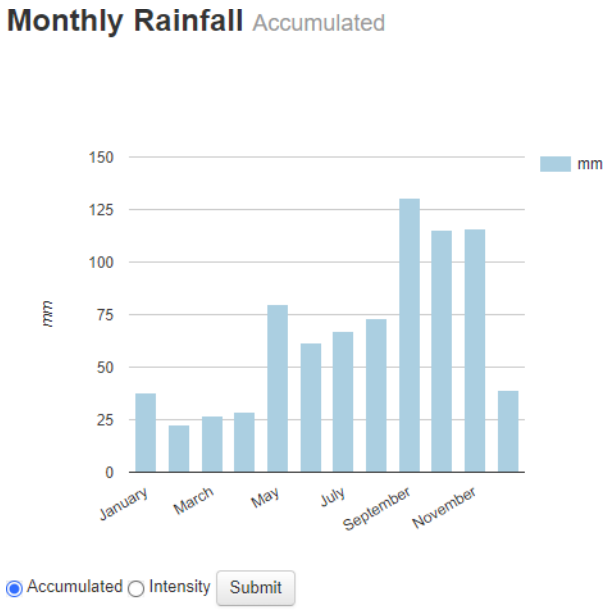
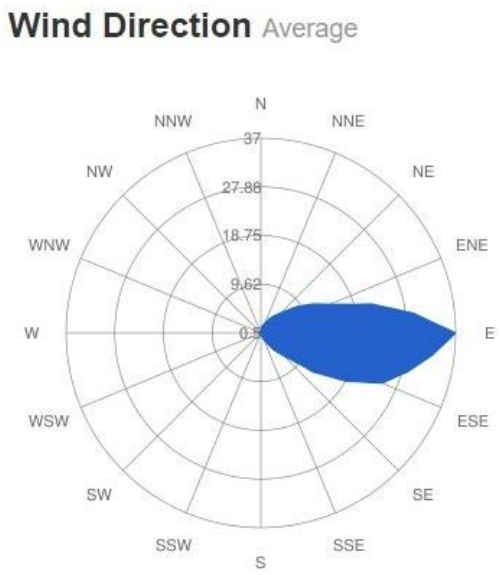


Figure 2-3. Accumulated Monthly Rainfall

Winds are most frequent from the east and have an average speed of 10.7 mph based on data from between 2011-2016. Hurricanes and tropical storms may occur typically between July and November.

Winds – Winds during the typical meteorological year are predominantly from the east to east-southeast but range from northeast to southeast 89% of the time. Wind from all other directions can also be observed and are usually the result of frontal or tropical storm systems.



Source for graphs: https://wisuki.com/statistics/936/long-bay

Figure 2-4. Average Wind Direction

2.2.6 Hydrology - occurrence, distribution, connectivity, movement and quantify of water within the property, (as applicable)

There are currently no water resources of note within the upland property. Infrastructure improvements to stormwater management and treatment are proposed within the site redevelopment with a design goal of no net discharge of upland stormwater to the marine environment. Site stormwater will be managed through site storage and deep well injection as required to meet this design goal. Given the impervious nature of the site, stormwater cannot penetrate and drain into the existing substrate. Therefore, grading will be applied to strategically direct stormwater away from the lot and towards the perimeter; flows will be directed away from the ship turning basin. By directing the flows towards the land, water can soak into the soil or be further directed to a catchment and if necessary deep well injection.

2.3 Biological Environmental Baseline Assessment

Environmental baseline assessments of the landside and marine environments surrounding the port were conducted between June 26 – 30, 2023. Terrestrial environments were heavily impacted by port operations but were assessed and documented. Within the marine environment, conditions were complicated by poor visibility and continuous port operations. Marine

environments were impacted by port operations, specifically prop-wash scouring and prop scars. The locations sites for both terrestrial and marine sites are shown on Figure 2-5.

Figure 2-5. Investigation Sites

2.3.1 Baseline Marine Environment

In the marine environment, a series of roughly shore-perpendicular transects were conducted. A diver was towed between locations and photo documentation was carried out at a series of plots along each transect. Photos of a half-meter-square quadrat were taken at each location. Access to areas around the dock and to the east of the port were limited due to ships at port and fuel being offloaded.

The marine habitats were assessed and found to closely match the habitats described in the 2017 EIA conducted by others. The marine environment consisted of primarily sand and coral rubble within the port and the tuning basin with little to no macro algae cover on the rubble. Outside the port and turning basin, the marine environment consisted of submerged aquatic vegetation (SAV).

Within the marine environments, there were four distinctly different habitats (Figure 2-6).

- Seagrass dominant SAV – Seagrasses vary in coverage varying between 15 and 25% with macroalgae coverage varying between 7 and 12%.
- Macroalgae dominant SAV – Macroalgae coverage is approximately 25% with seagrass coverage of approximately 6%
- Sand and Coral Rubble, with macroalgae – Mix of mostly sand with coral rubble. Macroalgae is found on the coral rubble, with no rooted macroalgae.
- Barren Sand – This area is found within the closest areas within the port and largely due to the constant movement of water from prop-wash during the manoeuvring of vessels inside the port.

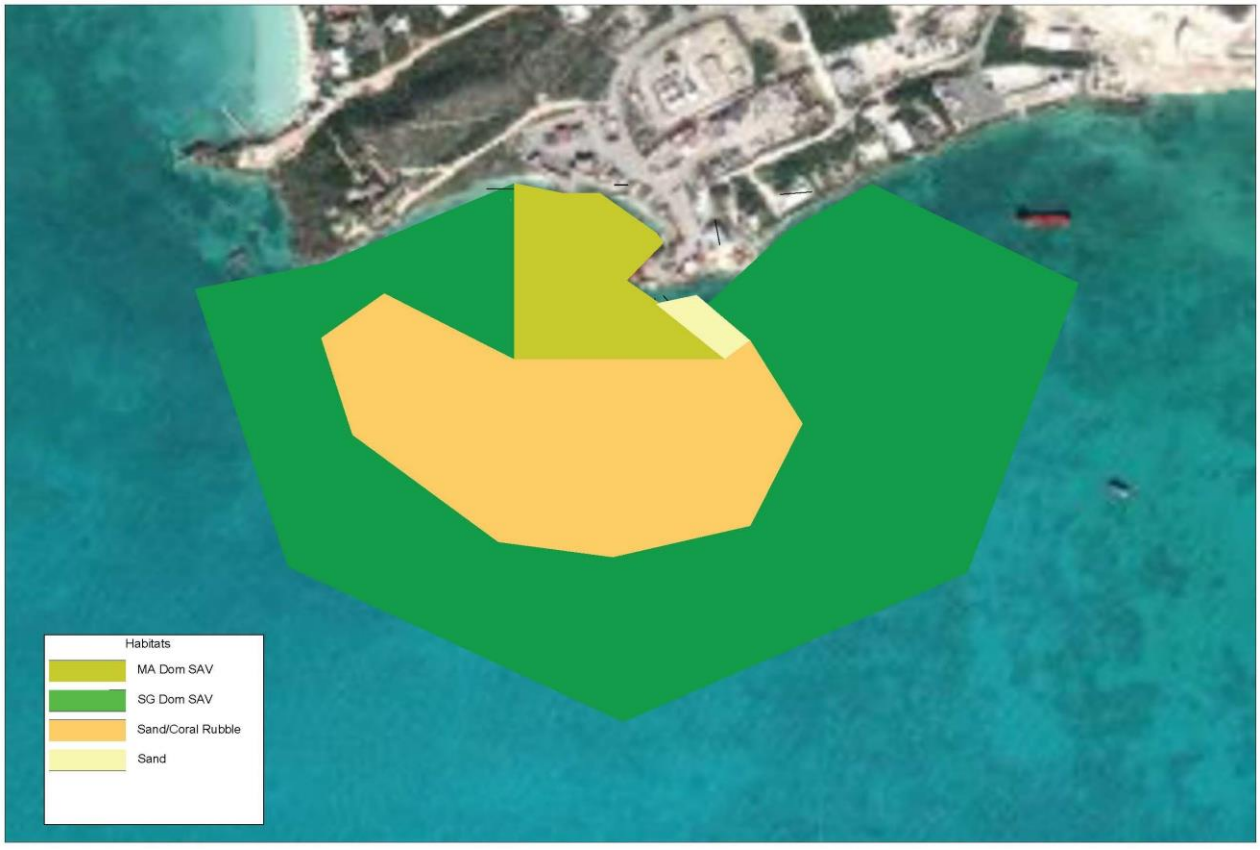


Figure 2-6. Habitat Map

Besides these main areas, a limited assessment of the bulkhead and dock was conducted during the small amount of time vessels were not in port. Along the vertical structures, corals of varying size were found, mostly lesser starlet corals and mustard hill corals.

Seagrass Dominant SAV

The largest habitat identified is seagrass dominant SAV consisting of approximately 6.5 acres of the surveyed area in the outermost portion surrounding the port. This area has seagrass densities ranging from 15% to 25% and macroalgae densities ranging from 7% to 12%.

Three species of seagrasses were identified within the project assessment area. *Thalassia testudinum*, or more commonly known as turtle grass, was the most abundant and found throughout the assessment area. *Halodule beaudettei* (aka *H. wrightii*) or Shoal grass was found more frequently in the nearshore environments while *Syringodium filiforme* or manatee grass was found more frequently in the offshore extent of the assessment area.

A small section of this habitat will be directly impacted by the planned port expansion from the dredging and the creation of the Phase 1 Wharf. In total, 0.2 acre will be directly impacted, the remaining 6.3 acres has the potential to be secondarily impacted from sedimentation and turbidity.

Photo 2-1. Seagrass with Macroalgae

Macroalgae Dominant SAV

Within the port, the primary habitat is macroalgae dominant SAV and is estimated to be approximately 0.7 acre in size. The macroalgae can be rooted or attached to rubble. The macroalgae averages 25% with seagrass averaging 6% within this habitat.

This area is the most heavily impacted by the proposed expansion. Dredging and wharf construction will result in direct impacts of approximately 0.6 acre.

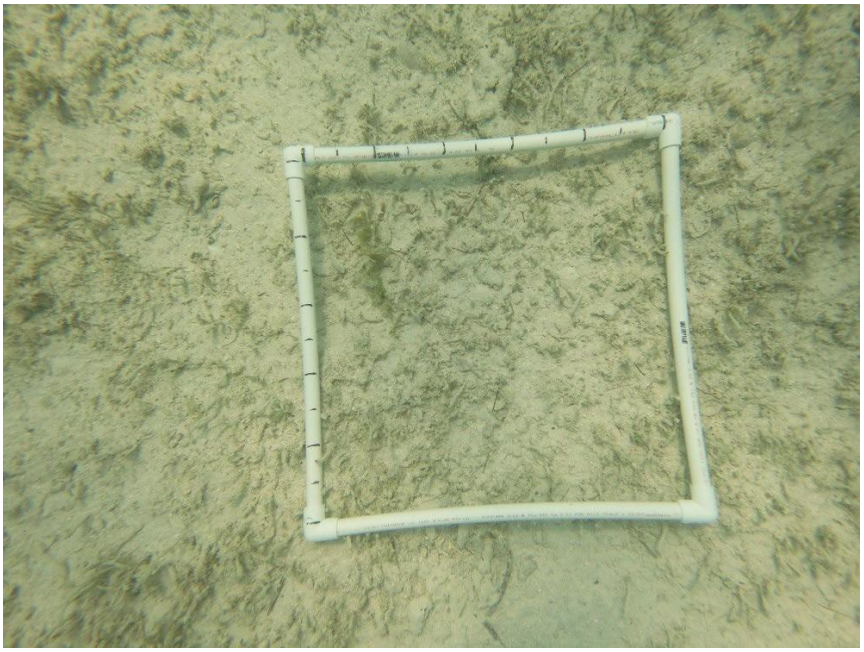


Photo 2-2. Macroalgae Dominant SAV

Sand/Coral Rubble with Macroalgae

Offshore of the port, in the center of the assessed area, is approximately 2.4 acres of sand mixed with coral rubble. Macroalgae coverage is found growing on hard surfaces of coral rubble. Coverage is estimated to be approximately 15%.

Impacts to this are estimated to be approximately 0.8 acre resulting from dredging and breakwater construction.

Photo 2-3. Sand with coral rubble

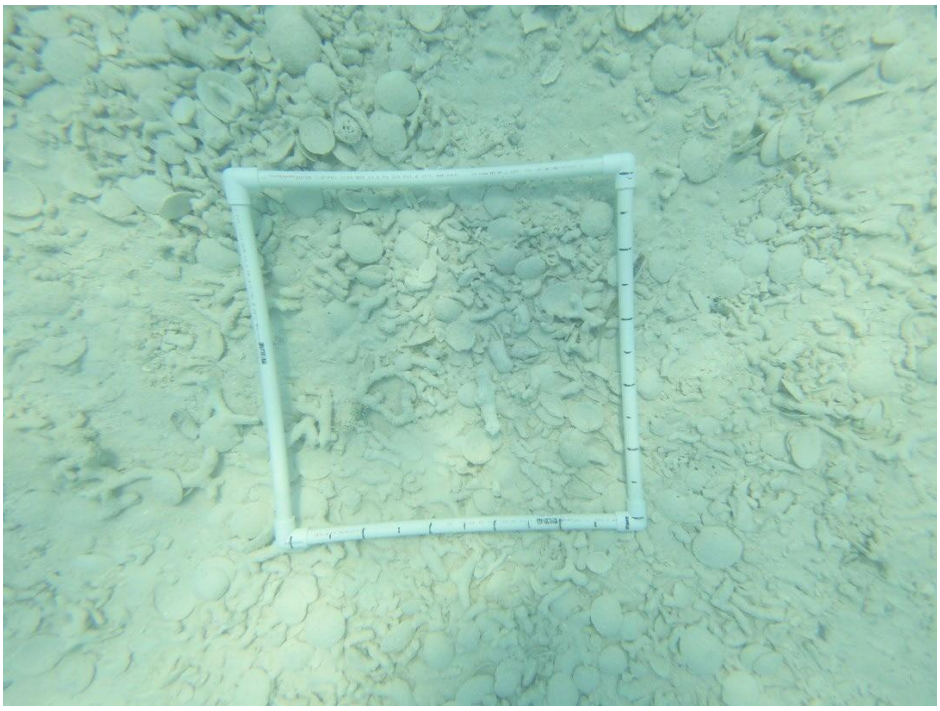


Photo 2-4. Macroalgae on sand and rubble

Vertical Structures, Patch Reefs, and Other Hard Surfaces

A limited assessment of the vertical structures surrounding the existing pier/wharf was conducted when access was allowed during the absence of vessels. Based on the number of corals observed during the assessment it is estimated that there are approximately 200 corals growing on the surface of the bulkhead.

A 15m X15m patch reef was identified during the 2016/2017 surveys conducted for the March 2017 EIA. Due to inaccessibility to the site during the offloading of fuel at the time of the 2023 assessment, verification could not be made to attest to the species or health of this patch reef.

Offshore of the port facility to the west, is a rocky shoreline which consist of submerged rock with coral and sponges. During the assessment it is estimated that there are approximately 120 corals within the area of secondary impacts.

As each of these areas are subject to impacts, both direct and indirect, it is recommended that the corals be harvested and relocated to a constructed mitigation reef.

Photo 2-5. Rocky shoreline west of the Port

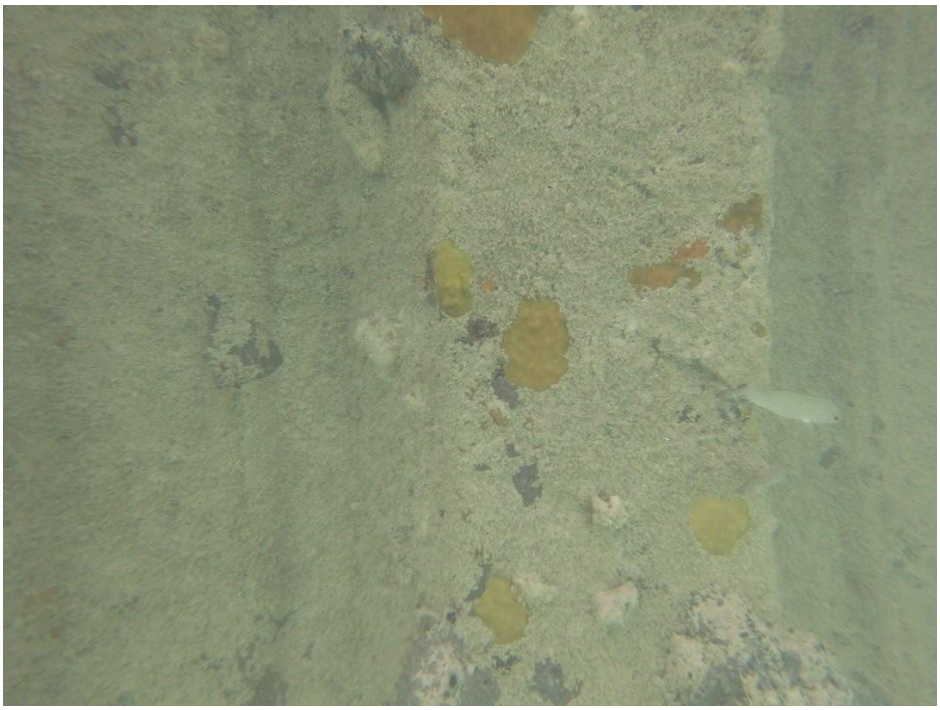


Photo 2-6. Corals on bulkhead of the existing pier.

For the purposes of this report, direct impacts are calculated by the footprint of the project area compared to the habitats mapped. Figure 2-7 shows the overlay of the project footprint on the defined habitats.

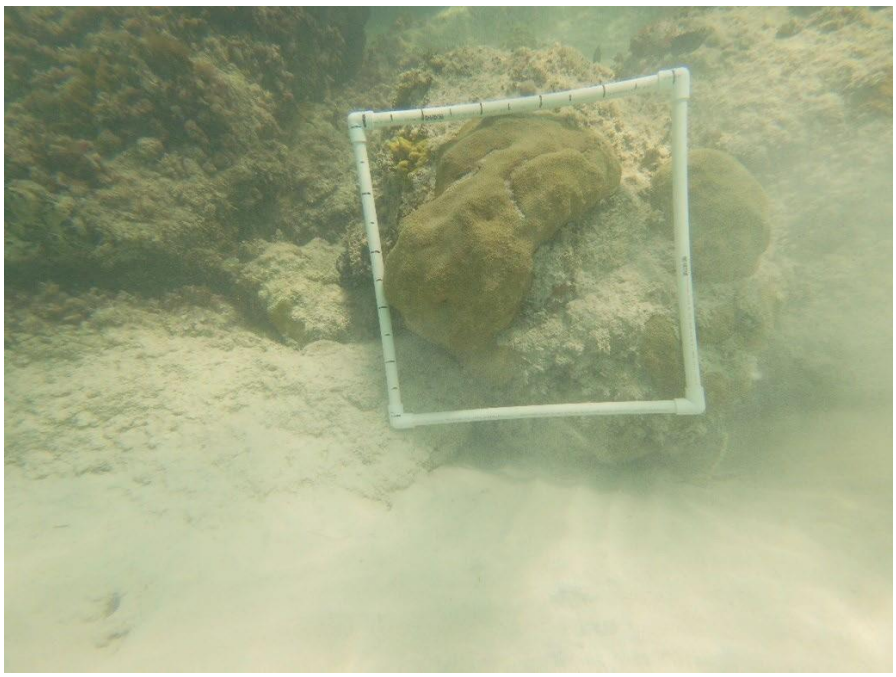


Photo 2-7. Coral along Rocky Shoreline West of the Port

Table 2-1. Marine Species List - South Dock Port Expansion Project

Marine Species List - South Dock Port Expansion Project					
NOTE: Marine species list from 2017 EIA, not all species were encountered during the 2023 EIA field investigation					
Invertebrates		Fish		Flora	
Common Name	Scientific Name	Common Name	Scientific Name	Common Name	Scientific Name
Finger coral	*Porites porites*	Silversides	Family Atherinidae	Turtle Grass	*Thalassia testudinum*
Mustard coral	*Porites astreoides*	Big Eye Scad	Selar crumenopthalmus	Shoal Grass	*Halodule beaudettei*
Lesser Starlet coral	*Siderastrea radiens*	Horse eye jack	Caranx latus	Manatee Grass	*Syringodium filiforme*
Greater starlet coral	*Siderastrea siderea*	Atlantic spadefish	chaerodipterus faber	Bristle Brush	*Penicillus spp*
Golfball Coral	*Favia fragum*	Surgeonfish	Acanthurus bahianus	Shoal Grass	*Halimeda spp.*
Boulder coral	*Orbicella annularis*	Blue Tang	Acanthurus bahianus	Mermaid's Fans	*Avrainvillia sp and Udotea sp.*
Rose coral	*Manicina areolata*	Gray Snapper	Lutjanus griseus	Mermaid's Wine Glass	*Acetabularia spp.*
Corky sea fingers	*Briareum asbestinum*	Schoolmaster	Lutjanus apodus	Laurencia spp.	*Laurencia spp.*
Tiger Lucines	*Codakia costata*	Damselfish	Stegastes spp.	Batophora oerstedii	*Batophora oerstedii*
Turkey Wing	*Arca zebra*	Bar Jack	Caranx ruber	Dictyota spp	*Dictyota spp.*
Egg Cockle	*Laevicardium mortoni*	Bucktooth Parrots	*Sparisoma radiens*	Padina spp	*Padina* spp
Smooth Tellin	*Tellina laevigata*	Yellowtail Snapper	*Ocyurus chrysurus*	Blue green algae	*Cyanophyta*
Stocky Cerith	*Ceritheum literatum*	Mutton snapper	*Lutjanus analis*		
Sea Biscuit	*Clypeaster rosaceus*	4 Eye Butterfly	*Chaetodon capistratus*		
Sea Egg	*Tripneustes ventricosus*	Slippery Dicks	*Halichoeres bivittatus*		
Donkey Dung Sea Cucumber	*Holothuria mexicana*	Stoplight parrot	*Sparisoma viride*		
Upside-down Jelly fish	*Cassiopeia xamachana*	Puddingwife	*Halichoeres readiatus*		
Cushion Sea Star	*Oreaster reticulatus*	Blue headed wrasse	*Thalassoma bifasciatum*		
Brown Spiny Sea Star	*Echinaster spinulosus*	Spotted Scorpionfish	*Scorpaena plumieri*		
Giant Anemone	*Condylactis gigantea*	Princess Parrot	*Scarus taeniopterus*		
Fire Sponge	*Tedania ignis*	French grunt	*Haemulon flavolineatum*		
Purple Tube sponge	*Pseudoceratina crassa*	Caesar grunt	*Haemulon carbonarium*		
Loggerhead sponge	*pheciospongia vesparium*	Blue-striped grunt	*Haemulon sciurus*		
Brown variable sponge	*Anthiosigmella varians*	Yellowfin Mojarra	*Gerres cinereus*		
Lumpy overgrowing sponge	*Holopsamma helwigi*	juvenile Parrots	*Scarus and Sparisoma spp.*		
Black ball sponge	*Ircinia strobilina*	juvenile grunts	*Haemulon spp*		
Stomatopods	*Order Stomatopoda*				
Lugworms	*Arenicola cristata*				

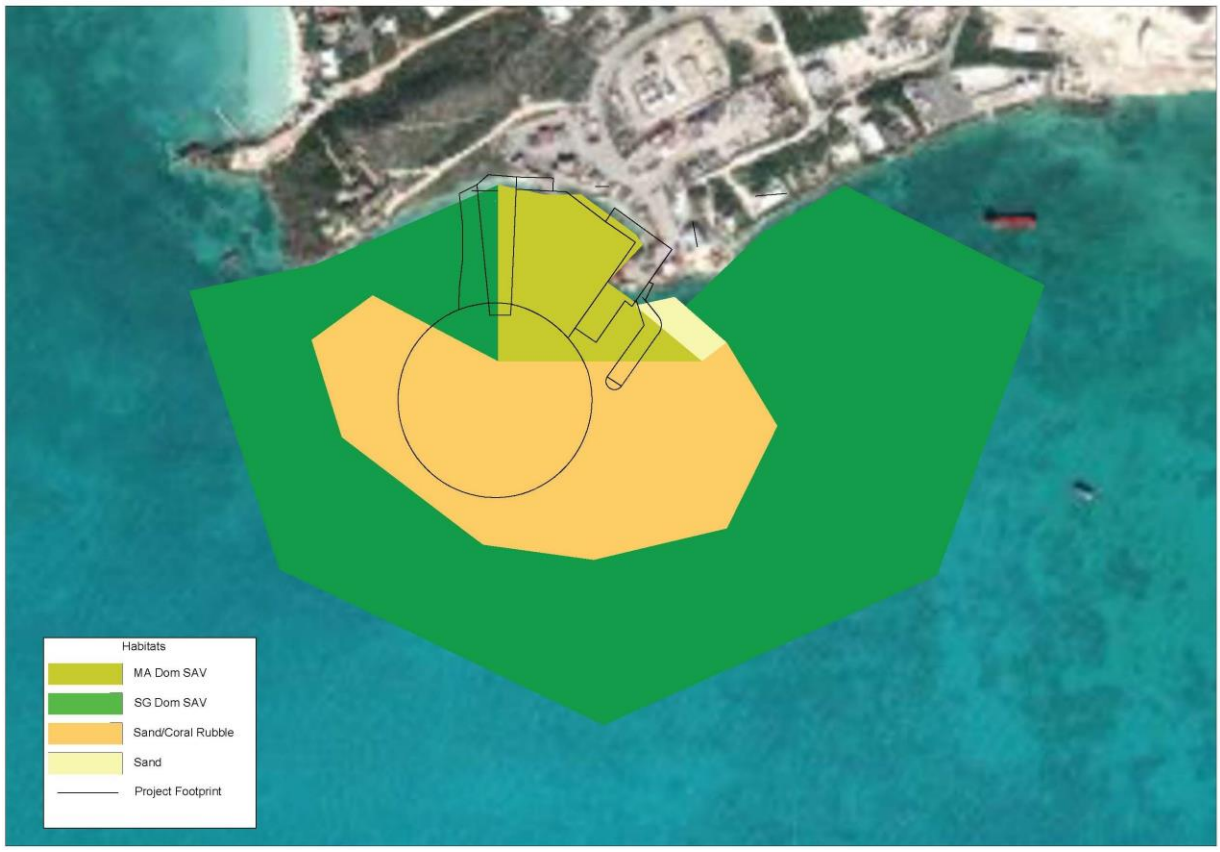


Figure 2-7. Habitats with Project Footprint

2.3.2 Baseline Terrestrial Environment

The terrestrial environment was very limited within the port and heavily impacted by port activities and human activities. Most of the vegetation found within the port consisted of invasive species, cultivated species, and pantropical weeds. There was a small site within the existing port facility that contained native floral species. The largest area of native species was found outside the fence of the existing facility perimeter fence, on port property, where the landward end of the Phase 1 wharf is planned to be constructed.

The site contains three main vegetative communities:

- Ornamental cultivated species – specifically *Scaevola taccada.*
- Invasive pantropical weeds – primarily along the shoreline and along fences.

- Native floral species – predominantly along the ridge behind the Port Authority building and along the west end of the port property at the landward end of the Phase 1 wharf. Native species can also be found intermittently in the coastal areas.

Photo 2-8. Beach Vegetation

Photo 2-9. Vegetation on the ridge behind the Port Authority Building

Photo 2-10. Native Flora to be impacted by Phase 1 Wharf (partially)

Photo 2-11. Cultivated Invasive - *Scaevola taccata*

Photo 2-12. Eradicated Australian pine – *Casuarina equisetifolia*

While not all species observed in 2017 were observed during the 2023 field investigation, Table 2-2 lists all species listed in the 2017 EIA. The assessment in 2023 did not add any new species.

Impacts to the terrestrial environment are expected to be minimal due to the heavily impacted nature of the site. It is anticipated that approximately 0.01 acre of native floral species will be directly impacted at the landward end of the Phase 1 wharf to provide connection to the port facility.

Table 2-2. Terrestrial Species List

Terrestrial Species List	
South Dock Port Expansion Project	
NOTE: Marine species list from 2017 EIA, not all species were encountered during the 2023 EIA field investigation.	
Flora	
Abelmoschus esculentus	Okra
Abutilon permolle	Velvety Abutilon
Agave spp.	Varigated Agave
Borrichia arborescens	Sea Ox-Eye
Bougainvilles glabra	Bougainvillea
Canavalia rosea	Bay Bean
Casuarina equisetifolia	Austrailian Pine
Catharanthus roseus	Periwinkle
Cenchrus insertus	burgrass
Coccoloba uvifera	Sea Grape
Conocarpus erectus	Green Buttonwood
Cynanchum angustifolium	Marsh Cynanchum
Dactyloctenium	Egyptian Grass
Elusine indica	Goosegrass
Euphorbia inaguensis	Wild Thyme
Euphorbia blodgetti	Blodgett's Spurge
Euphorbia cyathophora	Cuplike Spurge
Euphorbia hypericifolia	Hypericum-like Spurge
Heliotropium curvassavicum	Seaside Heliotrope
Ipomoea indica	Morning Glory
Ipomoea pes-capre	Railroad Vine
Lactuca intybacae	Wild Lettuce
Leucaena leucocephala	Cow Bush
Momordca charantia	Balsam Apple
Panicum maximum	Guinea Grass
Parthenium hysterophorus	Santa Maria
Phaseolus lunatus	Lima Bean
Pluchea symphytifolia	Bushy Fleabane
Portulaca oleracea	Purslane
Punica granatum	Pomegranate
Rachicallis americana	Sandfly Bush
Rhoeo spathacea	Oyster Plant
Scaevola taccada	Scaevola
Shinus terebinthifolius	Brazillian Pepper
Sesbania emerus	Smooth Sesban

Terrestrial Species List	
South Dock Port Expansion Project	
NOTE: Marine species list from 2017 EIA, not all species were encountered during the 2023 EIA field investigation.	
Sesuvium portulacastrum	Sea Purslane
Solanum americanum	Ink-Berry
Sporobolus domingensis	Dropseed Grass
Sporobolus virginicus	Seashore Rush-Grass
Stachytarpheta jamaicensis	Blue Rat Tail
Strumpfia maritima	Mosquito Bush
Stylosanthes hamata	Pencil Flower
Terminalia catappa	West Indian Almond
Tridax procumbens	Procumbent Tridax
FAUNA	
Anolis sagrei	Brown Anole
Arenaria interpres	Ruddy Turnstone
Columbina passerina	Common Ground Dove

2.4 Baseline Coastal Processes

The project area is located on the southern shoreline of Providenciales, Turks and Caicos and is largely sheltered from prevailing wind and sea conditions, which predominately emanate from the east to east-northeast. Wave conditions within the area are generally mild and associated with local wind-generated seas. Given that wave fetch is limited to the south and southwest, the potential for swell conditions is restricted. The magnitude of coastal sand transport is limited under normal conditions. Longshore transport mechanisms are the primary mechanism for movement and there is little indication of significant cross-shore movement.

2.4.1 Change to Wave Climate

Changes in wave climate due to excavation are anticipated to be minor and within the area of influence of the port facility. The project proposes minor increases in port draft that will result in negligible changes to wave conditions within the facility. The project design includes shoreline stabilization and inclusion of a new breakwater structure which will functionally reduce wave agitation within the immediate vicinity of the port.

2.4.2 Current and Tides

The information in the 2017 EIA related to tides and currents remains unchanged. The TCI have tides that are predominantly semidiurnal with an average range of 0.64 m (2.1 ft) and a spring tidal range of 0.79 m (2.6 ft). The average high tide level is 0.34 m (1.1 ft) [mean sea level (MSL)]. Although wind will play a role, tides produce (tidal) currents; it estimated they will be on the order of 0.01 to 0.1 foot per second (ft/s) at or near the project site.

2.4.3 Sediment Transport

Significant sand transport within this area would be typically associated with major storm events and would likely result in sedimentation of the channel approach and port basin. The growth of seagrasses and macro algae in the nearshore environment adjacent to the port suggests that active longshore sediment transport is limited.

2.5 Water Quality

Table 8 within the 2017 EIA gives information (including the original documentation) on the coastal water quality. Two water quality sites within the basin and one 500 m outside the basin to the south were established to collect and analyse a range of parameters; see Figure 51 in the 2017 EIA. Previous results show values within acceptable standards with slightly elevated levels of ammonia and nitrate in the inshore basin. Baseline turbidity was low [0.2 to 0.4 nephelometric turbidity units (NTU)] in the inshore basin and central basin, respectively.

An additional sample was taken and analysed in June 2023 for this report and the results show that all values for the test parameters were within acceptable range (Appendix D).

3.0 Project Description and Alternatives

3.1 Description of Project (Development Plan/Master Plan)

The South Dock Port project site is experiencing basin infilling, which is limiting the navigation of ships to onload/offload their cargo. Presently, the port and approach have a maximum navigational depth of -3.7 m (MSL), which is an issue since many vessels wishing to enter the port have drafts of -4.3 m. To avoid navigation issues, some laden ships need to wait until high tide to enter the port or perform an interim offloading to clear the seabed. These depth limitations have resulted in additional costs as shipping efficiency is reduced and pose the danger of ship grounding not only impacting that ship but also the ships needing to enter the port. Exacerbating the problem is the basin infilling above and beyond the depth itself; the rate of infilling is important to consider. This project aims deepen to the turning basin to -4.8 m [mean low water (MLW)], and the dockside areas to improve the navigation.

3.1.1 Project Design Based on Computer Modelling

An estimated 130,000 cubic meters (m^3) is planned to be dredged from the port approach, turning basin, and dockside area to improve safe navigation. The port will be dredged to estimated -4.8 m (MLW) with a rubblemound breakwater on the eastern side of the entrance to attenuate the waves within the harbour. A range of engineering is carried out to optimize the project design, which includes the use of computer modelling. This modelling is based upon fundamental physics applied to the study site. The study site often is complex with not only variable bathymetry, structures, and shorelines, but also needs to account for ever-changing water waves, tides, and storm (e.g., surge, winds, and barometric pressure). Modelling allows the engineer to change project details on the computer to see the effects of the design choices; many design scenarios, with various geometric (port) layouts, can be considered. After these scenarios are executed, they can be assessed to choose the best design for the port that enhances its usefulness and capacity. This gives confidence towards the engineering design.

3.2 Project Justification (Bio-physical, socio economics and other justifications)

The existing port is limited in usefulness and capacity. The port enhancements would allow shipping to be increased and be more efficient. The dredging and the pier improvements would allow ships with deeper drafts to navigate and to allow more docking of ships, respectively. Allowing larger ships and more ships would allow more cargo and goods to be transferred.

3.3 Construction Materials, Storage and Work Hours

Various construction materials will be needed for this project as it involves enhancements of structures and new structures. Dredging will occur on a 24-hour basis until completed. The remaining site construction will be conducted during normal business hours where possible, though construction tasks will need to accommodate ongoing port operations.

3.3.1 Construction Materials, including Sources

Various materials are needed to bring this project to fruition as cited in Appendix E. This includes materials for the dock/port like steel piles, structural steel, dock fenders, reinforced concrete, steel reinforcement, pavement materials, and fill and armour stone (for the rubblemound structure).

Concrete will be procured on Providenciales and it is anticipated that aggregates will be coming from Jamaica. Rocks for the revetment most likely will be provided from the Dominican Republic or The Bahamas. Steel (rebar) will most likely be provided from the US. Long lead Items (king piles, sheet piles and wailing beams) will be provided from China (sheet piles) and Germany (king piles and wailing beams). The source for asphalt is still being quoting.

3.3.2 Schedule of Working Hours

Conditions, working hours, and weekly schedules are detailed in Section 3.2 of the Dredging Management Plan (Appendix F). In summary, it shows dredging equipment will be utilized 12 hours a day and six days per week stopping only for maintenance, bunkering requirements and turbidity exceedances.

3.3.3 Storage of Construction Materials, and other items needed for the Project

A range of equipment is needed to carry out the construction work. The primary dredging piece of equipment is the hydraulic cutter suction dredge (HCSD). The HCSD will be used to dredge all materials within the dredging footprint at a rate as high as 500 cubic meters per hour (m^3/hr). The dredging position control is based upon the GPS system and tide charts. The vessel with cutter head position, bathymetric data, layer thickness to be dredged, and profiles of the dredge area with existing grade and design elevations is used to carry out this work. Scheduled maintenance is needed to have it optimally perform. In addition, smaller support boats will be available to aid in the work. Additionally, the rubblemound revetment and the pile/pier installation will require heavy machinery, which may consist of excavator, cranes, and pile drivers, which may

necessitate the use of barges as floating workspaces. Turbidity curtains will also be onsite and used to maintain turbidity levels.

3.4 Construction Phase Activities

Construction tasks and schedule are presented as two phases over the range of several months beginning in late 2023 and wrapping up in 2025. Table 3-1 shows the phase, task, start date, and duration. All the below dates are tentative as they will be subject to the approval of the construction permit. Construction tasking details can be found in Appendix E and Appendix F.

Table 3-1. Construction Tasks and Timelines

Phase	Task	Start Date	Approximate Duration (months)
Phase 1	Dredging	November 2023	2
	Wharf Construction	December 2023	11
	Yard Development	April 2024	6
	Site Service Water	April 2024	1.5
	Site Service Storm Sewer	February 2024	2
	Site Service Electrical	April 2024	4
Phase 2	Dredging	November 2024	2
	Wharf Construction	December 2024	10

3.4.1 Construction Methods and Program

The Basis of Design, the Dredging Management Plan, and Mooring design Plan are provided in Appendices E, F, and I respectively, to give the full details.

3.4.2 Access and Staging

Based on the previous 2017 EIA, the Port Authority had been advised that space is limited and that no room is available for staging, dewatering, and material storage at the South Dock facility (Robinson & Hanchell, 2016), however locating the dewatering site within the limited space of the port facility is feasible. Using a limited upland dewatering site poses additional obstacles and requires increased oversight and monitoring measures to achieve the desirable results. Turbidity curtains are a required measure, and in cases of limited upland space, additional curtains and other methods of mitigation may be required.

3.4.3 Solid Waste Management

It is anticipated that project solid waste associated with the construction phase may include items such as disposable food and beverage containers, expended parts (e.g., broken machine parts, used grinding wheels, spent hardware, etc.). These items will be disposed in accordance with the means and TCI policies.

3.4.4 Liquid Waste Management

In addition to solid waste during construction, liquid waste will need waste management. This includes the handling of machine oils and other fluids often associated with machinery. TCI does not have facilities to dispose of or process toxic and/or hazardous liquid waste.

Other project construction liquid wastes may include effluent from the dewatering of dredge spoil. Management of these wastes include the use turbidity control measures in coastal areas.

The project contractor will follow all accepted and allowable disposal protocols and policies.

3.4.5 Control of Air, Land, Water and Noise Pollution

Exhaust is a form of air pollution created from the combustion engines of heavy machinery. Depending on the model/year of the heavy equipment being used, there are products to help reduce exhaust pollution. Using a diesel exhaust fluid (DEF) to reduce air pollution is recommended, if applicable.

Given the port is an industrial facility, home residences and dwellings are not located immediately adjacent to the port. Since construction will occur at the port, noise pollution will be localized to the port area as a result of dredging pumps and excavator usage. Furthermore, since the port facility is a busy industrial area, pre-existing machinery and trucks are making noise day and night. Therefore, local residents should not be impacted by noises occurring during the construction phase. Hearing protection is recommended and/or required for the port employees, construction workers, engineers, and other notable people who will be onsite during the construction phase.

3.4.6 Handling of Fuels and other Substances

Hazardous fluid materials associated with the project include fuel, lubricating oil, and hydraulic fluids. These materials will be stored in approved containers. If an accidental land spill occurs, then excavation will be used to collect the contaminated soil. This contaminated soil will be trucked and disposed in an approved landfill. Fueling will take place within the port where

emergency protocol and procedures are able to be fulfilled. Regulations related to the handling, storage, and disposal of hazardous wastes have not been approved under the Public and Environmental Health Ordinance. Careful handling and following protocol will be carried out for best management practices (BMPs), and an emergency mitigation plan is in place in case an accident occurs.

3.4.7 Emergency Mitigation Plan

The 2017 approved EIA spells out the emergency mitigation plan for this project. In summary, the plan addresses emergencies related to natural and anthropogenic causes with the terrestrial and marine environments, which may include accidental spillage, hurricanes, fire, navigational incidents, operational safety, and others. Section 7 gives more information on this topic.

3.5 Coastal Flushing

The flushing of the port is due to tidal effects. The tide has an average range of 0.64 m over 6.21 hours (half of a semidiurnal tidal cycle).

3.6 Description of Operational Phase

This EIA section remains consistent with Section 4.4 of the 2017 EIA and provides the Description of Operational Phase.

3.7 Decommissioning Phase

Decommissioning of the port facility is not envisioned as it provides critical infrastructure that is in the public and national interest.

3.8 Potential Alternatives

Several different types of alternatives are considered ranging from doing nothing to design alternatives to site alternatives. The 2017 EIA provides a list of these alternatives.

3.8.1 “No Go” Alternative

The justification for this proposed project has been described throughout this document. Although the “No Go” alternative would eliminate the potential environmental impacts, the economic and logistical benefits would be eliminated too. The South Dock facility is presently a location that previously has been impacted: The proposed enhancements should not further exacerbate the

impacts. Additionally, the port is shoaling as the sediment accumulates; which precludes ships from navigating safely and/or limiting ingress and egress to high tide only.

3.8.2 Design Alternatives Based on Computer Models

Design alternatives may be conceptualized, modeled, and refined. Given the configuration of the port and the issues with sedimentation, wave modeling and sediment transport modeling are reasonable choices to assess design alternatives. Water wave transformation occurs from offshore to nearshore and ultimately within the port. The wave modeling provides information on wave height, refraction, diffraction, energy flux, and radiation stress, while sediment transport modeling yields quantities/directions and bathymetric evolution. Modeling the existing conditions (i.e., baseline) of the port layout, shoreline position, and bathymetry along with the offshore wave conditions is essential. Once calibrated, these baseline results can be compared with modeled design alternatives such as the effect of port dredging and breakwaters. Looking at the differences between the baseline and alternatives allows the design to be optimized and meet project goals.

For the baseline, the port/shoreline position can be digitized from aerial images and maps; the most recent bathymetry should be used as this will provide input to the model that most represents the current conditions. The alternative design aims to modify the baseline environmental conditions; the design process is iterative.

3.8.3 Activity Alternatives

The dredging of the approach, turning basin, and port itself is the main activity along with pier enhancements to allow for dock refurbishment and increasing the number of ships. No other alternatives exist given the nature of this project.

3.8.4 Site Layout Alternatives

Siting alternatives have been presented in the 2017 EIA (Section 4.6.2). Although South Dock provides the limited shipping operations, any alternative locations involve large environmental impacts and high costs.

3.8.5 Technology and Materials Alternatives

The port redevelopment plan has been specifically designed to adopt modern design and construction methodologies to optimize port operations and construction. These are further described within the study appendices.

3.8.6 Summary of All Alternatives

The possible alternatives for this project include “No Go,” siting, and technology alternatives. The “No Go” scenario keeps the status quo, which is a slow deteriorated access and efficiency to the port. Siting alternatives seem to be too costly in terms of price and environmental impacts. Technology alternatives are attractive and have the benefits of minimizing environmental impacts and improving project timeframes; however, there are drawbacks for dewatering and costs.

4.0 Legislative and Regulative Context

4.1 TCI Development Plan/Master Plan

The master plan has been provided and is included in Appendix G. This includes Phase 1, Phase 2, and accompanying works. Specifically, this involves designs for: dredging, quay wall, revetment, roll-on/roll-off (ro-ro) revetment, yard layout, electrical systems, and mechanical facilities. The port facility is incorporated into the existing TCI Development Plan.

4.2 Physical Planning Ordinance

Section 34 (1) of the Physical Planning Ordinance of the Turks and Caicos Islands (1989) authorizes the Physical Planning Board, while considering an application, to consider a number of factors to make a proper decision on the application. These factors include, among other factors:

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

4.3 TCI Development Manual

Special attention is paid to building line setbacks in coastal areas. The Turks and Caicos Development Islands Manual (1996) specifies that for coastal developments, the EIS minimum setbacks from the high-water mark should be determined by appropriate studies and by an examination of the known effect of high seas on the beach frontages. As a general rule, for slopes of beach less than 1:20, a permitted building line setback (measured from the high-water mark) of 100 ft is permitted for developments in coastal areas (The Turks and Caicos Islands Development Manual, 1996). These coastal setback requirements are not applicable to the operation of the port facility.

4.4 TCI Building Code

Providenciales Land Use Zoning Plan is an instrument used to control and regulate the orderly and progressive use of land. It designates various land areas to specific uses. Although the plan's life span expired in 1989, it remains the instrument used to govern land development on the island today. Preparation work for a comprehensive review of the plan is in the advance stages.

4.5 TCI Ports Authority Ordinance

The TCI Ports Authority Ordinance states that TCIPA is responsible for the management, oversight and maintenance of the ports and navigational access to ports within the territorial waters in the TCI. Therefore, TCIPA needs to ensure safe and navigable water access the South Dock Port facility, which bolsters the justification of this proposed project.

4.6 Maritime Laws

Maritime Laws relate to commerce and navigation on the open sea. DECR Maritime Affairs implements maritime laws and regulations for the safety and protection of mariners. This is important since much of the project work will take place on the water. The TCI Maritime Law Enforcement (Ordinance 04 of 2022) is handled by the Attorney General's Chambers of the TCI.

4.7 TCI Fisheries Protection Ordinance

Part Ill of the Fisheries Protection Ordinance contains provisions for conservation, including restrictions relating to the seabed (Regulation 10), including prohibitions against employing activities or devices that are harmful to marine life, and removing, shifting or in any way disturbing coral, seagrass, sand, rock, or other substances forming part of the seabed. Such activities are allowable with endorsement or other licensing by the Governor.

4.8 TCI Coast Protection Ordinance

Under the Coast Protection Ordinance "coast" means land bordering on the sea or any tidal water and having its seaward boundary at the low water mark.

There are no planned components or phases of this development, or any operations associated with the proposed development that will be in contravention of the Coast Protection Ordinance or prejudicial thereto; and no development or developmental components or operations of the development are being proposed within the coastal zone. The proposed 130-ft and 100-ft building

setback distances for buildings and other ancillary development, respectively, measured from the highwater mark, is not applicable to the port facility.

4.9 TCI Marine Pollution Ordinance

All proposed work will be in compliance with the requirements of the TCI Marine Pollution Ordinance. There will be no discharge or dumping of oils, waste, or other pollutants into the coastal or marine environment.

Containers for collection and storage of solid waste will be provided on the site, within the confines of the parcel boundaries. During construction, portable latrine(s) will be provided and maintained onsite by one of the local Sanitary Companies for liquid waste disposal. The contractor will be required to maintain acceptable environmental health and safety standards during construction. Containers of oils and other similar effluent will be collected, bagged, and disposed of separately at the public landfill facility. There will be zero tolerance for depositing of any garbage, rubbish, litter, or derelict article, which could eventually make its way into the coastal or marine environment. This includes any broken bottles or other glass or ceramic.

Solid waste debris is often problematic on construction sites and of particular concern when working in or near coastal environments due to the increased incidence of debris either blowing or floating away. Not only is it not aesthetically pleasing washing up on the shores but it can injure and kill marine organisms if they ingest it or are inadvertently trapped somehow in the wastes. Hoarding will be erected to enclose the entire property to prevent debris leaving the site.

All waste generated during construction, whether from daily food and beverage consumption of those working at the site or construction waste will be containerized and disposed of at the public landfill site daily. A lidded refuse bin will be provided and easily accessible to workers with clear instructions for immediate disposal. Inspections will be made at the end of the day to ensure that no waste remains behind on the jobsite.

5.0 Environmental Impact Assessment

5.1 Potential Impacts to the Biotic Environment, including predicted Direct and Indirect Impacts to Terrestrial, Coastal and Marine Assets

Project impacts to the environment include positive/neutral/adverse, temporary and long-term, and indirect and direct.

5.2 Long-Term Physical Environmental Impacts from Development

These anticipated impacts result from dredging, dock improvements, and wave protection structures. Positive impacts include the ability to accept larger vessels, accommodate more docked vessels, and improved navigation. Neutral impacts include the conversion and alteration of seafloor due to maintenance dredging (the project seafloor already had been dredged previously). Lastly, adverse direct impacts are limited to the footprint of the project and secondary impacts, such as suspended sediment and underwater construction noise, due to port improvements. Section 5.2 of the 2017 EIA goes into more detail about the physical environment.

5.3 Marine Construction Impacts, Specifically Dredging and Infill Impacts

The bulk of the potential impacts are expected to be marine related. Most of these will be direct impacts due to the dredging, pier installation, and revetment construction since the seabed will be excavated and modified. Secondary impacts, such as elevated turbidity impacting life along the seabed, need to be minimized, which can be accomplished by thoughtful monitoring and quick responses with appropriate measures. Section 5.1.2 of the 2017 EIA gives more details in the coastal and marine environments.

5.4 Terrestrial Construction Impacts

Limited terrestrial impacts are envisioned as the topside port facilities are established. Much of the upland has previously been disturbed because the port yard area is actively being used at the facility. Therefore, the terrestrial impacts will be minor compared to the present state. From the 2017 EIA, Section 5.1.1 describes the impacts of the proposed project; this 2023 EIA reflects the same potential impacts, such as the use of heavy machinery (noise), risk of accidental spillage, impacts to drainage, looking out for any remaining natural habitat and biodiversity, and adjacent soils.

The current plan will directly approximately 0.01 acre of native coastal flora where the phase 1 Wharf meets the land.

5.5 Water Quality - Turbidity Monitoring

Water quality by way of turbidity measurements needs to be monitored during the construction phase. Some marine habitats are sensitive; therefore, impacts need to avoided and managed. The EMP section and Section 5.3 in the 2017 EIA discuss these topics, but the overall goal remains the same, which is monitor the project area to avoid turbidity levels above the threshold of 15 NTUs, confining turbidity to the immediate construction area (e.g., via curtains), and mitigating elevated turbidity if exceeded. Dredge, dewatering, and spoil disposal also need attention so that water quality meets/exceeds expectation and apply corrective action if needed.

5.6 Shipping Access and Hindrance

Dredging, pile driving, dock fender installation, and rubblemound revetment construction need to be planned around the existing shipping schedule to avoid/minimize ships ingressing and egressing from the port. This suggests that evening and overnight dredging and construction will be needed when the port traffic is low or nil. This is covered in Section 5.4 of the 2017 EIA.

5.7 Accidental Spillages

The Accidental Spillage Section 5.5 in the 2017 EIA remains unchanged; if necessary, mitigation measures will be undertaken to avoid and reduce spill threats; see EMP Sections 4.3.12 and 4.3.13.

5.8 Noise

Section 5.6 in the 2017 EIA discusses the noise aspect. Although noise is a nuisance, there are no residential neighbourhoods in the immediate project vicinity. Therefore, 12-hour dredging and construction should not be an issue as described in Section 5.6 of the 2017 EIA.

5.9 Public Access and Recreational Use

The project site is a secure facility with no public access. Therefore, the approach, basin, and docks are not intended for recreational use as discussed in Section 5.10 in the 2017 EIA report.

5.10 Social, Cultural and Economic Impacts

This port facility is critical to the operation of the national and island economy. As such the proposed development is in the national and public interest. Improvements to the port will increase the capacity and resiliency of the facility which will further support broader national economic development.

5.11 Other Impacts

The bulk of the work for this project is underwater and within environments that have mostly been impacted already. Therefore, no discerning topside visual impacts are anticipated long-term. In the short-term, the project will have dredging machinery and dewatering means readily visible.

6.0 Monitoring

6.1 Monitoring Plan for Pre-, During and Post-Construction Activities

Monitoring is proposed and is further described within Section 7 of this document .

Pre-construction monitoring is needed to establish baseline conditions before construction takes place. This process documents the pre-construction/baseline conditions and allows for comparison during and after the construction. Monitoring during the construction is needed to safeguard natural resources and see that the project is following design specifications. Finally, post-construction monitoring is used to evaluate the change (from the baseline) and the performance of the project.

6.1.1 Biological Monitoring

The monitoring will require the establishment of monitoring and control stations which will be revisited during and after construction to assess changes and whether or not the changes are due to the project or natural phenomena. Monitoring station will be set up within 325 ft. of the dredge area on resources sensitive to sedimentation and turbidity. Control stations will be established well outside the influence of the project to ascertain if any recorded impacts are naturally occurring or project related.

Monitoring should occur prior to construction to record background information at each station to use in comparison to monitoring events. Monitoring events will occur during construction, biweekly and continue post-construction at six month, 1 year, and 2 year post-construction. Monitoring of benthic resources pre, during and post-construction is proposed and is described further within the EMP.

6.1.2 Physical Environmental Monitoring (Bathymetry, etc.)

As-built surveys will be completed to ensure the dredging conforms to the drawings and plans. The sedimentation monitoring, hydrographic/topographic surveys, and marine animal safety for this 2023 EIA follow Sections 7.1 and 7.2 of the 2017 EIA.

6.1.3 Water Quality (including turbidity)

The water quality and turbidity monitoring for this 2023 EIA follows Sections 7.1 and 7.2 of the 2017 EIA.

6.2 Required Field Team for Monitoring

In order to execute the monitoring plan referenced in Section 6.1, a diverse team is needed, which should include a marine biologist, a coastal/port engineer, and ultimate oversight by the Port Authority.

Additionally, the dredging contractors should designate a quality control officer to observe all phases of the project. This quality control officer should be able to act as an extension of the contractor. This officer will have total "Stop Work Authority" over the project and be knowledgeable/trained in turbidity control, spill containment/mediation, and BMPs.

6.3 Government Oversight

Government Oversight within Section 7.4 of the 2017 EIA remains unchanged here. In summary, it includes several TCI governmental agencies whose jobs aim to see that the project is carried out in a sound manner on behalf of the people of the TCI.

7.0 Mitigation

7.1 Schedule and Summary of Activities Requiring Mitigation

BMPs to avoid, reduce, repair, offset, and compensate for impacts are included in Table 14 of the approved 2017 EIA. These measures as expressed within this document remain consistent with the currently proposed development and site conditions. This table lists the impact feature, the management practice, and the recommended mitigation measure to apply. In summary, the table addresses impacts that are biological, physical, chemical, environmental, and aesthetic that occur in the air, on land, and underwater. Additional protocols for the implementation of these measures are provided within this document, most notably additional details regarding coral mitigation and turbidity monitoring.

7.2 Mitigation Measures for Any Predicted Impacts to the Biological Environment, including Terrestrial, Coastal and Marine Assets

Impacts to the biological environment are varied and detailed in the “Impacts to Biota” section of the 2017 EIA. The terrestrial project areas are largely disturbed through historical port development with few natural habitats; therefore, significant changes to the baseline condition are minimal. Regardless, any remaining natural habitats should be avoided as best as possible and replaced with similar biomass and species if accidental damage occurs.

Impacts from the project that can affect the coastal and marine environments are given also in the “Impacts to Biota” section. In summary, a combination of measures is cited that can be undertaken to mitigate potential issues, such as accidental spills, erosion and runoff, turbidity, sedimentation, coral damage, seagrass harm, and uncontrolled debris. Initial assessments, monitoring, and recommendations play key roles towards these management plans.

7.3 Mitigation Measures for Physical Environmental Impacts Associated with Dredging, Infill and Land-Based Construction

Turbidity and subsequent sedimentation are the primary impact concern associated with dredging and construction during the project. Therefore, minimization practices (turbidity curtains and upland spoil management) monitoring and control are the main proposed measures. Pre-, during-, and post-construction/dredging monitoring are proposed to assess baseline level so that elevated levels above the threshold can be implemented quickly. The “Turbidity and

Sedimentation" section of the 2017 expands on the summary here and specific protocols to be implemented are included within this document.

7.4 Storm Surge Analysis and Mitigation Plan for Sea Level Rise

The TCI are located within the Caribbean along the Lucayan Archipelago. Given their tropical geographic location, they are subject tropical storms and hurricanes. These weather systems can be particularly devastating since the TCI are low-lying and subject to storm surge/flooding and the accompanying waves. This condition is exacerbated long-term by sea level rise. There is concern that these storm events may become more frequent and more powerful. Therefore, a storm surge/hurricane modeling study was carried out for this project in order to assess hydrodynamics and guide design.

The full modeling memorandum can be found in Appendix H. In summary, this memorandum covers the expected waves and water level subject to hurricanes that involve high winds that setup water, surge that floods over land, and low atmospheric pressure leading to the inverse barometer effect. In order to assess, an Extreme Value Analysis (EVA) was applied to a range of historical tropical storms and hurricanes within vicinity of TCI; ultimately three hurricanes were considered: Irma (2017), Marine (2017), and Ike (2008). Next, a hydrodynamic model and a (water wave) spectral model were applied to propagate the storm to TCI over the bathymetry and topography using online data resources. Results were run and calibrated to the best ability. Extrapolating these modeled results to a 100-year storm via EVA results in a peak (energy based) wave height of 2.6 m, a peak wave period of 5.0 seconds, a maximum water elevation of +2.3 m (MSL), and a peak current of 1.1 m/s.

In addition to elevated water levels from tropical systems, sea level rise (SLR) was also considered in the design. Based upon data from the World Bank Climate Group Knowledge Portal, a SLR of 0.45 m over a 50-year period is recommended. This value corresponds to the design life of the proposed port redevelopment. A SLR allowance of 1.00 m was utilized as a basis of design for this project which correlates to a 100 year design period. So considering this larger SLR of +1.00 m, the port structures have incorporated a higher design standard increasing the resiliency of the project design. The documents in Appendices H, E, and I give these elevations to minimize flooding and impact.

In general, design elements of this project are sufficient to withstand impacts from a major storm event including considerations for long-term SLR. This redevelopment represents a significant

increase in the overall resilience of this facility which is critical infrastructure of national significance. It is noted that the facility is designed to flood under a major storm impact, though the facility would be closed under such conditions and the design accommodates the ability to re-open the facility efficiently following a storm occurrence.

7.5 Financial Resources for Mitigation

As a government entity, the port has sufficient resources to support mitigation efforts recommended within this study. Mitigation requirements are nominal given the relatively limited environmental impacts that will be realized through project implementation

7.6 Stakeholders/Public Consultation

The DoP requires that once the application has been submitted, it must be publicly announced. This may occur via local newspaper and online for a 30 day period to allow for public commentary. This allows the public an opportunity to offer comment and pose questions about the publicly accessible application.

This port facility is critical infrastructure of national importance and as such is in the public interest.

Although planning guidelines do not require public comment, as a courtesy in preparation of this EIA, meetings/conversations occurred with the principal stakeholders from TCIPA, PW, and Dock Direct. The DoP and DECR will be contributors towards the evaluation of the EIA, and other TCIG agencies are responsible for project oversight.

7.7 Environmental Management Plan (EMP)

A summary of the major environmental concerns and the strategies to address are provided in Table 7.1. These main issues are the same as those identified with the 2017 EIA study, though the adoption of hydraulic dredging (as recommended within the 2017 EIA study) reduced both the construction timeline and potential for dredge related impacts.

Table 7-1. Environmental Management Plan

Resource	Potential Impacts	Overall Significance	Proposed Management	Schedule	Cost
Terrestrial Resources	Adverse Impacts on Populations Of Endemic Species & Native Plants of Special Conservation Concern	Moderate	Perform thorough inspections for the presence, distribution & abundance of endemic species and Plants of Special Conservation Concern prior to initiating land clearing.	Pre-construction & Construction	Low
			To the extent desirable or necessary to maintain biodiversity on the site, relocate transplantable Endemic species and Native Plants of Special Conservation Concern out of areas to be developed and replanted into suitable areas within the port facility property.	Pre-construction & Construction	Low
			Develop educational materials (e.g., kiosks, printed matter, etc.) about Endemic Species and Native Plants of Special Conservation Concern and make these materials readily available to residents and visitors in hard-copy and/or electronic versions	Post-construction	Moderate
	Clearing of Vegetation	Moderate	Minimize clearing of native vegetation to only those areas necessary for grading and construction of proposed facilities.	Construction	Low
			Where possible, maintain native landscapes and use native drought-tolerant and salt-tolerant plant materials for landscaping.	Pre-construction	Low
			Preserve and transplant, to the extent practical.	Construction	Low
	Risk Introducing Non-Native Species, Foreign Diseases, And Escape of Pests	Moderate	Develop strict inspection systems at Customs and entry points to eliminate or minimize the risk of unintentional introduction of undesirable flora, fauna and pathogens.	Construction	Low
			Ensure that construction equipment is clean and pest free before entering and leaving the property.	Construction	Low
			Employ Early Detection-Rapid Response protocols to eradicate or control undesirable species.	Construction & Operation	Low
	Impacts to Wildlife Habitat	Low	Wherever possible, maintain native landscapes and use native plant materials for landscaping.	Pre-construction & Construction	Low
			Minimize clearing of native vegetation to only those areas necessary for construction of proposed facilities.	Construction	Low
			Implement an environmental monitoring program to include the monitoring and eradication or control of non-native species	Construction & Operation	Low
			Adopt and enforce covenants and protocols prohibiting the presence of unrestrained domestic pets.	Construction & Operation	Low
			If possible, avoid land clearing during the bird nesting season in areas where birds are actively nesting.	Construction	Low
			Consider the rescue of *Cerion* and *Hemitrochus* snails and their relocation to suitable receiver sites.	Construction	Low
Marine Resources	Prevent Adverse Impacts to Water Quality	High	Develop and implement a hurricane preparedness protection plan.	Pre-construction & during Construction	Moderate
			Install and nurture dune plantings to create a vegetated buffer between the construction area and the sea.		
			Use turbidity curtains and BEST management practices to ensure sedimentation and turbidity are controlled and monitoring results are less than the TCI standard of 15 NTUs		
	Impacts to Wildlife Habitat	High	Harvesting and relocation of corals, urchins, and any other sedentary species that can be caught and moved off site prior to dredging activities.		
			Removal of all debris from within the dredge footprint.		
			Monitoring of the adjacent resources outside the project footprint to assess heath and document any changes due to construction activities.		

7.7.1 Summary of the Potential Impacts of the Proposal

A summary of potential impacts is provided in Table 7.1. The primary concerns are marine related and associated with both construction and operational phases. Construction phase risks are similar to those that occurred during previous port construction phases, though given the disturbed nature of the site, the risk to in-situ resources is reduced. Operational phase impact risks are similar to existing risks at the port, though the implementation of improved infrastructure will reduce the operational impact potential once implemented.

7.7.2 Description of the Mitigation Measures

The proposed mitigation measures are detailed in the following sections.

7.7.2.1 Management of the terrestrial environment

While the expansion of the port footprint is limited, field investigations have identified discrete protected and endemic species, as well as species of concern within the expanded footprint for construction, notable within the buffer areas around the current cleared property. In general, it is recommended that the identified species be harvested and transplanted to an appropriate offsite receiver site. Transplantation should be conducted by individuals with specific knowledge and expertise with native and endemic vegetation.

The upland contractor will be required to develop a site specific Stormwater Pollution Prevention Plan (SWPPP) for construction related activities that will include soil stabilization for disturbed areas including BMPs. This will include discussion of transition from construction to operational phases.

Long term, the infrastructure improvements that will be implemented, particularly the management of stormwater onsite based on a design standard of no discharge will result in a net long-term improvement to the terrestrial environment, though it is noted that as a functioning port, the habitat functions provided by the property itself are negligible.

7.7.2.2 Marine Mitigation

Mitigation is proposed for marine project impacts, and EMPs associated with these actions are summarized within this section.

Mitigation Reef Construction and Coral Relocations

Live corals and other marine invertebrates are found within and surrounding the construction footprints and will be relocated to ensure survival of these endangered and threatened marine species. Relocation will increase the potential for survival of relocated species as it will remove them from the area of influence of both the construction and operational phases of the port. An artificial reef is also proposed to provide substrate and structural habitat for the relocated organisms and as mitigation for any damage to marine habitats that may occur during the construction process. Further this reef may serve as a receiver site for future relocation needs associated with future port project phases as necessary. The mitigation reef also represent a tangible, physical commitment by the Port Authority to the protection of environmental resources.

Deployment of the mitigation reef will occur prior to relocation efforts, though both will be advanced on an efficient basis to allow for the currently proposed construction timeline. While the majority of coral present are common species, isolated endangered or threatened coral colonies have been noted in the project vicinity. In addition, threatened species (urchins) were also observed within the project footprint. These will be relocated to the mitigation reef site. Animals of opportunity for gene banking may also be present within the project footprint and will be incorporated into the relocation program where appropriate. All work will be conducted utilizing local expertise and resources with appropriate permits from DECR for gene banking (of coral species) and for *Diadema* spp. urchins. Coral specimens that indicate special resistance to stony coral tissue loss disease (SCTLD) may be removed to the TCRF laboratory tanks for further research.

Candidate corals for relocation will be removed from a relatively shallow water environment on the south side of Providenciales. The proposed location of the mitigation reef is just inside the point known as Split Rock and near the public access road for Bonefish Beach. The area is similar in depth and on the south side to minimize live holding transport times from the donor site. Good water flow around the point, close access to nearby reef environs for new coral recruits, and minimal pollution sources are the other main factors for site selection. This area has also been chosen due to its proximity to publicly accessible areas that can be utilized in promoting reef awareness and etiquette. It is also just outside of the NR22: Pidgeon Pond and Frenchman's Creek Nature Reserve southern boundary which lies just north of the public access road seen in the Figure 7-1. This is a proposed location; final location will be delineated in concert with DECR staff.

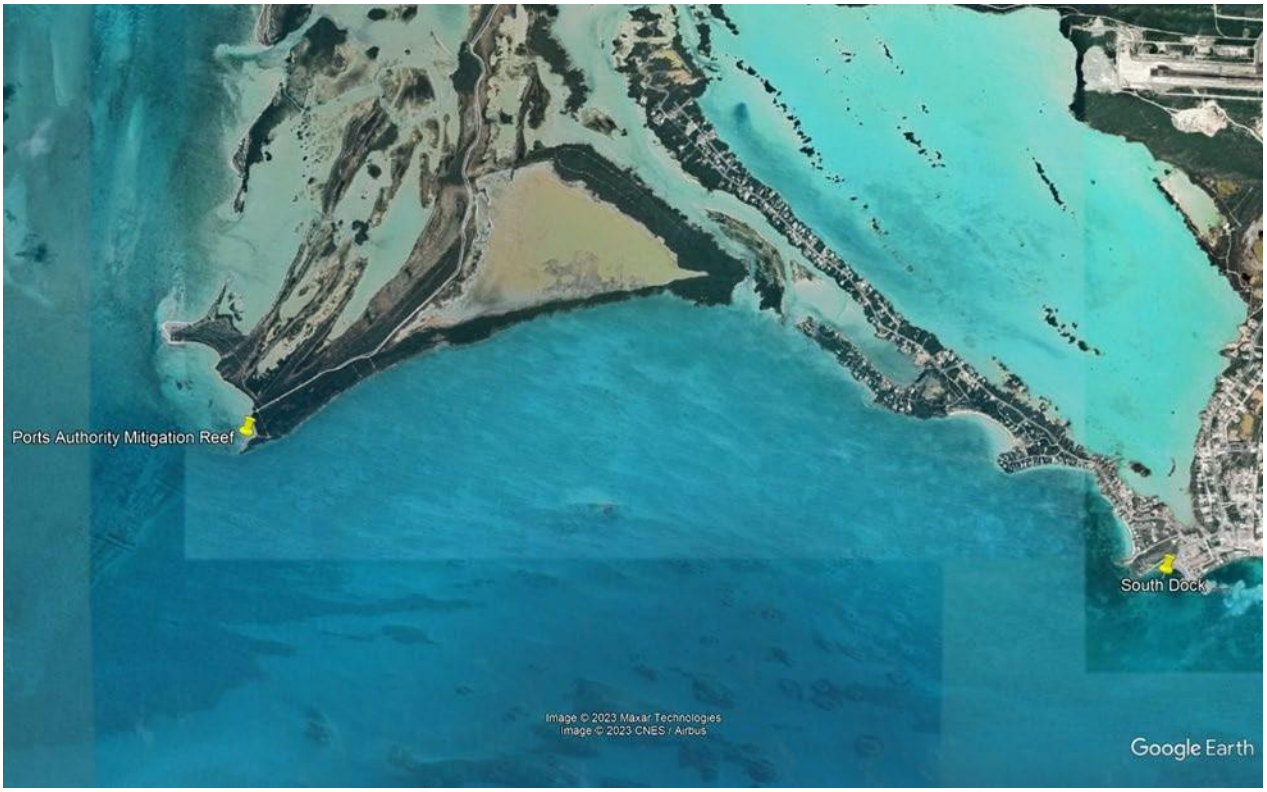


Figure 7-1. Proposed general location of mitigation reef with proximity to South Dock.

Pre-made Reef Ball™ artificial reef units are available on island and will be utilized for the mitigation reef. The available units are approximately 1.9 ft in height and 2.6 ft in width at the base with an average weight of 300 pounds per unit. In terms of configuration, reef units work best in clusters, where mobile organisms can roam from structure to structure for better predator protection. A series of linked clusters is envisioned for this project, potentially in the form of a marine organism such as a sea turtle, that can be seen from the cliffside aerial viewpoint. A total of 75 reef units are proposed. These modules are pre-existing and will not require additional manufacture. While other substrate such as native limestone boulders may be utilized, this substrate is limited on island and is desirable for other construction needs and would require additional time to procure.

Reef Ball units currently located along the canal in Long Bay Hills will be transported to a loading area where they can be put on a vessel for transport to the selected Split Rock site. Once the reef units are deployed, they will undertake final positioning and securing of the new reef environ.

Once the mitigation reef is in place, it will be secured to the seafloor by either fiberglass rebar stakes or a series of cables that wind through the units and are further anchored with sand anchors at key points. In the case of a storm event, the added weight of multiple units will ensure that the reef stays in place. An estimated total of 350 corals need to be relocated from the South Dock site, averaging a total of 4-5 coral transplants per reef unit. Depending on the final design configuration, the majority of corals will likely be placed on perimeter units with fewer in the interior portions.

The relocation phase will occur once the reef units are in place and secured. Local staff with coral relocation expertise will remove, transport and relocate the corals to mitigation reef site. Other marine invertebrates such as urchins and anemones will also be collected and relocated during the search and removal process. It is anticipated that a round of corals will be removed in the morning, transported to the site, and then cemented to the reef units upon arrival, with an estimated 50 colonies relocated in a given day. Given that the port will remain operational during relocation activities, relocation work will be coordinated with port operations to ensure efficiency and staff safety.

All aspects of the project will be documented (with photos) in a brief report that will be submitted to the port, DoP and DECR. Additionally, the protocol and initial template for a long-term monitoring program of the mitigation reef will be developed in concert with DECR.

Removal of Marine Debris and Invasive Species

Marine debris has the potential to become mobile during significant storm events, resulting in impacts to benthic species. Removal of marine debris from the study area is proposed as a mitigative measure to offset marine project impacts. This effort will be conducted in concert with preconstruction field and coral relocation efforts. Marine debris surveys will be conducted following impacts from significant hurricane events and will include both bathymetric surveys of the channel and approach. Marine debris associated with hurricanes will be removed as a post-storm restoration measure.

The presence of lionfish (*Pterois volitans*) was not noted during the benthic field studies, but these fish are likely present. This species is a non-native, invasive fish that competes with native species. Removal of specimens encountered during marine field efforts is proposed as a mitigative measure.

Marine Construction

In dredging, material will be excavated using a cutter-suction-head hydraulic dredge with discharge to upland containment. Construction will conform to accepted marine and international standards of hydraulic dredging.

All EMP requirements as delineated within this document relative to marine operations (dredging) shall apply to both initial construction and any future maintenance dredging.

Contractor Monitoring and Environmental Protection Requirements

The Dredging Contractor shall prepare an Environmental Protection Plan including, but not limited to, the specifications provided in this EMP. The plan will be discussed at the pre-construction meeting. The Contractor's Project Superintendent shall be responsible for the implementation of the plan and shall attend the pre-construction meeting. The plan shall include, but not be limited to, the following specifications.

Turbidity Control: The Contractor shall adopt all reasonable and practical means and methods to limit project-related turbidity and shall execute all project-related efforts in compliance with the project EMP. Regular monitoring of turbidity will be conducted under the direction of the Port Authority independent of the Contractor. The Contractor shall provide full access to the project site, including reasonable support for regular turbidity monitoring (by others). If turbidity monitoring indicates levels not in compliance, the Contractor shall modify construction means and methods as directed by the port. This direction may include temporary secession of excavation consistent with project permit conditions. The Contractor shall provide suitable transportation to and from the nearest public dock as requested by the Port to monitor the collection and analysis of turbidity samples as well as to collect and analyze comparative samples. All monitoring shall be conducted in accordance with the Contractor's Quality Assurance Plan and the terms of the EMP.

Pollution Prevention: The Contractor shall continuously monitor and manage all construction activities to comply with the following environmental requirements for pollution prevention. In addition, the Contractor must coordinate all construction efforts with the Engineer.

Pollution Control Facilities: The Contractor shall maintain constructed facilities and portable pollution control devices for the duration of the contract or for that length of time construction activities continue.

Air: The CONTRACTOR shall make all possible efforts to minimize air pollution. All activities, equipment, processes, and work operated or performed by the CONTRACTOR in accomplishing the specified construction shall comply with the applicable EPA air pollution standards[1].

Noise: All hauling and excavating equipment, including dredges and booster pumps, used on this work shall be equipped with satisfactory mufflers or other noise abatement devices. The CONTRACTOR shall conduct these operations so as to minimize construction noise. The use of horns, whistles, signals, and handling of dredge pipelines shall be held to the minimum necessary to ensure as quiet an operation as possible while maintaining safety on the job site. Dredges and booster pumps used on this work shall be equipped with satisfactory mufflers and/or other sound abatement devices to reduce engine noise.

Marine Noise: Pile driving shall only occur when turbidity curtains are in place and shall be initiated with a 'soft start' progression. Pile driving operations shall cease if marine mammals are observed within the immediate pile driving area and shall only be re-initiated when the area is clear of marine mammals. A wildlife observer shall be designated and present during all active pile driving operations and shall have the authority to cease operations upon identification of a marine mammal (cetacean) within 2 kilometers (km) of the active construction area. Operations will be suspended until the observed animal has on its own accord left the 2 km buffer zone surrounding the active worksite. The primary cetaceans of note within the area are bottlenose and spotted dolphin. Larger species of *baellenae* whales, although seasonally present within the TCI, are rarely present within the project region.

Sanitary Facilities: The CONTRACTOR shall supply and maintain, at minimum, one temporary sanitary facility for the use of land-based employees and subcontractors for upland operations. The facility shall be conveniently located in the vicinity of the disposal operation. Sanitary facilities shall be of an approved chemical type with regular servicing, as approved by the ENGINEER, and shall move with the discharge point. The facility shall be removed at the end of the project.

Solid Wastes: Solid wastes (including clearing debris) shall be placed in containers that are emptied on a regular schedule. All handling and disposal shall be conducted to prevent contamination of water, soil, or air. No steel, cables, wire, pipe, drums or any other debris shall

[1] EPA. National Ambient Air Quality Standards (NAAQS)

be disposed overboard. No burial of waste materials by the CONTRACTOR will be permitted. The CONTRACTOR shall at all times keep the project area free from accumulations of waste material or debris caused by his or her employees or work and shall remove same when necessary or required by the ENGINEER.

Fuel Transfer: Transfers of fuel, oil or any hazardous material shall be conducted in accordance with U.S. Coast Guard regulations (including, but not limited to, 33 CFR 156).

Fuel Dispensing: Secondary containment, which is capable of holding 110 percent of the tank contents, must be provided for each fuel storage tank and placed on a level surface. Fuel dispensing areas shall have available a 4-foot-square, 16-gauge metal pan with borders banded up and welded at corners directly below the bibb. Edges of the pans shall be 8-inch minimum in depth to ensure that no contamination of the ground takes place. Pans shall be emptied immediately after every dispensing of fuel. If any fuel spill occurs, the CONTRACTOR shall immediately excavate the contaminated ground and dispose of it offsite in an approved area.

Oil and Hazardous Material Spills and Containment: The CONTRACTOR shall ensure that all hazardous material spills including hydraulic fluid spills are immediately reported to the ENGINEER. All hazardous material spills shall be immediately cleaned up in accordance with the *USACE Safety and Health Requirements Manual*, document number EM 385-1-1 dated 3 September 1996. In accordance with EM 385-1-1, the CONTRACTOR shall use suitable methods to prevent the spread of hazardous materials from above-ground storage tanks and piping in case of leakage.

Bilge Water: CONTRACTORS are warned that pumping oil or bilge water containing oil into navigable water or into areas that would permit the oil to flow into such waters is prohibited. Non-compliance with this prohibition is subject to penalties provided for under TCI Law.

Historical, Archeological, and Cultural Resources: If during construction activities, the CONTRACTOR observes items that may have historical or archeological value, such observations shall be reported immediately to the ENGINEER, so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition is required. The CONTRACTOR shall cease all activities that may result in the destruction of these resources and shall prevent his/her employees and subcontractors from trespassing on, removing, or otherwise damaging such resources.

Should any artifacts be discovered the work will cease and the Port Authority will be contacted to make a determination on the significance of the finding and to determine the appropriate government agency to be contacted. Work will not resume until cleared by the relevant agency.

However, it is noted that during the field work conducted to date for the preparation of the EIA no artifacts have been discovered.

Construction Lighting: The CONTRACTOR shall provide a lighting plan for review and approval prior to project initiation. The plan will address both marine and beach project elements. Marine lighting shall conform to accepted international and TCI standards for equipment lighting, but shall be the minimum required to meet accepted standards. Beachside lighting shall be the minimum required to meet safety requirements.

The dredge contractor will be required to provide an EMP that will address operations on their floating equipment including BMP's for fuel and hazardous waste.

A minimum of seven (7) days prior to the Pre-Construction Meeting, the CONTRACTOR shall submit the following items for review and approval by the Owner and Engineer of Record.

Operations Plan. The Operations Plan shall describe the proposed equipment and construction methods including the following information:

Letter of Appointment designating a Project Superintendent(s), describing responsibilities and providing qualifications.

Proposed Equipment List including the specifications for horizontal and vertical positioning equipment and also including calibration information and limits of accuracy.

Proposed Construction Sequence and Methodology describing mobilization, demobilization and daily operations referenced to the work areas and access areas delineated in the construction plans.

Proposed Subcontractors and the segment(s) of work for which they will be responsible. Each subcontractor shall provide a list of a minimum of four similar previously conducted projects including the name of the project, the year(s) of construction, project description, dollar amount of contract award, excavation/fill volume, and name and phone number of the contractor's agent.

In addition, each subcontractor shall provide the following:

- Monitoring Plan
- Workers' Coverage Affidavit
- Environmental Protection Plan
- Quality Assurance and Quality Control (QA/QC) Plan.
- Accident Prevention Plan
- Safety Plan
- Copies of all required licenses, permits and certifications.
- Other Items as may be specified by Owner

Exclusion of the Public

The CONTRACTOR shall exclude the public from the immediate work area at all times during construction. The CONTRACTOR shall post a minimum of one dedicated employee for the sole purpose of full-time security at the discharge location. The project coordinator will provide guidance to the contractor on securing the site to prevent unauthorized persons from entering the facility during construction and operation. This guidance may include producing a list of persons authorized to enter the site and the issuance of identification badges for contractors and employees, the route and schedule for security patrols, the distance a watercraft may approach work areas and dock area by sea, and procedures to limit access by sea for safety and security reasons.

Post-construction, the facility will be International Ship and Port Facility Security (ISPS) complaint The ISPS Code is a comprehensive set of measures to enhance the security of ships and port facilities, developed in response to the perceived threats to ships and port facilities in the wake of the 9/11 attacks in the United States of America.

Night Operations

Night operations shall be limited to hydraulic dredging operations only. All other construction shall occur during daylight hours only. During nighttime dredge operations, the CONTRACTOR shall provide lighting necessary to safely accomplish the work and fully comply with all OSHA requirements. The CONTRACTOR shall shield or orient the lights to minimize light on the dune crest and landward, which could disorient drivers or disturb residents. The CONTRACTOR shall limit placed material dressing, grading, and tilling to daylight hours. The CONTRACTOR shall minimize noise during night operations and conform to noise limits as delineated in the most recent version of the IFC- General EHS guidelines for noise.

Throughout construction, direct lighting must be limited to the immediate construction area and shall be the minimum allowed to comply with safety requirements. Lighting on offshore or onshore equipment must be minimized through reduction, shielding, lowering, and appropriate placement to avoid excessive illumination of the water's surface.

Signal Lights

The CONTRACTOR shall display signal lights and conduct operations in accordance with the General Regulations of the Department of the Army and of the U.S. Coast Guard governing lights and day signals to be displayed as approved by the Secretary of the Army and Commandant, U.S. Coast Guard. (33 C.F.R. 80.18.- 8-31a: 33 C.F.R. 95.51 - 95.66; 33 C.F.R. 9.22 - 90.36; 33 C.F.R. 82 and C.G. Pub. 169, Navigation Rules, International-Inland dated May 1, 1977) (DAR 7-603.33). All applicable regulations shall be observed by the CONTRACTOR, including protocol for towing vessels with tows on which no signals can be displayed, vessels working on wrecks, dredges, and vessels engaged in laying cables or pipes or in submarine or bank protection operations, dredge pipeline, and vessels of more than 65 feet in length moored or anchored in a fairway or channel.

Notice to Mariners

Prior to construction, the CONTRACTOR is required to provide a Notice to Mariners describing the construction operations and work areas. If the CONTRACTOR encounters any unmarked hazards to navigation floating or on the ocean floor, it is the responsibility of the CONTRACTOR to provide a Notice to Mariners and to immediately notify the ENGINEER.

Hardbottom Communities: Hardbottom biological communities in the vicinity of project area are to be STRICTLY AVOIDED by the CONTRACTOR during all mobilization, demobilization, dredging and transit activities. Work and access areas, work exclusion areas, equipment requirements, and reef buffer zones are specified in the plans.

Limitations on Excavation: All excavation shall be performed within the specified dredge location and to the cut depth indicated on the plans. The CONTRACTOR shall be responsible for establishing controls as necessary to ensure that the specified excavation depth and delineated borrow areas are not exceeded.

Mobilization and Demobilization: Mobilization and demobilization to and from the project site shall be controlled by the CONTRACTOR to avoid contact with any and all hardbottom formations.

Mobilization: The CONTRACTOR shall perform the preparatory work and operations in mobilizing for beginning work on the project, including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies and incidentals to the project site, and for the establishment of temporary haul roads, temporary offices, buildings, safety equipment and first aid supplies, and sanitary and other facilities, as required.

Mobilization into the work area shall be through the corridor limits shown in the plans. No anchors shall be deployed outside the work area. All floating equipment shall be self-propelled or directly pushed. The CONTRACTOR shall monitor the location of each piece of floating equipment mobilized through the use of horizontal positioning equipment that has an accuracy of at least +3 ft. Position data shall be recorded every 1 minute. A copy of the data and plots shall be provided to the ENGINEER daily in the Contractor's Daily Quality Control Report. If any floating equipment (barges, pipe strings, dredges, etc.), other than self-propelled vessels (tugs, survey boats, crew boats, etc.), leaves the project area and is remobilized into the work area, these mobilization procedures shall be repeated. Demobilization shall be according to the same requirements for mobilization.

Equipment Positioning and Cut Depth Monitoring

Accuracy and Precision: The CONTRACTOR shall have equipment on the dredge that continuously measures the vertical and horizontal location of the cutterhead, drag arms, dustpan, or clamshell and is interfaced with the cut depth positioning equipment. The specifications for this equipment, calibration information, and limits of accuracy are to be provided to the ENGINEER. The ENGINEER will approve or reject use of specific equipment based on accuracy. Horizontal accuracy for dredge positioning shall be within +3 ft. Vertical accuracy for dredge depth positioning shall be within +1.0 ft. This equipment shall provide a permanent record of the equipment's position referenced to State Plane Coordinates (NAD 83, Florida East Zone) and NGVD 29 datum.

During dredging, reports on the position (x,y) of and bottom elevation (z) of the cutterhead shall be recorded. This position shall give both horizontal and vertical (depth corrected for tide in feet referenced to NAVD 88 datum) position. The dredge depth (cutterhead, dragheads, or dustpan) shall be corrected for tidal fluctuations by a method pre-approved and acceptable to the ENGINEER. The tide measurements must be acquired and applied to the vertical control equipment on a real-time or hourly basis. At a minimum, the report shall give the location at 30-second intervals for cutterhead, hopper, clamshell or dustpan dredges. During unloading of

hopper dredges and scows, data shall be collected at the time of the beginning of the unloading and immediately prior to departure to the borrow area. The CONTRACTOR shall also submit an ASCII file and a plot of the horizontal positions of the dredge for each day. The plot shall contain numbered position fixes that correspond to the positions discussed above.

Transport of Excavated Materials

Methods of Transport: The details of transporting the fill from the excavation area to the placement area shall be proposed by the CONTRACTOR for approval by the port.

Pipeline Method: All in-water pipelines shall be submerged except at the dredge, mono-buoy, and/or boosters. The CONTRACTOR shall propose location(s) of the submerged pipeline that must be approved by the ENGINEER prior to submerging the pipeline. The CONTRACTOR shall avoid hardbottom or seagrass locations in the proposed pipeline route and shall provide a plan view drawing clearly indicating the route relative to the known locations of hardbottom/seagrass in the plans.

The CONTRACTOR shall maintain a tight discharge pipeline at all times. The joints shall be constructed to preclude spillage and leakage. Leaks shall be promptly repaired, and the dredge shall be shut down until complete repair has been made to the satisfaction of the ENGINEER. The CONTRACTOR shall transport the ENGINEER to the leak repair site for visual inspection if requested by the ENGINEER.

Layout of Work for Fill Placement

Layout: Control data and elevations are shown on the Contract Drawings. The CONTRACTOR shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the layout of the work, subject to such modifications as the ENGINEER may require to meet changed conditions or as a result of necessary modifications to the contract work. The layout of the work shall be based on the cross-sections and not the plan views in the Construction Plans. The CONTRACTOR is responsible for verification of all horizontal and vertical control provided in the Contract Drawings. The CONTRACTOR must verify all horizontal and vertical control for all monuments within the project limits prior to construction.

Placement Template: Placement shall not occur outside of the upland containment area delineated within the project plans. Placement density shall be continuously monitored and adjusted as necessary to ensure proper operation of the upland containment area.

Dikes: Temporary containment and longitudinal dikes and spreader and pocket pipe shall be used as necessary to contain and dewater hydraulically placed material within the limits of the fill template cross-section and to minimize and control water turbidity. The CONTRACTOR shall not permit dredge-return water to flow landward of the fill section or water to form ponds outside of the fill placement areas. The CONTRACTOR shall protect existing drainage operations. Any material permitted to flow into or restrict the flow of an existing ditch, canal, or drainpipe shall be promptly removed. Structures within the fill section shall be protected by the CONTRACTOR to prevent potential damage by the CONTRACTOR's operations.

Materials Placed Outside the Work Area: If any material is deposited outside the work area, the CONTRACTOR may be required to remove such misplaced material and redeposit it as directed by the ENGINEER, at the CONTRACTOR's expense.

Misplaced Material: The CONTRACTOR shall minimize loss and/or misplacement of fill material. If, during the progress of the work, the CONTRACTOR should lose, dump, throw overboard, sink, or misplace any material, plant, machinery, or appliance which, in the opinion of the ENGINEER, should be removed, the CONTRACTOR shall recover and remove the material(s) immediately.

Quality Assurance

The CONTRACTOR shall be solely responsible for assuring the quality of all work conducted by the CONTRACTOR or its subcontractors in association with the contract for this project. The CONTRACTOR shall designate a Quality Assurance (QA) Officer for this contract, and the QA Officer shall assume responsibility for compliance with all requirements of this contract, including permit conditions, easements, statutes, laws, and applicable regulations. The CONTRACTOR shall prepare a Quality Assurance Plan specifying quality control (QC) procedures for all critical components of the work. The CONTRACTOR shall provide the ENGINEER access to all QC procedures, data, and reports at any time at the request of the ENGINEER. All activities associated with QA/QC shall be included in the costs for the dredge and fill bid item.

Unless otherwise noted, the CONTRACTOR shall conduct all QC procedures. The QA Plan will be discussed at the pre-construction meeting and the CONTRACTOR shall revise the QA Plan at the discretion of the ENGINEER. ENGINEER approval of the QA Plan shall be a required prerequisite to the start of construction. The CONTRACTOR shall maintain the QA Plan and all QC procedures in accordance with any changes made by the ENGINEER throughout the term of the contract.

The QA Plan shall include but not be limited to the following elements.

Letter of Appointment: A Letter of Appointment designates a QA Officer(s), describes responsibilities, provides qualifications, and delineates the line of authority and organizational reporting requirements of the QA Officer.

Personnel Training: Personnel responsible for initial training and dissemination of updated information throughout the term of the contract shall be specified as well as a comprehensive list of training issues covered. Training shall include review of all applicable EMP, permit conditions, licenses, easements, statutes, laws, and other regulations, environmental resource protection, methods of detecting and avoiding pollution, statutory and contractual pollution standards, and installation and care of facilities to ensure adequate and continuous environmental pollution control. QA/QC and supervisory personnel shall be thoroughly trained in the proper use of pollution monitoring devices and abatement equipment, and shall be thoroughly knowledgeable of applicable laws, regulations, permits, easements and other applicable requirements.

Quality Control Methods: Quality control methods shall include those requirements specified for monitoring and environmental protection, equipment calibrations, verification of the position of all dredging equipment, duplicate sample analyses (turbidity monitoring) and any other methods the CONTRACTOR proposed to assure the quality of their work.

QC Reporting Requirements: QC reporting requirements shall be specified in the QA Plan. The CONTRACTOR shall be required to prepare and submit to the ENGINEER the Contractor's Daily Quality Control Report. The Contractor's Daily Quality Control Report shall include as attachments the following: Dredge Position Printouts, Construction Stake Log, Turbidity Monitoring Reports and Chart, and Sea Turtle Observer's Report. The Contractor's Daily Quality Control Report with attachments is due to the ENGINEER on a daily basis by noon on the following day. Reports shall be provided from the first day of mobilization to the last day of work, including site restoration. The Daily Quality Control Report shall be filled out every day, regardless of whether work was accomplished. Failure to provide Daily Quality Control Reports to the ENGINEER shall result in delay in payments to the CONTRACTOR until the Daily Quality Control Reports are received and are acceptable to the ENGINEER.

QA Inspections: All compliance inspections conducted by the CONTRACTOR, or the ENGINEER shall be individually recorded on the Contractor's Daily Quality Control Report, including but not

limited to, the specific items required in this EMP. The inspector shall also record the recommended corrective action to be taken and shall conduct a follow-up inspection within 24 hours to ensure compliance with the corrective action. The Contractor's Daily Quality Control Report with recorded inspections are to be furnished to the ENGINEER daily.

Safety Requirements

The CONTRACTOR shall specify all safety inspection procedures and designate personnel responsible for supervising accident prevention activities and ensuring compliance with safety measures. At the time of the pre-construction meeting, the CONTRACTOR shall submit a Safety Plan to the port. The Safety Plan shall include but not be limited to the following elements.

Letter of Appointment: The CONTRACTOR shall provide a Letter of Appointment designating a Safety Officer(s), describing responsibilities, providing qualifications, and delineating the line of authority and organizational reporting requirements of the Safety Officer.

Accident Prevention Plan: The CONTRACTOR is required to submit to the ENGINEER an Accident Prevention Plan 10 days after the Notice of Award and prior to the pre-construction meeting. The Accident Prevention Plan must be in accordance with all government safety standards as specified in the latest EM 395-1-1, entitled "Safety and Health Requirements Manual." Submission of the plan does not constitute an endorsement on the part of the ENGINEER or ENGINEER of the CONTRACTOR'S Accident Prevention Plan. The plan is intended to provide a method by which the CONTRACTOR demonstrates an awareness of government safety standards.

The Accident Prevention Plan will specifically address operations of marine equipment including monitoring of equipment and minimization of collision risk. All vessels will be required to maintain minimum speeds required for steerage within the immediate project vicinity. Vessels will be required to have a traffic observer while navigating within the project vicinity. The traffic observers' duties will include continuous observations of both vessel traffic and the potential for marine mammals within the project vicinity. Vessels shall maintain the greatest practicable distance from marine mammals if observed. All major equipment shall maintain active advanced encryption standard (AES) transponders and shall remain only within areas designated for marine equipment within the construction drawings including ingress and egress routes. All marine equipment shall avoid areas of environmental (hardbottom and seagrass) resources designated within the construction drawings. All staff responsible for the operation of marine equipment shall be trained

in the specific requirements for safe vessel operation including issues related to environmental resources and the potential for marine mammals.

OSHA Standards: The CONTRACTOR shall review the U.S. Army Corps of Engineers Manual, General Safety Requirements EM 385-1-1, and the latest Occupational Safety and Hazard Agency (OSHA) standards and become fully knowledgeable of the personal protective equipment that must be provided to workers and shall be familiar with the safety standards applicable to the prevention of accidents during the construction of this project and shall comply with all applicable provisions.

Medical Emergencies: The criteria for designating a medical emergency and the procedures to be followed shall be specified by the CONTRACTOR. These procedures shall include local information relative to emergency treatment facilities and methods of transporting personnel, if necessary.

Hurricanes and Severe Storms: The CONTRACTOR shall monitor the National Oceanic and Atmospheric Administration (NOAA) marine weather broadcasts and other local commercial weather forecasting services during construction operations. The CONTRACTOR shall notify the ENGINEER at the time of any decision to move equipment in preparation for potential storms. The CONTRACTOR shall be responsible for acquiring approval for the use of local safe harbors from local authorities. The CONTRACTOR shall include the following information in the hurricane and storm procedures.

Weather Conditions for Terminating Operations: The CONTRACTOR shall provide a list of the equipment scheduled for use on this project and specify the conditions (e.g., wind speed, wave height, etc.) under which operations will be terminated and equipment will be secured.

Prioritized Methods for Storm Preparations: The CONTRACTOR shall provide a prioritized list of actions to be taken in the event of a severe storm and assign personnel to each action. The CONTRACTOR shall specify how each piece of equipment will be secured in place or moved to a safe harbor, including the details of all equipment necessary (e.g., tugs: size, capacity; number; work boats: size, capacity, number; storm anchors: type, size, number; chain or line: size, lengths; etc.).

Personnel Evacuation: The CONTRACTOR shall provide a plan for evacuation of personnel, including their responsibilities prior to evacuation, methods of transportation, alternate accommodation, etc.

Emergency Response for Equipment Failure: The CONTRACTOR shall specify emergency operating procedures to be implemented in the event of mooring equipment failures during sudden and severe adverse weather or any other conditions. These procedures shall include actions to be taken in response to loss of a spud(s), swing wires, anchor wires, or other mooring equipment or facilities.

Fire Extinguishers: The CONTRACTOR is specifically required to provide a fire extinguisher on all mobile construction equipment with a basic minimum extinguisher rating of 80-B:C to 120-B:C; which is equivalent to a 10-20 pound dry chemical extinguisher, compatible to the hazard(s) including combustible materials, flammable liquids and materials used in areas remote to other fire extinguisher equipment.

Backup Alarms: The CONTRACTOR shall operate and maintain backup alarms on all land-based mobile construction equipment 24 hours per day, unless specifically directed by the ENGINEER.

Hurricane and Severe Storm Plan: The CONTRACTOR shall submit a Hurricane and Severe Storm Plan within 10 calendar days after the Notice of Award and prior to the pre-construction meeting. This plan shall include but not be limited to the following elements:

a. Types of storms possible (winter storm, tropical storm, hurricane, and tornado).
b. Time intervals before storms strike the project area when action will be taken and details of the actions to be taken. The plan should be specific as to what weather/wave conditions will require work shutdown, removal of dredge, etc.
c. List of the equipment to be used on the job and its ability to handle adverse weather and wave conditions.
d. List of safe harbors or ports and the distance from the work area to these harbors and the time required to move the equipment to these harbors or ports. Copies of letters of approval for the use of these safe harbors or ports (local authorities, U.S. Coast Guard, etc.) where applicable.
e. Method of securing equipment in these safe harbors or ports.
f. List of equipment to be utilized to make this move to safe harbors or ports (tugboats, work boats, etc.), to include the name and horsepower of this equipment. The plan will include

only equipment capable of making the move to safe harbors or ports in adverse weather or sea conditions.

g. Methods of securing equipment not moved; i.e., pipelines (floating or submerged), pumpout stations, etc.

h. Plan of evacuation to include interim measures (i.e., immediate reaction plans to be taken for all storm occurrences, particularly sudden/flash storms).

i. Operating procedures to be undertaken when critical dredge equipment fails during sudden and severe adverse weather conditions, to include breaking of spuds, swing wires, anchor wires, or other mooring equipment or facilities.

The CONTRACTOR shall continually monitor the NOAA marine weather broadcasts and avail themselves of such other local commercial weather forecasting services as may be available.

Pier Construction

Pier construction shall be conducted utilizing the same EMP for waterborne equipment as delineated for dredging operations, including equipment operations, ingress, egress and avoidance of hardbottom resources.

Turbidity Curtains

The CONTRACTOR shall utilize upland containment to retain discharged dredge material within the areas designated for spoil disposal, and minimize the discharge of material into the nearshore to fine silt/clay fractions only. Coral fragments shall be retained within the upland containment areas.

Turbidity curtains shall be installed and maintained around active excavation, construction and discharge locations including both dredge operations and pier construction. The CONTRACTOR shall submit a turbidity curtain plan for review and approval prior to project initiation including the specific make and model of proposed curtains, the curtain mooring system and general curtain layout to meet project requirements. Curtains shall be in good working order and inspected on a daily basis, with documentation of function provided within the daily report by the CONTRACTOR. The CONTRACTOR shall maintain onsite sufficient curtain length in reserve to replace worn or damaged curtain sections.

Turbidity curtains should be installed at all sites of turbidity-generating activity, including the jetty construction area, dredge site and the dewatering site. The curtains may need to be removed

during periods of rough weather to prevent damage to the curtain and surrounding habitat; however, storm conditions should also necessitate cessation of dredging activities.

Placement of turbidity curtains will be adaptively managed based on sight and field conditions to meet the turbidity standards/testing requirements to ensure compliance with project turbidity standards. Curtains will be deployed in a manner not to impede marine species or present an entanglement risk. Curtains will be sufficiently secured and anchored so as not to pose a risk to hardbottom resources and where practicable will be located away from benthic resources.

Upland containment including settling ponds, diking and water control structures shall be implemented to minimize the potential for discharge of coral fragments into the marine environment. Turbidity curtains will be deployed around the return water discharge from upland disposal to minimize the potential for discharge of coral fragments (which may contain SCTLD) into the broader marine environment.

Monitoring and Construction Oversight – Marine Elements

The following construction oversight and monitoring tasks will be conducted in support of project construction. It is anticipated that a design-build contract will be negotiated by the Owner with an appropriate dredge and marine construction contractor. Given the scope of the construction and the type of equipment required, this contractor will need to be an international firm with sufficient experience, resources and expertise. Appropriate oversight of the construction contractor will be required, as will monitoring of the project throughout the construction process. The following major oversight and monitoring tasks will be implemented.

Pre-Construction Benthic Surveys: A pre-construction (baseline) marine benthic survey will be conducted to supplement existing site data and document pre-construction conditions. Survey effort will include identification and relocation of suitable resources within the project footprint to appropriate receiver sites outside the zone of influence of the project.

Pre-Construction Meeting: The Owner will facilitate a pre-construction meeting to review salient elements of construction with all relevant parties. At a minimum, this meeting will include representatives from the construction Contractor, the Engineer-of-Record, monitoring support staff, and relevant governmental entities. The conference will be held in Providenciales with the ability to participate by conference call.

Identification of Key Staff Roles and Responsibilities: The pre-construction meeting will include identification of key points of contact for all relevant parties and a contact list will be prepared and distributed, delineating each key staff member and his or her role and responsibility. The role and responsibility of each key staff member will be discussed at the pre-construction meeting and will include identification of staff with the contractual authority to suspend construction operations as a result of impacts. The pre-construction meeting will provide a review of major project elements, appropriate means and methods of construction, BMPs, and monitoring.

Review and Training of Oversight Monitoring Personnel: To the extent practicable, construction oversight will utilize local, on-island resources to provide daily observations of construction. Oversight procedures and responsibilities will be reviewed with individuals identified to support construction operations. This will include project-specific training of local staff to support construction oversight monitoring.

Review and Training of Staff Regarding listed and protected species: Relevant staff associated with both construction and operations will receive training regarding species of concern in the vicinity of the project. This includes consideration of upland species (primarily plans) and marine species (most notably corals, sea turtles, and marine mammals).

Construction Noise: All construction noise shall conform to the most recent International Finance Corporation (IFC) – General Environmental, Health, and Safety (EHS) Guidelines on noise including maximum levels. If issues regarding noise are identified during construction, ambient levels will be determined by measurement and adjusted accordingly.

Oversight and Monitoring during Marine Construction

The following listing provides a summary of oversight and monitoring activities that will occur during marine construction operations.

Oversight of Construction Operations: Oversight of construction operations will be a shared responsibility of all relevant construction parties, including the construction contractor, the Engineer-of-Record and monitoring support staff. The roles and responsibilities between all parties will be clearly delineated in the EMP and discussed at the pre-construction meeting.

Daily Reporting: The construction contractor will prepare a daily report of project progress during active construction in a format agreeable to the project engineer. This daily report will be

distributed to relevant parties and will include a summary of the previous day's progress, details of any issues or accidents, and assurance that turbidity curtains are in place and functional.

Turbidity Monitoring

Turbidity Monitoring: Turbidity monitoring will be conducted to ensure that values will not exceed a maximum increase of 15 NTU above background concentration during dredging at all sampling locations. Monitoring details are outlined in the following paragraphs.

Sampling Locations: Sampling locations should include the following areas: 1) jetty construction area, 2) dredge areas and 3) discharge site. Background sample points shall be taken at least 1,000 m from the project site outside of the zone of influence of the project. The Global Positioning System (GPS) coordinates of each turbidity sample location should be recorded, and samples should be taken from the approximate middle of the water column at each location.

Pre-construction in-situ turbidity measurements shall be taken weekly within the month prior to the commencement of dredging. Turbidity samples (in NTUs) shall be collected and analyzed at each sample location at mid-depth within the water column. The distance between the sample locations will be at least 500 ft. These measurements will help to characterize the conditions existing immediately prior to construction.

Turbidity monitoring will be conducted on a daily basis by a trained individual. The following protocol will be utilized.

Equipment and Monitoring Protocol: Samples will be measured in NTUs per the device manufacturer's guidelines. The device shall be factory calibrated within at least the previous year. Field calibration shall be conducted at least every week or if warranted, based on a reading comparison to a standard. A QA check to a 10 NTU standard shall be conducted prior to each sampling event to ensure the device is calibrated and reading properly. Samples shall be collected mid-depth utilizing a Niskin bottle or comparable sampling device. Samples shall be tested within 10 minutes of sample collection.

Frequency: Two sampling events will be conducted per day, nominally one in the morning and one in the afternoon, at least 4 hours apart. Samples will be taken during active construction, when the dredge has been operational for a minimum of 2 hours. Samples will not be taken if the dredge is not operating for a period greater than 4 hours, and this condition will be noted in the

daily sampling report. Additional sampling will occur if a significant increase in the turbidity plume size, extent or visual magnitude is observed between regular sampling intervals.

Background: A representative background sample will be collected a minimum of 1,200 ft up-current of the project in an area free of project influence prior to each compliance sampling event.

Compliance Sampling (Dredge): The dredge compliance sample will be collected at a distance of 500 m (1,640 ft) down-current of the operational dredge turbidity curtain perimeter, within the densest portion of any visible turbidity plume.

Compliance Sampling (Discharge): The discharge sample will be collected a distance of 500 m (1,640 ft) from the discharge, within the densest portion of any visible turbidity plume. Levels should be below the 15 NTU above background standard in this event.

Compliance Sampling (Jetty Construction and Pier Construction): The discharge sample will be collected at a distance of 500 m (1,640 ft) from the turbidity curtain perimeter, within the densest portion of any visible turbidity plume. Levels should be below the 15 NTU above background standard in this event.

Compliance Standard: Compliance will be demonstrated through a compliance turbidity reading of no more than 15 NTUs above background at each compliance station.

If an exceedance is observed at any compliance station, the monitor will immediately notify the port, the Authority, the construction contractor and relevant governmental parties. If an exceedance is observed, the CONTRACTOR will immediately cease the relevant construction operations until turbidity values fall within operational parameters. The CONTRACTOR will then make whatever practical modifications to the construction means and methods necessary to achieve turbidity compliance. Means and methods of construction are at the discretion of the CONTRACTOR, however, the CONTRACTOR must operate in compliance with the turbidity monitoring and turbidity levels established for this project.

A daily report delineating each sampling event will be prepared and will include the following items:

- Date, time, and location of sampling.
- A schematic map with the sample site(s) shown.

- Water depth at sample site.
- Sample depth.
- Weather, wind, and current conditions.
- Approximate tide (e.g., incoming or outgoing).
- General dimensions of the visible turbidity plume (delineated on a map) including relative distance to environmental resources.
- Documentation of any additional controls or practices that have been implemented to achieve compliance of the monitoring interval.
- Discussion of any exceedances, work cessation, or other corrective action that has been taken over the monitoring interval to achieve compliance.

Each report shall include a summary of turbidity values and a map delineating sample locations and relative extent of the turbidity plume. Reports will be submitted to relevant governmental entities for review on a weekly basis.

Once construction is completed, the removal of the turbidity curtains should occur only when turbidity levels inside and outside the curtain are reasonably equal and consistent with background samples.

Weekly Reporting

A weekly onsite progress meeting will be conducted between the CONTRACTOR, owners' representatives, the ENGINEER, and relevant governmental entities, with the ability to attend the meeting by conference call. This meeting will review construction progress to date and identify any issues or required corrective actions. A meeting summary will be prepared including action items and will be distributed to relevant parties.

During Construction Benthic Surveys

On a bi-weekly (every 2 week) basis following the initiation of construction and continuing until the completion of dredging operations, a reconnaissance survey of benthic resources within the project vicinity will be conducted. This survey will be conducted by individuals with specific expertise in coral resources (marine biologist or similar) in the vicinity of marine construction. This survey will focus on the general health and levels of stress and sedimentation observed on these resources. The survey will include screening protocols for coral disease, specifically with regard to the potential occurrence of SCTLD. A summary report will be prepared and distributed to the

project team. The engineer will be notified of any excessive sedimentation or visible stress of coral resources and, if deemed significant, will direct the contractor to alter construction means and methods to further reduce project turbidity and sedimentation.

Post-Construction Oversight and Monitoring

The following post-construction tasks will be conducted to document post-project conditions and certify that construction was completed in compliance with project plans and specifications.

Post-Construction Bathymetric Survey

A post-construction bathymetric survey of the excavation area will be conducted and compared to the pre-construction survey. The survey will be utilized to document contractor conformance with the project specifications and as a basis for payment and project acceptance. A comparison plot of the two surveys will be prepared to quantify the volume of material removed and to verify that all excavation occurred within the depths and spatial limits of the dredge template. An allowable (over dredge) tolerance of 0.5 m will be applied to final depths with all depths required to meet minimum design depths. The contractor will not be compensated for excavation beyond tolerance and will be required to continuously measure and report ladder depth during construction. The volume excavated will be utilized as the basis for payment.

Post-Construction Benthic Survey

A post-construction benthic survey will be conducted to document post-construction condition. The survey will include the project vicinity, including the pipeline corridor (following pipe removal) and will include an assessment of any transplanted resources.

Project Certification

Following a review of all project data, the Engineer-of-Record will prepare a project certification attesting to the completion of the project in conformance will the project plans and specifications. Any deviations from the project plans will be identified, including justification, and any incidences or unanticipated project impacts will be identified and discussed. The certification will include a summary of project construction, including final volumes, dates of construction, and turbidity monitoring values.

Long-Term Monitoring

Two additional benthic monitoring surveys will be conducted at Year 1 and Year 2 post-construction, utilizing the same protocols as the previous surveys. These surveys will include any coral relocation sites. The surveys will document recovery and recruitment within the areas of

project impact and will identify any secondary or operational issues observed relative to this project or the facility in general. Surveys will include assessments of general coral health and the occurrence and prevalence of coral disease (specifically SCTLD). Surveys will include species observations include fish, marine mammals and sea turtles.

Monitoring Based Contingency

Benthic monitoring will include an assessment of the loss and fragmentation of habitat attributable to the project. At any time, if monitoring surveys suggest impacts beyond those anticipated within the EIA, relevant governmental entities will be notified of the nature of the impacts and consulted regarding corrective or mitigative actions. This may include the implementation of additional monitoring or specific mitigative action as determined through consultation with relevant governmental entities.

8.0 Recommendations and Conclusions

The proposed project at the South Dock Port facility aims to improve the navigation, safety, and efficiency of transporting cargo to the TCI. This construction includes a combination of dredging, pier additions/upgrades, topside cargo holding/handling, and wave protection measures within the port itself and the adjacent (channel) approach and turning basin. This EIA aims to address concerns presented in the ToR by assessing baseline conditions, estimating impacts, and providing mitigation measures within the legal framework within TCI.

Terrestrial environmental impacts for this project are limited as the area is an operational port facility. Limited native and endemic vegetation is noted within the project area of influence and will be transplanted out of the project area of influence as a mitigative measure. The project includes implementation of improved surface water management for the upland portions of the facility which represents a significant mitigation for project impacts.

In general, potential impacts will be primarily marine-related and occur during construction and operational phases. As this is an active port facility, impacts will be similar to those that have already occurred due to initial port construction and current operational phases. Mitigation for impact to marine resources are proposed. An EMP has been developed, including the implementation of measures to minimize project impacts including monitoring. The 2017 EIA report summarizes potential construction impacts and impacts due to daily operations, as well as avoidance and recommended mitigation measures. These are echoed in this 2023 EIA report.

Marine environmental impacts are limited given the project site's previous existing use as a port, where dredging activities and construction activities have occurred in the past. Construction of a mitigative reef and relocation of appropriate species to the reef is proposed as a mitigative measure for impacts. Turbidity and subsequent sedimentation should be avoided / minimized via turbidity curtains to avoid secondary impacts. It is also recommended that in-situ solid waste (i.e., debris) be removed from the project site.

To successfully execute this program, monitoring and appropriate project oversite is required. Proposed efforts include monitoring related to turbidity and sedimentation, hydrographic, topographic, and biological monitoring. Based upon the observations and monitoring, mitigation measures can be implemented throughout the entire project life to avoid, reduce, repair, offset, and compensate for impacts.

9.0 Appendices