

NATIONAL ENVIRONMENTAL GUIDELINES

For

Marinas and Berthing Facilities



Belize City, Haulover Creek Harbour

Prepared by the Department of Environment

April 2009

1.0 INTRODUCTION

1.1 Background

The Belizean populace has very close ties with the Caribbean Sea, with over 65 percent living in coastal communities that rely primarily on fishing, tourism, and agriculture as their main source of livelihoods.

The coastal marina sector is closely related to the wider tourism and leisure industry by providing infrastructure and services for people to participate in the tourism industry as water taxis, tour guides, or cruise ship tenders and in leisure boating activities as local tourists. Marinas can also serve as visitor attractions in their own right.

With the growth of the Tourism Industry and the rapid growth of the cruise ship industry in the last five years there has been an increase demand for marina services where tender vessels, yachts, and other boats could moor and be offered safe harborage, and other supporting services.

1.2 Global Tourism

Global Tourism today generates over US \$6.2 trillion in expenditures and is expected to grow 4.6% per annum between 2006 and 2015. In 2005, the sector represented 6.5% of total global exports and contributed 3.8% of estimated total GDP. Taking into account spin-off effects, GDP contribution was estimated to be 10.6%. The industry generated 74 million jobs or 2.8% of total world employment. Tourism is one of the top five exports for 83% of all countries and is the main source of foreign exchange for 38% of the world's nations.

1.3 Belize Tourism Trends

In Belize, the rate of growth in tourism has been significant. The international visitor arrivals (overnight tourists and same-day visitors) for Belize almost reached 800,000 in 2003, and exceeded 1,000,000 in 2004. By 2007 the total arrivals had declined and were more in line with the 2003 figures at 876,183 arrivals. The cruise sector has accounted for the majority of this growth.

1.4 Boating and Berthing Demand Trends

A review of passenger vessel licensed for 1995 -2005 (see Table 1) shows a significant increase in the registration of passenger boats for Belize City coinciding with the growth of the cruise ship industry. This figure does not include the increase number of privately owned and transient yachts and cabin cruisers operating within Belize’s territorial waters, which has increased significantly in the past five years.

Table 1: Number of Passenger Boats Licensed by Area 1999 - 2005

City/Town/Village	1999	2000	2001	2002	2003	2004	2005
Belize City	52	67	40	90	267	267	699
Caye Caulker	71	110	59	61	58	36	141
Corozal	20	11	17	29	3	82	152
Dangriga	63	109	85	74	50	43	134
Monkey River	0	0	0	0	0	10	25
Orange Walk	19	36	10	46	22	18	42
Placencia	77	142	15	24	89	91	213
Punta Gorda	26	29	11	20	5	47	59
San Pedro	207	223	119	234	201	252	463
Sittee River					17	22	29
Seine Bight					4	2	7
Hopkins					10	9	20
Maskall					5	0	0
South Stan Creek					3	0	0
Ladyville					4	0	0
Total	535	727	356	578	738	879	1984

These figures indicate that there is a growing demand for marina services, and a present shortfall in the country’s ability to handle adequately these demands. This is indicative of global trend in the yachting industry, with more than 7,000 luxury yachts (80 ft/23 meters or more) globally, and more than 650 new mega-yachts slated to enter the waters this year in this year (2009) alone.

The majority of coastal marinas cannot meet supply for berths, especially in the South. This is true for all sizes of marina berths, though excess demand increases in relation to berth size reflecting the increasing trend for larger boats. These vessels often anchor in areas where they perceive there is safe harborage with sometimes-dire consequences to Belize's sensitive marine environment.

1.5 Purpose of the Guidelines

The pressure to meet these demands and prepare appropriate guidelines that are sensitive to the needs of the sector and focuses on the protection of the environment is of paramount importance to those involved in regulating the sector as well as those involved in its development. The Department of the Environment (DOE) has responded to several proposals for the construction of marinas or berthing facilities often as components of larger proposals, and has addressed the environmental implication associated with their development and construction through the Environmental Impact Assessment (EIA) process. However, the DOE has found it necessary to develop these GUIDELINES as another supporting tool to address the growing demand for the construction of additional marinas and berthing facilities.

1.6 Limitation of the Guidelines

This document has been prepared to provide guidance on aspects of the siting, design, construction, and operation of marinas in Belize. A wide range of physical, ecological and social environments exist within Belize's Territorial waters. Therefore, these guidelines cannot be considered comprehensive for any specific development or aspects of a particular development. The document should generally be seen as complementary to, rather than as a substitute for, the EIA regulations for projects that could have significant impacts on the environment.

These guidelines are a broad set of criteria designed to facilitate the planning and assessment of marinas. Strict adherence to these guidelines does not guarantee that approval by DOE and other regulatory agencies will be forthcoming, but rather this document should be treated as a resource to provide generic guidance on matters that may help to minimize unnecessary environmental impacts arising from the construction and operation of marinas.

Sensible use of this document will assist a developer intending to submit a marina proposal, and will facilitate an assessment of marina proposals by the DOE and the review of EIAs by the

National Environmental Advisory Committee (NEAC). This document is therefore a planning and assessment tool, one that should lead to an easier and quicker decision on a proposal. It is also anticipated that existing marinas will be encouraged to ensure compliance with the operational aspects of the guidelines.

The DOE should review the guidelines periodically and ensure that amendments or additions made to it take into consideration changes in design approaches, legislation, or technical knowledge. These guidelines are intended to be consistent with existing regulations and legislations of relevant government agencies and best practices and standards for the activities related to the planning, construction and operation of a marina.

Those marinas that are assessed to be compliant with these guidelines should be recognized by the DOE and a yearly certificate of compliance issued to these Marinas. The certificate will acknowledge their environmentally responsible actions, and be allowed to fly a DOE green marina flag from their property.

2.0 Summary of Marinas and Berthing Facilities in Belize

2.1 Marinas and Docking Facilities Located in Belize City Environs

2.1.1 Cucumber Beach Marina (Belize Adventure Complex)

This mainland marina is located 5 miles South West of Belize City proper on the Western Highway, and 3 miles SSW of Belize City Port via water. **Cucumber Beach Marina** caters to both the commercial and the recreational boater. The marina provides mooring for an average of 65 vessels of various sizes.



Entrance to the Marina is located at the following coordinates: N 17° -28.153, W 88° -14.775. Two

breakwaters maintain channel depth and extend out 660ft from the coastline. The channel entrance is 6 ft at low tide; the bottom is silted sand with no rocks anywhere approaching or within the marina. The jetties are lit at night as a navigational aide.

The edge of the Marina is almost completely lined by a 10' timbered deck and has 23 perpendicular wooden docks. These decks are lit at night, with 24 hours security (camera surveillance included) in addition to several other services and facilities.

Services available inside the mainland marina and on site include:

- Dry Docking Available
- Fuel (Gas/Diesel)
- Electricity
- Water (Chlorinated)
- Public telephone service
- Open Wireless Internet access in restaurant
- Cable on service center
- Laundromat (coin operated washers & dryers)
- Restrooms and showers
- A restaurant and bar

2.1.2 *Radisson Fort George Hotel and Marina*



The marina is located directly in front and across the street from the hotel. The Radisson Fort George Hotel & Marina classifies its marina as a “full-service marina” offering eight slips, plus fuel, water, complete shore hookup, a gated marina with 24-hour security, garbage disposal, laundry, deli, and a dive operation. The marina is a wooden T-head deck approximately 550 feet long and 250 feet wide at the head. Coordinates: N 17° 29’ 36.61”, W 88° 10’ 46.06”

2.1.3 *The Princess Hotel & Casino Marina*



Located in front of the hotel, the marina provides moorage for over 30 vessels, a breakwater as well as fuel on deck. Coordinates: N 17° 30’ 15.91”, W 88° 11’ 13.32”

2.1.4 *Moho Caye Marina, Belize*

Moho Caye Marina with coordinates N 17° -31.80, W 88° -12.00 is presently non-operational as a commercial marina. Access to the marina is via a narrow channel which appears to have silted up further limiting access to the marina by larger vessels with draft greater than 4.5 feet. There appear to be plans to restore and rebuild the marina docking facilities.

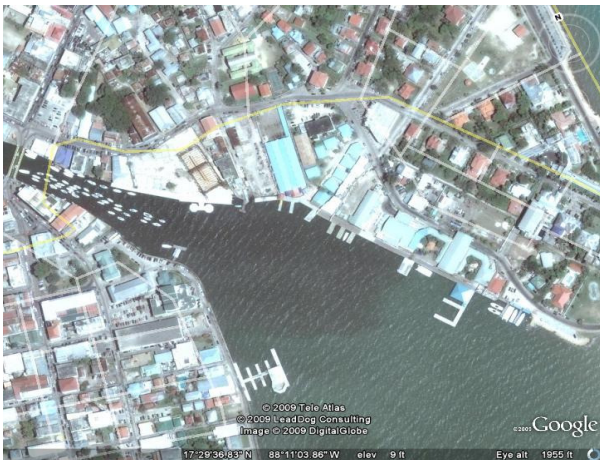


2.1.5 *Marina Towers Docking Facility*



The Marina Towers docking facility is a T-Head pier, which protrudes approximately 75 feet perpendicular to the coastline. This facility is strictly for the private use of guests and visitors. It provides no other services other than berthing of small vessels.

2.1.6 *Haulover Creek Docking Facilities*



Haulover Creek Docking Facilities



Bellevue overwater structure with docking facility

At the mouth of the Haulover Creek, there exist six docking facilities within the existing harbour. These facilities include two docking facilities on the Southern Foreshore area namely the Triple J pier and Belleview docking facilities, which contains six fingers. On the northern area there exist a series of docking facilities pertaining to several business establishments, the Water Taxi Association, National Cooperative, Brown Sugar, San Pedro Water Taxi, Tourism Village Complex, and Harbour View. These facilities all cater to small to medium watercrafts that are either used as pleasure crafts, tenders, water taxis, or private marine tour operators. These vessels have access to fuel facilities located on one of the decks.



L-R: Dynasty Marina and Shell Marina
Mile 2 High Northern Highway.



First Roundabout marina (Northern
Highway)

Further up the Haulover Creek, located approximately two miles on the Northern Highway, are two small marinas that cater primarily to local small vessels. These two marinas are referred to as the Shell Marina and the Dynasty Marina with both of them being serviced by the Buca Shell Gas Station, which separates the two marinas. Approximately 1000 feet further up lies another small marina, which has been out of service for a period.

2.2 Marinas and Docking Facilities Located in Ambergris Caye and Other Cayes

Most resorts and hotels with coastal frontage have constructed their own private piers/docks to receive guest and visitors inclusive of staff arriving by water, usually in skiffs and speedboats with shallow drafts. In addition, the piers/docks are often used to unload supplies, material, and other consumables required by the establishment. In Ambergris Caye, like in Caye Caulker and Saint Georges Caye the proliferations of these piers/decks on the windward side of the island have become a major issue of concern because of their impacts on beaches, pollution of

recreational waters, and their negative impacts on the overall esthetics of the area. For the purpose of this report, the authors have selected only those facilities that are advertised as marinas on their web sites and which have provided some form of information on their services.

2.2.1 *Belize Yacht Club and Marina, San Pedro, Ambergris Caye*

The Belize Yacht Club was built in 1980, and currently has 20 slips available for rent, for vessels up to 80'. The marina offers electricity and all slips except E & F dock have internet access via Wi-Fi (free of charge), cable TV, and Telephone hook up and pump out. There are currently no bathroom facilities or laundry facilities on the docks. In the interim, laundry service is offered through the hotel.

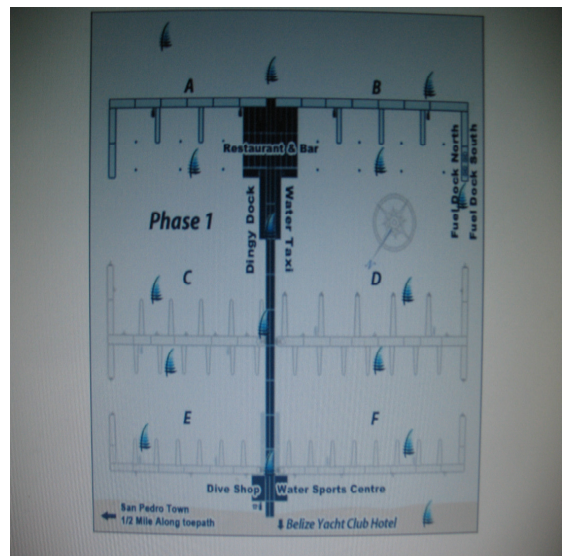


While there is no fuel dispensing units on the docks, refueling via barge is sometime arranged. **The marina advertizes as the only DEEP WATER, yacht friendly Duty Free Fuel from high-speed (100gal/min) pumps**

between Cozumel and Belize City.

The Belize Yacht Club has plans to upgrade into a more modern facility, which will accommodate up to 60 vessels. The marina will consist of a fixed T head, bulk headed pier with floating dock fingers, the marina will accommodate vessels ranging in size from 35' to over 100' and up to 7' draft. The Coordinates are: **N 17° -28.153, W 88°-14.775**. Included in the plans is the construction of an overwater restaurant and bar. The new facility is planned to feature:

- Metered Electric hookup up to 200 amps 240v;
- Metered water;
- Wi-Fi internet access
- Pump-out available at selected slips;
- 24 hr security;
- IGFA weigh station and cleaning station;
- Bar & Restaurant (phase 2)
- Swimming pool with swim up bar
- His and hers showers
- Coin operated Laundry facility
- Fuel: Gas and Diesel.



BYCM's proposed new facility.

2.2.2 *Caye Chapel Marina*

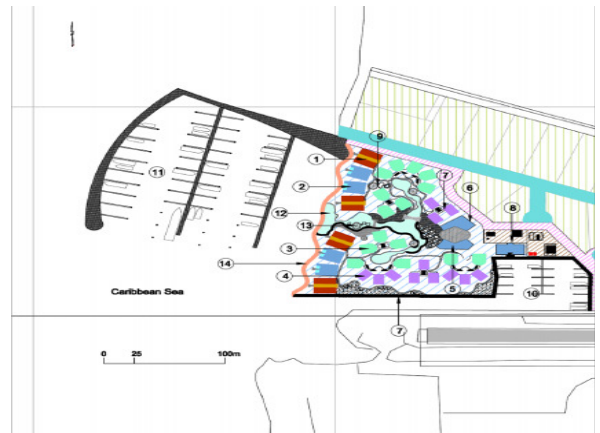
Caye Chapel is a deep-water landlocked marina containing 12-slip. The marina is centrally located on the leeward side of the island with the following coordinates N 17° 41' 50.01, W 88° 02' 40.91 for its entrance channel. It is designed to provide service for yachts up to 140 feet in length, and provide the following amenities: restaurant and bar, fuel and water.



2.2.3 *Pelican Point Marina, Caye Caulker*

Presently the existing facility consist of docking area primarily for small vessels and barges with low drafts, and provides fuel and water as part of their services. The entrance channel coordinates is N 17° 30' 15.91", W 88° 11' 13.32". There is a proposal to upgrade to a full service marina consisting of two components.

According to the EIA prepared for the proposed Pelican Point Marina & Yacht Club (July 2008), the proposed marina consists of two marinas, a large and small marina. The small marina is proposed as a land lock marina with 17 slips and with its entrance channel running parallel to the Caye Caulker airstrip. It is intended for smaller boats and to offload passengers, goods, and supplies. Below is Pelican Point Marina (existing facility) and proposed new facility



The large marina is proposed to be constructed on the leeward side of Caye Caulker jutting out approximately 650 feet and capable of holding 140 boat slips for both local and international water vessels up to 100 feet in length. The marina is proposed as a full service marina, inclusive of waste collection and disposal services, for solid waste, sewage, and bilge water.

2.2.3 Belize Odyssey Resort, South Beach, Caye Caulker

Belize Odyssey Resort is situated on four acres plot on South Beach, Caye Caulker. This hotel, like many other hotel resorts on the island, is serviced by a private boat docking pier 300 feet long on the windward side of the island, and sometimes advertised on their web sites as a marina. The pier sits on “botan” piles with wooden plank walkway. The additional services offered by this “marina” needs to be verified.



2.2.4 Blackbird, Turneffe Atoll

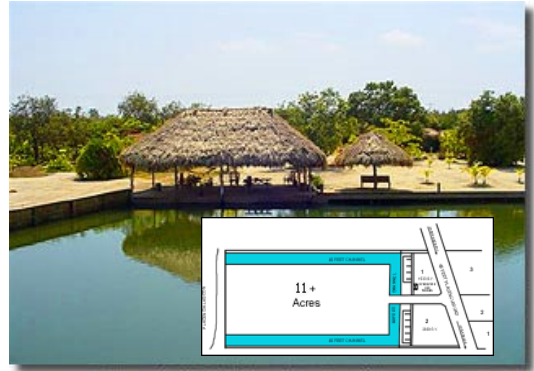
The marina facility at Blackbird Caye, Turneffe Atoll comprises of the northern dock (L-head) and the southern dock (T-head). The northern dock is the longer being approximately 200 feet long with one finger located in the middle on the north side for smaller boats docking. This main dock comprises of a dive and snorkel shop and basic services are provided such as electricity, fuel, water, and ice. The southern dock, which is approximately 100 feet long, is used by smaller vessels and for relaxing, swimming, etc. The Main dock’s Coordinates are **N 17° 18’ 39.34”, W 87° 48’ 01.44”**



2.3 Marinas and Docking Facilities Located in the Stann Creek and Toledo District

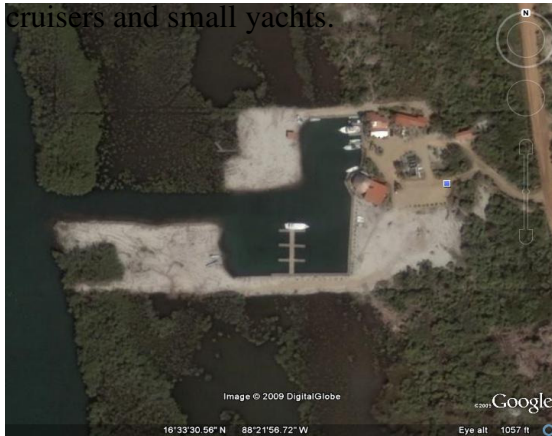
2.3.1 *Smugglers' Landing, Placencia*

Smugglers' Landing, Placencia is a new development which proposes to provide a dock area for boats, marina w/ condo/ resort/ casino/ residential/commercial site. The area in question is an 11 acres plot with two 40' wide channels to main Placencia lagoon and two - 185' x 100' docking space. The pictures below show the existing facilities with proposed development (Inset).



2.3.2 *Robert's Grove Marina*

This marina is located directly behind the Inn at Robert's Grove on the lagoon side of the Placencia peninsula. It is a landlocked marina containing a T-Head pier with four fingers with portions of the marina having a wooden dock bordering the East and southern edge of the marina. Services offered by the marina include fuel, restaurant, and bar, utilities (water, ice and electricity), and a convenience store. It caters primarily to smaller vessels including cabin cruisers and small yachts.



2.3.5 *Sittee River Marina, Stann Creek*

The Sittee River Marina is located approximately 1.25 mile east of the mouth of the Sittee River. The marina is approximately half way between Dangriga and Placencia and is being advertised as a “full service” marina. The entrance is marked with a lighthouse on the south. The marina has several docking areas along the river, bathrooms, shower facility, 24-hour security, ice, 110 V power, fresh water, groceries/sundries, marine, and fishing supplies and fuel. Water depth is approximately 4.5 feet deep at mean low tide and 5.5 feet deep at high tide. Coordinates: **N 16° 48.731 and W 88° 1.121**



2.3.6 *Alistair King Docking Facilities, Punta Gorda, Toledo*



The docking facilities are located immediately in front of Alistair King’s Texaco Service Station at #1 Front Street in Punta Gorda, Toledo. Although listed in the web pages by third parties as a “marina,” it is only a docking facility for boat owners to fuel their vessels. Boat owner use the service station store to stalk up with supplies. The dock is a T-Head type dock measuring 200 feet long and 100 feet at the T.

2.4 Marinas and Docking Facilities that are proposed and/or are under construction.

2.4.1 *Mayan Islands Complex, Ambergris Caye*

The **Mayan Islands** luxury hotel complex is one of the latest projects proposed for **Ambergris Caye**, which is reported to be under construction. A marina is included in the design for private yachts and access to **yacht charters**. As advertised in its web site, the marina is purported to be the “largest mega-yacht marina in the world,” with 400 slips holding up to 150’ yachts and additional space for 328 feet yachts. All properties and yacht slips are intended to be either privately owned or available through an exclusive rental program. No additional



information on this marina exists and the waters in the area are known to be shallow with bedrock just a few feet below the sandy layer. For mega yachts with drafts of up to eight feet, this implies that excessive dredging and excavation of bedrock will need to take place.

2.4.2 *The Peninsula Club Marina*

The proposed landlocked Peninsula Club Marina will be located on the lagoon side of the Placencia Peninsula. Eighty-eight private floating dock system slips ranging from 30 to 60ft are proposed to accommodate vessels up to 60 feet in length.





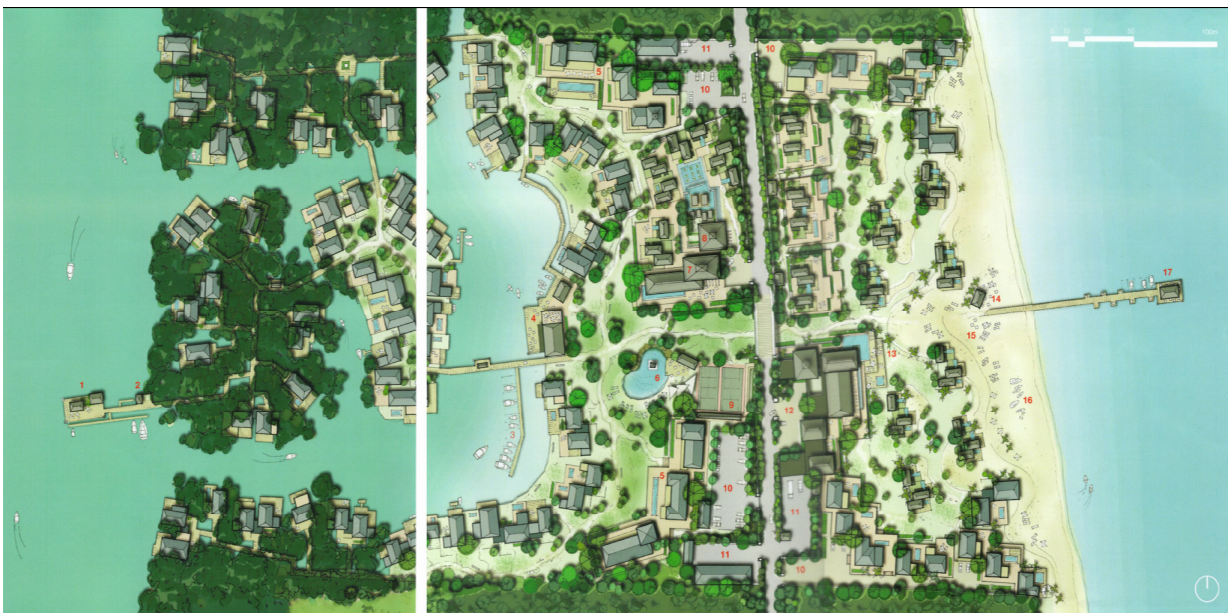
Services will include:

- Dredged and marked channel
- State-of-the-art floating dock system
- Dock master and support staff for concierge services
- Docks and piers designed for easy cart access
- Power, water and sewage at each slip
- Low-impact night lighting
- Manned security
- Catering and provisions

2.4.3 Placencia Resort

Plexar Capital LLC (a Nevis company) was granted environmental clearance for a 152-unit Resort in the Placencia, Luba Hati Area, and north of the Inn at Robert's Grove. The development proposes to include among other things:

- 150 boat slips in the Placencia Lagoon plus 50 repair slips.
- 2,648,600 cubic feet of fill is proposed to be dredged from the Lagoon for 6.7 acres of canals.



Artist rendition of the Placencia Resort depicting the marina on left of drawing.

Each residential unit located on the Placencia Lagoon will be fitted with decking for boat access and mooring (approximately 75 slips total), and a central boating facility with approximately 75

additional slips will be located on the Placencia Lagoon for Hotel and Beach residences lacking boat mooring facilities. Altogether, the plan calls for, 150 wet slips and an additional 50 dry slips for boat storage and maintenance. One boat refueling station will be placed on the extended Placencia Lagoon pier, supplied from an adjoining bunded fuel tank.

2.4.4. *Coco Plum Resort*



Cocoplum Resort is a resort community (north of Seine Bight) comprising of 224 acres of sea to lagoon land, in its ECP approval the 15 slip landlocked marina with two separate entrances was put on hold until an addendum was submitted with more details on the marina to DOE.

2.4.5 *Sapodilla Marina & Yacht Club, Ltd., located at Sanctuary Bay, Stann Creek*

Proposed as a private, gated, and exclusive “members only” community, Sapodilla Marina & Yacht Club, Ltd. is located at Sanctuary Bay, in the Stann Creek District, offering a wide range of amenities for its residents and guests including a marina village.

Estimated to have been completed in Spring of 2008, construction has commenced on a new marina, featuring approximately 200 fixed concrete dock slips, accommodating yachts up to 90ft



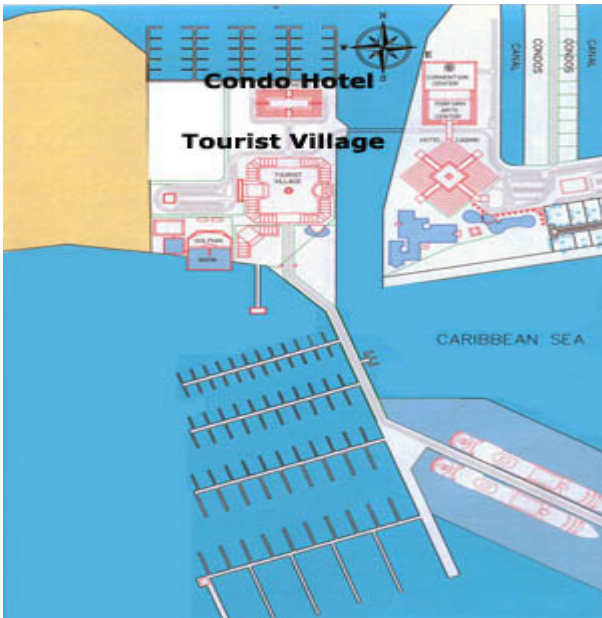
in length in an extremely well protected lagoon. A Marina Village and boating activities area is planned and it is proposed to include the following;

- convenience store
- Fuel, including high speed fueling for larger yachts
- dive shop with boutique
- yacht chandlery and service center
- golf cart rentals
- boat rental and charter booking office for sailing, diving and fishing charters
- restaurant and bar.

In addition, the proposed marina is expected to provide the following services:

- A marina basin depth of 10 ft with an entry channel controlling depth of 12ft
- 30 amp, 50 amp and 100 amp electrical service
- individual dock boxes for each marina slip
- dockside fresh water service
- pump out facilities for each slip
- coin operated laundry service
- shore side bathrooms and showers
- high speed satellite internet access
- Satellite TV service
- 24 hour Security service
- garbage and oil collection service
- Marina Clubhouse with a private restaurant and bar
- Pool and patio area adjacent to the Marina Clubhouse
- Tennis courts
- Fitness Center

2.4.6 Crown Paradise Marina- Cruise Ship Pier – Tourist Village, Commerce Bight, Stann Creek



The proposed complex will offer, in addition to hotel and condominiums, dockominiums and full service yacht marina. Spread over an area of 25-acres, the proposed marina will be a deep water marina built for 250 slips, 100 for yachts, 100 feet and above, 22 for crafts up to 80 feet, 48 slips for 70 feet yachts, 32-60 feet slips and 68-50 feet slips.

Also proposed is a two (2)-slip cruise ship dock. The dock will have the ability to house two cruise ships from 1,265 feet to 1,334 feet long. The marina will offer yacht supply store,

fueling docks, service area mobile hoist, and utilities to all slips.

2.4.7 Palm Harbour –Haney Farms Stann Creek



Palm Harbour is a proposed retired residential and marina development. The proposed subdivision project is located west of the Sapodilla Lagoon, east of Haney Shrimp Farm, south of Sittee Village and north of the Placencia Peninsula. It covers 2,040 acres of which 105.5 acres will be the marina component (this area includes

37.88 acres of property to be excavated) which will provide berthing access for the residents as well as for the visiting population.

The berthing will be facilitated by 15 to 19 marina piers, which will have a wide access for the small motorized/battery powered vehicles. In addition, services and amenities such as a fuelling station, wastewater and potable water services, boat maintenance yard and a commercial zone for semi commercial businesses.

2.4.8 Orange Point Marina (OPM), Toledo

OPM is a 2 acres landlocked marina with a 230 ft permanent dock with a ramp in place located on a 20 acres plot just south of Punta Gorda, Toledo District. The entrance channel is located at coordinates **N 16° 05' 08.90, W 88° 48' 33.28**. The entrance channel is protected by an approximately 100 feet groin running diagonally from the beach. There is a proposal to improve the marina to accommodate 40-50 boat slips, and provide the necessary marina services along with the other amenities included in a resort such as condominiums, restaurant and bar and tennis courts.



2.4.9 Wild Orchid Properties

Wild Orchid Properties located on the lagoon side near Robert's Grove, is a proposed 3 acres -35 condominium buildings development, which will include a yacht club and marina, with its services including pool, restaurant, and fitness center.



2.4.10 Belizean Resort Club

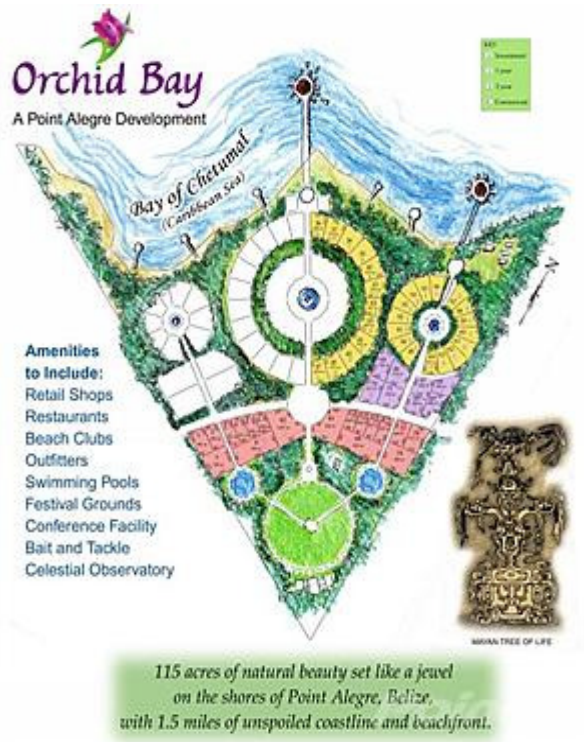


The Belizean Resort Club is an integrated resort hotel/condominium project to be constructed on a peninsula of approximately 130-acre within the Mayan Plantation. The Resort project is a part of a larger development master plan for the approximately 50 square mile Mayan Plantation.

The Resort is bordered by the Caribbean Sea to the East and an approximately 10,000+ acre lagoon to the West. It is located west of Ambergris Caye.

Access to the Resort (at least initially) will be by boat and helicopter and provide a full range of activities and amenities including: scheduled water taxi service to the International Airport, Belize City, and the Cayes; food and beverage service; diving, fishing, and bird watching tour services; shopping; a marina ; and recreational and meeting facilities. The proposed marina will have approximately 75 slips and cater primarily to smaller vessels because of the shallow waters surrounding the project site. No additional information on this marina is provided on their website.(DOE IS ASKED TO VERIFY THIS – NOT SURE WHERE THIS IS)

2.4.11 Orchid Bay Development



The Orchid Bay project in northern Belize comprises of over 4,000 feet of sea frontage within the Chetumal Bay and is proposed to include 300 private residences ranging from seaside casitas and condominiums to half-acre estates. Amenities proposed include an equestrian center complete with a six-acre horse pasture and stables, miles of walking and riding trails, a club house, boat slips, on-site outfitter for excursions, tennis courts, an observatory and concierge services. The beachside cantina will contain a restaurant, a palapa bar, free-form pool. Site construction is reported to be well under way.

2.4.12 Caribbean Yacht Club

Caribbean Yacht Club is located east of Corozal Town close to the Cerros Maya site. The property has 1800 feet of beachfront and 4000 ft of canal frontage. Among its amenities are two inland marinas are proposed that will be 300ft across surrounded by real estate. Very little information exists on this, except for this information, which was extracted from their web site.



3.0 Potential Environmental Impacts of Marina

This section is intended to very briefly summarize information on the potential consequences of marina development on Belize's fragile marine ecosystem.

Belize has the largest and most diverse coral reef ecosystem in the Western Hemisphere with portions given different levels of protected status. In 1996, UNESCO recognized seven sites as World Heritage Sites in recognition of their collective global significance, and of the need to ensure their integrity for future generations. Belize's highly diverse and productive coastal and marine ecosystems include coastal lagoons, mangroves, sea grass beds, and coral reefs.

Coral reefs, sea grass beds, and mangroves interact in a number of ways. The natural plant and animal communities of coastal areas serve multiple functions. Coral reefs serve a variety of functions, some that are not readily apparent. They provide protection to the shoreline from the effects of wave action and are an important habitat for fish for recreational fishing and an important source of livelihood and source of protein for many Belizeans. In addition, the aesthetic value of the Belize Barrier Reef and its supporting system plays a significant role in tourism and the appeal of Belize.

The breakdown of calcareous materials from coral reefs leads to sediment accumulation and the formation of the reef lagoon, which is eventually colonized by sea grass, and closer to shore, by mangroves.

Sea grass beds are found in shallow, calm lagoon areas between the coastline and the barrier reef, and serve to bind sediments, which create a stable substrate on the lagoon floor. This marine habitat provides breeding and feeding sites for animal species such as conch, lobster, crocodiles, and manatees, among others. In addition, they also act as sinks for terrestrial run-off, supplying abundant nutrients to coastal waters.

Mangroves develop in low lying coastal areas that are bathed by saline waters, generating a continuous input of dead-leaf materials into the surrounding waters. The leaves slowly disintegrate into fine particles, which provide food for small aquatic animals, which prosper in the relatively protected environment supplied by the large number of roots and trunks extending into the water.

Mangroves provide spawning and nursery areas, substrates for attachment for many organisms, and food for invertebrates, fish, birds and humans. Mangroves located in estuarine ecosystem affect that ecosystem by modifying current velocities and changing sedimentation patterns by actively trapping sediment within the water column. This helps to also purify the water that enters the coastal lagoons and other areas because trapped within the silt are toxic substances contained in terrestrial runoff. This purifying effect contributes significantly to the health and productivity of the sea grass beds and coral reefs. The elaborate network of prop roots in mangroves also forms a natural buffer against incoming storms, and acts to stabilize the shoreline, minimizing erosion.

Because of these ecological, economic, recreational, and aesthetic values inherent in Belize's coastal resources, it is important that coastal development do not irreversibly damage these features. Damage to the barrier reef or its supporting system can have significant implications to the marine ecosystem and the livelihood of many Belizeans.

Most coastal construction projects, including coastal marinas, will impact the environment in a variety of ways. Impacts can be perceived or real, and may be either beneficial or detrimental to the environment -beneficial in as much as a previously degraded environment may be restored.

One of the major concerns is the alteration of the environment caused by marina construction and operation is the modification of the shoreline and near shore submerged lands by dredging and filling activities, which results in the destruction by removal or smothering of benthic habitats and other life forms. The degree of destruction obviously depends on the quantity and quality of the benthic community at the site and the extent of the dredging and construction activity. Other adverse impacts from dredge and fill operations may include mangrove, coral reef and sea grass loss or degradation, destruction of fishery nursing ground, as a result of the physical impacts of equipment , increased turbidity or siltation, reduced dissolved oxygen or resuspension of nutrients or toxic pollutants.

Coral reefs are particularly susceptible to turbidity related impacts. Coral reefs are sensitive to periodic events in which turbidity is temporarily raised to many times the ambient amount, and thus are particularly susceptible to turbidity caused by dredge-and-fill processes. These periodic

events may be tolerated if they are infrequent and do not greatly exceed the upper levels of natural turbidity at the site. However, above a threshold, such an event may kill coral reefs.

Marinas are designed to provide safe, protected moorings for boats and are therefore usually located in calm waters on protected shorelines. These calm, sheltered areas generally support Mangroves and other important wetland species and submerged sea-grass beds. The importance of these plant communities lies in the vital functions that they perform in the aquatic ecosystem as mentioned above. Most important is their role in converting sunlight and nutrients into food useable by animals, thus forming the base of the aquatic food chain. Thus, the potential for habitat loss or alteration of these productive habitats is a major consideration in marina siting and design.

Shoreline and protective structures often associated with these facilities affect the physical, chemical, and biological components of the environment and may cause beach erosion and change flooding characteristics. Adverse effects may result from alterations in water circulation, deposition/erosion characteristics, and blockage of migration routes or shading in shallow- water habitats or addition of toxic chemical preservatives. On the other hand, the marina structures may provide suitable habitats for colonization, which may help to compensate for natural habitat altered or lost during construction. Certain structures may also attract fish into the area.

The maintenance, operation, and storage of recreational vessels have the potential to pollute adjacent waters and to impair air quality. Contaminants include dust from hull maintenance operations, solvents from engine repair shops, petroleum from careless fueling practices, sewage discharges from boats, and heavy metals from antifouling paints. These pollutants may be deposited directly into waterways or they may be carried in by storm water runoff.

These pollutants may affect the natural productivity of a site. Coral, algae and other animals and plants are sensitive to elevated nutrient concentrations and minute chemical changes and can be killed, overgrown or out-competed by other plants and animals. As a result, the composition or structure of a community can be dramatically changed.

Boat operation also may result in physical impacts to shorelines and to sensitive biota including coral reefs, sea grasses, mangroves, sea birds, manatees, and sea turtles.

The potential for environmental impacts is a function of many variables, including marina location, design, services offered, number, and type of boats served, marina management and operational performance. As a result, the potential for, or the degree of environmental changes is not the same for all marinas. Inevitably, there will be different sets of environmental circumstances for every project that is developed.

By adopting the best management practices recommended within these guidelines, marinas and berthing facilities are intended to reduce and minimize the potential impact of their construction and subsequent operations on the environment.

The document provides guidelines on the following topics:

- laws and regulations
- siting considerations for new or expanding marinas
- marina design and maintenance
- marina construction
- marina operations

4.0 LEGAL AND ADMINISTRATIVE FRAMEWORK

This section is aimed at reviewing relevant environmental protection and planning legislations related to construction and operations of marinas and berthing facilities. The construction and operations of a marina or berthing facility requires that relevant permits are obtained prior to the commencement of any construction activity. These permits are often governed by various different pieces of legislation and may vary depending on the exact location of the proposed activity, magnitude and the various activities (mangrove clearance, dredging, construction of groynes or breakwaters etc.) entailed in their construction and operations.

It is recommendable that proponents of marina and berthing facilities seek the advice of local planning authorities or of the DOE during the early planning stage of the proposed development.

4.1 The Environmental Protection Act No. 22/1992 and 328/2003

The Environmental Protection Act of 1992 legally established the Department of the Environment (Section 3). Under section 3 (3) the Department has the responsibility to monitor the implementation of the Act and Regulations, and to take necessary actions to enforce the provisions of the Act and its Regulations. This enabling legislation provides the Government and the Department with the comprehensive environmental protection authority it needs in order to address modern environmental management issues. The ACT also grants the Department of Environment broad regulatory and enforcement authority for the prevention and control of environmental pollution, conservation and management of natural resources, and regulating environmental impact assessments (EIAs).

The Environmental Protection Act entrusted the Department of the Environment with a broad range of functions relating, but not limited to, the assessment of water pollution, the coordination of activities relating to the discharge of wastes, the licensing of activities that may cause water pollution, the registration of sources of pollution and the carrying out of research and investigations as to the causes, nature and extent of water pollution, and the necessary prevention and control measures (Section 4). Although there are no specific regulations on Environmental Audits (EAs), the Department is empowered to require an EA as a tool as it goes about with the monitoring of the implementation of the Act and Regulations.

The Environmental Protection Act Revised Edition 2003, also charges the Department of the Environment with the responsibility for formulating environmental codes of practices, specifying procedures, practices or releases limits for pollution control relating to works, undertakings and activities during any phase of their development and operation, including the location, design, construction, start-up, closure, dismantling and clean-up phases and any subsequent monitoring activities. Under the Act, no person, installation, factory or plant shall, unless specifically permitted by the Department, emit, deposit or discharge or cause emission of any pollutant or contaminant into the atmosphere or environment in contravention of the permitted levels. Every person, installation, factory or plant emitting air pollutants is required to maintain and submit to the Department, records of the type, composition and quantity of pollutants emitted. Part V - 20 (4) of the Environmental Protection Act states that every project, programme or activity shall be assessed with a view of the need to protect and improve human health and living conditions and the need to preserve the reproductive capacity of ecosystems as well as the diversity of species. Furthermore, the EPA requires that any person or undertaking exploiting the land, water resources, seas or other natural resources shall ensure the protection of the environment against unnecessary damage or from pollution by harmful substances; and no person shall emit, import, discharge, deposit, dispose of or dump any waste that might directly or indirectly pollute water resources or damage or destroy marine life.

4.1.1 Environmental Impact Assessment Regulations SI 107/1995 and 24/2007

The Environmental Impact Assessment (1995) regulations describe in detail the processes involved in the preparation and evaluation of environmental impact assessments. The regulations divide projects or activities into three categories. The first category consists of those projects that automatically require an environmental assessment based on the sensitivity of the surroundings or the nature of the undertaking. The second category comprises those projects that may require an assessment to be carried out, but with some modifications based on the location and size of a project. The third category encompasses activities or programs that do not require an assessment to be conducted which may not have significant impacts on the environment. In March of 2007, amendments to the regulations were published. These amendments allow the Department to charge an application and processing fee for projects, programmes or activities requiring environmental clearance, streamlined project schedules and allowed for greater public

participation. In addition it also allows for a monitoring fee to be charged to ensure follow up during project implementation and operation.

The EIA is normally prepared by the proponent and submitted for review by the National Environmental Appraisal Committee (NEAC), whose function it is to ensure that the proposed undertaking takes into account all of the requirements, policies and regulations for protection of the environment, natural resources and socio-economic conditions, and is consistent with other land use in the area. Following review by NEAC, if the project is allowed to proceed, a Compliance Plan for the development and operation of the proposed works or activities is agreed between the proponent and DOE. Essentially, the Compliance Plan constitutes an approval to proceed with the project, provided the agreed mitigation, monitoring and other conditions specified within the Plan are implemented. Operators that do not comply with the terms of the Compliance Plan may be subject to a Stop Order issued by DOE.

4.1.2 Effluent Limitation Regulations SI 94/1995 Revised Edition 2003

The Environmental Protection Effluent Limitation Regulations came into force in 1996, at which time the Department of the Environment commenced enforcing the Regulations. The Regulations are intended to control and monitor discharges of effluent into any inland waters or the marine environment of Belize.

Under the Effluent Limit Regulations, DOE may require the owner or operator of a public facility which produces liquid and solid waste to report on the performance of the facility, the effluent discharged, the area affected by the discharge, and the control measures being undertaken for the discharge. Surface water, however, is not considered an effluent in this respect.

4.1.3 Pollution Regulations SI 56/1996 Revised Edition 2003

The Pollution Regulations of 1996 addresses issues of air, water and soil pollution, including noise pollution. Part III – 6 (1) deals generally with the emission of contaminants into the air where no person shall cause, allow or permit contaminants to be emitted or discharged either directly or indirectly into the air from any source. Regulation 31 of the Pollution Regulations

(1996) provides that a person shall not pollute the land so that the condition of the land is so changed as to be capable of making the land noxious or harmful to animals. Regulation 32 provides that no person shall cause any seepage or leaching contamination of the adjacent soil, groundwater or surface water. Regulation 33 empowers DOE to issue directions to persons operating a site for the elimination of waste or a solid waste treatment plant and disposal system. Regulation 35 prohibits the deposition of waste in a place other than a site approved by DOE for the storage or elimination of waste or operation of a waste treatment plant or waste management system.

4.2 Legislation Governing Planning and Construction

4.2.1 General

Marinas located in coastal urban areas such as Corozal, Belize City, Punta Gorda, Stann Creek, San Pedro and Caye Caulker may be subject to local bylaws and may be required to seek the approval of the local planning authority in addition to ensuring that they are in compliance with the requirements of national legislation. For example in Belize City and in San Pedro Town permits are required from the local authority (City Council and Town Board) for the construction of any piers within city/town limit. In the past the staking in or filling up of land on the banks of the Belize River within Belize City required a Ministerial permit.

4.2.2 Private Works Constructions Act, Chapter 337, Revised Edition 2003

Presently construction of any “wharf, bridge, pier, bathing or other kraal or other erection whatever upon, and to enclose, stake in or fill up any land on the shore of the sea or bank of any river in any part of Belize other than Belize City”, are subject to the granting of a license as required by Section 2 of the Private Works Constructions Act, Chapter 337, Revised Edition 2003.

4.2.3 Belize City Council Act Chap. 85 Revised Edition 2000

The Belize City Council Act provides for the regulation and assessment of building plans. This is in addition to the powers to lay out and manage streets and public open spaces. Under the act, all public canals constructed within the City of Belize are hereby vested in the council.

Under Section 25, without prejudice to any other powers conferred on the Council by the Act or any other law, the Council have the power and responsibility of coordinating activities and operations of all utility agencies and property developer within the Belize city with respect to the excavation and restoration of streets, canals, creeks and other public right of way, with the object of preventing damage to the city infrastructure and minimizing the disruption of utility services to Belize City

4.2.4 Housing and Town Planning Act Chapter 182, Revised Edition 2000

Under the Housing and Town Planning Act Chapter 182, the Housing and Planning Department has legal authority to execute planning schemes within Belize. While this process is not being fully implemented at the present time, it is important that the Housing and Planning Department and the Land Utilization Authority be involved at an early stage with the approval process for any sites involved.

4.3 Land Use Legislation

4.3.1 National lands Act 191, Revised Edition 2003

According to the National Lands Act Chap 191, Rev. Ed. 2003, national lands mean “all lands and sea bed, other than reserved forest within the meaning of the Forests Act, including cayes and parts thereof not already located or granted, and includes any land which has been, or may hereafter become, escheated to or otherwise acquired by the Government of Belize.”

Hence, any person desirous of building or construction a pier, berthing facility of marina is required to obtain a permit from the Lands and Survey Department for the lease and construction of such erections over any water body (national lands).

In addition, according to section (1) of the National Lands Act, the Minister may exempt from sale and reserve to the Government of Belize, the right of disposing of in a manner as for the public interests, “such lands as may be required as reserves, or as the sites of public quays, wharves or landing places on the sea coast or shores of streams.”

According to Section 3 of the National Lands Act there is the requirement of sixty-six feet reserve measured from high water mark along all water frontages which shall be reserved for Government or public purposes. Furthermore, Section 4 states “Access shall be provided from all surveyed lands to any public road, navigable river, creek, lake, or sea shore contiguous thereto.”

In Section 28 the National Lands Act states that in any “grant, lease or other document where the sea, or any sound, bay, or creek or any part thereof, affected by the ebb or flow of the tide, is described as forming the whole or part of the boundary of the land to be disposed of, such boundary or part thereof shall be deemed and taken to be the line of high water mark at ordinary tides.”

The digging of sand rules an SI under the National Lands Act Section 37 and 39(2) requires that anyone digging sand on national lands apply to the commissioner of Lands and Survey for permission to do so. Although this subsidiary law exists, it is hardly ever exercised since the Mines and Mineral Act seems to prevail with activities pertaining of extraction of minerals inclusive of sand and gravel.

These sections of the National Lands Act are important to consider when planning and obtaining permit for the development and construction of any pier, berthing, and marina facilities.

4.3.2 Land Utilization Act Chapter 188 Revised Edition 2000

Part III of the Land Utilization Act gives the minister responsible for lands the authority to make regulations to demarcate areas, water catchment areas or watersheds and prohibiting the clearing of any vegetation within those areas; and to provide for such other measures as may be required to prevent soil erosion. In addition, it also provides for the demarcation specific areas as special development areas and to stipulate the type of development that will be permitted within those areas. Several areas have been declared as special development areas and proposed development plans have been prepared for these areas but were never approved by GOB although they continue to serve as guidelines by several permitting agencies including DOE.

4.4 Coastal Zone Management Authority Act Chap. 329 Rev. Ed. 2000

The Coastal Zone Management Authority was legally established in 1998 with the passage of the Coastal Zone Management Authority Act (Act # 5 of 1998). Under section 5 (1), the main functions of the Authority include (i) to advise Government on Matters related to development and use of resources in the coastal zone in an orderly and sustainable manner; (ii) formulation of policies on coastal zone management; (iii) development of a coastal zone management plan and revise it as needed; (iv) commission monitoring and research of coastal areas; (v) promote public awareness and (vi) prepare guidelines for developers. The Coastal Zone Management Strategy seeks to facilitate improved management of coastal resources, to ensure economic growth is balanced with sound environmental management practices. The Strategy seeks to review and “enhance existing laws, regulations, ‘policies’ and guidelines relating to conservation, resource management and development controls in the coastal zone are.” These support a coastal area management framework that addresses the need for management approaches in location between, as well as within, Coastal and Marine Protected Areas, and special requirements for management development and conservation in the barrier reef region, particularly the Cayes.

With the current re-activation of the Coastal Zone Management Authority, it would be prudent to enlist this institution’s review and evaluation of proposals to develop and construct piers, berthing and marina facilities in coastal zone areas.

4.5 Mines and Minerals Act Chap. 226 Revised Edition 2000

The Mines and Minerals (General) Regulations provide a general framework for the implementation of the Mines and Minerals Act. These Regulations cover a range of topics such as application, duties, terms and conditions and failure to comply with the conditions of a mining license. *Under the Act “land” includes land beneath water.* The Act also addresses dredging and sand mining, which is essential in avoiding destruction to coastal habitats such as seagrass beds and the coral reef. Under Section 36, it requires that any application of a mining (includes dredging) license should be accompanied by a proposal for the prevention of pollution, the treatment of wastes, the safeguarding of natural resources and the minimization of the effects of mining on surface and underground water.

4.6 The Forest Act Chap. 213, Revised Edition 2000 & Forests (Mangrove Protection) Reg. SI No. 52 of 1989

*The Forest Act provides for the protection and conservation of all mangrove forests on both private and national lands, any alterations to which require evaluation and a permit by the Forestry Department. The protection of all mangroves fall under this Act via the Forest (Protection of Mangrove) Regulations. Mangrove clearance may be permitted under this legislation. In most cases a permit to clear mangroves is issued **after a multi-agency assessment is conducted.***

This Act also includes for the establishment of Forest Reserves which may include mangroves, littoral forests and water bodies. However, no specific regulations exist under this Act that address littoral forests. The Forest Act is currently being revised.

4.6.1 The Forests (Protection of Mangrove) Regulations, 1989

The Forests (Protection of Mangrove) Regulations, 1989, prohibit any "alteration" (which includes cutting and defoliating, but does not include "selective trimming") of mangroves on any land except with a permit (reg. 4). Alterations which involve dredging or filling can be authorized only in "exceptional circumstances." Factors considered for issuing or denying permits include the proximity of the proposed project to coastal and reef areas known to be of outstandingly high ecological value (reg. 5(2) (i)), and the existing or proposed plans such as the barrier reef regional management and development plan. The Mangrove Regulations were amended in 1992 to increase the level of fines and sanctions.

4.7 Protected Areas Legislations

4.7.1 National Parks System Act, Chap. 215 Revised Edition 2000

According to Section 6 of the National Park Systems Act, no person shall, within any national park, nature reserve, wildlife sanctuary or natural monument, except as provided under section 7, or with the written authorization of the Administrator, permanently or temporarily reside in or build any structure of whatever nature whether as a shelter or otherwise; remove any antiquity, cave formation, coral or other object of cultural or natural value; quarry, dig or construct roads or trails; and introduce organic or chemical pollutants into any water.

4.7.2 Fisheries Act Chap. 210 Revised Edition 2000

In accordance with Section 14 of the Fisheries Act Chap. 210 Rev. Ed. 2000, the Minister may declare any area within the fishing limits of Belize and as appropriate any adjacent surrounding land, to be a marine reserve. An area declared a marine reserve prohibits any person from damaging, destroying, removing any species of flora or fauna and from disturbing the natural beauty of such area or do any other act which may be prohibited by the specific Statutory Instrument declaring a marina reserve. A license for these activities must be obtained from the Fisheries Administrator.

4.7.3 EIA Regulation SI No. 24 of 2007

In addition, the EIA Regulation SI No. 24 of 2007 requires that construction any large marina, port and inland waterway and infrastructure projects including the constructions of hotels, resorts facilities and golf courses within or in close proximity of the boundaries of a protected area or a World Heritage Site be required to carry out an EIA.

4.8 Belize Port Authority Act Chaps. 233 and 233S Revised Edition 2000 & 2003

Respectively

Under Sec 23 (1) the Minister may, after consultation with the Authority, grant in writing a license to any person, corporation or other body to construct and operate a private port subject to such terms, conditions and restrictions and on the payment of such fees as the Minister may consider appropriate (Private ports 15 of 1989).

Under part III 19-(3) and in particular and without prejudice to the generality of the provisions of subsections (1) and (2), it is the duty of the Authority – (a) to operate the ports as appears to it best calculated to serve the public interest; (b) to regulate and control navigation within the limits of ports and their approaches; (c) to maintain, improve and regulate the use of such ports and services and facilities therein as it considers necessary or desirable; (d) to provide for such ports and the approaches thereto such pilotage services, beacon, buoys and other navigational services and aids as it considers necessary or desirable; (e) to exercise the duties and functions relating to shipping and navigation excisable under the provisions of any other law.

Under PART VII (pilotage) 53 – (1) The territorial waters of Belize shall be compulsory pilotage waters and all ships other than those excepted under subsection (2), navigating within the waters under the pilotage of a licensed pilot.

Under section 55(1), the Minister may make regulations on the hauling up or launching of boats from any pier, bridge, or wharf, or at or from any point or place on the shore of the sea or on the bank of any river or canal or regulate the manner in which vessels, boats and rafts may be fastened to or brought or kept alongside of any pier, bridge, wharf, wall, staking, shore, or bank.

Part VIII Special Provisions in Relations to Ports 70 –(1) deal with accidents occurring in the port related to loss of human life or serious injuries to person or properties and collision between ships. Section (76) of the Act deals with persons endangering safety of operations while section (90) deals with restrictions on execution against property of the Authority.

Under 2003 (1) Belize city Port – Limits of the Port are declared starting at the Belize city Swing Bridge on the north bank of the Haulover Creek thence down stream to Fort George Light thence northwards along the coast to the Belize River Mouth, thence easterly to Mapp’s Caye thence along the western coast of the Drowned Cayes to the southern point of Water Caye thence south-westerly to the northern point of Long Caye, thence due west to the coast thence northerly along the coast back to the Belize City Swing Bridge.

The Port Authority Regulations Section 74 (2003) make regulations relating to anchorage or obstruction of turning basis and channels, unauthorized movements of ships and lights and mooring or manoeuvring in the territorial waters of Belize.

4.9 The Public Health, Act Chaps. 40 and 40 S Revised Edition 2000 and 2003

Respectively

The Public Health Act covers liquid and solid waste disposal and issues relating to general public health. The Ministry of Health is given a mandate for addressing public health issues and related complaints, monitoring of sewage and solid waste, and prosecution of public health offenders. In

addition all persons handling food for public consumption are required to have a food handler's certificate.

Section 22 of the Public Health Act Chap 40 S Rev. Ed. 2003 known as the **Removal of Refuse By-Laws** prohibits littering and indiscriminate deposit of waste in public places. These regulations require, among other things, the occupier of each premise to provide himself with a suitable receptacle for containing household refuse

4.10 Belize Tourist Board Act Chap. 275 of 2000

The Belize Tourist Board Act establishes the Belize Tourist Board (BTB) with wide responsibilities for the promotion of tourism in Belize. Apart from being charged with the development of the tourist industry, the BTB also has responsibility to foster understanding within Belize of the importance of environmental protection and pollution control, and the conservation of the natural resources (11(k)). The 2003 revised edition contains specific regulations relating to requirements and licenses, etc., of tour guides, tour operators, and local water passenger and water sport vessels.

5.0 ENVIRONMENTAL GUIDELINES

5.1 Procedural Issues

5.1.1 All applications for the construction of Marinas or berthing facilities must be accompanied by all supporting documentation and detailed project proposal. A proposal must endeavor to be socially acceptable, safe, technically feasible, economically viable, and environmentally sound.

- a) The proposal must show clearly how it has integrated these guidelines in the planning and design of the facility and how it intends to ensure its compliance in the operational phase.
- b) Other supporting environmental considerations that are site specific, taken to minimize adverse impacts of design and construction should be included in the submission.
- c) All applications *must be accompanied* by a digital video and aerial photographs of the site and adjacent coastline as part of baseline data to monitor impacts of marina and assess effectiveness of mitigation measures.

5.1.2 During application, an Environmental Management Plan will be required providing details of the proposed marina and its proposed operations. The Environmental Management Plan must include:

- Identification of potential environmental impacts;
- How activities will be managed to reduce these impacts;
- A monitoring program;
- Emergency response plans including the removal of the structure as result of damage by fire, hurricane or other natural disaster or at the end of its useful life;
- Operational plan;

5.1.3 The development and construction of any marina is required to obtain the following permits:

- Environmental Clearance from DOE;
- Effluent Licence from DOE for operational activities;
- Permit from the Lands and Survey Department for lease of the sea bed;
- Construction Permit from the Planning Authority in whose jurisdiction the proposed structure falls;

- Permit from the Local Government, if the activity lies within an urban area or existing community;
- Permit from the Port Authority;
- Permit from the Petroleum and Geology Department for any dredging and/or removal of material;
- Permit from the Forest Department for the removal of any mangrove or riparian forest;
- Permit from Fisheries Department if the activity lies within a Marine Reserve

5.1.4 Permitting agency should **implement a policy of no-net-loss** of certain critical habitats such as riparian and littoral forests, fringing mangroves, corals and sea-grass beds and policies intended to prevent the introduction or spread of exotic species and the over-exploitation of fishery resources. **Thus, habitat restoration measures (either onsite or offsite and either in-kind or out-of-kind, of an area equivalent to the area disturbed or altered will be required.**

5.1.5 Any permit issued will be in the name of the duly registered applicant(s) and any transfer of ownership will require permits to be renewed with the names of new owners for permits to remain valid.

5.1.6 All applicants must show proof of ownership of water-frontage property and in the instance of a company; it must be duly registered in Belize.

5.1.7 The applicants will have the following responsibilities:

- To comply with all relevant laws and conditions of the permit;
- To meet all costs of permits and monitoring associated with the subsequent installation and operation of the facility;
- To take any action necessary to protect the environment and users of the facility should any problems arise with the structure.

5.1.8 As a precaution, the cost of removal or cleanup of the structure as a result of an accident or an act of nature must be covered by a bond or bank guarantee provided by the applicants, which is lodged with Department of the Environment to cover any

environmental damage or rehabilitation costs of the project. These funds may be used to complete construction of specific mitigation measures of the project; to allow removal and environmental repair; or to clean up or repair the site following accidental damage.

- a) The size of the bond may be equivalent to the cost of installation of the facilities and could be determined by a certified valuer.
- b) The bond amount will be reviewed from time to time (generally at the time for renewal of the permit) to ensure it keeps abreast of: inflation, costs for removal, and any other changes which may affect its appropriateness.

5.2 Information Required for Marinas Required to Conduct EIAs or LLES.

This section deals with information requirements that should be considered in the preparation of in the Terms of Reference of Marinas or Berthing facilities that could have significant impacts on the environment and are required to conduct an EIA or LLES.

The information requirements contained within this guideline should be considered as additional and complementary to that information which is required in the EPA and EIA regulations.

General Guidelines

5.2.1 Wind Climate: Wind, waves, currents, tides and floods are collectively termed coastal processes and influence the distribution of sediments and thus the shape of the coastline. Winds can influence marinas indirectly through their effect on wave or directly by affecting comfort, maneuverability of vessels in confined areas, or design strengths necessary to prevent damage to vessels and structures in extreme conditions.

- a) EIA preparers should be required to assess local winds, waves, currents, tides and flooding for desired sites. The direction and strength of winds on marina operations with consideration of extreme conditions should form part of this assessment.
- b) EIA prepares should provide information on the steepness, height, period and direction of waves, the coincidence of waves with extreme winds (hurricanes) and

currents, and the probability of occurrence of wave characteristics to likely do structural or boat damage. For criteria for an 'excellent' wave climate multiply wave height by 0.75 and for a 'moderate' wave climate multiply wave height by 1.25. (Mercer et al. 1982)

5.2.2 EIA preparers should conduct a detailed hydrographic survey of the proposed Marina site and access and exit channels. This survey should include a history of the substrate in terms of siltation rates, marine life, bottom growth and shoaling, examine tidal, eddy and flood-related currents, and tide range.

a) Tidal range, natural water depth at the site and the projected completed project depth at the marina are hydrographic considerations necessary for evaluating the natural circulation of the area and the projected flushing rate of the marina basin.

b) During the hydrographic survey, it is also important to note the locations of underwater hazards or obstructions.

5.2.3 Water Circulation

EIA preparers should determine the flushing rates of the marina basin based on information and data obtained on near-shore currents, wind patterns, wave conditions (regular and storm), and groundwater influx.

5.2.4 EIAs for Marinas should be required to conduct a comprehensive geotechnical investigation and should include: soil, marine sediment and rock classification, grain size distributions and shape, in situ soil density, stratigraphy, soil strength parameters and deformation, and chemical composition of any sediments to be excavated if there is any doubt over the possible presence of contaminants.

a) Advanced knowledge of currents in the area of construction, and of sedimentation characteristics, allows prediction of direction and persistence of turbidity plumes, thereby facilitating assessment of potential impacts of dredging on surrounding marine communities.

- b) The geotechnical study should identify the range of material types at the site, which may strongly influence the layout, cost and project feasibility.
- c) The information contained in the study is also necessary for the detailed design of the facility, particularly for excavation (if required), and the marina structures, e.g. jetties, mooring piles, breakwaters, seawalls, reclamations and land based facilities.
- d) Geotechnical properties may influence construction timing, techniques and costs, all of which may also affect the results of an assessment of environmental impacts.

5.2.5 Demand Studies. EIA preparers should be required to justify the construction of a marina or berthing facility based on the demand for the facility. The demand for facilities should be assessed by studying boat registration statistics and tourist projections, boat owner surveys, public subscription and regional planning studies and its design should be substantiated by demand studies.

5.2.6 Proponents should be able to demonstrate the effect of the proposal on existing use of the site and nearby areas.

5.3 SITING OF MARINAS

Proper siting is probably the single most important aspect in the planning and development of a marina that is consistent with the efforts of the Department of the Environment to balance development with the need to protect the environment. A well-chosen marina location that meets the needs of the developer and at the same time minimizes environmental impacts is normally the most cost effective to develop and is more likely to receive the quickest approval. These marinas also often require less monitoring since it is easier to mitigate their impacts on the environment. In addition, the design and engineering aspects of a marina become less complex although these will depend greatly on the characteristics of the specific site.

The evaluation and selection of a site for a marina or docking facility includes, among other aspects, considerations of land and water access, access to utilities, the area required for

facilities, ambient weather and physical environmental conditions, sensitive environments in need of protection, the existing social environment and aesthetics.

General Guideline

- 5.3.1. The proposed site should ideally provide shelter from the prevailing winds.
- 5.3.2. The site should be free of, and readily protected from, strong surge or the potential for wave damage.
- 5.3.3. Marinas should be sited in areas of high water exchange rates.
- 5.3.4 The 66 feet buffer along the edge of a permanent body of water shall be observed and only minimum clearance of vegetation will be allowed to permit access to Marina or berthing facility.
- 5.3.5. No marina support facility such as tackle shops or dry storage areas shall be permitted in the buffer
- 5.3.6 When selecting a site for a new or expanding marina, care must be taken to avoid or minimize impact upon the following resources: a) submerged aquatic vegetation; b) tidal and non-tidal wetlands; c) corals; d) rare, threatened, or endangered species; d) fish spawning, nursery, or propagation areas; e) bird nesting sites and existing riparian forests or mangrove forests with interior dwelling bird species.
- 5.3.7 Every effort should be made to maintain long-shore sediment movement - including allowance for possible future bypass dredging. It may not be possible to avoid sedimentation at the marina site, but, by careful planning, it is possible to minimize the degree of sedimentation and ensure that any sedimentation which does occur can be relatively simply (and economically) removed.
- 5.3.8 The construction of landlocked marinas shall avoid the windward side of Islands and shall endeavor to use where possible natural coves and existing channels as entrance and exit channels.
- 5.3.9 No landlocked marina shall be permitted in the eastern coast of San Pedro Town, Caye Caulker and St George's Caye, Placencia and Hopkins.

- 5.3.10 No marina or berthing facility will be allowed to be constructed over the Belize Barrier Reef or any living reef structure(s).
- 5.3.11 No marina, which will require the alteration of the Belize Barrier Reef System, will be permitted and all marinas or berthing facility within a one-kilometer distance of the barrier reef or supporting reef system will be required to carry out an EIA and conform to the highest environmental standards for the prevention of pollution.
- 5.3.12 Marina fingers should have a minimum set-back distance of 50 feet from shore to minimize impacts on shoreline processes by boats and to minimize impacts on potential usage of beaches. For shoreline without beaches and which have mangroves and other littoral forest a minimum set back of 25 feet should be required.
- 5.3.13 No marina shall be established within a one-mile distance from a community water intake/abstraction site or within a declared water abstraction zone.
- 5.3.14 Marinas or berthing facilities should select areas of least currents and should extend out far enough to reach depths of at least 6 to 8 feet to minimize dredging and intended boat traffic would have sufficient draft to prevent resuspension of silt by propellers, providing this does not pose a threat to navigation.
- 5.3.15 Marinas or berthing facilities shall not be built within known navigational channels.
- 5.3.16 The location of a marina or berthing facility must not conflict with zoning objectives, Management Plans, or other management measures within a zoned area and may not be permitted within protected areas.

5.4 Marina Design

The ultimate environmental performance of a properly sited coastal marina depends on the marina design, construction, and operation. The layout of marina land facilities is usually determined by the physical constraints of the particular location. The initial designs and layouts should be influenced by biological, environmental, socio-economic, structural, and aesthetic considerations. However the engineering of marinas will-be dictated by physical

environmental factors and feasibility. Design and construction of breakwaters will depend on proper calculation of wind and waves generated, type of materials used in construction and potential effects of failure of those designs under extreme events.

General Guidelines

- 5.4.1 It is recommended that a land to water area ratio of between 50:50 and 40:60 be adopted for preliminary planning of a marina development, depending on the extent of shore-based facilities to be provided.
- 5.4.2 The design of a marina must be such that it can be entered under adverse weather conditions and would provide enough shelter that vessels could maneuver within channels and fairways to enable access to berths without threat of collision.
- 5.4.3 To minimize sedimentation through marina design, overdredging should be considered in the proposed design plan. Recommended design depths are exclusive of site-specific requirements for additional depths necessary to store estimated silt accretion that occurs between scheduled dredging intervals.
- 5.4.4 The design depths and widths of various water areas within a boat marina must take into consideration the sizes and types of boats expected to use the marina, wave action, currents, water level fluctuations, levels of seasonal boat traffic, silt deposition rates and anticipated frequencies of dredging in order to maintain the minimum design depths over projected dredging intervals.
- 5.4.5 Marina design should ensure that structures are placed in such a manner to maximize the rates of water exchange. Through optimal marina design, many of the problems associated with either excessive or inadequate circulation can be avoided or minimized.
- 5.4.6 All structures should be designed and placed so as not to restrict water circulation or mixing within the marina basin or to increase shoaling.
- 5.4.7 Water circulation can be assisted by considering properly designed culverts, pilings and bridge spans, and by using discontinuous mounds for open water discharge.

- 5.4.8 All structures including breakwater and protective works should be designed to withstand a category 4 hurricane.
- 5.4.9 Marinas should allow for sea level rise (Minimum acceptable 'Greenhouse' allowance) in their design. For Belize this is expected to be 0.3 meters.
- 5.4.10 Non- essential or short-lived facilities (pathways, internal roads, car parks) may be placed at lower levels, so long as a developer indicates that these structures will be raised or replaced later due to sea level rise.
- 5.4.11 The types of the material and layout design of the marina should be based on the geotechnical assessment of the marina site.
- 5.4.11 Marinas are to include appropriate and aesthetic social amenities (restaurants & bars, restrooms and laundromats etc.), and infrastructure in their design.
- 5.4.12 The design should provide for periodic repair and maintenance without loss of safety or amenity.
- 5.4.13 “Full Service” Marinas should typically include such facilities as berthing or docking areas, shoreside facilities for unloading, loading, storage, and refueling operations, a small-boat launching ramp and various related infrastructure to accommodate activities such as access to water, power, waste disposal facilities (especially for vessels), shower and laundry facilities, and land access (e.g. roads).
- 5.4.14 Design depths for a specific marina must be based on a design low water elevation established. The information considered should include low tide levels and lowest recorded water depths.
- 5.4.15 Required minimum depths below design low water must be determined based on the type, length, and draft of the boats expected to be berthed in a marina, or specific sections within a larger marina.

Channels and Fairways Guidelines

- 5.4.16 Entrance channels should be straight; aligned into prevailing winds; and not in an area of shoaling.
- 5.4.17 In the interests of safety, channels must be properly marked, both approaching and inside the marina and in compliance with the requirements of the Port Authority.
- 5.4.18 To minimize maneuvering accidents, it has been found that minimum fairway widths between rows of berths in well protected waters should be the greater of 65ft or $L + 2$ m (where L is length of longest boat in marina). The preferred width is $1.75 L$.
- 5.4.19 Turning areas should be provided, particularly adjacent to fuelling berths and dead-end channels. Water area for turning, entering and leaving berths should be 2.25 times the length of the longest boat (minimizing chance of collision).
- 5.4.20 Table 2 below provides minimum water depths below design low water, but does not address additional depths that may be necessary for silt deposition storage

Table 2: Minimum Channel Widths and Depths

Channels: °	Entrance Channel	Interior Channel
Minimum Bottom Width:	75 ft	75 ft
Minimum Depth Below Design Low Water:	3 ft below deepest draft boat or 5 ft, whichever is greater	2 ft below deepest draft boat or 4 ft, whichever is greater

- 5.4.21 The length and depth of berths should confirm to the minimum recommended standard contained in Table 3.

Table 3 Minimum Berth Length and Water Depth

Berth Length (feet)	Minimum Berth Water Depth (feet)	
	Powerboats	Sailboats
Up to 45 ft	6 ft	6 ft
Up to 55 ft	8 ft	8 ft
Up to 65 ft	8 ft	10 ft
Over 65 ft	Site Specific Determination	

Marin Basin Design Guidelines

In the design of a marina basin, the following should be considered:

5.4.22 Minimise vertically faced structures since vertically faced structures lead to reflection of wave energy, causing confused seas and high wave energy within the berthing area.

5.4.23 Design of the basin must facilitate adequate flushing of the marina. Adequate flushing of a marina is necessary for maintaining the water quality of the marina basin and adjacent waterway. Natural circulation near the site should be maintained whenever possible. Poorly flushed marinas can become stagnant and permit the concentration of pollutants from the marina facility and boats. The settling and accumulation of organic material and fine sediments can result in decreased dissolved oxygen levels and shoaling within the marina basin.

5.4.24 Give consideration to the diversion of streams and creeks to high flushing zones. Adjacent streams or creeks should not be allowed to discharge into the marina basin as they may cause water quality problems.

5.4.25 Minimum depth of the basin should not be less than 8 ft at mean low tide level. It is recommended that the minimum depth within the mooring basin (at MLTL) should be no less than the maximum draught of moored craft plus half the predicted wave height plus tolerance of 1 ft or 1.5 ft for seabed conditions comprising soft material or rock

respectively, plus allowance for siltation. As a general rule, these factors sum to at least 8 ft as a minimum during MLWS.

- 5.4.26 Maximize tidal exchange and mixing in the basin; minimize backwaters and current constrictions. Open marinas located on existing channels will generally have the same flushing rate as the channel. Marina basins with excessively deep or dead-end areas that have lower than natural rates of exchange tend to accumulate potential pollutants or require long periods of time for flushing and for organic matter to decompose. Semi-enclosed marinas or marinas with dredged basins should be designed to maximize tidal exchange and mixing with the marina.
- 5.4.27 Ensure channel depths eliminate 'sills' ponding deep basin areas. Marina basin depths should not be deeper than the open water channel to which the basin is connected and not deeper than the marina access channel to promote proper circulation. Basin and channel depths should gradually increase towards open water. Dredging of natural channel sills for larger marinas should be avoided.
- 5.4.28 Provide two openings, at opposite ends of marina to establish flow through currents to enhance water circulation
- 5.4.29 Minimize 'dead' water by creating curved surfaces. Basins should avoid having vertical wall and should endeavour to have gently rounded corners or circular or oval shaped basins. Bottom contours should gently slope towards the entrance with no pockets or depressions.

Fingers (berths) and Walkways Guidelines

- 5.4.30 Berths or fingers should be orientated at right-angles to the walkway (maximizes numbers, reduces maneuvering difficulties).
- 5.4.31 Berths should be arranged so that, wherever possible, fingers are symmetrically located on opposite sides of the walkway (reduces maneuvering difficulties).

5.4.32 Smaller berths should generally be located closer to the shore (more easily maneuvered into and out of).

5.4.33 In general, boats for hire are used more frequently and by less experienced people than privately owned boats at the marina. Berths for these boats should be readily accessible to the open waterways to minimize maneuvering within the marina. They should also be wider to accommodate inexperienced drivers.

5.4.34 Walkway widths depend on likely usage levels, length of walkway and the extent of ancillary services mounted on the walkway. The walkway should be wide enough to allow two-way pedestrian traffic with barrows.

5.4.35 Fingers have lower levels of usage; hence the width may be reduced to provide passage of only one person at a time. The optimum length of a finger should be 0.8 times the length of the berth but could be within a range of 0.6 times the berth length and 1.0 times the berth length.

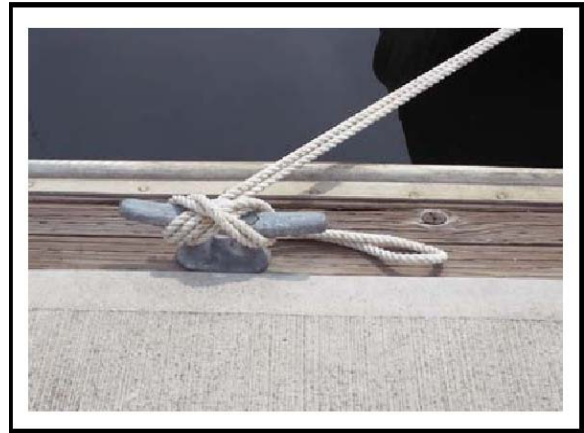
5.4.36 The width of Marina Fingers depend on the length of the berth with the following being recommended:

Fingers	
Minimum Width	Length Range
3.0 ft	For all finger floats of 59 feet or less
4.0 ft	60 ft & over
6.0 ft	80 ft & over
8.0 ft	120 ft & over



View of Finger float Clear Width Including Walers

5.4.37 Minimum finger float width dimensions are considered to be “clear” widths. Cleats or rings along the top edge of a finger float, and hoses and power cords connected to utility pedestals, should not be considered to be reductions of the clear width of finger floats. However, hoses and power cords shall not be allowed to lay across an accessible finger float.



5.4.38 The clear width will often include the thickness of walers along the sides of finger floats. In some dock structures, the widths of single or double walers can add 3 to 7 inches of width to each side of a finger float, amounting to an additional overall width of 6 to 14 inches.



5.4.39 Main Walkways – The Maximum Length of 700 feet is a practical maximum length of a main walkway.



Long Uniform-Width Main Walkway

5.4.40 The clear width of a main walkway should be of uniform width throughout its length. Otherwise, problems will occur with regard to utilities and the clean orderly alignment of finger floats and fairways.

5.4.41 The minimum width of a main walkway shall be 6 ft. As length increases, width must increase in consideration of: a) increased pedestrian traffic and maintenance activities; b) movement of supplies, equipment and gear; c) larger utility lines and pull boxes; d) lighting needs; e) and emergency access for rescue and law enforcement personnel.

5.4.42 Fendering is required along walkways of both fixed and floating structures. Fendering is needed along walkways for two reasons. Firstly, it should prevent vessels getting under fixed structures, and secondly it will reduce the damage in the event of a collision.

5.4.43 A 'tee' should be incorporated at the end of each walkway to prevent wave buffeting of boats berthed at the distal end of the walkways. This area should be used for temporary mooring only.

Access Pier or Gangways Guidelines

5.4.44 Piers that are used only for pedestrian access or gangways shall be provided with Guard railings. The height of the top rail of guard railings shall be not less than 42 inches, measured from the finished deck surface to the top of the top rail.



Guard Rail w/Hand Rail Meets 4" Sphere Test

5.4.45 In addition to the Guardrails ,handrails must also be provided on both sides of gangways and must be not less than 34 nor more than 38 inches above the walking surface, measured to the top of the handrail.

5.4.46 It is recommended that large marinas and piers have a minimum of two gangways to better respond to the need for emergency exits.

5.4.47 All gangways or pedestrian exists shall have a minimum clear gangway width of 36 inches.



C

5.4.48 Gangway decks must have a durable non-skid surface to provide traction, especially when wet, and when gangways are at steeper slopes.

5.4.49 Toe plates provided at either the lower and/or upper ends of a gangway, provide a smooth transition between the gangway deck surface and shore or a marina dock.



Toe Plate on Non-Accessible Gangway, or

5.4.50 The maximum toe plate slope is 3:1 under any in-service conditions or water levels. This applies to gangway toe plates on both coastal and inland waterways.

5.4.51 Gangway utility connections require careful design, installation and utility bridges across the land/water interface, providing a flexible link between shoreside and dockside utility lines.

Material Considerations Guidelines

5.4.52 In selecting materials for berthing systems, keep the following in mind:

<ul style="list-style-type: none"> • corrosion resistance • impact resistance • strength of materials • minimum thickness • ultraviolet resistance • cost • flexibility • ease of maintenance • vandalism 	<ul style="list-style-type: none"> • availability • pleasing appearance • past performance • decking texture / traction • local code requirements • weight • color • dissimilar metal galvanic corrosion • thermal expansion and contraction
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Decking Guidelines

- 5.4.53 Decking can be attached to a structural frame, or it can be part of the structural frame as in the case of cast concrete. Decking used in marinas includes various types of wood, pressure treated or untreated; recycled plastic lumber products; metal; fiberglass; and concrete.
- 5.4.54 Marina decking should be oriented so the “grain” runs across the primary direction of travel. Decking grain includes broom and brush finishes on concrete docks; gaps between lumber decking; and ridges, serrations, knurling marks and other traction enhancing elements imparted to concrete, metal and plastic decking.
- 5.4.55 The decking on an accessible route shall not have gaps wider than ½ inch, and the gaps must be perpendicular to the path of travel to the maximum extent possible.
- 5.4.56 Changes in decking level up to ¼ inch maximum shall be permitted to be vertical. Changes in level between ¼ inch and ½ inch maximum shall be beveled with a slope not steeper than 1:2.
- 5.4.57 Where a change in level greater than ½ inch cannot be avoided, it shall be ramped at a slope not to exceed 1:12, with smooth transitions at the top and bottom of the ramp.
- 5.4.58 Lumber (wood) decking should be oriented laterally, across the width of a dock, and never longitudinally, along the length of a dock. This applies to all walkways and floats including gangways.

Piles Guidelines

- 5.4.59 Pilings Consideration should be given to the most appropriate materials to be used for piles. Moored treated wooden structures can impact water quality within the marina basin through the leaching of wood preservatives. Potential impacts can be avoided or reduced by using alternative materials such as concrete-filled, steel-reinforced PVC, plastics or other non-conventional materials.
- 5.4.60 Using alternative preservatives such as chromated copper arsenate (CCA salt) can also minimize chemical leaching.

5.4.61 Marina piles must be provided at appropriate locations and in sufficient numbers to reliably sustain dock system in place under all design loadings, conditions and circumstances.

5.4.62 Consideration must be given to pile loadings from forces applied to the berths, piles and the boats occupying the berths. These forces include wind, waves, currents, flood flows, impacts from boats underway, debris, partially sunk boats, and seismic events. Some of these forces may occur concurrently.

5.4.63 Marina guide piles should be placed at the ends of all finger floats adjacent to channels. The piles will help guard against accidental impact damage to docks and berthed boats from vessel traffic in the channels. Such impact incidents can be caused by severe wind conditions, currents, and traffic problems.



5.4.64 The use of solid structures should be avoided in order to minimize habitat loss by allowing adequate water circulation.

5.4.65 The marina designer should also minimize structure width to allow for maximum sunlight penetration.

5.4.66 Docks and piers should be elevated as high as possible and orientated in a north-south rather than an east-west direction. These designs will avoid excessive shading of aquatic habitats.

5.4.67 Cut-off elevations for guide piles should be not less than 4 ft above the deck of a dock not including the height of pile caps.

5.4.68 Guide pile caps should be provided, typically made of fiberglass, polyethylene or other ultraviolet resistant plastic materials. Pile caps discourage the roosting of birds, can be color coded to identify particular fairways or channels, and are useful for mounting various marina operation devices such as signs, markers, antennas, video cameras, etc.



Pile Cap and Marker Signs

Environmental Loads

5.4.69 Waterway debris loadings on marina dock systems may occur because of unique local conditions. River based marinas are subject to flood events that bring large quantities of limbs, branches, logs, trees, roots, abandoned boats, swept away piers, piles and other large debris that pile up against a marina and its berthed boats.



5.4.70 Upstream Debris Deflection Boom may be used to deflect floating debris and encourage it to pass around a marina rather than through it.

UTILITIES

- 5.4.71 Utility lines on shore should be located underground as is appropriate, and to the extent reasonably possible and financially feasible. Such utility lines include potable water, fire suppression, electrical power, telephone, cable TV, Internet, lighting, security systems, aids to navigation systems,, sanitary sewer and drainage.
- 5.4.72 Utility sizing, location, design and construction must conform to internationally accepted industry practice and all other applicable regulations.
- 5.4.73 Landside utilities should be located, designed and installed with consideration given to practical uses of the marina facilities after construction is completed.
- 5.4.74 Utility planning should provide reasonable access for future maintenance, repair, replacement or expansion of utility lines without major disruption of normal marina functions.
- 5.4.75 All utility lines in marina berthing structures should be installed to provide maximum public safety as well as protection from impacts, mechanical wear and damage, and environmental elements such as heat, water and rodents.
- 5.4.76 Utility sizing and capacity should be determined on the basis of current and projected use demands, anticipating future levels of service and how to reasonably provide it if necessary.
- 5.4.77 No permanent utility lines should be located on and attached to the deck surface of marina docks. Electrical outlets, water supply hose connections, and TV jacks are usable only with lines, cords and hoses that are connected between utility boxes and berthed boats. However, they are temporary in nature and function, and should not be permanently attached to the deck surface.
- 5.4.78 All utility lines in a dock system should have not less than 6 inches minimum clearance above the water surface at any given time.



Non-Permanent Utility Lines Across Finger float

5.4.79 Where utility lines pass through structural members within a dock system, the holes in the structural members are to be free of rough edges and abrasive surfaces that will cause accelerated wear on the utility lines.

Potable Water Service on Marina Docks

5.4.80 Each potable water line should deliver water to all hose connections and should have sufficient water pressure.



Utility Station

5.4.81 All potable water lines on marina docks shall be equipped at the shore end with appropriate anti-siphon devices to prevent back flows into the service mains.

5.4.82 A minimum of one (1) standard 3/4 inch hose connection is to be provided for each berth.

5.4.83 Dedicated potable water and fire suppression lines should be provided on marina docks.

5.4.84 Utility hoses and/or lines, whether permanent or temporary, shall not be allowed across the deck of any walkways.

Fire Suppression Systems on Marina Dock Systems

5.4.85 It is required that marinas have equipment, systems and sustainable water resources to suppress, control and extinguish fires on boats, docks, buildings, fueling stations and other marina service centers.

5.4.86 It is recommended that the fire department be included in all stages of marina design for both new and alteration projects. This will help ensure that all fire code requirements are addressed, and will facilitate the smooth and effective inspection and completion of projects.

5.4.87 Fire lines must be from materials that will stand up under the required working pressures and temperatures, and be corrosion resistant in a wet environment.

5.4.88 All pipe fittings and valves used must have a pressure rating not less than the pipe itself.

5.4.89 All pipe fittings and valves must be of a material that will not soften from the heat of a fire, rupture and/or otherwise fail while being used to fight a marina fire.

5.4.90 All pipe, fittings and valves must be highly corrosion resistant, particularly in coastal marinas subject to salt water and salt air corrosion.

5.4.91 Where sharp bends occur in fire lines, restraints must be installed to stabilize the pipe and diminish movement resulting from sudden pressure changes, expansion, contraction and water hammer from valve closures.

- 5.4.92 To protect fire lines, they must be located below the marina deck on both low and high-pressure systems.
- 5.4.93 Fire hydrants must be located at appropriate spacing to afford immediate protection to all structures, boats and equipment in a marina. The spacing should be such that a charged fire hose will be able to reach the outboard end of each finger float in a marina.
- 5.4.94 The required number of fire hydrants and other fire suppressing equipment will depend on the marina size and layout and a determination made by the Fire Department.
- 5.4.95 For areas outside a reliable urban water supply system, water should be abstracted directly from the marina basin for use in fighting a fire.
- 5.4.96 Marinas are also encouraged to utilize portable fire cart that can be taken quickly to any area on a marina. Such carts should be self contained and equipped with gasoline engine driven pumps, adequate hose lengths, locking wheels and foam suppression systems.
- 5.4.97 At least one strategically located device for calling the local fire department should be located on the docks in a marina.
- 5.4.98 In cases where a marina consists of two or more dock sections, or marina basins, at least one fire-call device should be provided in each section and/or basin.
- 5.4.99 Marina fueling stations located on marina docks should be equipped with a fire-call device, located not more than 100 feet from the fuel dispensing equipment.

Electrical Power Services on Marina Dock Systems

- 5.4.100 All marinas are required to have its electrical system installed by a licenced electrician or electrical engineer and shall carry out annual ground integrity testing and biennial inspections of wiring.

- 5.4.101 Marina electrical systems should be adequate to supply the power demands for boat slips, lighting, fuel stations, sewage pumpout stations, buildings, navigation aids, and maintenance and repair work.
- 5.4.102 Marina user shall have unobstructed access to utilities in a marina, including electrical power outlets and jacks for telephone and cable TV.
- 5.4.103 It is recommended that a minimum of one (1) 120 volt, 20 amp outlet be provided at each boat berth, regardless of the length of the berth or the boat that occupies it. In berth catering to larger vessels the requirements may exceed this minimum recommendation.
- 5.4.104 Sub-metering of marina electrical outlets is highly recommended. The installation and use of kilowatt hour sub-meters in marinas has a dramatic positive impact on the reduction of electrical power consumption.
- 5.4.105 Sub-meters must be located within the vertical range of 30-75 inches, measured from the deck surface to the axis of the sub-meter to provide safe and adequate access for persons who are required to calibrate and maintain the sub-meters.
- 5.4.106 Marine grade electrical outlets designed and manufactured for reliable use in fresh and salt water environments are to be used to provide electrical power to boat slips.
- 5.4.107 Electrical outlets are to be installed in dock storage boxes or electrical power centers located along the edge of walkways and at the head of finger floats.
- 5.4.108 The electrical dock storage boxes are also often fitted with jacks for telephone and cable TV service.
- 5.4.109 A separate storage box with potable water supply hose bibs should be provided or the water supply bibs should be located at the lower end of the utility storage box where water could not come in contact with electrical outlets in the event of a ruptured pipe.

5.4.110 From the electrical outlets, power is supplied to a berthed boat via a portable electrical cord that extends between the outlet and a boat. The portable cord should be rated for this use, including proper plug type, wire size and cord length.

5.4.111 A boat in a berth must be tied up such that the normal movement of the boat within the berth will not pull, jerk or damage the outlet, electrical cord or the boat's electrical system.

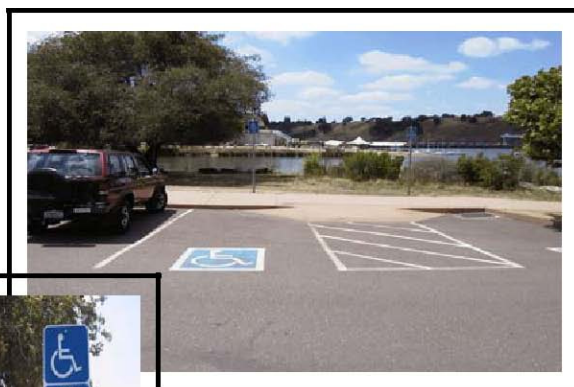
Vehicle Parking

5.4.112 A large portion of the land area associated with a marina may be required for car parking. This can amount to a major cost in a marina development.

5.4.113 Parking Assessment of parking requirements should include: a) craft usage patterns; b) public usage of other marina services; c) alternative parking possibilities; d) special parking for disabled persons access; e) special areas for large vehicle; f) parking for cars and attached trailers.



Single Vehicle Accessible Parking Spaces



Van Accessible Parking Space
Van Accessible Sign Inset

5.4.114 Parking spaces should be made available for persons with a disability. These spaces should be wider than normal (at least 12 feet) and should be identified as being reserved for people with a disability. They should be located close to the land based buildings and comprise at least 1% of the available parking spaces.

5.4.115 Separate parking should be provided for large and commercial vehicles (buses and vans).

- 5.4.116 Wherever possible, delivery and maintenance vehicle traffic should be kept separate from car park areas and circulation roads.
- 5.4.117 Marina parking areas should be located near the berths they serve.
- 5.4.118 Provide separate areas for car parking only.
- 5.4.119 Allow for drive-through parking spaces and allow emergency vehicle access to 'high risk' areas such as workshops.
- 5.4.120 Avoid large asphalted areas through use of green areas. Green areas in the form of strips or islands may be used as a means of controlling traffic and trailer parking areas.
- 5.4.121 Gravel or shell grit surfacing is an attractive alternative to concrete or asphalt and may be appropriate in many instances and has benefits of decreasing runoff velocity, increasing infiltration, and allowing suspended solids to settle out of runoff water.
- 5.4.122 Experience has shown that grass can withstand trailer loads without undue damage and therefore it is recommended that all trailer-parking areas be grassed and Provide overflow grassed parking areas.
- 5.4.123 and vegetated revetments provide better habitat and protection for juvenile fish and are preferable to vertical walls, where feasible. If vertical walls are necessary, they should contain weep holes covered with a filter cloth.
- 5.4.124 Parking area should be sloped such that runoff from paved areas nourishes adjacent site landscaping.
- 5.4.125 Parking may be allocated using the following minimum provisions: 0.6 parking spaces per wet berth; 0.2 parking spaces per dry storage berth; 0.5 parking spaces per marina employee; and 0.3 per restaurant seating.

5.4.126 Parking areas should have a clear set of rules for traffic and clearly signposted.

5.4.127 Minimum Parking Space Dimensions shall confirm with the following :

Table 4 Recommended Minimum Parking Space Dimensions

Type of Parking Space	Width	Length
single-vehicle	9 ft	20 ft
vehicle/trailer	10 ft	40 ft
recreational vehicle (vans& buses)	11 ft	40 ft

Restroom Facilities

5.4.128 Restroom facilities at marinas and other recreational berthing facilities typically include toilet compartments, urinals, lavatories, mirrors, showers, interior/exterior lighting, drinking fountains, benches and walkways.

5.4.129 Restrooms may be provided for both men and women. Unisex toilet rooms may be provided in lieu of, or in combination with, conventional male/female restrooms.

5.4.130 Toilet facilities should be provided at convenient points and should consider the following recommended ratio.

Table 5 Recommended Minimum Parking Space Dimensions

Item	Amenities for every 50-75 persons	
	Male	Female
Toilets	1	2
Urinals	1	--
Showers	1	1
Basins	1	1

5.4.131 Large, full service Marinas should provide a laundromat, locker, and similar facilities.

5.4.132 Access and ease of use by disabled persons should be incorporated in the design and location of amenities buildings.

5.4.133 All toilets should be ultra-low flush fixtures with a maximum flow rate of 1.6 gallons per flush.

5.4.134 Public restrooms in marinas should be designed, constructed and maintained to provide sanitary facilities that are clean, well lit, safe and convenient for public use.

5.4.135 Restrooms in marinas should be located near the berths and parking areas, all of which must be linked together by accessible routes providing access to all marina features, services and primary functions.



5.4.136 Clear access to and from restrooms should be provided with restrooms strategically located to provide easy access from different areas within the marina or berthing facility.

Other Waste Treatment and Disposal Facilities

5.4.137 All large marinas are required to have onshore pump-out facilities for bilge water and sewer.

5.4.138 Three types of onshore marina wastewater collection systems are available: marina-wide systems, portable/mobile systems, and slip side systems. Wastewater collection systems connected to the Marina's overall sewerage system are recommended. Marina-wide wastewater collection systems include one or more centrally located wastewater pump-out installations. Vessels requiring the wastewater pump-out services would dock at the pump-out installation and a flexible hose would be connected to a wastewater fitting in

the deck of the vessel. These units pump to an onshore holding tank (or truck) or to an onshore wastewater collection and treatment system. Portable/mobile systems are similar to marina-wide systems except that the pump-out stations are mobile. The mobile unit includes a positive displacement pump and a small storage tank. Slip side systems provide continuous wastewater collection facilities at each slip. In general, there are two types of slip side systems, each with modifications available to customise the system. Pump-out systems use an on board grinder pump to transport wastes to a main sewer. Vacuum systems use differential pressure to transport wastewater from each slip to a central collection tank from which wastewater may then be pumped to a sewer or hauled to a wastewater treatment plant. Both types of systems can also handle bilge water discharged from boats.

5.4.139 All sewage treatment systems require a minimum drain field setback of 100 ft from surface water.

5.4.140 Marinas are required to set aside 5% of total land area for maintenance with these areas to be located above high tide mark to avoid contamination of incoming tidal water.

Fueling Facilities

5.4.141 The location of a fuelling facility is an important decision with respect to safety. It should be located to be easily accessible by visiting and passing boats, without access through the main berthing area.

5.4.142 When planning a fuel berth, the following points should be considered in order that a good balance between maximum benefit and potential environmental impacts are achieved: access to fuel berth by boats in marina and visiting boats; access of fire fighting vehicles to fuel berth; size of fuel storage tank and proximity to marina office.

5.4.143 Provisions should be included in the plan and designs for adequate fire fighting equipment, lighting of fueling berth (for safety and security), provision of fuel spillage protection devices to be kept on site, flexible fuel supply lines from shore to berth as approved by the Department of Environment, and automatic fuel cut-off valves. In

addition only refueling by authorized personnel only should be carried out and fuel facilities should have back pressure automatic shut-off nozzles.

5.4.144 Any fuel transfer systems operating within or across the intertidal zone should use vacuum operated pumps, dry break couplings or drip trays; provision for reporting and dealing with all spills; and, security against vandalism and unauthorized use.

5.4.145 Locate fuelling facilities leeward of marina with respect to prevailing winds and leeward of exits to permit safe evacuation of boats in the event of fire.

5.4.146 Ensure easy access to the fueling facility and the placement of the safety signs.

5.4.147 Fueling berths should preferably be in the area of greatest flushing in order to minimize water quality impacts.

Boat Launching Facilities

5.4.148 Boat launching ramps are required at most marina facilities for the launching and recovery of hire boats, transient craft, dinghies, boats for sale and for deliveries from manufacturers.

5.4.149 Boat launching facilities typically consist of boat launching lanes, boarding floats, vehicle-trailer maneuvering areas, roadways, parking areas, and driveways.

5.4.150 Boat launching facilities that are a component of a marina complex should be located to minimize conflicts in vehicle and boat traffic.

5.4.151 In the design of slipways, and maintenance areas, the paving design must allow for very high point loads. Such loads are generated beneath the wheels of fork lift trucks (as used in dry stacks), hardstand cradles (for small boats and cruisers), under keel chocks, slipway rail supports, parallel boat lifts and straddle transporters.

5.4.152 Careful attention must also be paid to drainage and disposal of stormwater and wash down wastes from these areas.

- 5.4.153 Maintenance area drainage should therefore include a collection pit from which waste can be removed and bunds around the area to divert external stormwater. Marine growth and paint should be removed by mechanical means wherever and whenever possible.
- 5.4.154 Ramps should be located away from sensitive areas such as seagrass beds.
- 5.4.155 To reduce risk of accident, ramp slope should be 1:10 (recommended) and not exceeding 1:8.
- 5.4.156 The construction of double width ramps is recommended and for ease of use, each lane should have a minimum width of 12 feet.
- 5.4.157 Minimum lighting for ramp usage should be provided and **ramp lanes** indicated by painted lines.
- 5.4.158 Adequate water depths at the toe of the ramp at low water should allow all tide boat launching.
- 5.4.159 Sufficient area should be provided for approach ramps, maneuvering cars and trailer parking areas.
- 5.4.160 As an alternative to ramps, marine ways (dolly) and hoists can be used to minimize shoreline alterations.

Breakwaters and Revetments

- 5.4.161 Breakwaters or revetments are used to absorb and reflect wave energy away from the marina and to protect boats within the marina basin. Solid breakwaters can reduce water circulation and affect water quality.
- 5.4.162 Design of these structures should therefore include consideration of natural current and sediment flow, wave patterns and overall flushing characteristics.

- 5.4.163 Breakwaters should be designed to permit flushing and should be designed to withstand a category 4 cyclone and incorporate allowance for sea level rises.
- 5.4.164 Solid breakwater design should include consideration of natural current and sediment flow, wave patterns and overall flushing characteristics.
- 5.4.165 Circulation can often be maintained by providing openings in solid breakwaters between the fixed breakwater and shore.
- 5.4.166 Sloping riprap structures are preferred for breakwater construction. If the land margin needs stabilization, a sloping riprap wall (revetment) with underlying filter cloth is preferred - these have the advantages of maximizing habitat niche creation, economy, reduction of wave reflectance problems, and minimization of sedimentation.
- 5.4.167 Floating breakwaters have a number of advantages over fixed breakwaters but are only effective for sheltered sites.
- 5.4.168 Although floating breakwaters are only effective for wavelengths shorter than twice the width of the breakwater and are not effective on open coasts, they offer certain advantages over fixed breakwaters as follows: they can be used where soft or unstable bottom precludes the use of fixed structures; they can be easily relocated if necessary; they can minimize potential interference with fish migration and shoreline processes and can reduce benthic habitat modification.
- 5.4.169 Sloping Revetments (stair-step or sloped 45° or less) should be used when required and vegetated to provide better habitat and protection for juvenile fish. If vertical walls are necessary, they should contain weep holes covered with a filter cloth.
- 5.4.170 The marina designer should aim to maximize vegetated landscaping. If the land margin needs stabilization, a sloping riprap wall with underlying filter cloth is preferred. These have the advantages of maximizing habitat niche creation, economy, and reduction of wave reflectance problems. In some cases, stabilizing walls have been successfully

vegetated with mangrove plantings to provide strength and soften the visual intrusion of such walls.

Boat Maintenance Area

5.4.171 Air quality problems can arise from: vapors from **volatile** organic solvents used in degreasers, primers, thinners, paints, and antifoulants; spray painting drift; dust from abrasive blasting, sanding, planing, wood shaving and sawdust. Paint, spray odors and dust fallout can be a very real nuisance to neighbors, but can be controlled in a number of ways.

5.4.172 Marinas are required to maintain adequate separation distances (100 feet minimum) between boat building / maintenance areas and neighbors or to enclose workshop and making provision for proper ventilation.

5.4.173 Atomized spray guns which produce large amounts of overspray are not to be used in open areas. The use of these types of spray guns will require they be used in spray 'booths.'

5.4.174 Abrasive blasting should be conducted during low wind conditions to minimize dust from sanding and marinas are encouraged to use suitable dust collectors or industrial vacuum cleaners.

5.4.175 Maintenance area drainage should include a collection pit and provision should be made for regular cleaning.

Commercial Facilities

5.4.176 Appropriate commercial facilities are often essential to the financial viability of a marina and should be considered in the design of marina and in estimating parking spaces.

5.5 CONSTRUCTION

General

- 5.5.1 All construction activity shall be in accordance with approved designs.
Navigation aids such as channel beacons, buoys shall be provided during construction.
- 5.5.2 Blasting activities are to be severely restricted and may be completely prohibited in marine reserves or other marine protected areas.
- 5.5.3 Construction supervisors are required to exercise all suitable cautions including public notification and exclusion, warning sirens and protective barriers.
- 5.5.4 Construction contracts or subcontracts shall incorporate as part of the contract the set of environmental conditions approved by the Department of the Environment or other permitting agency that will protect the marine environment from careless or destructive construction practices.
- 5.5.5 For construction of marinas in or near environmentally sensitive areas, developers will be required to cover all expenses associated with the presence of an officer appointed to act as an Environmental Supervisor
- 5.5.6 The environmental supervisor should be empowered to stop or suspend works in certain specified circumstances.
- 5.5.7 No jettying of piles will be permitted in close proximity to sensitive areas. In these areas piles will need to be driven down or by means of drilling.
- 5.5.8 Staging of required vegetation clearance so that cleared sections are re-vegetated, while sections remain with its natural vegetation to minimize the proportion which has been cleared and easily eroded.
- 5.5.9 Where access is by means of land requiring the construction of a new access road, the environmental issues associated with the impacts of this road will addressed in the project proposal submitted to DOE for its consideration.

- 5.5.10 No sheet piling will be used instead of pole piling. The number and diameter of pilings must be minimized as appropriate without reducing structural integrity.
- 5.5.11 No construction material except piles and other support structures are permitted to enter the waterway during construction.
- 5.5.12 Any stain, paint or preservative to be applied should be completely dried/cured on land before installation.
- 5.5.13 Painting underwater surfaces should be avoided. The basis for this recommendation is that overwater structures “provide additional substrate for the growth of fouling communities.” Painting of under water surfaces discourages such growth.
- 5.5.14 A plan detailing the process for construction and installation of the marina or berthing facility addressing possible affects on the environment must form part of the information submitted to DOE for their consideration.
- 5.5.15 In instances where structures wider than 6 feet are constructed above mangroves or other vegetation, they should be required to include grating or translucent panels such that light under the structure is at least 60% of ambient open water light.

Dredging and Excavation

- 5.5.16 Dredging is to be undertaken only in a manner that uses the best practicable available technology to minimize impacts on the site or adjacent areas.
- 5.5.17 To reduce unnecessary dredging, slips for boats with deep draughts will be placed in areas that are closest to the entrance or areas that are naturally deeper.
- 5.5.18 All boat servicing amenities including fuel, wastewater, and bilge water servicing will be located in deep areas accessible to all size vessels intended to be moored at the marina.

- 5.5.19 The natural turbidity levels should be assessed to monitor likely impacts that could be caused by sedimentation from dredging.
- 5.5.20 If dredged material is suspect of possible contamination with heavy metals or persistent organic pollutants, sampling and analyses of the intended dredged spoils will be carried out prior to commencement.
- 5.5.21 Contaminated dredged spoils will need to be disposed inland in a contained area approved by the Department of the Environment.
- 5.5.22 All dredging activities occurring near environmentally sensitive areas are required to utilize protective measures such as silt curtains and bunds to protect water quality in adjacent areas during construction by preventing the dispersal of silt materials.
- 5.5.23 To the maximum extent feasible, dredging and filling activities should be restricted in nursery areas, near coral, and during critical periods in the life of important sport and commercial species.
- 5.5.24 Bunds used to enclose de-watering of spoil should be vegetated to minimize silt loss.
- 5.5.25 A simple treatment such as ionization or aeration can be adequate for reduction of BOD and COD before the discharge of supernatant liquid from spoil areas enters into receiving waters.
- 5.5.26 Dumping of uncontaminated soil in sea may be considered with the prior consent of the Fisheries Department, Lands and Survey Department, and the Department of the Environment for the creation of 'spoil islands' for habitat replacement. Spoil islands would be best placed up-drift of dredged areas, since the new islands will then intercept further material and reduce ongoing dredging requirements.
- 5.5.27 All works, including on-land works, are to be carried out in a manner that ensures sediment laden material does not wash into the receiving water body.

- 5.5.28 All earth moving activities should be conducted during the drier months of the year.
- 5.5.29 Wet excavation of clay material is to be minimized as far as practicable, unless the site can be effectively banded.
- 5.5.30 Erosion and sediment controls (silt traps) measures are to be installed before upland construction begins.
- 5.5.31 Do not schedule dredging during critical life stages of local aquatic organisms. Schedule dredging and other construction activities at times other than during spawning, migration or critical life stages of fish and other aquatic organisms known to inhabit the area in question.

Lighting

The purpose of these guidelines is intended to control beach front lighting and lighting of Marinas and berthing facilities to protect nesting sea turtles and their hatchlings.

- 5.5.32 Exterior light fixtures shall be positioned so that point source of light or any reflective surface of a light fixture is not directly visible from the beach and areas in front of the beach dune are not directly or indirectly illuminated.
- 5.5.33 Exterior light fixtures with direct line sight of the beach should have their bulbs and non reflective interior surface completely shielded down light or must be recessed and be of low wattage and yellow “bug” type lights (≤ 50 Watts).
- 5.5.34 All fixtures must be mounted as low in elevation as possible through use of low mounted wall fixtures, low bollards and ground level fixtures. Floodlights, uplights or spotlights that are directly visible from the beach shall not be used.
- 5.5.35 Exterior light used expressly for safety or security purposes shall be limited to the minimum number and configuration required to achieve their functional roles. The use of motion detection that keep lights off except when approached and switch lights on for the minimum duration possible are preferred.

5.5.36 Only low intensity lighting shall be used in parking areas within line of sight of the beach and these lights must be positioned or shield so that the light is cast downwards.

5.5.37 Tinted glass shall be installed on all windows and glass doors on structures within the line of sight of the beach.

Pollution Control and Prevention

5.5.38 During construction all construction waste must be that could pollute ground and water resources must be transported back to mainland for proper disposal. Innocuous construction waste may be used as fill provided it is properly covered.

5.5.39 Work camp for construction workers must provide proper temporary latrines where sewage is collected in sealed septic containers retrofitted with a leach system.

5.5.40 Work camp for construction workers must ensure that gray water is properly disposed through leach fields built in areas containing vegetation to allow for uptake of nutrient.

5.5.41 During the construction phase, all dry organic waste may be burnt in metal containers and ash collected and properly disposed of.

5.5.42 Noise from construction must be maintained to a minimum and in areas where noise may produce a nuisance and disruptive to the fauna of the area, work must be scheduled where it causes the least disturbance.

5.5.43 No material will enter any water body during construction and removal of temporary structures.

5.6 OPERATIONS

Key areas of concern during the operational phase of a marina development are those associated with day-to-day management and maintenance of facilities; user education to marina management goals; control over boating operations; maintenance dredging; runoff control; boat wastes; fuel management; noise management; and staff training.

- 5.6.1 In an effort to keep water quality near the marina as high as possible, the following guidelines should form part of the operating permit for the facility and should be included in Environmental Compliance Plan signed by the developer.
- 5.6.2 In addition, it is recommended that the environmental conditions agreed to in the ECP be later included in the operational manuals of the Marina Facilities.
- 5.6.3 During marina operation and maintenance, implementation of a clear and complete operations and maintenance manual will need to be prepared to assist in the environmentally sound management of the marina facility.
- 5.6.4 All employees should be provided with a copy of the manual and dock masters and marina attendants are required to be fully familiar with all management practices and permit conditions.
- 5.6.5 Proper and accurate maintenance and servicing records of all marina service and safety equipment are required to be kept for inspection by authorities.
- 5.6.6 In general, marina personnel should be sufficiently experienced, trained, and familiar with marina operation and maintenance plans to: handle administrative requirements and problems; properly execute or manage marina services such as boat launching, fuelling and boat repairs; exercise necessary control over marina activities; and maintain the premises in good condition.
- 5.6.7 Marina maintenance staff is also required to ensure that a quantitative water quality-monitoring program approved by the Department of Environment is carried out in accordance with the conditions stipulated and that proper record be kept.
- 5.6.8 All housekeeping standard should form part of the rental agreement signed by marina users and marina staff are required to monitor their adherence. Infractions should have administrative penalties to assist in ensuring compliance.

- 5.6.9 Marina staff, in particular the dock master and marina attendants should be completely familiar with specified standard operational procedures.
- 5.6.10 Marina staff should also receive training and certification from suppliers and equipment manufacturers on proper operation and maintenance of boats and specialized marina equipment. The specifications of performance standards for marina equipment are important in controlling pollutant releases.
- 5.6.11 Ensure routine marina upkeep and maintenance. Routine marina upkeep should include: the regular collection of all litter in covered containers; the regular maintenance of fuel pumps and spill prevention systems; the removal of debris that accumulates on the shore and in grease/solids traps; as well as maintenance of 'wear and tear' on structures and coatings.
- 5.6.12 User Education informs boaters of regulations regarding sewage discharge. An effective means of controlling sewage pollution from boats is to educate boaters about the potential health and environmental hazards associated with the discharge of sewage and to encourage boaters not to discharge either treated or untreated wastes into a marina basin.
- 5.6.13 Marinas and vessels within a marine protected area must have its sewage treated to tertiary level prior to release from point-source discharges.
- 5.6.14 Marina operators or harbor masters should post regulations prohibiting the discharge of any waste into marina waters and include this as part of a rental agreement when slips or dry storage spaces are rented.
- 5.6.15 Inform boaters of benefits of having well-tuned engines to cut down on emissions and save on fuel.
- 5.6.16 Only phosphate free detergents should be permitted for washing boats to reduce the amounts of nutrients entering the water from this source.

- 5.6.17 Marinas with more than 50 berths shall be required to have a bilge water pump out facility to separate oil from water. Smaller marinas will be required to have vessels docked at their facilities to use oil filtration devices on bilge pumps, or commercial oil-absorbent pads placed in the bilge to soak up oil and fuel prior to bilge water discharge.
- 5.6.18 Vessels shall be required to collect drainings from sump plumbing before they enter the bilge.
- 5.6.19 All boat maintenance including painting, sand blasting, engine repairs, boat washing activities shall be conducted upland away from any body of water.
- 5.6.20 Boat maintenance areas should be enclosed or activities performed behind canvass screens to help confine dust and residues from maintenance activities.
- 5.6.21 Maintenance areas are required to be bunded or to have drainage channels and sediment traps to facilitate cleanup and help prevent contamination of marina from runoff. Sediment traps are required to be serviced on a regular basis to collect and remove trapped contaminated material.
- 5.6.22 Maintenance painting involving the use of spray equipment, particularly air-driven spray guns which produce large volumes of over-spray drift will be required to be carried out in a spray booth or enclosed shed with proper ventilation.
- 5.6.23 No tributyltin oxide based paints shall be used in any marina or berthing facility.
- 5.6.24 Marinas and berthing facilities are required to eliminate the use of copper-based antifouling paints on floats, buoys, and other non-boat surfaces. This step may lead to fouling on these surfaces, however, these fouling communities are an important food source for foraging fishes which in turn attract sport fishes into the area.
- 5.6.25 No maintenance dredging is to commence without the prior written permission of the Geology and Petroleum Department and the Department of the Environment.

- 5.6.26 Maintenance Dredging should be carried using suction head dredges since most maintenance dredging involves spot dredging of silt-fines or sands. Suction head dredges have been used for this work around marina structures to prevent damage that dragline and clamshell dredges may cause. A suction head dredge uses high pressure water jets to loosen bottom material and compressed air to operate pneumatic slurry pumps that force material in concentration through a discharge line. To control turbidity, silt curtains are required to be placed around dredging area.
- 5.6.27 Marinas are required to have an effective stormwater management plan to protect the water quality in the marina basin from being impacted by pollutants in stormwater runoff from upland facilities and spills. All paved areas should slope away from the water body into vegetated areas. Storm drains around facility and parking areas should lead to sumps (collection pits) or sediment traps and then to detention ponds, or vegetated areas before reaching water body.
- 5.6.28 All outfalls should be located to discharge into areas away from the Marina basin with high flushing.
- 5.6.29 Controlling sanitary wastes from boats is one of the primary marina permitting issues because of the potential impacts from bacterial contamination. Overall fecal coli form counts should not exceed 200 per 100 ml of sample water within the facility at any time.
- 5.6.30 All sewage treatment plant are required to meet a standard of 20 mg/L BOD and 30 mg/L prior to discharge. This standard is coupled with maximum total nitrogen and total phosphorus levels of 4 and 1 milligram per liter (ppm) respectively in marine protected areas.
- 5.6.31 On board marine sanitation devices (MSDs) are normally classified as Type I, Type II, or Type III. Type I and II MSDs treat and discharge the wastes to the water body. Type III devices are on board holding tanks which must be periodically emptied to an onshore facility. All vessels in the marina having an MSD will need to be recorded and properly logged and all vessel prohibited from discharging within the marina.

- 5.6.32 Vessels use as live aboard vessels will be required to connected to a sanitary waste collection system when moored in the marina or to use the marina wastewater pump out facility. A minimum penalty of 5000 Bz Dollars will be charged on behalf of the DOE for any infraction.
- 5.6.33 Marinas with more than 50 berths dedicated to live aboard vessels, yachts or lager vessels are required to provide oil water (bilge water) reception facilities capable of meeting a standard of 20ppm oil in water.
- 5.6.34 Marina and berthing facilities are required to provide adequate garbage disposal services. Rainproof garbage receptacles should be strategically placed throughout the facility where spilt content may not get into water and where they provide ready access to boat users and visitors.
- 5.6.35 Color coded containers for hazardous waste (motor oil containers, oil and fuel filters, soiled cloth, and sorbent towels/pods) need to be provided particularly in maintenance areas.
- 5.6.36 Containers should be emptied on a regular basis.
- 5.6.37 Marinas are required to strictly enforce the speed limits within marinas and adjacent waterways, which shall be considered as no wake zones.
- 5.6.38 Channel shall be clearly marked and signs posted to assist in safety, the protection of manatees, other aquatic organisms, and the prevention of shore erosion due to boat wash.
- 5.6.39 Marinas are required to prohibit fishing in the marina.
- 5.6.40 All marinas are required to keep their grounds clean and attractive. In addition to the normal grounds-keeping duties, the maintenance staff should carry out regular

landscaping responsibilities and use very conservatively of insecticides, herbicides and fertilizers.

- 5.6.41 Maintenance staff should be required to also carry out pollution prevention duties and clean up of petroleum spills from upland fuelling stations; and maintaining a regular rubbish/garbage collection schedule.
- 5.6.42 Fish cleaning facilities (including waste disposal) should be provided at boat launching ramps where this does not exist should prohibit fish cleaning activities.
- 5.6.43 Marinas providing fueling services are required to have an oil spill contingency plan and appropriate equipment for dealing with spills approved by the Department of the Environment. In addition, they are required to train fuel attendants in prevention and handling of fuel spills employing appropriate safety procedures.
- 5.6.44 Marinas near residential areas are required to maintain a 'good neighbor' policy by stipulating and enforcing rules to control noise. Buffers between marina sites and residential areas should be provided and maintained.
- 5.6.45 Other than engine noises, the main sources of marina noise are: cutting, grinding, hammering, planning, sand blasting, air compressors and staple guns, and trucks and equipment. Marinas near residential areas are required to undertake adequate amelioration measures to substantially reduce noise levels.
- 5.6.46 These measures include: maintaining adequate separation distances between boat building/maintenance areas and neighbors; restricting hours of operation for noisy activities; designing buildings to contain noise; the use of acoustic barriers and damping and insulating materials; and fitting efficient exhaust mufflers to vehicles and equipment.