Japan International Cooperation Agency (JICA)

Autoridad Marítima de Panamá (AMP)

No.

Final Report

THE STUDY ON THE COMPREHENSIVE PORTS DEVELOPMENT PLAN IN THE REPUBLIC OF PANAMA

Volume 2
Master Plans and Feasibility Study

August 2004

PACIFIC CONSULTANTS INTERNATIONAL
INTERNATIONAL DEVELOPMENT SYSTEM INC.

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Note: The following exchange rate are used in this report.
1.00 Balboa = US Dollar 1.00 = Japanese Yen 108
December 2003

Bocas del Toro Port

Almirante Port

Chiriqui Port

Coquira Port

La Palma Port

LIST OF ABBREVIATIONS

ACP	:	Autoridad del Canal de Panamá (Panama Canal Authority)
AMP	:	Autoridad Marítima de Panamá (Panama Maritime Authority)
ANAM	:	Autoridad Nacional del Ambiente (National Authority of Environment)
ANCON	:	Asociacion Nacional para la Conservación de la Naturaleza /National Association for Nature Conservation
API	:	Administración Portuaria Integral (Integrated Port Administration)
APN	:	Autoridad Portuaria Nacional de Panamá (National Port Authority of Panama)
APSA	:	Atlantic Pacific, S.A.
ARI	:	Autoridad de la Región Interoceánica (Authority of the Interoceanic Region)
AUC	:	United Self Defense of Colombia
BFZA	:	Baru Free Zone Authority
BOO	:	Build-Own-Operate
BOT	:	Build-Operate-Transfer
CAPAC	:	Cámara Panameña de la Construcción (Panamanian Chamber of Construction)
CBP	:	Customs and Border Protection
CCT	:	Colon Container Terminal
CEMIS	:	Multimodal Industrial Service Center
CFZ	:	Colon Free Zone
CIQ	:	Customs, Immigration, Quarantine
COCATRAM	:	Commission of Central American Maritime Transport
CSI	:	Container Security Initiative
C-TPAT	:	Customs-Trade Partnership Against Terrorism
DGRMC	:	General Directorate of Marine and Coastal Resources
DHS	:	Department of Homeland of Security
DINAAC	:	National Aquaculture Directorate
DMPSP	:	Development Master Plan for Selected Ports
DO	:	Dissolved Oxygen
EAP	:	Economic Active Population
ECMWF	:	European Center for Medium-range Weather Forecasts
EIA	:	Energy Information Association
EIA	:	Environmental Impact Assessment
EIRR	:	Economic Internal Rate of Return
FAO	:	Food and Agriculture Organization of the United Nations
FC	:	Fecal Coliform
FCCA	:	Asociacion de Cruceros de Florida y el Caribe (Florida and Caribbean Cruisers Association)

FDI	:	Foreign Direct Investment
FERTICA	:	Fertilizantes de Centro America (Panamá) S.A.
FFD	:	Fondo Fiduciario para el Desarrollo (Develop Fiduciary Funds)
FSPDP	:	Feasibility Studies for Priority Development Projects
FTAA	:	Free Trade Area of the Americas
GANTRAP	:	Not-traditional Agricultural Exporters Association of Panama
GCO	:	Office of General Comptroller
GDP	:	Gross Domestic Product
GMT	:	Gross Metric Tons
ICAVE	:	Internacional de Contenedores Asociados de Veracruz (Internacional Associated Containers of Veracruz)
IDAAN	:	Instituto de Acueductos y Alcantarillados Nacionales (National Institute of Aqueducts and Sewage)
IDB/IADB	:	Inter-American Development Bank
IEE	:	Initial Environmental Examination
IMO	:	International Maritime Organization
INCOP	:	Instituto Costarricense de Puertos del Pacífico (Pacific Port Institute of Costa Rica)
IPAT	:	Instituto Panameño de Turismo (Panamarian Institute of Tourism)
IPDP	:	Individual Port Development Plans
IQ	:	Individual Quota
ISPS Code	:	International Ship and Port Facility Security Code
IT	:	Information Technology
JAPDEVA	:	Junta de la Administración Portuaria y de Desarrollo Economico de la Vertiente Atlantica (Port Administration and Economic Development of Atlantic Slope Union)
JICA	:	Japan International Cooperation Agency
JMA	:	Japan Meteorological Agency
JWA	:	Japan Weather Association
KCS	:	Kansas City Southern Railway
LLC	:	Lanigan Holdings
MARPOL	:	International Convention for Prevention of Marine Pollution
MEF	:	Ministerio de Economia y Finanzas (Ministry of Economy and Finance)
MICI	:	Ministry of Commerce and Industry
MIDA	:	Ministry of Agricultural Development
MIT	:	Mansanillo International Terminal
MIVI	:	Ministerio de Vivienda (Housing Ministry)
MOP	:	Ministerio de Obras Públicas (Ministry of Public Works)
MOPT	:	Ministry of Public Works and Transport

MSY	:	Maximum Sustainable Yield
MTSA	:	Maritime Transportation Security Act
NAMPF	:	Nationwide Allotment of Major Port Function
NMS	:	National Maritime Strategy
NMS	:	Servicio Maritimo Nacional (National Maritime Service)
NPDCP	:	National Port Development Conceptual Plan
NPS	:	National Port Strategy
OCUPA	:	Operadora de la Cuenca del Pacifico, S.A. de C.V (Pacific Basin Operator)
PCC	:	Pure Car Carrier
POT	:	Land Use Management Plan
PPC	:	Panama Port Company
PPP	:	Public and Private Partnership
PROPRIVAT	:	Unidad Coordinadora para el Proceso de Privatización (Coordinator Unity for Privatization Process)
PTP	:	Petro-terminal de Panama S.A.
RGDP	:	Regional Gross Domestic Product
SCF	:	Standard Conversión Factor
SCT	:	Secretary of Communications and Transportation
SIECA	:	Central Economic Integration System
SINCOTAVECOP	:	Sindicato de Conductores de Taxis y Vehículos Comerciales de la Provincia (Union of Taxi Drivers and Commercial Vehicles of the Province)
SOLAS	:	International Convention for Safety of Life at Sea
SPC	:	Special Purpose Company
TAC	:	Total Allowable Catch
THC	:	Total Hydrocarbon
TMM	:	Transportacion Marítima Mexicana (Mexican Maritime Transportation)
TN	:	Total Nitrogen
TP	:	Total Phosphorus
TSA	:	Transport Security Administration (United States)
UNFPA	:	United Nations Population Fund
UNHCR	:	United Nations High Commissioner for Refugees
USAID	:	U.S. Agency for International Development
UCST	:	Coordinator Unit of the Transportation Sector
UTM	:	Universal Transverse Mercator's Projection System
VAF	:	Value-Added Facility
VAS	:	Value-Added Service
VIPA	:	Virgin Island Port Authority
WB	:	World Bank

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12. MASTER PLAN OF BOCAS DEL TORO PORT

12.1 Development Scenario

12.1.1 Rationale

In the process of the elaboration of the master plan of Bocas del Toro Port development, the following factors have been taken into considerations.

(1) The Socio-Economic Activities of Bocas del Toro City

The principal industry of Bocas del Toro City is tourism. The attractiveness of the city is natural beauties and thus the tourism promotion program focuses eco-tourism rather than large scale commercial resorts.

(2) The Roles and Functions of Bocas del Toro

The original role of the port was to provide a transport route to and from the mainland. Due to the recent increase in tourists in the area, the City has been playing a role as the crossroads of the tourist traffic: incoming and outgoing tourists and island hopping tourists.

(3) The Traffic Expected in the Future

For the past few years, the tourists visiting Bocas del Toro have been increasing. The increase in tourists is contributed by the development of new access from Changuinola to Bocas del Toro via scenic canal. The number of passenger traffic at Bocas del Toro Port is expected to increase to 1.78 million in 2024, which is seven times of that observed in 2002.

(4) The Responsibility of AMP at Bocas del Toro

AMP is not only responsible for the administration and management of the national port Bocas del Toro, but also for the coastal zone management and the registration of the ships including small passenger crafts. It is also its responsibility to preserve natural environment and marine resources. The coordination with other government agencies is one of the key roles of AMP. AMP is the partner of IPAT for the tourism promotion there.

(5) Existing problems

1) Port facilities for passenger boats

While AMP is operating Ro/Ro ramps at both Bocas del Toro and Almirante Ports, there are no appropriate docking facilities for small passenger crafts. Since the passenger wharf was damaged few years ago, the passenger boat operators have constructed their own docking facilities, which are not always comfortable and safe enough.

2) Competition among the passenger boat operators

Competition among the passenger craft operators is serious and this situation might cause the dumping of fares, which may lead deterioration of service level especially safety and comfortableness.

AMP has the responsibility to provide a fair competitive opportunity for the boat operators. The competition among the operators should be promoted provided that each player observes the rules, fulfills the safety standards and maintains the service level.

3) No Coordination among the Government Agencies in the Issuance of the Permission of the Exclusive use of Coastal Zone

Without proper coordination among the government agencies to issue the permissions for the use of coastal zones, the coastal areas are fully occupied by private structures, which are out of harmony with the historic houses of colonial style. Since it is the responsibility of AMP to manage the coastal zones and to coordinate with other government agencies concerned, AMP is a key player to settle this issue.

In consideration of the above mentioned situation, it has been identified that Bocas del Toro Port is the key element for the tourism promotion, and that AMP has the responsibility to positively take actions to settle the existing problems there. In fact, only AMP has the authority to manage the port, shipping, coastal zone use and pollution control in Bocs del Toro in an integral manner.

12.1.2 Development Scenario

The basic idea of the development of Bocas del Toro is to restore a suitable environment of tourism of the port area. AMP has administrative powers to manage the ports, i.e. Bocas del Toro and its counterpart port Almirante, to regulate the use of the coastal areas and to enforce regulations related to ships and shipping. Thus, AMP has a great opportunity and power to contribute to the restoration of tourism environment at Bocas del Toro, especially in and around port areas.

The plan should intend not only to restore the damaged passenger boat pier but also to establish an activity center at the port area through collective efforts of various institutions concerned: IPAT, local governments and private sector.

In addition to tourism elements such as beautification of the port area, the commercialization of the local fishing, and well-combined service scheme by both Ro/Ro ferry and passenger boats should be elaborated in the master plan. The same concept should be employed for the development of both Bocas del Toro and Almirante ports. The project sites are the existing AMP ports and adjacent areas.

The project shall include the following elements:

- Reconstruction of the passenger wharf and terminal
  The wharf should accommodate both ferries plying between Bocas del Toro and Almirante and small crafts carrying passengers to various resorts and tourist spots. The terminal building should have enough spaces for waiting lounge, ticket counter, exhibition room, administration office, etc.
- Improvement of Ro/Ro Ramp, access road and parking area
- Boardwalk along the shore as well as mooring spots for small crafts
- Fish market for tourists (Bocas del Toro only)
- Shopping mall and restaurants (Bocas del Toro only)
- Ship waste and sewage treatment facility

Above all, AMP should take initiative to establish land use plan of Bocas del Toro, especially areas adjacent to the port. Coastal view should be restored by regulating the construction of structures on the shore as well as the strict enforcement of marine pollution regulations.

The image of the development of Bocas Del Toro is shown in Figure 12.1.1

Almirante Port should also be developed as the partner port of Bocas del Toro Port.

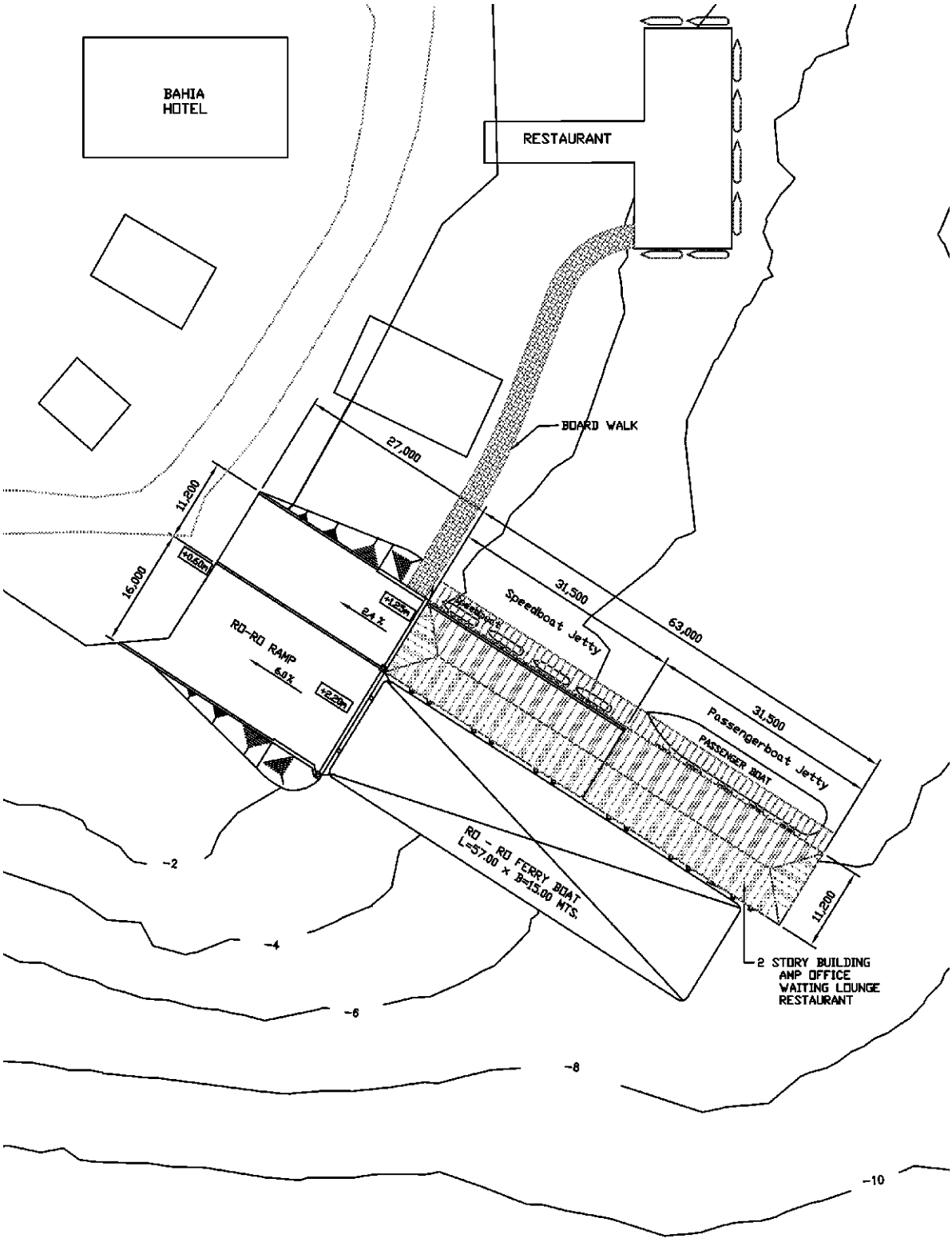


Figure 12.1.1 Conceptual Plan of Bocas del Toro Port Development

12.2 Demand

12.2.1 Present Circumstances in Bocas del Toro

"The Study of Tourism Development in the Coastal Area of the Republic of Panama 1995" by Japan International Cooperation Agency (JICA) is referenced.

The province of Bocas del Toro has the longest coast (488 km) among the three provinces facing the Caribbean. According to the guidebook, there are 9 islands, 51 islets and 200 rocky isles in the Province. This zone belongs to Changuinola, Bocas del Toro and Chiriqui Grande districts in the Bocas del Toro province. The area covered is 8,745 km^2, and the population was 100,667 in 2003 according to "Contraloria General de la Republica, Direccion de Estadistica y Censo".

The main economic activities in this zone are dependent on the primary sector and its GDP accounted for approximately 50 % of the whole GDP of the Province in 2000. Changuinola, which is the largest city in the Bocas del Toro province, is the main center of economic activities and a large banana estate has been operated there. The town of Bocas del Toro is located in Colon Island, and Bathtimentos is located in Bastimentos Island. These town are the only areas where population is concentrated in the islands. Tropical rain forest is extensive in this region. Among the 94 tourism resources listed in IPAT's database, most in this area are coastal, consisting of 16 beaches, 13 fishing spots, 14 flora and fauna locations and 7 coral reefs.

There are 10 airports in the Bocas del Toro province, of which two airport, Bocas del Toro and Changuinola, are designated as the international airports. These two airports have scheduled flights to the Panama City and David in Chiriqui province. Bocas del Toro airport has a 1,500 m runway paved in asphalt and Changuinola airport has a 1,100 runway paved in asphalt. There are three state ports in this zone (namely, Almirante, Bocas del Toro and Chiriqui Grande) and a lot of small private piers, which are used by small boat taxis/launches to connect the surrounding islands since the sea conditions are usually calm.

12.2.2 Present Passenger Movement

(1) Passenger Movement by Boat Taxis

1) Expreso Taxi 25 S.A.

The history of Expreso Taxi 25 S.A. is shown in Table 12.2.1.

Table 12.2.1 Passenger Movement on Expreso Taxi 25 S.A.

(Unit: trip)

Year	Almirante to Bocas	Bocas to Almirante	Total Passengers	Number of Trip
2000	46,589	44,268	90,857	9,028
2001	62,059	59,147	121,206	10,754
2002	65,200	62,650	127,850	11,930
2003	81,054	78,308	159,362	12,160

Source: Expreso Taxi 25 S.A.

Presently two boat taxi companies with regular services (namely, Expreso Taxi 25 S.A. and Bocas Marine & Tours S.A.) are operating in Bocas del Toro. Expreso Taxi 25 S.A., which has operated boat taxis in Bocas del Toro for 15 years, is a long-established company. The company owns 5 boats with capacities for 15-19 passengers and one boat with capacity for 65 passengers. The number of return trip per day is 16-20 trips in high season and below 16 trips in low season.

2) Bocas Marins & Tours S.A.

Bocas Marine & Tours S.A. started a service between Bocas del Toro and Almirante in December 2000 and a service between Bocas del Toro and Changuinola in November 2002. The company owns 6 boats with capacity for 19 passengers.

The history of Bocas Marine & Tours is shown in Tables 12.2.2 and 12.2.3.

Table 12.2.2 Passenger Movement (1) on Bocas Marine & Tours, Almirante-Bocas

(Unit: trip)

Year	Almirante to Bocas	Bocas to Almirante	Total Passengers	Number of Trip
2000*	1,550	1,300	2,850	**
2001	**	**	**	**
2002	65,393	67,224	132,617	13,228
2003	63,147	58,442	121,589	11,958

Source: Bocas Marine & Tours S.A.
* November to December, 2000
** No data available

Table 12.2.3 Passenger Movement (2) on Bocas Marine & Tours, Bocas-Changuinola

(Unit: trip)

	Bocas to Changuinola	Changuinola to Bacas	Total Passengers	Number of Trip
2002*	1,526	1,135	2,661	515
2003	34,261	32,941	67,202	5,957

Source: Bocas Marine & Tours S.A.
* November to December, 2002

Table 12.2.4 shows the passenger classification (Panamanian/Foreigner) by route from September 19, 2003 to January 20, 2004.

Table 12.2.4 Passenger Classification by Route

(Unit: trip)

Route	Total Passenger	Panamanian		Foreigner	
		Person	Share (%)	Person	Share (%)
Bocas to Almirante	41,233	36,420	88.3	4,812	11.7
Bocas to Changuinola	24,115	15,508	64.3	8,607	35.7
Total	65,348	51,928	79.5	13,419	20.5

Source: Bocas Marine & Tours S.A.

According to Bocas Marine & Tours, reasons why the company started a service between Bocas del Toro and Changuinola are as follows:

- Discount air tickets are beginning to appear in Europe.
- Many tourists from USA and Europe visited Costa Rica for the purpose of eco-tours before, but recently a part of the tourists come to Bocas del Toro through Costa Rica in order to enjoy real eco-tours.
- Bocas Marine & Tours S.A. is now in cooperation with a tour agency in Costa Rica to attract foreign tourists to Bocas del Toro.

The company forecasts that foreign tourists to Bocas del Toro will increase with a growth rate of 10~15 %/year due to attractive nature in Bocas del Toro, by which tourists from Europe and USA will be much fascinated.

3) Passenger Movement on Boat Taxis

The passenger movement on boat taxis is shown in Table 12.2.5.

Table 12.2.5 Passenger Movement on Boat Taxis

(Unit: trip)

	Bocas del Toro to Almirante			Bocas del Toro to Changuinola		
	Embark	Disembark	Total	Embark	Disembark	Total
(2000)						
Expreso Taxi	44,268	46,589	90,857			
Bocas Marine	1,300	1,550	2,850			
Corperation	31,225	29,287	60,512			
Atlantic	4,792	5,452	10,244			
Total	81,585	82,828	164,463			
(2001)						
Expreso Taxi	59,147	62,059	121,206			
Bocas Marine	*	*	*			
Corperation	*	*	*			
Atlantic	*	*	*			
Total	122,250	123,994	246,244			
(2002)						
Expreso Taxi	62,650	65,200	127,850			
Bocas Marine	67,224	65,393	132,617	1,526	1,135	2,661
Palanga	7,635	7,227	14,862			
Sea Voyager	315	353	668			
Total	137,824	138,173	275,997	1,526	1,135	2,661
(2003)						
Expreso Taxi	78,308	81,054	159,362			
Bocas Marine	63,147	58,442	121,589	34,261	32,941	67,202
Palanga	6,914	7,124	14,038			
B.B. Vindos	1,111	1,091	2,202			
Total	149,480	147,711	297,191	34,261	32,941	67,202

Source: Panama Maritime Authority (AMP) and Boat Taxi Companies
* No data available

(2) Passenger Movement on Buses

SINCOTAVECOP S.A. is a bus company having the base in Changuinola. The company have the following bus network in the Bocas del Toro province:

Table 12.2.6 Bus Network in Bocas del Toro

Route	Number of Return trips (per day)	Capacity of Bus
Changuinola to Almirante	17 Buses x 3 trips	21 passengers
Changuinola to Chiriqui Grande	6 Buses x 1 trips	21 passengers
Changuinola to Guabito (Border)	15 Buses x 3 trips	21 passengers
Changuinola to San Jose (Costa Rica)	1 Bus x 1 trip	54 passengers

Source: SINCOTAVECOP S.A.

According to SINCOTAVECOP S.A., the company owns 204 buses and the number of bus users is 5~6,000 passengers per day on average. In addition, a new bus terminal is under construction in Changuinola in order to cope efficiently with an increase of passengers.

(3) Passenger Movement on Airs

There are two airports in the Bocas del Toro province (namely, Bocas del Toro Airport and Manuel Nino Airport (Changuinola)), which have scheduled flights to the Panama City and David in the Chiriqui province. The number of passengers at these airport is shown in Table 12.2.7.

Table 12.2.7 Number of Passengers by Airports in Bocas del Toro

(Unit: trip)

Airport	1998	1999	2000	2001	2002
(Bocas del Toro)					
Embark					12,438
Disembark					13,494
Subtotal	22,342	24,720	27,008	23,378	25,932
(Changuinola)					
Embark					7,986
Disembark					8,048
Subtotal	21,176	20,612	9,459	14,758	16,034
(Total)					
Embark	20,748	22,024	17,581	18,463	20,424
Disembark	22,779	23,319	18,886	19,673	21,542
Total	43,527	45,343	36,467	38,136	41,966

Source: Autoridad Aeronautica Civil, Republica de Panama

12.2.3 Passenger Movement Forecast

(1) Passenger Movement on Boat Taxis

Referring to Table 12.2.4 Passenger Classification by Route, passengers are classified as follows:

Table 12.2.8 Nationality by Route

(%)

	Panamanian	Foreigner (Tourist)
Bocas del Toro to Almirante	88	12
Bocas del Toro to Changuinola	64	36
Total	80	20

Table 12.2.9 Passenger Route by Nationality

(%)

	Bocas del Toro to Almirante	Bocas del Toro to Changuinola
Panamanian	85	15
Foreigner (Tourist)	58	42

Based on Tables 12.2.8 and 12.2.9, the number of trip for passengers (Panamanian and Foreigner) in 2003 is estimated as shown in Table 12.2.10.

Table 12.2.10 Number of Trip for Passengers in 2003

(Unit: trip)

Passenger Total	Panamanian	Foreigner (Tourist)
364,393	291,514	72,879
(100%)	(80%)	(20%)

The future passengers by route are calculated based on the assumption that: ① number of Panamanian will increase with growth rate of population in the Bocas del Toro province (2.05 %/year), ② number of tourists will increase with growth rate of 10 %/year (refer to Chapter 10.4.11 Bocas del Toro Port), and ③ share of tourists through Changuinola route, which is attractive for foreigners, will increase from 42 % to 50 %.

Accordingly, the passenger movement by route and by nationality in 2024 is estimated as shown in Table 12.2.11.

Table 12.2.11 Passenger Movement by Route and by Nationality in 2024

(Unit: trip)

Passenger	Bocas del Toro to Almirante	Bocas del Toro to Changuinola
Panamanian	390,000	70,000
Foreigner (Tourist)	270,000	270,000
Total	660,000	340,000

(2) Passenger Movement by Air

The future tourists by air are calculated based on the assumption that: ① share of tourists by air will be 80 % of the whole passengers, and ② number of tourists will increase with growth rate of 4 %/year equivalent to growth rate of passengers, which visit Bocas del Toro by air.

Accordingly, the future tourist number by air in 2024 is estimated to be 25,000 persons.

(3) Passenger Movement in 2024

The passenger movement in 2024 is shown in Table 12.2.12.

Table 12.2.12 Passenger Movement in 2024

	Trip	Person
Bocas del Toro to Almirante	660,000	330,000
Bocas del Toro to Changuinola	340,000	170,000
Bocas del Toro to Islands	590,000	295,000

12.3 Natural Conditions

This section describes natural conditions about Bocas del Toro Port and Almirante Port, focusing topographic and bathymetric conditions, oceanographic conditions and subsoil conditions for the master plan study.

12.3.1 Topographic and Bathymetric Conditions

Topographic and bathymetric surveys were conducted in order to get detail current information, more than existing maps and/or charts around existing ports on the following conditions: that Datum elevation was referenced to the MLW based on tide observation related to the Port of Cristobal, the geographic coordinates used Mercator's Universal System (UTM), grid zone No.17 and the spheroid was based on Clark 1866 on the survey maps.

Bocas del Toro Port : The results of topographic and bathymetric surveys are shown in Figure 12.3.1. Two benchmarks indicated in the figure were established as shown below.

BM Description	Coordinates		Elevation	
	E	N	Datum	(m)
1	363,693.76	1,031,969.51	MLW	1.30
2	363,739.76	1,032,043.51		0.80

The landside around existing Bocas del Toro Port is mostly flat and there are some subdivided residences, some boat launchers for tourists or locals, accommodations and restaurants. Seabed configuration is regularly parallel to the boundary between land and sea up to -10 m and its gradient is about 1/10 to 1/20, although there is a small plateau about 500 m at the forehead of the existing port area.

Almirante Port : The results of topographic and bathymetric surveys are shown in Figure 12.3.2. Two benchmarks indicated in the figure were established as shown below.

BM Description	Coordinates		Elevation	
	E	N	Datum	(m)
1	346,951.00	1,026,936.00	MLW	1.31
2	346,856.78	1,026,947.31		1.94

The landside around existing Almirante Port is mostly flat and there are some commercial sectors, some boat launchers for tourists or locals, Ro-Ro ferry dock, residences and a big banana export company. Seabed configuration is regularly parallel to the boundary between land and sea up to -10 m and its gradient is about 1/20 to 1/30. Towards the public boat launcher areas inside the bay, the contour lines are complicated, but describing is uniform. The contour lines become deeper more fronting toward bay mouth, especially since the depth probably has been dredged around the banana company pier and is about -12 to -14 m at present.

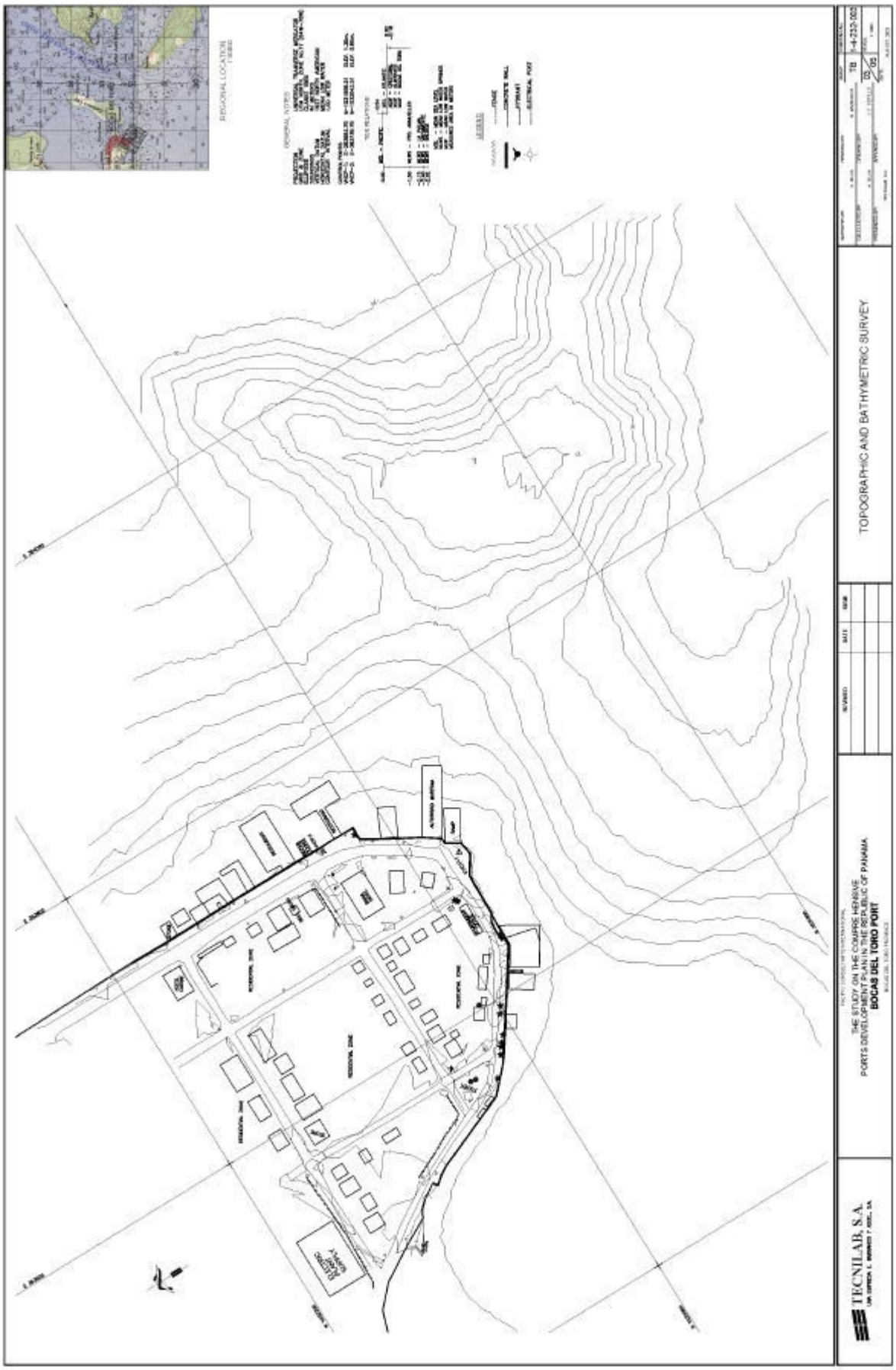


Figure 12.3.1 Survey Map at Bocas del Toro Port

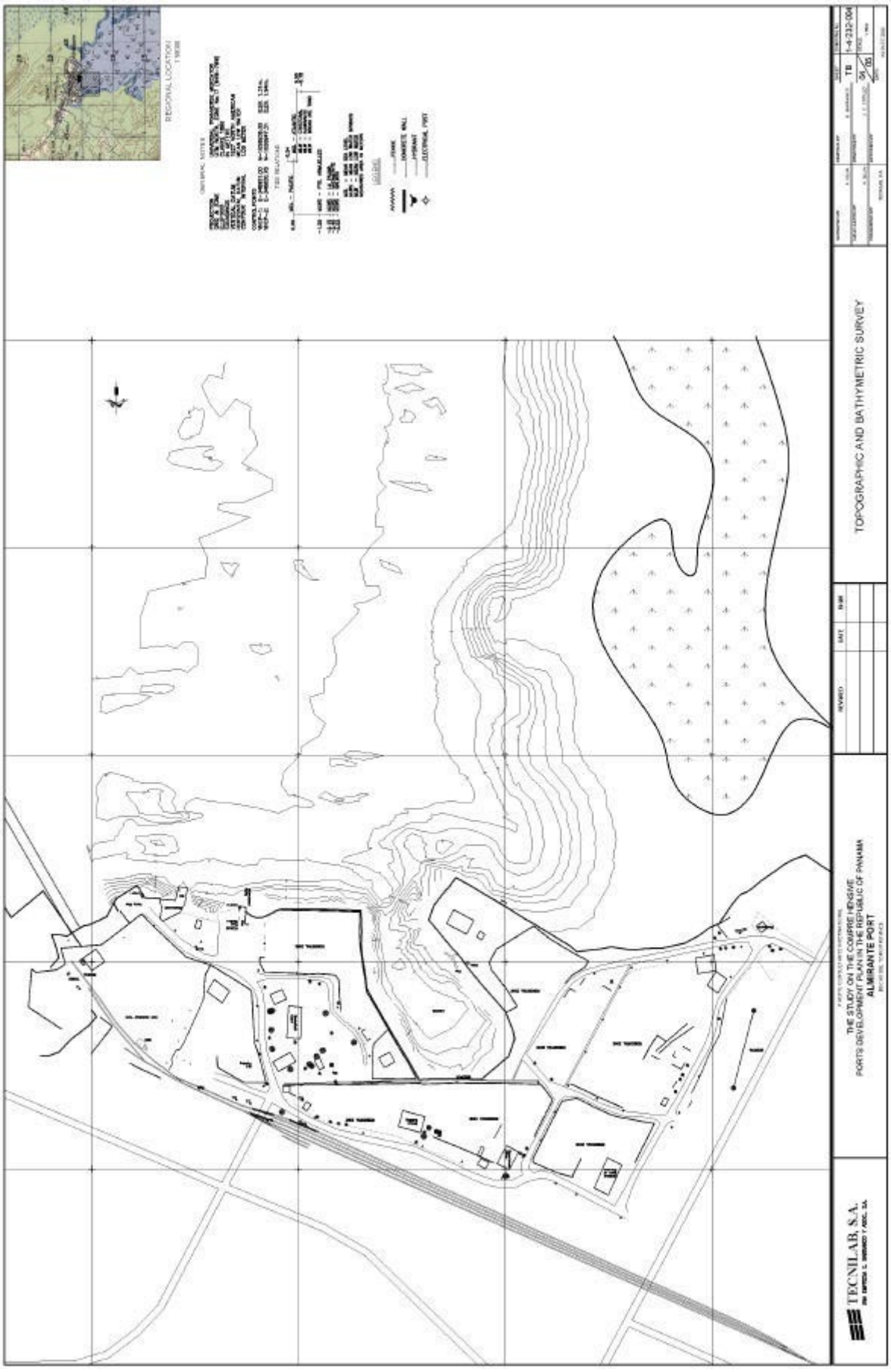


Figure 12.3.2 Survey Map at Almirante Port

12.3.2 Oceanographic Conditions

Generally oceanographic conditions on Bocas del Toro Port and Almirante Port are summarized in Table 12.3.1. The information is referenced from the existing publication[1], design and survey reports or drawings conducted by AMP.

At these ports, there are no permanent tide observation spots and authorized tide relation, although predicted tide data by harmonic analysis is disclosed from public or private sectors in publications or internet website just for reference. The following correction coefficients with the tide of Cristobal Port are extracted from the publication. Tidal Range is quite small, less than 0.6 m, comparing with the Pacific Ocean. Experimentally the MLW on these ports seems to define -0.18 m from the MSL on the Atlantic Ocean officially established in using the tide data observed on Cristobal Port, based on temporary tide observation or tide study.

Annual maximum wave height on Bocas del Toro Port is small, less than 1.0 m because the area around existing port is surrounded with several islands and exceeds in wind waves generated from the wind of E-S direction. Almirante Port lies in the inlet, so that the waves are less than 0.3 m. Current of these areas is maximum 0.5 m/sec except for the channel among several islands.

Table 12.3.1 Summary of Oceanographic Conditions

Name of Port	Tide							Current (m/sec)	Waves (Annual Max.)		Referred Nearest TidePoint
	Ref. Port	Difference from Reference Port				Tidal Range (m)	MLW from MSL (Atrantic)		Height $H_{1/3}$ (m)	Period T (sec)	
		Time (HH:MM)		Height (m)							
		HWL	LWL	HWL	LWL						
Bocas del Toro Port	Cristobal	+0:21	+0:24	× 1.14	× 1.14	< 0.6	-0.18	< 0.5*	< 0.5*	n/a	
Almirante Port									< 0.3*	n/a	

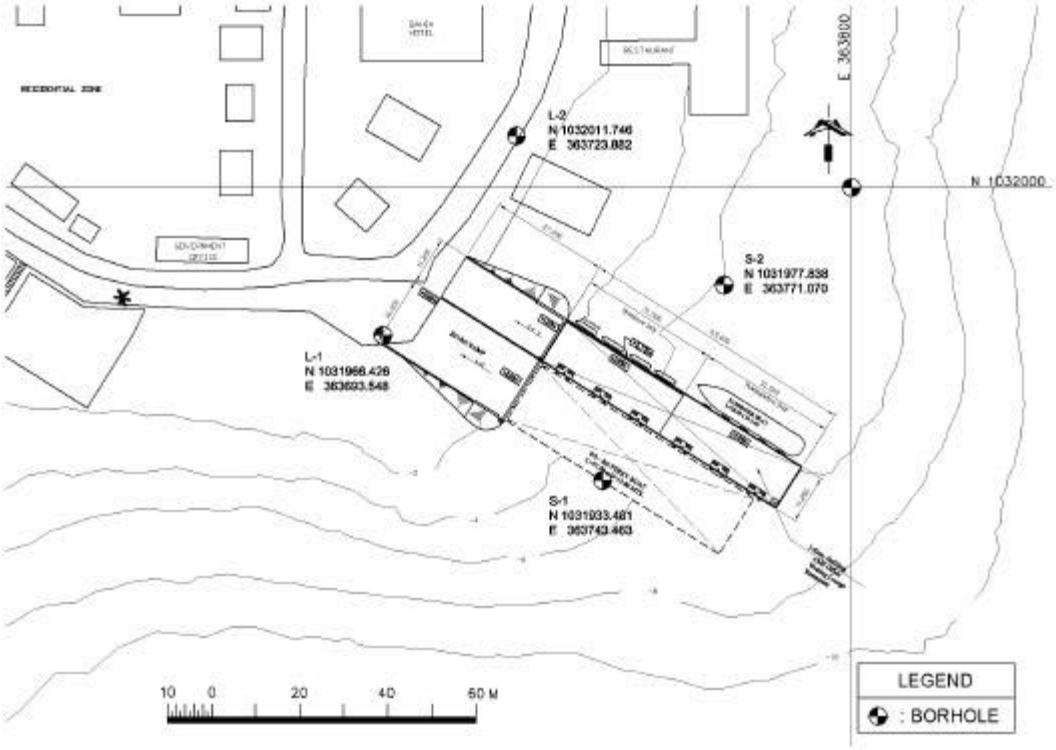
Note
1) Tide information to each port in the list is referred from nearest reference place authorized in official publication.
2) Difference such as time and height for HWL and LWLshould be added or multiplied with correspnded level of referred nearest point.
3) Asterisked values of current and waves mean figure by interview and chart.

12.3.3 Subsoil Conditions

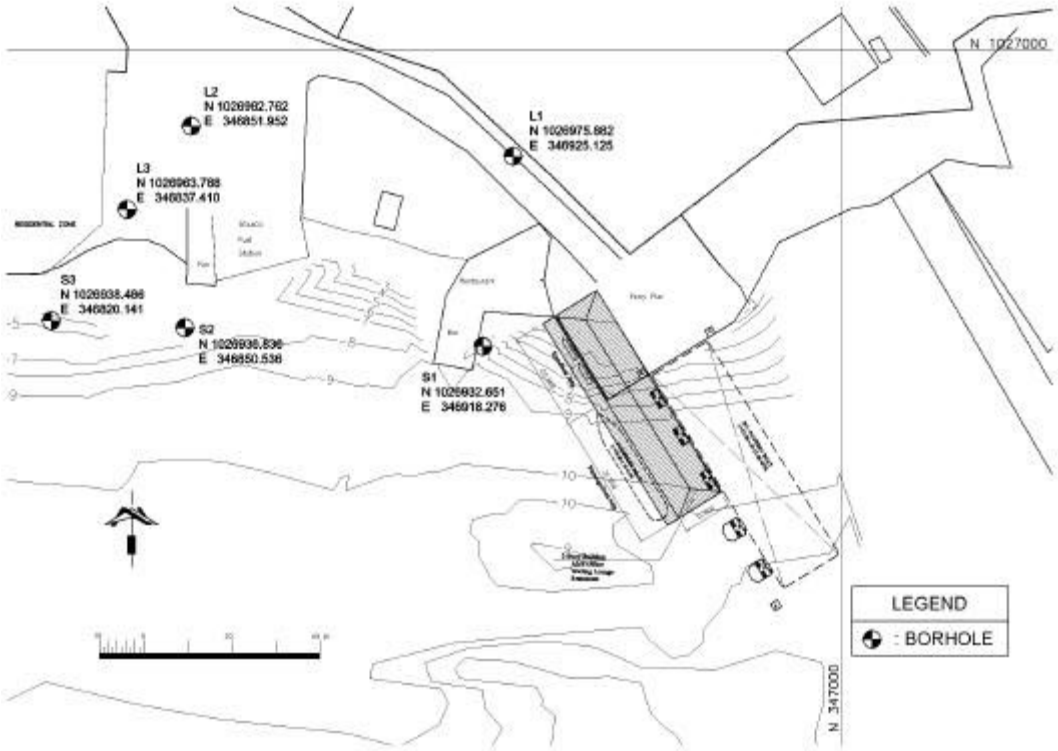
Soil investigations were conducted around existing ports in order to get detail information for the target points.

Bocas del Toro Port : Figure 12.3.3 (a) shows borehole locations. Subsoil profiles along representative section were assumed based on the boring logs and SPT-N values as presented in Figure 12.3.4.

[1] International Marine, Tide Tables 2003 West Coast of North and South America, McGraw Hill Press, 2002
US Defence Mapping Agency & Admiralty, UK, Chart



(a) Bocas del Toro Port



(b) Almirante Port

Figure 12.3.3 Location Map of Boring Points

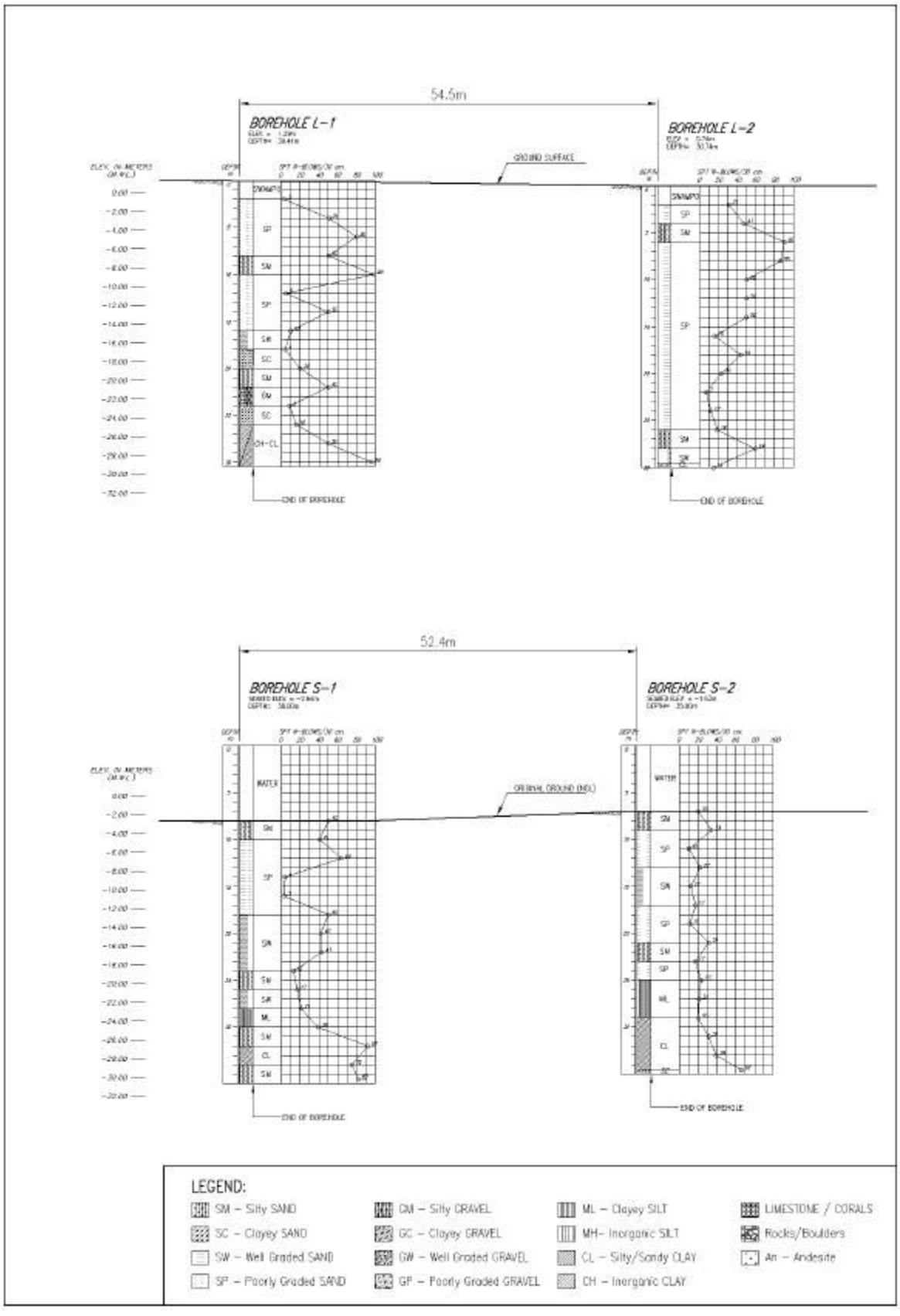
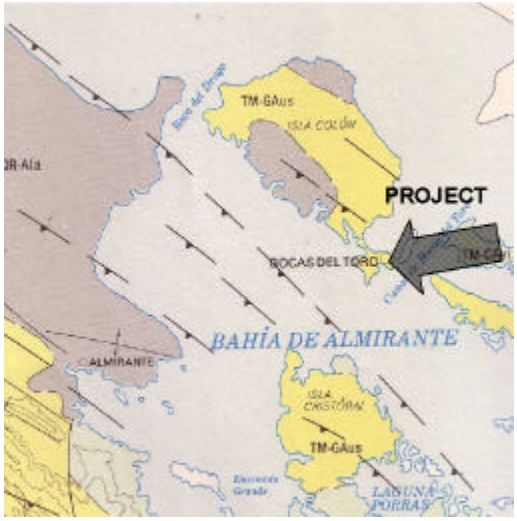


Figure 12.3.4 Boring Logs at Bocas del Toro Port

This site is located in the Uscari Formation, composed of shale, siltstone, sandstone, conglomerate, and piroclastics as shown in the figures below.

Boreholes L-1 and L-2: The first strata consist of a layer of organic debris partially to very decompose named as "swamp". In the next layers were found stratas of Poorly Graded Sand (SP) with dense to very dense compactness, non plastic; Poorly Graded Silty Sand (SM) with dense to very dense compactness, non plastic; Well Graded Sand (SW) with loose to dense compactness, non plastic; Clayey Sand (SC) and Silty Sand (SM) with firm to hard consistency and medium to low plasticity;



Inorganic Clay (CH) with hard consistency and low plasticity. The color of all layers varies from light gray to greenish gray, gray, and dark gray.

Boreholes S-1 and S-2: In both, residual water was found up to 7.0 and 8.0 m depth respectively. Typical layers consist of Poorly Graded Silty Sand (SM) with very dense compactness and non plastic; Poorly Graded Sand (SP) with very dense compactness and non plastic; Well Graded Sand (SW) with very firm to very dense compactness and non plastic; Silty Sand (SM) with even consistency and low plasticity; Inorganic Silt (ML) with very even consistency and low plasticity; and Inorganic Clay (CL) with hard consistency and low plasticity.

Almirante Port : Figure 12.3.3 (b) shows borehole locations. Subsoil profiles along representative section were assumed based on the boring logs and SPT-N values as presented in Figure 12.3.5.

This site is located on Las Lajas Formation, composed of alluvion, consolidated sediments, sandstone, coral, mangrove, conglomerate, carbonaceous shale, and delta deposition.

Figure 12.3.5 Boring Logs at Almirante Port

Boreholes L-1, L-2 and L-3: In the boreholes L-1 and L-2 the first strata consists of a fill composed of coarse gravel, coral, well and poorly graded sand, loose to medium compactness, medium natural water content, this layer cannot be observed in L-3. The next stratas consist of Well Graded Sand (SW), Poorly Graded Sand (SP), Poorly Graded Gravel (GP), loose to medium compactness, low natural water content; Clayey Sand (SC), soft consistency, high to medium natural water content; Silty Sand (SM) soft consistency, low plasticity, high natural water content;

Inorganic Silt (MH) with consistent to hard consistency were observed. The rock strata consist of Clayey and Silty Sandstone and Sandstone.

Boreholes S-1, S-2 and S-3: In the borehole S-1, S-2 and S-3, the subsoil layers are formed from the following: Well graded Sandy Gravel, loose compactness, medium to high natural water content, Poorly Graded Silty Sand (SM), very loose to dense compactness, non plastic, high to medium natural water content; also observed were Clayey Sand (SC), soft to very consistent consistency, low plasticity, medium to high natural water content; Inorganic Silt (MH) and Inorganic Clay (CH), consistent to hard consistency, low plasticity. In these boreholes the rock strata consists of Argillaceous Sandstone.

12.4 Environmental Condition

12.4.1 Water Environment

The coastal port water environmental condition at both Bocas Del Toro and Almirante were studied by conducting sampling and analysis of both water and seabed material (sediment) at 4 locations in each of the port waters and their vicinity. The water quality sampling were conducted two times once each during low tidal and high tidal condition, while sediment sampling was conducted only once during low tidal condition.

Water quality sampling and analysis were conducted both at field, for simple parameters, and in laboratory. The field parameters measured included water temperature, water turbidity, pH, transparency and DO (dissolved oxygen). The laboratory parameters measured included DO, COD (chemical oxygen demand), total nitrogen (TN), total phosphorus (TP), fecal coliform (FC) and extractive substance in normal-hexane (oil content).

The seabed material parameters analyzed in laboratory included, total oil content (total hydrocarbon/THC) and the 10 heavy metals of Cu (copper), Zn (zinc), Be (beryllium), Cr (chromium), Ni (nickel), V (Vanadium), Cd (Cadmium), Hg (Mercury), Pb (Lead) and As (Arsenic).

(1) Port Water Quality

It is noted that the water quality parameters measured are essentially indicators of organic, nutrient, bacterial and oil pollution. In overall, the analytical results indicated no chronic water quality deterioration attributed to organic pollutants in any of the 2 port waters, which was also evident from visual site inspection conducted in these port water areas. Still progressing nutrient pollution with significant levels of total nitrogen (TN) and total phosphorus (TP), attributed to long-term secondary effects of organic pollutants such as wastewaters of domestic origin, was noted in the coastal waters of both ports of Bocas Del Toro and Almirante. In this respect it is worth to mention that on a comparative basis the coastal port waters of Almirante is visibly somewhat deteriorated than that of Bocas Del Toro.

In general in large water body like coastal water a TN level of more than 1 mg/l and a TP level of more than 0.1 mg/l could be regarded as indicators of significant nutrient pollution with potential eutrophication. The TN and TP levels measured in these 2 port waters, in particular the TN level as the primary indicator of secondary pollution due to organic matter, in overall, exceeded the above-mentioned limitations. In this respect it is noted that the measured range of TN and TP in Bocas Del Toro is 0.2-5.3 mg/l and 0.03-0.17 mg/l, respectively and that in Almirante is 0.1-4.9 mg/l (TN) and 0.03-0.11 mg/l (TP). The progressing nutrient pollution in both of these port waters could be attributed their semi-closed nature of being located in bay areas.

As per bacterial pollution, as the indicator of contamination due to recent discharge of human wastes of fecal origin, no significant FC levels were measured in both port waters. However, this does not imply there is no bacterial pollution since the results represents only most recent bacterial contamination. In fact human waste discharge into Almirante port waters is visibly evident.

Concerning oil pollution that should be attributed to water vessels (including passenger and tourist boats that are dominant in both of these ports) of direct port operational activity, very significant oil pollution level exceeding even 10 mg/l was measured at least once each during both instances of high tide and low tide sampling in both port waters. Accordingly, oil pollution level in these port coastal waters is assessed as very significant.

(2) Port Sediment Quality

The sediment (seabed material) quality was evaluated for potential heavy metal and oil contamination level using the Dredged Material Quality Standards of Netherlands (1987), as given in the World Bank Technical Paper No.126 (1990) on “Environmental Considerations for

Port and Harbor Developments". It is noted that this standards is used under the presumption that unpolluted sediment quality representing metal and oil contents in natural sediments would be same as that in Netherlands. It is further noted that this Standards of Netherlands does not include two of the heavy metallic elements measured, namely, beryllium (Be) and Vanadium (V). Accordingly, the sediment quality was evaluated with respect to the remaining 8 heavy metallic elements and total oil content (total hydrocarbon/THC) measured in the seabeds of both ports.

The results of evaluation indicated no significant heavy metallic contamination in the seabeds of both port waters. Still the seabed of Almirante port is highly contaminated with oil (total hydrocarbon/THC) having measured oil content amounting to more than even 27,500 mg/kg. It is noted that as per the Standards of Netherlands oil content exceeding 5000 mg/kg already indicates high oil contamination in seabed. This extremely high oil pollution in Almirante seabed should be attributed principally to the disposal of oil into port waters due to inadequate waste oil management arising from direct port operational activity of vessel (boat), ferry and ship movements.

(3) Conclusions

In overall, based on the results of water quality analysis, the coastal water environment of both of these ports of Boca sDel Toro and Almirante is assessed as satisfactory with no chronic organic pollution. Still significant oil pollution in the coastal waters of both of these ports is noted, implying the requirement for strict oil pollution control measures by AMP concerned to vessel and ship movements.

The seabed material (sediments) is assessed as not significantly contaminated with respect to the measured heavy metallic elements in both ports of Bocas Del Toro and Almirante. Still, the seabed of Almirante port is assessed as highly contaminated with oil (total hydrocarbon) content, even though the seabed of Bocas Del Toro has no significant oil contamination.

12.4.2 Coastal Ecology

The coastal ecology of both Bocas Del Toro and Almirante areas are quite similar since both areas boast coral reef and marine grass (seaweed) ecosystems even though coral reef is more dominant in Bocas Del Toro coastal waters. Still, the significant difference between them as far as the vicinity of port water areas are concerned is that Bocas Del Toro boasts beach area while Almirante boasts mangroves. The salient features of coastal ecology in each of these areas are delineated below.

(1) Bocas Del Toro

The coastal marine ecosystem of Bocas Del Toro is denominated by coral communities, consisting of patches associated to shallow areas. Also there are patches of seaweeds typically located in between the coral communities. Although the dominant species of seaweed that inhabits the area is *Thalassia,* it coexists with *Halodule, Syringodium* and to a lesser degree *Halophila.*

The coral communities of Bocas Del Toro coastal waters are of exuberant variety that is composed of hard coral, soft coral and sponges. Moreover a variety of commercially important fauna such as crustaceans (shrimps, crabs, lobsters) and fish inhabit these coral communities. The fauna species include pink shrimps, lobsters, queen conches and sea turtles. The deeper water areas are inhabited by demersal fish such as porgy *(Lutjanus spp.)* and sharks *(Rhizoprinodon sp.)* and also pelagic fish such as kingfish *(Scomberomorus sp.)* and the amberjack *(Seriola sp.).*

(2) Almirante

Coastal marine pollution of Almirante port waters is a very significant environmental issue that basically affects its aquatic ecology. Untreated disposal of wastewaters and garbage principally of domestic and also of industrial origin, in combination with unfavorable topography of being located in a bay area that inhibits active exchange of waters with open sea, is the major cause for the degradation of aquatic ecology. Moreover, deforestation of the mangrove woods in the adjacent wetland (swampy) areas exacerbates the coastal ecological degradation.

Mangrove woods that represents the coastal ecology of Almirante Bay is dominated by red mangrove (*Rhizophora mangle),* the canopy of which follows the pattern characteristic to the Caribbean being of low height and extension (inhabiting marginal fringe area). Other significant aquatic flora is seaweed, represented by manatee grass (*Thalassia testudinum)* that is prevalent in the proximity to mangrove wood islands.

The coastal marine ecosystem of the Almirante area has a wide range of species of fauna with commercial value. Such fauna species include pink shrimps *(Panaceus duorarum),* mangrove wood oysters *(Crassotrea rhizophorae),* lobsters *(Pamulirus Panamá* and *P. guttatus)* and queen conches *(Strombus gigas).* Also the adjacent sandy littoral is inhabited with some species of turtle, such as the green turtle *(Chelonia mydas)* and Hawksville Turtle *(Eretmochelys imbricata).*

12.4.3 Social Environmental Aspects

The social environmental aspects principally targeting the population living around both of the port areas was studied using available data as well as focused interview surveys. The basic social environmental condition of the population along with perception of the population concerning the port development is delineated below for the respective port areas of Bocas Del Toro and Almirante

(1) Bocas del Toro Island

The island of Bocas del Toro, also known as Isla Colon, has a population of 3,139 inhabitants (Year 2000 census). This population is composed of 1,603 men and 1,531 women with an index of masculinity of 105%. The population of less than 15 years of age represents a 30.2%. The potentially economically active population from 15 to 64 years is of 62.3%.

Of the population potentially economically active, 1,142 persons are employed. The unemployment ratio is 6.2 %, which is low. The median income of the working population is USD (Balboa) 286.4, while the median family income being USD 458.6. These median levels are higher in comparison to Almirante. The main economic activity of the island is centered on tourism that provides a number of alternative tourism related economic activities as well. This island has an airport, which facilitates easy access of tourists to the area. Next to tourism, fishing is the significant economic activity. The Island of Bocas del Toro has strong bonds with all the islands of the Archipelago located in its vicinity such as Bastimentos, principally consequent to frequent tourist tours.

The population of Bocas Del Toro Island identified the living environmental condition as normal, and hence satisfactory. Concerning the construction of the port as per the master plan the population does not perceive any significant adverse environmental effects. In fact the perception of the population is that the project is very necessary and would be of great help to reap further economic benefits to the community. In this respect concerning commercial properties potentially relocated due to the expansion of port facility, opinion of the proprietors is somewhat divided. Some are willing to move out provided they are duly indemnified and being accepted as part of the project and hence provided with alternative suitable nearby locations to reestablish their businesses, while others prefer the project facilities being located elsewhere so as not to interfere with their current business activities.

(2) Almirante

According to the census of year 2000, the population of the community of Almirante is of 7,754 inhabitants composed of 3,801 men and 3,953 women. Accordingly, the index of masculinity for Almirante is 96.2%. The population under 15 years of age is about 39.5% of the total population, while that of from 15 to 64 years, which in general represents potentially economically active population, is 55.5%.

Of the population potentially economically active, 2,090 persons are employed. The unemployment ratio is 17.4%, which is rather high. The median income of the working population is USD (Balboa) 229.0. In the case of a family the median income is USD 296.0. These median income levels are rather low. Of the 2,090 persons employed, 530 are dedicated to farming, though farming does not constitute an activity of great importance. The major farm products are the otoe, zapallo and cocoa. Cocoa is the most important farm product with small-scale commercialization that resulted in the creation of a cocoa cooperative in Almirante. The major economic activity of the area is the processing of banana for export, which employs a significant portion of the population. The other activity of importance is coastal fishing followed with commerce.

The major communities linked to Almirante are Changuinola and the island of Bocas del Toro and their respective links are essentially related to banana processing and tourism. Concerning the

tourism link of Alimirante with Bocas Del Toro, Alimirante serves simply as the water transport mode link for tourists from mainland, and hence Almirante is just a passing point.

The population of Almirante identified the living environmental condition as bad, principally concerned to the poor handling of solid waste (garbage) and poor quality of potable (drinking) water. Referring to the construction of the port as per the master plan the population does not perceive any significant adverse environmental effects. They believe, already being a port community, port facility does not have any adverse environmental effects. In fact the perception of the population is that the project is necessary and would bring economic benefits to the community. In this respect concerning commercial properties potentially relocated due to the expansion of port facility, the proprietors are willing to move out provided they are duly indemnified and being accepted as part of the project and hence provided with alternative suitable nearby locations to reestablish their businesses.

12.5 Facility Planning and Layout

12.5.1 Requirement of the Port

On the basis above discussion, Bocas del Toro and Almirante Ports want the facilities to fulfill the following requirements:

1) Types of Facilities

Both Bocas del Toro and Almirante Ports should have a ramp for Roll-on/Roll-off ferry and the passenger wharves. The passenger wharves must accommodate various sizes of passenger boats. In the principal route, Bocas del Toro – Almirante, the operators are expected to deploy larger size of ships, while in the other route for tourists the current size of passenger will remain, because of the nature of the voyages.

2) Traffic Demand

The traffic in 2024 is forecasted s follows:

<u>Bocas del Toro Port</u>			
Cargo traffic	general cargo	unloading;	89,000 tons,
		loading;	80,000 tons,
		total;	169,000 tons
Passenger	Bocas del Toro – Almirante;		660,000 trips (330,000 persons)
	Bocas del Toro – Changuinola;		340,000 trips (170,000 persons)
	Bocas del Toro-various islands;		590,000 trips (295,000 persons)
	Total;		1,590,000 trips (795,000 persons)
<u>Almirante Port</u>			
Cargo traffic	general cargo	unloading	80,000 ton,
	loading		89,000 ton
Passenger	Almirante – Bocas del Toro:		660,000 trips (330,000 persons)

3) Other features of the port

Both Bocas del Toro and Almirante Ports should have a passenger terminal that will provide various services for the passengers including, ticketing office, waiting room, shops and restaurants as well as clean rest rooms. In addition, the port facilities should be such designed that they are in concert with the atmosphere of the coastal resort.

12.5.2 Berth Requirements

The total cargo traffic between Bocas del Toro and Almirante is estimated to be 169,000 tons in 2024. The existing Roll-on/Roll-off service has enough capacity.

The passenger crafts employed in each route are assumed as follows:

Passenger service on the principal route, Bocas del Toro and Almirante, shall be provided with the Roll-on/Roll-off ferry and a passenger craft having passenger capacity of 70 persons, which is larger than those presently deployed. The passenger craft deployed in the route Bocas del Toro and Changuinola is assumed to remain unchanged, because the topography of the navigation channel of this route limits the size of the boats. In addition, for the trip along this scenic route, tourists would prefer riding on open type small crafts than sitting in enclosed cabins. For the passenger trips to various islands, the passenger services could be provided by the hotels with their private boats apart from the public transport service.

Thus, the transport scheme in Bocas del Toro is summarized in Table 12.5.1. It is assumed that the passenger traffic should be heavy in the morning and more frequent service should be needed. Therefore, as shown in the Table, it is assumed that the peak hour should be three hours and, during the period, all the boats should be fully loaded, while during off peak hours, the boats would not always be full.

As the consequence of the berth requirement calculation (Table 12.5.1), the following berths are identified to be necessary in 2024.

Table 12.5.1 Calculation of Berth Requirement at Bocas del Toro Port

Route	Total passengers		Passenger Capaccity per ship	Load factor	Service Freqency per hour hours		Service hours per day	Servic days per year	Annual passenger capacity	Ship at berth per ship	Berths during peak hour	Year Total Ship Call
	Trips	Person	persons	Off Peak hours	Peak	Off pk	hours	days	persons	Minutes	Berth	Ships
Bocas del Toro-Almirante	660,000	330,000										
Ro/Ro Ferry			300	0.4			1	365	43,800			365
Water Taxi			70	0.5	2	2	8	365	281,050	30	1.00	5,840
Bocas del Toro- Changuinola	340,000	170,000	20	0.7	5	3	8	365	186,150	20	1.67	10,950
Bocas del Toro - Islands												
Public service	590,000	295,000	20	0.7	5	2	6	365	140,160	20	1.67	7,665
Private service (Hotels)			10	0.7	12	3	6	365	154,395			16,425
Total	1,590,000	795,000			24				805,555		**4.3**	24,820
			Peak hours/day:		3 hours							

Bocas del Toro Port	
Cargo and passenger	One Ramp for Roll-on/Roll-off ferry (Existing ramp has enough capacity)
Passenger	One berth for large passenger boats (with a capacity of 70 persons) Four berths for small passenger boats (with capacities of 20 persons).
Almirante Port	
Cargo and passenger	One Ramp for Roll-on/Roll-off ferry (Existing ramp has enough capacity)
Passenger	One berth for large passenger boat (with a capacity of 70 persons).

It is also assumed that, during peak hours, small passenger boats arrive and depart frequently, thus, an additional water space with proper mooring facilities is needed for the passenger boats to queue before it docks at the berths to load the passengers.

12.6 Preliminary Design of Facilities

12.6.1 Design Concept

The new port facilities planned at Bocas del Toro Port are mainly "Berth for RO-RO ferry boat," and "Jetty for passenger boats and speedboats."

The design concepts for the marine facilities are as follows:

- To be able to accommodate three kinds of vessels at the same time
- To be located at the AMP premises
- To be easy for ship maneuvering and access-friendly for passengers
- To be suitable as the gateway of the tourist resort.

The general layout plan at Bocas del Toro Port is shown in Figures 12.6.3 and 12.6.4. The layout of the RO-RO ramp is planned to be located at the same place of the existing ramp. This layout is determined so that the ship maneuvering is easy for berthing/deberthing. The structural type of berth is selected with open pile type to adapt the target vessels and subsoil conditions.

The similar layout plan is planned at the existing RO-RO ramp in Almirante Port as shown in Figure 12.6.5.

12.6.2 Design Conditions

(1) Natural Conditions

1) Tide

Tide levels at Bocas del Toro Port are shown in Table 12.6.1.

Table 12.6.1 Tide Levels at Bocas del Toro Port

HHW (Higher High Water Level)	+0.36 m
MHW (Mean High Water Level)	+0.24 m
MLWS (Mean Low Water Spring)	±0.00 m

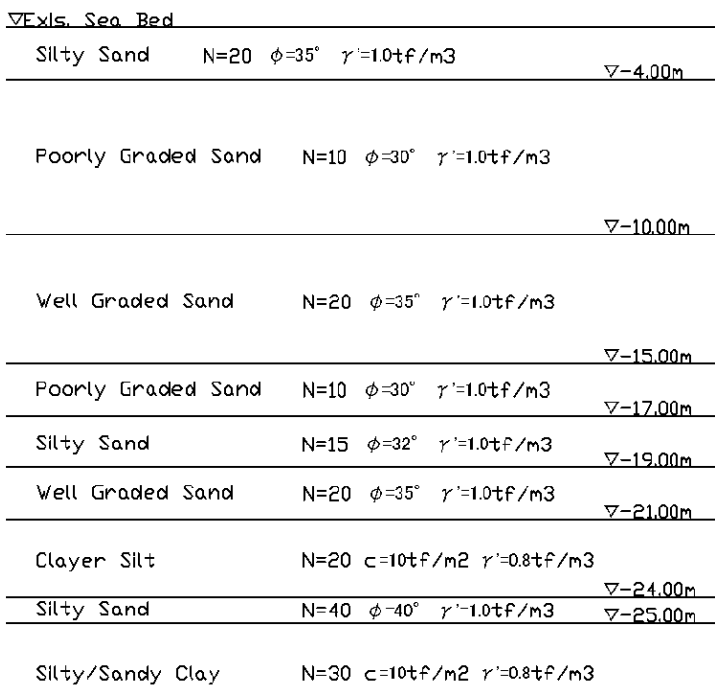
Source: JICA Study Team

2) Wave

Significant Wave Height: $H_{1/3}$ = 1.0 m

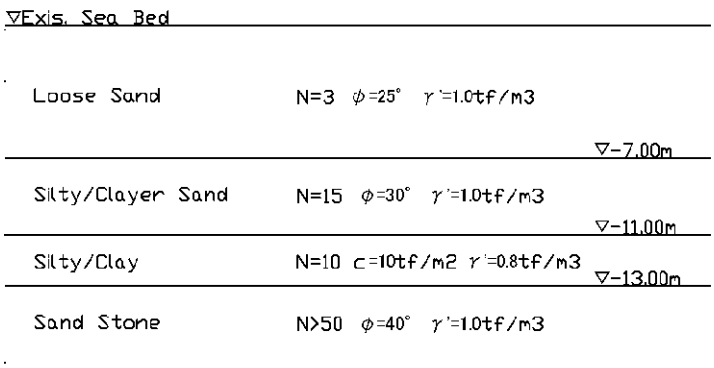
3) Subsoil Conditions

According to the result of subsoil investigations, the typical subsoil conditions at site are as shown in Figures 12.6.1 and 12.6.2.



Source: JICA Study Team

Figure 12.6.1 Typical Subsoil Conditions at Bocas del Toro



Source: JICA Study Team

Figure 12.6.2 Typical Subsoil Conditions at Almirante

4) Seismic Coefficient

Seismic coefficient of effective peak acceleration at Bocas del Toro Port is 0.21 according to the Regulation of Structural Design for the Republic of Panama 1994.

(2) Usage Conditions

1) Target Vessels

The proposed maximum dimensions of the target vessels are shown in the following table:

Table 12.6.2 Dimensions of Target Vessels

	RO-RO Ferry Boat	Passenger Boat	Speed Boat
Tonnage (GRT)	1,000	-	-
Length overall (m)	57.0	28.0	9.0
Breadth (m)	15.0	5.0	2.0
Draught (m)	1.8	1.5	0.5

Source: Estimate by JICA Study Team

2) Surcharge

Surcharge for normal condition: W=1.0 tf/m^2

Surcharge for seismic condition: W=0.5 tf/m^2

3) Live Load

RO-RO ferry ramp: Total weight of truck = 20 tf/truck

Passenger boat jetty: Total weight of truck = 15 tf/truck

4) Width of Passenger boat jetty: 11.2 m

Width of RO-RO ferry ramp: 16.0 m

5) Lifetime: 50 years

12.6.3 Design of Berthing Facilities

(1) Crown Heights

The crown heights of jetty are determined by the following formula and in consideration of existing ground level and target vessels.

Crown Height of Jetty = HHW (+0.36 m) + 0.8*$H_{1/3}$(1.0 m) = +1.16 m , say +1.25 m

The crown height of RO-RO ramp is determined as +2.2 m in consideration of the elevation of the existing ramp of the target ship, which is from +2.3 m to +2.6 m above MLWS.

(2) Required Depth

The required depth of jetty is determined by the following formula and in consideration of existing seabed level and facilities.

Required Depth of Jetty = MLWS (±0.00 m) – Draught (1.8 m) – 0.5*$H_{1/3}$(1.0 m) = -2.3 m,
say -2.5 m

(3) Selected Structural Type

The passenger boat and speedboat jetty are planned with open pile type RC deck structure supported by the PC concrete piles. Based on the subsoil investigation at the site, a hard sandy layer (N value > 30) is encountered at about –24 m below MLWS. Thus, the concrete piles are to be driven into this layer to secure the bearing force.

For the horizontal force of the berth such as vessel berthing, mooring force and seismic force of the berth, the coupled batter piles are to be used. Based alignment of the piles and loads on the berth, the adopted size of the piles are 500 mm for the passenger boat and speedboat jetty.

The RC deck for the jetty is consist of RC pile cap, RC beam on the piles and RC slab.

Based on the design vessel size, jetty accessories such as mooring bollards and fenders are determined. The capacities of accessories are planned 15-ton bollard and V-type 300H fenders for passenger boat and 25-ton bollard and V-type 500H fenders for Ro-Ro ferry boat. The mooring bollards are installed about 10 m intervals for the passenger boat jetty and the curbing are installed between the bollards.

The typical section is shown in Figure 12.6.6.

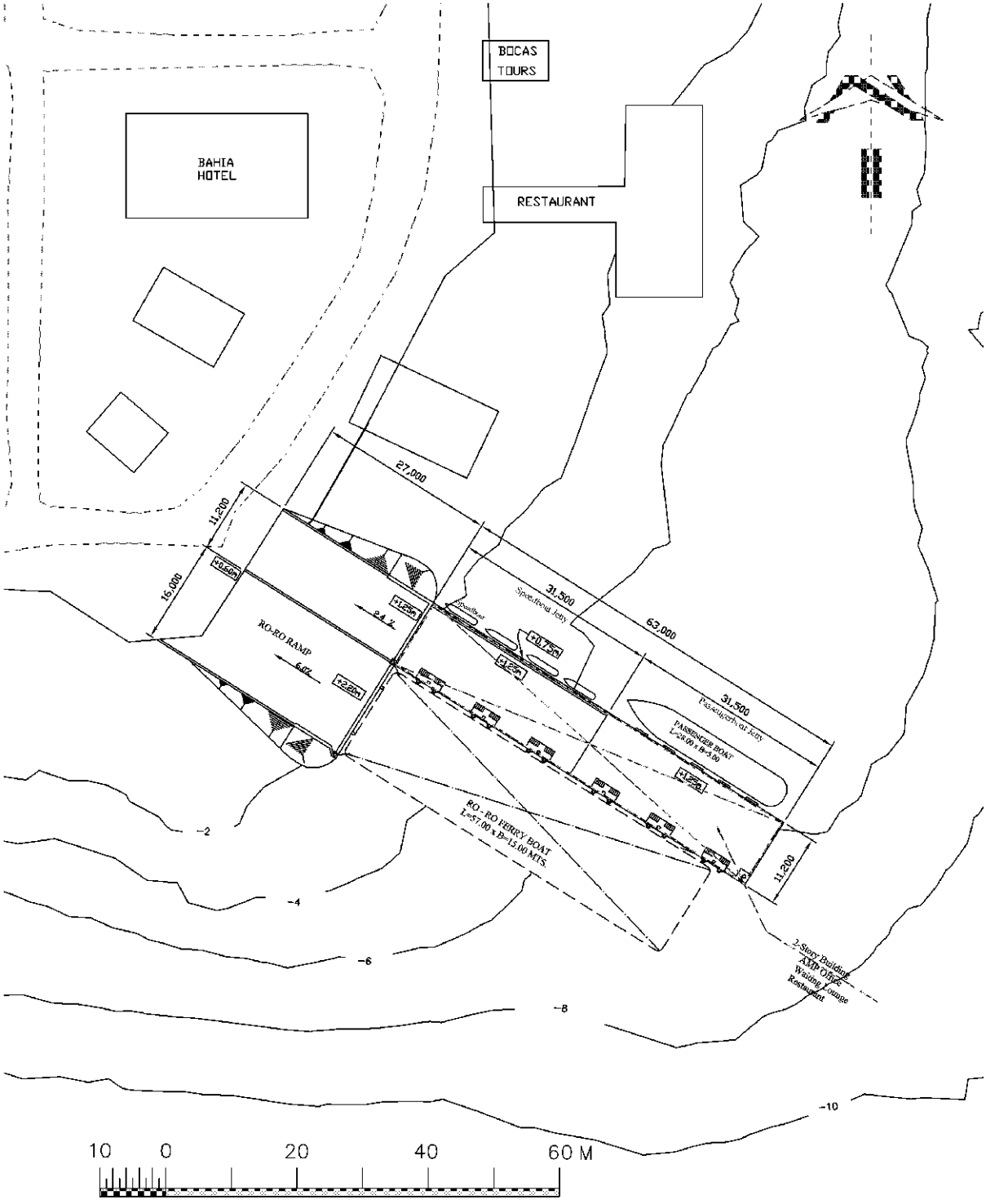


Figure 12.6.3 General Plan of Bocas del Toro Port

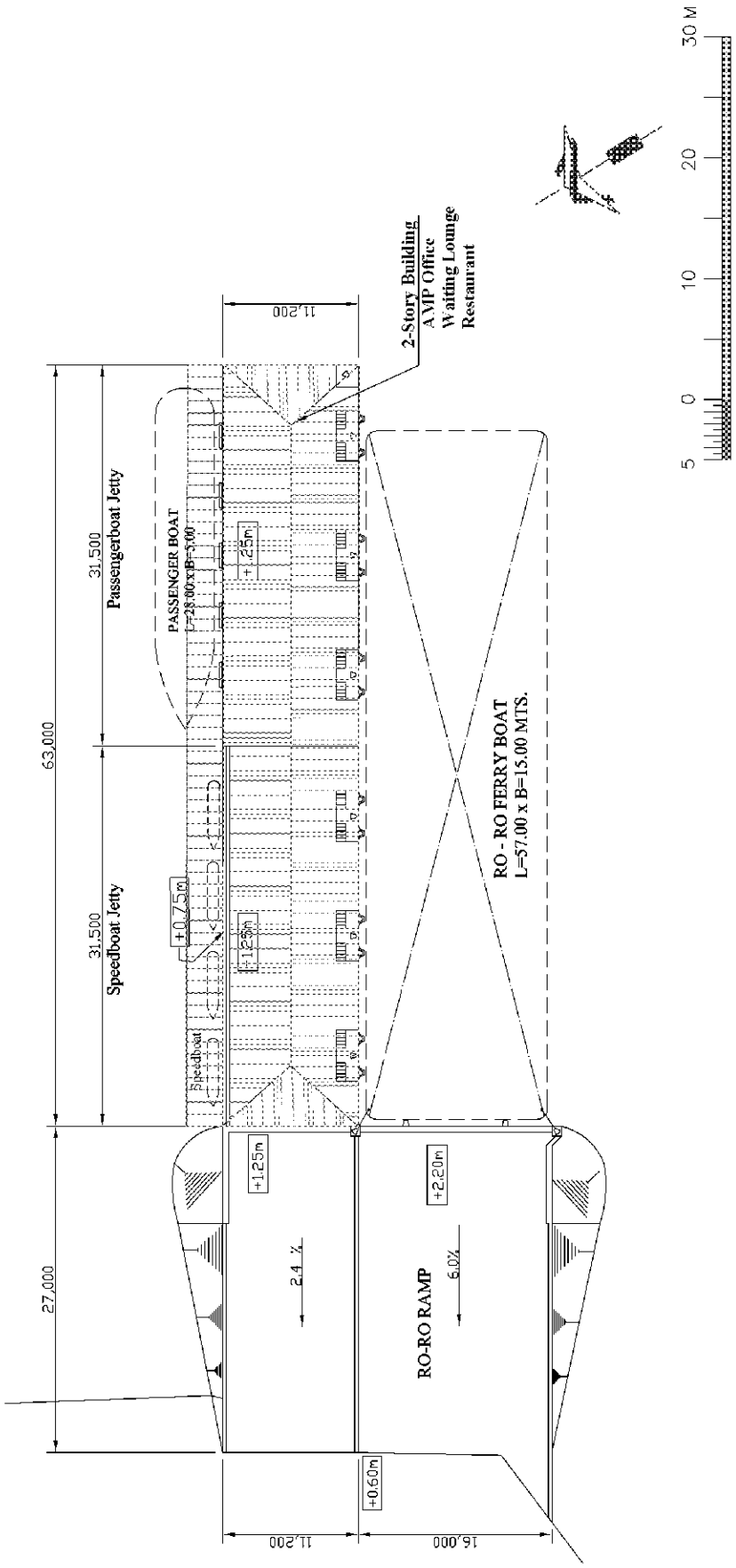


Figure 12.6.4 General Layout Plan of Marine Facilities

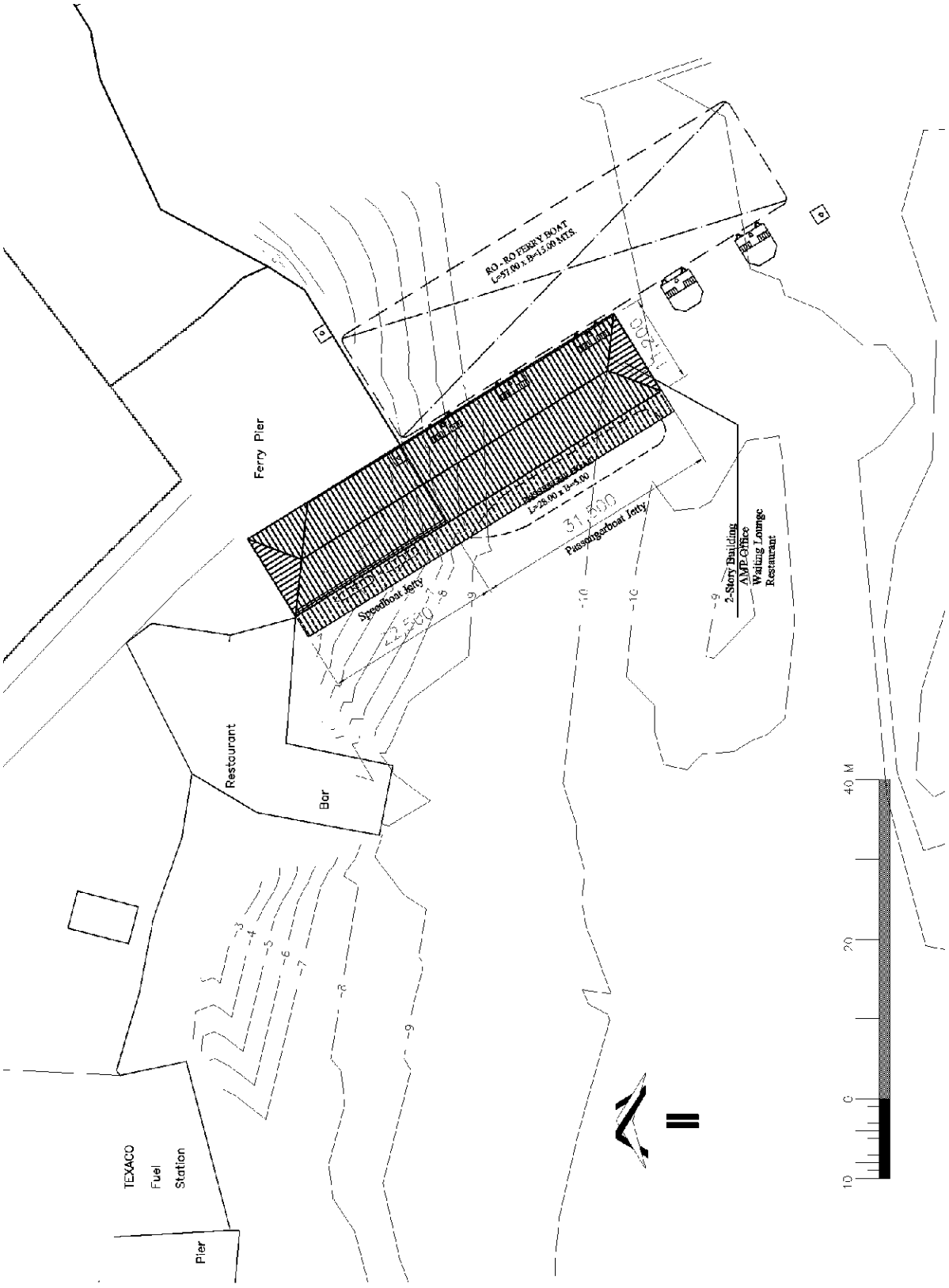


Figure 12.6.5 General Layout Plan of Almirante Port

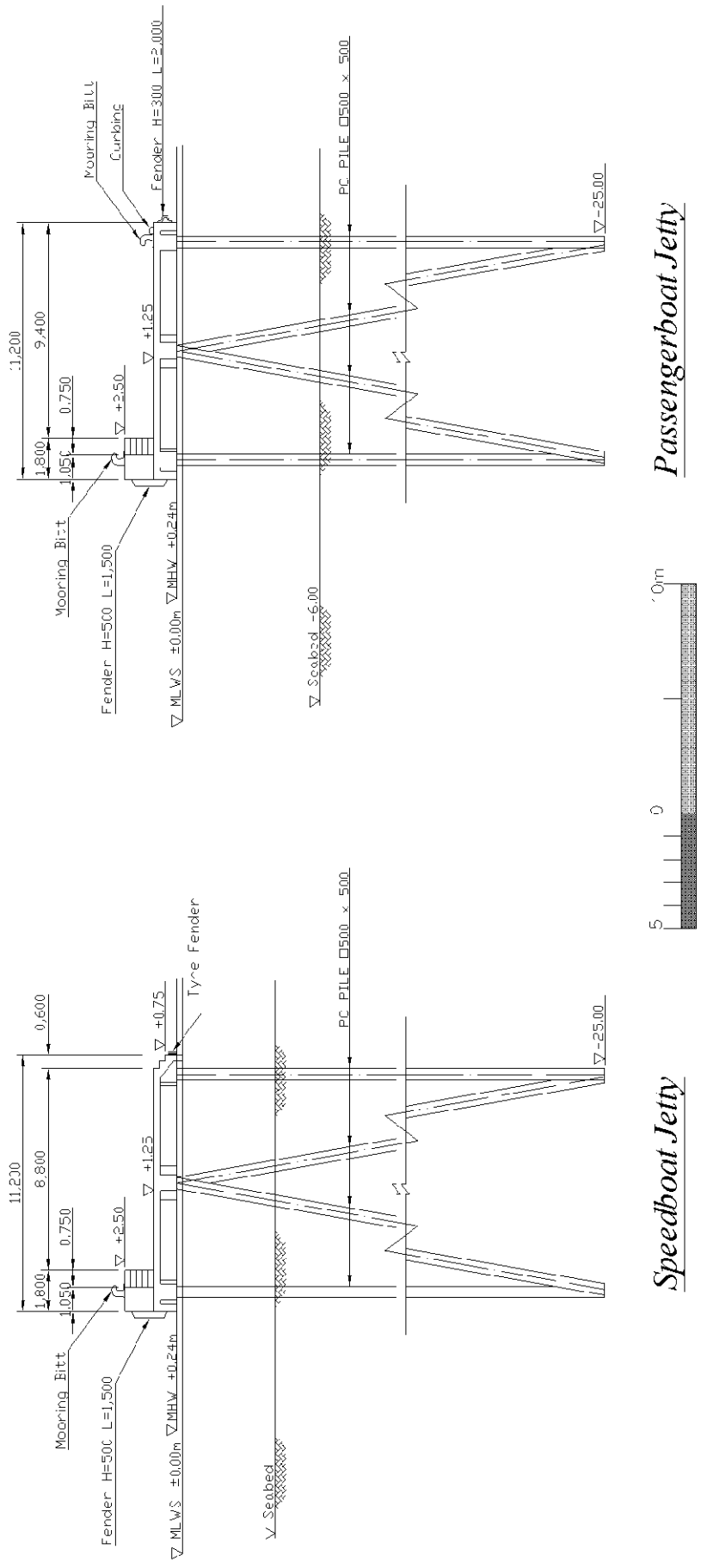


Figure 12.6.6 Typical Sections of Jetty Structures

12.7 Project Implementation

In this section, major construction methods, procurement of construction materials and construction equipment are discussed. The information on the procurement conditions below is based on the market investigations and interviews from the construction companies and suppliers, etc.

12.7.1 Project Site

Bocas del Toro town is the provincial capital in Bocas del Toro Province. Supply of commodities is greatly dependent on the main land. A Ro-Ro ferry is plying between Bocas del Toro and Almirante. Heavy or large construction materials will be transported by long wheelbase trucks from Changuinola and/or David. Both sites are located at a well-sheltered area from offshore waves, and there is a ferry terminal at each site.

Bocas del Toro is an important tourism area, and construction works shall be carried out with the greatest care for environmental preservation. To minimize turbid water, pile supported jetty was selected with a minimized reclamation work.

12.7.2 Construction Method for the Major Facilities

(1) Berthing Facilities: PC-Pile supported Jetty (-2m)

1) Piling

The estimated pile length is approx. 21 m at each site, Bocas del Toro and Almirante. A pre-stressed concrete pile divided in two pieces will be connected in the piling leader and driven by D-40 hammer from a piling barge.

2) Concreting

Total concrete volume is estimated at 1,200 cu.m or less at each site. A concrete mixing plant (20 cu.m/hour) shall be mobilized to Bocas del Toro.

(2) Civil Works

1) Reclamation

The minimum area necessary for the ramp and approach road is to be reclaimed. Reclamation volume is approx. 700 cu.m at each site.

2) Revetment

A concrete block made revetment is constructed around the ramp and it’s approach line from the adjoining land.

3) Pavement

The reclaimed land and approach are paved with concrete. The total area of the pavement is approx. 870 sq.m.

(3) Yard / Building

A 600 sq.m of RC-concrete made, piloti-type terminal building is to be constructed on the jetty, at the both terminals. Piloti floor is designed as a platform to passenger boats. The upper floor will be used as a waiting lounge for passengers.

(4) Utilities

1) Electricity

Required electricity will be supplied through city line operated by the private company.

2) Water

Water for the office will be supplied by the IDAAN; however, ships can be supplied at Almirante.

(5) Demolition of the Existing Facilities

The existing concrete made ramp and Jetty will be demolished and disposed at designated disposal areas. The total volume of the concrete debris is approx. 200 cu.m at Bocas del Toro and 140 cu.m at Almirante. The scrapped steel frame at the Bocas del Toro will be removed.

Prior to the construction works, a temporary ramp shall be constructed in the vicinity of the existing ramp.

12.7.3 Purchase of the Materials

(1) Fine Aggregates

River sand will be supplied from Changuinola.

(2) Stone

1) Coarse Aggregates

Gravels and boulders will be supplied from Changuinola.

2) Armor Stone

Armor stone, 1 ton/pc, will be supplied from Changuinora.

(3) Reclamation Material

Reclamation material is available at both sites. It will be carried from locations within a 10 km radius.

(4) Others

1) PC-Pile, Cement, RC-bar etc.

The majority of construction materials, such as PC-pile, cement and steel materials, shall be transported from Panama City through David by land, since, large quantities of these materials are not available at the vicinity of Bocas del Toro and Changuinora.

2) Wood

Wooden artifact and timber will be purchased at Changuinola and/or David.

3) Accessories

Mooring devices such as rubber fenders and mooring post shall be imported or purchased through trade agents in Panama City.

12.7.4 Mobilization of the Construction Equipment

(1) Heavy Equipment

1) Bulldozer, Dump Truck, Roller, etc.

Common equipment except mobile cranes will be borrowed from Changuinola and/or David.

2) Mobile Crane

Mobile cranes shall be mobilized from Panama City.

(2) Piling Barge, Tug Boat and/or Work Boat

A piling barge with D-40 hammer shall be mobilized from Panama City or Limon Bay area . The first lot of construction materials, such as PC-pile, can be mobilized by this barge.

(3) Concrete Plant

Ready mixed concrete is available at Almirante. A concrete mixing plant of an optimum size for Bocas del Toro site will be borrowed from Panama City, since, transportation from Almirante has disadvantages from the view of quality control and schedule management.

12.8 Project Costs and Capital Expenditure

12.8.1 Project Costs

(1) Introduction

In this section, the preliminary cost for the master plan was estimated based on the following method.

- For the purpose of estimation of the preliminary cost, unit prices of each element such as major construction materials, equipment and manpower cost are determined on the basis of the regional unit prices collected from the contractors and the suppliers on December 2003, in the field survey in the study area.
- The basic costs of imported products are estimated using the exchange rate on December 2003.
- The capacity and capability of the local contractors are checked with respect to their experience of marine construction works considering the size of each experience.

(2) Preliminary Cost

Based on the above conditions, preliminary cost for the master plan is estimated as shown in the following table.

Table 12.8.1 Preliminary Cost for Master Plan of Bocas del Toro / Almirante

Bocas del Toro						Unit : USD
	Item	**Dimensions**	**Unit**	**Quantity**	**Unit Rate**	**Amount**
1	Demolition	Exist. Jetty, Shed, Ramp, Office	l.sum	1	89,816.0	89,816
2	Jetty	705.6 sq.m	sq.m	706	2,104.8	1,485,124
3	Revetment	for Ramp	lin.m	70	3,009.1	210,638
4	Reclamation	Land for the Office	cu.m	687	55.6	38,165
5	Pavement	for the above Item 3. and 4.	sq.m	868	106.0	92,008
6	Buildings	Terminal Bld. 1,200sq.m	sq.m	605	500.0	302,500
7	Outdoor Lighting		unit	16	1,250.0	20,000
8	Utilities	Supply line, Connection to city line	l.sum	1	67,150.0	67,150
Sub Total						**2,305,401**
Almirante						Unit : USD
	Item	**Dimensions**	**Unit**	**Quantity**	**Unit Rate**	**Amount**
1	Demolition	Exist. Ramp	l.sum	1	57,893.0	57,893
2	Jetty	705.6 sq.m	sq.m	605	1,615.1	977,130
3	Bresting Dolphin	PC Pile Supported	unit	2	141,520.0	283,040
4	Mooring Dolphin	PC Pile Supported	unit	1	63,367.0	63,367
5	Revetment	for Ramp	lin.m	106	2,959.7	313,726
6	Reclamation	Land for the Office	cu.m	802	50.9	40,788
7	Pavement	for the above Item 3. and 4.	sq.m	1,255	106.0	133,030
8	Buildings	Terminal Bld.	sq.m	605	500.0	302,500
9	Outdoor Lighting		unit	16	1,250.0	20,000
10	Utilities	Supply line, Connection to city line	l.sum	1	65,750.0	65,750
Sub Total						**2,257,224**
Bocas del Toro, Almirante Total						**4,562,624**

12.8.2 Capital Expenditure

The capital expenditure schedule is based on assumptions as follows for economic analysis purpose.

- Start detailed design and select the contractor in 2006.
- Construction in 2007.
- Life expiring facilities such as utilities, mooring devices and plant are to be renewed in 10th year.

Table 12.8.2 Capital Expenditure Schedule for Master Plan of Bocas del Toro/Almirante

Bocas del Toro/Almirante	**USD 4,562,625**

YR	Construction		0.92	Plant / Equipment		0.08	Engineering	Maintenance
	Foreign	Local	Sub Total	Foreign	Local	Sub Total	10%	1%
F : L	0.59	0.41	1.00	0.59	0.41	1.00		
2006							273,758	
2007	2,462,803	1,714,641	4,177,444	227,083	158,098	385,181	182,505	
2008								45,626
2009								45,626
2010								45,626
2011								45,626
2012								45,626
2013								45,626
2014								45,626
2015								45,626
2016				Renewal of Plant/Equipment				45,626
2017				227,083	158,098	385,181		45,626
2018								45,626
2019								45,626
2020								45,626
2021								45,626
2021								45,626
2023								45,626
2024								45,626
ST	2,462,803	1,714,641	4,177,444	454,165	316,197	770,362		
T	4,947,806						456,263	
GT	5,404,068							

12.9 Administration and Management

This section as well as Sections 13.9, 14.9, 15.9 describes the roles and function of AMP toward the finalization, the authorization, and the realization of the port development master plans proposed in this chapter.

In Section 10.3, the administration and management plans have been proposed in order that AMP should take responsibilities to administrate and manage the national port system as prescribed in the Organic Law and the National Maritime Strategy. The measures and approaches proposed for the nationwide port development plan have been elaborated within the existing framework and the current practice of administrative scheme of AMP. However, the Master Plans discussed here are rather intended to practice at the maximum the administrative competence of AMP to realize its missions. The master plans have been proposed with the intention not only to settle the existing issues but also to support proactively the local socioeconomic activities with the utilization of the infrastructural development plan as one of the tools that AMP can make use. Therefore, the Administration and Management plans proposed hereunder may not be limited within the frame work of current administrative practice of AMP.

12.9.1 Items to be taken into consideration in the planning

(1) Nature of services of the port facilities

The Bocas del Toro-Almirante Port development master plan consists of two elements: the RoRo ferry terminals and the passenger terminals. The RoRo ferry terminals serve for the basic transport service to supply the goods to the islands and to provide accesses to the residents of the islands, while the passenger terminals serve for the local tourism businesses as well as the basic transport service to the people living in the islands and the coastal communities in Bocas del Toro Province.

AMP has direct responsibilities to maintain the port infrastructure and to improve and promote the ferry services. The safety and security of the passengers and goods and assuring scheduled regular services are key elements. On the other hand, the local industries, especially those involved in tourism business have concern about the passenger terminals for small boats. In fact, the most of those who are concerned with the tourism businesses are complaining the inappropriate environment of the passenger terminals. On the basis of its Organic Law and the the National Maritime Strategy, AMP has the administrative responsibility to assure the safety and improvement of the business environment of maritime industries. In addition, the water pollution control and the coastal management, as well as the coordination with the agencies concerned with these elements, are also the responsibilities of AMP.

(2) Interfacing with other regional and local projects

1) Multiphase Program for Sustainable Development of Bocas del Toro

A "Multiphase Program for Sustainable Development of Bocas del Toro[2]" is on-going under an IADB loan. The principal objective of the program is to foster socioeconomic activities and to promote private investments that would yield economic, social and environmental benefits. The program consists of three components:

a. Strengthening management capacity of local administration;
b. Sustainable management and productive development of natural resources; and
c. Basic services and transport infrastructure.

In the process of planning and implementing the ports development, the Administration should carefully follow the Program. The following issues in the Program are significant:

- The participation of the residents in the decision-making process and in the annual operating plans is important.
- Coordination with the views of relevant industries, such as tourist industry and fisheries, particularly of artisan fishermen.

[2] See 3.2.2 of the Report.

- Pollution control to cope with the economic and population growth result in increase of solid and liquid wastes that may cause the damage of coral reefs and other resources, which are vital elements of the tourism potential of Bocas del Toro

2) Municipal Development and Decentralization Program

The central government is making efforts in the capacity building of the local governments. Since the proposed port development plan is intended to promote the local business and also require the coordination with the local communities in the entire process of the project implementation, the project will provide precious opportunities for the local government to practice its capacity to organize communities to formulate consensus plans. AMP is responsible to coordinate with the local government not only for this particular project but also for the integrated coastal management and the preservation of marine environment.

3) Interfacing and incorporating with the urban development plan

Since the project site is a part of the urban center of the municipality of Bocas del Toro, in the process of finalizing the port development plan, the urban center development plan together with a consensus land-use plan should be established. Without such plans, neither landowner nor leaseholder agrees to evacuate the place even with indemnification. The land-use plan has its ground on the urban plan of the region.

The awarding concessions for the use of shore areas should be assessed in the light of the urban development plan and the land-use plan. Thus, consensus among Municipal government, MEF, MIDA, IPAT needs to be formulated to establish common guidelines to award new concessions and to terminate the existing concessions when they are expired.

The municipality, if successfully fostered as planned in 'Municipal Development and Decentralization Program'[3], may be the lead agency of the urban-planning with the assistance of MIVI, MOP and IPAT. If the municipality would not have adequate capability, MIVI may take leadership. In any case, AMP should announce the port development plan to the public and initiate the cooperative work to incorporate the port development plan at an early stage of urban development.

12.9.2 Administration and management Plan

(1) Policy and strategy of the project

This project aims at the securing the RoRo ferry service and the promotion of the tourism business. The strategy introduced in the project is how to generate the fund needed for improvement of the shipping service and the promotion of the tourism business in Bocas del Toro.

[3] See 3.1.4 of the Report.

The main idea is to raise the fund out of the charges collected from the tourists. Besides the tourist taxes collected through hotels, it is reasonable to charge the tourists who use the port facilities. The better services are provided, the higher charges can be paid by the tourists. Thus, by constructing attractive passenger terminals and collecting higher charges, the fund raised can cover the cost for the improvement of the RoRo ferry terminals as well as for the beautification of the urban center of Bocas del Toro and Almirante.

In addition to the financial assistance through the collection of charges at the passenger terminal, AMP with the coordination of other agencies concerned, should second the beautification program by the execution of its administrative competence in awarding and terminating concession contracts on the private use of shore zones and in controlling maritime safety, security and pollution.

(2) Steps to be taken by AMP Head quarters

AMP Headquarters should take the following steps.

First of all, AMP Headquarters should start discussion with the agencies concerned with the projects. To this end, a task force to proceed with the following tasks should be formulated in the Planning and Development Division:

1) Authorization of the project

   a. To inform the project proposal to MEF, IPAT, MIDA, and local government to formulate consensus on the proposed master plans. Discussions with them should cover such issues that fund raising through the collection charges. Interfacing and incorporation with the on-going Multiphase Program for Sustainable Development of Bocas del Toro.

   b. To assist the local government to get consensus and authorization of the urban development plan and the land-use plan.

2) Clarifying the existing situation of the private use of shore zones

   a. To make a full inventory of the existing concession contracts that the AMP and APN have been awarded on the coastal zones near the project sites;

   b. Through the coordination of MEF and Local government, to make a full inventory of the existing land titles of the shore zones near the project sites and construction permissions issued by other agencies.

   c. Trough the coordination with agencies concerned, to clarify the procedure and guide lines of awarding new concessions and permission to use shore zones in the future.

3) Finalizing the infrastructure development plan

a. To hold forums in Bocas del Toro and Almirante to continue discussions to get consensus among those concerned with the tourism, transport and fishing businesses as well as the representatives from the local governments to finalize the plan.

b. Through the discussion in the forums, to clear all the outstanding issues related to the port development.

c. To clarify the areas that the local private firms and individuals can participate in the project: financing and operating the passenger terminal buildings, for instance.

(3) Steps taken by the Local Port Offices of Bocas del Toro and Almirante Port

In addition to the operation and maintenance work that the local port offices are performing, the following tasks should be carries out by the Administrators of the port offices under the supervision of the Headquarters.

1) Coordination with the agencies concerned

The Administrators are liaisons between the Headquarters and the local offices of the various government agencies. Being the Liaison, the Administrator should be the focal point in the communications between the local communities and the AMP Headquarter, and all the information of the progress in the Headquarter should be propagated to the local communities and vice versa.

2) Regular meeting of the forum

Administrator should hold the forum regularly, to discuss outstanding issues.

12.10 Economic Analysis

12.10.1 Objective of Economic Analysis

The objective of economic analysis is to facilitate the selection of the project in order to achieve the optimum resources allocation from the national economic point of view. For that objective, the benefit that the project brings to the national economy and the cost to implement the project, will be compared.

12.10.2 Flow of Economic Analysis

The economic analysis has the following five major steps;

(1) The setup of “With Project Case” and “Without Project Case”
(2) The estimation of the cost
(3) The estimation of the benefit

(4) The conversion from market price to economic price
In order avoid the market distortion of the price, the true cost for the project (economic price) must be estimated and used.

(5) The comparison of the cost / the benefit and the estimation of EIRR etc.

12.10.3 Standard Conversion Factor (SCF)

When the economic price is estimated at the border price level, the market price of non-international tradable goods must be converted to the border price level by multiplying Standard Conversion Factor (SCF).

The formula of SCF is as follows;

$$SCF = (M+X) / \{(M + Tm) + (X – Tx + Sx)\}$$

Where M: Import, X: Export, Tm: Import Duty, Tx: Export Tax, Sx: Export Subsidy.

In Table 12.10.1 shows the estimate of SCF for the current Panamanian economy that is 0.88. This number will be used for all four projects.

Table 12.10.1 Standard Conversion Rate

1000 USD

Year	2000	2001	2002	
Import	581,770	573,584	608,296	
Export	771,515	809,537	775,748	
Import Duties	202,000	172,000	184,000	
Export Taxes	0	0	0	
Import Subsidies	0	0	0	
Official Exchange Rate	1	1	1	
				Averaged
SER (Standard Exchange Rate)	1.149	1.124	1.133	1.136
SCR (Standard Conversion Rate)	0.870	0.889	0.883	0.881

Data Source: MEF

12.10.4 Scope of the Economic Analysis

The scope of the economic analysis covers the renovated passenger terminal and ferry terminals at both Bocas del Toro Port and Almirante Port that have been proposed above. The economic analysis assesses the economic viability of the project from the viewpoint of the national economy.

12.10.5 Estimation of the Economic Cost

Table 12.10.2 summarizes the economic cost of the Bocas del Toro / Almirante Port Project over the coming 50 years: as commonly recognized, the life of the port infrastructure is assumed to be 50 years if proper maintenance program is done.

The domestic portion of the construction cost is multiplied by SCF in order to estimate the economic cost (i.e. true cost to the society).Contingencies for the construction cost are estimated at 10 percent level.

Engineering fee is expected at 10 percent for the construction cost except machine and electric equipment.

The cost of the operation and the maintenance has been estimated to be 1% of total construction cost.

Even with the new terminals at Bocas del Toro and Almirante Ports, the port offices of AMP do not need additional staff members, because the actual operation of the passenger terminals are done by private sector, most probably by the association of passenger boat operators. Therefore, the incremental personnel cost should be zero through whole project life (2005 through 2024).

Table 12.10.2 Overall Cost and EIRR of the Bocas del Toro / Almirante Port Project

USD

Year	Foreign Currency Total (Market Price)	Domestic Currency Total (Market Price)	Domestic Currency Total (Economic Price)	Total Construction Cost	Contingencies	Engineering Fee	Total Capital Investment	Operations & Maintenance (except Personnel)	Personnel Cost	Total O&M Cost	Overall Cost	Overall Benefit	Net Benefit
2005	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	0	0	273,757	273,757	0	0	0	273,757	0	(273,757)
2007	2,689,885	1,872,739	1,648,011	4,337,896	397,169	182,505	4,917,570	0	0	0	4,917,570	0	(4,917,570)
2008	0	0	0	0	0	0	0	45,626	0	45,626	45,626	0	(45,626)
2009	0	0	0	0	0	0	0	45,626	0	45,626	45,626	911,755	866,129
2010	0	0	0	0	0	0	0	45,626	0	45,626	45,626	980,214	934,588
2011	0	0	0	0	0	0	0	45,626	0	45,626	45,626	1,054,610	1,008,984
2012	0	0	0	0	0	0	0	45,626	0	45,626	45,626	1,135,501	1,089,874
2013	0	0	0	0	0	0	0	45,626	0	45,626	45,626	1,223,498	1,177,871
2014	0	0	0	0	0	0	0	45,626	0	45,626	45,626	1,319,272	1,273,646
2015	0	0	0	0	0	0	0	45,626	0	45,626	45,626	1,423,561	1,377,935
2016	0	0	0	0	0	0	0	45,626	0	45,626	45,626	1,537,173	1,491,547
2017	227,083	158,098	139,127	366,209	0	0	366,209	45,626	0	45,626	411,835	1,660,997	1,249,162
2018	0	0	0	0	0	0	0	45,626	0	45,626	45,626	1,796,008	1,750,381
2019	0	0	0	0	0	0	0	45,626	0	45,626	45,626	1,943,276	1,897,649
2020	0	0	0	0	0	0	0	45,626	0	45,626	45,626	2,103,977	2,058,351
2021	0	0	0	0	0	0	0	45,626	0	45,626	45,626	2,279,404	2,233,777
2022	0	0	0	0	0	0	0	45,626	0	45,626	45,626	2,470,974	2,425,348
2023	0	0	0	0	0	0	0	45,626	0	45,626	45,626	2,680,246	2,634,620
2024	0	0	0	0	0	0	0	45,626	0	45,626	45,626	2,908,933	2,863,307
2025	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,158,915	3,113,289
2026	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2027	227,083	158,098	139,127	366,209	0	0	366,209	45,626	0	45,626	411,835	3,432,259	3,020,424
2028	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2029	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2030	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2031	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2032	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2033	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2034	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2035	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2036	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2037	227,083	158,098	139,127	366,209	0	0	366,209	45,626	0	45,626	411,835	3,432,259	3,020,424
2038	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2039	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2040	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2041	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2042	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2043	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
2044	0	0	0	0	0	0	0	45,626	0	45,626	45,626	3,432,259	3,386,633
													EIRR
													20.74%

12.10.6 Estimation of the Benefit

Although the project will bring economic benefit both in direct and indirect forms, only the benefit results from the increase in the foreign tourists and in their spending are accounted.

If the current port terminals at both Bocas del Toro and Almirante would not repaired and improved, some tourists will not come again and bad information will be disseminated. Thus, 15% the increase of foreign tourist to Bocas del Toro will be the positive result of the project. And they are expected to spend USD 100 per person, which constitutes the economic benefit.

Tourist are expected to increase annually at ten percent level through whole study period (2005 – 2024) of foreign passengers to Bocas del Toro. But, if the current port terminals at both Bocas del Toro and Almirante are not repaired and improved, repeaters will not increase and unfavorable information will be dissimilated.

Thus, fifteen percent of the increase of foreign tourists to Bocas del Toro will be the positive result of the project. And fouregn tourists are expected to spend USD 100 per person, which constitutes the economic benefit. Table 12.10.3 summarizes the economic benefits.

Table 12.10.3 Economic Benefit of the Bocas del Toro / Almirante Port Project

Year	Number of Foreign Passengers thru Panama City by Air	Contribution by Port Facility Improvement (15 %)	Economic Benefit (USD)	Number of Foreign Passengers thru Changinola	Contribution by Port Facility Improvement (105%)	Economic Benefit (USD)	Total Economic Benefit (USD)
2003	21,576			36,415			0
2004	22,439			40,056			0
2005	23,336			44,062			0
2006	24,270			48,468			0
2007	25,241	3,786	378,610	53,314	5,331	533,145	911,755
2008	26,250	3,938	393,755	58,646	5,865	586,459	980,214
2009	27,300	4,095	409,505	64,511	6,451	645,105	1,054,610
2010	28,392	4,259	425,885	70,962	7,096	709,616	1,135,501
2011	29,528	4,429	442,920	78,058	7,806	780,577	1,223,498
2012	30,709	4,606	460,637	85,863	8,586	858,635	1,319,272
2013	31,938	4,791	479,063	94,450	9,445	944,498	1,423,561
2014	33,215	4,982	498,225	103,895	10,389	1,038,948	1,537,173
2015	34,544	5,182	518,154	114,284	11,428	1,142,843	1,660,997
2016	35,925	5,389	538,880	125,713	12,571	1,257,127	1,796,008
2017	37,362	5,604	560,436	138,284	13,828	1,382,840	1,943,276
2018	38,857	5,829	582,853	152,112	15,211	1,521,124	2,103,977
2019	40,411	6,062	606,167	167,324	16,732	1,673,236	2,279,404
2020	42,028	6,304	630,414	184,056	18,406	1,840,560	2,470,974
2021	43,709	6,556	655,630	202,462	20,246	2,024,616	2,680,246
2022	45,457	6,819	681,856	222,708	22,271	2,227,078	2,908,933
2023	47,275	7,091	709,130	244,979	24,498	2,449,785	3,158,915
2024	49,166	7,375	737,495	269,476	26,948	2,694,764	3,432,259

12.10.7 Economic Internal Rate of Return (EIRR)

As Table 12.10.2 shows the estimate of EIRR for the project is 20.74 percent. The EIRR of 20.7% is well above the level 13% - 15%, which are the levels commonly employed to assess an infrastructure project to be economically feasible.

12.11 Initial Environmental Examination (IEE)

The long-term environmental effects consequent to the implementation of the master plan in Bocas del Toro and Almirante are evaluated on preliminary basis, delineated between social effects and other effects, so as to form the IEE (Initial Environmental Examination). The environmental effects are principally focused on potential adverse long-term effects and their significance and mitigation measures as appropriate. The completed provisional IEE format for screening and checklist for scoping established by JICA is shown in Table 12.11.1 and Table 12.11.2 respectively.

(1) Social Effects

The basic facilities planned for both berthing of passenger and tourist boats and Ro-Ro ferry in Bocas del Toro, and the passenger boats and Ro-Ro ferry in Almirante involve essentially rehabilitation of existing damaged facilities belonging to AMP and located over coastal sea waters both at Bocas del Toro and Almirante. Accordingly, provision of basic port facilities in itself does not involve any land acquisition or resettlement of population including housing compensation.

Nevertheless, the coastal road beautification plan in Bocas del Toro and other auxiliary plans of AMP office and restaurant in Almirante that are to be located in the vicinity of the respective passenger and ferry berth areas may involve land acquisition as well as resettlement of population, and housing and commercial property compensation requirements. In this respect the affected people are willing to be cooperative provided they are awarded due compensation and given alternative suitable locations to reestablish their businesses and other activities. Accordingly, it is concluded that potential adverse social effects consequent to the implementation of the overall master plan is manageable and all land and property acquisition works could be accomplished in an amicable manner with the adoption of a reasonable compensation and relocation system.

The beneficial social effects of the master plan include, in addition to the direct employment opportunity linked to passenger, tourist boats and ferry operation, indirect employment opportunities and economic development related to the realization of eventual tourism development in Bocas del Toro.

(2) Other Effects

The berths for passenger and tourist boats as well as Ro-Ro ferry terminal in Bocas del Toro are sited on coral seabed, currently. They would continue to remain the same even following the

rehabilitation of these facilities as per this master plan. This will continue to exert some adverse effects on the coastal coral reefs in this very limited area, an inevitable long term and somewhat adverse effect.

Anyhow since the affected coral areas are not pristine and have been affected already for a long time, it is assessed that any potential adverse effects due to these berthing facilities on coral communities in the seabed is not that significant.

In fact the most significant potential long-term adverse effects consequent to the berthing of passenger/tourist boats as well as Ro-Ro ferry is the potential sea water pollution due to improper waste management of vessel generated wastes such as oily (bilge) wastes and garbage. In this respect AMP as the project owner shall undertake a vigilant waste management program, including surveillance against illegal dumping of wastes by vessels, so as not to pollute the coastal waters of berthing areas. This requirement has particular relevance for Bocas del Toro where tourism is the most significant development component of the master plan.

Table 12.11.1 Format for Screening-Bocas del Toro and Almirante Master Plan

No.	Environnemental Item	Description	Evaluation*1	Remarks (reasons)
Social Environment				
1.	Resettlement	Resettlement due to an occupancy (transfer of rights of residence/land ownership)	[Y][N][?]	Resettlement may be involved
2.	Economic activities	Loss of bases of economic activities, such as land, and change of economic structure	[Y][N][?]	No significant loss is anticipated
3.	Traffic and public facilities	Impacts on schools, hospitals and present traffic conditions such as the increase of traffic congestion and accidents	[Y][N][?]	Potential iinterference to normal traffic due to construction traffic
4.	Split of community	Community split due to interruption of area traffic	[Y][N][?]	No effect (no split)
5.	Cultural property	Damage to or loss of value of churches, temples, shrines, archaeological remains or other cultural assets	[Y][N][?]	No known treasures, still be verified
6.	Water rights and rights of common	Obstruction of fishing rights, water rights, rights of common	[Y][N][?]	Some infterfernce to water vessel traffic during construction
7.	Public health condition	Degeneration of public health and sanitary conditions due to generation of garbage and the increase of vermin	[Y][N][?]	An issue of construction site management
8.	Waste	Generation of construction wastes, surplus soil and general wastes	[Y][N][?]	From construction site works
9.	Hazards (risk)	Increase in danger of landslides, cave-ins, etc.	[Y][N][?]	Construction safety management issue
Natural Environment				
10.	Topography and geology	Changes of valuable topography and geology due to excavation or filling work	[Y][N][?]	The plan is basically rehabilitation
11.	Soil erosion	Topsoil erosion by rainfall after reclamation and deforestation	[Y][N][?]	Surface erosion, a construction site management issue
12.	Groundwater	Contamination caused by damage and filtrate water in excavation work and lowering of groundwater table due to overdraft	[Y][N][?]	No effect (no interference to groundwater)
13.	Hydrological situation	Changes of river discharge and riverbed condition due to landfill and drainage inflow	[Y][N][?]	No effect on surface flow
14.	Coastal zone	Coastal erosion and change of vegetation due to coastal reclamation and coastal changes	[Y][N][?]	A constuction site management issue
15.	Fauna and flora	Obstruction of breeding and extinction of species due to changes of habitat conditions	[Y][N][?]	Not significant as plan is small scale
16.	Meteorology	Changes of temperature, precipitation, wind, etc. due to large-scale land reclamation and building construction	[Y][N][?]	No effect (Plan is not that large scale)
17.	Landscape	Change of topography and vegetation due to reclamation. Deterioration of aesthetic harmony by structures	[Y][N][?]	No reclamation works
Pollution				
18.	Air pollution	Pollution cause by exhaust gas or toxic gas from vehicles	[Y][N][?]	Construction vehicles
19.	Water pollution	Pollution cause by inflow of silt, sand and effluent from factories, etc.	[Y][N][?]	No dredging works
20.	Soil contamination	Contamination caused by dust and asphalt emulsion	[Y][N][?]	During construction works
21.	Noise and vibration	Noise and vibration generated by vehicles	[Y][N][?]	During construction works
22.	Land subsidence	Deformation of land and land subsidence due to the lowering of groundwater table	[Y][N][?]	No interference to groundwater
23.	Offensive odor	Generation of exhaust gas and offensive odor by facility construction and operations	[Y][N][?]	Construction works
Overall evaluation: Necessity for implementation of IEE and/or EIA			[Y][N]	Preliminary EIA study is recommended

*1 Y: Yes
N: No
?: Unknown (To be confirmed)

Table 12.11.2 Checklist for Scoping-Bocas del Toro and Almirante Master Plan

No.	Environmental Item	Evaluation	Reasons
Social Environment			
1	Resettlement	C	Land acquisition and resettlement may be involved
2	Economic activities	D	The project will benefit passenger service and tourism industry (D in evaluation means no adverse effect).
3	Traffic and public facilities	B	Some interference of construction work and traffic with regular traffic
4	Split of community	D	No community split is involved
5	Cultural property	C	Existence of treasures is not expected, but to be verified
6	Water rights and Rights of common	B	Construction works interference to existing right of water vessel passage rights is anticipated
7	Public health condition	C	Construction site worker related public health management
8	Waste	B	Generation of construction and facility operational waste
9	Hazards (risk)	C	Construction site safety management
Natural Environment			
10	Topography and geology	D	No significant adverse effect is anticipated
11	Soil erosion	B	A construction site management issue to be taken care of
12	Groundwater	D	No effect since project is not related to groundwater
13	Hydrological situation	D	No effect since project would not interfere with surface flow characteristics
14	Coastal zone	D	No adverse effect is anticipated since the offshore facility plan is basically rehabilitation
15	Fauna and flora	B	Some short–term adverse effect during construction is anticipated
16	Meteorology	C	Project has no effect though meteorology may effect construction works
17	Landscape	D	Project design is aimed at improved landscape, beneficial effect
Pollution			
18	Air pollution	B	Use of construction machinery, vehicles may cause air pollution
19	Water pollution	B	The construction works may cause some water pollution also proper facility management is required to mitigate operational water pollution
20	Soil contamination	D	No significant soil contamination is anticipated
21	Noise and vibration	B	Construction machinery and vehicles may produce noise and vibration
22	Land subsidence	D	No effect since project has no interference to groundwater
23	Offensive odor	D	There exists no significant source of offensive odor

Note 1: Evaluation categories:
A: Serious impact is expected
B: Some impact is expected
C: Extent of impact is unknown (Examination is needed. Impacts may become clear as study progresses.).
D: No impact is expected. IEE/EIA is not necessary.

Note 2: The evaluation should be made with reference to the “explanation of item” (Table 4-5)

12.12 Recommendations on Regional Economic Development

Once again, the development of Bocas del Toro Port is not merely the infrastructure development. The port development plan should be interfaced with the city plan. It is very important for AMP to consult with the local port users and other government agencies including local government, at various stages of the project. Especially, the operation and management scheme of the passenger terminal should be acceptable one by the boat operators.

While AMP carries out the project, it should establish a policy and guidelines in the issuance of the permission of constructing structures in coastal zones. The policy and guidelines should be in line with the city development plan and should also require the coordination with other agencies concerned with coastal zone management.

The passenger terminal building is intended to provide the spaces for commercial activities such as ticketing, restaurant and shops. The detail plan and design of the building should be elaborated by a collective work between public and private

Since both Bocas del Toro and Almirante Port lack passenger facilities and the upgrading the safety and improvement of the port amenity are urgent to attract more tourists, the project should be implemented soon. Taking into consideration of the scale of the project, the whole plan should be implemented in one package.

The development plan should be finalized as the collective work among those concerned with the tourism and port related businesses. Thus, AMP has to take action immediately.