15. MASTER PLAN OF LA PALMA PORT

15.1 Development Scenario

15.1.1 Basic Development Needs

The fishing grounds of Gulf of San Miguel and the Darien coast accommodate vigorous fishing activities by several types of fishing boats such as the local artisanal fishing boats, industrial shrimp trawlers and semi-industrial fishing boats from other provinces.

The fisheries in Darien have long been handicapped for transportation of the fish-catches to the Panama area and other consuming regions due to poor land traffic conditions and also poor infrastructure conditions for fishery. The industrial shrimp-trawlers and semi-industrial fishing boats operating in the Darien fishing ground have been obliged to continue high cost fishing due to lack of a proper fishing port where they could land their fish-catches and they could refuel the fishing boats.

It is against this background that the region has been far left behind from the economic development of Panama without any local fishing industry developing in Darien.

AMP (Direccion General de Recursos Marinos y Costeros), as the governmental agency responsible for the development of fisheries in Panama, has executed a series of training programs for the artisanal fishing people on the coast of Gulf of San Miguel aiming at the improvement of their living conditions: namely, (i) organizing of fishermen's cooperative societies, (ii) technology transfer and education of fish processing, (iii) training of coastal navigation techniques.

The government of Panama is promoting the construction of the Pan-American Highway from Panama to the Darien region as the Sustainable Development Program in Darien Province being assisted by IDB. In the program, there is the construction plan of the ferry facility to secure the waterway traffic between Quimba and La Palma.

In this chapter of the study, development of fishing infrastructure facilities at La Palma is proposed, in conjunction with the above traffic development, aiming at the establishment of the regional industries of the Darien based on the marine resources of the region.

15.1.2 Development Targets

(1) Short-term Development

To construct a fishing port at La Palma to land the fish-catches of the Darien fishing ground. The purpose of the facilities is to consolidate the regional fish-catches and, in conjunction with the road traffic via Quimba, to provide highly fresh marine products economically and efficiently to Vacamonte (the major processing base of marine products) and to Panama City (the major consuming region).

The proposed facilities are as follows.

1) Ramp for Artisanal Fishing Boats
2) Fish-landing Pier for Industrial Shrimp Trawlers
3) Water-supply and Refueling Facility for the fishing boats
4) Ice-making Plant and Ice Storage

(2) Long-term Development

To establish a fish-processing industry at La Palma, and to promote the sustainable development and exploitation of the marine resources in the Darien region.

The ultimate goal of the project is to facilitate the establishment of an activity center of the coastal communities in Darien Province. Since fishing is the key industry in the province, the project is intended to create additional job opportunities in this industry. For the sustainable development in this sector, it is vital to preserve marine resources. Thus the target of the project has been identified to be establishing value-added industries in the port complex of La Palama. By promoting a fish-processing industry, it is possible to create job opportunities in fishing industry there without increasing the fish catch.

The same concept should be introduced to the forestry industry. By inviting wood processing industry in La Palama Port complex, more job opportunities could be created. Even though the Master Plan will not propose any specific facilities for the wood processing industry, the port should be so planned that the port complex has enough space to accommodate the industry.

It is foreseen that, when shrimp-processing is done at La Palma Fishing Port Complex, the existing fish-processing firms in Vacamonte Port will be suffering from short of processing volume there. However, there is no reason for the people in Darien to continue sacrificing their own potential to establish value-added business by giving up the product from the fishing ground in their province to those industries outside of the province.

The shrimp processing business is flourishing in Vacamonte Port under the advantageous regulations for the Port that restrict the shrimp processing business in other areas. Now, Vacamonte Port has potentials in various fields such as Tuna handling, Ship-repair and logistics businesses, while fish processing is the only value-added business that is most realistic in La Palma under the current environment. In fact, in Vacamonte Port, the operator of Tuna pier has proposed the investment in expansion of the pier to improve their service and the ship-repair firm has also sent a request for the permission to expand its capacity to serve for Tuna boats as well as shrimp boats. The port has a lot of opportunity to compensate some loss in shrimp processing volume.

(3) Benefits by Development

The following benefits are assumed to be realized by the above-mentioned development.

1) The fish-catch by shrimp-trawlers operating in the Darien fishing ground is to be landed at La Palma within 40 km distance from the fishing ground, and travel time will be shorten compared to the distance between the Vacamonte port and Darien (160 km). Consequently the improvement of operational performance of the shrimp trawlers and cost savings will be achieved. Also, shipment and processing of fresher shrimps with higher market prices will be realized.

2) The fish-catch by semi-industrial and artisanal fishing boats will be consolidated and landed efficiently at La Palma with fresher quality, and to be provided regularly to the consuming regions with more reasonable prices.

3) It is expected that the marketing outlet for Darien's artisanal fisheries will be expanded, and consequently the fishing people's income and the quality of life will be improved.

4) Fish processing industry is to be operated at La Palma and local employment will be provided. Consequently, employment in related industries will be promoted.

15.1.3 Present Status of Shrimp Fishing

Shrimp fishing on the Pacific coast of Panama is run mainly by the industrial shrimp trawlers with more than 240 boats licensed (refer to Table 15.1.1). Because of the rich marine resources along the coast and the stable market prices, fish-catching works will stay and operate at the fishing ground full blast as long as the shrimp-catches stay fresh, to go back to their mother port. Most of the shrimp trawlers ply between the fishing grounds and Vacamonte Port for landing in about two weeks period (15 - 18 days).

The volume of shrimp-catch by the industrial shrimp trawlers has been decreasing, and the total volume by six species of shrimp has changed ranging 5,000 - 6,000 tons/year since 1998 (Table 15.1.2, Figure 15.1.1). Among them, the catch of Camaron Blanco (white shrimp) is relatively stable with the volume about 1,100 tons/year.

As for the species of Camaron Blanco (white shrimp), there is an estimate of Maximum Sustainable Yield (MSY) that ranges 1,800 - 2,300 tons/year (4 - 5 million pounds/year), and the current volume of catch is in the half extent of MSY.

Source: Informacion sobre la Ordenacion Pesquera de la Republica de Panama, Enero 2002; FAO Country Profile

Following the intensification of the price competition in the international market, the export prices of shrimps from Panama is decreasing (Table 15.1.3). It is said that the price of Camaron Blanco has got as low as 6 USD/pound in 2003.

The countermeasures to be taken by the shrimp trawling industries are to lower the operating cost by landing their fish-catches at the nearest port as possible and to upgrade their market prices by processing the shrimps with fresher and higher quality. Hence, the development of La Palma Fishing Port, which is located nearest from the Darien fishing ground, will play a very important role.

Table 15.1.1 Number of Licensed Fishing Boats by Fishing Activity

Types of Fishing Activity	Year	2000	2001	2002
Total		**6,120**	**6,684**	**7,427**
Industrial Fishing	(English Name)	**614**	**632**	**763**
Atun	Tuna	30	30	110
Anchovetas y arenques	Anchovy and herring	30	31	32
Camaron	Shrimp	**231**	**247**	**244**
Corvina, Cojinua	Whiting, Scad	15	15	15
Doncella, Pajarita	Gilthead	3	3	2
Dorado	Dolphin Fish	108	108	139
Pargo, Mero, Tiburon	Sea bream, Grouper, Shark	197	198	221
Artisanal Fishing		**5,506**	**6,052**	**6,664**

Source: Direccion General de Recursos Marinos y Costeros, AMP

Table 15.1.2 Production of Shrimp by Industrial Fishing in Panama

Year	Shrimp Total	Shrimp (Unit in tons/year)					
		Blanco (White)	Cabezon (Bighead)	Carabali	Fidel	Rojo (Red)	Titi (Small)
1992	4,005	1,097	29	111	146	1,150	1,472
1993	4,747	1,111	161	119	367	1,075	1,914
1994	5,187	1,012	742	94	597	995	1,747
1995	6,666	1,307	1,100	100	528	1,116	2,515
1996	8,304	1,072	3,497	113	388	649	2,585
1997	8,979	906	4,100	98	720	1,024	2,131
1998	6,112	1,529	718	83	115	655	3,021
1999	5,441	1,116	1,433	49	241	859	1,743
2000	5,328	912	998	76	663	1,079	1,600
2001	5,185	1,022	798	82	349	1,143	1,791

Source: Direccion General de Recursos Marinos y Costeros, AMP

Table 15.1.3 Change of Export Prices of Shrimps in Panama (Unit in USD/pound)

Shrimp	(English name)	1998	1999	2000	2001	2002
Blanco	White	8.1	8.5	9.5	9.8	7.1
Titi	Small	1.3	1.6	2.0	1.8	1.3
Carabali		2.3	2.6	2.2	2.4	1.5
Rojo	Red	3.9	2.5	3.1	3.5	3.3
Fidel		1.7	1.6	2.4	2.1	1.7

Source: Direccion General de Recursos Marinos y Costeros, AMP; Note: pound (libra) = 0.453 kg

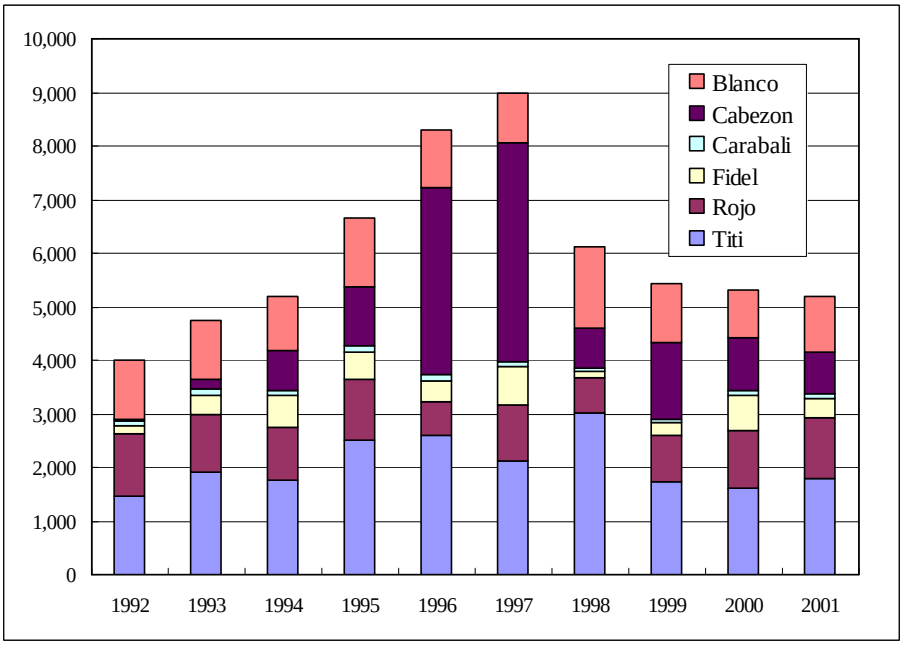


Figure 15.1.1 Production of Shrimp in Panama

15.2 Production and Staged Development

15.2.1 Fishing Ground and Shrimp Production

The production of Camaron Blanco (white shrimp) and the share of the production by three fishing grounds (Chiriqui, Chame, Darien) have been studied statistically since 1960s (refer to Table 15.2.3 at the end of this section). The share of the production of Camaron Blanco by the fishing grounds are as follows in recent years; Chiriqui 5%, Chame 5%, Darien 90% (refer to Figure 15.2.1, Table 15.2.1).

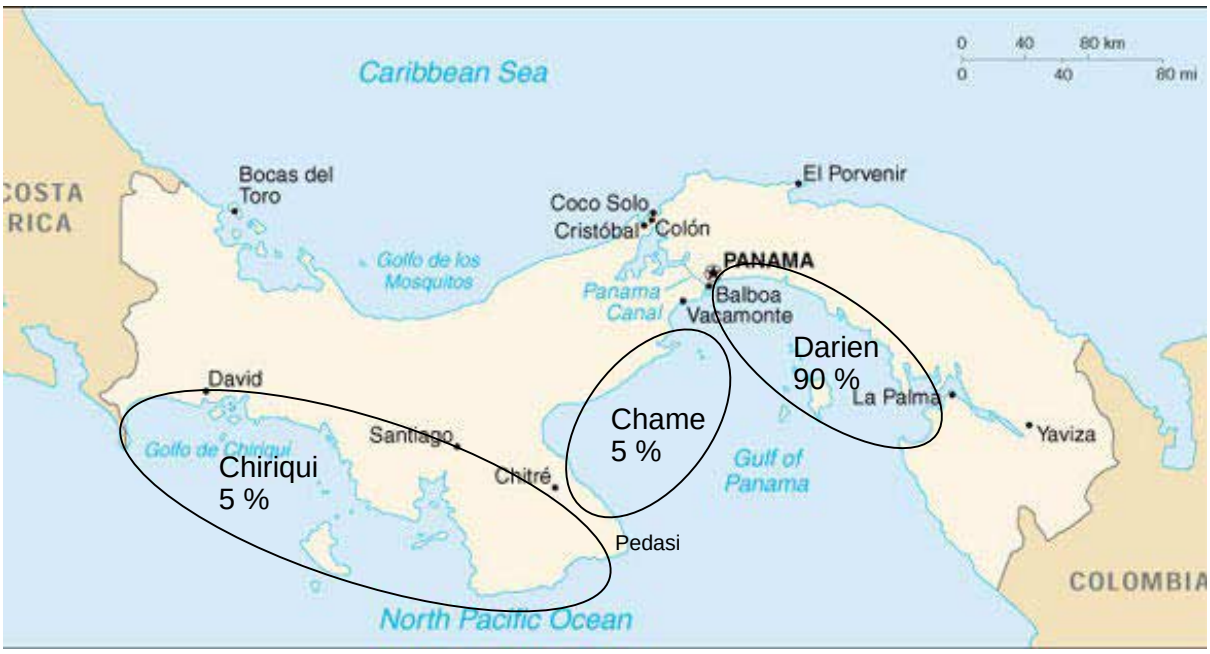


Figure 15.2.1 Fishing Grounds and Shares of Camaron Blanco (White Shrimp)

Table 15.2.1 Production of Camaron Blanco by Fishing Ground in Panama

(Unit in tons/year)

Year / Fishing Ground	1997	1998	1999	2000	2001
Darien	792 (88%)	1,658 (88%)	985 (89%)	818 (90%)	895 (94%)
Chame	58 (6 %)	114 (6 %)	80 (7 %)	48 (5 %)	26 (3 %)
Chiriqui	51 (6 %)	121 (6 %)	44 (4 %)	43 (5 %)	34 (4 %)
Total	**901**	**1,893**	**1,109**	**910**	**955**

Source: Direccion General de Recursos Marinos y Costeros, AMP

Note: **Darien Fishing Ground** consists of the coastal area along Panama and Darien Provinces (from Panama Canal to Gulf of San Miguel). **Chame** Fishing Ground has its range from Panama Canal to Bahia de Parita. **Chiriqui** Fishing Ground ranges from Pedasi to Bahia de Chalco Azul.

As mentioned above, the total volume of shrimp-catch of six species by the industrial shrimp trawlers is about 5,000 tons/year on the Pacific coast of Panama.

Assuming the productivity of the Darien fishing ground as 90 % of the whole, the total production of shrimp-catch from the coast of Panama Province to Gulf of San Miguel can be evaluated as 4,500 tons/year. La Palma fishing port is expected to accommodate shrimp-catch from the Darien fishing ground in association with the ports of Vacamonte and Coquira. Hence, one third of the shrimp-catch (i.e., **1,500 tons/year)** can be expected as the volume to be landed at La Palma.

Establishment of fish processing industry is expected as well at La Palma in the future. Upon achievement of the above target volume of landing, 2 to 3 fish processing companies will be able to operate at La Palma (based on the interview at the company running at Vacamonte).

Note: 5,000 tons/year is the total volume of shrimp-catches by the 244 licensed boats (Table 15.1.1, as of 2002) during the 35 weeks of fishing period per year (except for the closed seasons of shrimp fishing in January, February, September and October). Hence, the specific productivity of the industrial shrimp trawlers in Panama is estimated as 600 kg / boat / week.

15.2.2 Shrimp Landing by Industrial Shrimp Trawlers

Since one third of the shrimp-catch from the Darien fishing ground (i.e., **1,500 tons/year)** can be expected as the volume to be landed at La Palma, this figure is to be set as the development target of the shrimp volume to be landed at La Palma fishing port.

(1) Short-term: The target volume of shrimp at the initial stage of the development; **500 tons/year** The number of the Industrial Shrimp Trawlers calling at La Palma for landing is estimated as **24 boats/week** from the above volume divided by the specific productivity of the industrial shrimp trawlers in Panama, i.e., 600 kg / boat / week.

(2) Middle-term: the target volume at 10-year after; **1,000 tons/year**, **48 boats/week**

(3) Long-term: the target volume at 20-year after; **1,500 tons/year, 72 boats/week**
Staged development process is assumed as shown in Figure 15.2.2.

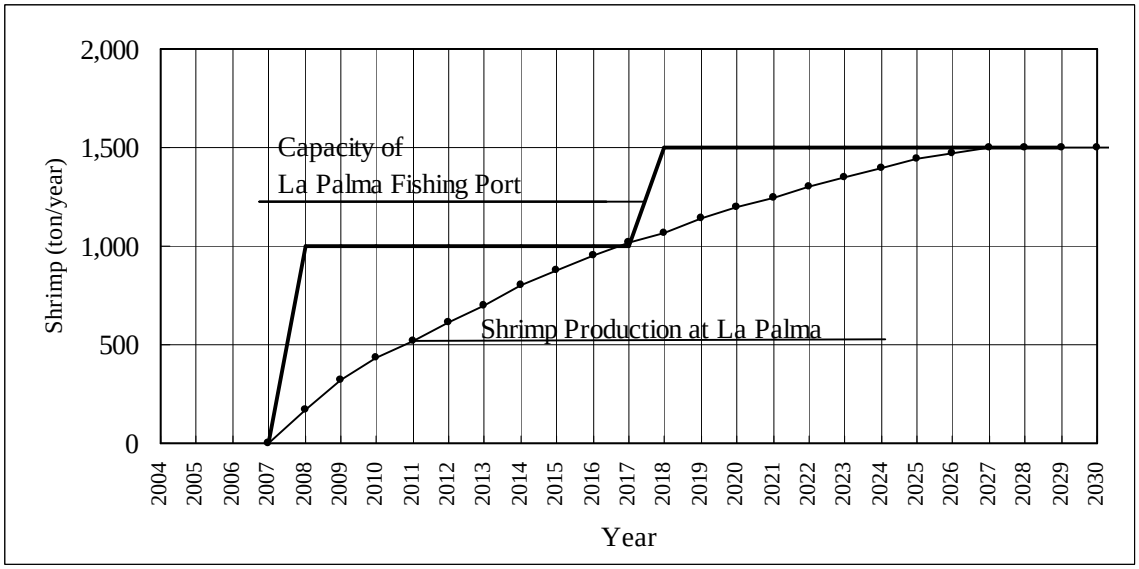


Figure 15.2.2 Staged Development of La Palma Fishing Port

15.2.3 Fish Landing by Local Artisanal Fishing Boats

(1) As for the activities of artisanal fishing and the fishing villages of Darien Province, the registered number of fishing boats and the number of fishermen are shown in Table 15.2.2.

The fishing villages in the table are divided into groups by geophysical locations (refer to Figure 15.2.3). Those are the villages located on the outer bay coast of Gulf of San Miguel (1st group; Garachine, Taimati), the villages located on the inner bay coast (2nd group; La Palma, La Paz, etc.), the villages located on the coast of mainland Darien (3rd group; Quimba, Puerto Lala, etc.), the villages located on the outer coast of Darien (4th group; Jaque, Puerto Piña) and semi-industrial fishing boats registered at the other provinces (5th group).

The shrimp-catch and fish-catch volumes in the table are the estimate based on the unit volume: 4 tons/boat/year (refer to Notes below). The fishing boats are small boats with outboard engines.

(2) The fish-catch of the 2nd group of Artisanal fishing villages (La Palma, Punta Alegre, La Paz, etc.) is assumed to be collected by fish-brokers at each village and landed at La Palma.

(3) Ice-supply is also planned as for the fishing boats of the 2nd group through fish-brokers.

(4) The fish-catches of the 4th and 5th groups of Semi-industrial fishing are also assumed to be landed at La Palma. Since their numbers of the active boats are not recorded, the total number is assumed as 30 boats registered at Jaque and other provinces.

(5) The fish-catches of the 1st and 3rd groups of Artisanal fishing (Garachine, Taimati, Quimba, etc.) are, currently, transported by fish-brokers directly to Panama by air-route or via Quimba

by land-route. The fish-catches will be transported without going through La Palma at the initial stage of the La Palma development.

(6) At the later stage, it is expected that, after the fish-brokers understand the merit of the La Palma fishing port, and their fish-catches will be consolidated at La Palma.

Table 15.2.2 Estimate of Artisanal Fishing Activity in Darien Region

Artisanal Fishing (Small Boats with Outboard Engine)

Group	Name of Villages	Number of Fishing Boats	Number of Fishermen	Ratio Men/Boat	Shrimp-Catch (ton/year) *1	Fish-Catch (ton/year) *2
1	Garachine	293	661	2.26	117	1,055
	Taimati	49	92	1.88	20	176
	Sub-total	342	753		137	1,231
		48 %				
2	La Palma	100	227	2.27	40	360
	Cucunati	4	10	2.50	2	14
	El Pinal	10	22	2.20	4	36
	Punta Alegre	174	352	2.02	70	626
	La Paz/Rio Congo	39	79	2.02	16	140
	Sub-total	327	690		131	1,177
		46 %				
3	Quimba	10	25	2.50	4	36
	Arreti	4	10	2.50	2	14
	Puerto Lara	23	44	1.91	9	83
	Santa Fe	3	6	2.00	1	11
	Cana Blanca	1	2	2.00	0	4
	Sub-total	41	87		16	148
		6 %				
	Total	**710**	**1,530**		**284**	**2,556**

Semi-industrial Fishing (Fishing Boats smaller than 10-GRT)

Graoup	Name of Villages	Number of Fishing Boats	Number of Fishermen	Ratio Men/Boat	Shrimp-Catch (ton/year)	Fish-Catch (ton/year) *3
4	Jaque	7	24	3.43	-	152
	Puerto Pina	1	2	2.00	-	22
	Sub-total	8	26		-	174
5	Other Province	Not recorded		-	-	-
	Total (assumed)	**30**	-		-	**650**

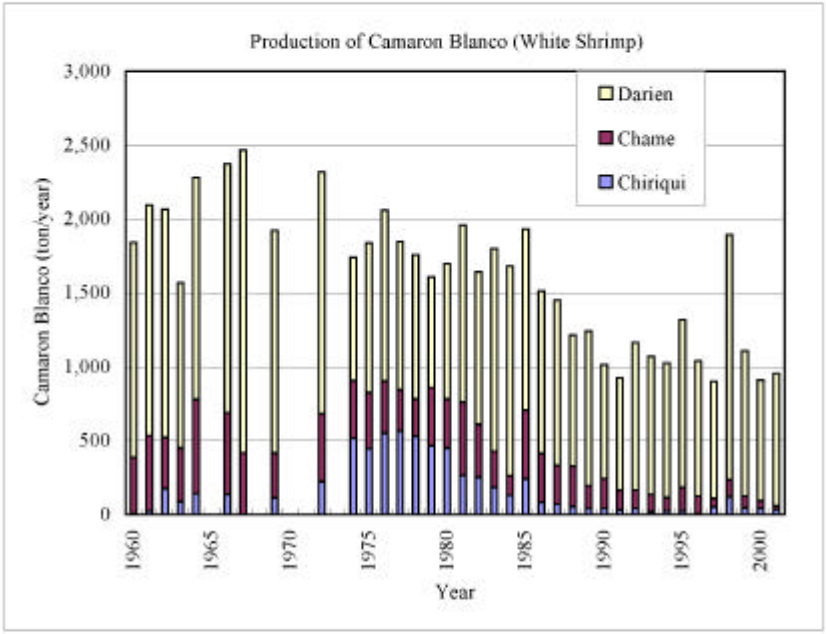
Source: Direccion General de Recursos Marinos y Costeros, AMP, Diciembre de 2003.
Notes:
*1 Volumes of Shrimp-catch and Fish-catch are estimated as 4 tons/boat/year based on the following study report (1.8 - 6 ton/boat/year); Consultoria para Elaborar el Plan de Manejo Costero Integral en el Golfo de San Miguel y Zonas Adyacentes, en el Marco del Programa de Desarrollo Sostenible del Darien, Junio de 2003, Arden & Price Consulting / University of Miami
*2 Proportion of Shrimp-catch to Fish-catch is estimated as 1:9 based on the actual records at Garachine.
*3 Fish-catch by Semi-industrial fishing is assumed as follows based on the hearing at Coquira and Garachine; average 2,000 pounds/sail x 3 sails/month x 12 months/year x 2/3 (operational rate due to weather conditions).

Figure 15.2.3 Fishing Villages of Gulf of San Miguel, Darien Province

Table 15.2.3 Production of Camaron Blanco by fishing Ground

(in Ton)

Year	Fishing Ground: Darien		Chame		Chiriqui		Total
1960	1,455	79%	384	21%	3	0%	1,843
1961	1,561	75%	511	24%	23	1%	2,095
1962	1,544	75%	346	17%	174	8%	2,065
1963	1,118	71%	364	23%	87	6%	1,569
1964	1,501	66%	638	28%	141	6%	2,280
1965							
1966	1,685	71%	550	23%	138	6%	2,373
1967	2,052	83%	416	17%		0%	2,468
1968							
1969	1,510	78%	302	16%	113	6%	1,924
1970							
1971							
1972	1,636	71%	460	20%	223	10%	2,319
1973							
1974	835	48%	389	22%	516	30%	1,740
1975	1,011	55%	381	21%	446	24%	1,838
1976	1,157	56%	353	17%	550	27%	2,060
1977	1,001	54%	277	15%	567	31%	1,846
1978	977	56%	249	14%	531	30%	1,757
1979	745	46%	393	25%	466	29%	1,605
1980	919	54%	330	19%	451	27%	1,699
1981	1,198	61%	498	25%	264	13%	1,959
1982	1,032	63%	358	22%	251	15%	1,641
1983	1,374	76%	244	14%	184	10%	1,801
1984	1,422	84%	131	8%	131	8%	1,683
1985	1,226	63%	467	24%	239	12%	1,933
1986	1,100	73%	331	22%	82	5%	1,513
1987	1,119	77%	261	18%	72	5%	1,451
1988	889	73%	271	22%	55	5%	1,214
1989	1,047	84%	154	12%	41	3%	1,242
1990	773	76%	200	20%	41	4%	1,014
1991	762	82%	131	14%	32	3%	925
1992	1,002	86%	124	11%	41	4%	1,166
1993	934	87%	116	11%	20	2%	1,070
1994	913	89%	90	9%	24	2%	1,027
1995	1,136	86%	159	12%	24	2%	1,319
1996	916	88%	119	11%	6	1%	1,041
1997	792	88%	58	6%	51	6%	901
1998	1,658	88%	114	6%	121	6%	1,893
1999	985	89%	80	7%	44	4%	1,109
2000	818	90%	48	5%	43	5%	910
2001	895	94%	26	3%	34	4%	955



Source: Direccion General de Recrsos Marinos y Costeros, Vacamonte, Autoridad Maritima de Panama

15.3 Natural Conditions

This section describes natural conditions about La Palma Port, focusing topographic and bathymetric conditions, oceanographic conditions and subsoil conditions for the master plan study.

15.3.1 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 MLWS based on tide observation related to the Port of Balboa, 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.

La Palma Port : The results of topographic and bathymetric surveys are shown in 15.3.1. Two benchmarks indicated in the figure were established as shown below.

BM Description	Coordinates		Elevation	
	E	N	Datum	(m)
1	814,891.57	930,544.85	MLWS	5.65
2	814,840.85	930,393.10		6.03

The landside around existing La Palma Port has many wooden buildings on the trestle, stretching along the river. Most residents stay at the berme of the hill lying behind. Unique flat expansive land space is at the runway of the existing domestic airport located to the northwest of the existing river port, so that the access road to other internal habitation must use a part of the runway during non operational aircraft schedule. However, the airport is being relocated to another area to a reserve longer and wider runway for current aircraft.

The distribution of the contour line for the riverbed around the existing port is mostly parallel to the river up to –10 m and its gradient is about 1/25.

15.3.2 Hydraulic Conditions

Generally hydraulic conditions on La Palma Port are summarized in Table 15.3.1. The information is referenced from the existing publication[7], design and survey reports[8] or drawings conducted by AMP.

At this port, there are no permanent tide observation spots and authorized tide relation, although predicted tide data on Punta Garachine by harmonic analysis is available to refer to the port.

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

[8] PERBAS, S.A., Estudio de Corrientes Marinas Frente al Muelle en Los Puerto de La Palma Y Qumba, 2003

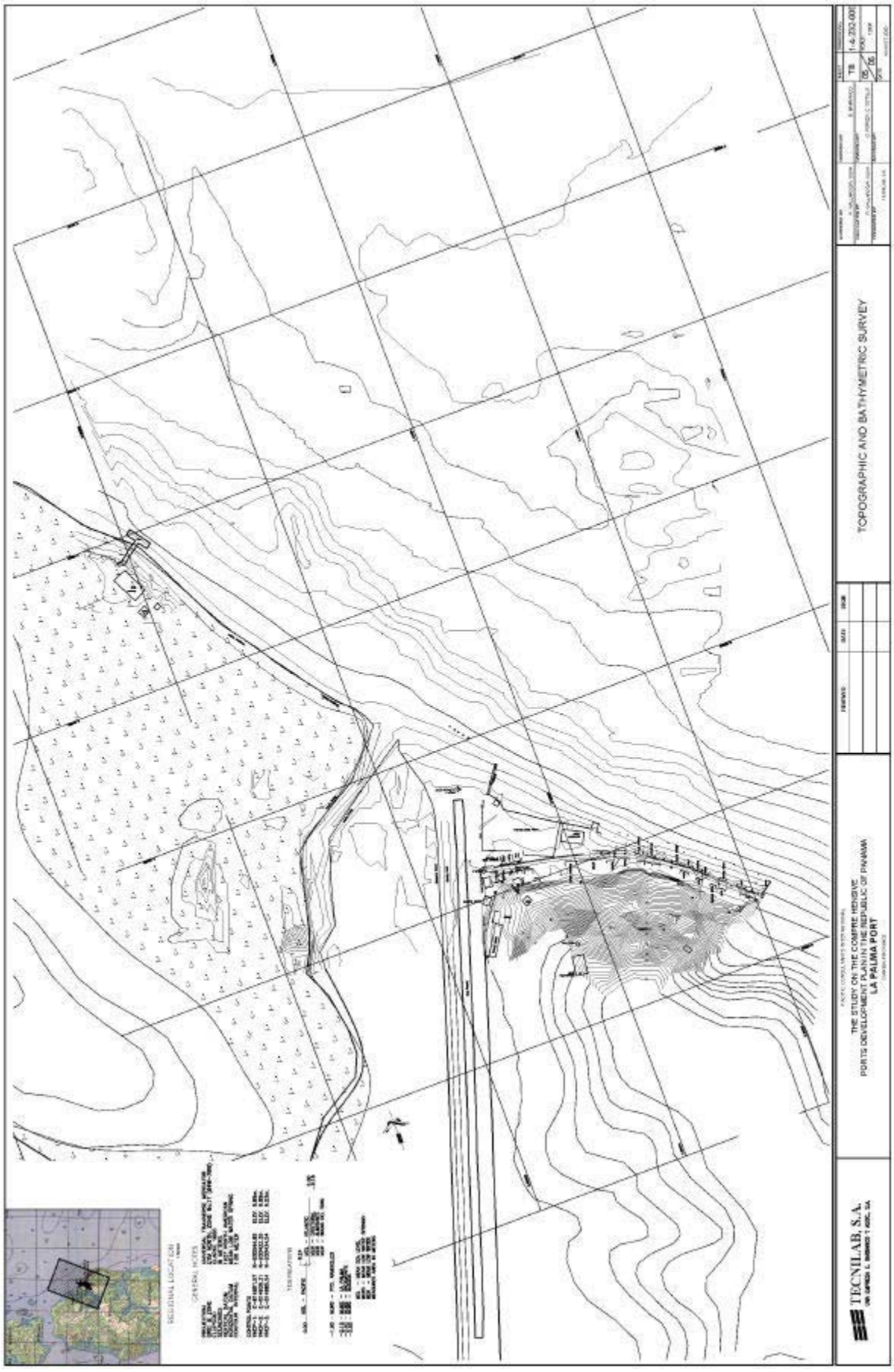


Figure 15.3.1 Survey Map at La Palma Port

The port is located in the entrance area inside the bay; the actual water level fluctuation may be affected by tidal range more than river flux.

However, the following correction coefficients with the tide of Balboa Port shown in the table are extracted as reference information.

Table 15.3.1 Summary of Hydraulic Conditions

Name of Port	Tide								Current (m/sec)	Waves (Annual Max.)		Referred Nearest TidePoint
	Ref Port	Difference from Reference Port				Tidal Range (m)	MLWS from MSL (Pacific)			Height $H_{1/3}$ (m)	Period T (sec)	
		Time (HH:MM)		Height (m)								
		HWL	LWL	HWL	LWL							
La Palma Port	Balboa	0:00	-0:08	-0.61	-0.09	< 6.4*	-2.15		< 1.0	-	-	Punta Garachine

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.

Tidal Range is less than 6.4 m, the same as Coquira Port. Experimentally, the MLWS on the port seems to define -2.15 m from the MSL on the Pacific Ocean officially established in using the tide data observed on Balboa Port, based on temporary tide observation or tide study.

Around the port area, it is observed that erosion along bank may be advanced by ship generated waves.

Current of the area around port is maximum 1.0 m/sec at best althrough the existing survey report was referenced.

15.3.3 Subsoil Conditions

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

La Palma Port : Figure 15.3.2 shows borehole locations. Subsoil profiles along representative section were assumed based on the boring logs and SPT-N values as presented in Figure 15.3.3.

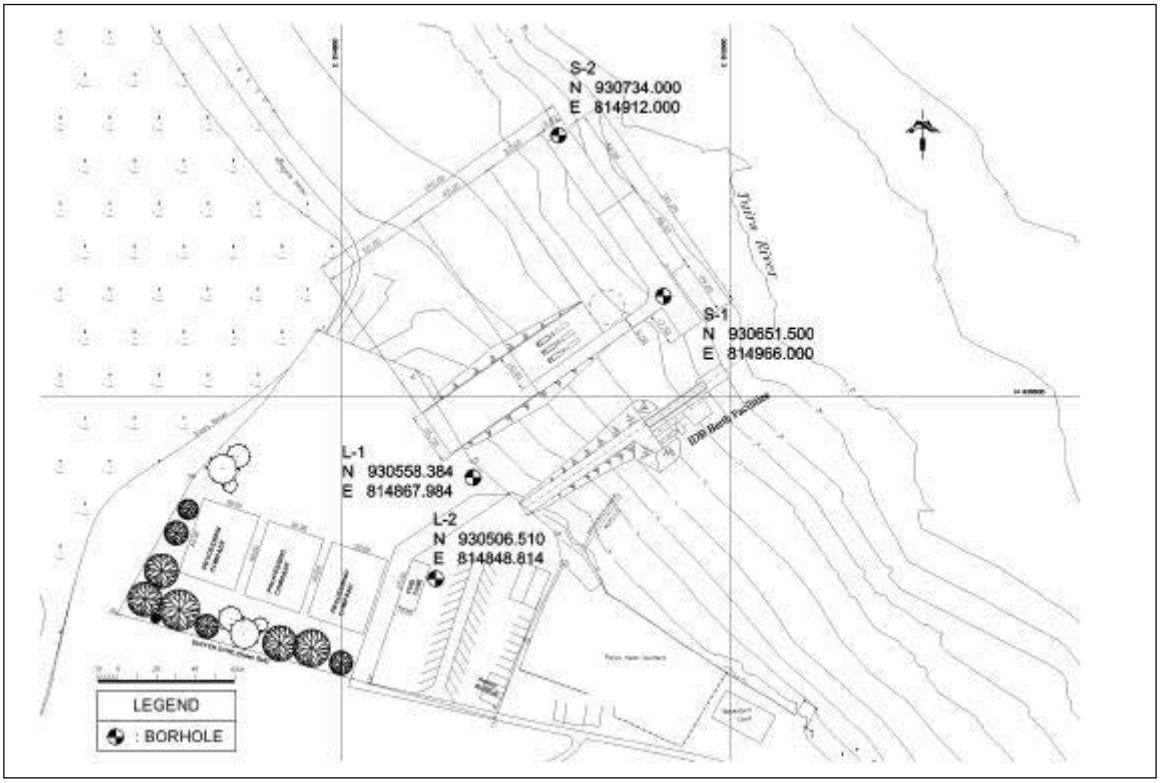


Figure 15.3.2 Location Map of Soil Investigations

This site is located on Punta Sabana Formation, composed of padded lavas, basalt and interstratified diabase with pyroclastic sediments.

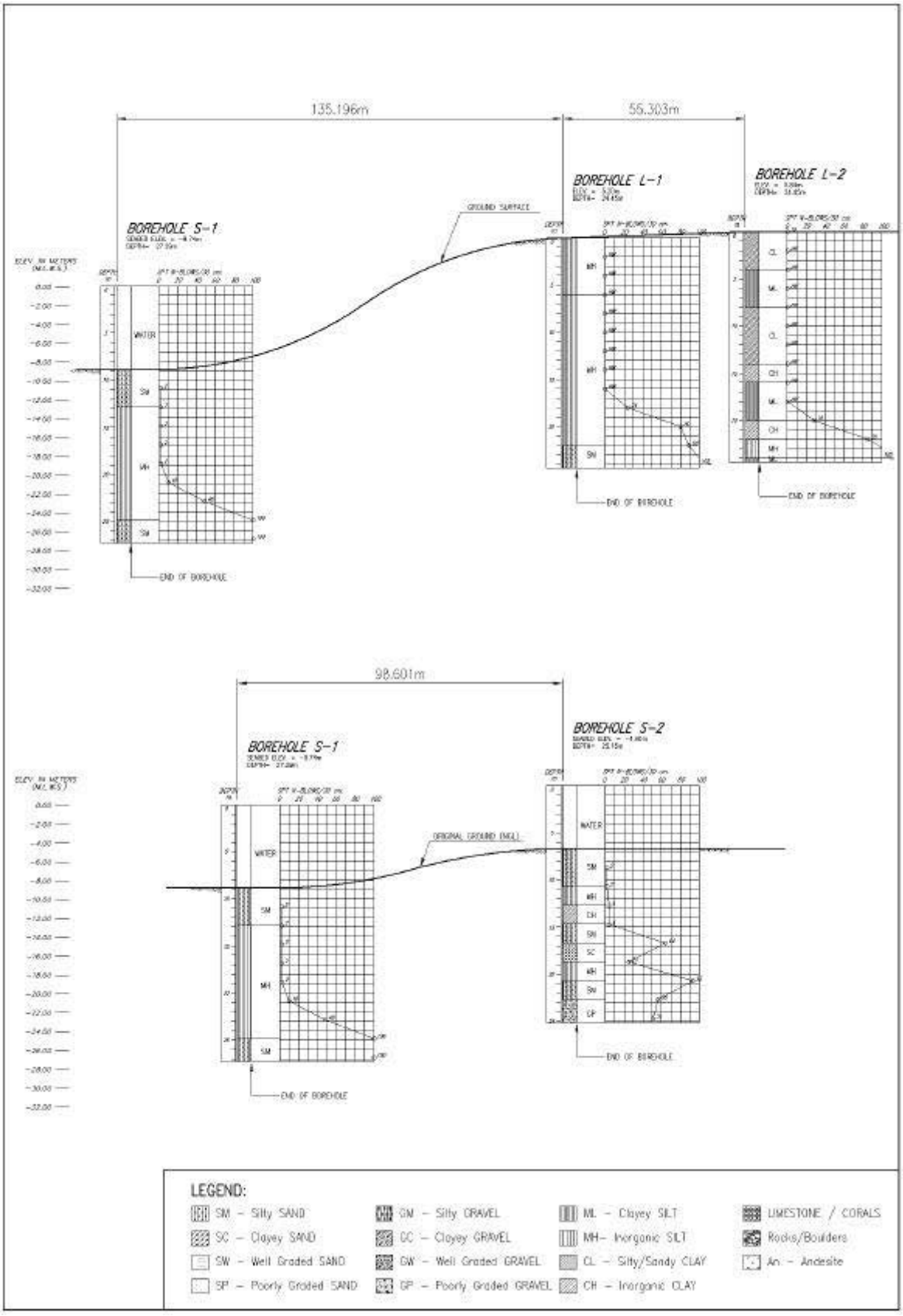
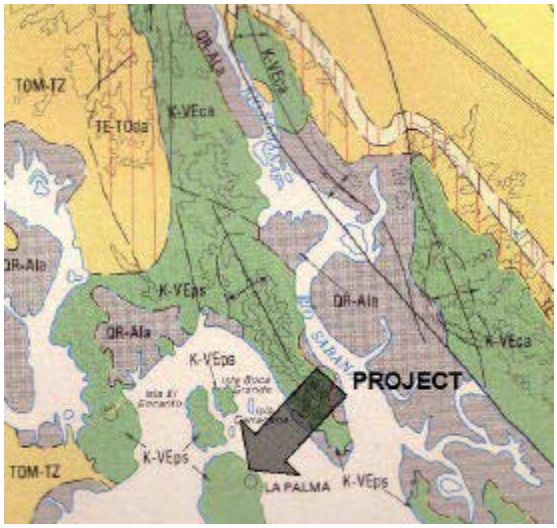


Figure 15.3.3 Boring Logs at La Palma Port



Boreholes L-1 and L-2: In the boreholes L-1 and L-2 the first strata consists of a layer of Fill composed by Inorganic Silt (MH), in L-1, very soft consistency, medium plasticity, high natural water content and Silty Clay in L-2, with wood fragments very soft consistency, medium plasticity. The next stratas are formed from Inorganic Silt (ML-MH), very soft consistency, low plasticity, high natural water content; the consistent change to very consistent and hard since 18.0 m depth in L-1 and 22.0 meters of depth in L-2;

Silty Sand (SM), with mudstone fragments, hard consistency, low plasticity, medium natural water content.

Boreholes S-1 and S-2: In the Boreholes S-1 and S-2; the stratigraphy starts with Silty Sand (SM), soft consistency, medium plasticity, high natural water content with wood fragments in S-2; Inorganic Silt (MH), soft to hard consistency, medium plasticity, high to low natural water content; Inorganic Clay (CH), in S-2, with wood fragments, soft consistency, medium plasticity, high natural water content; Clayey Sand (SC), in S-2, with gravel and feldspar crystal, low consistency, low plasticity; Poorly Graded Gravel (GP), in S-2, with siliceous rock fragments very dense compactness, non plastic, low natural water content.

15.4 Environmental Condition

15.4.1 Water Environment

The coastal port water environmental condition at the La Palma port area was studied, similar to those ports of Bocas Del Toro and Almirante as dealt with in Section 12.4 and also the Chiriqui port as dealt with in Section 13.4, by conducting sampling and analysis of both water and seabed material (sediment) at 4 locations. 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

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 the 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 this La Palma port. It is noted that similar nutrient pollution is also measured in the port waters of Bocas Del Toro and Almirante as well (ref. Section 12.4.1). The progressing nutrient pollution in the La Palma port waters could be attributed its semi-closed nature being located in the estuarine area of Tuira River.

As per bacterial pollution, as the indicator of contamination due to recent discharge of human wastes of fecal origin, rather high FC levels up to 1000 No./100ml were measured in the estuarine coastal port waters.

Concerning oil pollution that should be attributed to water vessels (predominantly passenger boats) 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 the port waters. Accordingly, oil pollution level 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 seabed.

The results of evaluation indicated no significant heavy metallic contamination in the seabed of the port waters. Also there is no oil (total hydrocarbon/THC) contamination in seabed. Accordingly the seabed is assessed as non-contaminated.

(3) Conclusions

In overall, based on the results of water quality analysis, the coastal water environment of the La Palma port is assessed as satisfactory with no chronic organic pollution. Still significant oil

pollution in the coastal waters is noted, implying the requirement for strict oil pollution control measures by AMP concerned to vessel movements.

The seabed material (sediments) is assessed as not significantly contaminated with respect to the measured heavy metallic elements and oil (total hydrocarbon) content.

15.4.2 Coastal Ecology

Mangrove woods dominate the estuarine ecosystem of La Palma, where the rivers Tuira and Sabana meet. The species of mangrove that inhabits this area include *Lagunculia, Conocarpus*, and *Rhizophora*.

The fauna species that inhabits this estuarine water include white shrimps (*Lytopenaeus vanamei, L. stylirostris* and *L. brevirostris)* and fish species of white corvina (*Cynoscion albus* and *C. stoltzmann),* all having a high commercial importance. Sporadic incursions of tarpon (*Megalops atlanticus)* were also reported.

15.4.3 Social Environmental Aspects

The social environmental aspects principally targeting the population living around the La Palma port area 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.

The total population of La Palma is 1,741 inhabitants (Year 2000 census) with a high index of masculinity of 126.1%. The potentially economically active population from 15 to 64 years of age is 63.5%. It is pointed out that La Palma is administered as a special zone with restricted passage to visitors including Panamanians residents of other areas.

Of the potentially economically active population, 541 are employed. The unemployment ratio is 14.1%, which is rather high. The median income of the working population is USD (Balboa) 319.0, while the median family income being USD 348.7. Public sector is the major employer in La Palma. Major economic activity of the area is commerce followed with fishing. It is noted that subsistence farming is the most prevalent agricultural activity and hence its output is not that significant.

The population of La Palma considers the living environmental condition as bad, in particular concerned to the poor handling of solid waste (garbage) and sewage (domestic wastewater). Referring to the construction of the port as per the master plan the population does not perceive any significant adverse environmental effects. They believe any potential adverse environmental effect is manageable. In fact the perception of the population is that the project is necessary and would bring economic benefits and hence would enhance the standards of living of the community.

15.5 Facility Planning and Layout

15.5.1 Dimensions of Fishing Boats

Based on the actual records (Table 15.2.2), dimensions of the fishing boats for design purpose are summarized as follows.

Table 15.5.1 Dimensions of Fishing Boat (Maximum Size)

	Industrial Shrimp Trawler	Semi-industrial Fishing Boat	Artisanal Fishing Boat
Length overall (m)	20	14	9
Breadth (m)	5.5	3.5	2.0
Draught (m)	1.5 - 2.0	1.0 - 1.5	0.5
Tonnage (GRT)	50 - 150	10	
Engine Power (HP)	300 - 350	100 - 150	40
Crew	5－6	3－4	2
Number of Boats	Short-term: 24 Middle-term: 48 Long-term: 72	30	100

Source: Estimate by JICA Study Team

15.5.2 Dimensions of Port Facilities at La Palma

(1) Berth for Industrial Shrimp Trawler Boats

- Design Length of Quay: unit quay length = Ship length (L) + margin length (0.15 L) = 23 m
- Design Depth of Quay: draught (1.5 - 2.0 m) + under-keel clearance (0.5 m) = **MLWS -3m**

(2) Operational Time

- Operational time for Shrimp-landing: Shrimp-landing work consists of the following process.
  Berthing of boat, unloading and weighing of shrimp, and deberthing. A series of process will take about 2.0 - 2.5 hours for shrimp-landing per boat (1,000 - 1,500 pounds).
- Time for Refueling and Water-supply: Assumed to take 1.5 - 2.0 hours.
- Total operational time for shrimp-landing, refueling and water-supply is estimated to take about 4 hours/boat.

(3) Berth Occupancy

- Number of operational shrimp trawlers: In short-term, 24 boats/week (6 days) x 35 weeks/year is assumed. Hence, the average number of boats to call at La Palma is given as 4 boats/day.
- Short-term (Initial Development): 4 boats/day. In order to set in the total operation time for 4 boats within daytime, construction of **4 berths** is considered. Berth occupancy is estimated as follows.
  (4 hours/boat/berth x 4 boats/day)/ 4-berth = 4 hours/day/berth

- Middle-term: 48 boats/week (8 boats/day)
  (4 hours/boat/berth x 8 boats/day)/ 4-berth = 8 hours/day/berth
- Long-term: 72 boats/week (12 boats/day), 4 more berths should be constructed (total **8 berths**).
  (4 hours/boat/berth x 12 boats/day)/ 8-berth = 6 hours/day/berth
  Redundant time of berth occupancy will be provided to the convenience and utilization of semi-industrial fishing boats.

(4) Ramp for Artisanal Fishing Boats

- Design Width of Ramp: Width is planned as **15 m** to accommodate at least 3 boats simultaneously (refer to Figure 15.5.1).
- It is assumed that the 50 artisanal fishing boats (50 %) out of the 100 boats registered at La Palma will land fish-catch daily.
- Operational time of fish-landing: The process of fish-catch landing works (berthing of boat, unloading and weighing of fish, and taking-off the berth) will take about 30 minutes (0.5 hours) per three boats. Total operational time of fish-landing is estimated to take 8.3 hours/day for 50 boats/day (0.5 hour x 50 boats/day / 3 boats = 8.3 hours/day).

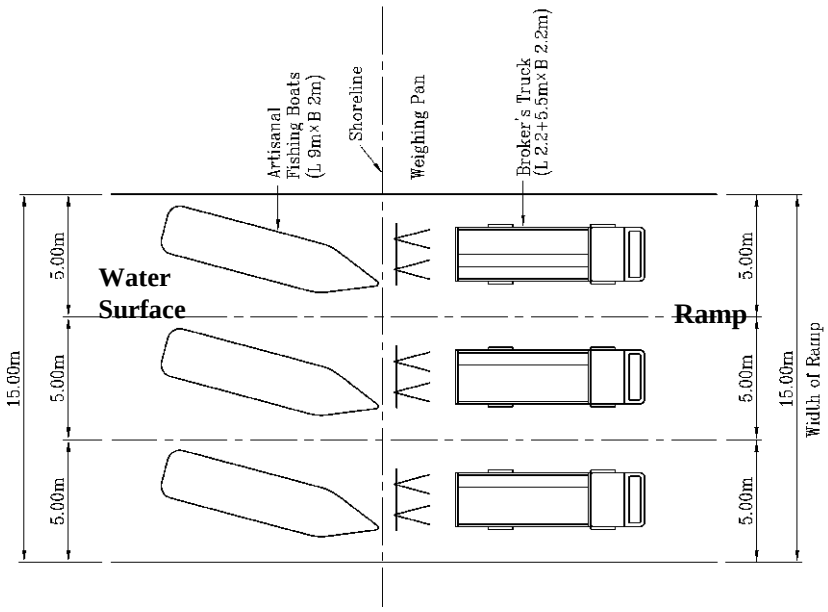


Figure 15.5.1 Dimensions and Utilization of Ramp at La Palma

General layout plan of the La Palma Fishing Port development is shown in Figure 15.6.2.

15.5.3 Ice Making Plant

(1) Ice Consumption by Fishing Boats

Current industrial fishing boats are equipped with their own refrigerating system and ice supply is no longer needed for their fishing activities. Therefore the ice making plant is planned for ice supply to the semi-industrial and artisanal fishing boats and for the distribution purpose of fish catches as well.

This estimate assumes that the fish-catch of the fishing boats in the area of the 2nd group (refer to Table 15.2.2) in Gulf of San Miguel will be landed at La Palma Port, and ice will be supplied to the fishing boats through fish brokers. The catches per boat/sail/year are summarized in Table 15.5.2. In the estimate, the ice volume is determined to cope with the requirement during the most active fishing period of the region.

Table 15.5.2 Fish-catch by Sail and by Boat type (La Palma)

Boat Type	Annual Fish-catch (ton)		Number of Boats	Number of Sails/year	Fish-catch (kg/boat/sail)
	Shrimp	Fish			
Semi-industrial Fishing Boat	-		30 *1	24 *2	-
		650			902.8
Artisanal Fishing Boat	131		183 *3	111 *4	6.4
		1,177	78 *3	240	62.9

Notes
* 1: Assumed number of boats to come to the Darien fishing ground (refer to Table 15.2.2).
* 2: 3 sails/month x 12 months/year x 2/3 (operational rate due to weather conditions).
* 3: 70% of the fishing boats are registered to shrimp-fishing and 30% are to fishes. About 80% of the registered boats are assumed active in average (after the study of University of Miami, June 2003).
* 4: In the case of artisanal shrimp-fishing in Darien, 90% of the annual catch is captured in the five months from April to August, and 20 days per month in average are operational.
(5 months/year x 20 days/month)/90 % = 111 days/year.

The volume of ice to be consumed in the fishing activities is estimated assuming efforts to improve the freshness-keeping of fish-catch and is given as follows:

Ice for shrimp (to keep market price high): 1.0 times of the shrimp-catch volume,
Ice for quality fishes: 0.7 times of the fish-catch volume.

Table 15.5.3 Estimation of Ice loaded in Fishing Boats (La Palma)

Boat Type	Fish-kind	Fish-catch (kg/boat/sail)	Ratio of Ice	Ice Volume (kg/boat/sail)
Semi-industrial Fishing Boat	Shrimp	-	-	-
	Fish	902.8	0.7	632
Artisanal Fishing Boat	Shrimp	6.4	1.0	6.4
	Fish	62.9	0.7	44.0

Table 15.5.4 Ice Consumption Volume for Fishing (La Palma)

Boat Type	Fish-kind	Number of Boats	Number of Sails/year	Ice Volume (kg/boat/sail)	Annual Ice consumption (ton/year)
Semi-industrial Fishing Boat	Shrimp	-	-	-	-
	Fish	30	24	632	455
Artisanal Fishing Boat	Shrimp	183	111	6.4	130
	Fish	78	240	44.0	824
					1,409

Ice for Fishing: 1,409 tons/year = 117.4 tons/month = **4.7 tons/day** (25 days/month)

(2) Ice Consumption for Distribution

The required ice volume for keeping freshness of the catch is empirically assumed as follows.

Ice for shrimp (to keep market price high): 1.0 times of the shrimp-catch volume,
Ice for quality fishes: 0.5 times of the fish-catch volume.

Table 15.5.5 Ice Consumption Volume for Distribution (La Palma)

Boat Type	Fish-kind	Fish-catch (ton/year)	Ratio of Ice	Ice Volume (ton/year)	Active days	Ice Volume (ton/day)
Industrial and Semi-industrial	Shrimp	1,000	1.0	1,000	210	4.8
	Fish	650	0.5	325	240	1.4
Artisanal Fishing Boat	Shrimp	131	1.0	131	111	1.2
	Fish	1,177	0.5	588.5	240	2.4
					Total	**9.8**

Based on the above calculation results (4.7 + 9.8 = 14.5 tons/day), an ice making plant with a capacity of **15 tons/day** will be installed.

(3) Type of Ice

The ice will be sold to the fishing boats and brokers. There are three types of ice generally used for the fisheries: namely, block ice, plate ice, flake ice.

Comparing with other types of ice, the block ice requires the facility of larger size and many attachments. Also, the plant cost as well as running cost of this type of equipment is most expensive (refer to Table 15.3.6) among the three types. Therefore block ice is not recommendable in this Project.

Comparing the plate ice with flake ice, the making capacity per unit horsepower of a plate ice plant is more effective than a flake ice plant. Repairing of a plate ice plant is easier. Most of the ice will be loaded on ship with ice storage boxes, for which plate ice is more suitable. Moreover, plate ice is suitable for long sailing since it melts slowly. For the reasons above, plate ice is considered most recommendable.

Table 15.5.6 General Characteristics of Ice in Type

Type of Ice	Flake Ice	Plate Ice	Block Ice
Shape/Dimension (mm)	10 x 15 x 1.2	30 x 40 x 15	600 x 200 x 800
Ice Making Cycle	Continuous	Approx. 30 min.	24 - 48 hours
Temperature at Ice Making	Approx. - 2ºC	0ºC	At storage: - 10ºC
Melting Speed in Water	Quick	Slow	Slow
Fit for Fish Body	Good	Good	Damage on fish
Plant Cost	Low	Low	High
Handiness of Ice	Easy	Easy	Difficult
Suitability to Fish Type	Not suitable to big and medium fishes due to large void between fishes.	Suitable for all type of fish since good contact between fish and ice.	Contact with fish become well after the surface of block ice is melted.
Running Cost	0.5	0.5	1.0
Maintenance/Check	Adjustment require technical know-how	Adjustment is easy	Adjustment require technical know-how
Operation Mode	Automatic operation	Automatic operation	Man power for dehydration, etc.

15.5.4 Fuel Consumption by Fishing Boats

(1) Assumptions

1) Industrial Shrimp-trawlers

Engine Power: 350 HP in average as for Industrial Shrimp-trawlers

Fuel Consumption Rate: 70 litre/hour of Diesel Oil at full-power

2) Semi-industrial Fishing Boats

Engine Power: 150 HP in average

Fuel Consumption Rate: 30 litre/hour of Diesel Oil at full-power

3) Artisanal Fishing Boats

Engine Power: 40 HP in average

Fuel Consumption Rate: 18 litre/hour of Gasoline at full-power

Note: Fuel Consumption Rate of Motor Boat (Source: YAMAHA)

Inboard Engine	Engine Power	Cruising Speed	Full Speed
(Diesel Oil; litre/hour)	100 HP	14	20
	150 HP	21	30
	350 HP	49	70
	400 HP	56	80
	450 HP	63	90
Outboard Engine	Engine Power	Cruising Speed	Full Speed
(Gasoline; litre/hour)	25 HP	7.0	10.7
	40 HP	12.5	18.5
	50 HP	15.0	22.0
	75 HP	23.0	34.0
	115 HP	33.0	49.0

(2) Fuel Consumption

1) Industrial Shrimp-trawlers

Fuel consumption by a shrimp trawler in a week sailing-out is calculated as follows:

- 2 x 2 hours from/to La Palma to/from Darien Fishing Ground:
  70 litre/hour x 4 hours = 280 litre/boat
- Fishing Operation at the fishing ground (20 hours sailing at half speed for 6 days)
  20 hours/day x 6 days x (1/4) x 70 litre/hour = 2,100 litre/boat

The weekly consumption of Diesel oil by the industrial shrimp trawlers (48 boats; middle-term) is estimated as follows:

(280 + 2,100) litre/boat x 48 boats = 114,240 litre (28,560 gallons)

2) Semi-industrial Fishing Boats

Similarly, the fuel consumption by Semi-industrial Fishing Boats is estimated as follows:

30 litre/hour x 4 hours + 20 hours/day x 6 days x (1/4) x 30 litre/hour = 1,020 litre/boat

The weekly consumption of Diesel oil by the semi-industrial fishing boat is estimated as follows considering the average 30 boats/week:

1,020 litre/boat x 30 boats = 30,600 litre/week (7,650 gallons)

3) Fuel Consumption of Artisanal Fishing Boats (Gasoline)

Fuel Consumption Rate: 18 litre/hour of Gasoline at full power.
18 litre/hour x 4 hours + 6 hours/day x (1/4) x 18 litre/hour = 99 litre/boat

Assuming the number of active boats per week as 300 (50 boats x 6 days),

99 litre/boat x 300 boats/week = 29,700 litre/week (7,425 gallons)

(3) Capacity of Fuel Tanks

1) Diesel Oil

The following total weekly fuel consumption by the Industrial Shrimp-trawlers and Semi-industrial Fishing Boats is planned as the storage volume of Fuel Tank (Diesel Oil).

114,240 litre + 30,600 litre = 144,840 litre/week (about 36,000 gallons)

2) Gasoline

Weekly fuel consumption by the artisanal fishing boats is planned as the storage volume of Fuel Tank (Gasoline): 29,700 litre/week (about 7,500 gallons).

Approximately, 25 m x 10 m space will be required for the storage tanks of Diesel Oil (36,000 gallons), Gasoline (7,500 gallons) and lubricant. The oil storage space shall be enclosed by an Oil Retaining Wall (height: 1.2 - 1.5 m above ground level).

15.5.5 Water Supply

Water supply to the port facility and fishing boats are basically planned to come from the city water of La Palma.

The city water supply in La Palma sometimes becomes short in the dry season. Water for ice making and water supply to fishing boats should be secured to supply water steadily in the port. Therefore, a water reservoir tank of 20 m^3 in capacity and pressure device are planned to be installed as a countermeasure to avoid the cut-off of water supply.

15.6 Preliminary Design of Facilities

15.6.1 Design Concept

The new port facilities planned at La Palma Port are mainly "Berth for shrimp trawler boats," "Ramp for artisanal fishing boats" and "Ice Making Plant."

The following particular conditions are to be considered to design these facilities:

- Large Tidal Range; approx. 6 m
- Strong Tidal Current; 2.0 knot/sec
- Soft Ground; Thickness of the soft clayey silt is more than 20 m
- Shallow Beach; Slope of the existing seabed is 6 %
- Adjacent to IDB berth facilities; approx. 20 m to north side.

The design concepts for the marine facilities are as follows:

- To be able to accommodate calling boats at any time
- To adapt the strong tidal currents and subsoil conditions
- To be easy for ship maneuvering.

The general layout plan at La Palma Port is shown in Figures 15.6.3 and 15.6.4. The layout of the berth for shrimp trawler boats is parallel to the shoreline and extends to the opposite side of the IDB berth facilities. This layout is determined so that the ship maneuvering is easy for berthing/deberthing in the strong tidal current. The structural type of berth is selected open pile type to adapt to tidal currents and subsoil conditions.

15.6.2 Design Conditions

(1) Natural Conditions

1) Tide

Tide levels at La Palma Port are determined by referring to AMP as part of the studies related to the new IDB berth facilities at La Palma and Puerto Quimba.

Table 15.6.1 Tide Levels at La Palma Port

HHW (Higher High Water Level)	+5.46 m
MLWS (Mean Low Water Spring)	±0.00 m
LLW (Lowest Low Water Level)	-0.76 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 15.6.1 and 15.6.2.

▽Existing Ground

Inorganic Silt N=1, c=1.4tf/m^2, γ =1.5tf/m^3

▽-1.0 m (below MLWS)

Inorganic Silt N=1, c=0.6tf/m^2, γ '=0.5tf/m^3

▽-13.0 m (below MLWS)

Inorganic Silt N=20, c=10tf/m^2, γ '=0.5tf/m^3

Figure 15.6.1 Typical Subsoil Conditions at Land Side

Source: JICA Study Team

▽Existing Sea Bed

Inorganic Silt N=2, c=2.0tf/m^2, γ '=0.5tf/m^3

▽-23.0 m (below MLWS)

Inorganic Silt/Silty Sand N>50, c=10tf/m^2, γ '=0.5tf/m^3

Figure 15.6.2 Typical Subsoil Conditions at Sea Side

Source: JICA Study Team

4) Seismic Coefficient

Seismic coefficient of effective peak acceleration at La Palma Port is 0.18 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 15.6.2 Dimensions of Target Vessels

	Industrial Shrimp Trawler Boat	Artisanal Fishing Boat
Tonnage (GRT)	150	-
Length overall (m)	20.0	9.0
Breadth (m)	5.5	2.0
Draught (m)	2.0	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: Total weight of truck = 20 tf/truck

4) Width of Berth: 13 m
Width of Access Bridge: 6.5 m
Width of Ramp: 15 m

5) Lifetime: 50 years

15.6.3 Design of Berthing Facilities

(1) Crown Heights of Berth

The crown heights of berth are determined by the following formula and in consideration of existing ground level and facilities.

Crown Height of Berth = HHW (+5.46 m) + 0.6*$H_{1/3}$ (1.0 m) = +6.06 m, say <u>+6.5 m</u>

(2) Required Depth of Berth

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

Required Depth of Berth = LLW (-0.76 m) – Draught (2.0 m) – 0.5*$H_{1/3}$ (1.0 m) = -3.26 m,
say <u>-3.5 m</u>

(3) Selected Structural Type

The shrimp berth and access bridge are planned with open pile type RC deck structure supported by the PC concrete piles. Based on the subsoil investigation for the site, an inorganic silt layer (N value > 20) is encountered at about –13 m to –23 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 on the alignment of the piles and loads on the berth, the adopted size of the square piles are 600 mm x 600 mm for the shrimp berth and 500 mm x 500 mm for the access bridge.

The RC deck for the berth consists of RC pile caps, RC beams on the piles and RC slab on the beams.

Based on the design vessel size, berth accessories such as mooring bollards and fenders are determined. The capacities of accessories are planned 15-ton bollard and wooden fenders. The mooring bollards are installed at 10 m intervals for the shrimp berth and the curbing are installed between the bollards. The shrimp berth will be equipped with mechanical hoists for landing catches and loading ice.

The typical structure is shown in Figure 15.6.5 for the shrimp berth and Figure 15.6.6 for the access bridge.

15.6.4 Design of Ramp

(1) Crown Heights of Berth

The crown heights of ramp are determined by the following formula and in consideration of existing ground level and facilities.

Crown Height of Ramp = HHW (+5.46 m) + 1.0*$H_{1/3}$ (1.0 m) = +6.46 m, say <u>+6.5 m</u>

(2) Required Depth of Ramp

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

Required Depth of Ramp = MLWS ($\pm$0.00 m) – Draught (0.5 m) – 0.5*$H_{1/3}$ (1.0 m) = -1.0 m,
say <u>-1.0 m</u>

(3) Selected Structural Type

The structural type of ramp is concrete slipway type on the rubble mound. The slope of the ramp is planned with a single-gradient as 1:6 to be utilized by small ships for human power-based lifting of ships. The structure of the front wall of the ramp is planned with gravity type of pre-cast

concrete wall. The pavement of the ramp consists of cast-in-place concrete slab (thickness 20 cm) above +2.0 m and pre-cast concrete block (slab size: 2 x 2 m, thickness 30 cm) below +2.0 m from MLWS.

The steel sheet piles are placed at the both side of the rubble mound for the purpose of the soft-ground-stabilization method, which is to prevent the circular slip failure.

The typical structure is shown in Figure 15.6.7 and Figure 15.6.8 for the ramp.

15.6.5 Sediment Transport and Design Consideration

La Palma is located at the estuary of Rio Tuira inpouring Gulf of San Miguel. Though it is well sheltered from ocean waves, its location is exposed to the strong tidal current induced by large tidal range here in addition to the inherent river flow. The maximum flow speed is to reach to 2.5 knots (about 1.2 m/s).

Figure 15.6.9 La Palma AMP Pier at low tide

Sediment transport takes place due to the strong tidal current going up and down in the estuary. Fine grains in sediment (mud and silt) are to be sorted and washed away by the strong current. Only coarse grains (sand and gravel) can selectively remain on the beach (refer to Figure 15.6.9).

Since the shrimp landing berth and access bridge are designed with the piled pier structure and the current can pass through the structure, sedimentation problem may not be worried at the foot of the pier. Sedimentation will take place at the water area where water flow is stagnant.

Sedimentation is anticipated at the water area where water flow is stagnant such as the places between the ferry jetty (IDB Project) and the ramp for artisanal fishing boats in the case that those strctures are constructed by embankment and the beaches situated next to these facilities. Sohoreline will advance forward in these beaches and water will become shallower.

Design consideration will be required not to obstruct the river water flow and sediment transport passing by the structures. For this purpose, the part of approach connecting shoreline and the ramp and shrimp berth is designed with the piled pier structure (refer to Figures 15.6.3 and 15.6.4).

15.6.6 Design of Ice Plant

The ice making plant is planned for ice supply to the semi-industrial and artisanal fishing boats. The location of ice plant is on the land side near the shore line.

The general description of the ice plant is shown in following Table 15.6.3.

Table 15.6.3 General Description of Ice Plant

Ice Productivity	15 tons/day
Type of Ice	Plate Ice
Plant Size	9 m * 12 m = 108 m^2
Building	RC structure, 2- Storied
Generator	100 KVA
Water Tank	20 tons

Source: JICA Study Team

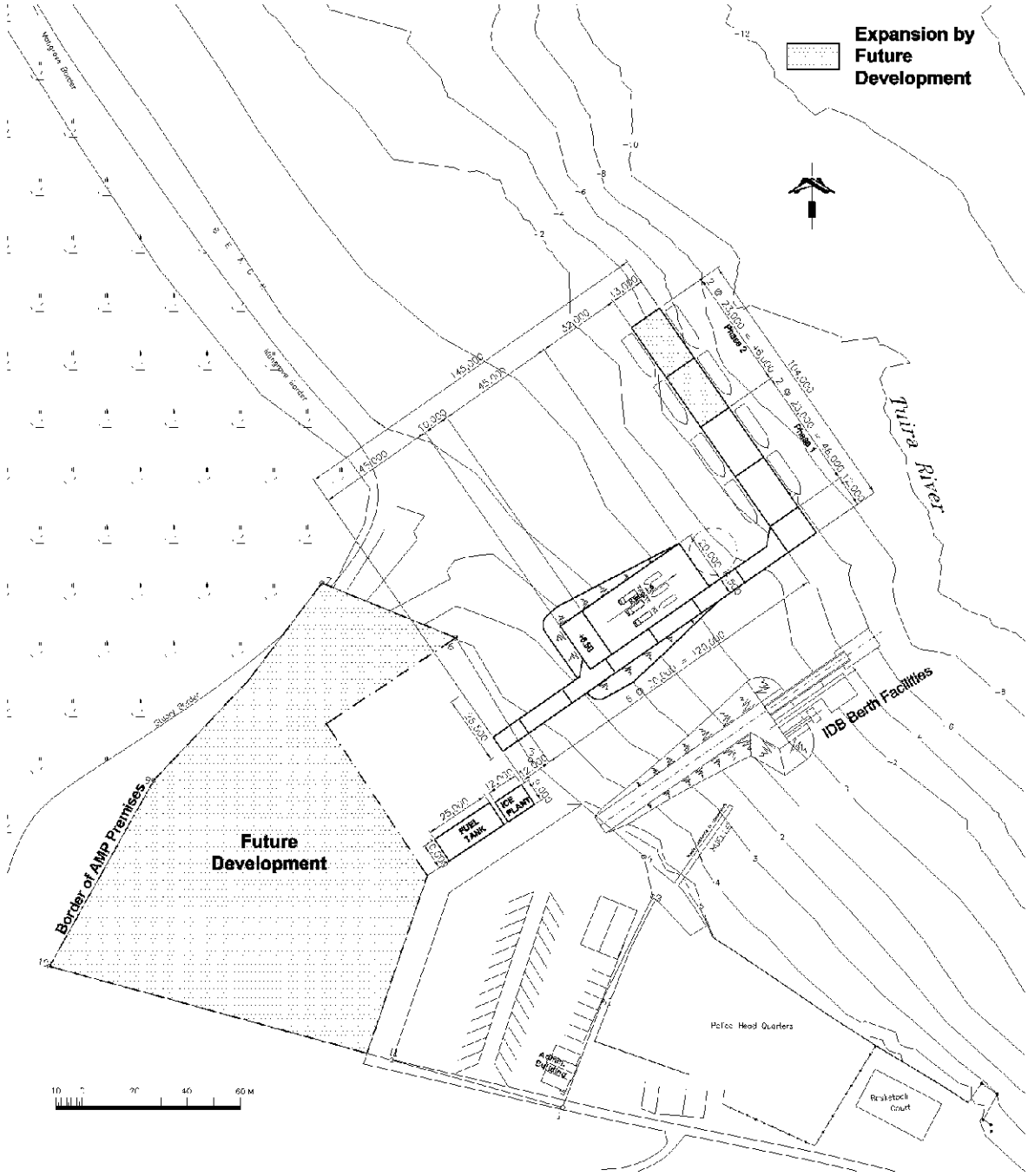


Figure 15.6.3 General Plan of La Palma Port

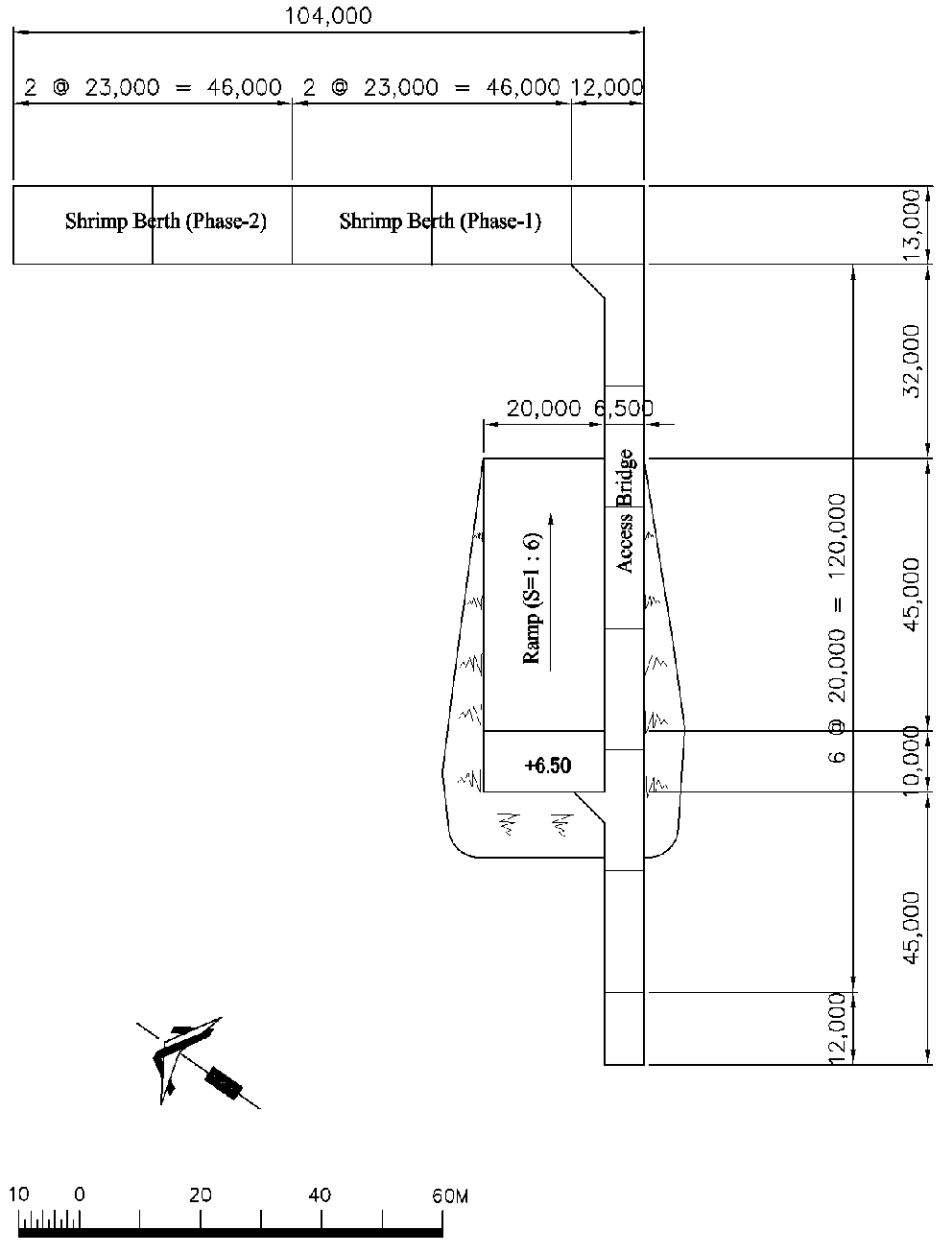


Figure 15.6.4 General Layout Plan of Marine Facilities

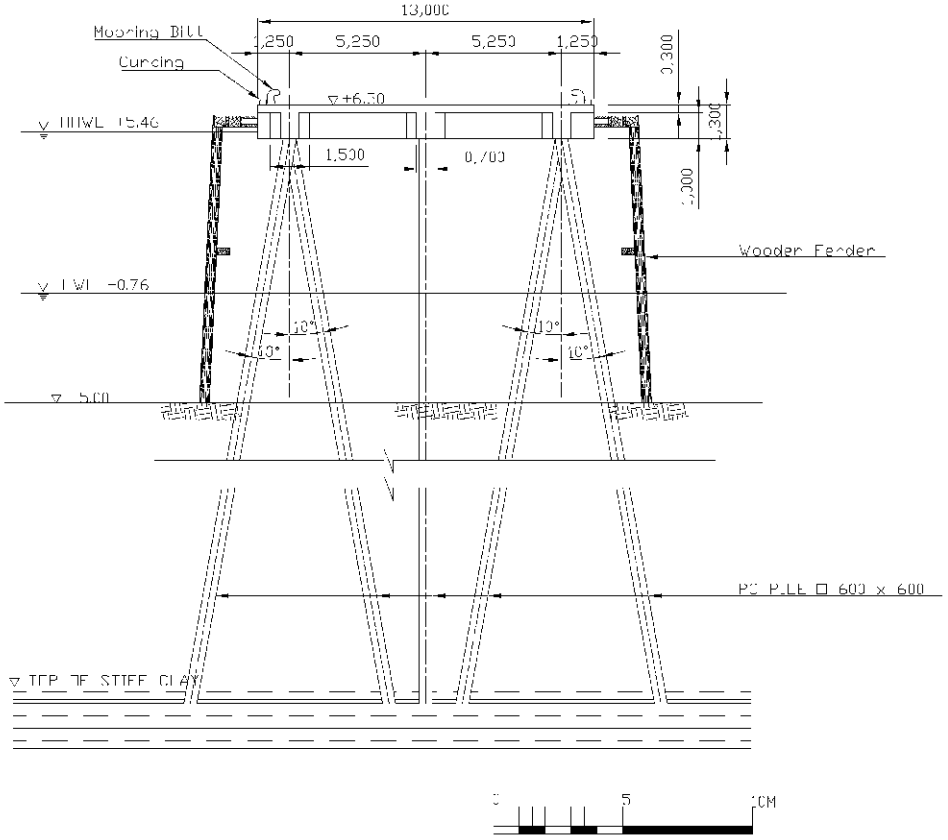


Figure 15.6.5 Typical Section of Shrimp Berth

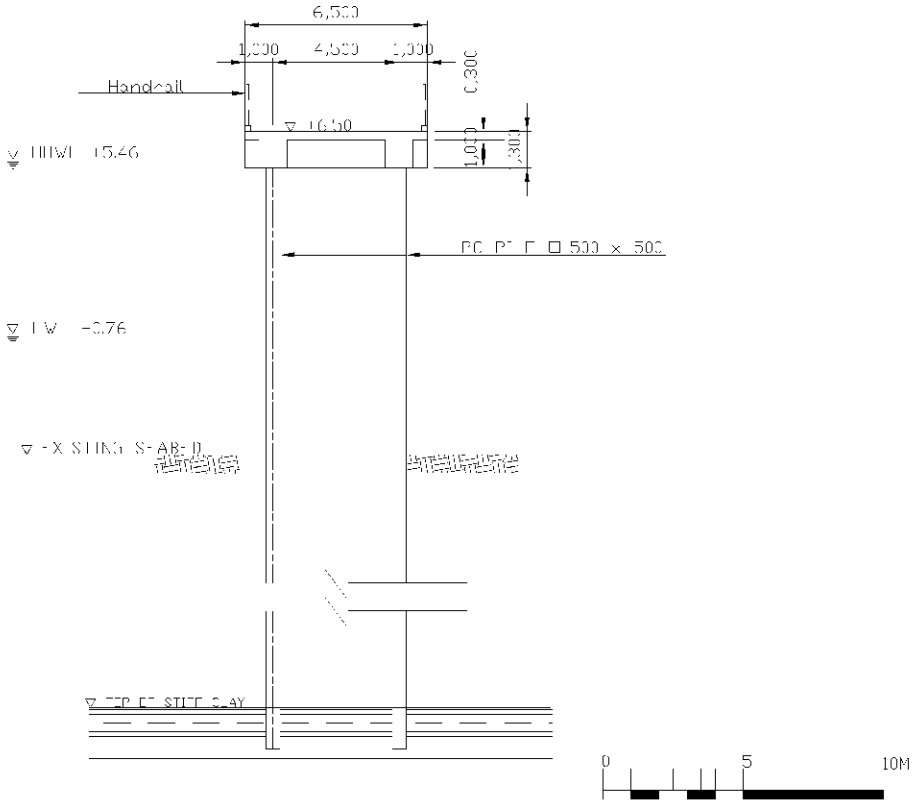


Figure 15.6.6 Typical Section of Access Bridge

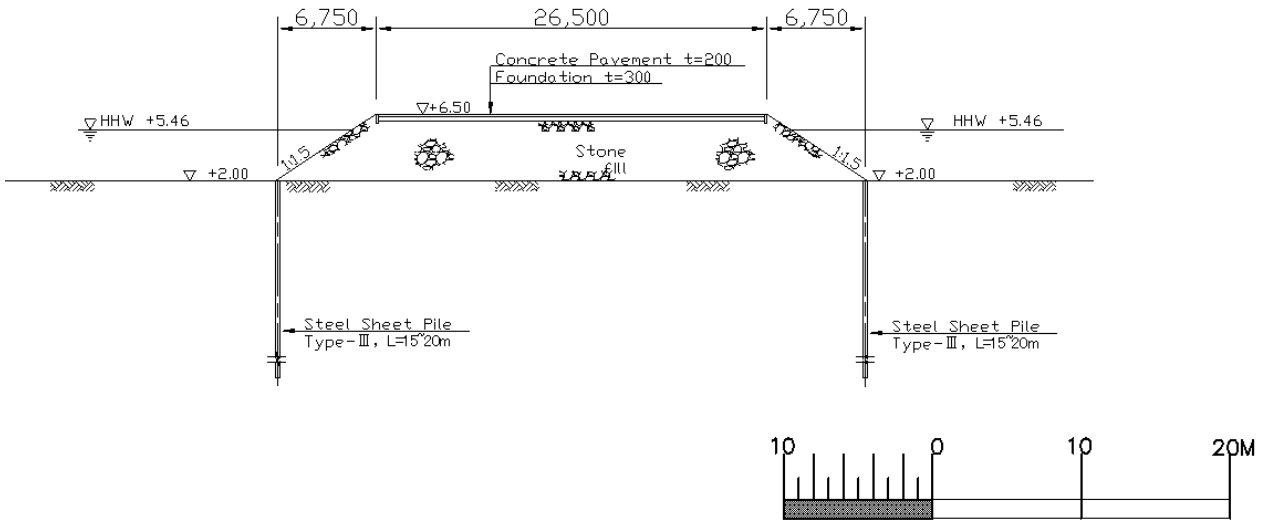


Figure 15.6.7 Typical Cross Section of Ramp

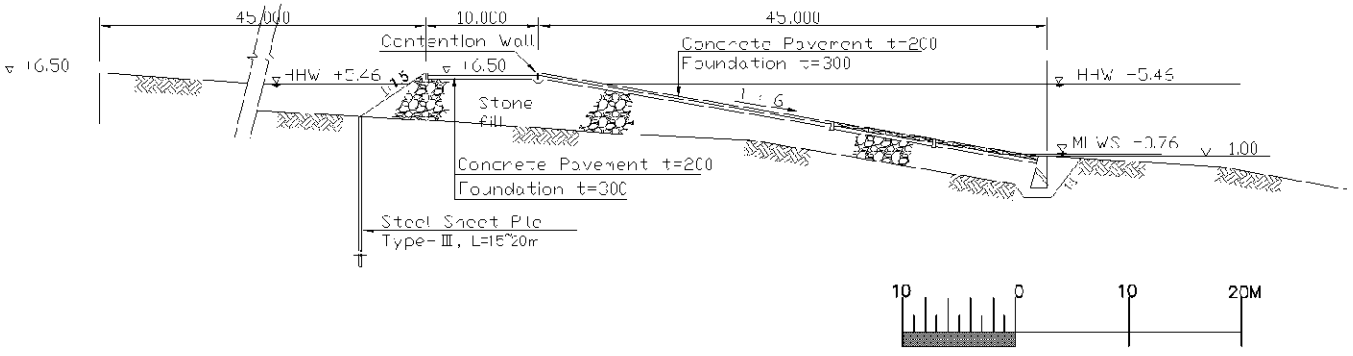


Figure 15.6.8 Typical Longitudinal Section of Ramp

15.7 Project Implementation

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

15.7.1 Project Site

La Palma is the most developed town in Darien Province as it is the provincial capital. There are two ways to access from Panama City: by sea from fiscal pier (or Coquira port), and by land through Quimba. There is an existing AMP's quaywall in the center of La Palma, and it is providing services for these merchant ships. In case of land access, small passenger boats are being operated from Quimba and arrive at the slipway beside of the above AMP's quaywall.

The site is located at the west end of the town, bordered by the La Palma airport. Shallow beach, consisting of soft clay to silt, is extending wider in front of the site. The wave condition is generally calm.

15.7.2 Construction Method for the Major Facilities

(1) Berthing Facilities: PC-Pile supported T-shaped Jetty (-5m)

1) Piling

The pile length is approx. 25 m (trestle) to 34 m (jetty); therefore, a pre-stressed concrete pile divided in 2 or 3 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 2,300 cu.m or less. Temporary concrete mixing plant (20 cu.m/hour) shall be mobilized to the site.

(2) Civil Works

1) Slipway

Rubble stone mound is to be banked from the land side by use of bulldozer. Steel sheet pile (SSP-III or equivalent) is to be driven along the both bank sides to protect from slope failure. The toe protection blocks will be installed by divers during low tide.

2) Revetment

The original shoreline is covered by armor stone.

(3) Yard / Building

1) Land Preparation

18,500 sq.m (Phase I : 4,100 sq.m, Phase II : 14,400 sq.m) of hinterland is leveled at + 6.00 to 6.50 m height above M.L.W.L.

2) Building

150 sq.m of a concrete block management office and 400 sq.m of a steel structure, asbestos roofing shed is to be constructed in the project area.

(4) Utilities

1) Fuel

Diesel oil and gasoline supply facilities are to be constructed. The tank capacities are 36,000 gallons (12,000 gallon x 3 unit) and 7,500 gallons (3,800 gallons x 2 unit)each.

2) Electricity

Required electricity will be supplied through city line operated by the private electric power company. Substation is constructed by this project and city line is connected to this substation. Three phase electricity is supplied for the ice making plant.

3) Water

City water line is connected to the port. Required water for the port facilities and the fishing boats will be supplied at the moment. However, present capacity is not enough for the fishery processing plants which may be constructed in future. To solve this problem, IDAAN is planning to increase water supply capacity by using IDB's funds.

(5) Others

1) Handling Gear

Deck cranes (max. 3.7 t hoisting capaticy) are equipped on the pier for unloading/loading of fishery products and fishing gears. Hoist type crane is recommended for easiness of maintenance.

2) Ice Making Plant

An imported knockdown type plant will be assembled at the site. A steel framed, asbestos roofing, two-story shed is to be constructed.

15.7.3 Purchase of the Materials

(1) Fine Aggregate

River sands will be supplied from Chepigana (20 km from La Palma).

(2) Stone

1) Coarse Aggregate

Coarse aggregates will be supplied from Chepigana, or supplied from Buena Vista (6.5 km from Playa Grande, 12 km from La Palma) by barge.

2) Armor Stone

200-300 kg/pc armor stone is available at Chepigana, and further details will be reported later.

(3) Reclamation Material

Reclamation material is available in La Palma. 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 shall be transported from Panama City by using chartered ships from Juan Diaz or Coquira.

2) Wood

Wooden artifacts, such as doors, window frames, shall be purchased from Panama City and it's suburb, but sawn timber for structural beam is available at La Palma.

3) Accessories

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

4) Equipment etc.

An ice making plant (1), deck cranes (4), and forklift (1) are to be imported or purchased through trade agents in Panama City.

15.7.4 Mobilization of the Construction Equipment

(1) Heavy Equipment

All of heavy equipment shall be mobilized from Panama City by land. The beach landing barge for mobilization will be chartered at Quimba. It can be landed at Senon near La Palma.

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

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

(3) Concrete Plant

A concrete mixing plant of an optimum size will be borrowed from Panama City.

15.8 Project Costs and Capital Expenditure

15.8.1 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 contractors and 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 15.8.1 Preliminary Cost for Master Plan of La Palma Port

La Palma (Phase I, II)						Unit : USD
	Item	**Dimensions**	**Unit**	**Quantity**	**Unit Rate**	**Amount**
1	Land Preparation	including Parking and Hinterland	sq.m	18,487	7.2	132,824
2	Berth/Trestle	2,246 sq.m	sq.m	2,246	1,536.8	3,451,662
3	Mooring Buoy	Steel Made	unit	2	20,000.0	40,000
4	Slipway	B 20m x L 45m	l.sum	1	858,656.0	858,656
5	Revetment		lin.m	130	796.5	103,545
6	Buildings	Shed 400sq.m	l.sum	1	235,000.0	235,000
7	Ice Making Plant	7.5 t/dayx2, with Ice Storage	l.sum	1	1,200,000.0	1,200,000
8	Fuel Supply	with Accessories	l.sum	1	302,140.0	302,140
9	Pavement	Parking Area	sq.m	4,137	106.0	438,522
10	Outdoor Lighting		unit	35	1,250.0	43,750
11	Deck Crane		unit	4	12,500.0	50,000
12	Utilities	Supply line, Connection to city line	l.sum	1	212,800.0	212,800
13	Handling Equip.	3.0 t Forklift, Diesel	unit	1	19,500.0	19,500
14	Cooler Box	1 cu.m	pcs	50	913.0	45,650
Phase I,II Total						**7,134,049**

15.8.2 Capital Expenditure

The capital expenditure schedule assumptions are as follows for economic analysis purpose.

- Start detailed design and select the contractor in 2006.
- Construction (1st phase) in 2007.
- Life expiring facilities such as utilities, mooring devices and plant are to be renewed in 10th year.
- Construction (2nd phase) in 2017.

Table 15.8.2 Capital Expenditure Schedule for Master Plan of La Palma Port

La Palma	USD	Phase-I	Phase-II	Total
		5,917,587	**1,216,462**	**7,134,049**

YR	Construction		0.73	Plant / Equipment		0.27	Engineering	Maintenance
	Foreign	Local	Sub Total	Foreign	Local	Sub Total	10%	1%
F : L	0.63	0.37	1.00	0.63	0.37	1.00		
2006	Phase-I						355,055	
2007	2,719,433	1,622,058	4,341,490	987,239	588,857	1,576,096	236,703	
2008								59,176
2009								59,176
2010								59,176
2011								59,176
2012								59,176
2013								59,176
2014								59,176
2015								59,176
2016	Phase-II			Renewal of Plant/Equipment				59,176
2017	761,970	454,492	1,216,462	987,239	588,857	1,576,096	121,646	59,176
2018								71,340
2019								71,340
2020								71,340
2021								71,340
2021								71,340
2023								71,340
2024								71,340
ST	3,481,403	2,076,549	5,557,952	1,974,478	1,177,715	3,152,192		
T	8,710,145						713,405	
GT	9,423,550							

15.9 Administration and Management

15.9.1 Items to be taken into consideration in the planning

(1) Policy and strategy of the project

The objective of the development of the fishing port facilities is twofold: to establish activity center of the region at La Palma and to preserve the marine resources in Darien coastal area.

For the realization of the first objective, AMP should act not only as the administrative and managerial body of the port, but also as a coordinator to organize all the institutions concerned with the local socioeconomic activities. The second objective, however, is the enhancement of the functions of AMP itself.

(2) Concept of the project

The idea employed in the project is, by relocating some of the commercial fishing boats currently based in Vacamonte Port to La Palma Port, to create new businesses opportunities in La Palma. At the same time, the port will provide artisan fishermen with access to the commercial market.

(3) Inter-modal transport service between La Palma and Quimba

The project highly relies on the inter-modal transport system to be realized by the Darien Sustainable Development Plan. It is the responsibility of AMP to ensure that RoRo ferry service will start between La Palma and Quimba as soon as the RoRo facilities are completed.

It is also vital for the project to promote intra-regional feeder services in the coastal shipping routes within Darien Province.

(4) Other infrastructure

In addition to the transport infrastructure, water, electricity and communication are key elements for the success of the project.

15.9.2 Administration and management Plan

(1) Steps taken by AMP Headquarters

1) Review of the existing policy and regulations

So far, it has been the government's policy to centralize the shrimp processing industry at Vacamonte Fish Port, for the promotion of the Fish Port. Therefore, AMP needs to review and, if necessary, make necessary amendments of rules and regulations in order to allow the establishment of shrimp processing business in other places. A full explanation of the change of policy should be given to shrimp processing firms, especially those based on Vacamonte Port.

2) Incentives to the commercial fishing boats to move to La Palma

To encourage the relocation of the commercial fishing boats to La Palma, AMP should provide better service to the users of La Palma Port than those who remain in Vacamonte Port. All the possible incentive measures should be taken.

3) Interfacing with Darien Sustainable Development Plan

AMP should coordinate MEF and other agencies concerned to interface the project with the on-going Darien Sustainable Development Plan.

4) Public Relations

AMP should propagate the project as well as the inter-modal services between La Palma and Quimba to the public to promote the transport service along the Pan-American Highways. In addition, it should announce its policy for the promotion of the intra-regional coastal shipping with the regional hub port at La Palma.

AMP should also organize forums among the local artisan fishermen. The participation of the local fishermen is also indispensable in the stage of the finalization of the development plan, in particular the operational scheme of the fish port facilities.

5) Formulation of urban development plan of La Palma

AMP should start talks with the local agencies, including the local governments and various ministries concerned, to formulate the urban development plan at La Palma. The preparation of the land use plan should be started at the earliest opportunity for the establishment of activity center with the maximum use of the space generated by the relocation of the airport and the existing AMP port facilities.

In line with the Municipal Development and Decentralization Program, the municipality should be the lead agency in the preparation of the urban-planning. AMP should act proactively in support of the municipality in the coordination with the Darien Project Office of MEF, MIVI and IPAT and so on.

6) Security

When the fishing port is operational, public and private properties such as buildings and equipment, the security is the most important element to protect these properties from robbery. AMP should coordinate with the National Police to establish a security system in the port area.

Security system for the whole municipality is also important to encourage the private firms to think of starting business in La Palma.

(2) Steps taken by the Local Port Offices of La Palma Port

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

2) Coordination with the agencies concerned

The Administrator is the liaison between the Headquarters and the local 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.

3) Regular meeting

Administrator should hold forums among local fishermen and local agencies regularly, to discuss outstanding issues related to the project.

15.10 Economic Analysis

15.10.1 Scope of the Economic Analysis

This is the completely new fishery port construction project. A portion of the industrial fishery boats currently based at Vacamonte fishery port is expected to move to the new La Palma fishery boat complex. The trip time to the Darien fishery ground will decrease remarkably. The reduction of time between fish catch and the market will bring about higher market price due to the freshness. Secondly, the fuel saving is realized from the closeness to the Darien fishery ground from homeport.

The IDB related projects are excluded from the economic analysis. The facilities such as storage and ice plant that will be operated by private business under concession are also excluded.

15.10.2 Estimation of the Economic Cost

Table 15.10.1 summarizes the economic cost of the La Palma Fishery Port Project.

The domestic portion of the construction cost is multiplied by SCF (standard Conversion Factor) 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.

Due to the difficulty of estimating long-term operation and maintenance cost (except for the personnel cost), we adapt the professional judgment of the engineers based on the construction cost.

As for the La Palma port project, the number of the staff is expected to increase by one according to our master plan. The averaged personnel cost is estimated by dividing total personnel cost of AMP as of 2002 with the number of AMP staff. The averaged personnel cost is expected to increase at annual rate of three percent through the project period.

15.10.3 Estimation of the Benefit

Although there are tremendous expected direct and indirect economic benefits from the project, we only estimate the following three groups of the economic benefits that is summarized in **Table 15.10.2**

Table 15.10.1 Overall Cost and EIRR of the La Palma 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
2006	0	0	0	0	0	355,055	355,055	0		0	355,055		(355,055)
2007	3,706,672	2,210,915	1,945,605	5,652,277	414,684	236,703	6,303,665	0	0	0	6,303,665		(6,303,665)
2008	0	0	0	0	0	0	0	59,176	10,629	69,805	69,805	490,752	420,947
2009	0	0	0	0	0	0	0	59,176	10,948	70,124	70,124	680,073	609,949
2010	0	0	0	0	0	0	0	59,176	11,276	70,452	70,452	834,972	764,520
2011	0	0	0	0	0	0	0	59,176	11,614	70,790	70,790	989,871	919,081
2012	0	0	0	0	0	0	0	59,176	11,963	71,139	71,139	1,144,770	1,073,631
2013	0	0	0	0	0	0	0	59,176	12,322	71,498	71,498	1,316,880	1,245,382
2014	0	0	0	0	0	0	0	59,176	12,691	71,867	71,867	1,454,568	1,382,701
2015	0	0	0	0	0	0	0	59,176	13,072	72,248	72,248	1,575,045	1,502,797
2016	0	0	0	0	0	0	0	59,176	13,464	72,640	72,640	1,695,522	1,622,882
2017	1,749,209	1,043,349	918,147	2,667,356	116,192	0	2,783,548	59,176	13,868	73,044	2,856,592	1,781,577	(1,075,015)
2018	0	0	0	0	0	0	0	59,176	14,284	73,460	73,460	1,962,054	1,888,594
2019	0	0	0	0	0	0	0	59,176	14,713	73,889	73,889	2,065,320	1,991,431
2020	0	0	0	0	0	0	0	59,176	15,154	74,330	74,330	2,151,375	2,077,045
2021	0	0	0	0	0	0	0	59,176	15,609	74,785	74,785	2,237,430	2,162,645
2022	0	0	0	0	0	0	0	59,176	16,077	75,253	75,253	2,323,485	2,248,232
2023	0	0	0	0	0	0	0	59,176	16,559	75,735	75,735	2,409,540	2,333,805
2024	0	0	0	0	0	0	0	59,176	17,056	76,232	76,232	2,478,384	2,402,152
2025	0	0	0	0	0	0	0	59,176	17,057	76,233	76,233	2,478,384	2,402,151
2026	0	0	0	0	0	0	0	59,176	17,058	76,234	76,234	2,478,384	2,402,150
2027	987,239	588,857	518,194	1,505,433	0	0	1,505,433	59,176	17,059	76,235	1,581,668	2,478,384	896,716
2028	0	0	0	0	0	0	0	59,176	17,060	76,236	76,236	2,478,384	2,402,148
2029	0	0	0	0	0	0	0	59,176	17,061	76,237	76,237	2,478,384	2,402,147
2030	0	0	0	0	0	0	0	59,176	17,062	76,238	76,238	2,478,384	2,402,146
2031	0	0	0	0	0	0	0	59,176	17,063	76,239	76,239	2,478,384	2,402,145
2032	0	0	0	0	0	0	0	59,176	17,064	76,240	76,240	2,478,384	2,402,144
2033	0	0	0	0	0	0	0	59,176	17,065	76,241	76,241	2,478,384	2,402,143
2034	0	0	0	0	0	0	0	59,176	17,066	76,242	76,242	2,478,384	2,402,142
2035	0	0	0	0	0	0	0	59,176	17,067	76,243	76,243	2,478,384	2,402,141
2036	0	0	0	0	0	0	0	59,176	17,068	76,244	76,244	2,478,384	2,402,140
2037	987,239	588,857	518,194	1,505,433	0	0	1,505,433	59,176	17,069	76,245	1,581,678	2,478,384	896,706
2038	0	0	0	0	0	0	0	59,176	17,070	76,246	76,246	2,478,384	2,402,138
2039	0	0	0	0	0	0	0	59,176	17,071	76,247	76,247	2,478,384	2,402,137
2040	0	0	0	0	0	0	0	59,176	17,072	76,248	76,248	2,478,384	2,402,136
2041	0	0	0	0	0	0	0	59,176	17,073	76,249	76,249	2,478,384	2,402,135
2042	0	0	0	0	0	0	0	59,176	17,074	76,250	76,250	2,478,384	2,402,134
2043	0	0	0	0	0	0	0	59,176	17,075	76,251	76,251	2,478,384	2,402,133
2044	0	0	0	0	0	0	0	59,176	17,076	76,252	76,252	2,478,384	2,402,132
													EIRR
													16.39%

Table 15.10.2 Overall Benefit of The La Palma Port Project

USD

Year	Annual Treatment Volume (Ton)	Ship Calls/Year	Ship Calls/week	Market Value Improvement Per Ton	Annual Benefit from Market Value Improvement	Fuel Saving Per Ton	Annual Fuel Saving	Land Transportation Cost per Truck	Annual Land Transportation Cost	Overall Benefit
2005										
2006										
2007										
2008	320	533	15	1,584	506,880	137.1	43,872	300	(60,000)	490,752
2009	430	717	20	1,584	681,120	137.1	58,953	300	(60,000)	680,073
2010	520	867	25	1,584	823,680	137.1	71,292	300	(60,000)	834,972
2011	610	1,017	29	1,584	966,240	137.1	83,631	300	(60,000)	989,871
2012	700	1,167	33	1,584	1,108,800	137.1	95,970	300	(60,000)	1,144,770
2013	800	1,333	38	1,584	1,267,200	137.1	109,680	300	(60,000)	1,316,880
2014	880	1,467	42	1,584	1,393,920	137.1	120,648	300	(60,000)	1,454,568
2015	950	1,583	45	1,584	1,504,800	137.1	130,245	300	(60,000)	1,575,045
2016	1,020	1,700	49	1,584	1,615,680	137.1	139,842	300	(60,000)	1,695,522
2017	1,070	1,783	51	1,584	1,694,880	137.1	146,697	300	(60,000)	1,781,577
2018	1,140	1,900	54	1,584	1,805,760	137.1	156,294	0	0	1,962,054
2019	1,200	2,000	57	1,584	1,900,800	137.1	164,520	0	0	2,065,320
2020	1,250	2,083	60	1,584	1,980,000	137.1	171,375	0	0	2,151,375
2021	1,300	2,167	62	1,584	2,059,200	137.1	178,230	0	0	2,237,430
2022	1,350	2,250	64	1,584	2,138,400	137.1	185,085	0	0	2,323,485
2023	1,400	2,333	67	1,584	2,217,600	137.1	191,940	0	0	2,409,540
2024	1,440	2,400	69	1,584	2,280,960	137.1	197,424	0	0	2,478,384

(1) Market price increase due to the freshness

Our fishery expert estimates the market price of white prawn as 13904 USD per ton (through Vacamonte), 17072 USD per ton (through La Palma, Phase I), and 17348 USD (through La Palma, Phase II). The price difference will be the economic benefit. But, due to uncertainty in operation and market condition, we adopt the half of the price difference as the economic benefit.

(2) Saving of fuel cost

One return trip (16 days) to Darien fishery ground from Vacamonte requires 1,400 liter diesel oil which costs 595 USD. One return trip (6 days) to Darien fishery field from La Palma requires 280 liter diesel oil which costs 119 USD. Thus, the saving of fuel cost per one ton of shrimp at La Palma is estimated as 137 USD.

(3) Land transportation cost from La Palma to Vacamonte

During Phase I, the white prawn must be transported from La Palma to Vacamonte because the processing facility at La Palma is planned in Phase II. The land transportation cost to Vacamonte must be subtracted from the economic benefit.

15.10.4 Economic Internal Rate of Return (EIRR)

As Table 15.10.1 shows the estimate of EIRR for the project is 16.39 percent. The EIRR of 16.4 % is above the levels of 13% - 15%, which are the levels commonly employed to assess an infrastructure project to be economically feasible.

15.11 Initial Environmental Examination (IEE)

The long-term environmental effects consequent to the implementation of the master plan in La Palma are evaluated on preliminary basis so as to form the IEE (Initial Environmental Examination). The environmental effects are separated between social effects and other effects, principally focusing 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 15.11.1 and Table 15.11.2 respectively.

(1) Social Effects

Basically the planned facilities are to be constructed above the water of Turia River, the piers for ship berthing, and the adjoining mangrove shoreline belonging to the owner of the plan, AMP. Accordingly the implementation of the plan involves no land acquisition or resettlement of population including any housing compensation. Hence there exist no potential social adverse effects consequent to the implementation of the port development facilities as per the master plan. On the other hand beneficial social effects of increased employment opportunities in shrimp fishery will be realized.

(2) Other Effects

The plan for the provision of shoreline facilities involves destruction of some mangrove woods, an irreversible ecological loss. Still, the loss for the provision of essential shoreline access facilities to the piers itself is very little and could be regarded as extremely insignificant. Even though the establishment of all planned facilities of the master plan including the shrimp processing companies within the mangrove woods owned by AMP will result in the irreversible loss of a mangrove vegetation in an area of only about 2 ha, which is considered admissible in consideration to the vast mangrove wood lands that exists in the area, it is still recommended to minimize this loss in mangrove woods. In this respect it is recommended that the shrimp processing companies, that are planned to be provided in the long term, be located elsewhere in an existing highland area so as to make the loss in mangrove vegetation negligible, provided such a nearby highland area would be available during the time of establishment of these shrimp processing companies.

Moreover, berthing of ships and also shrimp processing would result in inherent waste generation. AMP as the project owner, so as not pollute the estuarine waters of Turia River, shall properly manage these wastes. The potential wastes generated due to vessel berthing include oily (bilge) wastes and also garbage. Proper management of these wastes so as to mitigate illegal dumping of such wastes into the river waters is the only available means to mitigate water environmental pollution attributed to vessel berthing.

Table 15.11.1 Format for screening-La Palma 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][?]	No land acquisition or resettlement
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][?]	Infterfernce to fishing during construction, a possibility
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 small-scale
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][?]	Some loss of estuarine mangrove
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 significant 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 and shirimp processing operation 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 15.11.2 Checklist for Scoping-La Palma Master Plan

No.	Environmental Item	Evaluation	Reasons
Social Environment			
1	Resettlement	D	No resettlement is involved
2	Economic activities	D	The project will benefit port service. (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 fishing rights may be 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 coastal zone at project site (In fact estuarine river zone)
15	Fauna and flora	B	Some short–term adverse effect during construction is anticipated. Also some loss of mangrove due to reclamation
16	Meteorology	C	Project has no effect though meteorology may effect construction works
17	Landscape	D	Plan is small enough to exert any significant change in landscape
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	C	Shrimp processing is a source of potential facility operational 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)

15.12 Recommendations and Regional Development

(1) Development of Fishing Infrastructure at Garachine

Rio Tuira and eight rivers, large and small, are pouring into Gulf of San Miguel of Darien. They are stimulating reproduction of the marine resources in the gulf. The offshore water area of the 65 miles coast reaching the frontier of Colombia is known as a rich fishing ground of the migratory fishes such as tuna (*atun*), bonito and scads (*jurel*). Darien is endowed with the abundant marine resources still unexploited.

The largest fishing village on the coast of the Gulf of San Miguel is Garachine. Although about 40 % of the Darien's artisanal fishermen are concentrate there, their fishing activities are largely constrained by the big tidal range there. A tidal flat wetland of 500 - 800 m width emerges from the shoreline at low tide; sailing out to fish and land fish-catch are possible only in a limited time. The fishing boats of Garachine land on the bank of a small estuary at the beach, and they sail out after waiting for high tide.

Presently, the fish-catches land at Garachine are handled by eight fish-brokers and are transported to Panama City by air-route or road via Quimba. The fish-catches are handled solely in the buyers market.

A fishermen's cooperative is being organized at Garachine aiming at steady income and improvement of life for fishermen. Cooperative shipment of the fish-catches is getting possible using their own boats. Garachine should be equipped with a full-time accessible fish landing facility and a cold storage.

Hence, the development of the fishing infrastructure at Garachine in line with the development at La Palma is highly recommendable to enable the full-time fishing activity which is constrained by the tide level at present.

(2) Development of Aquaculture in Gulf of San Miguel

The development plan of the La Palma fishing port has the prospect to invite the fish processing industry to set up its plants at La Palma in the future. However, there are closed seasons of shrimp fishing set up for about 4 months in a year presently. In order to avoid the idling of the processing plant operation in the closed season for shrimp, it is necessary to secure raw materials for the processing by other means. Hence, Study Team would like to recommend the development of the aquaculture of shellfishery in Gulf of San Miguel.

Aquaculture of the shellfishery such as *Concha Negra* (arch shell), *Ostra* (oyster) and *Almeja* (clam) is expected to be successful because it is better adapted to the environment of the tidal flat. It will take 5 - 10 years efforts of surveys and examinations before becoming operational. Hence the earlier implementation is recommended.

By these means, stable operation of the fish processing industry at La Palma and also improvement of steady income for the artisanal fishermen in the region will be ensured.

(3) Sustainable Development of Marine Resources

Over fishing of shrimp by fishermen is often a controversial topic. The education of fishermen to enhance their conservation mind towards marine resources and surveillance and regulation of the fishing activities by National Police and the marine resources authority are necessary. Required budgetary steps must be taken.

The problem will not be solved only by the enhancement of surveillance and regulation. To this end, an organization of the artisanal fishermen is necessary. It is most important to realize that the conservation of the marine resources can be conducted by self-responsibility through formulation of an organization of the fishermen.

(4) Study Surveys to Optimize Shrimp Fishing

It is inevitable for shrimp fishing to be sustainable, for the time being, depending on the administrative control such as closed season and/or closed area of fishing. In the long run, it is necessary to formulate the cooperative partnership between industrial fishing and artisanal fishing to achieve the pertinent control of fishing.

For this purpose, Study Team would like to recommend the execution of environmental surveys, shrimp resources surveys and fishing control studies to examine the possibility of the shrimp fishing control by means of Total Allowable Catch (TAC), Individual Quota (IQ) of shrimp-catch and reduction of the licensed ships converting to other fishing categories.

1) Environmental Surveys

The surveys to examine whether the environment of the shrimp fishing ground on the Pacific coast of Panama is favorable to the larvae and juveniles of shrimp. The main focuses of the surveys will be on the marine environment (water quality, current), inpouring rivers (water quality, discharge volume, land-use of the catchment area), generating rate of larvae of the natural shrimp, status of the mangrove conservation or land-use of the coastal area, etc.

2) Shrimp Resources Surveys

The marine resources surveys to examine the Maximum Sustainable Yield (MSY) of the shrimp species. The main focus will be on Camaron Blanco (white shrimp), which is caught in a competing manner between the industrial and artisanal fishing.

Shrimp is one of the annual species and is considered as a relatively stable marine resource if there is no abnormal climate such as El Niño or large-scale hurricane. Hence, it is considered rather simple to understand the status of the resources.

Surveys will be conducted at the shrimp fishing grounds on the Pacific coast of Panama using a chartered shrimp trawler of the region. Analysis of the distribution of the fishing ground of shrimps and estimation of the allocation of the shrimp resources will be conducted based on the survey results. The existing database of monthly shrimp-catches will be also analyzed.

3) Fishing Control Studies

Based on exploitable resources and their distribution, specific measures will be studied on the shrimp fishing control such as administrative regulations, reduction of the licensed ships, shrimp-catch control by TAC and/or IQ, etc. Social and economic impacts by those regulatory measures (employment, income, export, etc.) will be also studied.

16. FEASIBILITY STUDY ON BOCAS DEL TORO PORT SHORT-TERM PROJECT

16.1 Identification of Short-term Development Projects

The elements of the port infrastructure proposed in the master plan are the improvement of RoRo ferry berth and the new construction of the passenger terminal.

The construction of the passenger terminals at both Bocas del Toro and Almirante Ports are urgent, because there are no suitable port facilities for passengers. The improvement of the RoRo ferry berth is also urgent to ensure the safe and smooth maneuvering of the ferry. Above all, the project is intended to provide a space to be one of the symbolic structures in the tourism city, Bocas del Toro.

In addition, it is also urgent for AMP to ensure the safety and efficiency of the RoRo ferry operation. Taking into consideration of the fact that the existing passenger wharf of AMP was bumped by a ferry and damaged, it is very necessary to construct the fenders for the ferry boat.

Taking into considerations of the scale of the project and the urgency of the improvement of both elements, it is recommended that the whole master plan should be implemented in one package. It is also desirable that the project be started at the earliest opportunity.

16.2 Facility Requirements and Layout

16.2.1 Facility Requirements

Facility requirements in the short-term development plan at Bocas del Toro Port and Almirante Port are shown in Table 16.2.1.

Table 16.2.1 Summary of Facilities at Bocas del Toro and Almirante

Item	Description
Waterfront Facilities	◆ RO-RO Ferry Berth (Length 63 m, water depth –2.5 m) ◆ Speedboat Jetty (Length 31.5 m, water depth –1.0 m) ◆ Passenger Boat Jetty (Length 31.5 m, water depth –2.0 m) ◆ Revetment, retaining wall for protecting reclamation works
Utility Supply Facilities	◆ Elevated water tank (100 tons), and water supply line to building ◆ Electric power supply to buildings
Buildings	◆ Complex (2-story Building; AMP Office, Waiting Lounge, Restaurant, Public Toilet, Ticket Booth, etc.): 700 m^2

16.2.2 Port Layout Plan

The port layout plan for short-term plan is shown in Figures 16.2.1, 16.2.2 and 16.2.3.

16.2.3 Design of Port Facilities

(1) Quay Structure

Considering the subsoil conditions, a suitable structure type for the quay has been studied and are summarized in Table 16.2.2. As shown in the Table, the advantage and disadvantage of three alternatives were reviewed and compared in terms of cost, construction period and environmental conditions.

An open pile type quay structure will be the most suitable to the site condition. The typical section of the open pile type quay wall is shown in Figure 16.2.4, and the dolphin mooring structure for RO-RO ferry at Almirante port is shown in Figure 16.2.5.

Suitable quay fixtures to the objective vessels, i.e. rubber fenders and bollards, have been selected as shown in the above figures. The following capacities are expected:

- Rubble Fender for RO-RO ferry: Absorption energy of 90 kN・m
- Rubble Fender for Passenger boat: Absorption energy of 40 kN・m
-- Bollard for RO-RO ferry: Tractive force of 35 ton in every direction
- Bollard for Passenger boat: Tractive force of 25 ton in every direction

(2) Buildings

The complex planned in the short-term plan is 2-story RC building equipped with required interior furnish. The complex includes AMP office, Waiting Lounge, Restaurant, Public Toilet, and Ticket Booth. The structural drawing of building is shown in Figure 16.2.6.

(3) Utilities

1) Water Supply

Fire fighting, ship's supply and other domestic consumption in the terminal have been considered and the water supply line will be connected at mains of Bocas del Toro area. Relevant facilities, such as reservoirs (20 tons), elevated tanks (100 tons) and pumps will be included, together with their network pipes.

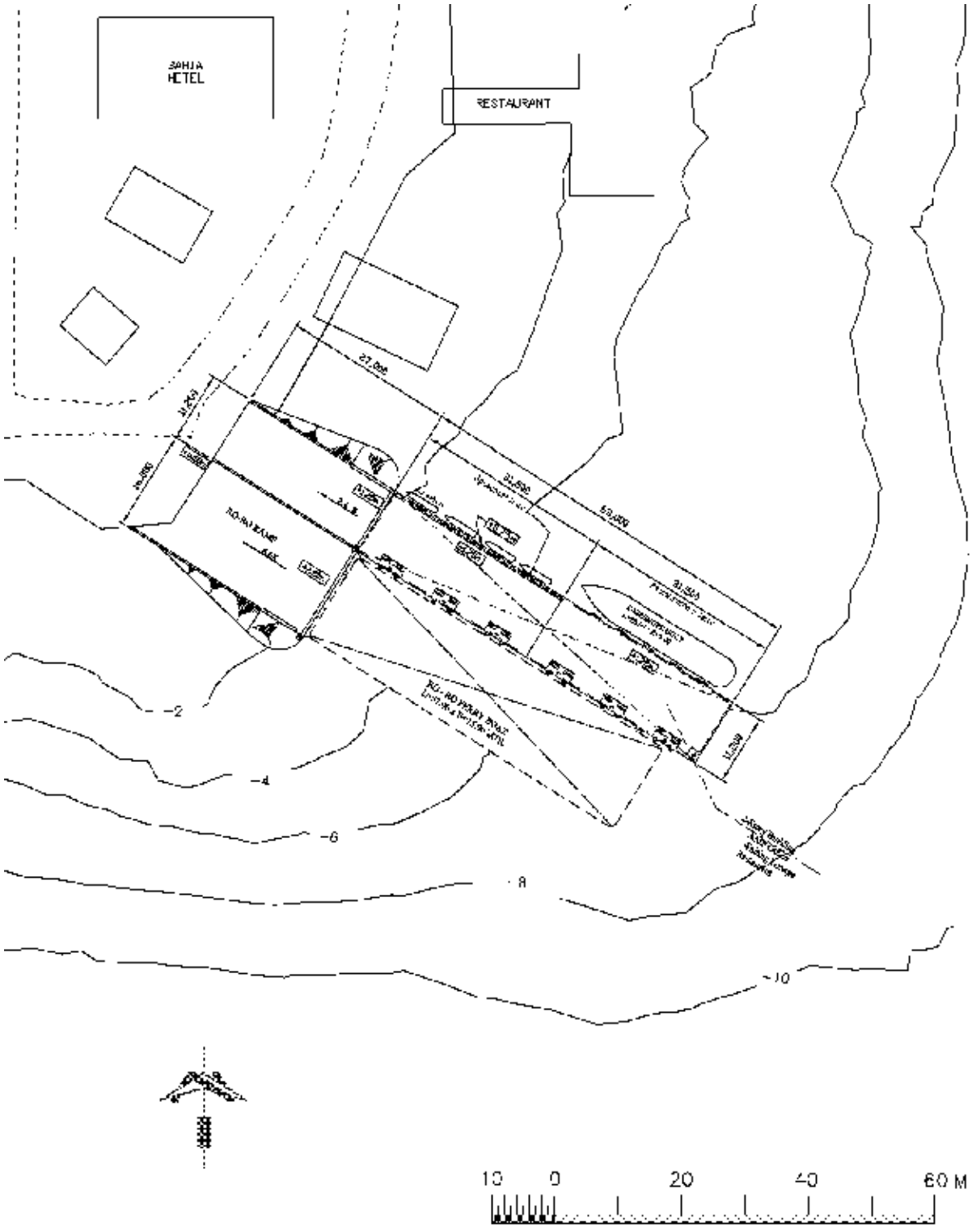


Figure 16.2.1 General Plan of Bocas del Toro Port

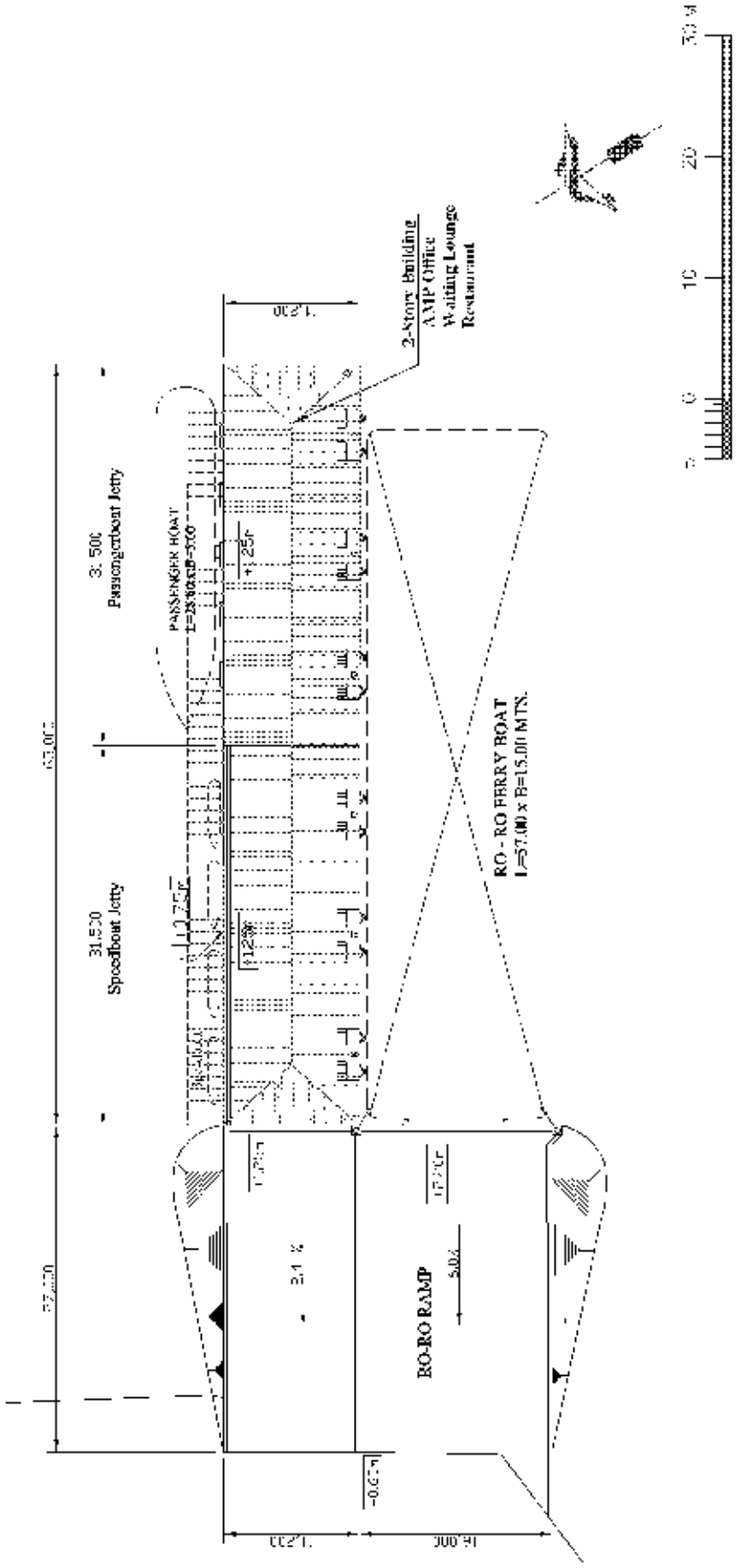


Figure 16.2.2 General Layout Plan of Marine Facilities (Bocas del Toro)

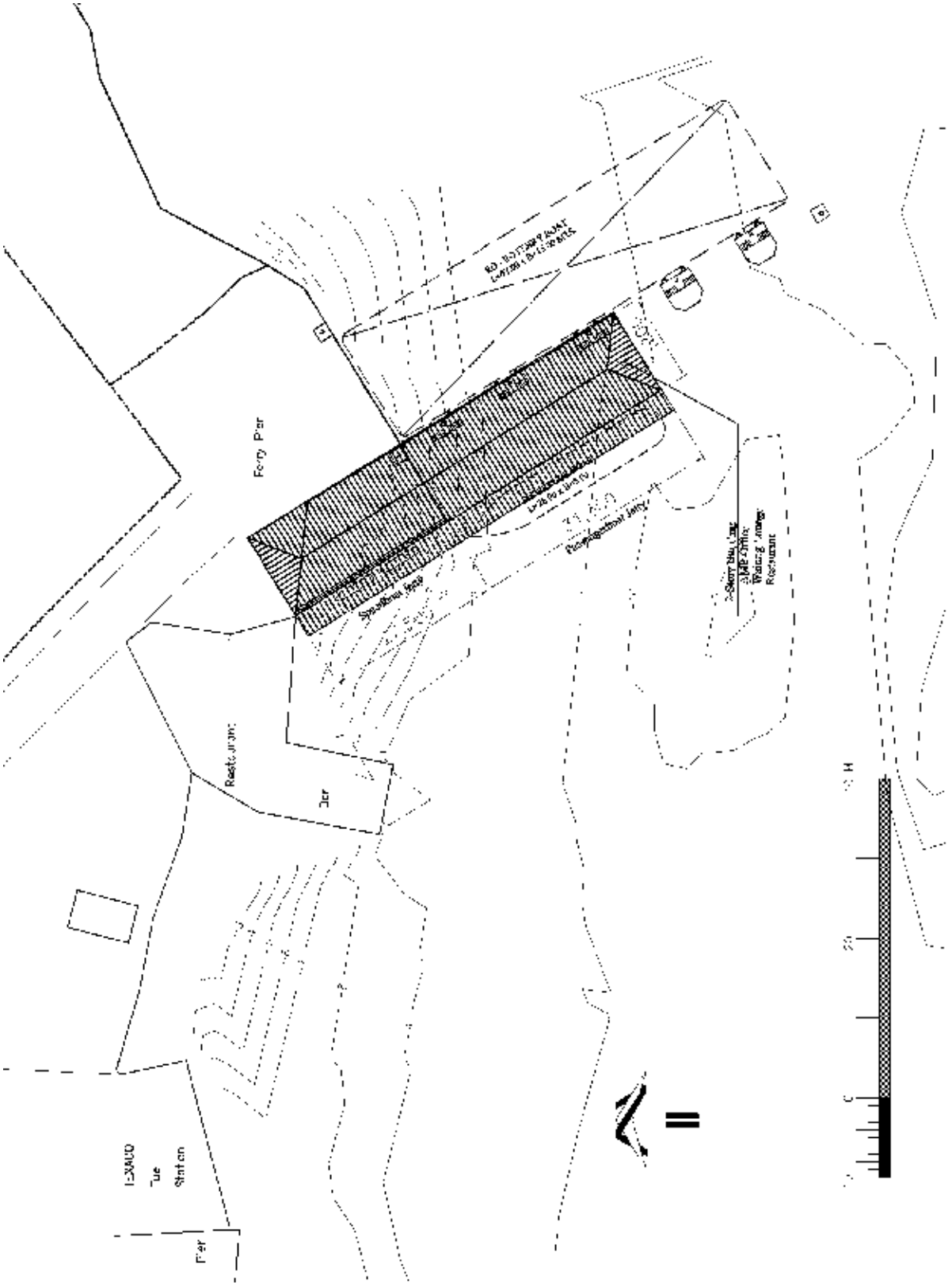
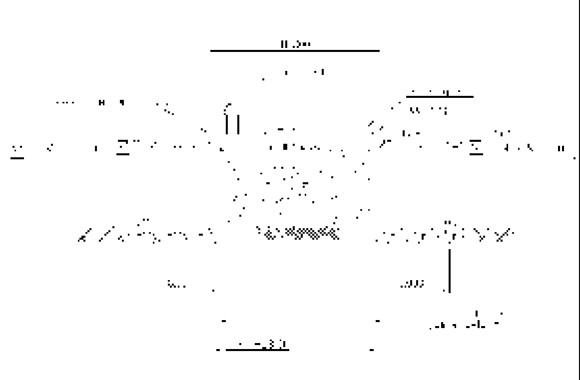
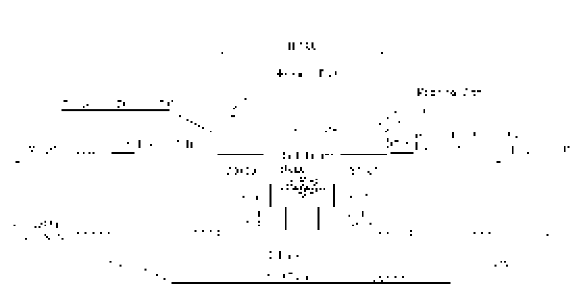
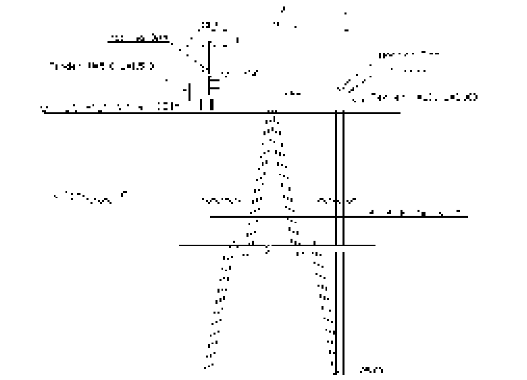
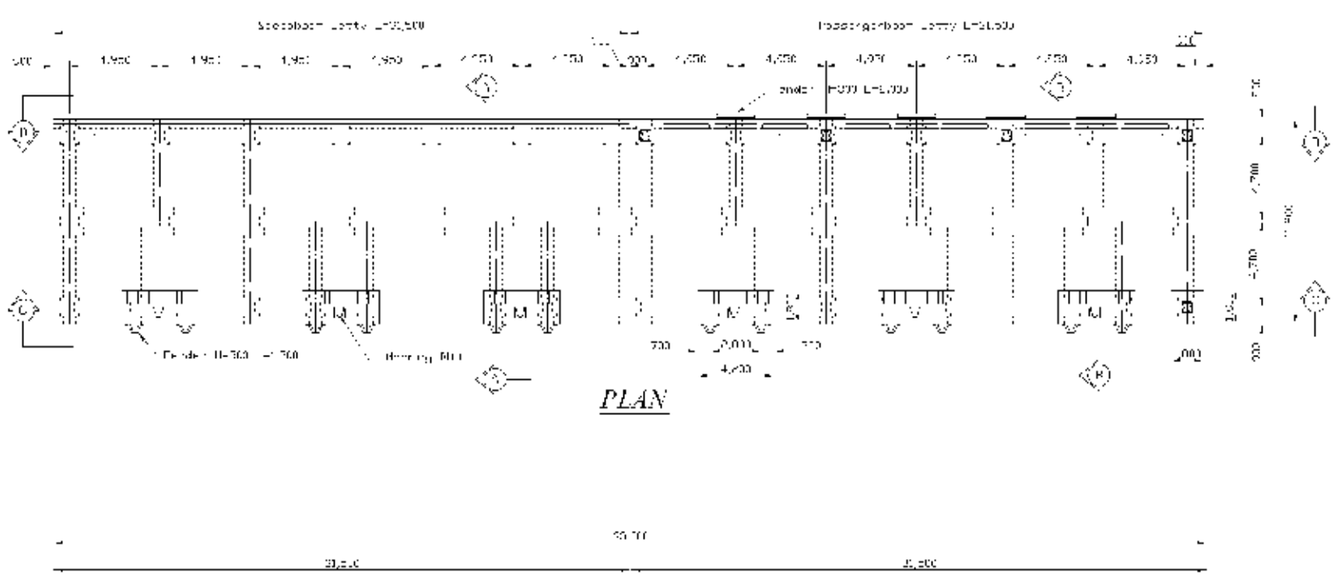
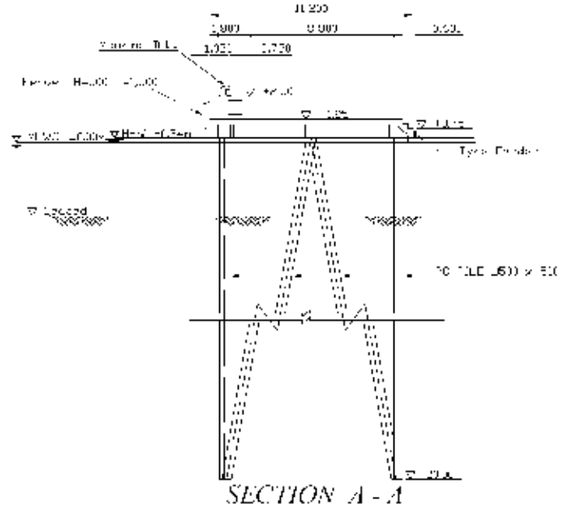


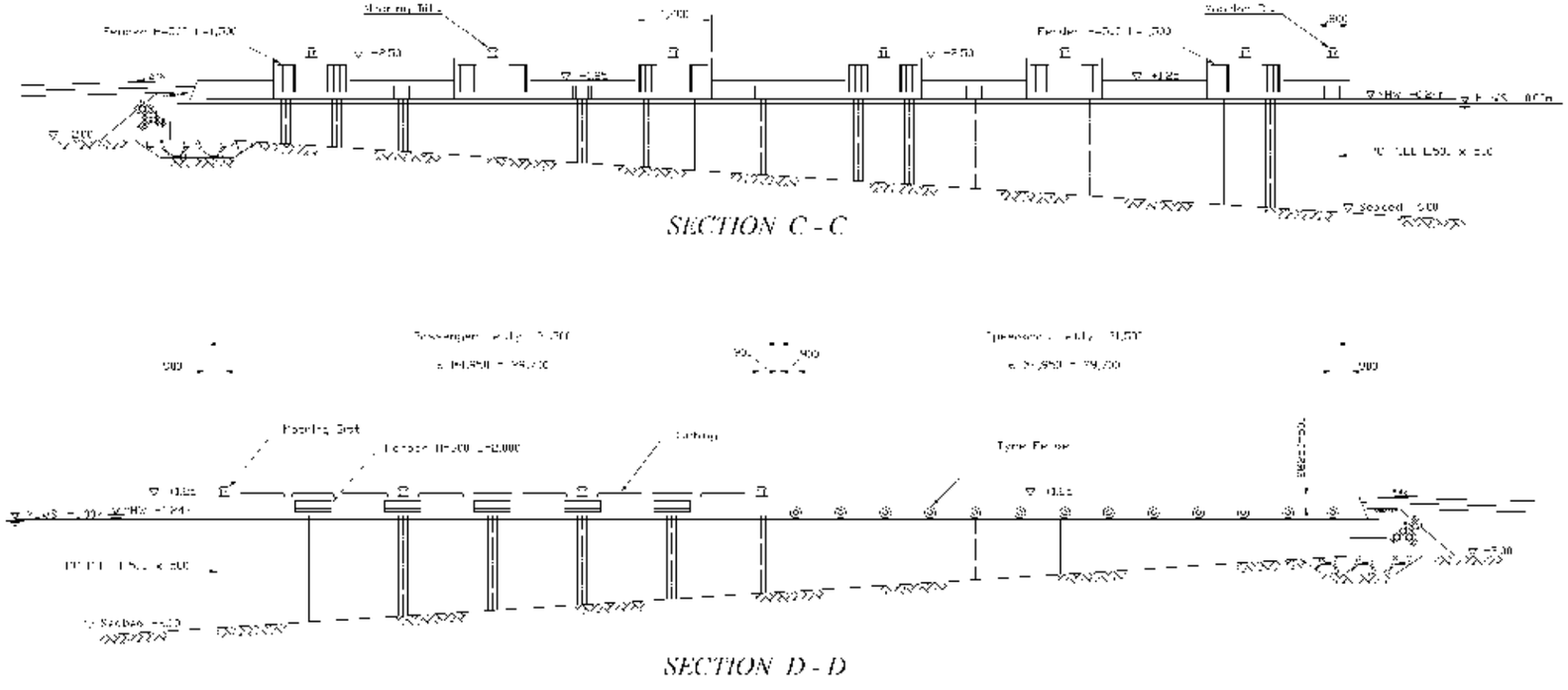
Figure 16.2.3 General Plan of Almirante Port

Table 16.2.2 Comparison of Quay Structure Types

	Steel Sheet Piles (SSP) W-wall Type	Gravity Type (Concrete Blocks)	Open Pile Type (Concrete Piles)
Typical Cross Section			
Evaluation	*Adjustable and flexible to the change of soil condition *Construction cost is the highest among the three types	*Complicated works and longer work period *Has negative affect on environment by dredging and reclamation works.	*Suitable and adopted for the design conditions *Simple construction procedure, economical cost and short construction period *Commonly adopted in Panama
	× (Not Recommendable)	× (Not Recommendable)	○ (Recommendable)
Advantage	*The construction period may be the shortest among the alternatives. *Sheet piling works and dredging/reclamation works can be conducted at the same time.	*Material is locally available and can be used, thus construction cost is economically superior. *More suitable to shallow water depth than other 2 types. *Maintenance is easy and structure has reasonable durability.	*The construction cost may be the lowest among the alternatives. *Volume of reclamation works will be minimal. *PC pile driving works and reclamation works can be progressed separately at the same time.
Disadvantage	*Corrosion of SSP should be considered. *SSP and tie wires have to be imported. *The construction cost may be the highest among the three types. *Reclamation and backfilling works are required.	*The large fabrication yard for concrete blocks is required. *Floating equipment is required during construction period. *The construction work is complicated to make level of mound for block installation and to set them exactly at the position. *Construction period may be the longest. *Dredging and reclamation works are required.	*Large offshore pile driving equipment may be required *PC pile is not easy to adjust its length by changes of soil and sea bed topography. *Construction period will be longer than SSP type structure.







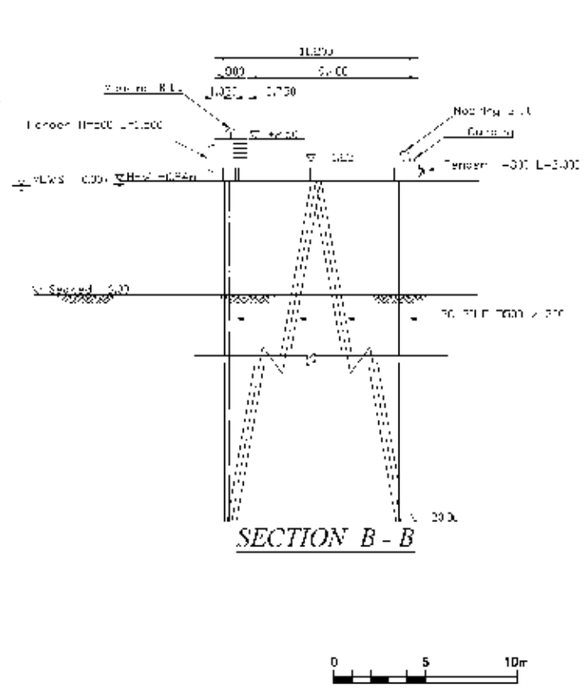


Figure 16.2.4 Typical Plan and Sections of Quay Wall

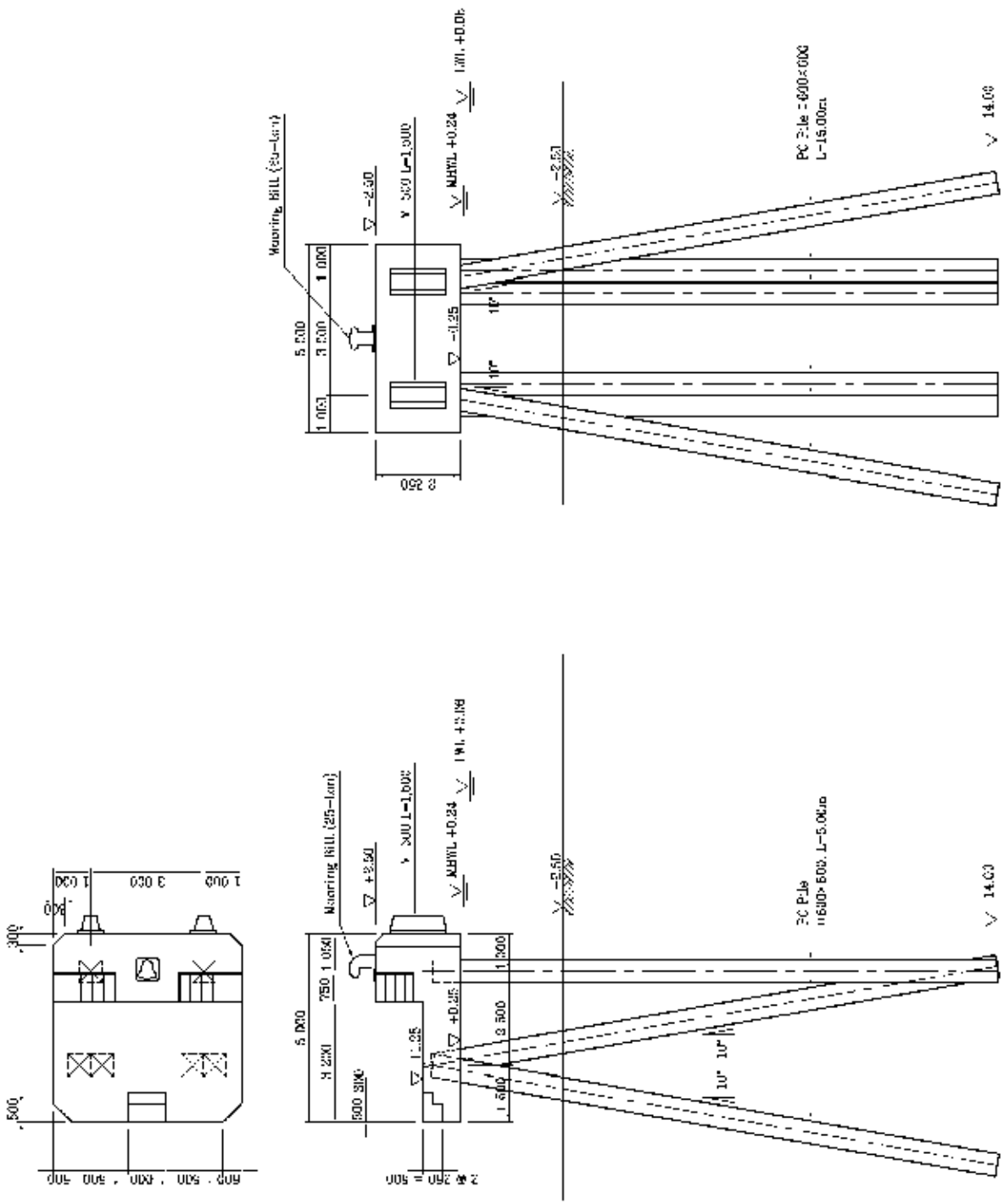
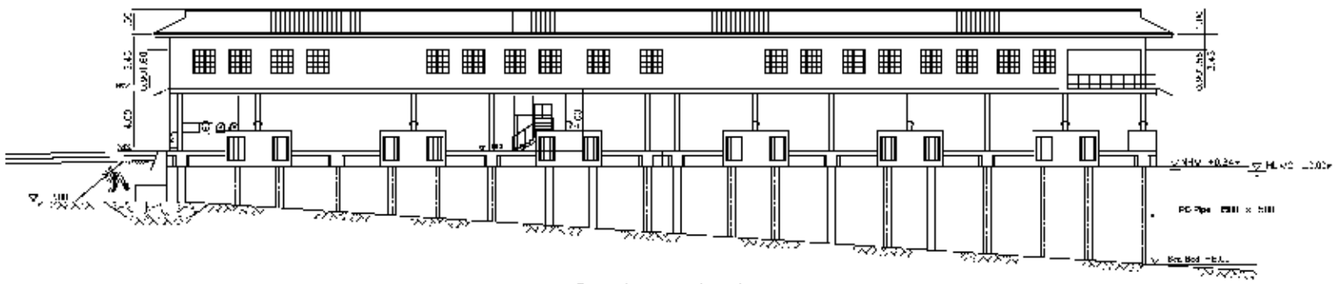
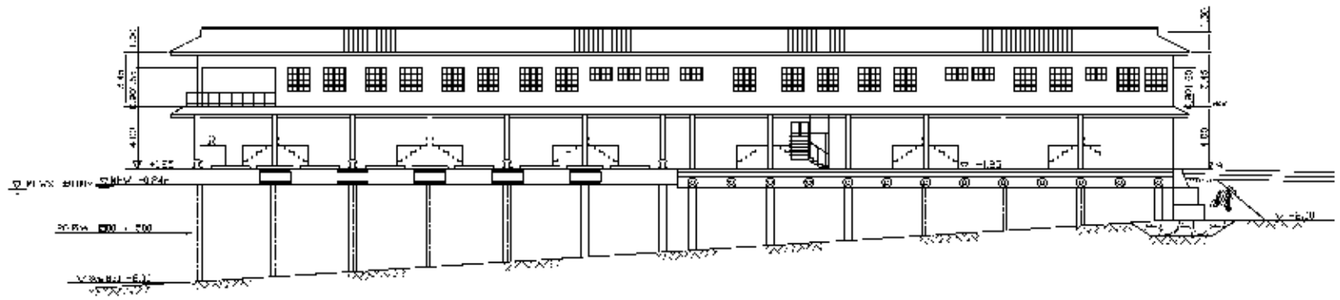


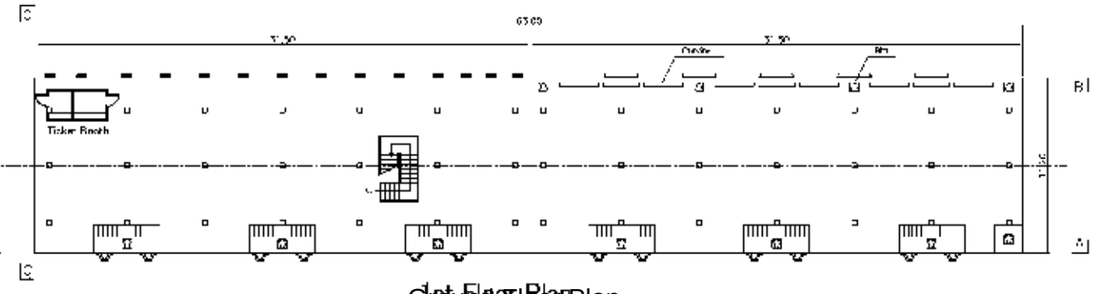
Figure 16.2.5 Typical Plan and Sections of Dolphin Mooring Structure



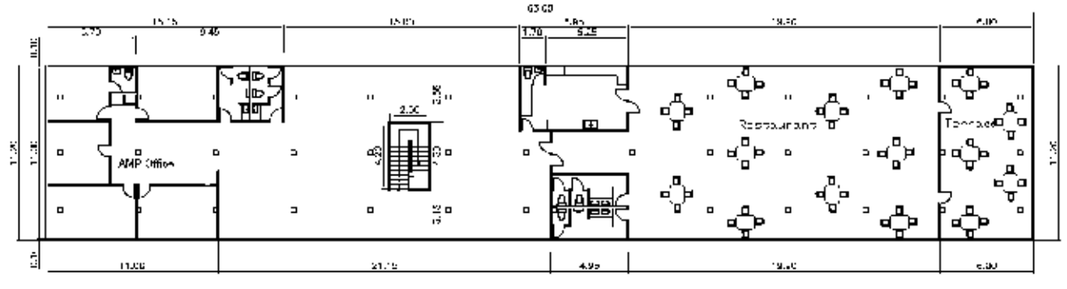
Section A-A



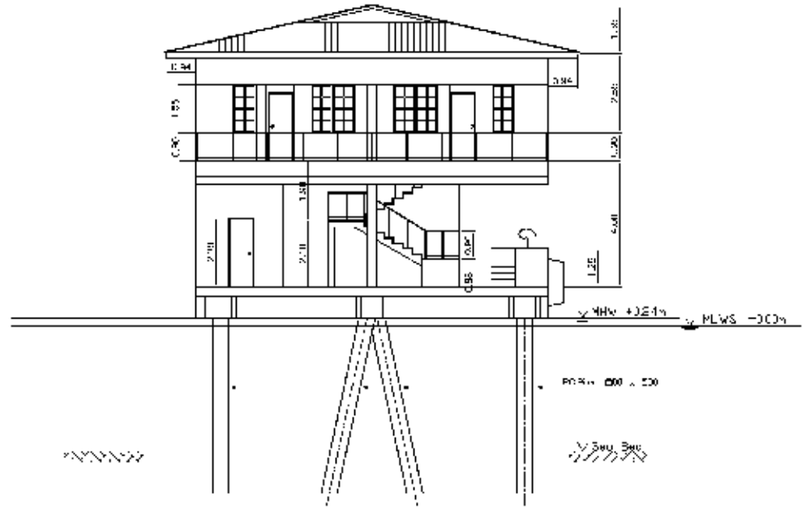
Section 3-3



1st Floor Plan
Ground Floor Plan



Upstairs Plan



Section C-C

Figure 16.2.6 Typical Plans and Sections of Complex

16.3 Project Implementation

16.3.1 Introduction

In this section, the project cost for the feasibility study was estimated based on the following method.

- For the purpose of estimation of the project cost, unit prices of each element such as major construction materials, equipment and manpower cost are determined on the basis of the local 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 construction schedule is reviewed based on the government procedures and the financial program.

16.3.2 Project Cost

Based on the above conditions, project cost for the feasibility study is estimated as shown on the following table.

Table 16.3.1 Project Cost for Feasibility Study 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**

16.3.3 Implementation Schedule

Implementation schedule for the project is studied based on following understandings.

- Formulate a mutual consensus for the project, between user, residents and the related authorities, by the end of 2004.
- Establish the operating body of the passenger terminal in the first half of 2005.
- Finalize the basic plan and estimate the budget. Request the budget for IADB and the government by the second half of 2005.
- Complete the detailed design and prepare the tender documents for the construction by the third quarter of 2006, and carry out the tender in the next quarter.
- Start and complete the construction in 2007. Open the port in the early part of 2008.

The schedules for each construction items are shown on the following table.

Table 16.3.2 Project Implementation Schedule for Bocas del Toro/Almirante Port

Bocas del Toro / Almirante	2004		2005		2006		2007		2008		2009	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
1. Consensus Building for Development												
2. Finalization of Development Plan												
(1) Development Plan including Basic Design												
(2) Operation and Management Plan												
3. Selection Process of IADB Projects												
4. Budgetary Arrangement of IADB and Government												
5. Detail Design Study, Preparation of Tender Documents, Supervision												
6. Tender Process and Contractor Selection												
7. Construction Process												
(1) Demolition												
(2) Jetty including Dolphin (Almirante)												
(3) Revetment												
(4) Reclamation												
(5) Pavement												
(6) Buildings												
(7) Outdoor Lighting												
(8) Utilities												
8. Commencement of Port Operation												

16.4 Administration and Management

In Sections 12.9, 13.9, 14.9 and 15.9, the administrative and managerial approach toward the realization of the proposed master plans have been discussed for the selected four ports. The discussions in these sections have focused on the administrative and coordinating steps to be undertaken by AMP as the leading implementing agency of the plan. The discussions in this Section as well as Sections 17.4, 18.4, 19.4, rather focus on the steps to be undertaken by AMP in order to assure the funding for the implementation of the proposed projects and for the management and operation after the completion of the port infrastructure.

16.4.1 Port Infrastructure Development Scheme

In recent years, several schemes have been applied for the implementation of the infrastructure development.

Following Panamanian experience as well as global practice of this kind, port infrastructures for ocean-going vessels have often been built by private sector under BOT (Build-Operate-Transfer) or BOO (Build-Operate-Own), which are fall on hybrid concession scheme. However, when sufficient cargo throughput is not envisaged over the initial stage of port operation, the financial and commercial risks of the private sector will be considerably high. To encourage private participation in the project, risk management schemes in terms of finance and operation should be introduced.

When the private sector participates in port development, it tends to try to recover its investment within the agreed term (generally 20-25 years). To this end, the tariff for the services they provide tends to be set to such a level that can recover their investment.

There are different views on the issue who should bear the cost of basic infrastructure such as breakwaters, access channels basins: the users of the specific ports or the public, i.e., taxpayers.

There are three alternative schemes are currently practiced:

1) Government bears wholly or partly the construction cost of basic infrastructure (Examples: US, France and Japan).
2) Public sector and interested private firms create a special purpose company (SPC) to carry out construction and operation of a port development project. Public sector's share reduces the burden and risk of private sector to a certain extent (the Petroterminal of Panama is an example).
3) Public sector reduces the risk and burden by such means as subsidy, provision of grace period of concession fee or long-term reduction of concession fees.

The first alternative will diminish the private sector's burden at the initial stage of the project and this may attract investors. Under the second alternative, the public sector as a shareholder would have some control over the SPC, especially regarding the following:

- SPC provides adequate service throughout the concession term,
- The public sector could urge SPC to observe relevant safety and environmental protection standards,
- The charges levied on port users should be reasonable and do not endanger the competitive position of the port.

Under the third alternative, the public sector is not responsible to arrange a huge amount of expenditure on the infrastructure development, while it should guarantee the private partner's return over a long period of time.

More specifically, these alternative schemes can be illustrated in Table 6.4.1 with the examples seen in Panama.

Table 16.4.1 Public-Private Partnership (PPP) in the development of Port infrastructure

Capital investment on Port infrastructure		Type	Capital Investment	Construction	Ownership	Operation	Type of Concession	Example
Purly Public	Gover-nment	1	Public	Public	Public	Public	None	Vacamonte
		2	Public	Public	Public	Private	Operation right (Piecemeal Concession)	Pedregal, Aguadulce
Mix	Joint Venture	3	Public - (Property) Private - (Stock)	Public - (Property) -	SPC*	SPC	Public share is converted to stock Operation right is awarded to the Joint Venture Company (Piecemeal Concession)	PTP Oil Facilities at Charco Azul & Chiriqui Grande
		4	Public (Stock) Private (Stock)	SPC	SPC	SPC	Development right is awarded to the Joint Venture Company (Hybrid Concession)	PTP Dry cargo facilities Chiriqui Grande
Purly Private	Private	5	Private	Private	Private	Private	Development right (Hybrid Concession) BOT, BOO, etc.	Almilante Banana Pier MIT

Note: PPC, CCT are the combination of Type 2 and Type 5
SPC; Special Purpose Company,

One extreme scheme is the public funding only. The other extreme is the private funding only. Before the creation of AMP, APN had constructed the port infrastructure out of purely public funds, i.e. Type 1 scheme in Table 16.4.1, while some ancillary services such as cargo handling, bunker and water supply, were provided by private firms under (piecemeal) concession contracts. Since 1993, the Panamanian government had pushed through the privatization of the existing ports. Where port infrastructure existed, Type 2 scheme was employed, while Type 5 was employed where no infrastructure existed. In either Types, no new public investment has been done, since there was existing infrastructure or substantial traffic demands that were attractive for private firms to start port business. So far the privatization has been successfully performed, especially for the major international ports in Canal Area**.** However, the privatization of other local ports have not been performed as successful as the major international ports.

To promote the private participation in the port operation, some other schemes are possible. For Type 2, the government is able to find private firms who is interested in the operation of the port by the public investment to develop and upgrade the port infrastructure to meet the demand of the economic environment and, in turn, the demand of maritime business. For Type 5, the government may offer more attractive conditions in the concession contracts to invite the private sector in port business: the exoneration of concession charges or charge free land lease are the extreme examples, which have been actually exercised by Panamanian government. In the latter case, even though the government does not invest on the port infrastructure, it sacrificed the revenues that the government could generate.

Other possible scheme to promote private investment in the development of port infrastructure is that the public sector shoulders some portion of the investment needed for the development of port infrastructure. The typical exercise of this type by PPP is to establish a joint venture between

the government (most of the cases through a public corporation or an authority) and private firms. Depending on the form of the public investment, there are two types; the government share may be provided in the form of property (Type 3) or capital (Type 4). In Panama, the Petro-terminal of Panama is a government funded company. The government of Panama invested its property, i.e., the petroleum terminal facilities, and the government share was converted to stocks.

Being an autonomous body AMP may invest and establish a joint venture of maritime related business. However, Type 4 seems to be unrealistic because the primary function of AMP is administrative rather than managerial and operational and the Organizing Law of AMP has no provisions of capital investment in private business. In addition, the Maritime Strategy focuses on the encouragement of private participation wherever it is possible in the maritime business. The employment of Type 1 scheme should be limited to only where the port has the function to provide minimum access for the remote communities and no other institutions is able to manage and operate the port.

Therefore, the possibility of the employment of Types 2, 3 and 4 will be examined in the discussion of the investment scheme for the priority projects.

16.4.2 Conditions for Private Participation

Bocas del Toro and Almirante Ports have two roles: the RoRo Ferry facilities are basic infrastructure to support the socioeconomic activities in the island, while the development of the passenger terminal aims at the promotion of local tourism related industries. Therefore, while, AMP has the responsibility of ensuring the ferry service, the local tourism industries in Bocas del Toro are the prime beneficiaries of the improved passenger terminals, and they may be interested in investing themselves for the development of the passenger terminals.

In the light of the current policy of AMP, Type 5 may be assessed to be the most desirable scheme from the viewpoint of minimizing the amount of the public investment on the port infrastructure. However, if the passenger terminal is operated by a concessionaire, it is quite likely that the terminal is built and operated its own business policy. Taking into consideration of the ultimate objective of the project, i.e., the involvement of the local communities and industries in the port planning and management, Type 2 scheme, i.e. concession of operation right only, is suitable for the management and operation of the passenger terminal, especially the upstairs.

The financial analysis in the following sections shows that the project is financially feasible, provided that 10% of the total construction cost be paid by the government and the rest of 90% be financed by a soft loan with the interest rate of 3%, This analysis assumes that AMP will be managing and operating the whole port facilities, both the RoRo Ferry and the Passenger terminals. Since the FIRR of the project is about 9%, some portion of the construction cost can be shouldered by a commercial loan with higher interest rate. The construction of the passenger terminal building may be financed by commercial loans. AMP should also request IPAT for financial assistance to this project for the tourism promotion.

16.4.3 Administration, Management and Operation

(1) Organizing the stakeholders

The primary task of AMP is to organize all the stakeholders of this project. In particular, the operators of passenger boats are the primary stakeholders. AMP should start the negotiation with them first to formulate a cooperative of the operators and then to have the consensus operational scheme among the operators for the smooth operation of the passenger terminal. AMP should also commit them to the fair competition by strict prohibition illegal services by those passenger boat owners without proper licenses.

In the process of the detailed design of the passenger terminal, opinions of the stakeholders should be given due consideration. The administrator of both Bocas del Toro and Almirante Ports, should formulate a local port advisory committee that consists of the representatives of the stakeholders of the both ports.

(2) Financial sources

While some portion of the superstructure such as the passenger terminal building may be financed the private sector, AMP has to bear the construction cost of the whole infrastructure. Since the project is also aiming at strengthening of organizing capability of the local government and promoting local tourism industry, it might be eligible for IADB loan. Relatively small projects such as rehabilitation of roads, drainage and sewage system, small-scale water supply and waste disposal related to this project seem to be most eligible for on-going IADB program.

(3) Port ancillary services

Private sector should participate in such ancillary services such as fuel and water supply, running stores and restaurant, clean-up of port area and garbage collection. Since the area is rich in marine resources and has the potential to attract tourists, environment protection (water quality, marine grass) should be carefully implemented in cooperation with the competent agencies. The Administrators should take appropriate steps on its own or by using concessionaires to dispose of liquid and solid waste from their operating facilities, and also oversee the waste disposal of concessionaires.

16.4.4 Recommendations

(1) Consensus opinion for the project

Whether Bocas del Toro will continue to attract tourists highly relies on the steps to be undertaken by AMP. First of all, AMP should keep in touch with the local communities, local and national governments, those who are involved in tourism business. AMP should hold forums regularly to have consensus opinion on the project including facility layout, and the operational scheme of the passenger terminal and tariff to be charged to the used, among others.

(2) Ensure the public fund

While AMP requests and negotiates with the central government the necessary fund, it should coordinate with other agencies concerned for the collaboration to realize the project and for the improvement other infrastructure and services such as road, communications, water supply and sewage and waste treatment and garbage collection. In addition, it is more important for AMP to disseminate that the project is intended to develop a port for the local people and industry and that the local community should also appeal to the government via.

(3) Operating body of the passenger terminal

While AMP is responsible for the operation of RoRo Ferry berth as it has been, it should make efforts to establish a separate management body for the passenger terminal by either a concession contract with a private firm or a cooperative of the stakeholders. It is also important to encourage local industries to participate in the project financially and technically.

(4) Security and safety

It is the responsibility of AMP to take all possible measures to ensure the security and safety in the ports and ships. Thus, AMP should assess the vulnerability to crimes and prepare security enhancement program.

16.5 Economic Analysis

Since the Priority project is the same as the project proposed as the Master Plan. Therefore, the Economic Analysis is the same as described in Chapter 12.10.

During the stage of the feasibility study the sensitivity analyses are carried out with the purpose to ensure the economic feasibility of the projects.

16.5.1 Sensitivity Analysis

The sensitivity analysis on the EIRR has been carried out under the following three unfavorable situations.

Case A: The ten percent overrun of the capital investment cost
Case B: The ten percent decrease of the economic benefit
Case C: Both Case A and Case B (the worst scenario)

Cases	EIRR
Base Case	20.74 %
Case A	19.51 %
Case B	19.33 %
Case C	18.17 %

The detail the sensitivity analysis will be shown in **Appendix N**.

16.5.2 Qualitative Evaluation of Economic Benefit

In addition to the quantitative economic benefit considered in the economic analysis, there is additional economic benefit elements though they are difficult to be quantitatively evaluated. One element of these benefits is the increase in the number of Costa Rican tourists.

Bocas del Toro Island is now expected to be a center of marine sports in Caribbean Sea. In addition, tourists from Costa Rica are increasing. In order to realize rapid development as tourist center that is key economic base of the region, the port terminal improvement of Bocas del Toro / Almirante is prerequisite. Without the facility improvement of terminals, the region will lose substantial portion of potential customers. Although these economic benefits to the region are not fully quantified, the aggregated economic benefit will be far greater than the one that is shown above in numbers.

16.5.3 Conclusion

Considering relatively high EIRR with robustness shown in the sensitivity analysis where unfavorable situations are assumed and qualitative evaluation mentioned above, this project is feasible and recommendable from economic point of view.

16.6 Financial Analysis

16.6.1 Objective of Financial Analysis

The objective of financial analysis is to provide necessary indices to evaluate the project from the financial point of view of the entity, which is called “the managing entity” hereafter, that invests and obtains revenue through the construction and operation of the facilities. The financial analysis focuses on the financial soundness of the specific entity, while the economic analysis focuses the benefits of the national economy, i.e. the whole society of the country. The objective of the financial analysis as well as “the Common Procedures and assumptions of the Financial Analysis” described in Section 16.6.2 remains the same for other ports discussed in Sections 17.6 through 19.6.

In the economic analysis, the revenues and the expenditure over the project life have been expressed in terms of economic prices. However, in the financial analysis, market prices are employed to express the revenues and expenditures. Then, Financial Internal Rate of Return (FIRR) is estimated for net cash inflow for the project cycle and the Pro Forma Financial Statements (Income Statement, Cash Flow statement and Balance Sheet) will be forecast. On the basis of these two types of information, the financial feasibility shall be discussed.

16.6.2 Common Procedure and Assumptions of the Financial Analysis

(1) Entity that manages the projects

As discussed in Chapter 11, one of the objectives of the four selected projects is to promote the participation of private sector in port development, management and operation. Thus, the entities

that the financial analysis focuses are the one which actually implement the project, and they need not to be AMP.

The most suitable and realistic public-private combination has been examined and proposed for respective ports.

(2) Scope of financial analysis.

The financial analysis focuses only the business that is directly managed by the entity while the activities of the concessionaires who may operate some portion of the port facilities is excluded from the analysis. In addition, the financial analysis evaluates the difference between the WITH project case and the WITHOUT project case, that is, the analysis concentrates only on the difference, not on the whole activity of the entity.

(3) Base data for port fee

The average port fees in three ports (Aguadulce, Fiscal Panama and Vacamonte) are computed from the current data and selectively used as the basis for the port fees in the projects.

The port service fees will be allocated to cargo and calling ships evenly. That is, ships are expected to bear the half of whole port service fees. In estimation, it is assumed that the fee paid by ships will be eventually transferred to cargo. Therefore, all port fees will be proportional to the cargo handling volume. Distribution of the tonnage of calling ships and ship calls are not considered.

(4) Concession revenue

In case of new Chiriqui port and La Palma fishery port, the proposed port fee will be substantially higher than the existing base fee in Aguadulce and Vacamonte port. As the concession fees from concessionaire are eventually transferred to the calling ships, they are assumed to be included in increased port fees. If the concession fees become substantial, then the general port fees will be lowered.

(5) Condition of loan

Interest: 3 percent (Boca del Toro/Almirante, La Palma), 6 Percent (Chiriqui, Coquira)

Grace Period: Five years from the start of the operation

Repayment (to start from sixth year of the operation): Twenty years (except for Coquira), ten years (Coquira).

(6) Depreciation

Depreciation Period: forty years for civil works and ten years for plant and equipment.

Salvage Value at the end of life: Ten percent

(7) Contingencies for the construction costs.

Ten percent for civil works. Zero for Plant and Equipment.

(8) Engineering fee.

Ten percent of the construction costs except for Chiriqui. Five percent of the construction costs for Chiriqui

(9) Renewal investment of plant and equipment (in every ten years)

Except for La Palma fishery port, the renewal investment cost will be born fully by the project. In case of La Palma port, the renewal investment becomes possible only with additional grant.

(10) Treatment of inflation factor

Considering the current very stable situation of price in Panama (1.0 % increase in 2002 and 0.3 % in 2001), the consideration of inflation is excluded in the financial analysis.

(11) Operation and Maintenance Cost Increase due to the Growth of per Capita Income

Considering low growth rate of per capita income and high unemployment rate, the cost push factor in the operation and maintenance cost is ignored.

(12) Estimate of Financial Revenue after 2015 in Financial Analysis.

Although the feasibility analysis covers from 2005 to 2014, the estimation of FIRR requires the forecasting of the financial revenue during the whole project period (until 2024). If there is redundant capacity in 2014 and the demand increase from 2015 is expected, then revenue increase after 2015 is considered.

16.6.3 Scope of Financial Analysis

It should be noted that, in the financial analyses presented in the feasibility study are not intended to evaluate the feasibility of the whole proposed projects. Though the economic analyses of the proposed projects have shown the economic viability, the proposed projects are not necessarily financially feasible. This is because the benefits gained by the projects are not directly contributed to the revenue of those entities that implement the project. The latter often will be able to charge only certain portions of the economic benefits to the beneficiaries.

Thus, the financial analysis presented hereunder is intended to demonstrate the conditions that ensure the financial soundness of the managing entity in its investment and operation and maintenance of the facilities. This means that, in such case that the project will encounter difficulties to pay for the investment, the public expenditure shall be proposed to ensure the financial soundness of the operating entity. In other words, the financial analysis shall demonstrate the conditions that the government should provide in order to make the project sustainable.

With respect to the IDB related projects are excluded from the financial analysis. Secondly, the facilities that will be constructed and/or operated by private business under concession are also excluded. The scope of the financial analysis is limited to the renovated passenger terminal and ferry terminal at both Bocas del Toro Port and Almirante Port.

16.6.4 Assumptions employed in the Financial Scheme of the Project

The conditions employed in the financial analysis of Bocas del Toro/Almirante project are summarized in Table below.

Since the RoRo Ferry terminal operation is fundamental services for the public, it is realistic to assume that the AMP port office will continue the management of the ports. It is of course that the private sector may be interested in the operation of the passenger terminal and in running other services related to the passenger such as shops and restaurants at the terminal. Thus, additional revenue obtained by space rental is taken into consideration.

It should be noted that 10% of the construction cost be paid by the government expenditure and will not be paid back by the project, while 90% of the construction cost, as well as the maintenance and operational cost, will be paid back out of the revenue of the project.

Name of the Port	Bocas del Toro / Almirante
Managing Entity	Government (Local Office of AMP)
Shareholders	Not Applicable
Financing Scheme of the Construction Costs	Loan (90%) and Government Expenditure (10%)
Interest Rate for Loan	3%
Grace Period (from the start of the Operation)	5 years
Repayment	20 years
Financial Source of Renewal Investment of Plant and Equipment	By managing entity (Local Office of AMP)

16.6.5 Estimation of the Financial Cost

The financial cost is same as the cost in economic analysis but expressed in market price instead of in economic price. However, it was assumed that ten percent of construction cost, which is correspond to the construction cost of the administration office building, should be borne by AMP administration budget.

Contingencies for the civil engineering cost are estimated at 10 percent level. Engineering fee is expected at ten percent for the construction cost except machine and electric equipment. It has been assumed that the long-tern operation and maintenance cost is assumed to be 1% of the construction cost on the basis of experience of the engineers.

As for the Bocas del Toro / Almirante port project, the number of the staff is expected at the same level, because the actual operation of the passenger terminal is assumed to performed by the association of boat operators and the work of AMP will be limited to the operation of RoRo ferry

Terminal only, thus the scale of the work load remains unchanged. Therefore, the incremental personnel cost will be zero through whole project life (2005 through 2024).

The project coats expended in each year are shown in the columns of Civil Work, Plant & Equipment, and maintenance in **Table 16.6.1**.

Table 16.6.1 Estimate of FIRR for Bocas del Toro/Almirante Port Project

USD

Year	Civil	Plant & Equipmen	Enginneri ng	Investment	90% of Investment	Maintenance	Total Cash	Passenger Revenue	Cargo Revenue	Space Rental	Total Revenue	Net Cash Inflow
			10%			1%						
2005						0	0	0				0
2006		0	273,757	273,757	246,381	0	246,381	0				(246,381)
2007	4,595,181	385,181	182,505	5,162,867	4,646,580	45,626	4,692,206					(4,692,206)
2008	0	0	0	0	0	45,626	45,626	206,945	51,736	4,234	262,915	217,289
2009	0	0	0	0	0	45,626	45,626	229,709	57,427	4,446	291,582	245,956
2010	0	0	0	0	0	45,626	45,626	254,976	63,744	4,668	323,388	277,762
2011	0	0	0	0	0	45,626	45,626	283,024	70,756	4,901	358,681	313,055
2012	0	0	0	0	0	45,626	45,626	314,157	78,539	5,146	397,842	352,216
2013	0	0	0	0	0	45,626	45,626	348,714	87,178	5,404	441,296	395,670
2014	0	0	0	0	0	45,626	45,626	387,072	96,768	5,674	489,514	443,888
2015	0	0	0	0	0	45,626	45,626	421,522	105,380	5,958	532,860	487,234
2016	0	0	0	0	0	45,626	45,626	459,037	114,759	6,256	580,052	534,426
2017	0	385,181	0	385,181	385,181	45,626	430,807	499,891	124,973	6,568	631,432	200,625
2018	0	0	0	0	0	45,626	45,626	544,382	136,095	6,897	687,374	641,748
2019	0	0	0	0	0	45,626	45,626	592,832	148,208	7,242	748,282	702,656
2020	0	0	0	0	0	45,626	45,626	645,594	161,398	7,604	814,596	768,970
2021	0	0	0	0	0	45,626	45,626	703,052	175,763	7,984	886,799	841,173
2022	0	0	0	0	0	45,626	45,626	765,623	191,406	8,383	965,412	919,786
2023	0	0	0	0	0	45,626	45,626	833,764	208,441	8,802	1,051,007	1,005,381
2024	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2025	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2026	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2027	0	385,181	0	385,181	385,181	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2028	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2029	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2030	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2031	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2032	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2033	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2034	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2035	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2036	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2037	0	385,181	0	385,181	385,181	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2038	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2039	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2040	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2041	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2042	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2043	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
2044	0	0	0	0	0	45,626	45,626	907,969	226,992	9,242	1,144,203	1,098,577
												EIRR
												10.69%

Note: (1) Ten percent contingency is included in Investment
(2) The Renewal of Plant & Equipment is fully born by the Project.

16.6.6 Estimation of the Financial Revenue

(1) The total port fee is estimated from the number of the expected ship calls. The number of ship calls is expected to increase annually at ten percent on average from 2003 to 2024 (at higher rate before 2014 and lower rate after 2015) in twenty passenger type boat.

(2) Port fee per ship call is assumed as USD 10 for 70 passenger boats and USD 4 for 20 passenger boat. Current port fee per ship call is USD 0.50 without port service.

(3) The number of ship calls of island trip is assumed as the half of the trip from/to Almirante and Changuinola (20 passenger's equivalent).

(4) Aggregated port fee for RORO service is assumed as one forth of the aggregated port fee for passenger boats.

(5) Annual space rental fee for 30 percent of second floor of Bocas del Toro terminal is expected at USD 20 per square meter and rental fee is expected to increase at 5 percent per year

Table 16.6.2 summarized the estimated financial revenue. The revenue elements and their respective value in each year are summarized in the columns of Port Fee, Island Trip Port Fee, Passenger charge, and Revenue form Cargoes are summarized in **Table 16.6.3**

Table 16.6.2 Estimate of Port Fee from Ships in Bocas del Toro / Almirante Port Project

(USD)

Year	Bocas-Almirante (Ship Calls)		Port Fee (@$10)	Bocas-Changuinola (Ship	Port Fee (@$4)	Island Trip (Ship Calls)	Port Fee (@$2)	Fee from Passenger Boat	Fee from Cargo (USD)	Total Revenue
Passenger Boat Capacity	20	Converted to70		20		Half of Almirante and Chang Route			One Forth of Total Passenger Boat Fee	
	A	B	C	D	E	F=(A+B) / 2	G	H=C+E+G	I=H / 4	J=H+I
2003	24,118			5,957						
2004	26,771			6,612						
2005	29,716			7,340						
2006	32,985			8,147						
2007	36,613			9,043						
2008	40,640	11,611	116,115	10,038	40,152	25,339	50,678	206,945	51,736	258,681
2009	45,111	12,889	128,888	11,142	44,568	28,126	56,253	229,709	57,427	287,136
2010	50,073	14,307	143,065	12,368	49,471	31,220	62,441	254,976	63,744	318,721
2011	55,581	15,880	158,802	13,728	54,913	34,654	69,309	283,024	70,756	353,780
2012	61,695	17,627	176,271	15,238	60,953	38,466	76,933	314,157	78,539	392,696
2013	68,481	19,566	195,660	16,914	67,658	42,698	85,396	348,714	87,178	435,892
2014	76,014	21,718	217,183	18,775	75,100	47,395	94,789	387,072	96,768	483,840
2015	82,779	23,651	236,512	20,446	81,784	51,613	103,225	421,522	105,380	526,902
2016	90,147	25,756	257,562	22,266	89,063	56,206	112,412	459,037	114,759	573,796
2017	98,170	28,049	280,485	24,247	96,989	61,209	122,417	499,891	124,973	624,864
2018	106,907	30,545	305,448	26,405	105,621	66,656	133,312	544,382	136,095	680,477
2019	116,422	33,263	332,633	28,755	115,022	72,588	145,177	592,832	148,208	741,040
2020	126,783	36,224	362,237	31,315	125,259	79,049	158,098	645,594	161,398	806,992
2021	138,067	39,448	394,477	34,102	136,407	86,084	172,168	703,052	175,763	878,815
2022	150,355	42,958	429,585	37,137	148,547	93,746	187,491	765,623	191,406	957,029
2023	163,736	46,782	467,818	40,442	161,768	102,089	204,178	833,764	208,441	1,042,205
2024	178,309	50,945	509,454	44,041	176,165	111,175	222,350	907,969	226,992	1,134,961

16.6.7 Financial internal Rate of Return (FIRR)

On the basis of the above estimated costs and revenues, the FIRR has been calculated to be 10.7% (See Table 16.6.1).

16.6.8 Pro Forma Financial Statements

The provisional financial statement is given in Table 16.6.3.

(1) Income Statement

It is assumed that the operation will start at 2008. As seen in Table 16.6.3, Annual income will become positive at 2011 (4th year of operation, see the row indicated "Net Profit", see also Fig. 16.6.1), while the cumulative profit will become positive at 2014 (the end of feasibility study period, see the row "Cum. Profit")

Table 16.6.3 Pro Forma Financial Statements for Bocas del Toro / Almirante Port Project

																			(USD)
Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Income Statement																			
Annual Depr	0	6,874	135,709	135,709	135,709	135,709	135,709	135,709	135,709	135,709	135,709	133,935	136,219	136,219	136,219	136,219	136,219	136,219	136,219
Annual Interest	7,391	146,789	146,789	146,789	146,789	146,789	146,789	139,450	132,110	124,771	117,431	110,092	102,752	95,413	88,073	80,734	73,395	66,055	58,716
Operation & Maintenance	0	0	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626
Total Expenses	7,391	153,663	328,124	328,124	328,124	328,124	328,124	320,785	313,445	306,106	298,766	289,653	284,597	277,258	269,918	262,579	255,240	247,900	240,561
Total Revenue			262,915	291,582	323,388	358,681	397,842	441,296	489,514	532,860	580,052	631,432	687,374	748,282	814,596	886,799	965,412	1,051,007	1,144,203
Net Profit	(7,391)	(153,663)	(65,209)	(36,542)	(4,736)	30,557	69,718	120,511	176,069	226,754	281,286	341,779	402,777	471,024	544,678	624,220	710,172	803,107	903,642
Cum Profit	(7,391)	(161,055)	(226,263)	(262,805)	(267,541)	(236,984)	(167,266)	(46,755)	129,314	356,068	637,354	979,133	1,381,910	1,852,934	2,397,612	3,021,832	3,732,004	4,535,111	5,438,753
Cash Flow Statement																			
Loan	246,381	4,646,587	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Revenue	0	0	262,915	291,582	323,388	358,681	397,842	441,296	489,514	532,860	580,052	631,432	687,374	748,282	814,596	886,799	965,412	1,051,007	1,144,203
Total Inflow	246,381	4,646,587	262,915	291,582	323,388	358,681	397,842	441,296	489,514	532,860	580,052	631,432	687,374	748,282	814,596	886,799	965,412	1,051,007	1,144,203
Investment	246,381	4,646,587	0	0	0	0	0	0	0	0	0	385,181	0	0	0	0	0	0	0
Operation & Maintenance	0	0	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626	45,626
Interest	7,391	146,789	146,789	146,789	146,789	146,789	146,789	139,450	132,110	124,771	117,431	110,092	102,752	95,413	88,073	80,734	73,395	66,055	58,716
Loan Repayment							0	244,648	244,648	244,648	244,648	244,648	244,648	244,648	244,648	244,648	244,648	244,648	244,648
Total Outflow	253,773	4,793,376	192,415	192,415	192,415	192,415	192,415	429,724	422,385	415,045	407,706	785,547	393,027	385,687	378,348	371,008	363,669	356,329	348,990
Net Inflow	(7,391)	(146,789)	70,500	99,167	130,973	166,266	205,427	11,572	67,129	117,815	172,346	(154,115)	294,347	362,595	436,248	515,791	601,743	694,678	795,213
Cum Cash	(7,391)	(154,180)	(83,681)	15,486	146,459	312,725	518,152	529,724	596,854	714,669	887,015	732,900	1,027,247	1,389,842	1,826,090	2,341,881	2,943,624	3,638,301	4,433,514
Balance Sheet																			
Cash	(7,391)	(154,180)	(83,681)	15,486	146,459	312,725	518,152	529,724	596,854	714,669	887,015	732,900	1,027,247	1,389,842	1,826,090	2,341,881	2,943,624	3,638,301	4,433,514
Fixed Assets	246,381	4,892,968	4,892,968	4,892,968	4,892,968	4,892,968	4,892,968	4,892,968	4,892,968	4,892,968	4,892,968	5,278,149	5,278,149	5,278,149	5,278,149	5,278,149	5,278,149	5,278,149	5,278,149
Cum Depr	0	(6,874)	(142,583)	(278,292)	(414,001)	(549,710)	(685,419)	(821,128)	(956,837)	(1,092,546)	(1,228,255)	(1,362,190)	(1,498,409)	(1,634,628)	(1,770,847)	(1,907,066)	(2,043,285)	(2,179,504)	(2,315,723)
Total Assets	238,990	4,731,913	4,666,705	4,630,163	4,625,427	4,655,984	4,725,702	4,601,565	4,532,985	4,515,091	4,551,729	4,648,859	4,806,988	5,033,363	5,333,393	5,712,964	6,178,488	6,736,947	7,395,941
Loan	246,381	4,892,968	4,892,968	4,892,968	4,892,968	4,892,968	4,892,968	4,648,320	4,403,671	4,159,023	3,914,374	3,669,726	3,425,078	3,180,429	2,935,781	2,691,132	2,446,484	2,201,836	1,957,187
Net Equity	(7,391)	(161,055)	(226,263)	(262,805)	(267,541)	(236,984)	(167,266)	(46,755)	129,314	356,068	637,354	979,133	1,381,910	1,852,934	2,397,612	3,021,832	3,732,004	4,535,111	5,438,753
Total L&E	238,990	4,731,913	4,666,705	4,630,163	4,625,427	4,655,984	4,725,702	4,601,565	4,532,985	4,515,091	4,551,729	4,648,859	4,806,988	5,033,363	5,333,393	5,712,964	6,178,488	6,736,947	7,395,941
Financial Ratios																			
Net Fixed Assets	246,381	4,886,094	4,750,385	4,614,676	4,478,967	4,343,258	4,207,549	4,071,840	3,936,131	3,800,422	3,664,713	3,915,959	3,779,740	3,643,521	3,507,302	3,371,083	3,234,864	3,098,645	2,962,426
Operating Expenses	0	6,874	181,335	181,335	181,335	181,335	181,335	181,335	181,335	181,335	181,335	179,561	181,845	181,845	181,845	181,845	181,845	181,845	181,845
Operatiing Revenues	0	0	262,915	291,582	323,388	358,681	397,842	441,296	489,514	532,860	580,052	631,432	687,374	748,282	814,596	886,799	965,412	1,051,007	1,144,203
Net Operating Income	0	(6,874)	81,580	110,247	142,053	177,346	216,507	259,961	308,179	351,525	398,717	451,871	505,529	566,437	632,751	704,954	783,567	869,162	962,358
Depreciation Rxpenses	0	6,874	135,709	135,709	135,709	135,709	135,709	135,709	135,709	135,709	135,709	133,935	136,219	136,219	136,219	136,219	136,219	136,219	136,219
Repayment of Loan	0	0	0	0	0	0	0	244,648	244,648	244,648	244,648	244,648	244,648	244,648	244,648	244,648	244,648	244,648	244,648
Interst for Long-Term Debt	7,391	146,789	146,789	146,789	146,789	146,789	146,789	139,450	132,110	124,771	117,431	110,092	102,752	95,413	88,073	80,734	73,395	66,055	58,716
ROI			1.7%	2.4%	3.2%	4.1%	5.1%	6.4%	7.8%	9.2%	10.9%	11.5%	13.4%	15.5%	18.0%	20.9%	24.2%	28.0%	32.5%
Operating Ratio			69.0%	62.2%	56.1%	50.6%	45.6%	41.1%	37.0%	34.0%	31.3%	28.4%	26.5%	24.3%	22.3%	20.5%	18.8%	17.3%	15.9%
Working Ratio			17.4%	15.6%	14.1%	12.7%	11.5%	10.3%	9.3%	8.6%	7.9%	7.2%	6.6%	6.1%	5.6%	5.1%	4.7%	4.3%	4.0%
Debt Service Coverage Ratio			148.0%	167.6%	189.2%	213.3%	239.9%	103.0%	117.8%	131.9%	147.6%	165.1%	184.7%	206.6%	231.1%	258.5%	289.2%	323.6%	362.1%

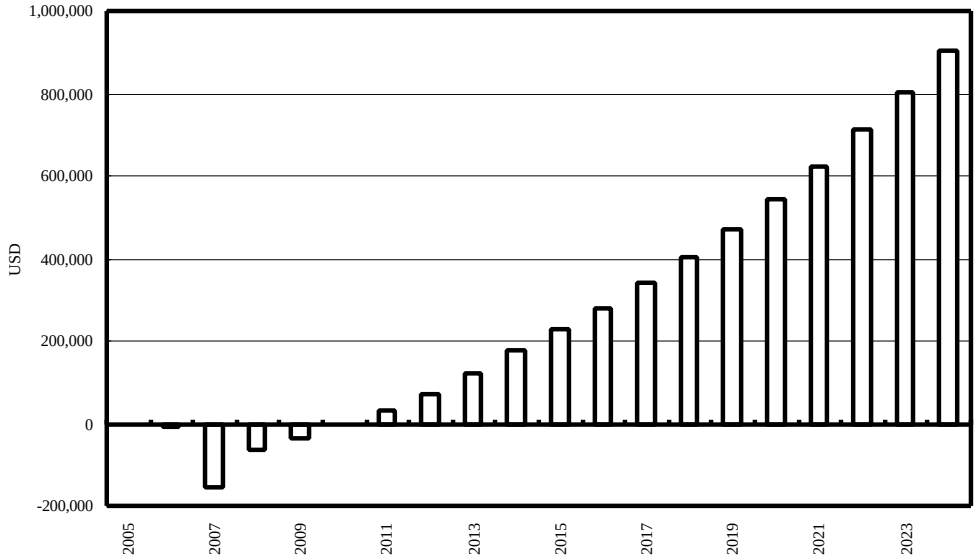


Figure 16.6.1 Annual Net Profit (Bocas del Toro/Almirante)

(2) Cash Flow Statement

From the first year of operation, the net cash flow is positive except for 2017 due to the renewal of Plant / Equipment with own cash. Cumulative cash will become positive at 2009 (second year of operation) and keep positive until 2024 (See the Row of "Net Inflow of Table 16.6.1 and Fig. 16.6.2).

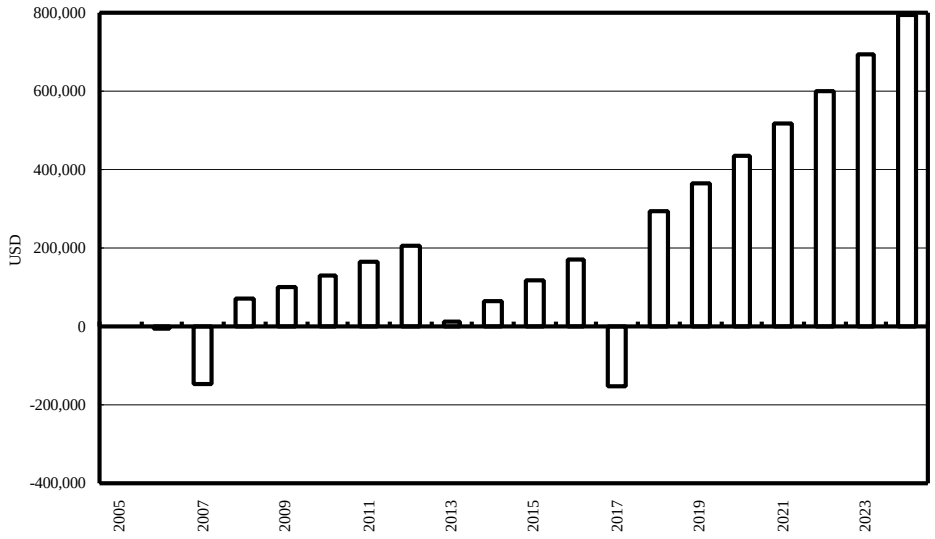


Figure 16.6.2 Net Cash Inflow (Bocas del Toro/Almirante)

(3) Balance Sheet

Cash position becomes positive at 2009 but net equity becomes positive at 2014.

16.6.9 Financial Evaluation of the Project

Assessment of the financial soundness of the key projects to be implemented by imaginary entities, respectively, has been done by financial ratio analysis through the pro forma financial statements to be supposedly reported by the imaginary entity responsible for administration, management and operations of the facility

(1) Profitability

The profitability of the key projects has been assessed by Rate of Return on Assets (ROI) defined as follows:

Rate of Return on Assets (ROI) =Net Operating Income / Net Fixed Assets

In this project, the criterion of the financial indicator is to exceed the maximum interest rate of the potential lenders that is estimated to be 3.0% from the year 2011, and from the year 2014, the criterion of over 7% is satisfied.

(2) Operational Efficiency

The operational efficiency of the key projects has been assessed by the two financial indicators. One is Operating Raito defined as follows:

Operating Raito = Operating Expenses / Operating Revenues

The criterion of the above financial indicator is to be less than 0.70 – 0.75. In this project from the first year of operation (2008), the criterion is satisfied through the project life

The other is Working Ratio defined as follows:

Working Raito =
(Operating Expenses- Depreciation Expenses) / Operating Revenues

The criterion of the above financial indicator is to be less than 0.50 - 0.60. From the starting year of operation (2008), the criterion is satisfied through the project life

(3) Long-Term Solvency

The long-term solvency (debt repayment capacity) of the port management and operations entity will be assessed by Debt Service Coverage Ratio defined as follows:

Debt Service Coverage Ratio =
(Net Operating Income + Depreciation Expense) /
(Repayment Amount of Principal + Interest for Long-Term Debt)

The criterion of the above financial indicator is to exceed 1.0. From the starting year of operation (2008), the criterion is satisfied all of the years through the project life.

16.6.10 Sensitivity Analysis on FIRR

Due to the shortage of traffic volume growth and other unforeseeable factors, the actual revenue benefits might not be realized fully and the actual costs might exceed our estimates. Therefore, we have done the sensitivity analysis on the FIRR with the following three unfavorable situations.

Case A: The ten percent overrun of the capital investment cost
Case B: The ten percent decrease of the economic benefit
Case C: Both Case A and Case B (the worst scenario)

Cases	FIRR
Base Case	10.69 %
Case A	9.81 %
Case B	9.78 %
Case C	8.92 %

The detail the sensitivity analysis will be shown in **Appendix N**.

16.6.11 Financial Evaluation of the Project

Considering the estimated high FIRR (10.69%) as public infrastructure project and the soundness of the pro forma income statement and cash flow statement, this project is financially feasible and recommendable.

Incidentally, the calculation without the government expenditure (subsidy) of 10% of the construction cost yielded the FIRR of 9.88%. Therefore, this project is considered to be financially feasible even without government subsidy.

16.7 Environmental Impact Assessment (EIA)

Basically, environmental impacts by a project are caused consequent to activities involved in the three significant stages of a project execution (implementation), namely, pre-construction stage, construction stage and post-construction (operation) stage.

The activities involved and the relevant environmental impacts during each of the above three stages of a project execution are essentially distinct. In particular, impacts during construction stage of a project are basically of short-term (temporary) in nature being confined to the duration of the construction activities while those of operation stage are potentially of long-term (permanent) in nature. It is noted that most temporary impacts due to construction activities could be managed and minimized, if not entirely mitigated, with careful planning and execution of the construction/installation works.

Potential environmental impact during pre-construction stage of a project is principally social aspects in nature, and caused by potential land acquisition issues for the provision of project facilities.

With due consideration to the above aspects, potential environmental impacts consequent to the execution of the short-term projects in both Bocas Del Toro and Almirante ports are evaluated so as to form the EIA (environmental impact assessment). It is noted that this EIA was conducted following the overall EIA guidelines of ANAM (National Environmental Authority). The EIA Report, formulated with the assistance of Panamanian expertise, is compiled as separate document. Still summarized version of the EIA document is given in Appendix P.

Formal EIA documentation in Spanish strictly conforming the EIA guidelines of ANAM needs to be formulated when the project is actually commenced with due consideration to any modification to the project components as deemed necessary.

First of all, concerning the potential impacts of pre-construction stage of both Bocas Del Toro and Almirante port projects, they involve no land acquisition requirements since all basic project facilities will be provided in offshore seawater areas and shoreline inland areas belonging to the owner of the project, AMP and hence there exists no adverse social effect during the pre-construction stage of the project. Accordingly, environmental impacts and mitigation during construction and operation stages of the projects are only dealt with below. In this respect environmental impact assessment (EIA) matrix focused on the significant environmental effects and also adverse effects that could be mitigated as good engineering practice during the construction stage and operation stage are summarized respectively in Table 16.7.1 and Table 16.7.2.

(1) Construction Stage Impacts

Inherent temporary adverse effects of construction works on the ambient environment (atmosphere) are potential air pollution and noise nuisance due to material and equipment transportation, storage and installation works. Dust nuisance due to easily airborne materials like sand is the most significant air pollution issue of construction works that could be mitigated with water spraying and/or covering such materials with plastic sheets. Even though noise nuisance due to construction works is somewhat inevitable still restricting high noise prone activities like pile driving to daytime regular working hours only could mitigate its severe adverse effects.

Potential surface soil erosion in construction sites of both ports, though the site areas concerned are not that large, shall be given due considerations due to their proximity to the coastal seawaters. Erosion control, including the provision of barriers against surface soil erosion runoff into coastal waters, shall be an integral part of construction site management. In this respect covering of easily airborne materials like sand with plastic sheets would provide the dual benefit of air pollution control and erosion control due to rainfall runoff.

(2) Operation Stage Impacts

Potential port operational environmental impacts are of long-term and hence the mitigation measures are also of long-term in the form of port operational environmental management. The

most significant environmental management requirement is proper waste management due to vessel operation principally focused on waste oil (bilge waste) and garbage and also waste generated due to port terminal operation. Also it is important to eliminate spillage of oil into port waters during fuel oil handling. In this respect it is noted that under the current operational condition localized oil pollution in the port terminal areas of both Bocas del Toro and Almirante were observed.

Accordingly, improved waste management by AMP, both due to vessel operation and also port terminal operation in combination with surveillance against illegal dumping of wastes by vessels into port waters, so as to protect the port coastal water environment of berthing areas, shall be implemented. This port waste management program could be further complemented with a port water quality monitoring program at least targeting initially simple potable parameters, in particular DO (dissolved oxygen) level, which is a very good indicator of organic pollution level in water bodies.

(3) Conclusion and Recommendations

1) Conclusion

It is concluded that potential adverse environmental effects consequent to the project execution and its subsequent operation of the port terminals in both Bocas del Toro and Almirante are manageable and hence not that significant. Still, the most important port operational environmental requirement to be ensured is proper waste management.

2) Recommendations

It is recommended to initiate a port water quality monitoring program initially targeting at least simple potable water quality parameters, in particular DO level, by AMP. This monitoring program could be initiated at least concurrently with the commencement of construction works. The monitoring plan is given in the EIA document of Appendix P.

Currently the most significant source of pollution in coastal port waters, in particular in the port waters of Almirante, is the runoff of untreated wastes consequent to land based miscellaneous anthropogenic activities that are essentially not related to direct port operational activity. Accordingly, it is utmost important, as the highest priority, to improve overall waste management including the provision of sewage treatment plant in Almirnate and also operational improvement of existing facultative pond treatment plant in Bocas del Toro (Isla Colon). It is further emphasized that these waste management improvement measures need to be undertaken independently irrespective of the status of implementation of these port development projects.

In fact improper management of wastes of land based anthropogenic activities being the principal cause of coastal water environmental degradation is a nation-wide environmental issue to be dealt with as also pointed out in Section 5.2 of Chapter 5.

Table 16.7.1 Environmental Assessment Matrix (Construction Stage)

Bocas del Toro and Almirante ports						
Project stage	**Project Activities**	**Environmental component**	**Environmental variable**	**Environmental Effect**	**Environmental Measure**	**Recommendations**
Construction	1. Access roads implementation 2. Cuts and removal of land surface 3. Piles foundation 4. Material and equipment transportation	Atmosphere	Air quality	Increase in air particles	Spray with water or cover with plastic sheets easily airborne materials like sand, soil, etc.	Organize the number of heavy equipment and transportation vehicles that will be used in the construction works.
			Noise levels	Increase in noise levels	Working hours is scheduled during regular shift. Work is performed only during the day for high noise work like piling.	Avoid working too late at night or too early in the morning to mitigate noise generation that would seriously affect nearby communities.
		Soils	Erosion processes	Alteration of lithologic structure, erosion and modification of sedimentary distribution	Implement barriers that will stop the deposition of sediments in the water.	Ensure erosion control is integral part of construction site management.
			Intrinsic scenery	Modification of scenic landscape	Implement structures that will be in harmony with the landscape.	Provide final landscape to be in harmony with surrounding environment.
		Socio-economic and cultural	Employment	Creation of direct eventual jobs	No mitigation measures are needed due to the fact that the effect is positive and economically beneficial.	Review temporary personnel's abilities and skills that could be occupied in other activities during the operation stage of the project.

Table 16.7.2 Environmental Assessment Matrix (Operation Stage)

Bocas del Toro and Almirante Ports						
Project stage	**Project Activities**	**Environmental component**	**Environmental variable**	**Environmental Effect**	**Environmental Measure**	**Recommendations**
Project operation	1. Port maintenance operation 2. Navigation and boats transport 3. Harbour activities (passengers, commercial, etc.)	Soils	Soil composition	Soil contamination by fuel and other wastes	Implement a fuel, oil, solid and liquid waste management plan including the conduct of surveillance of vessels and port seabed quality monitoring.	Comply with established oil and other pollution control regulations.
		Environmental quality	Marine water	Variations in physical and chemical factors	Control measures in concordance with national and international marine policies related with port and marinas management (MARPOL).	Comply with established oil and other pollution control regulations.
		Marine fauna	Marine species (composition and dynamics)	- Reduction in species composition - Dynamics alteration (species stratification and distribution)	Comply with ANAM[1] and AMP[2] regulations on nature conservation, navigational safety and coastal environmental protection.	Ensure implementation of port water pollution control measures to facilitate continuous natural recovery.
		Socio-economic and cultural	Demography	Increase in immigration	Reinforcement of public service infrastructures for port operational activities.	The project should be incorporated in the promotion and creation of public services.
			Education	Changes in education, especially in profession and careers related with tourism	Support general population training to face tourist activity.	Promote the operation of the port and the tourist activity associated with the project.
			Employment	Creation of direct eventual jobs	No mitigation measures are needed due to the fact that the effect is positive and economically beneficial.	Conduct regular training programs to ensure continuous skill development of operational personnel.
			Basic utilities	Increase in basic services demand, specifically security and waterway transport	Support the reinforcement of infrastructure and police personnel conditions to guarantee tourist security, including improvement of waterway transportation.	Coordinate with competent institutions concerned to social security and waterway transportation.

Bocas del Toro and Almirante Ports						
Project stage	**Project Activities**	**Environmental component**	**Environmental variable**	**Environmental Effect**	**Environmental Measure**	**Recommendations**
			Sanitation	Increase of liquid and solid wastes	Support reinforcement of sanitary infrastructure to meet the sanitation demand.	Coordinate with competent institutions concerned to sanitation.
			Transportation networks	Increase of the transportations	No mitigation measures are needed due to the fact that the effect is positive and beneficial.	Coordinate with competent institutions to ensure effective link to other related transportation systems.
			Ethnic groups, traditions and costumes	Changes in traditions and costumes	Evaluate the mechanisms for conservation, preservation and integration of costumes and traditions.	Establish and maintain close socio cultural relations with ethnic groups.

[1] Autoridad Nacional del Ambiente (National Environmental Authority)
[2] Autoridad del Marítima de Panamá (Panama Maritime Authority)

17. FEASIBILITY STUDY ON CHIRIQUI PORT SHORT-TERM PROJECT

17.1 Identification of Short-term Development Projects

The port will have two types of wharves: tuna wharves and a multi-purpose wharf. The tuna boats currently calling on Puerto Armuelles for supply need more convenient docking facilities. On the request of the tuna company, the PTP has been carrying out the study for the construction of tuna wharves in their jurisdiction in Charco Azul, which is about five kilometers to the south of Puerto Armuelles. The proposed project is aiming at maximizing the benefits from the new port infrastructure by integrating the two development plans: the port facilities for the tuna boats and those for the public use, i.e. a multi-purpose wharf. By integrating the development of there two types of structures, tuna can be exported from the same port when they are loaded via the multi-purpose wharf while the latter can ensure the regular users. Both tuna boats and oceangoing cargo ships, especially container liners, need an all-whether wharf in the port. To this end, breakwaters are needed due to the geographical and oceanographic conditions of Chiriqui.

Since the construction of the breakwaters amounts to a big share in the construction cost and in order to make maximum use of the investment on the breakwaters, it is recommended that the whole project should be implemented in one package. The tuna boats are also benefited by the breakwaters: because, with the sheltered berths and water area, the tuna boats do not require all the crew members to watch the boats, and some of the crew can be take rest ashore.

On the basis of the demand forecast described in Section 13.2, the following are the potential cargoes that are expected to be handled at the Chriqui New Port:

(1) Presently existing users of the ports in Chiriqui Province

Tuna boats regularly calling on Puerto Armuelles Port

Reefer ships occasionally calling on Charco Azul Port

Dry bulk ships calling on Pedregal Port (Sugar and fertilizer)

(2) Potential cargoes presently transported overland from other ports

Dry cargoes brought from Costa Rica

Import container cargoes brought from Balboa and Colon

Local products exported from Balboa and Colon

Those users indicated in the first group will be the clients of the new Chiriqui Port. They will call on the new port as soon as it starts operation. On the other hand, those potential cargoes indicated in the second group will be gradually increasing after the port starts its operation, and unless the project is implemented and the port starts operation. Though the volume of the potential cargoes is expected to increase considerably in proportional to the growth of the local economic activities, the scale of the local economy is not large enough to require an additional multi-purpose berth within the coming 20 years.

Figure 17.1.1 shows the volumes of various commodities in the coming years, while Figure 17.1.2 shows the berth occupancy rate of the multi-purpose berth. As seen in Figure 17.1.2, in the year 2024, the berth occupancy rate is still less than 60%. This implies that even with only one berth, the port still has enough capacity for the smooth wharf operation without congestion. The conditions employed in the estimation of the berth occupancy rate are shown in Table 17.1.1.

Therefore, it is concluded that the short term plan should cover the whole port facilities proposed in the master plan.

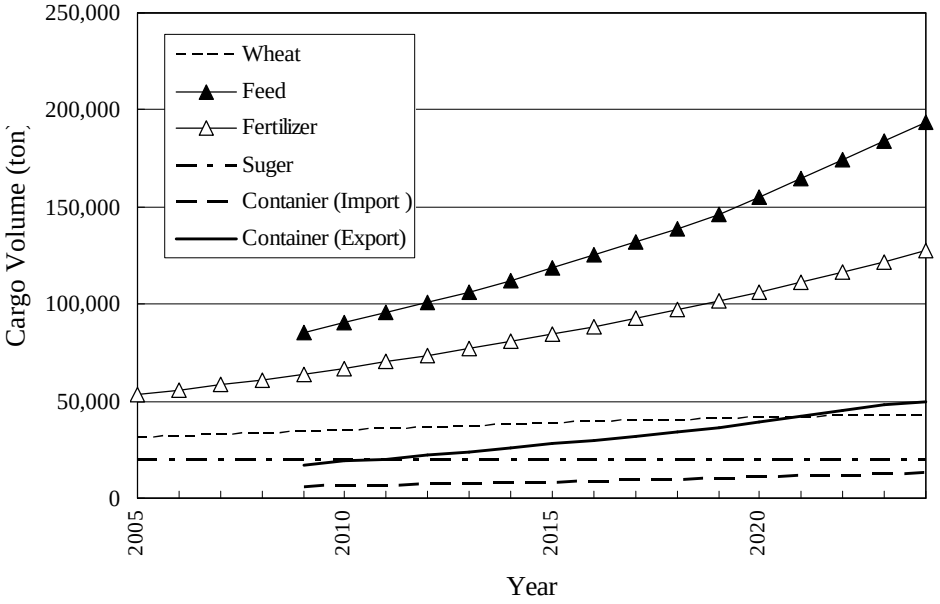


Figure 17.1.1 Cargo Volumes at Chriqui New Port for Various Commodities

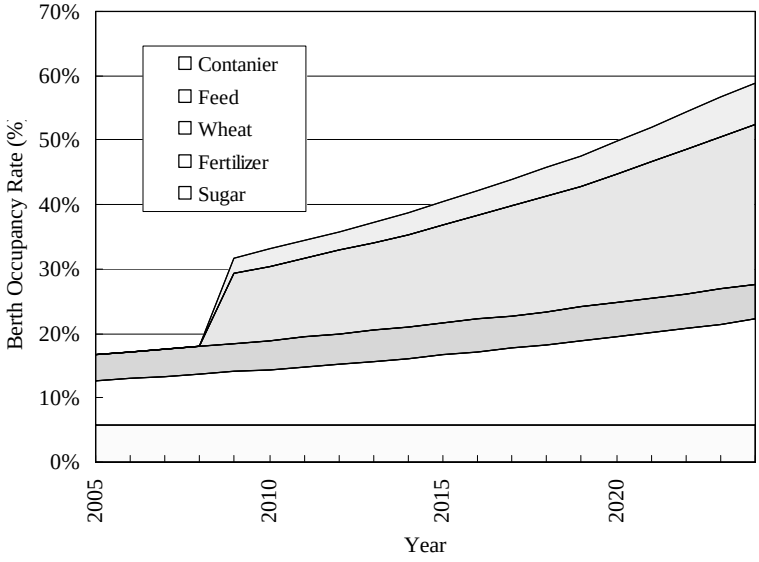


Figure 17.1.2 Berth Occupancy Rate in the Coming Years

Table 17.1.1 Assumptions Employed in Berth Occupancy Rate

Commodity	Cargo Volume per ship call (tons)	Handling Productivity (ton/hour/Crane)	Number of Cranes	Handling time/ship (days)
Except sugar	5000 ton	30	3	2.31
Sugar	2000 ton	20	2	2.08
Container cargoes	70 boxes Including Empty Containers	8 Boxes/hour/Crane	1	0.36

17.2 Facility Requirements and Layout

17.2.1 Facility Requirements

Facility requirements in the short-term development plan at Chiriqui Port are shown in Table 17.2.1.

Table 17.2.1 Summary of Facilities at Chiriqui Port

Item	Description
Waterfront Facilities	◆ Multi-purpose Berth (Length 230 m, water depth –12.0 m) ◆ Reefer Ship Berth (Length 110 m, water depth –6.5 m) ◆ Tuna Berth (Length 120 m, water depth –5.0 m) ◆ Breakwater and Groin
On Land Facilities	◆ Service road construction with drainage system inside the port area ◆ Open yard for conventional cargo and container ◆ Fence and Landscaping
Utility Supply Facilities	◆ Water supply reservoir (50 tons) and over head tank (200 tons) with supply piping to buildings and firefighting ◆ Electric power supply to buildings, lighting to buildings and yard
Buildings	◆ Administration Building: 300 m^2 ◆ Cold Storage: 2,300 m2 ◆ Gate House: 2 lane, 1 booth
Access Road	◆ 2-lanes road connecting port area and existing national road

17.2.2 Port Layout Plan

The port layout plan for short-term plan is shown in Figures 17.2.1 and 17.2.2.

17.2.3 Design of Port Facilities

(1) Quay Structure

Considering the subsoil conditions, a suitable structure type for the quay has been studied and are summarized in Tables 17.2.3 and 17.2.4. As shown in the Tables, the advantage and disadvantage of three alternatives were reviewed and compared in terms of cost, construction period and environmental conditions.

An open pile type quay structure will be the most suitable to the site condition for Multi-purpose berth. The typical section of the open pile type quay wall is shown in Figure 17.2.3. A SSP type quay structure will be the most suitable to the site condition of Reefer Sip Berth and Tuna Berth. The typical section of the SSP type quay wall is shown in Figures 17.2.4 and 17.2.5.

Suitable quay fixtures to the objective vessels, i.e. rubber fenders and bollards, have been selected as shown in the above figure. The following capacities are expected:

- Rubble Fender for Multi-purpose Berth: Absorption energy of 400 kN•m
- Rubble Fender for Reefer Ship Berth: Absorption energy of 40 kN•m
- Rubble Fender for Tuna Berth: Absorption energy of 40 kN•m
- Bollard for Multi-purpose Berth: Tractive force of 100 ton in every direction
- Bollard for Reefer Ship Berth: Tractive force of 25 ton in every direction
- Bollard for Tuna Berth: Tractive force of 10 ton in every direction

(2) Buildings

Buildings planned in the short-term plan are summarized in Table 17.2.2. Considerations in the design are presented below:

- Administration office and Gate House will be RC building equipped with required interior furnish for office use.
- Cold storage shed will be a single story building and framed by steel structures in order to offer wider space at a least number of the supporting columns. Office and machine room will be included.

Table 17.2.2 Outline of Buildings at Chiriqui Port

Building	No.	Floor Area (m^2)	Story	Structural Particulars		
				Frame	Wall	Roof
Administration Building	1	300	2	R/C	Concrete Block	R/C
Cold storage shed	1	2,300	1	Steel	Concrete Block	Galvanized Iron Sheet
Gate House	1	2 lane, 1 booth	1	R/C	Concrete Block	Galvanized Iron Sheet

(3) Pavement

Pavement inside the terminal area has been studied in view of its specific use for the operation. Depending on the critical loading for each area, suitable types of the pavement are selected.

For this selection, considerations in the design are the following:

- Apron of the berth and passageway inside the yard: ideally only loaded trailer trucks and unloaded handling equipment will pass on the pavement. Thus it does not need to be designed for heavy wheel loads of the equipment, such as forklifts/side loaders/reach stackers for loaded containers.

- Multi-purpose Yard: considering the site conditions, the yard will be provided in the reclamation on firm stratum and no serious settlement will be expected. Accordingly, concrete pavement has been selected. Wheel loads of the loaded equipment and required container loads should be considered.
- The access road to the terminal: asphalt concrete pavement is designed for various types of vehicles.

(4) Utilities

1) Drainage

Inside the yard, storm water will be collected by an appropriate gradient of the pavement to the surface drainage, which will be of an open type, i.e. U-shaped ditch, V-shaped gutter, etc. The main drainage will be a buried concrete box culvert type, to which surface and domestic drains will be connected. Septic tanks for each building will be also installed, as well as spilled wastewater collector for the container washing and maintenance works.

2) Water Supply

Fire fighting, ship's supply and other domestic consumption in the terminal have been considered and the water will be tapped at mains of Chiriqui area. Relevant facilities, such as reservoirs (50 tons), elevated tanks (200 tons) and pumps will be included, together with their network pipes.

3) Power Supply

Substation and emergency generator for lighting and building supply will be provided.

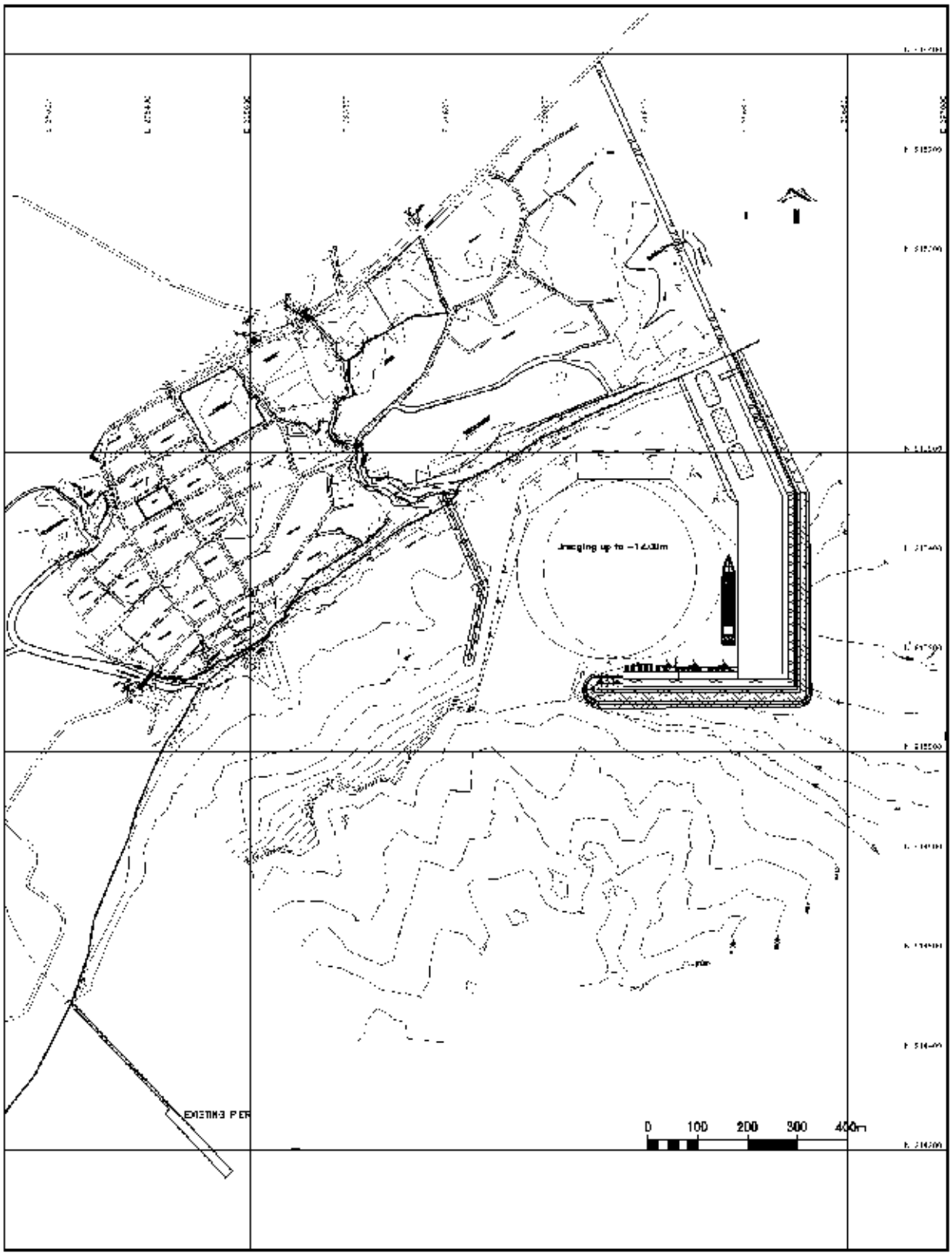


Figure 17.2.1 General Plan of Chiriqui Port

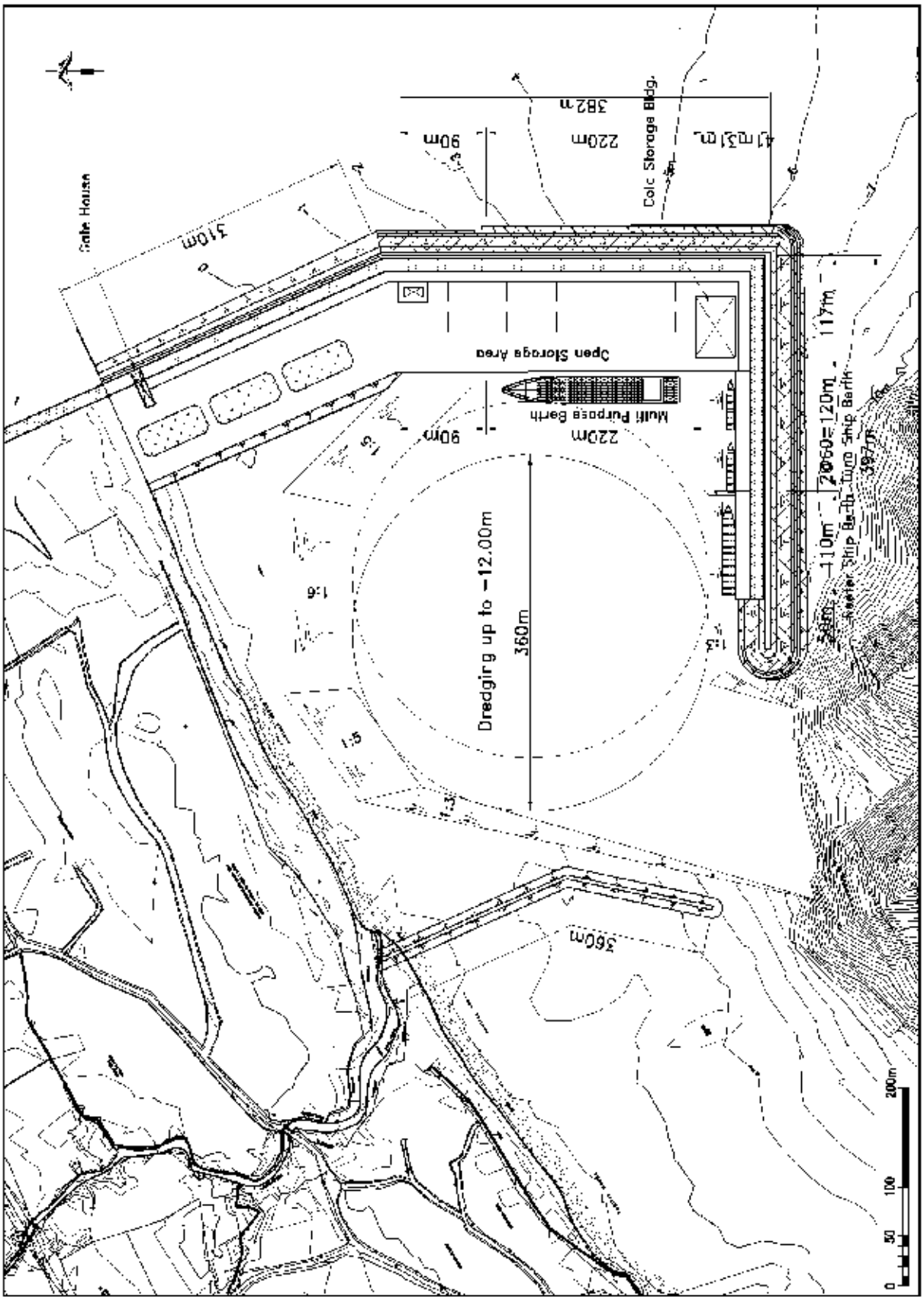


Figure 17.2.2 General Layout Plan of Facilities

Table 17.2.3 Comparison of Quay Structure Types for Multi-purpose Berth

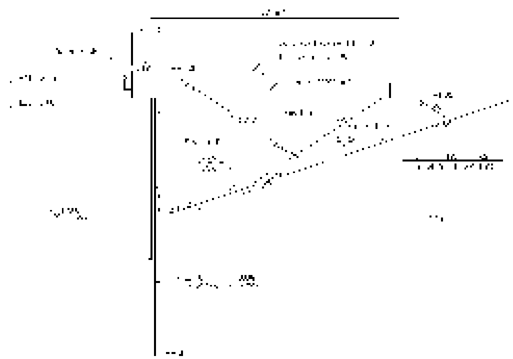
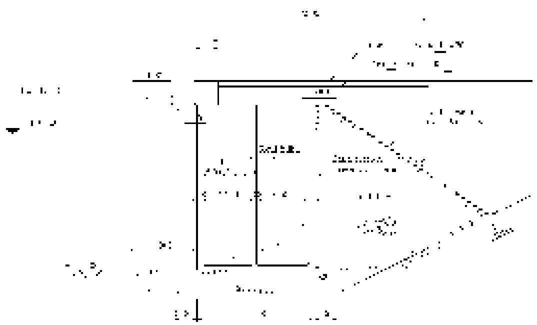
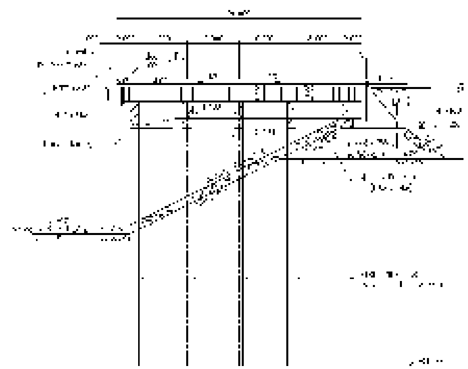
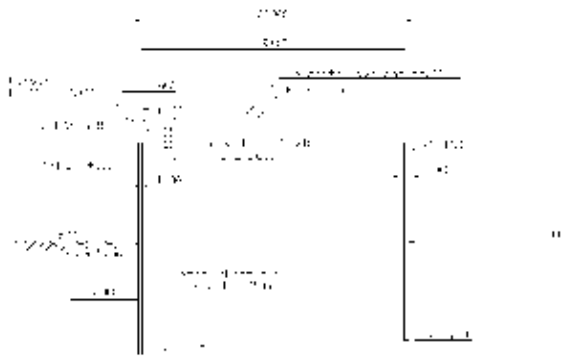
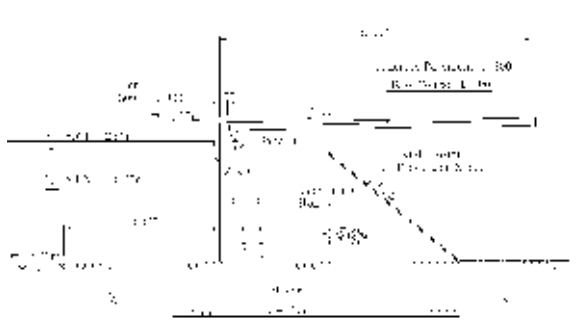
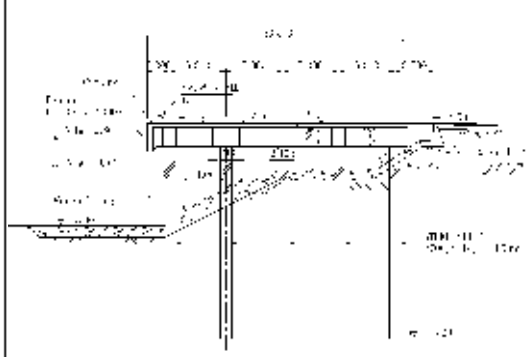
	Steel Pipe Sheet Pile (SPSP)	Caisson Type	Steel Pipe Pile (SPP)
Typical Cross Section			
Evaluation	*Simple in works and shorter construction period *Adjustable and flexible to the change of soil condition at site	*Complicated works and longer work period *Construction cost is the highest among the three types *Has negative effect on environment	*Suitable and adopted for the design conditions *Simple construction procedure and economical cost and short construction period *Environmental impacts may be minimal
Advantage	× (Not Recommendable) *The construction period may be the shortest among the alternatives. *Sheet piling works and dredging/reclamation works can be conducted at the same time.	× (Not Recommendable) *Material is locally available and can be used, thus material cost is economically superior. *More suitable to shallow water depth than other 2 types. *Maintenance is easy and structure has reasonable durability.	○ (Recommendable) *The construction cost may be the lowest among the alternatives. *Volume of reclamation works will be minimal. *Steel Pile driving works and revetment works can be progressed separately at the same time.
Disadvantage	*Corrosion of SPSP should be considered. *SPSP and tie wires have to be imported. *The construction cost may be higher than SPP type.	*Caisson yard or floating dock is required for fabrication. *Large floating equipment is required during installation. *The construction work is complicated to make level of mound for caisson installation and to set them exactly at the position. *Construction period may be the longest	*Corrosion of SPP should be considered. *SPP have to be imported. *Dredging works should be progressed before pile driving works. *Large offshore pile driving equipment may be required. *SPP is not easy to adjust its length by changes of soil and seabed topography. *Additional retaining wall is required for reclamation works. *Construction period will be longer than SPSP type structure.

Table 17.2.4 Comparison of Quay Structure Types for Reefer Ship/Tuna Berth

	Steel Sheet Pile (SSP)	Gravity Type (Concrete Blocks)	Steel Pipe Pile (SPP)
Typical Cross Section			
Evaluation	*Simple in works and shorter construction period *Construction cost is most economical among the three types *Adjustable and flexible to the change of soil condition at site	*Complicated in works and longer period of works *Construction cost is the highest of the three types *Has negative affect on environment	*Simple construction procedure *Environmental impacts may be minimal
	○ (Recommendable)	× (Not Recommendable)	× (Not Recommendable)
Advantage	*The construction period may be the shortest among the alternatives. *The construction cost may be lower than SPP type. *Volume of dredging and reclamation will be minimal. *Sheet piling works and dredging/reclamation works can be conducted at the same time.	*Material is locally available and can be used, thus material cost is economically superior. *More suitable to shallow water depth than other 2 types. *Maintenance is easy and structure has reasonable durability.	*Volume of reclamation works will be minimal. *Steel Pile driving works and reclamation works can be progressed separately at the same time.
Disadvantage	*Corrosion of SSP should be considered. *SSP and tie wires have to be imported.	*Block yard is required for fabrication. *Large floating equipment is required during installation. *The construction work is complicated to make level of mound for block installation and to set exact position for installation. *Construction period may be the largest.	*The construction cost may be higher than SSP type. *Corrosion of SPP should be considered. *SPP have to be imported. *Dredging works should be progressed before pile driving works. *Large offshore pile driving equipment may be required. *SPP is not easy to adjust its length by changes of soil and seabed topography. *Additional retaining wall is required for reclamation works. *Construction period will be longer than SSP type structure.

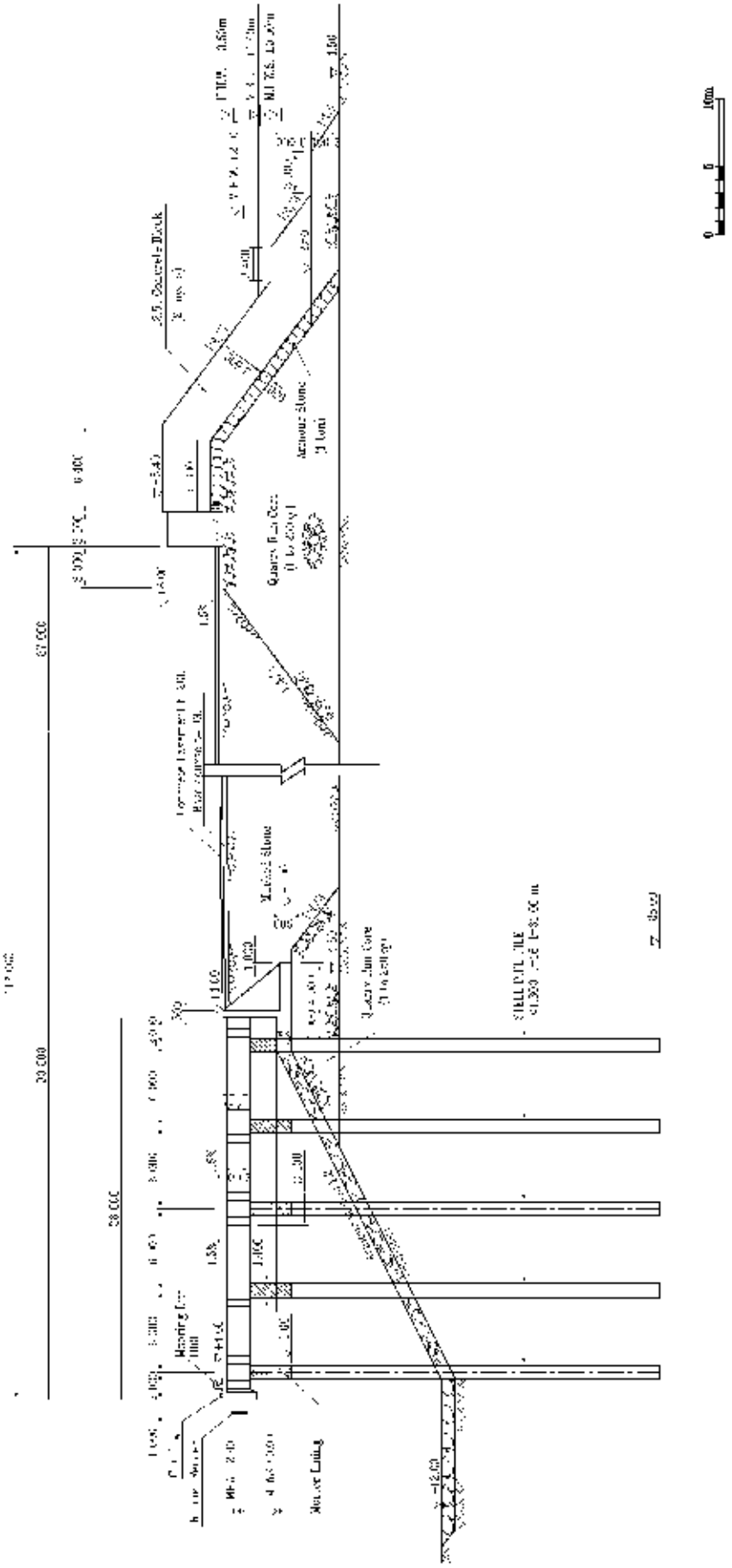


Figure 17.2.3 Typical Section of Multi-purpose Berth

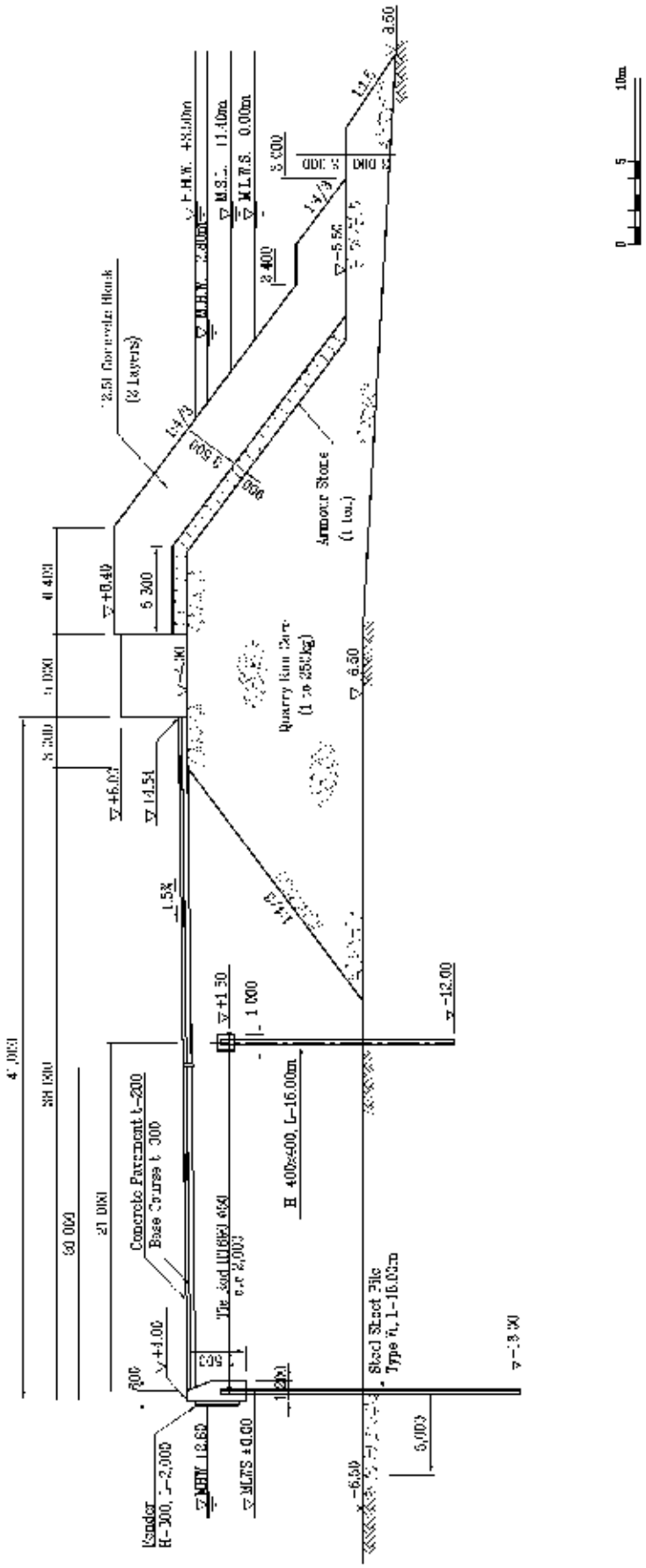


Figure 17.2.4 Typical Section of Reefer Ship Berth

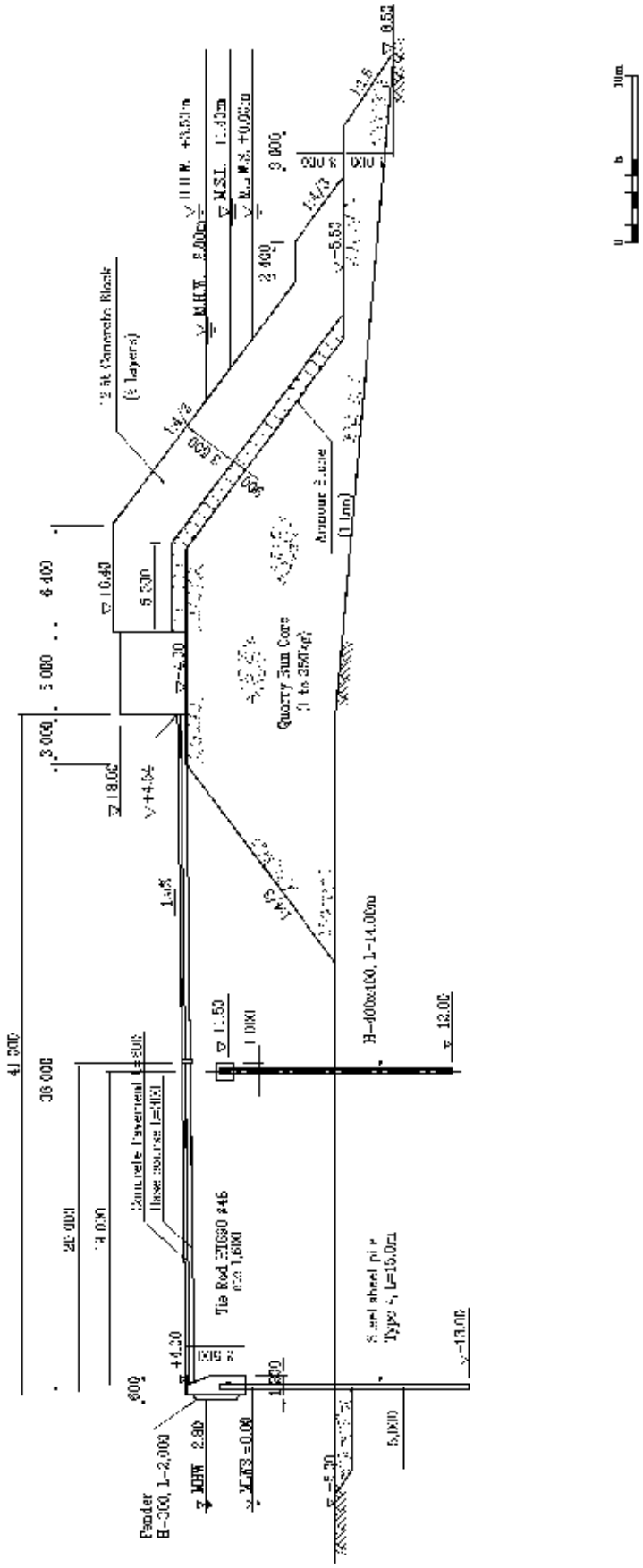


Figure 17.2.5 Typical Section of Tuna Berth

17.3 Project Implementation

17.3.1 Introduction

In this section, the project cost for the feasibility study was estimated based on the following method.

- For the purpose of estimation of the project cost, unit prices of each element such as major construction materials, equipment and manpower cost are determined on the basis of the local unit prices collected from the contractors and the suppliers in December 2003, through the field survey.
- The basic costs of imported products are estimated using the exchange rate on December 2003.
- The construction schedule is reviewed based on the government procedures and the financial program.

17.3.2 Project Cost

Based on the above conditions, project cost for the feasibility study is estimated as shown on the following table.

Table 17.3.1 Project Cost for the Feasibility Study of Chiriqui Port

Chiriqui						Unit : USD
	Item	**Dimensions**	**Unit**	**Quantity**	**Unit Rate**	**Amount**
1	Dredging	up to -12m	cu.m	1,938,000	2.0	3,876,000
2	Reclamation	up to +4m	cu.m	449,192	7.0	3,144,344
3	-12m Berth	Multi Purpose Berth	lin.m	250	47,935.2	11,983,804
4	-6.5m Berth	Refer Carrier Berth	lin.m	110	10,480.5	1,152,860
5	-5m Berth	Tuna Boat Berth incl. Approach	lin.m	120	9,558.3	1,146,992
6	Breakwater	South East Side	lin.m	780	29,281.7	22,839,690
7	Groin	West Side	lin.m	360	716.1	257,796
8	Revetment	East Side	lin.m	310	2,926.4	907,184
9	Building	RC-made, Flat Floor	sq.m	250	500.0	125,000
10	Pavement		sq.m	38,790	80.0	3,103,200
11	Fuel Supply	for Fishing Boat	l.sum	1	203,780.0	203,780
12	Outdoor Lighting		unit	95	1,250.0	118,750
13	landscaping		sq.m	32,760	3.0	98,280
14	Utilities	Reservoir, Elevated Tank etc.	l.sum	1	835,764.0	835,764
Total						**49,793,444**

17.3.3 Implementation Schedule

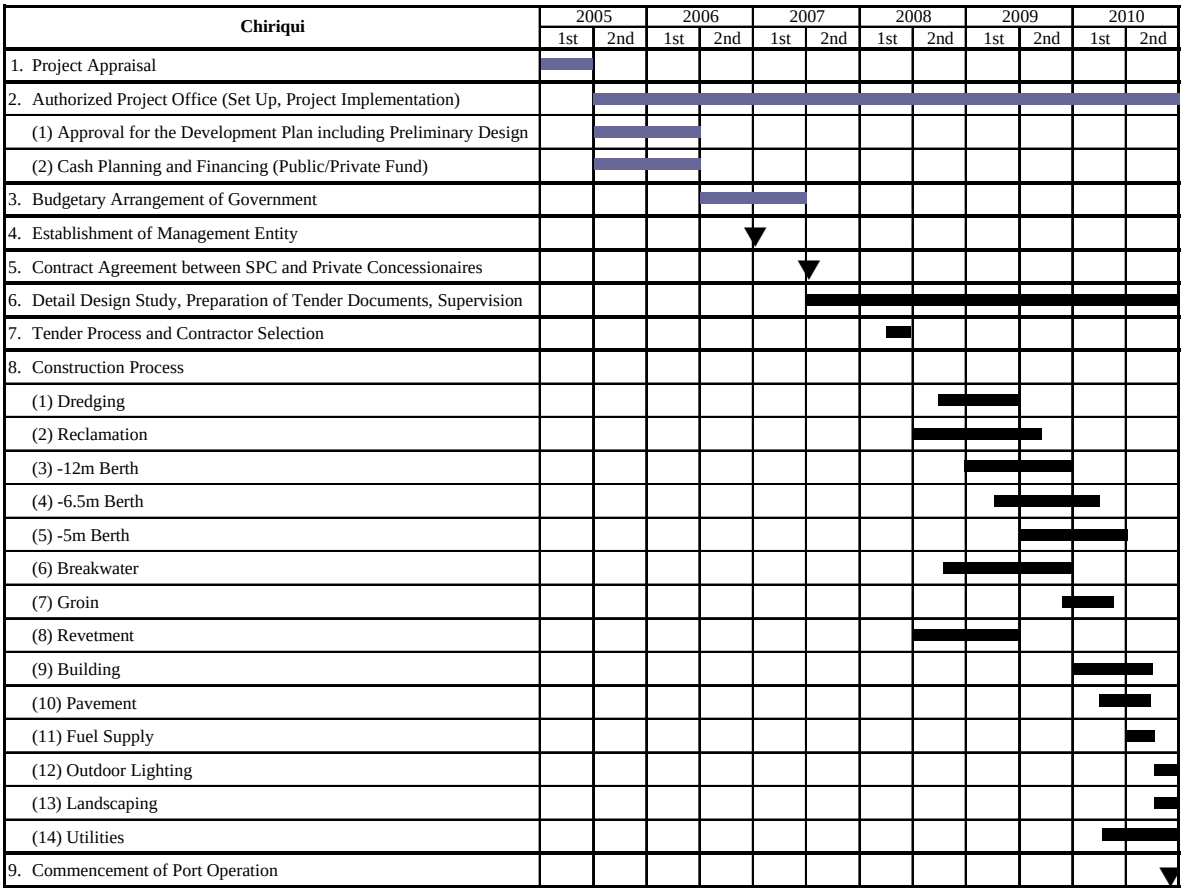
Implementation schedule for the project is studied based on following understandings.

- Set up the project office, which delegated strong power for the project promotion, and establish the development plan by the first half of 2006. Roles of public and private sectors to be studied by this office.
- Establish the Management Body (SPC: Special Purpose Company for the port operation) by the end of 2006.

- Acquire the budget by the middle of 2007.
- The concession agreement for private operators to be concluded by the middle of 2007.
- Complete the detailed design and prepare the tender documents for the construction by the first quarter of 2008, and carry out the tender in the next quarter.
- Start the construction in the second half of 2008, and complete by the end of 2010. Open the port in the early part of 2011.

The schedules for each construction items are shown on the following table.

Table 17.3.2 Project Implementation Schedule for Chiriqui Port



17.4 Administration and Management

17.4.1 Port Infrastructure Development Scheme

Since the function of the port includes services to specific users, i.e., tuna boats, and to other public users, public-private joint financing seems to be realistic. The major elements of the port infrastructure are the breakwaters, basin and wharves. The cost of the breakwater amounts to 45% of total construction cost of about USD 50 million.

The breakwaters are very necessary to have the port operational throughout the year, because of the geographical and oceanographic characteristics of Chiriqui Province. Thus, public investment is vital for the realization of the project. According to the financial analysis, the project is assessed financially viable, provided that 30% of total construction cost will be granted by the public sector. The FIRR of 8 % implies that, combined with a soft loan, some portion of the construction cost of wharves can be funded by a commercial loan.

Taking into considerations of the wide range of the stakeholders of the project, it is recommended that an independent management body, i.e. Special Purpose Company (SPC), should be established for the new Chiriqui port and that the government should provide the SPC with the port infrastructure in terms of equity or through concession contract (Please see Table 16.4.1, Type 3).

17.4.2 Conditions for Private Participation

Since the amount of investment is relatively large, a private-public mixed investment scheme (Private-Public Partnership-PPP) should be sought.

The cost for the most basic and costly infrastructure such as breakwaters and dredging of channel and basin should be covered by public sector, while the wharves especially tuna wharves, can be covered wholly or partially by private sector. The multi-purpose wharf is for public use and there are many examples of the PPP schemes applied for this type of port development in the world.

Thus, for the development of Chiriqui New Port, it is recommended to create an SPC that has the same nature as the PTP. While the government will provide the SPC with the basic port infrastructure in terms of assets, the SPC will be financing itself to develop the tuna and the multi-purpose wharves. Since the multi-purpose wharf is intended to serve for the public, the SPC may raise fund in terms of stocks from various stakeholders especially in Chiriqui Province. The PTP, the Baru Free Zone Authority, the fertilizer importers and sugar companies are primary stakeholders. In addition, the port terminal operators and logistics firms based in Metropolitan Panama may be interested in participating in the investment and the operation of the port.

17.4.3 Administration, Management and Operation

AMP has the responsibility of undertaking the following steps among others:

(1) Financing for the construction of basic port infrastructure
(2) Establishment of the Special Purpose Company for the management and operation of the New Chiriqui Port.

After the establishment of the SPC, the roles and functions of AMP are rather administrative services, which are as the same as those currently practiced in the major Port in Canal Area. Furthermore, being a member of the board directors of SPC representing the government's share, AMP should proactively support the business of SPC.

Apart from the business activities of SPC, AMP has the responsibility to maintain the public relations in the region, the nation and the maritime society of the world to promote Chiriqui port. The PTP, the Baru Free Zone Authority and IPAT are the primary partners of AMP in the activities of port sales.

17.4.4 Recommendations

The public-private partnership is the key element of the project. Organizing the stakeholders of the project is most important role of AMP. Since the multi-purpose wharf constructed for the public use, it is recommended that SPC should be established to manage and operate the whole port on the financial basis of the investment by the government and the stakeholders. The government should shoulder the funds needed for the construction of the basic port infrastructure such as breakwaters, access channels and basin, while the private sector should shoulder the cost of the construction of the wharves.

Sixty percent of the construction cost (USD 30 million) should be financed by the government and 50% (or USD 15 million) of which should be the grant element that shall be given to the SPC in terms of equity as the government share.

AMP has the responsibility to regulate the SPC in the same manner as it is administrating the major international port in Canal area. In addition, it has also an important responsibility to participate in the management of SPC as one of the major shareholders.

17.5 Economic Analysis

Since the Priority project is the same as the project proposed as the Master Plan. Therefore, the Economic Analysis is the same as described in Chapter 12.10.

During the stage of the feasibility study the sensitivity analyses are carried out with the purpose to ensure the economic feasibility of the projects.

17.5.1 Sensitivity analysis

The sensitivity analysis on the EIRR has been carried out under the following three unfavorable situations.

17.5.2 Sensitivity Analysis on EIRR

The sensitivity analysis on the EIRR has been performed with the following three unfavorable situations.

Case A: The ten percent overrun of the capital investment cost
Case B: The ten percent decrease of the economic benefit
Case C: Both Case A and Case B (the worst scenario)

Cases	EIRR
Base Case	15.42 %
Case A	14.31 %
Case B	14.16 %
Case C	13.11 %

The details of the sensitivity analysis will be shown in Appendix N.

17.5.3 Qualitative Evaluation of Economic Benefit

This project aims to construct the first full scale modern port that accommodates ocean going ships including container ships outside of Canal Zone in the Republic of Panama. Chiriqui Province has the largest population and industrial concentration next to Canal Zone. The growth potential is very high if fundamental infrastructure is provided. Especially, this port is the gateway to the Pacific Ocean to Baru Multimodal Free Zone that is now promoted as the trigger of the regional development. The new Chiriqui Port will give the economic benefit not only to the region but also to the eastern part of Costa Rica and accelerate the economic development there. Although these economic benefits to the region are not fully quantified, the aggregated economic benefit will be far greater than the one that is shown above in figures.

17.5.4 Conclusion

Considering relatively high EIRR with robustness shown in the sensitivity analysis where unfavorable situations are assumed and qualitative evaluation mentioned above, this project is feasible and recommendable from economic point of view.

17.6 Financial Analysis

17.6.1 Scope of Financial Analysis

This is the completely new port construction project. The facilities that will be constructed and operated by private business under concession are excluded.

17.6.2 Establish of Special Purpose Company (SPC)

The goal of the project of Chiriqui New Port is to promote the participation of private sector in the investment and management. Thus, in order to facilitate the participation of private business and to achieve operating efficiency, the study team has proposed the introduction of special purpose company (SPC) is recommended to operate both multipurpose terminal and fishery wharf of the new port.

To make the project feasible, it was assumed that 40% of the total construction cost shall be given to the SPC as equity investment while the rest of 60% of the cost shall be financed by loan. It is also assumed that the share between public and private sectors for the equity investment and loan shall be determined at later stage through the negotiation, though the Panamanian Government will be expected to have the majority portion of the equity.

Once the SPC is established, its business should be sustainable. Therefore, the depreciation of the equity and the renewal investment of plant and equipment (in every ten years), as well as the maintenance and operation cost shall be born fully by the project.

17.6.3 Assumed Financial Scheme of the Project

The conditions employed in the financial analysis of Chiriqui New Port project are summarized in Table below. Considering the introduction of the commercial loan, the interest rate be employed in the cash flow analysis is set at 6 %

Name of the Port	Chiriqui
Managing Entity	Special Purpose Company (SPC)
Shareholders	Government and Private Participant
Financing Scheme of the Construction Costs	Equity Investment (40%) and Loan (60%)
Interest Rate for Loan	6%
Grace Period (from the start of the Operation)	5 years
Repayment of loan	20 years
Financial Source of Renewal Investment of Plant and Equipment	By managing entity

17.6.4 Estimation of the Financial Cost

The financial cost is same as the cost in economic analysis but expressed in market price, not in economic price. Forty percent of equity investment is not required to repay but is to be depreciated.

Contingencies for the construction cost are estimated at 10 percent level.

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

The saving of the annual dredging cost of USD 259,000 in the Pedregal port is considered in financial analysis.

As for this, the number of the staff is expected at the same level. Therefore, the incremental personnel cost will be zero through whole project life (2005 through 2024) while Armuelles office will be closed and its eight staff will be transferred to this port.

The project costs expended in each year are shown in the columns of Civil Work, Plant & Equipment, and maintenance in **Table 17.6.1**

Table 17.6.1 Estimate of FIRR for New Chiriqui Port Project

USD

Year	Civil	Plant & Equipment	Engineering	Investment	60% of Investment	Maintenance	Dredging Cost of Pedregal	Net Maintenance Cost	Total Cash Outflow	Cargo (Ton)	Port Fee (Cargo)	Port Fee (Tuna)	Total Cash Inflow	Net Cash Inflow
2005				0	0			0	0				0	0
2006				0	0			0	0				0	0
2007	0	0	995,869	995,869	597,521			0	597,521				0	(597,521)
2008	21,341,173	516,312	497,934	22,355,419	13,413,251			0	13,413,251				0	(13,413,251)
2009	16,005,879	387,234	497,934	16,891,047	10,134,628	0	0	0	10,134,628	0	0	0	0	(10,134,628)
2010	16,005,879	387,234	497,934	16,891,047	10,134,628	0	0	0	10,134,628	0	0	0	0	(10,134,628)
2011	0	0	0	0	0	497,934	(259,000)	238,934	238,934	311,400	2,646,900	67,086	2,713,986	2,475,052
2012	0	0	0	0	0	497,934	(259,000)	238,934	238,934	325,700	2,768,450	67,086	2,835,536	2,596,602
2013	0	0	0	0	0	497,934	(259,000)	238,934	238,934	341,400	2,901,900	67,086	2,968,986	2,730,052
2014	0	0	0	0	0	497,934	(259,000)	238,934	238,934	356,100	3,026,850	67,086	3,093,936	2,855,002
2015	0	0	0	0	0	497,934	(259,000)	238,934	238,934	374,400	3,182,400	67,086	3,249,486	3,010,552
2016	0	0	0	0	0	497,934	(259,000)	238,934	238,934	391,800	3,330,300	67,086	3,397,386	3,158,452
2017	0	0	0	0	0	497,934	(259,000)	238,934	238,934	410,400	3,488,400	67,086	3,555,486	3,316,552
2018	0	0	0	0	0	497,934	(259,000)	238,934	238,934	428,200	3,639,700	67,086	3,706,786	3,467,852
2019	0	0	0	0	0	497,934	(259,000)	238,934	238,934	447,100	3,800,350	67,086	3,867,436	3,628,502
2020	0	1,290,780	0	1,290,780	1,290,780	497,934	(259,000)	238,934	1,529,714	471,100	4,004,350	67,086	4,071,436	2,541,722
2021	0	0	0	0	0	497,934	(259,000)	238,934	238,934	495,820	4,214,470	67,086	4,281,556	4,042,622
2022	0	0	0	0	0	497,934	(259,000)	238,934	238,934	518,900	4,410,650	67,086	4,477,736	4,238,802
2023	0	0	0	0	0	497,934	(259,000)	238,934	238,934	542,100	4,607,850	67,086	4,674,936	4,436,002
2024	0	0	0	0	0	497,934	(259,000)	238,934	238,934	564,600	4,799,100	67,086	4,866,186	4,627,252
2025	0	0	0	0	0	497,934	(259,000)	238,934	238,934	587,184	4,991,064	67,086	5,058,150	4,819,216
2026	0	0	0	0	0	497,934	(259,000)	238,934	238,934	610,671	5,190,707	67,086	5,257,793	5,018,859
2027	0	0	0	0	0	497,934	(259,000)	238,934	238,934	635,098	5,398,335	67,086	5,465,421	5,226,487
2028	0	0	0	0	0	497,934	(259,000)	238,934	238,934	660,502	5,614,268	67,086	5,681,354	5,442,420
2029	0	0	0	0	0	497,934	(259,000)	238,934	238,934	686,922	5,838,839	67,086	5,905,925	5,666,991
2030	0	1,290,780	0	1,290,780	1,290,780	497,934	(259,000)	238,934	1,529,714	714,399	6,072,393	67,086	6,139,479	4,609,765
2031	0	0	0	0	0	497,934	(259,000)	238,934	238,934	742,975	6,315,288	67,086	6,382,374	6,143,440
2032	0	0	0	0	0	497,934	(259,000)	238,934	238,934	772,694	6,567,900	67,086	6,634,986	6,396,052
2033	0	0	0	0	0	497,934	(259,000)	238,934	238,934	803,602	6,830,616	67,086	6,897,702	6,658,768
2034	0	0	0	0	0	497,934	(259,000)	238,934	238,934	835,746	7,103,840	67,086	7,170,926	6,931,992
2035	0	0	0	0	0	497,934	(259,000)	238,934	238,934	869,176	7,387,994	67,086	7,455,080	7,216,146
2036	0	0	0	0	0	497,934	(259,000)	238,934	238,934	903,943	7,683,514	67,086	7,750,600	7,511,666
2037	0	0	0	0	0	497,934	(259,000)	238,934	238,934	940,101	7,990,854	67,086	8,057,940	7,819,006
2038	0	0	0	0	0	497,934	(259,000)	238,934	238,934	977,705	8,310,488	67,086	8,377,574	8,138,640
2039	0	0	0	0	0	497,934	(259,000)	238,934	238,934	1,016,813	8,642,908	67,086	8,709,994	8,471,060
2040	0	1,290,780	0	1,290,780	1,290,780	497,934	(259,000)	238,934	1,529,714	1,057,485	8,988,624	67,086	9,055,710	7,525,996
2041	0	0	0	0	0	497,934	(259,000)	238,934	238,934	1,099,785	9,348,169	67,086	9,415,255	9,176,321
2042	0	0	0	0	0	497,934	(259,000)	238,934	238,934	1,143,776	9,722,096	67,086	9,789,182	9,550,248
2043	0	0	0	0	0	497,934	(259,000)	238,934	238,934	1,189,527	10,110,980	67,086	10,178,066	9,939,132
2044	0	0	0	0	0	497,934	(259,000)	238,934	238,934	1,237,108	10,515,419	67,086	10,582,505	10,343,571
														FIRR
														9.79%

Note: (1) Ten percent contingency for Civil Works is included in Investment.
(2) The Renewal of Plant & Equipment is fully born by the Project.

Note: (1) Ten percent contingency is included in Investment.

(2) The Renewal of Plant & Equipment is fully born by the Project.

17.6.5 Estimation of the Financial Revenue

(1) While the current port fee for cargo at Aguadulce port is USD 1.25 per ton on average, the new port fee for cargo is expected at USD 4.25 per ton, considering the remarkable improvement of facilities and services and the disappearing of waiting time caused by low tide.

(2) As explained in **16.6.2 (3)**, the total port revenue from cargo ships will be twice of the fee for the cargo.

(3) The operation business of the wharf will be carried out by private concern (concessionaire).

(4) Container of 1 TEU is expected to carry ten tons of cargo.

(5) The unloading volume of tuna from tuna boats will be 20 tons per ship call. The port fee for tuna boat will be same as the current averaged port fee at Vacamonte port.

The revenue elements and their respective value in each year are summarized in the columns of Revenue from cargoes, Port Fees for Cargo ships and tuna boats are summarized in **Table 17.6.1**

17.6.6 Financial internal Rate of Return (FIRR)

As Table 17.6.1 shows the estimate of FIRR for the project is 9.79%.

17.6.7 Pro Forma Financial Statements

The financial situation of the managing entity is calculated as shown in Table 17.6.2.

(1) Income Statement

The operation will start at 2011. Annual income will be positive at 2011 (first year of operation) but cumulative profit will become positive at 2016 (the sixth year of the operation (see the Row indicated as "Net Profit" in Table 17.6.3 and see also Figure 17.6.1).

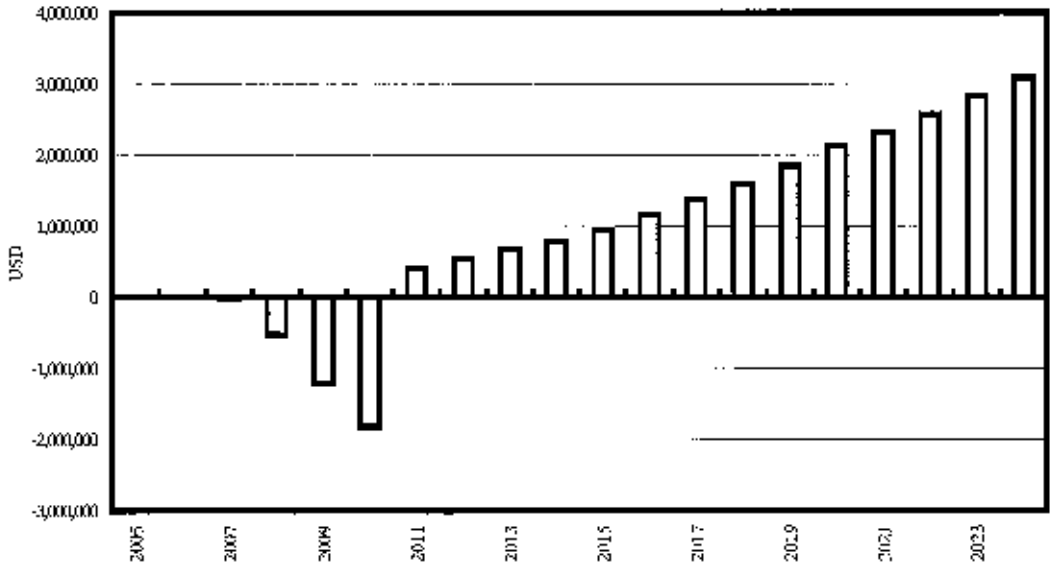


Figure 17.6.1 Annual Net Profit (New Chiriqui)

(2) Cash Flow Statement

From the first year of operation, the net cash flow is positive except. Cumulative cash will become positive at 2013 (third year of operation) and keep positive until 2014 (See the Row of "Net Inflow of Table 17.6.3 and Figure 17.6.2).

(3) Balance Sheet

Cash position becomes positive at 2013 but net equity becomes positive at 2016.

Table 17.6.2 Pro Forma Financial Statements for New Chiriqui Port Project

(USD)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Income Statement																		
Annual Depr	0	14,654	337,968	582,285	826,602	826,602	826,602	826,602	826,602	826,602	826,602	824,989	796,301	774,584	869,037	869,037	869,037	869,037
Annual Interest	21,511	504,388	869,234	1,234,081	1,234,081	1,234,081	1,234,081	1,234,081	1,234,081	1,172,377	1,110,673	1,048,969	987,265	925,561	863,857	802,153	740,449	678,745
Operation & Maintenance	0	0	0	0	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934
Total Expenses	21,511	519,042	1,207,202	1,816,366	2,299,617	2,299,617	2,299,617	2,299,617	2,299,617	2,237,913	2,176,209	2,112,892	2,022,500	1,939,079	1,971,828	1,910,124	1,848,420	1,786,716
Total Revenue	0	0	0	0	2,713,986	2,835,536	2,968,986	3,093,936	3,249,486	3,397,386	3,555,486	3,706,786	3,867,436	4,071,436	4,281,556	4,477,736	4,674,936	4,866,186
Net Profit	(21,511)	(519,042)	(1,207,202)	(1,816,366)	414,369	535,919	669,369	794,319	949,869	1,159,473	1,379,277	1,593,894	1,844,936	2,132,357	2,309,728	2,567,612	2,826,516	3,079,470
Cum Profit	(21,511)	(540,553)	(1,747,755)	(3,564,121)	(3,149,752)	(2,613,834)	(1,944,465)	(1,150,146)	(200,277)	959,196	2,338,473	3,932,367	5,777,303	7,909,660	10,219,388	12,787,001	15,613,517	18,692,987
Cash Flow Statement																		
Equity Investment (40%)	239,009	5,365,300	4,053,851	4,053,851	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loan	358,513	8,047,951	6,080,777	6,080,777	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Revenue	0	0	0	0	2,713,986	2,835,536	2,968,986	3,093,936	3,249,486	3,397,386	3,555,486	3,706,786	3,867,436	4,071,436	4,281,556	4,477,736	4,674,936	4,866,186
Total Inflow	597,521	13,413,251	10,134,628	10,134,628	2,713,986	2,835,536	2,968,986	3,093,936	3,249,486	3,397,386	3,555,486	3,706,786	3,867,436	4,071,436	4,281,556	4,477,736	4,674,936	4,866,186
Investment	597,521	13,413,251	10,134,628	10,134,628	0	0	0	0	0	0	0	0	0	1,290,780	0	0	0	0
Operation & Maintenance	0	0	0	0	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934	238,934
Interest	21,511	504,388	869,234	1,234,081	1,234,081	1,234,081	1,234,081	1,234,081	1,234,081	1,172,377	1,110,673	1,048,969	987,265	925,561	863,857	802,153	740,449	678,745
Loan Repayment									0	0	1,028,401	1,028,401	1,028,401	1,028,401	1,028,401	1,028,401	1,028,401	1,028,401
Total Outflow	619,032	13,917,639	11,003,862	11,368,709	1,473,015	1,473,015	1,473,015	1,473,015	1,473,015	2,439,712	2,378,008	2,316,304	2,254,600	3,483,676	2,131,192	2,069,488	2,007,783	1,946,079
Net Inflow	(21,511)	(504,388)	(869,234)	(1,234,081)	1,240,971	1,362,521	1,495,971	1,620,921	1,776,471	957,674	1,177,478	1,390,482	1,612,836	587,760	2,150,364	2,408,248	2,667,153	2,920,107
Cum Cash	(21,511)	(525,899)	(1,395,133)	(2,629,214)	(1,388,243)	(25,722)	1,470,249	3,091,170	4,867,641	5,825,315	7,002,793	8,393,276	10,006,112	10,593,872	12,744,237	15,152,485	17,819,638	20,739,744
Balance Sheet																		
Cash	(21,511)	(525,899)	(1,395,133)	(2,629,214)	(1,388,243)	(25,722)	1,470,249	3,091,170	4,867,641	5,825,315	7,002,793	8,393,276	10,006,112	10,593,872	12,744,237	15,152,485	17,819,638	20,739,744
Fixed Assets	597,521	14,010,773	24,145,400	34,280,028	34,280,028	34,280,028	34,280,028	34,280,028	34,280,028	34,280,028	34,280,028	34,280,028	34,280,028	35,570,808	35,570,808	35,570,808	35,570,808	35,570,808
Cum Depr	0	(14,654)	(352,622)	(934,907)	(1,761,509)	(2,588,112)	(3,414,714)	(4,241,316)	(5,067,918)	(5,894,520)	(6,721,122)	(7,546,111)	(8,342,413)	(9,116,997)	(9,986,034)	(10,855,071)	(11,724,108)	(12,593,145)
Total Assets	576,011	13,470,220	22,397,645	30,715,907	31,130,276	31,666,195	32,335,564	33,129,882	34,079,751	34,210,823	34,561,699	35,127,193	35,943,728	37,047,684	38,329,012	39,868,223	41,666,339	43,717,408
Loan	358,513	8,406,464	14,487,240	20,568,017	20,568,017	20,568,017	20,568,017	20,568,017	20,568,017	19,539,616	18,511,215	17,482,814	16,454,414	15,426,013	14,397,612	13,369,211	12,340,810	11,312,409
Equity Investment	239,009	5,604,309	9,658,160	13,712,011	13,712,011	13,712,011	13,712,011	13,712,011	13,712,011	13,712,011	13,712,011	13,712,011	13,712,011	13,712,011	13,712,011	13,712,011	13,712,011	13,712,011
Cum Profit	(21,511)	(540,553)	(1,747,755)	(3,564,121)	(3,149,752)	(2,613,834)	(1,944,465)	(1,150,146)	(200,277)	959,196	2,338,473	3,932,367	5,777,303	7,909,660	10,219,388	12,787,001	15,613,517	18,692,987
Total L&E	576,011	13,470,220	22,397,645	30,715,907	31,130,276	31,666,195	32,335,564	33,129,882	34,079,751	34,210,823	34,561,699	35,127,193	35,943,728	37,047,684	38,329,012	39,868,223	41,666,339	43,717,408
	0	0	0	0	0	0	0	0	(0)	0	0	0	0	0	0	0	0	0
Financial Ratios																		
Net Fixed Assets	597,521	13,996,118	23,792,778	33,345,121	32,518,519	31,691,917	30,865,315	30,038,713	29,212,110	28,385,508	27,558,906	26,733,917	25,937,616	26,453,812	25,584,775	24,715,738	23,846,701	22,977,664
Operating Expenses	0	14,654	337,968	582,285	1,065,536	1,065,536	1,065,536	1,065,536	1,065,536	1,065,536	1,065,536	1,063,923	1,035,235	1,013,518	1,107,971	1,107,971	1,107,971	1,107,971
Operatiing Revenues	0	0	0	0	2,713,986	2,835,536	2,968,986	3,093,936	3,249,486	3,397,386	3,555,486	3,706,786	3,867,436	4,071,436	4,281,556	4,477,736	4,674,936	4,866,186
Net Operating Income	0	(14,654)	(337,968)	(582,285)	1,648,450	1,770,000	1,903,450	2,028,400	2,183,950	2,331,850	2,489,950	2,642,863	2,832,201	3,057,918	3,173,585	3,369,765	3,566,965	3,758,215
Depreciation Rxpenses	0	14,654	337,968	582,285	826,602	826,602	826,602	826,602	826,602	826,602	826,602	824,989	796,301	774,584	869,037	869,037	869,037	869,037
Repayment of Loan	0	0	0	0	0	0	0	0	0	1,028,401	1,028,401	1,028,401	1,028,401	1,028,401	1,028,401	1,028,401	1,028,401	1,028,401
Interst for Long-Term Debt	21,511	504,388	869,234	1,234,081	1,234,081	1,234,081	1,234,081	1,234,081	1,234,081	1,172,377	1,110,673	1,048,969	987,265	925,561	863,857	802,153	740,449	678,745
ROI					5.1%	5.6%	6.2%	6.8%	7.5%	8.2%	9.0%	9.9%	10.9%	11.6%	12.4%	13.6%	15.0%	16.4%
Operating Ratio					39.3%	37.6%	35.9%	34.4%	32.8%	31.4%	30.0%	28.7%	26.8%	24.9%	25.9%	24.7%	23.7%	22.8%
Working Ratio					8.8%	8.4%	8.0%	7.7%	7.4%	7.0%	6.7%	6.4%	6.2%	5.9%	5.6%	5.3%	5.1%	4.9%
Debt Service Coverage Ratio					200.6%	210.4%	221.2%	231.3%	244.0%	143.5%	155.0%	166.9%	180.0%	196.1%	213.6%	231.6%	250.8%	271.1%

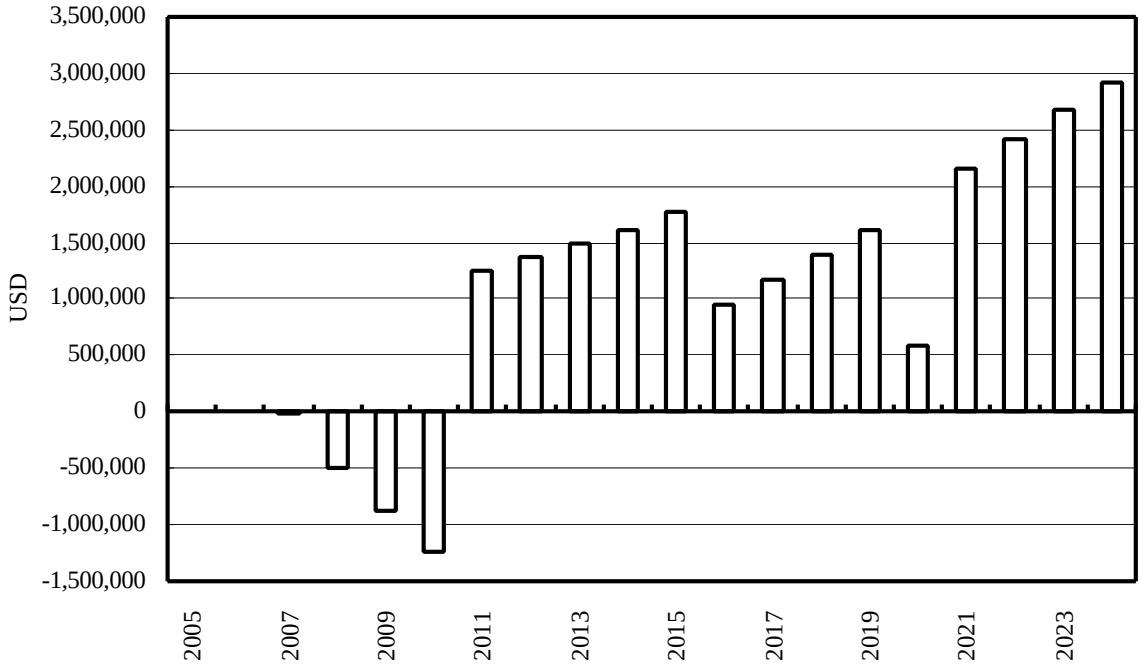


Figure 17.6.2 Net Cash Inflow (New Chiriqui)

17.6.8 Financial Ratios

(1) Profitability

In this project, the Rate of Return on Assets (ROI) is to exceed the maximum interest rate of the potential lenders that is estimated to be 3.0% from the first year of the operation (2011), and from the year 2015, the criterion of over 7% is satisfied.

(2) Operational Efficiency

The criterion of the Operating Raito is to be less than 0.70 – 0.75. In this project from the first year of operation (2011), the criterion is satisfied through the project life

The criterion of Working Ratio is to be less than 0.50 - 0.60. From the starting year of operation (2011), the criterion is satisfied through the project life. The saving of Pedregal dredging cost contributes the improvement of the Working Ratio.

(3) Long-Term Solvency

The criterion of the Debt Service Coverage Ratio is to exceed 1.0. From the starting year of operation (2011), the criterion is satisfied all of the years through the project life.

17.6.9 Sensitivity Analysis on FIRR

Due to the shortage of traffic volume growth and other unforeseeable factors, the actual revenue benefits might not be realized fully and the actual costs might exceed our estimates. Therefore, we have done the sensitivity analysis on the FIRR with the following three unfavorable situations.

Case A: The ten percent overrun of the capital investment cost
Case B: The ten percent decrease of the economic benefit
Case C: Both Case A and Case B (the worst scenario)

Cases	FIRR
Base Case	9.79 %
Case A	9.05%
Case B	8.92%
Case C	8.22%

The detail the sensitivity analysis will be shown in **Appendix N**.

17.6.10 Financial Evaluation of the Project

Considering that the estimated high FIRR (9.79%) as public infrastructure project and the soundness of the pro forma income statement and cash flow statement during feasibility study period, this project is financially feasible and recommendable. The project could be attractive for the private sector.

17.7 Environmental Impact Assessment (EIA)

Basically, environmental impacts by a project are caused consequent to activities involved in the three significant stages of a project execution (implementation), namely, pre-construction stage, construction stage and post-construction (operation) stage. Environmental impacts during construction stage of a project are basically of short-term (temporary) being confined to the duration of the construction activities while those of operation stage are potentially of long-term (permanent). It is noted that most temporary impacts due to construction activities could be managed and minimized, if not entirely mitigated, with careful planning and execution of the construction/installation works.

Potential environmental impact during pre-construction stage of a project is principally social aspects in nature, and caused by potential land acquisition issues for the provision of project facilities.

With due consideration to the above aspects, potential environmental impacts consequent to the execution of the short-term new Chiriqui port development project in Puerto Armuelles, which is basically same as that of the long-term master plan, is evaluated so as to form the EIA (environmental impact assessment). It is noted that this EIA was conducted following the overall

EIA guidelines of ANAM (National Authority of Environment). The EIA Report, formulated with the assistance of Panamanian expertise, is compiled as separate document. Still summarized version of the EIA document is given in Appendix P.

Formal EIA documentation in Spanish strictly conforming the EIA guidelines of ANAM needs to be formulated when the project is actually commenced with due consideration to any modification to the project components, in particular concerning the disposal management of dredged material, as deemed necessary.

First of all, concerning the potential impacts of pre-construction stage, the required hinterland for the new port would involve land acquisition and also some housing compensation and resettlement of population. Still, such requirements are of small-scale since the hinterland of the project site is not a highly developed area despite its proximity to the urban center of Puerto Armuelles. Moreover, the affected people are willing to be cooperative provided they are awarded due compensation for their resettlement. Accordingly, it is concluded that potential adverse social effect during the pre-construction stage of the project is manageable and could be accomplished in an amicable manner with the adoption of a reasonable compensation and relocation system, and hence not that significant.

Accordingly, environmental impacts and mitigation during construction and operation stages of the project are only dealt with below. In this respect environmental impact assessment (EIA) matrix focused on the significant environmental effects and also adverse effects that could be mitigated as good engineering practice during the construction stage and operation stage are summarized respectively in Table 17.7.1 and Table 17.7.2.

(1) Construction Stage Impacts

Inherent temporary adverse effects of construction works on the ambient environment (atmosphere) are potential air pollution and noise nuisance due to material and equipment transportation, storage and installation works. Dust nuisance due to easily airborne materials like sand is the most significant air pollution issue of construction works that could be mitigated with water spraying and/or covering such materials with plastic sheets. Even though noise nuisance due to construction works is somewhat inevitable still restricting high noise prone activities like pile driving to daytime regular working hours only could mitigate its severe adverse effects. These construction environmental impact mitigation measures are extremely important also as good engineering practice of construction site management for this large-scale new port construction project.

Potential surface soil erosion in the construction site could be very significant due to the large-scale of the project and also its proximity to the coastal open seawaters with high tidal range. Accordingly, erosion control, including the provision of barriers against surface erosion runoff into coastal waters, shall be an integral and important part of construction site management. In this respect covering of easily airborne materials like sand with plastic sheets would have dual benefit of air pollution control and erosion control due to rainfall runoff.

Moreover, the construction works of the port involve a very significant dredging and subsequent dredged material management works principally for the provision of turning basin with a maximum draft depth of 11m. The total quantity of dredging is estimated at about 2.4 million m^3 and the dredged material is of clayey soil and evaluated as non-contaminated (ref. Section 13.4.1). Still as per its soil property, the dredged material has no significant engineering reuse potential for such use as a reclamation material. Still it has the potential for reuse in regeneration of mangrove vegetation, though a suitable nearest area for such reuse for regeneration of mangrove vegetation is available only at a distance of about 7 km away from the project site located beyond the Rio Palo Blanco area, which is rather far away.

Accordingly, it is assumed that most economically viable option will be under sea disposal of this uncontaminated dredged material using submerged pipe, at a disposal depth of 10m below sea level, in deep seawaters of about 120m deep, located at a distance of about 1km offshore from the dredging area of the project. It is considered that even though this location is much near the coastline, still under sea disposal would not lead to any significant dispersion of disposed material to the coastal area. Nevertheless, it is required to conduct further studies during the initial phase of the detailed engineering design stage of the project, on the suitability of this nearest offshore disposal location assumed in this feasibility study in combination with other alternative deep-sea locations including the suitability of beneficial use for regeneration of mangrove woods in particular when a subsidy on disposal cost could be obtained in the form of mangrove environmental restoration fund. In this respect, potential alternative offshore dredged material disposal locations, including the location that could be used for the beneficial use of dredged material for regeneration of mangrove vegetation in Rio Palo Blanco area, are identified under Table 17.7.1.

Concerning the evaluation of alternative offshore deep-sea disposal sites of dredged material, oceanographic water quality simulation studies will be necessary to model the extent of potentially affected seawater surface area due to increased turbidity consequent to the disposal of dredged material and hence to determine the most suitable offshore deep sea location for dredged material disposal. In general, a sea surface water turbidity level represented by 20 mg/l of SS (suspended solids) level could be regarded as the maximum limit in the extent of water area affected by increased turbidity consequent to the disposal of dredged material. In the event of using offshore disposal, water quality monitoring program focused on SS measurement around the vicinity of the disposal area, spanning the time period of dredging and dredged material disposal works, will be required.

Finally, it is emphasized that the water quality deterioration due to increased water turbidity in the vicinity of dredged material disposal area of sea is only a temporary adverse effect of medium term spanning basically the period of dredging works. Moreover, the availability of deep sea area of 100m and more just 1 km offshore and beyond from the project (dredging) area implies favorable seabed topography to allow for economically and environmentally sound deep sea

disposal of dredged material. In other words, deep-sea disposal of dredged material is a feasible option of dredged material management. The only aspect to be determined during the detailed engineering study is the selection of the most suitable economically viable and environmentally acceptable deep-sea disposal location based on the finally selected disposal method between undersea disposal at about 10m below sea level as proposed in this feasibility study and open sea disposal that might be considered in the detailed engineering study. The study on dredged material disposal in deep-sea will also include oceanographic water quality simulation as mentioned above. Still, beneficial use for regeneration of mangroves should be investigated and naturally remains as the most preferred option of dredged material management.

This dredging and dredged material disposal works would adversely affect the aquatic life, in particular the benthic organisms inhabiting the seabed having very little mobility for a considerable period of time, at least spanning the entire period of dredging and dredged material disposal works and also probably some time even beyond this dredging work period. However, in the long-term the aquatic life in the areas, including benthic organisms is expected to recover naturally. Accordingly, any potential adverse effects consequent to this dredging and dredged material disposal works are assessed as only of medium term and have no significant long-term (permanent) adverse effects.

(2) Operation Stage Impacts

Potential port operational environmental impacts are of long-term and hence the mitigation measures are also of long-term in the form of port operational environmental management. The most significant environmental management requirement is proper waste management due to vessel operation principally focused on waste oil (bilge waste) and garbage and also waste generated due to port terminal operation.

Concerning wastes of port terminal operation, wastes generated due to fish processing work is very significant, which would be a predominantly putrescible organic solid waste. This waste also would require due management measures by AMP to mitigate potential coastal water pollution. Still, since this solid waste of fish origin is amenable for processing as animal feed and hence has market potential for reuse, such a reuse program is recommended.

It is noted that this new port will be a relatively large scale international port that would handle a variety of cargo including containers and hence will be called by large ships up to a maximum capacity of 25,000 DWT. Moreover, the port is protected with breakwaters so as to maintain calm port waters, an important requirement for safe handling of containers. This calm port water environment due to its limited exchange of waters with open sea has the potential to result in accumulation of water pollutants in the port waters attributed to ship berthing as well as port terminal operation including cargo handling activities, in particular handling of dry-bulk cargo having high dispersion potential.

In order to mitigate potential port water pollution, AMP as the project owner shall undertake a vigilant waste management program for the port. In particular, enforcement of MARPOL regulations and its Annexes concerned to the mitigation of marine pollution due to ships and vessels, including the implementation of port state control requirements, is emphasized. Moreover, surveillance against illegal dumping of wastes by ships and vessels into port waters shall be implemented.

This port waste management program could be further complemented with a port water quality monitoring program at least targeting initially simple potable parameters, in particular DO (dissolved oxygen) level, which is a very good indicator of organic pollution level in water bodies. Still, in the long-term following the beginning of operation of the port a detailed water quality monitoring program for the port focused on both water quality and seabed material quality as measured in this study and described in Section 13.4.1 of Chapter 13 is recommended to be initiated in co-operation with ANAM.

Moreover, regular conduct of bathymetric survey in the port waters and to conduct the required maintenance dredging as appropriate to ensure design draft requirement and hence safe berthing of ships and vessels is emphasized as the most significant port operational safety requirement.

(3) Conclusion and Recommendations

1) Conclusion

It is concluded that potential adverse environmental effects consequent to the project construction and its subsequent operation of the port terminals are manageable. Though dredged material management is the most significant environmental issue concerned to the construction works of the project, deep sea disposal of dredged material is a feasible option in consideration to the availability of vast deep sea waters in the vicinity and further of the project area and also to the non-contaminated nature of the dredged material. Still, beneficial use of the dredged material for the regeneration of mangrove woods in the mangrove wetland area located beyond the Rio Palo Blanco should be investigated and be the preferred option.

Concerning operation of the project facilities, due care in adherence to the port operational management requirements focused on ship and port terminal waste management, in particular enforcement of MARPOL regulations and its Annexes in combination with strict implementation of port state control requirements, is utmost important so as to mitigate potential long-term adverse environmental effects of port operation.

2) Recommendations

It is recommended to initiate a port water quality monitoring program initially targeting at least simple potable water quality parameters, in particular DO level, by AMP. This monitoring program could be initiated at least concurrently with the commencement of construction works. The monitoring plan is given in the EIA document of Appendix P.

Still, in the long-term following the beginning of operation of the port a detailed water quality monitoring program focused on both water quality and seabed material quality is recommended to be initiated in co-operation with ANAM. Moreover, regular conduct of bathymetric survey and maintenance dredging works is emphasized as the most significant port operational safety requirement.

Currently the most significant source of pollution in coastal waters of this new Chiriqui port area is the runoff of untreated wastes consequent to the land based miscellaneous anthropogenic activities via Rio La Carcacha. The river mouth of this Rio La Carcacha is located just adjacent to the project area and hence runoff through this river has the potential to cause water environmental degradation of the future port area. Accordingly, it is utmost important to improve overall waste management including the provision of sewage treatment plant for the urban area of Puerto Armuelles. It is further emphasized that the waste management improvement measures need to be undertaken independently irrespective of the status of implementation of this new Chiriqui port development project.

In fact improper management of wastes of land based anthropogenic activities being the principal cause of coastal water environmental degradation is a nation-wide environmental issue to be addressed as also pointed out in Section 5.2 of Chapter 5.

Table 17.7.1 Environmental Assessment Matrix (Construction Stage)

Chiriqui port						
Project stage	**Project Activities**	**Environmental component**	**Environmental variable**	**Environmental Effect**	**Environmental Measure**	**Recommendations**
Construction	1. Access roads implementation 2. Cuts and removal of land surface 3. Dredging of marine seabed and dredged material disposal 4. Piles foundation 5. Breakwater (Jetty) construction 6. Material and equipment transportation	Atmosphere	Air quality	Increase in air particles	Spray with water or cover with plastic sheets easily airborne materials like sand, soil, etc.	Organize the number of heavy equipment and transportation vehicles that will be used in the construction works.
			Noise levels	Increase in noise levels	Working hours is scheduled during regular shift. Work is performed only during the day for high noise work like piling.	Avoid working too late at night or too early in the morning to mitigate noise generation that would seriously affect nearby communities.
		Soils	Geoforms	Modification of the geoforms	Design and implement good technical methodology for dredging and excavation.	Ensure use of established construction methods and procedures.
			Erosion processes	Erosion and modification of sedimentary distribution	Implement barriers that will stop the deposition of sediments in the water.	Ensure erosion control is integral part of construction site management.
			Intrinsic scenery	Modification of scenic landscape	Implement structures that will be in harmony with the landscape.	Provide final landscape to be in harmony with surrounding environment.
		Ocean	Bottom sediments	Alteration of lithologic structure and composition	Design and implement good technical methodology for dredging works.	Assessment of sites for disposal of dredged material (sediment). [1]
		Environmental quality	Marine water	Variations in physical and chemical factors	Ensure proper management of construction site waste.	Establish a monitoring program for water quality in port zones and dredged material disposal site.
		Marine fauna	Marine species (composition and dynamics)	- Reduction in species composition - Dynamics alteration (species stratification and distribution)	Comply with ANAM[2] and AMP[3] regulations on nature conservation and coastal environmental protection.	Ensure proper management of dredging and dredged material disposal works.

Chiriqui port						
Project stage	**Project Activities**	**Environmental component**	**Environmental variable**	**Environmental Effect**	**Environmental Measure**	**Recommendations**
		Socio-economic and cultural	Employment	Creation of direct eventual jobs	No mitigation measures are needed due to the fact that the effect is positive and economically beneficial.	Review temporary personnel's abilities and skills that could be occupied in other activities during the operation stage of the project.
			Sanitation	Increase of liquid and solid wastes	Support reinforcement of sanitary infrastructure to meet the sanitation demand.	Coordinate with competent institutions concerned to sanitation.

[1] Sites that are suggested for the disposal of dredged sediments require a profound study in order to know its environmental viability. These sites are located in the following coordinates:

Site 1: Coordinates 8º14'45'' N, 82º48'30'' W, Depth: 245 meters, distance 3.4 nautical miles from the project site. (1 nautical mile=1.85km)
Site 2. Coordinates 8º14'28'' N, 82º49'54'' W , Depth: 345 meters, distance 2.5 nautical miles from the project site.
Site 3: Coordinates 8º15'03''N, 82º50'23''W, Depth: 275 meters, distance, 1.7 nautical miles from the project site.
Site 4: Coordinates 8º16'10"N 82º51'00"W, Depth: 120 meters, distance 0.7 nautical miles from the project site. (proposed disposal location of this feasibility study)
Site 5: East zone (Zone 2) of the "Palo Blanco" (8º18'00'' N, 82º48'30'' W). For the use of this site as place for the deposition of dredged sediments and plantation (regeneration) of mangrove, it is necessary to conduct a Soil and Ecology Study.

[2] Autoridad Nacional del Ambiente National Environmental Authority) [3] Autoridad del Marítima de Panamá (Panama Maritime Authority)

Table 17.7.2 Environmental Assessment Matrix (Operation Stage)

Chiriqui port						
Project stage	**Project Activities**	**Environmental component**	**Environmental variable**	**Environmental Effect**	**Environmental Measure**	**Recommendations**
Project operation	1. Port maintenance operation 2. Navigation and boats transport 3. Harbour activities (cargo handling)	Atmosphere	Air quality	Increase in air particles by emissions	Implement an Action Plan for the optimization, effective use and circulation of port vehicles.	Organize the number of vehicles and equipment concerned to port cargo transportation.
		Soils	Soil composition	Soil contamination by fuel and other wastes	Implement a fuel, oil, solid and liquid waste management plan including the conduct of surveillance of vessels and port seabed quality monitoring.	Comply with established oil and other pollution control regulations.
		Ocean	Bottom sediments	Alteration of lithologic structure and composition	Design and implement good technical methodology for maintenance dredging works.	Conduct regular bathymetric survey to optimize the dredging frequency.
		Environmental quality	Marine water	Variations in physical and chemical factors	Control measures in concordance with national and international marine policies related with port and marinas management (MARPOL).	Comply with established oil and other pollution control regulations.
		Marine fauna	Marine species (composition and dynamics)	- Reduction in species composition - Dynamics alteration (species stratification and distribution)	Comply with ANAM[1] and AMP[2] regulations on nature conservation, navigational safety and coastal environmental protection.	Ensure implementation of port water pollution control measures to facilitate continuous natural recovery.
		Socio-economic and cultural	Demography	Increase in immigration	Reinforcement of public services infrastructures for port operational activities.	The project should be incorporated in the promotion and creation of public services.
			Employment	Creation of direct eventual jobs	No mitigation measures are needed due to the fact that the effect is positive and economically beneficial.	Conduct regular training programs to ensure continuous skill development of operational personnel.
			Basic utilities	Increase in basic services demand, specifically security	Support the reinforcement of infrastructure and police personnel conditions to guarantee security.	Coordinate with competent institutions concerned to social security.

Chiriqui port						
Project stage	**Project Activities**	**Environmental component**	**Environmental variable**	**Environmental Effect**	**Environmental Measure**	**Recommendations**
			Sanitation	Increase of liquid and solid wastes	Support reinforcement of sanitary infrastructure to meet the sanitation demand.	Coordinate with competent institutions concerned to sanitation.
			Transportation networks	Increase of the transportations	No mitigation measures are needed due to the fact that the effect is positive and beneficial.	Coordinate with competent institutions to ensure effective link to other related transportation systems.
			Ethnic groups, traditions and costumes	Changes in traditions and costumes	Evaluate the mechanisms for conservation, preservation and integration of costumes and traditions.	Establish and maintain close socio cultural relations with ethnic groups.

[1] Autoridad Nacional del Ambiente (National Environmental Authority) [2] Autoridad del Marítima de Panamá (Panama Maritime Authority)

18. FEASIBILITY STUDY ON COQUIRA PORT SHORT-TERM PROJECT

18.1 Identification of Short-term Development Project

Study Team identified a short-term development project based on the Master Plan and its staged development program (refer to Figure 14.5.1). Construction of a new berth and port management function at Coquira is proposed in response to the immediate needs to cope with the shortfall of the port capacity at Panama Port.

Main components of the project are summarized in Table 18.1.1. A general cargo berth (30 m x 15 m) and shed (1,000 m^2) need to be created. These facilities will be able to cover the requirements in the dozens of years following the closing of Panama Port.

Table 18.1.1 Short-term Development Project

Facility	Dimensions	Remarks
General Cargo Berth	30 m x 15 m	
Shed	1,000 m^2	
Administration Building	300 m^2	2-story Building
Workshop	400 m^2	Repair and maintenance of equipment
Equipment for Cargo Handling	Mobile Crane x 1 Unit	25-ton
	Forklift x 3 Unit	3.5-ton, Diesel
Parking Space	1,200 m^2	Truck, bus, equipment
Land Acquisition	9,000 m^2	
Approach Road	900 m^2	Widen existing road
Utilities	Water, Fuel, Yard Lighting, Electricity connection	

18.2 Facility Requirements and Layout

18.2.1 Facility Requirements

Facility requirements in the short-term development plan at Coquira Port are shown in Table 18.2.1.

Table 18.2.1 Summary of Facilities at Coquira Port

Item	Description
Waterfront Facilities	◆ General Cargo Berth (Length 30 m, water depth –2.0 m) ◆ Retaining wall for preventing scouring
On Land Facilities	◆ Service road construction with drainage system inside the port area ◆ Parking ◆ Fence and Landscaping
Utility Supply Facilities	◆ Water supply reservoir (20 tons) and over head tank (100 tons) with supply piping to buildings and firefighting ◆ Fuel Tank ◆ Electric power supply to buildings, lighting to buildings and yard

Item	Description
Buildings	◆ Administration Building: 150 m^2 x 2-story ◆ Cargo Storage Shed: 1,000 m^2 ◆ Workshop: 400 m^2
Access Road	◆ Existing road widening
Equipment	◆ 25-ton capacity mobile crane: 1 ◆ 3.5-ton capacity forklift trucks: 3

18.2.2 Port Layout Plan

The port layout plan for short-term plan is shown in Figure 18.2.1.

18.2.3 Design of Port Facilities

(1) Quay Structure

Considering the subsoil conditions, a suitable structure type for the quay has been studied and are summarized in Table 18.2.3. As shown in the Table, the advantage and disadvantage of three alternatives were reviewed and compared in terms of cost, construction period and environmental conditions.

An open pile type quay structure will be the most suitable to the site condition. The typical section of the open pile type quay wall is shown in Figure 18.2.2.

Suitable quay fixtures to the objective vessels, i.e. rubber fenders and bollards, have been selected as shown in the above figure. The following capacities are expected:

- Rubble Fender: Absorption energy of 40 kN･m
- Bollard: Tractive force of 15 ton in every direction

(2) Buildings

Buildings planned in the short-term plan are summarized in Table 18.2.2. Considerations in the design are presented below:

- Administration office will be RC building equipped with required interior furnish for office use.
- Cargo storage shed and workshop will be a single story building and framed by steel structures in order to offer wider space at a least number of the supporting columns.

Table 18.2.2 Outline of Buildings at Coquira Port

Building	No.	Floor Area (m^2)	Story	Structural Particulars		
				Frame	Wall	Roof
Administration Building	1	300	2	R/C	Concrete Block	R/C
Cargo storage shed	1	1,000	1	Steel	Concrete Block	Galvanized Iron Sheet
Workshop	1	400	1	Steel	Concrete Block	Galvanized Iron Sheet

(3) Pavement

Pavement inside the terminal area has been studied in view of its specific use for the operation. Depending on the critical loading for each area, suitable types of the pavement are selected.

For this selection, considerations in the design are the following:

- Apron of the berth and passageway inside the yard: ideally only loaded trailer trucks and unloaded handling equipment will pass on the pavement. Thus it does not need to be designed for heavy wheel loads of the equipment, such as forklifts and mobile crane.
- Cargo handling yard: considering the site conditions, the yard will be provided in the reclamation on firm stratum and no serious settlement will be expected. Accordingly, concrete pavement has been selected.
- The access road to the terminal: asphalt concrete pavement is designed for various types of vehicles.

(4) Utilities

1) Drainage

Inside the yard, storm water will be collected by an appropriate gradient of the pavement to the surface drainage, which will be of an open type, i.e. U-shaped ditch, V-shaped gutter, etc. The main drainage will be a buried concrete box culvert type, to which surface and domestic drains will be connected. Septic tanks for each building will be also installed, as well as spilled wastewater collector for the container washing and maintenance works.

2) Water Supply

Fire fighting, ship's supply and other domestic consumption in the terminal have been considered and the water will be tapped at mains of Coquira area. Relevant facilities, such as reservoirs (20 tons), elevated tanks (100 tons) and pumps will be included, together with their network pipes.

3) Power Supply

Substation and emergency generator for lighting and building supply will be provided.

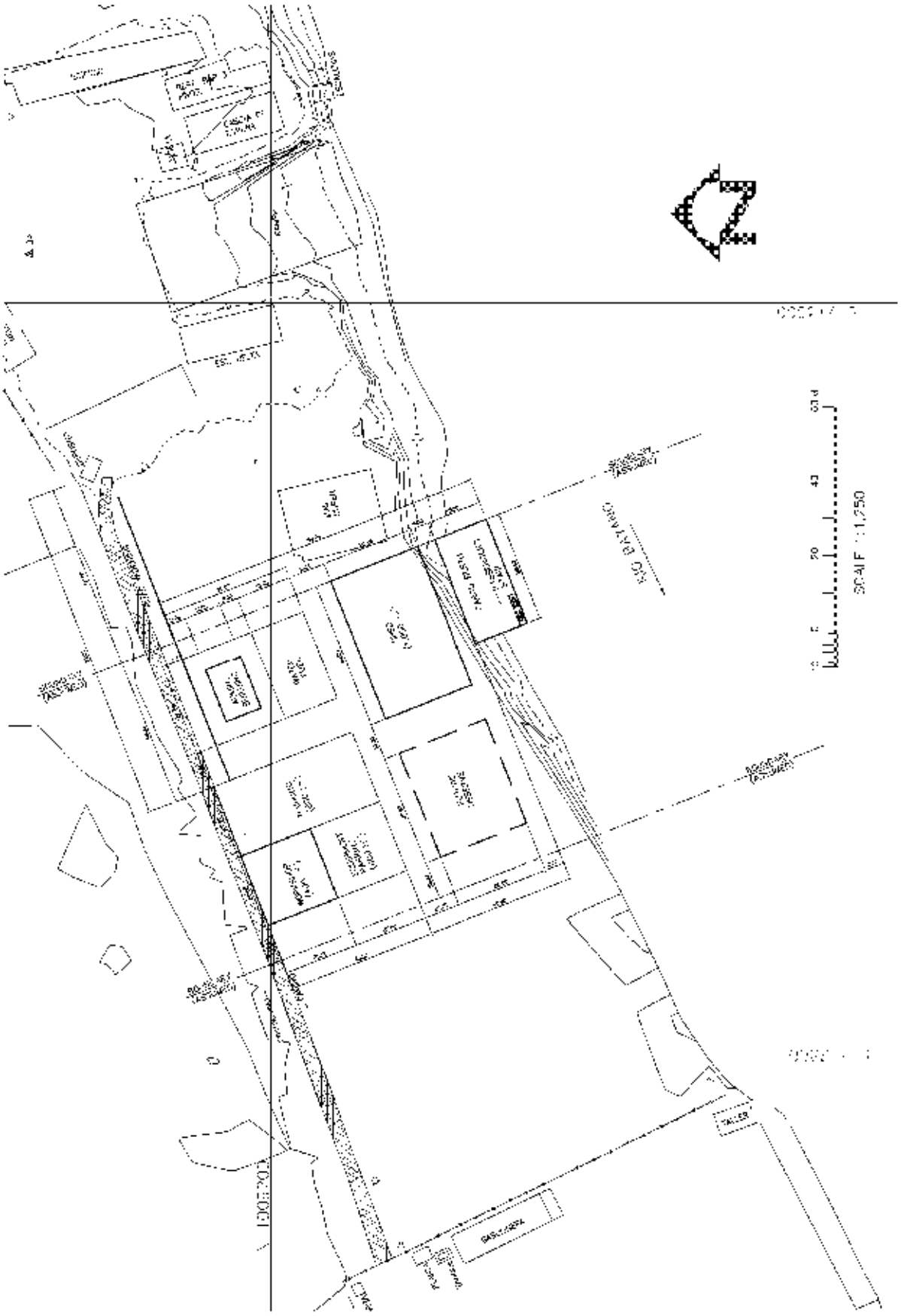
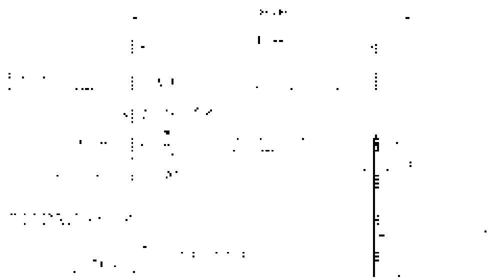
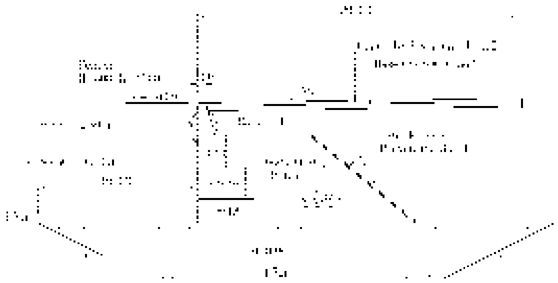
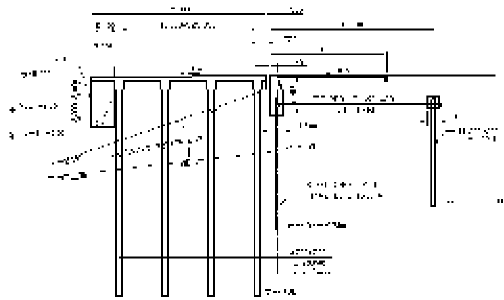


Figure 18.2.1 General Plan of Coquira Port

Table 18.2.3 Comparison of Quay Structural Type

	Steel Sheet Pile (SSP)	Gravity Type	PC Pile Type (PCP)
Typical Cross Section			
Evaluation	*Hindering the river current *Simple in works and shorter construction period *Adjustable and flexible to the change of soil condition at site	*Hindering the river current *Complicated in works and longer work period *Construction cost is the highest of the three types *Has negative affect on environment	*Suitable and adopted for the design conditions *Simple construction procedure and economical cost and short construction period *Environmental impacts may be minimal
	× (Not Recommendable)	× (Not Recommendable)	○ (Recommendable)
Advantage	*The construction period may be the shortest among the alternatives. *Sheet piling works and dredging/reclamation works can be conducted at the same time.	*Material is locally available and can be used, thus material cost is economically superior. *Maintenance is easy and structure has reasonable durability.	*The construction cost may be the lowest among the alternatives. *Volume of reclamation and dredging works will be minimal. *Sheet Pile driving works and reclamation works can be progressed separately at the same time.
Disadvantage	*Corrosion of SPSP should be considered. *SSP and tie wires have to be imported.	*Block yard is required for fabrication. *Floating equipment is required during construction. *The construction work is complicated to make level of mound for block installation and to set exact position for installation. *Construction period may be the longest.	*Corrosion of SPP should be considered. *PCP is not easy to adjust its length by changes of soil and seabed topography. *Additional retaining wall is required for reclamation works. *Construction period will be longer than SSP type structure.

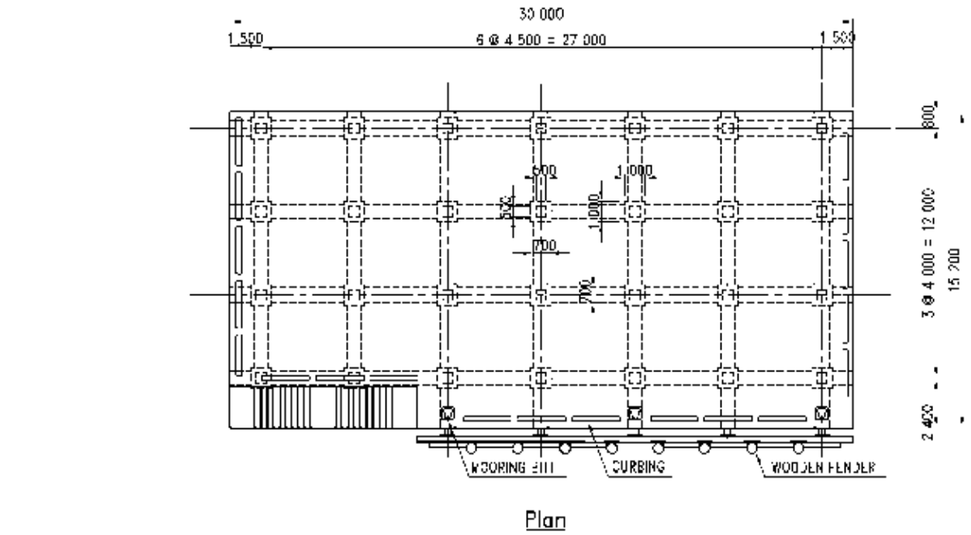


Figure 18.2.2 Typical Plan and Section of Quay Wall

18.3 Project Implementation

18.3.1 Introduction

In this section, the project cost for the feasibility study was reviewed based on the following method.

- For the purpose of estimation of the project 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 construction schedule is reviewed based on the government procedures and the financial program.

18.3.2 Project Cost

Based on the above conditions, project cost for the feasibility study is estimated as shown on the following table.

Table 18.3.1 Project Cost for the Feasibility Study of Coquira Port

Coquira						Unit: USD
Item		**Dimensions**	**Unit**	**Quantity**	**Unit Rate**	**Amount**
1	Land Preparation	Including Hinterland	m^2	7,200	4.3	30,660
2	-0.3m Berth	450 sq.m	m^2	450	2,301.7	1,035,776
3	Revetment	SSP type	m	40	6,822.9	272,914
4	Building	Office, Workshop, Shed, Gate & Fence	m^2	1,700	245.6	417,500
5	Fuel Supply	Oil Tank and Piping	l.sum	1	115,120.0	115,120
6	Pavement	Hinterland	m^2	2,675	106.0	283,550
7	Outdoor Lighting		unit	30	1,250.0	37,500
8	Landscaping		m^2	1,440	3.0	4,320
9	Utilities	Supply Line, Connection to city line	l.sum	1	65,920.0	65,920
10	Equipment	Crane and Forklift	l.sum	1	83,500.0	83,500
Total						**2,346,760**

18.3.3 Implementation Schedule

Implementation schedule for the project is studied based on following understandings.

- Formulate a mutual consensus for the project, between user, owners, leaseholders and the related authorities, by the end of 2004.
- Finalize the basic plan including development plan and management plan in the first half of 2005.
- Budgeting based on the cash plan for the public/private sector by the end of 2005.
- The concession agreement for private operators to be concluded by the end of 2005.

- Complete the detailed design and prepare the tender documents for the construction by the third quarter of 2005, and carry out the tender in the next quarter.
- Start and complete the construction in 2006. Open the port in the early part of 2007.

The schedules for each construction items are shown on the following table.

Table 18.3.2 Project Implementation Schedule for Coquira Port

Coquira	2004		2005		2006		2007		2008		2009	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
1. Consensus Building for Development		▼										
2. Finalization of Development Plan			▬									
(1) Development Plan including Basic Design			▬									
(2) Operation and Management Plan			▬									
3. Financial Arrangement			▬	▬								
4. Contract Agreement between AMP and Private Concessionaires				▼								
5. Detailed Design, Preparation of Tender Document and Supervision				▬	▬	▬						
6. Tender Process and Contractor Selection				▬								
7. Construction Process												
(1) Land Preparation					▬							
(2) -3.0m Berth					▬	▬						
(3) Revetment					▬							
(4) Building						▬						
(5) Fuel Supply						▬						
(6) Pavement						▬						
(7) Outdoor Lighting						▬						
(8) Landscaping						▬						
(9) Utilities						▬						
(10) Equipment						▼						
8. Commencement of Port Operation							▼					

18.4 Administration and Management

18.4.1 Port Infrastructure Development Scheme

Since the nature of the project to construct a basic infrastructure to ensure the access sea routes to the remote communities, the construction cost should be shouldered by public fund. Fifty percent of the of the project cost (about USD 1 million), which covers the construction of the wharf should be granted as the equity of AMP. AMP should find a concessionaire that invests itself to construct the land-based facilities of the port and operates the whole new port.

Thus, the development of Coquira Port is the Type 2 scheme (See Table 16.4.1).

18.4.2 Conditions for Private Participation

By providing the basic port infrastructure with reasonable, or rather attractive fees, AMP will be able to invite a private firm who invests and operates the port under a concession contract: this should be a Hybrid concession). The concessionaire can also run ancillary business such as bunker and water supply, ship repair and logistics for the coastal shipping.

18.4.3 Administration, Management and Operation

Provided that the cargo wharf of Coquira Port is operated by a private firm under a concession contract, AMP should take the following functions:

- to regulate the concessionair to observe relevant safety and environmental protection standards,
- to regulate and monitor the levels of the service provided and the tariff charged to the port users.
- to ensure the secure within the port area in coordination with the National Police.

18.4.4 Recommendations

The key items for the realization of Coquira Cargo Port are:

(1) to ensure the public fund and
(2) to invite a private firm to operate the port under aconcession contract.

While AMP negotiates with the private operator the conditions of concession, it should pay due consideration on the quality of the services provided and the level of the tariff charged to port users.

18.5 Economic Analysis

Since the Priority project is the same as the project proposed as the Master Plan. Therefore, the Economic Analysis is the same as described in Chapter 12.10.

During the stage of the feasibility study the sensitivity analyses are carried out with the purpose to ensure the economic feasibility of the projects.

18.5.1 Sensitivity analysis

The sensitivity analysis on the EIRR has been carried out under the following three unfavorable situations.

18.5.2 Sensitivity Analysis on EIRR

Due to the shortage of traffic volume growth and other unforeseeable factors, the actual costs might exceed our estimates and the actual economic benefits might not be realized fully. Therefore, we have done the sensitivity analysis on the EIRR with the following three unfavorable situations.

Case A: The ten percent overrun of the capital investment cost
Case B: The ten percent decrease of the economic benefit
Case C: Both Case A and Case B (the worst scenario)

Cases	EIRR
Base Case	13.39 %
Case A	12.91 %
Case B	12.77 %
Case C	11.83 %

The detail of the sensitivity analysis will be shown in **Appendix N**.

18.5.3 Qualitative Evaluation of Economic Benefit

This port is planned as the substitute port for Fiscal Panama port that is to be closed near future but is keeping the lifeline to the islands in the Bay of Panama and some coastal village of Darien Province. The value of the lifeline is very large and really unquantifiable. Although the highway route to Darien Province is under construction, the sea route to the Province has still very important role to the regional development in the coastal area of the Province. In addition, Coquira is becoming eastern suburb of the City of Panama and this port will have a role of the gate to sea in the eastern part of Panama City where industrial complex and logistics depots are concentrating with the expansion of Panama City to the east. Although these economic benefits to the region are not fully quantified, the aggregated economic benefit will be far greater than the one that is shown above in numbers.

18.5.4 Conclusion

Considering relatively high EIRR with robustness shown in the sensitivity analysis where unfavorable situations are assumed and qualitative evaluation mentioned above, this project is feasible and recommendable from economic point of view.

18.6 Financial Analysis

18.6.1 Scope of Financial Analysis

The Panama Fiscal Port is now handling the cargo to the islands in the Bay of Panama and to the Darien Province. Due to the city planning of the Panama City, the Panama Fiscal Port is to be closed in near future. The Study Team proposes the Coquira Port to succeed the cargo handling for Darien Province and islands. A new berth construction project is planned at the neighborhood of the current Coquira port. The Study Team assumes that the Panama Fiscal Port will close at the end of 2014.

18.6.2 Assumed Financial scheme of the Project

Since the project aims at ensuring the access to the communities in the islands in Gulf of Panama, basically, it is the responsibility of the government to provide alternative port facilities to the existing Panama Port regardless of the financial feasibility. Taking into consideration of the environment in Coquira Port, it seems to be most rational to assume that a private concessionaire will operate the port: the land is privately owned and there is already a private company that operate a fishing port and ship repair facilities. In order to reduce the burden of the investment of

the government, it is the study team's proposal that the facilities constructed at the sea and shore can be provided by the expense of AMP, while the facilities to be constructed on land side should be invested by private company that operate the port. To attract the private sector, the charge of the lease of the facility on the sea that is constructed by the fund of the government should be minimal, i.e. free of charge. However, the operation and maintenance cost of the sea portion should be carried by the concessionaire, i.e. private operator.

The conditions of the financial analysis is summarized in the Table below.

Name of the Port	Coquira
The Construction of Sea Portion	By the Expense of AMP (56.8 % of total construction cost)
Charge of lease (concession) of the facility (constructed by the government)	Free
Managing Entity	Private Company (Concessionaire)
Shareholders	Private shareholders
Financing Scheme of the Construction Costs	Loan (100%)
Interest Rate for Loan	6%
Grace Period (from the start of the Operation)	5 years
Repayment	10 years
Financial Source of Renewal Investment of Plant and Equipment	By managing entity

18.6.3 Estimation of the Financial Cost

The financial cost is same as the cost in economic analysis but expressed in market price, not in economic price.

Contingencies for the construction cost are estimated at 10 percent level.

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

Due to the difficulty of estimating long term operation and maintenance cost (except for the personnel cost), we adapt the professional judgment of the engineers based on the construction cost.

The saving of the annual maintenance cost of USD 31,200 in the Fiscal Panama port from 2015 is excluded in financial analysis.

As for this, the number of the staff is expected at the same level. Therefore, the incremental personnel cost will be zero through whole project life (2005 through 2014) while the Fiscal Panama port office will be closed at 2014 and a part of its staff will be laid off.

The repayment of loan is assumed to start after five years of the operation while it is not the cost but has substantial impact on the cash flow.

Table 18.6.1 summarized the estimated financial cost.

Table 18.6.1 Estimate of FIRR for Coquira Port Project

USD

Year	Civil	Plant & Equipment	Engineering Fee	Investment	Maintenance	Net Maintenance Cost	Total Cash Outflow	Total Cargo to Island and Coastal Area	Cargo at Coquira (Ton)	Total Port Fee	Net Cash Infrow
					1%					16.17	
2005	0	0	140,806	140,806			140,806				(140,806)
2006	815,793	271,440	93,870	1,181,103			1,181,103				(1,181,103)
2007	0	0	0	0	23,468	23,468	23,468	17,445	6,978	112,834	89,366
2008	0	0	0	0	23,468	23,468	23,468	18,510	8,330	134,688	111,220
2009	0	0	0	0	23,468	23,468	23,468	19,675	9,838	159,072	135,604
2010	0	0	0	0	23,468	23,468	23,468	20,948	11,521	186,301	162,833
2011	0	0	0	0	23,468	23,468	23,468	22,343	13,406	216,772	193,304
2012	0	0	0	0	23,468	23,468	23,468	23,869	14,321	231,577	208,109
2013	0	0	0	0	23,468	23,468	23,468	25,540	15,324	247,789	224,321
2014	0	0	0	0	23,468	23,468	23,468	27,371	16,423	265,553	242,085
2015	0	0	0	0	23,468	23,468	23,468	19,829	19,829	320,635	297,167
2016	0	271,440	0	271,440	23,468	23,468	294,908	15,344	15,344	248,112	(46,796)
2017	0	0	0	0	23,468	23,468	23,468	12,094	12,094	195,560	172,092
2018	0	0	0	0	23,468	23,468	23,468	10,870	10,870	175,768	152,300
2019	0	0	0	0	23,468	23,468	23,468	10,974	10,974	177,450	153,982
2020	0	0	0	0	23,468	23,468	23,468	11,080	11,080	179,164	155,696
2021	0	0	0	0	23,468	23,468	23,468	11,177	11,177	180,732	157,264
2021	0	0	0	0	23,468	23,468	23,468	11,297	11,297	182,672	159,204
2023	0	0	0	0	23,468	23,468	23,468	11,409	11,409	184,484	161,016
2024	0	0	0	0	23,468	23,468	23,468	11,522	11,522	186,311	162,843
2025	0	0	0	0	23,468	23,468	23,468	11,638	11,638	188,186	164,718
2026	0	271,440	0	271,440	23,468	23,468	294,908	11,756	11,756	190,095	(104,813)
2027	0	0	0	0	23,468	23,468	23,468	11,876	11,876	192,035	168,567
2028	0	0	0	0	23,468	23,468	23,468	11,998	11,998	194,008	170,540
2029	0	0	0	0	23,468	23,468	23,468	12,122	12,122	196,013	172,545
2030	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2031	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2032	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2033	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2034	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2035	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2036	0	271,440	0	271,440	23,468	23,468	294,908	12,249	12,249	198,066	(96,842)
2037	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2038	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2039	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2040	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2041	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2042	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2043	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
2044	0	0	0	0	23,468	23,468	23,468	12,249	12,249	198,066	174,598
											FIRR
											11.27%

Note: Ten percent contingency for Civil Works is included in Investment.

18.6.4 Estimation of the Financial Revenue

(1) The current port fee for cargo at Fiscal Panama port is USD 8.08 per ton on average. The new port fee at Coquira port for cargo is expected at same level. As explained in 16.6.2 (3), the total port revenue from cargo ships will be twice of the fee for the cargo.

(2) The operation of the port will start at 2007. The forty percent of the cargo previously handled at Fiscal Panama port will move to Coquira port at 2007 and will increase at rate of five percent of total traffic to Darien and islands until 2014.

(3) Compensation for transfer from Panama to Coquira is not considered while there may exist a right to ask the compensation to the City of Panama

Table 18.6.1 summarized the estimated financial revenue.

18.6.5 Financial internal Rate of Return (FIRR)

As Table 18.6.1 shows the estimate of FIRR for the project is 11.27%.

18.6.6 Pro Forma Financial Statements (Table 18.6.2)

Table 18.6.2 Pro Forma Financial Statements for Coquira Port Project

(USD)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Income Statement																				
Annual Depr	0	4,689	50,600	50,600	50,600	50,600	50,600	50,600	50,600	50,600	50,600	48,572	47,220	47,220	47,220	47,220	47,220	47,220	47,220	47,220
Annual Interest	8,448	79,315	79,315	79,315	79,315	79,315	79,315	71,383	63,452	55,520	47,589	39,657	31,726	23,794	15,863	7,931	0	0	0	0
Operation & Maintenance			23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468
Total Expenses	8,448	84,003	153,382	153,382	153,382	153,382	153,382	145,451	137,519	129,588	121,656	111,697	102,414	94,483	86,551	78,620	70,688	70,688	70,688	70,688
Total Revenue			112,834	134,688	159,072	186,301	216,772	231,577	247,789	265,553	320,635	248,112	195,560	175,768	177,450	179,164	180,732	182,672	184,484	186,311
Net Profit	(8,448)	(84,003)	(40,548)	(18,694)	5,690	32,919	63,390	86,126	110,270	135,965	198,979	136,415	93,146	81,285	90,898	100,544	110,044	111,984	113,795	115,622
Cum Profit	(8,448)	(92,452)	(133,000)	(151,694)	(146,004)	(113,085)	(49,696)	36,431	146,700	282,666	481,644	618,059	711,205	792,491	883,389	983,933	1,093,976	1,205,961	1,319,756	1,435,378
Cash Flow Statement																				
Loan	140,806	1,181,103	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Revenue	0	0	112,834	134,688	159,072	186,301	216,772	231,577	247,789	265,553	320,635	248,112	195,560	175,768	177,450	179,164	180,732	182,672	184,484	186,311
Total Inflow	140,806	1,181,103	112,834	134,688	159,072	186,301	216,772	231,577	247,789	265,553	320,635	248,112	195,560	175,768	177,450	179,164	180,732	182,672	184,484	186,311
Investment	140,806	1,181,103	0	0	0	0	0	0	0	0	0	271,440	0	0	0	0	0	0	0	0
Operation & Maintenance	0	0	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468	23,468
Interest	8,448	79,315	79,315	79,315	79,315	79,315	79,315	71,383	63,452	55,520	47,589	39,657	31,726	23,794	15,863	7,931	0	0	0	0
Loan Repayment								132,191	132,191	132,191	132,191	132,191	132,191	132,191	132,191	132,191	132,191	0	0	0
Total Outflow	149,254	1,260,417	102,783	102,783	102,783	102,783	102,783	227,042	219,111	211,179	203,248	466,756	187,385	179,453	171,522	163,590	155,659	23,468	23,468	23,468
Net Inflow	(8,448)	(79,315)	10,051	31,905	56,289	83,518	113,989	4,535	28,678	54,374	117,387	(218,644)	8,175	(3,685)	5,928	15,573	25,073	159,204	161,016	162,843
Cum Cash	(8,448)	(87,763)	(77,711)	(45,806)	10,484	94,002	207,991	212,527	241,205	295,579	412,966	194,323	202,498	198,813	204,740	220,314	245,387	404,591	565,607	728,450
Balance Sheet																				
Cash	(8,448)	(87,763)	(77,711)	(45,806)	10,484	94,002	207,991	212,527	241,205	295,579	412,966	194,323	202,498	198,813	204,740	220,314	245,387	404,591	565,607	728,450
Fixed Assets	140,806	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909
Cum Depr	0	(4,689)	(55,288)	(105,888)	(156,488)	(207,087)	(257,687)	(308,287)	(358,886)	(409,486)	(460,086)	(508,658)	(555,878)	(603,098)	(650,319)	(697,539)	(744,759)	(791,979)	(839,200)	(886,420)
Total Assets	132,358	1,229,457	1,188,909	1,170,215	1,175,905	1,208,823	1,272,213	1,226,149	1,204,228	1,208,002	1,274,790	1,007,574	968,529	917,623	876,331	844,684	822,536	934,521	1,048,316	1,163,938
Loan	140,806	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,321,909	1,189,718	1,057,527	925,336	793,145	660,954	528,764	396,573	264,382	132,191	0	0	0	0
Cum Profit	(8,448)	(92,452)	(133,000)	(151,694)	(146,004)	(113,085)	(49,696)	36,431	146,700	282,666	481,644	618,059	711,205	792,491	883,389	983,933	1,093,976	1,205,961	1,319,756	1,435,378
Total L&E	132,358	1,229,457	1,188,909	1,170,215	1,175,905	1,208,823	1,272,213	1,226,149	1,204,228	1,208,002	1,274,790	1,279,014	1,239,969	1,189,063	1,147,771	1,116,124	1,093,976	1,205,961	1,319,756	1,435,378
Financial Ratios																				
Net Fixed Assets			1,266,620	1,216,021	1,165,421	1,114,821	1,064,222	1,013,622	963,023	912,423	861,823	813,251	766,031	718,811	671,590	624,370	577,150	529,929	482,709	435,489
Operating Expenses			74,068	74,068	74,068	74,068	74,068	74,068	74,068	74,068	74,068	72,040	70,688	70,688	70,688	70,688	70,688	70,688	70,688	70,688
Operatiing Revenues			112,834	134,688	159,072	186,301	216,772	231,577	247,789	265,553	320,635	248,112	195,560	175,768	177,450	179,164	180,732	182,672	184,484	186,311
Net Operating Income			38,766	60,620	85,004	112,233	142,704	157,509	173,721	191,485	246,567	176,072	124,872	105,080	106,761	108,475	110,044	111,984	113,795	115,622
Depreciation Rxpenses			50,600	50,600	50,600	50,600	50,600	50,600	50,600	50,600	50,600	48,572	47,220	47,220	47,220	47,220	47,220	47,220	47,220	47,220
Repayment of Loan			0	0	0	0	0	132,191	132,191	132,191	132,191	132,191	132,191	132,191	132,191	132,191	132,191	0	0	0
Interst for Long-Term Debt			79,315	79,315	79,315	79,315	79,315	71,383	63,452	55,520	47,589	39,657	31,726	23,794	15,863	7,931	0	0	0	0
ROI			3.1%	5.0%	7.3%	10.1%	13.4%	15.5%	18.0%	21.0%	28.6%	21.7%	16.3%	14.6%	15.9%	17.4%	19.1%	21.1%	23.6%	26.6%
Operating Ratio			65.6%	55.0%	46.6%	39.8%	34.2%	32.0%	29.9%	27.9%	23.1%	29.0%	36.1%	40.2%	39.8%	39.5%	39.1%	38.7%	38.3%	37.9%
Working Ratio			20.8%	17.4%	14.8%	12.6%	10.8%	10.1%	9.5%	8.8%	7.3%	9.5%	12.0%	13.4%	13.2%	13.1%	13.0%	12.8%	12.7%	12.6%
Debt Service Coverage Ratio			112.7%	140.2%	171.0%	205.3%	243.7%	102.2%	114.7%	129.0%	165.3%	130.7%	105.0%	97.6%	104.0%	111.1%	119.0%	N/A	N/A	N/A

(1) Income Statement

The operation will start at 2007. Annual income will become positive at 2009 (third year of operation) but cumulative profit will become positive at 2012. (see the Row indicated as "Net Profit" in Table 18.6.3 and see also Figure 18.6.1).

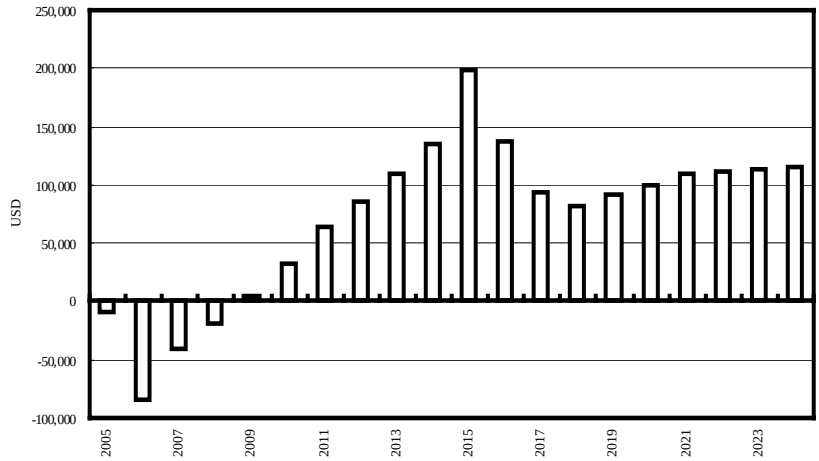


Figure 18.6.1 Annual Net Profit (Coquira)

(2) Cash Flow Statement

From 2007, the net cash flow is positive. Cumulative cash will become positive at 2009. After finishing the repayment of the loan at 2022, the cash position will improve remarkably (See the Row of "Net Inflow of Table 18.6.3 and Figure 18.6.2).

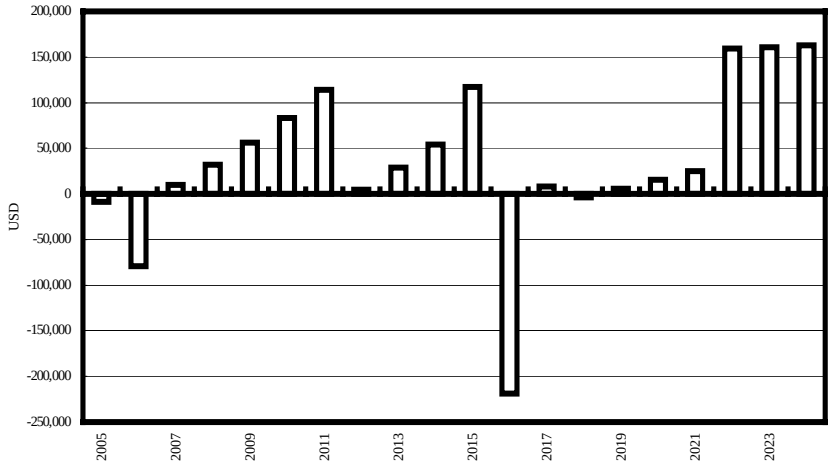


Figure 18.6.2 Net Cash Inflow (Coquira)

(3) Balance Sheet

Cash position becomes positive at 2009 and net equity becomes positive at 2012.

18.6.7 Financial Ratios

(1) Profitability

In this project, the Rate of Return on Assets (ROI) is to exceed the maximum interest rate of the potential lenders that is estimated to be 3.0% from the first year of the operation (2007), and from the year 2009, the criterion of over 7% is satisfied.

(2) Operational Efficiency

The criterion of the Operating Raito is to be less than 0.70 – 0.75. In this project from the first year of operation (2007), the criterion is satisfied through the project life

The criterion of Working Ratio is to be less than 0.50 - 0.60. From the starting year of operation (2007), the criterion is satisfied through the project life. The saving of Fiscal Panama port maintenance dredging cost contributes the improvement of the Working Ratio after 2015.

(3) Long-Term Solvency

The criterion of the Debt Service Coverage Ratio is to exceed 1.0. From the first year of operation (2007), the criterion is satisfied all of the years through the project life.

18.6.8 Sensitivity Analysis on FIRR

Due to the shortage of traffic volume growth and other unforeseeable factors, the actual revenue benefits might not be realized fully and the actual costs might exceed our estimates. Therefore, we have done the sensitivity analysis on the FIRR with the following three unfavorable situations.

Case A: The ten percent overrun of the capital investment cost
Case B: The ten percent decrease of the economic benefit
Case C: Both Case A and Case B (the worst scenario)

Cases	FIRR
Base Case	11.27 %
Case A	11.07%
Case B	9.76%
Case C	8.64%

The detail the sensitivity analysis will be shown in **Appendix N**.

18.6.9 Financial Evaluation of the Project

Considering that the estimated FIRR (11.27%) as public infrastructure project and the soundness of the pro forma income statement, and that the cash flow statement and financial rations during feasibility study period and thereafter, this project is financially feasible and recommendable. In the above financial analysis, it was assumed that the facilities at sea and shore (equivalent to 56.8% of the total construction cost) shall provided by the government and that the facilities shall be leased to the private operator without charge. However, the lease charge should be determined in the process of negotiation. Since the FIRR is relatively high, it is assessed that even with some charge for the lease, the project is still attractive for the private sector.

In such a case that some financial contribution is given by the City of Panama, the financial situation of the project will be improved remarkably. This project is necessary to keep the lifeline to the islands in the Gulf of Panama and the coastal villages of Panama and Darien Provinces. Besides the numerical analysis on the financial feasibility, this social factor should be duly taken into consideration.

18.7 Environmental Impact Assessment (EIA)

Basically, environmental impacts by a project are caused consequent to activities involved in the three significant stages of a project execution (implementation), namely, pre-construction stage, construction stage and post-construction (operation) stage. Environmental impacts during construction stage of a project are basically of short-term (temporary) being confined to the duration of the construction activities while those of operation stage are potentially of long-term (permanent). It is noted that most temporary impacts due to construction activities could be managed and minimized, if not entirely mitigated, with careful planning and execution of the construction/installation works.

Potential environmental impact during pre-construction stage of a project is principally social aspects in nature, and caused by potential land acquisition issues for the provision of project facilities.

With due consideration to the above aspects, potential environmental impacts consequent to the execution of the short-term port development project in the Coquira port is evaluated so as to form the EIA (environmental impact assessment). It is noted that this EIA was conducted following the overall EIA guidelines of ANAM (National Environmental Authority). The EIA Report, formulated with the assistance of Panamanian expertise, is compiled as separate document. Still summarized version of the EIA document is given in Appendix P.

Formal EIA documentation in Spanish strictly conforming the EIA guidelines of ANAM needs to be formulated when the project is actually commenced with due consideration to any modification to the project components as deemed necessary.

Concerning the potential impacts of pre-construction stage of the project, it involves land acquisition requirement since the hinterland riverbank area of the port is privately owned. Still, since the area is basically an existing port, AMP should be able to procure the required land with the provision of reasonable compensation and hence potential adverse effect is considered as not significant. Accordingly, environmental impacts and mitigation during construction and operation stages of the project are only dealt with below. In this respect environmental impact assessment (EIA) matrix focused on the significant environmental effects and also adverse effects that could be mitigated as good engineering practice during the construction stage and operation stage are summarized respectively in Table 18.7.1 and Table 18.7.2.

(1) Construction Stage Impacts

Inherent temporary adverse effects of construction works on the ambient environment (atmosphere) are potential air pollution and noise nuisance due to material and equipment transportation, storage and installation works. Dust nuisance due to easily airborne materials like sand is the most significant air pollution issue of construction works that could be mitigated with water spraying and/or covering such materials with plastic sheets. Even though noise nuisance due to construction works is somewhat inevitable still restricting high noise prone activities like pile driving to daytime regular working hours only could mitigate its severe adverse effects.

In fact Coquira area has very low population and there are no residents living in the vicinity of the port (project area). Accordingly, in particular, noise nuisance does not seem to be a significant issue. However, these ambient environmental mitigation measures are good engineering practice of construction works that contains the important element of occupational health and safety of construction personnel.

(2) Operation Stage Impacts

Potential port operational environmental impacts are of long-term and hence the mitigation measures are also of long-term in the form of port operational environmental management. The most significant environmental management requirement is proper waste management due to vessel operation principally focused on waste oil (bilge waste) and garbage and also waste generated due to port terminal operation. Also it is important to eliminate spillage of oil during oil handling into port waters that has already been identified as a significant environmental issue in the current operation of Coquira port.

Accordingly, improved waste management by AMP, both due to vessel operation and also port terminal operation in combination with surveillance against illegal dumping of wastes by vessels into port waters, so as to protect the port river water environment of berthing areas, shall be implemented. This port waste management program could be further complemented with a port water quality monitoring program at least targeting initially simple potable parameters, in particular DO (dissolved oxygen) level, which is a very good indicator of organic pollution level in water bodies.

(3) Conclusion and Recommendation

1) Conclusion

It is concluded that potential adverse environmental effects consequent to the project execution and its subsequent operation of the Coquira port is manageable and hence not that significant. Still, the most important port operational environmental requirement to be ensured is proper waste management.

2) Recommendation

It is recommended to initiate a port water quality monitoring program initially targeting at least simple potable water quality parameters, in particular DO level, by AMP. This monitoring program could be initiated at least concurrently with the commencement of construction works. The monitoring plan is given in the EIA document of Appendix P.

Table 18.7.1 Environmental Assessment Matrix (Construction Stage)

Coquira port						
Project stage	**Project Activities**	**Environmental component**	**Environmental variable**	**Environmental Effect**	**Environmental Measure**	**Recommendations**
Construction	1. Access roads implementation 2. Cuts and removal of land surface 3. Piles foundation 4. Material and equipment transportation	Atmosphere	Air quality	Increase in air particles	Spray with water or cover with plastic sheets easily airborne materials like sand, soil, etc.	Organize the number of heavy equipment and transportation vehicles that will be used in the construction works.
			Noise levels	Increase in noise levels	Working hours is scheduled during regular shift. Work is performed only during the day for high noise work like piling.	Avoid working too late at night or too early in the morning to mitigate noise generation that would seriously affect nearby communities.
		Socio - economic and cultural	Employment	Creation of direct eventual jobs	No mitigation measures are needed due to the fact that the effect is positive and economically beneficial.	Review temporary personnel's abilities and skills that could be occupied in other activities during the operation stage of the project.

Table 18.7.2 Environmental Assessment Matrix (Operation Stage)

Coquira port						
Project stage	**Project Activities**	**Environmental component**	**Environmental variable**	**Environmental Effect**	**Environmental Measure**	**Recommendations**
Project operation	1. Port maintenance operation 2. Navigation and boats transport 3. Harbour activities (passengers, commercial, etc.)	Atmosphere	Air quality	Increase in air particles by emissions	Implement an Action Plan for the optimization, effective use and circulation of port vehicles.	Organize the number of vehicles concerned to port transportation.
		Soils	Soil composition	Soil contamination by fuel and other wastes	Implement a fuel, oil, solid and liquid waste management plan including the conduct of surveillance of vessels and port water quality monitoring.	Comply with established oil and other pollution control regulations.
		Environmental quality	Marine/River water	Variations in physical and chemical factors	Control measures in concordance with national and international marine policies related with port and marinas management (MARPOL).	Comply with established oil and other pollution control regulations.
		Marine fauna	Marine species (composition and dynamics)	- Reduction in species composition - Dynamics alteration (species stratification and distribution)	Comply with ANAM[1]and AMP[2] regulations on nature conservation, navigational safety and river/coastal environmental protection.	Ensure implementation of port water pollution control measures to facilitate continuous natural recovery.
		Socio-economic and cultural	Employment	Creation of direct eventual jobs	No mitigation measures are needed due to the fact that the effect is positive and economically beneficial.	Conduct regular training programs to ensure continuous skill development of operational personnel.
			Basic utilities	Increase in basic services demand, specifically security	Support the reinforcement of infrastructure and police personnel conditions to guarantee security.	Coordinate with competent institutions concerned to social security.
			Sanitation	Increase of liquid and solid wastes	Support reinforcement of sanitary infrastructure to meet the sanitation demand.	Coordinate with competent institutions concerned to sanitation.

[1] Autoridad Nacional del Ambiente (National Environmental Authority) [2] Autoridad del Marítima de Panamá (Panama Maritime Authority)

19. FEASIBILITY STUDY ON LA PALMA PORT SHORT-TERM PROJECT

19.1 Identification of Short-term Development Project

Study Team identified a short-term development project based on the Master Plan and its staged development program (refer to Figure 15.2.2). This short-term project is made up of the components in response to the immediate needs to launch a consolidation center of the regional fish-catches.

Main components of the project are summarized in Table 19.1.1. A Ramp for Artisanal Fishing Boats and Fish-landing Pier for Industrial Shrimp Trawlers need to be created. These facilities will be able to meet the requirements in the following ten years. The next phase of development will become necessary in 2016 - 2017.

Table 19.1.1 Short-term Development Project

Facility	Dimensions	Remarks
Ramp for Artisanal Fishing Boats	20 m x 45 m	
Shrimp Jetty and Trestle	Jetty: 4 berth, 58 m x 13 m Trestle: 132 m x 6.5 m	1,642 m^2
Mooring Buoy	2 units	
Ice Making Plant and Ice Storage	7.5 tons/day x 2 units	108 m^2
Fuel Tank and supply facilities	Diesel Oil (36,000 gallons; 144 m^3), Gasoline (7,500 gallons; 30 m^3), and Lubricant	with accessories and attachments
Water Supply	Reservoir: 20 m^3	
Equipment for Fish Landing	Deck Crane x 4 Units	1 ton at 10 m reach
	Forklift x 1 Unit	3 tons, Diesel
Cooler Box	50 boxes	1 m^3
Utilities	Lighting, Electricity connection	

19.2 Facility Requirements and Layout

19.2.1 Facility Requirements

Facility requirements in the short-term development plan at La Palma Port are shown in Table 19.2.1.

Table 19.2.1 Summary of Facilities at La Palma Port

Item	Description
Waterfront Facilities	◆ Shrimp Berth (Length 92 m, water depth –3.5 m) ◆ Ramp (Length 45 m, water depth –1.0 m, Slope 1:6) ◆ Access Bridge (Length 132 m, Width 6.5 m) ◆ Revetment for protecting reclamation works
On Land Facilities	◆ Fuel Tanks (Diesel Oil and Gasoline) ◆ Fence and Landscaping
Utility Supply Facilities	◆ Water supply reservoir tank of 20 m^3 with supply piping
Buildings	◆ Ice Plant (15 tons/day, 108 m^2)
Equipment	◆ Mechanical Hoists

19.2.2 Port Layout Plan

The port layout plan for short-term plan is shown in Figures 19.2.1 and 19.2.2.

The present status of the waterfront land for the project is covered with ecologically significant mangrove forest. In order to minimize the loss in mangrove forest, the layout plan for short-term development of port facilities is made so that the land area for the facilities is kept to the required minimum.

19.2.3 Design of Port Facilities

(1) Quay Structure

Considering the subsoil conditions, a suitable structure type for the quay has been studied and are summarized in Table 19.2.3. As shown in the Table, the advantage and disadvantage of three alternatives were reviewed and compared in terms of cost, construction period and environmental conditions.

An open pile type quay structure will be the most suitable to the site condition. The typical section of the open pile type quay wall is shown in Figure 19.2.3.

Suitable quay fixtures to the objective vessels, i.e. rubber fenders and bollards, have been selected as shown in the above figure. The following capacities are expected:

- Wooden Fender for Shrimp Berth: Absorption energy of 40 kN・m
- Bollard for Shrimp Berth: Tractive force of 15 ton in every direction
- Mechanical Hoist: 3.5-ton capacity

(2) Ramp for artisanal fishing boats

The structural type of ramp is concrete slipway type on the rubble mound. The slope of the ramp is planned with a single-gradient as 1:6 to be utilized by small ships for human power-based lifting of ships. The steel sheet piles are placed at the both side of the rubble mound for the purpose of the soft-ground-stabilization method, which is to prevent the circular slip failure. The typical structure is shown in Figures 19.2.4.

(3) Access Bridge

Based on the subsoil investigation for the site, the access bridges are planned with open pile type RC deck structure supported by the PC concrete piles. Based on the alignment of the piles and loads on the bridge, the adopted size of the square piles is 500 mm x 500 mm. The RC deck for the berth consists of RC pile caps, RC beams on the piles and RC slab on the beams. The typical structure is shown in Figures 19.2.5.

(4) Buildings

The building planned in the short-term plan is Ice Plant, which is planned for ice supply to the semi-industrial and artisanal fishing boats. The general description of the ice plant is shown in Table 19.2.2. The structural drawing of building is shown in Figure 19.2.6.

Table 19.2.2 General Description of Ice Plant

Ice Productivity	15 tons/day
Type of Ice	Plate Ice
Plant Size	9 m * 12 m = 108 m^2
Building	RC structure, 2- Storied
Generator	100 KVA
Water Tank	20 tons

Source: JICA Study Team

(5) Pavement

Pavement inside the project area has been studied in view of its specific use for the operation. Depending on the critical loading for each area, suitable types of the pavement are selected.

For this selection, considerations in the design are the following:

- Apron of the berth and passageway inside the yard: ideally only loaded trucks and unloaded handling equipment will pass on the pavement. Thus it does not need to be designed for heavy wheel loads of the equipment.
- Ramp: the pavement of the ramp consists of cast-in-place concrete slab (thickness 20 cm) above +2.0 m and pre-cast concrete block (slab size: 2 x 2 m, thickness 30 cm) below +2.0 m from MLWS.
- The access road to the site: asphalt concrete pavement is designed for various types of vehicles.

(6) Utilities

1) Drainage

Inside the yard, storm water will be collected by an appropriate gradient of the pavement to the surface drainage, which will be of an open type, i.e. U-shaped ditch, V-shaped gutter, etc. The main drainage will be a buried concrete box culvert type, to which surface and domestic drains will be connected. Septic tanks for each building will be also installed.

2) Water Supply

Fire fighting, ship's supply and other domestic consumption in the site have been considered and the water will be tapped at mains of La Palma area. Relevant facilities, such as reservoirs (20 tons), elevated tanks (50 tons) and pumps will be included, together with their network pipes.

3) Power Supply

Substation and emergency generator for lighting and building supply will be provided.

4) Fuel Supply

Fuel supply, such as diesel oil for industrial shrimp-trawlers and semi-industrial fishing boats and gasoline for artisanal fishing boats, has been considered. The planned storage volume of fuel tanks for diesel oil and gasoline are as follows:

- Diesel Oil: 36,000 gallons
- Gasoline: 7,500 gallons

Approximately, 25 m x 10 m space will be required for the storage tanks of fuel and lubricant. The fuel storage space shall be enclosed by an Oil Retaining Wall (1.2 –1.5 m high above ground level).

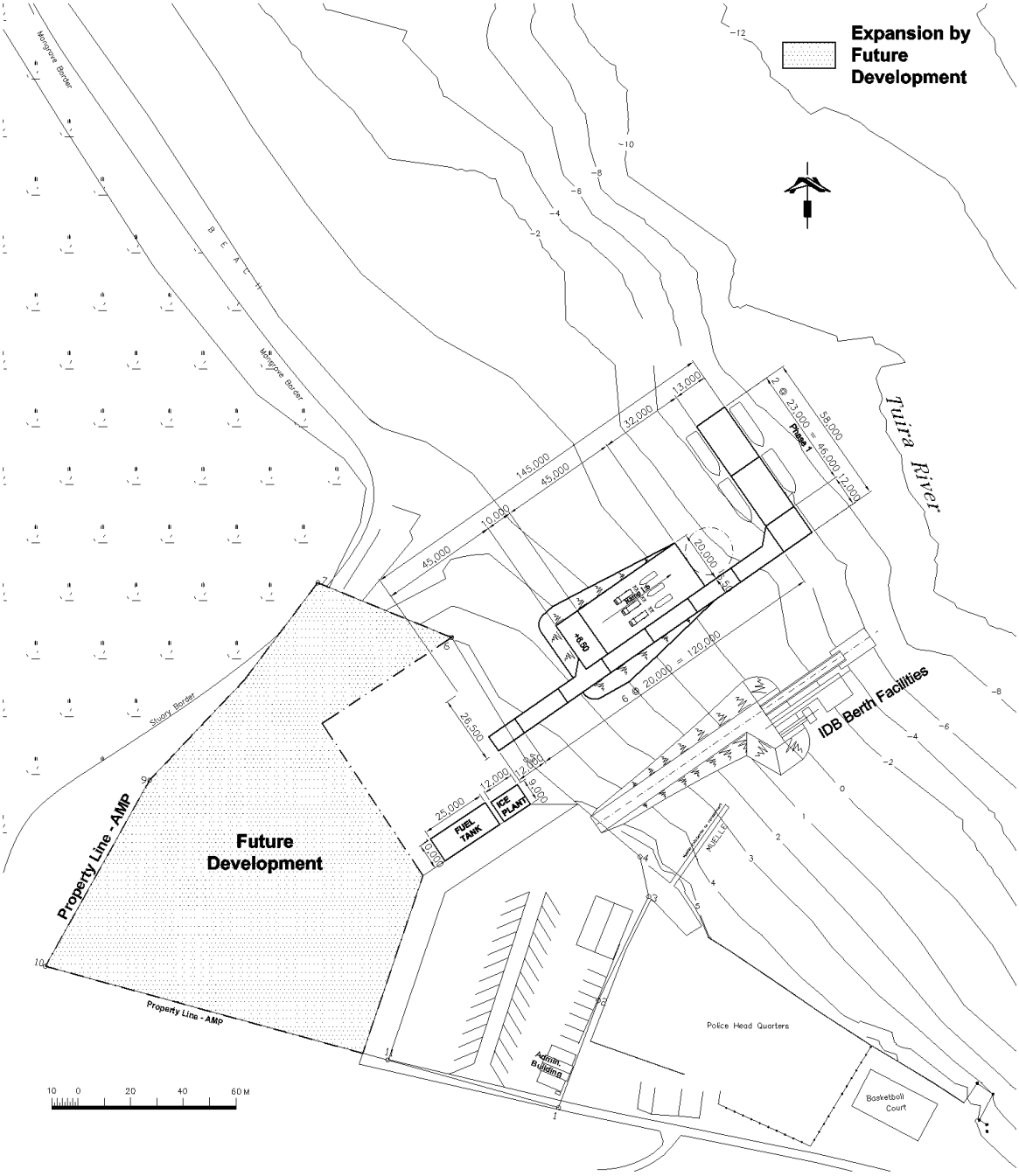


Figure 19.2.1 General Plan of La Palma Port

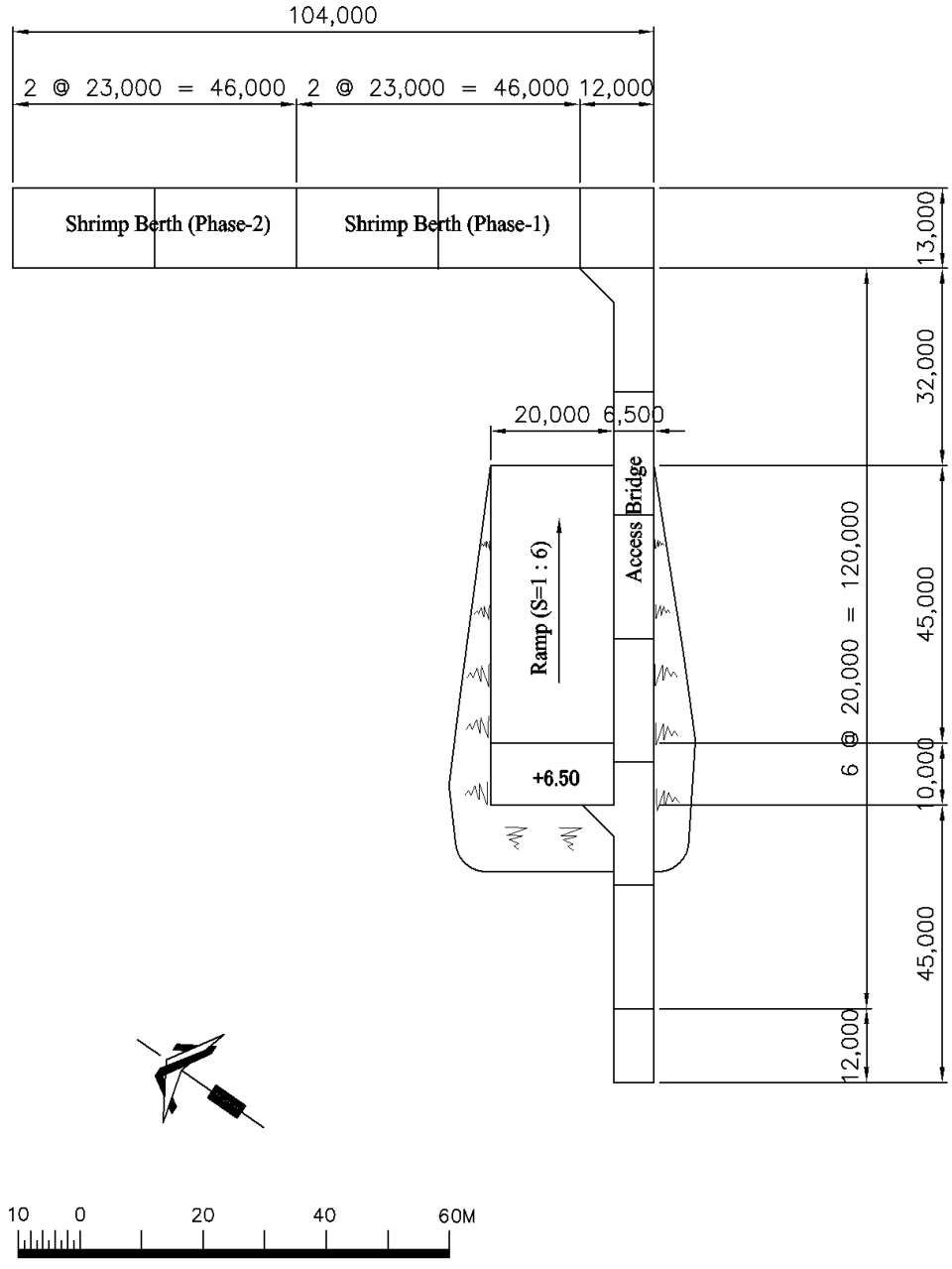
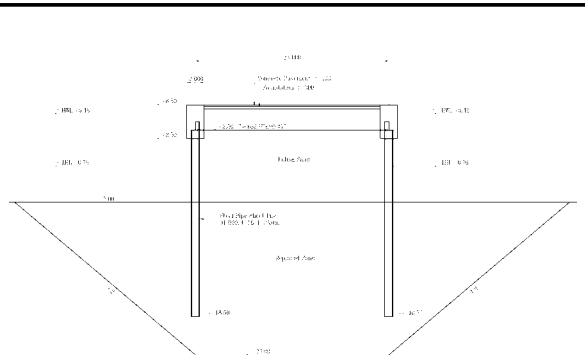
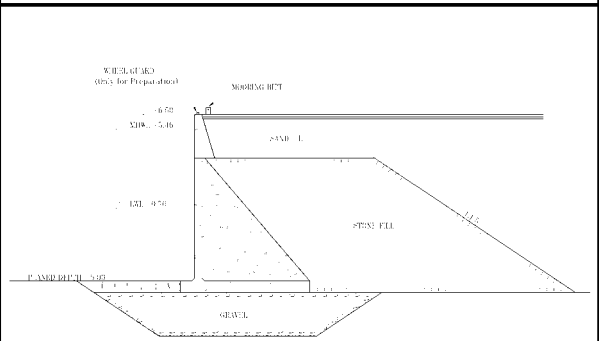
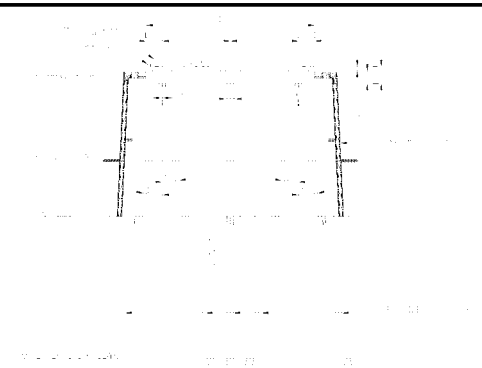


Figure 19.2.2 General Layout Plan of Marine Facilities

Table 19.2.3 Comparison of Quay Structural Type

	Steel Sheet Piles (SSP) W-wall Type	Gravity Type (L-Shaped Blocks)	Open Pile Type (Concrete Piles)
Typical Cross Section			
Evaluation	*Hindering the river current *Construction cost is the highest of the three types *Adjustable and flexible to the change of soil condition at site *Has negative affect on environment	*Hindering the river current *Not suitable for soft ground condition *Complicated in works and longer work period *Construction cost is the highest among the three types *Has negative affect on environment	*Suitable and adopted for the design conditions *Simple construction procedure, economical cost and short construction period *Commonly adopted in Panama *Environmental impacts may be minimal
	× (Not Recommendable)	× (Not Recommendable)	○ (Recommendable)
Advantage	*The construction period may be the shortest among the alternatives. *Sheet piling works and dredging/reclamation works can be conducted at the same time.	*Material is locally available and can be used, thus material cost is economically superior. *Maintenance is easy and structure has reasonable durability.	*The construction cost may be the lowest among the alternatives. *Volume of reclamation works will be minimal. *PC Pile driving works and reclamation works can be progressed separately at the same time.
Disadvantage	*Corrosion of SSP should be considered. *SSP and tie wires have to be imported. *The construction cost may be the highest of the three types. *Dredging, reclamation and backfilling works are required.	*The large block fabrication yard is required. *Floating equipment is required during installation. *The construction work is complicated to make level of mound for block installation and to set exact position for installation. *Construction period may be the longest. *Dredging and reclamation works are required.	*Large offshore pile driving equipment may be required. *PC pile is not easy to adjust its length by changes of soil and seabed topography. *Construction period will be longer than SSP type structure.

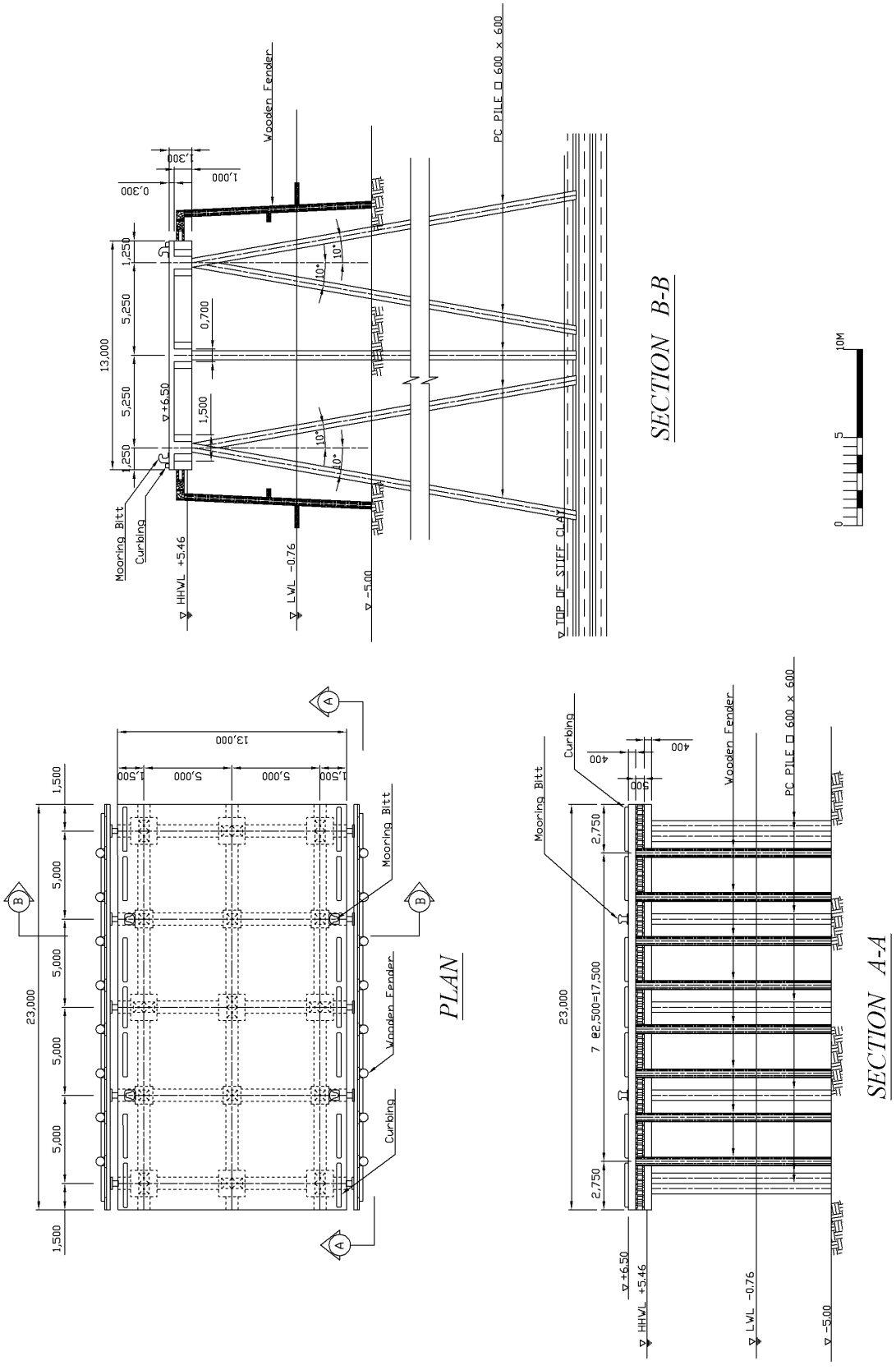


Figure 19.2.3 Structural Design of Shrimp Berth

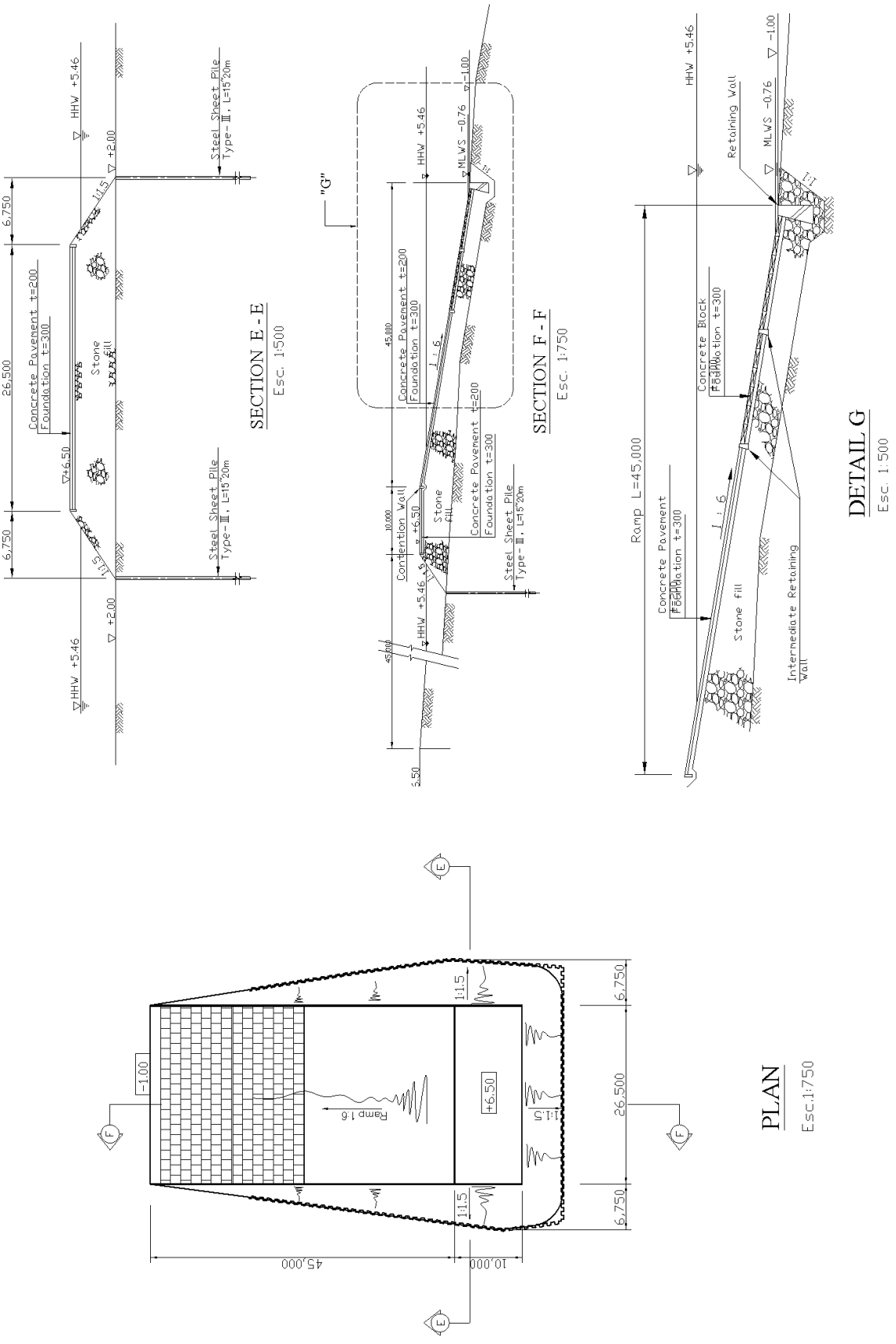


Figure 19.2.4 Structural Design of Ramp

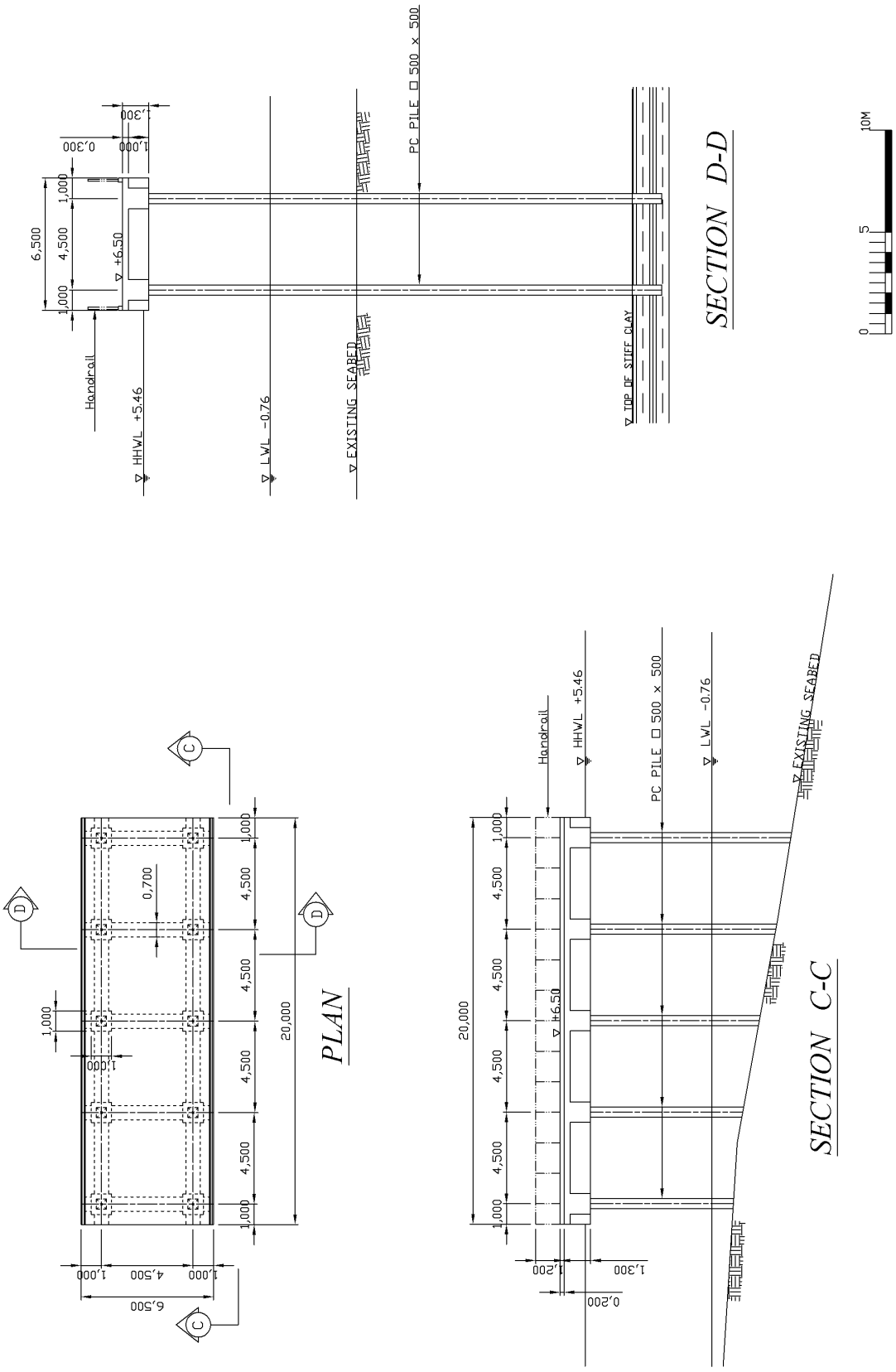


Figure 19.2.5 Structural Design of Access Bridge

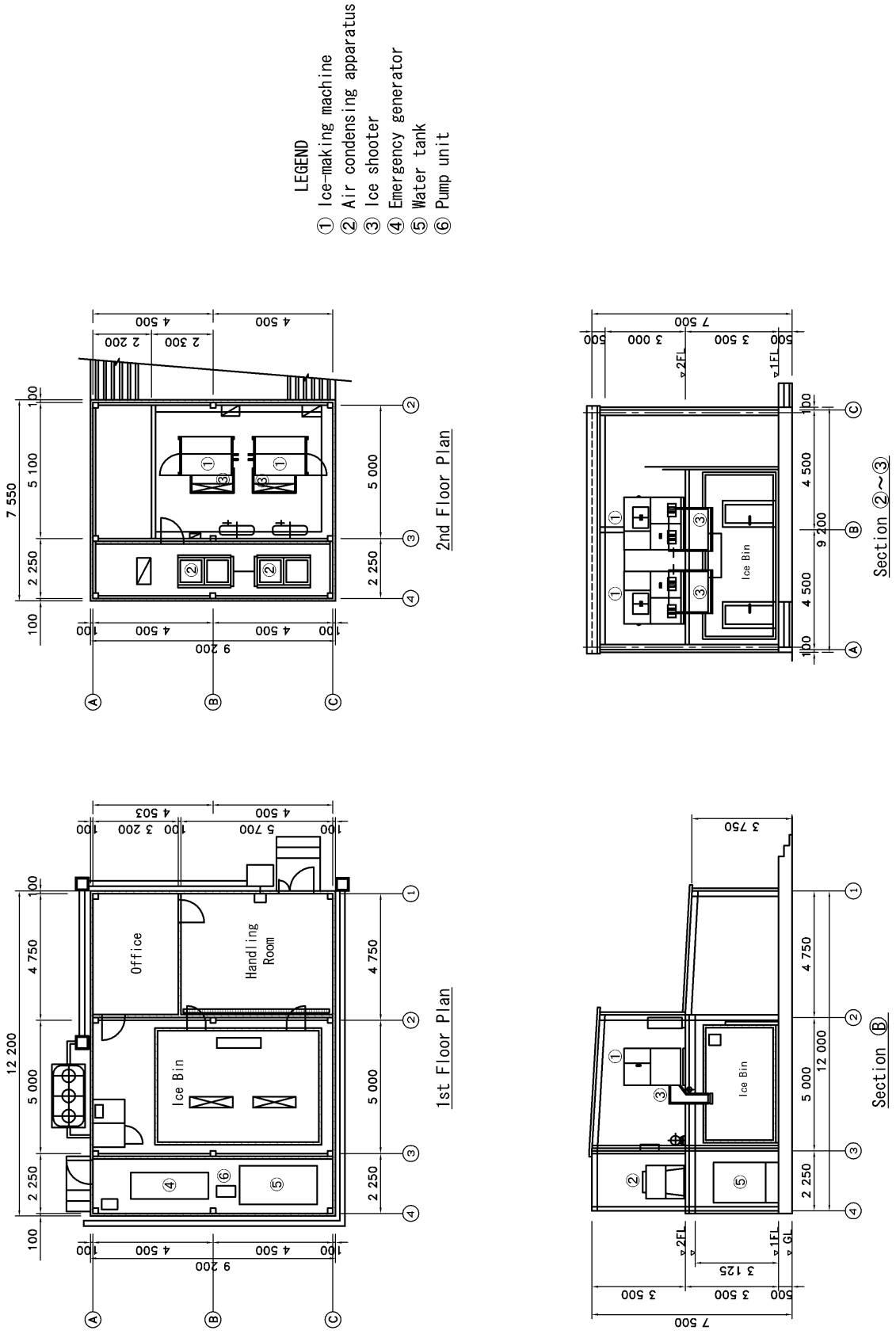


Figure 19.2.6 Structural Design of Ice Plant

19.3 Project Implementation

19.3.1 Introduction

In this section, the project cost for the feasibility study was reviewed based on the following method.

- For the purpose of estimation of the project 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 construction schedule is reviewed based on the government procedures and the financial program.

19.3.2 Project Cost

Based on the above conditions, project cost for the feasibility study is estimated as shown on the following table.

Table 19.3.1 Project Cost for the Feasibility Study of La Palma Port

La Palma (Phase I)						Unit : USD
	Item	**Dimensions**	**Unit**	**Quantity**	**Unit Rate**	**Amount**
1	Land Preparation	Parking Area	sq.m	4,137	4.1	17,044
2	Berth/Trestle	1,648 sq.m	sq.m	1,648	1,426.6	2,350,980
3	Mooring Buoy	Steel Made	unit	2	20,000.0	40,000
4	Slipway	B 20m x L 45m	l.sum	1	858,656.0	858,656
5	Revetment		lin.m	130	796.5	103,545
6	Buildings	Shed 400sq.m	l.sum	1	235,000.0	235,000
7	Ice Making Plant	7.5 t/dayx2, with Ice Storage	l.sum	1	1,200,000.0	1,200,000
8	Fuel Supply	with Accessories	l.sum	1	302,140.0	302,140
9	Pavement	Parking Area	sq.m	4,137	106.0	438,522
10	Outdoor Lighting		unit	35	1,250.0	43,750
11	Deck Crane		unit	4	12,500.0	50,000
12	Utilities	Supply line, Connection to city line	l.sum	1	212,800.0	212,800
13	Handling Equip.	3.0 t Forklift, Diesel	unit	1	19,500.0	19,500
14	Cooler Box	1 cu.m	pcs	50	913.0	45,650
Phase I Total						**5,917,587**

19.3.3 Implementation Schedule

Implementation schedule for the project is studied based on following understandings.

- It is assumed that the project budget to be financed by grant aid by the end of 2005.
- Complete basic design by the first quarter of 2006.
- Complete detailed design and prepare the tender documents for the construction by the third quarter of 2006, and carry out the tender in the next quarter.
- Start and complete the construction in 2007. Open the port in the early part of 2008.

The schedules for each construction items are shown on the following table.

Table 19.3.2 Project Implementation Schedule for La Palma Port

La Palma	2004		2005		2006		2007		2008		2009	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
1. Preparation and Submission of TOR												
2. Financial Arrangement												
3. Basic Design Study												
4. Detailed Design, Preparation of Tender Document and Supervision												
5. Tender Process and Contractor Selection												
6. Construction Process (Phase I)												
(1) Land Preparation												
(2) Berth / Trestle												
(3) Mooring Buoy												
(4) Slipway												
(5) Revetment												
(6) Buildings												
(7) Ice Making Plant												
(8) Fuel Supply												
(9) Pavement												
(10) Outdoor Lighting												
(11) Deck Crane												
(12) Utilities												
(13) Handling Equipment												
(14) Cooler Box												
7. Commencement of Port Operation												

19.4 Administration and Management

19.4.1 Port Infrastructure Development Scheme

At present, there is no private firm in the Municipality of Chepigana where La Palma is located that has the capacity and experience in the port management and operation, and AMP port office has been a sole agency that carries out day-to-day interactive functions with the local communities.

La Palma Fish Port development is not merely the development of port infrastructure, but also aims at the community organization. In the light of the present status of AMP in the local communities and its responsibilities in the management and operation of the new inter-modal facilities, AMP should directly manage and operate the La Palma Fish Port too. Thus, Type 1 scheme in Table 16.4.1 is recommended.

19.4.2 Conditions for Private Participation

The project requires public fund for the construction of the port facilities. The financial analysis shows that the 90 % of the construction cost should be the grant. Only 10% of the total construction cost can be recovered by the revenues from the fish port operation.

While AMP itself manage and operate La Palma Fish Port, there are various types of businesses that could be run by private firms.

Since the new fishing port is newly developed, the AMP should invite private firms who are operating ancillary services at La Palma fishing port: bunker and water supply, ice plant, cold storage, garbage collection, clean-up the port area and logistic services. Other services such as communication, public market and banking services are also needed for the daily operation of the port. If the cooperatives of local fishermen want to run some of these services, AMP should assist them technically and financially. This is because one of the key elements of the project is to establish an access to the commercial markets for the local fishermen to sell their catches.

19.4.3 Administration, Management and Operation

In general, the administration and management system of Vacamonte Port can be applied to La Palma Port, even though the scale of the business is different. Those recommendations for the improvement of the management and operation of Vacamonte Port (see Chapter 10.5) hold true for La Palma Fishing Port.

The AMP local office should ensure that all the port services are properly performed, in particular the security and safety. It is also responsible for pollution control.

Another objective of the development of La Palma Fish Port is to monitor closely the volumes of marine production. AMP should set-up an effective measure to monitor the fishery products brought to not only La Palma Port but also to other ports in Darien Province. The cooperation between AMP and cooperatives of artisan fishermen is vital for the successful monitoring of AMP.

19.4.4 Recommendations

AMP has the responsibility in organizing the passenger ship operators, local fisher men and local communities. Therefore, it is recommended that the cooperatives of fishermen should operate the fish port. The monitoring the daily fish catch should be carried out by the cooperatives. With the new port facilities, the work of AMP Local office will expand and, thus, more manpower will be needed. However, it is possible to utilize the human resources locally available such as the cooperatives of passenger boat operators and the cooperatives of local fishermen. AMP should try to outsource the manpower rather than simply increase the numbers of staff.

19.5 Economic Analysis

19.5.1 Scope of the Economic Analysis

Since the master Plan of La Palma Port proposed that the project should be implemented in two stages. Thus, an economic analysis has been also carried out for the priority project at La Palma to evaluate the economic feasibility of the first stage of the project.

19.5.2 Estimation of the Economic Cost

Table 19.5.1 summarizes the economic cost estimated in the same manner described in Section 15.10.

Table 19.5.1 The Overall Cost and EIRR of the La Palma 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
2006	0	0	0	0	0	355,055	355,055	0		0	355,055		(355,055)
2007	3,706,672	2,210,915	1,945,605	5,652,277	414,684	236,703	6,303,665	0	0	0	6,303,665	0	(6,303,665)
2008	0	0	0	0	0	0	0	59,176	10,629	69,805	69,805	490,752	420,947
2009	0	0	0	0	0	0	0	59,176	10,948	70,124	70,124	680,073	609,949
2010	0	0	0	0	0	0	0	59,176	11,276	70,452	70,452	834,972	764,520
2011	0	0	0	0	0	0	0	59,176	11,614	70,790	70,790	989,871	919,081
2012	0	0	0	0	0	0	0	59,176	11,963	71,139	71,139	1,144,770	1,073,631
2013	0	0	0	0	0	0	0	59,176	12,322	71,498	71,498	1,316,880	1,245,382
2014	0	0	0	0	0	0	0	59,176	12,691	71,867	71,867	1,454,568	1,382,701
2015	0	0	0	0	0	0	0	59,176	13,072	72,248	72,248	1,742,245	1,669,997
2016	0	0	0	0	0	0	0	59,176	13,464	72,640	72,640	1,749,100	1,676,460
2017	987,239	588,857	518,194	1,505,433	0	0	1,505,433	59,176	13,868	73,044	1,578,477	1,749,100	170,623
2018	0	0	0	0	0	0	0	59,176	14,284	73,460	73,460	1,749,100	1,675,640
2019	0	0	0	0	0	0	0	59,176	14,713	73,889	73,889	1,749,100	1,675,211
2020	0	0	0	0	0	0	0	59,176	15,154	74,330	74,330	1,749,100	1,674,770
2021	0	0	0	0	0	0	0	59,176	15,609	74,785	74,785	1,749,100	1,674,315
2022	0	0	0	0	0	0	0	59,176	16,077	75,253	75,253	1,749,100	1,673,847
2023	0	0	0	0	0	0	0	59,176	16,559	75,735	75,735	1,749,100	1,673,365
2024	0	0	0	0	0	0	0	59,176	17,056	76,232	76,232	1,749,100	1,672,868
2025	0	0	0	0	0	0	0	59,176	17,057	76,233	76,233	1,749,100	1,672,867
2026	0	0	0	0	0	0	0	59,176	17,058	76,234	76,234	1,749,100	1,672,866
2027	987,239	588,857	518,194	1,505,433	0	0	1,505,433	59,176	17,059	76,235	1,581,668	1,749,100	167,432
2028	0	0	0	0	0	0	0	59,176	17,060	76,236	76,236	1,749,100	1,672,864
2029	0	0	0	0	0	0	0	59,176	17,061	76,237	76,237	1,749,100	1,672,863
2030	0	0	0	0	0	0	0	59,176	17,062	76,238	76,238	1,749,100	1,672,862
2031	0	0	0	0	0	0	0	59,176	17,063	76,239	76,239	1,749,100	1,672,861
2032	0	0	0	0	0	0	0	59,176	17,064	76,240	76,240	1,749,100	1,672,860
2033	0	0	0	0	0	0	0	59,176	17,065	76,241	76,241	1,749,100	1,672,859
2034	0	0	0	0	0	0	0	59,176	17,066	76,242	76,242	1,749,100	1,672,858
2035	0	0	0	0	0	0	0	59,176	17,067	76,243	76,243	1,749,100	1,672,857
2036	0	0	0	0	0	0	0	59,176	17,068	76,244	76,244	1,749,100	1,672,856
2037	987,239	588,857	518,194	1,505,433	0	0	1,505,433	59,176	17,069	76,245	1,581,678	1,749,100	167,422
2038	0	0	0	0	0	0	0	59,176	17,070	76,246	76,246	1,749,100	1,672,854
2039	0	0	0	0	0	0	0	59,176	17,071	76,247	76,247	1,749,100	1,672,853
2040	0	0	0	0	0	0	0	59,176	17,072	76,248	76,248	1,749,100	1,672,852
2041	0	0	0	0	0	0	0	59,176	17,073	76,249	76,249	1,749,100	1,672,851
2042	0	0	0	0	0	0	0	59,176	17,074	76,250	76,250	1,749,100	1,672,850
2043	0	0	0	0	0	0	0	59,176	17,075	76,251	76,251	1,749,100	1,672,849
2044	0	0	0	0	0	0	0	59,176	17,076	76,252	76,252	1,749,100	1,672,848
													EIRR
													15.68%

19.5.3 Estimation of the Benefit

Although there are tremendous expected direct and indirect economic benefits from the project, we only estimate the following three groups of the economic benefits that is summarized in Table 19.5.2

Table 19.5.2 Overall Benefit of The La Palma Port Project

USD

Year	Annual Treatment Volume (Ton)	Ship Calls/Year	Ship Calls/week	Market Value Improvement Per Ton	Annual Benefit from Market Value Improvement	Fuel Saving Per Ton	Annual Fuel Saving	Land Transportation Cost per Truck	Annual Land Transportation Cost	Overall Benefit
2005										
2006										
2007										
2008	320	533	15	1,584	506,880	137.1	43,872	300	(60,000)	490,752
2009	430	717	20	1,584	681,120	137.1	58,953	300	(60,000)	680,073
2010	520	867	25	1,584	823,680	137.1	71,292	300	(60,000)	834,972
2011	610	1,017	29	1,584	966,240	137.1	83,631	300	(60,000)	989,871
2012	700	1,167	33	1,584	1,108,800	137.1	95,970	300	(60,000)	1,144,770
2013	800	1,333	38	1,584	1,267,200	137.1	109,680	300	(60,000)	1,316,880
2014	880	1,467	42	1,584	1,393,920	137.1	120,648	300	(60,000)	1,454,568
2015	950	1,583	45	1,584	1,672,000	137.1	130,245	300	(60,000)	1,742,245
2016	1,000	1,667	48	1,584	1,672,000	137.1	137,100	300	(60,000)	1,749,100
2017	1,000	1,667	48	1,584	1,672,000	137.1	137,100	300	(60,000)	1,749,100
2018	1,000	1,667	48	1,584	1,672,000	137.1	137,100	300	(60,000)	1,749,100
2019	1,000	1,667	48	1,584	1,672,000	137.1	137,100	300	(60,000)	1,749,100
2020	1,000	1,667	48	1,584	1,672,000	137.1	137,100	300	(60,000)	1,749,100
2021	1,000	1,667	48	1,584	1,672,000	137.1	137,100	300	(60,000)	1,749,100
2022	1,000	1,667	48	1,584	1,672,000	137.1	137,100	300	(60,000)	1,749,100
2023	1,000	1,667	48	1,584	1,672,000	137.1	137,100	300	(60,000)	1,749,100
2024	1,000	1,667	48	1,584	1,672,000	137.1	137,100	300	(60,000)	1,749,100

(1) Market Price Increase due to the Freshness

The same as Section 15.10.

(2) Saving of Fuel Cost

The same as Section 15.10

(3) Land transportation cost from La Palma to Vacamonte

During Phase I, the white prawn must be transported from La Palma to Vacamonte because the processing facility at La Palma is planned in Phase II. The land transportation cost to Vacamonte must be subtracted from the economic benefit.

19.5.4 Economic Internal Rate of Return (EIRR)

As Table 19.5.1 shows the estimate of EIRR for the project is 15.68 percent.

19.5.5 Sensitivity Analysis on EIRR

Due to the shortage of traffic volume growth and other unforeseeable factors, the actual costs might exceed our estimates and the actual economic benefits might not be realized fully. Therefore, we have done the sensitivity analysis on the EIRR with the following three unfavorable situations.

Case A: The ten percent overrun of the capital investment cost
Case B: The ten percent decrease of the economic benefit
Case C: Both Case A and Case B (the worst scenario)

Cases	EIRR
Base Case	15.68 %
Case A	14.44 %
Case B	14.22 %
Case C	13.05 %

The detail of the sensitivity analysis will be shown in **Appendix N**.

19.5.6 Qualitative Evaluation of Economic Benefit

The Darien Province is the worst developed region in the country while the physical distance to the central part of the country is not far. Most economic and business activities in the country are planned in the outside of the Darien Province. Recent IDB project to build the highway to Darien and RORO service to La Palma is historical breakthrough to the development of the region.

But, in addition to the improvement of transportation infrastructure, the local industry that supports the region economically has to be promoted. The Darien Province has very rich marine resources, especially prawn but those resources are now directly taken to Vacamonte port and no economic benefit is brought to the Darien Province. The new La Palma fishery complex will be the trigger to the development of the region and will bring additional industrial development in La Palma in near future. Further, it will be the symbol of the regional development and will give the confidence to the local people to catch up to the other region. Although these economic benefits to the region are not fully quantified, the aggregated economic benefit will be far greater than the one that is shown above in numbers.

19.5.7 Conclusion

While EIRR in this feasibility analysis is lower than other three projects, considering that this is the key project to bring the breakthrough to the worst developed region and in the previous chapter of the master plan high EIRR is estimated in long run, and qualitative evaluation mentioned above, this project is feasible and recommendable from economic point of view.

19.6 Financial Analysis

19.6.1 Scope of Financial Analysis

This is the completely new fishery port construction project. A portion of the industrial fishery boats currently based at Vacamonte fishery port is expected to move to the new La Palma fishery boat complex. The trip time to the Darien fishery ground will decrease remarkably. The reduction of time between fish catch and the market will bring about higher market price due to the freshness. Secondly, the fuel saving is realized from the closeness to the Darien fishery ground from homeport.

Though the economic analysis showed that the project will bring substantial benefit for the country, it is quite difficult to collect port charges to the users who are the beneficiaries of the project. This is because the project aims at the "alleviation of income gap and poverty" and the "mitigation of socioeconomic regional disparities" and it is vital elements to give an incentive to the commercial fish boats to base at La Palma Port. Therefore, basically, the investment cost should be shouldered by the government.

The IDB related projects, i.e. the Inter-modal transport development in Darien, are excluded from the financial analysis. The facilities that will be constructed and operated by private business under concession are also excluded.

19.6.2 Assumed Financial Scheme of the Project

It is assumed that 90% of the total construction cost shall be financed by the grant of the government. Only 10% of the construction cost shall be financed by loan. While the maintenance cost shall be paid fully from the revenue, the depreciation of the investment is considered partially (only for ten percent portion, i.e. loan portion). Thus, the financial analysis for La Palma Port is not the whole project but only for the financial feasibility of the operation and maintenance of the fishing port. The conditions of the financial analysis are listed in the Table below.

Name of the Port	La Palma
Managing Entity	Government (Local Office of AMP)
Shareholders	Not Applicable
Financing Scheme of the Construction Costs	Grant (90%) and Loan (10%)
Interest Rate for Loan	3%
Grace Period (from the start of the Operation)	5 years
Repayment	20 years
Financial Source of Renewal Investment of Plant and Equipment	Managing Entity (10%) and Grant (90%)
Annual Maintenance and operation Cost	Paid form the operation revenue

19.6.3 Estimation of the Financial Cost

The financial cost is same as the cost in cost analysis but expressed in market price, not in financial price but grant is expected for ninety percent of the investment cost and renewal investment at every eleven years.

Contingencies for the civil engineering cost are estimated at 10 percent level.

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

Due to the difficulty of estimating long term operation and maintenance cost (except for the personnel cost), we adapt the professional judgment of the engineers based on the construction cost.

As for this, the number of the staff is expected at the same level. Therefore, the incremental personnel cost will be zero through whole project life (2005 through 2024).

Table 19.6.1 summarized the estimated financial cost.

Table 19.6.1 Estimate of FIRR for La Palma Port Project

USD

Year	Civil	Plant & Equipment	Engineering	Investment	10% of Investment	Maintenance	Total Cost (10% Case)	Prawn (Ton)	Fee Rate per ton	Port Fee from Industrial Fishing	Port Fee from Artisanal Fishing Boat (@5)	Total Revenue	Net Cash Inflow
			10%			1%			298.53				
2005				0	0		0						0
2006	0	0	355,055	355,055	35,506		35,506			0	0	0	(35,506)
2007	4,775,639	1,576,096	236,703	6,588,438	658,844	0	658,844	0		0	0	0	(658,844)
2008				0	0	59,176	59,176	320	208.97	66,871	1,460	68,539	9,363
2009	0	0	0	0	0	59,176	59,176	430	208.97	89,858	1,460	91,526	32,350
2010	0	0	0	0	0	59,176	59,176	520	208.97	108,665	1,460	110,333	51,157
2011	0	0	0	0	0	59,176	59,176	610	208.97	127,472	1,460	129,141	69,965
2012	0	0	0	0	0	59,176	59,176	700	208.97	146,280	1,460	147,948	88,772
2013	0	0	0	0	0	59,176	59,176	800	208.97	167,177	1,460	168,845	109,669
2014	0	0	0	0	0	59,176	59,176	880	208.97	183,894	1,460	185,563	126,387
2015	0	0	0	0	0	59,176	59,176	950	208.97	198,522	1,460	200,191	141,015
2016	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2017	0	1,576,096	0	1,576,096	157,610	59,176	216,786	1,000	208.97	208,971	1,460	210,639	(6,146)
2018	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2019	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2020	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2021	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2022	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2023	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2024	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2025	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2026	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2027	0	1,576,096	0	1,576,096	157,610	59,176	216,786	1,000	208.97	208,971	1,460	210,639	(6,146)
2028	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2029	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2030	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2031	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2032	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2033	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2034	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2035	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2036	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2037	0	1,576,096	0	1,576,096	157,610	59,176	216,786	1,000	208.97	208,971	1,460	210,639	(6,146)
2038	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2039	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2040	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2041	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2042	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2043	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
2044	0	0	0	0	0	59,176	59,176	1,000	208.97	208,971	1,460	210,639	151,463
													FIRR
													12.74%

Note: Ten percent contingency for Civil Works is included in Investment.

19.6.4 Estimation of the Financial Revenue

(1) The port fee for unloading of shrimp at Vacamonte fishery port is USD 298.53 per ton on average. The new port fee for unloading at La Palma fishery boat complex for shrimp is expected at the 70 percent of current Vacamonte fee level in order to attract the shrimp boats.

(2) USD 5 will be assessed for artisan fishery boats except for the boats in Garachine. Seventy percent of collection rate is assumed.

Table 19.6.1 summarized the estimated financial revenue.

19.6.5 Financial internal Rate of Return (FIRR)

As Table 19.6.1 shows the estimate of FIRR for the project is 12.74%.

19.6.6 Pro Forma Financial Statements (Table 19.6.2)

Table 19.6.2 Pro Forma Financial Statements for La Palma Port Project

(USD)

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Income Statement																			
Annual Depreciation	0	1,446	27,340	27,340	27,340	27,340	27,340	27,340	27,340	27,340	27,340	26,477	25,902	25,902	25,902	25,902	25,902	25,902	25,902
Interest (3%)	1,065	20,830	20,830	20,830	20,830	20,830	19,789	18,747	17,706	16,664	15,623	14,581	13,540	12,498	11,457	10,415	9,374	8,332	7,291
Operation & Maintenance		0	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176
Total Expenses	1,065	22,276	107,347	107,347	107,347	107,347	106,305	105,263	104,222	103,180	102,139	100,235	98,618	97,576	96,535	95,493	94,452	93,410	92,369
Total Revenue	0	0	68,539	91,526	110,333	129,141	147,948	168,845	185,563	200,191	210,639	210,639	210,639	210,639	210,639	210,639	210,639	210,639	210,639
Net Profit	(1,065)	(22,276)	(38,807)	(15,821)	2,987	21,794	41,643	63,582	81,341	97,011	108,501	110,405	112,022	113,063	114,105	115,146	116,188	117,229	118,271
Cum Profit	(1,065)	(23,342)	(62,149)	(77,969)	(74,983)	(53,188)	(11,545)	52,037	133,378	230,388	338,889	449,294	561,315	674,378	788,483	903,629	1,019,817	1,137,046	1,255,317
Cash Flow Statement																			
Loan	35,506	658,844	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Revenue	0	0	68,539	91,526	110,333	129,141	147,948	168,845	185,563	200,191	210,639	210,639	210,639	210,639	210,639	210,639	210,639	210,639	210,639
Total Inflow	35,506	658,844	68,539	91,526	110,333	129,141	147,948	168,845	185,563	200,191	210,639	210,639	210,639	210,639	210,639	210,639	210,639	210,639	210,639
Investment	35,506	658,844	0	0	0	0	0	0	0	0	0	157,610	0	0	0	0	0	0	0
Operation & Maintenance	0	0	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176	59,176
Interest (3%)	1,065	20,830	20,830	20,830	20,830	20,830	19,789	18,747	17,706	16,664	15,623	14,581	13,540	12,498	11,457	10,415	9,374	8,332	7,291
Loan Repayment							34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717
Total Outflow	36,571	679,674	80,006	80,006	80,006	80,006	113,682	112,641	111,599	110,558	109,516	266,085	107,433	106,392	105,350	104,309	103,267	102,226	101,184
Net Inflow	(1,065)	(20,830)	(11,467)	11,520	30,327	49,134	34,266	56,204	73,964	89,633	101,123	(55,445)	103,206	104,248	105,289	106,331	107,372	108,414	109,455
Cum Cash	(1,065)	(21,896)	(33,363)	(21,843)	8,483	57,618	91,883	148,088	222,051	311,684	412,808	357,362	460,568	564,816	670,105	776,436	883,808	992,222	1,101,677
Balance Sheet																			
Cash	(1,065)	(21,896)	(33,363)	(21,843)	8,483	57,618	91,883	148,088	222,051	311,684	412,808	357,362	460,568	564,816	670,105	776,436	883,808	992,222	1,101,677
Fixed Assets	35,506	694,350	694,350	694,350	694,350	694,350	694,350	694,350	694,350	694,350	694,350	851,960	851,960	851,960	851,960	851,960	851,960	851,960	851,960
Cum Depr	0	(1,446)	(28,786)	(56,126)	(83,466)	(110,806)	(138,146)	(165,486)	(192,826)	(220,166)	(247,506)	(273,983)	(299,885)	(325,788)	(351,690)	(377,592)	(403,494)	(429,396)	(455,298)
Total Assets	34,441	671,008	632,201	616,381	619,367	641,162	648,087	676,952	723,575	785,868	859,651	935,339	1,012,643	1,090,988	1,170,376	1,250,804	1,332,275	1,414,786	1,498,340
Loan	35,506	694,350	694,350	694,350	694,350	694,350	659,632	624,915	590,197	555,480	520,762	486,045	451,327	416,610	381,892	347,175	312,457	277,740	243,022
Cum Profit	(1,065)	(23,342)	(62,149)	(77,969)	(74,983)	(53,188)	(11,545)	52,037	133,378	230,388	338,889	449,294	561,315	674,378	788,483	903,629	1,019,817	1,137,046	1,255,317
Total Liabities & Equity	34,440	671,008	632,201	616,380	619,367	641,161	648,087	676,951	723,575	785,868	859,651	935,338	1,012,643	1,090,988	1,170,375	1,250,804	1,332,274	1,414,786	1,498,339
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Financial Ratios																			
Net Fixed Assets			665,564	638,224	610,884	583,544	556,204	528,864	501,524	474,184	446,844	577,977	552,075	526,172	500,270	474,368	448,466	422,564	396,662
Operating Expenses			86,516	86,516	86,516	86,516	86,516	86,516	86,516	86,516	86,516	85,653	85,078	85,078	85,078	85,078	85,078	85,078	85,078
Operatiing Revenues			68,539	91,526	110,333	129,141	147,948	168,845	185,563	200,191	210,639	210,639	210,639	210,639	210,639	210,639	210,639	210,639	210,639
Net Operating Income			(17,977)	5,010	23,817	42,625	61,432	82,329	99,047	113,675	124,123	124,986	125,561	125,561	125,561	125,561	125,561	125,561	125,561
Depreciation Rxpenses			27,340	27,340	27,340	27,340	27,340	27,340	27,340	27,340	27,340	26,477	25,902	25,902	25,902	25,902	25,902	25,902	25,902
Repayment of Loan			0	0	0	0	34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717	34,717
Interst for Long-Term Debt			20,830	20,830	20,830	20,830	19,789	18,747	17,706	16,664	15,623	14,581	13,540	12,498	11,457	10,415	9,374	8,332	7,291
ROI			-20.8%	5.8%	27.5%	49.3%	71.0%	95.2%	114.5%	131.4%	143.5%	145.9%	147.6%	147.6%	147.6%	147.6%	147.6%	147.6%	147.6%
Operating Ratio			126.2%	94.5%	78.4%	67.0%	58.5%	51.2%	46.6%	43.2%	41.1%	40.7%	40.4%	40.4%	40.4%	40.4%	40.4%	40.4%	40.4%
Working Ratio			86.3%	64.7%	53.6%	45.8%	40.0%	35.0%	31.9%	29.6%	28.1%	28.1%	28.1%	28.1%	28.1%	28.1%	28.1%	28.1%	28.1%
Debt Service Coverage Ratio			44.9%	155.3%	245.6%	335.9%	162.9%	205.1%	241.1%	274.4%	300.9%	307.2%	313.9%	320.8%	328.0%	335.6%	343.5%	351.8%	360.6%

(1) Income Statement

The operation will start at 2008. Annual income will be positive from the third year of operation (2010) but cumulative profit will become positive at 2013 (see the Row indicated as "Net Profit" in Table 19.6.3 and see also Figure 19.6.1).

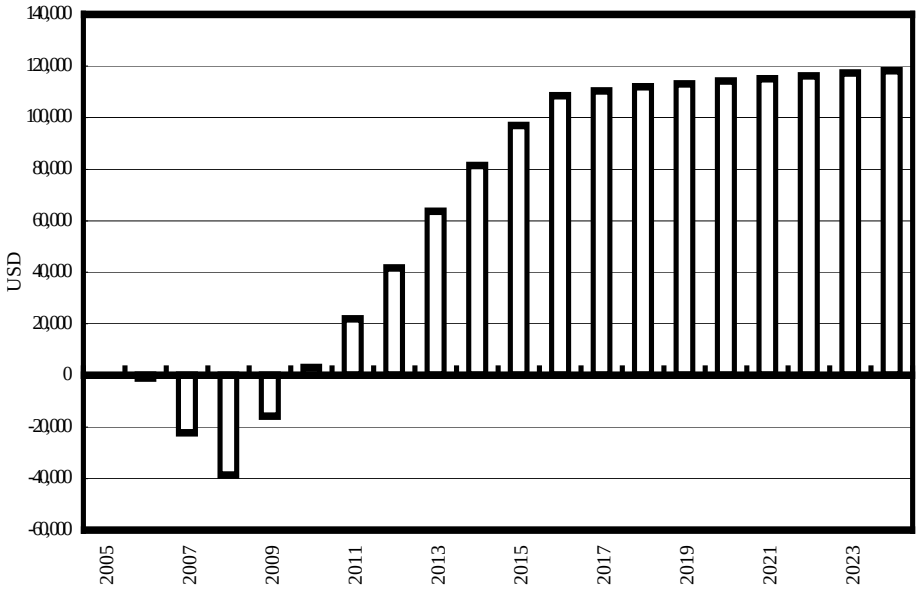


Figure 19.6.1 Annual Net Profit (La Palma)

(2) Cash Flow Statement

From the second year of operation, the net cash flow is positive. Cumulative cash will become positive from 2010 (third year of the operation) (See the Row of "Net Inflow of Table 19.6.3 and Figure 19.6.2).

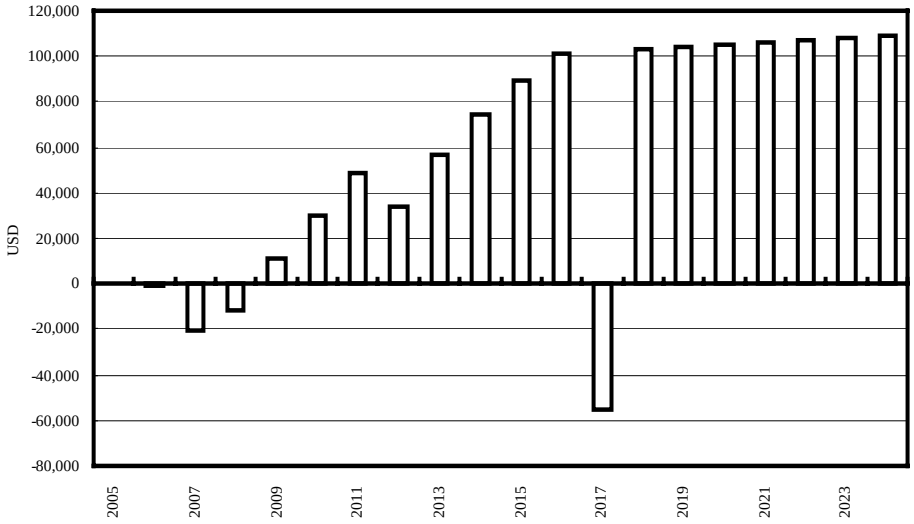


Figure 19.6.2 Net Cash Inflow (La Palma)

(3) Balance Sheet

Cash position is positive from the third year of operation and net equity become positive at 2013.

19.6.7 Financial Ratios

(1) Profitability

In this project, the Return on Investment (ROI) is to exceed the criterion of over 7% from the third year of operation (2010).

(2) Operational Efficiency

The criterion of the Operating Ratio is to be less than 70 -75%. The criterion is satisfied from 2011 through the project life.

The criterion of Working Ratio is to be less than 0.50 - 0.60. From the third year of operation (2010), the criterion is satisfied through the project life.

(3) Long-Term Solvency

The criterion of the Debt Service Coverage Ratio is to exceed 1.0. From the second year of operation (2009), the criterion is satisfied all of the years through the project life.

19.6.8 Sensitivity Analysis on FIRR

Due to the shortage of traffic volume growth and other unforeseeable factors, the actual revenue benefits might not be realized fully and the actual costs might exceed our estimates. Therefore, we have done the sensitivity analysis on the FIRR with the following three unfavorable situations.

Case A: The ten percent overrun of the capital investment cost
Case B: The ten percent decrease of the economic benefit
Case C: Both Case A and Case B (the worst scenario)

Cases	FIRR
Base Case	12.74 %
Case A	11.72%
Case B	10.94%
Case C	10.00%

The detail the sensitivity analysis will be shown in **Appendix N**.

19.6.9 Financial Evaluation of the Project

Considering that the estimated FIRR (12.74%) as public infrastructure project and the soundness of the pro forma income statement, and that the cash flow statement and financial ratios during feasibility study period and thereafter, this project is financially feasible and recommendable if the grant portion of the investment cost is expected.

19.6.10 Summary of the Assumed Financial Scheme of the Projects

Summing up the financial analysis for the four ports, the conditions of the analysis and the results of FIRR are listed in **Table 19.6.3.**

Table 19.6.3 Summary of Assumed Financial Scheme of the Project

Name of the Port	Bocas del Toro / Almirante	Chiriqui	Coquira	La Palma
Managing Entity	Government (AMP)	Special Purpose Company (SPC)	Private Company (Consessionarie)	Government (AMP)
Shareholders	Not Applicable	Government and Private Participant	Private shareholders	Not Applicable
Depreciation	Considered Fully	Considered Fully	Considered Fully (for Land Portion)	Partially considered (loan portion, i.e., 10%)
Financing Scheme of the Construction Costs	Loan (90%) and Government Expenditure (10%)	Equity Investment (40%) and Loan (60%)	56.3 % of the total construction cost is paied by the Government. The rest of 43.2 % is financed by loan	Grant (90%) and Loan (10%)
Interest Rate for Loan	3%	6%	6%	3%
Grace Period (from the start of the Operation)	5 years	5 years	5 years	5 years
Repayment	20 years	20 years	10 years	20 years
Financial Source of Renewal Investment of Plant and Equipment	By managing entity	By managing entity	By managing entity	Managing Entity (10%) and Grant (90%)
Remarks			The Sea Portion of the Port is constructed by the AMP expense and will leased to the concessionaire at fee of charge.	
FIRR	10.69%	9.79%	11.27%	12.74%
Government expenditure	10% of the total construction Cost (USD 543,000)	To be determined through negotiation (However, the major portion should be shouldered by the government)	56% of Total Construction cost USD 1,333,000	90% of the total construction cost USD 533,000

19.7 Environmental Impact Assessment (EIA)

Basically, environmental impacts by a project are caused consequent to activities involved in the three significant stages of a project execution (implementation), namely, pre-construction stage, construction stage and post-construction (operation) stage. Environmental impacts during construction stage of a project are basically of short-term (temporary) being confined to the duration of the construction activities while those of operation stage are potentially of long-term (permanent). It is noted that most temporary impacts due to construction activities could be managed and minimized, if not entirely mitigated, with careful planning and execution of the construction/installation works.

Potential environmental impact during pre-construction stage of a project is principally social aspects in nature, and caused by potential land acquisition issues for the provision of project facilities.

With due consideration to the above aspects, potential environmental impacts consequent to the execution of the short-term port development project in the La Palma port is evaluated so as to form the EIA (environmental impact assessment). It is noted that this EIA was conducted following the overall EIA guidelines of ANAM (National Environmental Authority). The EIA Report, formulated with the assistance of Panamanian expertise, is compiled as separate document. Still summarized version of the EIA document is given in Appendix P.

Formal EIA documentation in Spanish strictly conforming the EIA guidelines of ANAM needs to be formulated when the project is actually commenced with due consideration to any modification to the project components as deemed necessary.

Concerning the potential impacts of pre-construction stage of the project, it involves no land acquisition requirements since project area belongs to the owner of the project, AMP and hence there exists no adverse effect during the pre-construction stage of the project. Accordingly, environmental impacts and mitigation during construction and operation stages of the project are only dealt with below. In this respect environmental impact assessment (EIA) matrix focused on the significant environmental effects and also adverse effects that could be mitigated as good engineering practice during the construction stage and operation stage are summarized respectively in Table 19.7.1 and Table 19.7.2.

(1) Construction Stage Impacts

Inherent temporary adverse effects of construction works on the ambient environment (atmosphere) are potential air pollution and noise nuisance due to material and equipment transportation, storage and installation works. Dust nuisance due to easily airborne materials like sand is the most significant air pollution issue of construction works that could be mitigated with water spraying and/or covering such materials with plastic sheets. Even though noise nuisance

due to construction works is somewhat inevitable still restricting high noise prone activities like pile driving to daytime regular working hours only could mitigate its severe adverse effects.

Potential surface soil erosion in the construction site, though the site area is small, shall be given due considerations due to its proximity to the dynamic and tidally influenced estuarine coastal waters of Turia River. Erosion control, including the provision of barriers against surface erosion runoff into coastal estuarine waters, shall be an integral part of construction site management. In this respect covering of easily airborne materials like sand with plastic sheets would provide the dual benefit of air pollution control and erosion control due to rainfall runoff.

The project site concerned is mangrove coastline. Even though the construction of short-term project facilities will not result is any significant loss in the mangroves since most of the facility provision is located on and beyond the coastline toward offshore (mangrove vegetation area lost is only about 0.4 ha), it still might result in the perception of significant change in land usage. Accordingly, it is important for AMP as the owner of the project to maintain active communication with the community of La Palma and also other concerned institutions to elucidate the insignificance of land use change due to the provision of port facilities along the coastline of mangrove woods.

(2) Operation Stage Impacts

Potential port operational environmental impacts are of long-term and hence the mitigation measures are also of long-term in the form of port operational environmental management. The most significant environmental management requirement is proper waste management due to fishing vessel operation principally focused on waste oil (bilge waste) and garbage and also waste generated due to port terminal operation. Also it is important to eliminate spillage of oil during fuel oil handling into port waters. In this respect it is noted that under the current operational condition localized oil pollution in the passenger terminal areas of the La Palma port was observed.

Accordingly, improved waste management by AMP, both due to vessel operation and also port terminal operation in combination with surveillance against illegal dumping of wastes by vessels into port waters, so as to protect the port coastal water environment of berthing areas, shall be implemented. This port waste management program could be further complemented with a port water quality monitoring program at least targeting initially simple potable parameters, in particular DO (dissolved oxygen) level, which is a very good indicator of organic pollution level in water bodies.

(3) Conclusion and Recommendations

1) Conclusion

It is concluded that potential adverse environmental effects consequent to the project execution and its subsequent operation of the La Palma port terminal is manageable and hence not that

significant. Still, the most important port operational environmental requirement to be ensured is proper waste management.

2) Recommendations

It is recommended to initiate a port water quality monitoring program initially targeting at least simple potable water quality parameters, in particular DO level, by AMP. This monitoring program could be initiated at least concurrently with the commencement of construction works. The monitoring plan is given in the EIA document of Appendix P.

Currently the most significant source of pollution in the estuarine coastal waters of La Palma is the runoff of untreated wastes consequent to land based miscellaneous anthropogenic activities that are essentially not related to direct port operational activity. Accordingly, it is utmost important, as the highest priority, to improve overall waste management including the provision of sewage treatment plant/human waste management system to serve the population of La Palma. It is further emphasized that the waste management improvement measures need to be undertaken independently irrespective of the status of implementation of this port development project.

In fact improper management of wastes of land based anthropogenic activities being the principal cause of coastal water environmental degradation is a nation-wide environmental issue to be addressed as also pointed out in Section 5.2 of Chapter 5.

Table 19.7.1 Environmental Assessment Matrix (Construction Stage)

La Palma port						
Project stage	**Project Activities**	**Environmental component**	**Environmental variable**	**Environmental Effect**	**Environmental Measure**	**Recommendations**
Construction	1. Access roads implementation 2. Cuts and removal of land surface 3. Piles foundation 4. Material and equipment transportation	Atmosphere	Air quality	Increase in air particles	Spray with water or cover with plastic sheets easily airborne materials like sand, soil, etc.	Organize the number of heavy equipment and transportation vehicles that will be used in the construction works.
			Noise levels	Increase in noise levels	Working hours is scheduled during regular shift. Work is performed only during the day for high noise work like piling.	Avoid working too late at night or too early in the morning to mitigate noise generation that would seriously affect nearby communities.
		Soil	Erosion processes	Erosion and modification of sedimentary distribution	Implement barriers that will stop the deposition of sediments in the water.	Ensure erosion control is integral part of construction site management.
			Intrinsic scenery	Modification of scenic landscape	Implement structures that will be in harmony with the landscape.	Provide final landscape to be in harmony with surrounding environment.
		Socio-economic and cultural	Employment	Creation of direct eventual jobs	No mitigation measures are needed due to the fact that the effect is positive and economically beneficial.	Review temporary personnel's abilities and skills that could be occupied in other activities during the operation stage of the project.
			Land usage	Perception of change in land usage	Conduct effective communication with the community to promote project activities and its benefits.	Coordinate and maintain effective communication with concerned competent institutions.

Table 19.7.2 Environmental Assessment Matrix (Operation Stage)

La Palma port						
Project stage	**Project Activities**	**Environmental component**	**Environmental variable**	**Environmental Effect**	**Environmental Measure**	**Recommendations**
Operation	1. Port maintenance operation 2. Navigation and boats transport 3. Harbour activities (fishery cargo)	Atmosphere	Air quality	Increase in air particles by emissions	Implement an Action Plan for the optimization, effective use and circulation of port vehicles.	Organize the number of vehicles concerned to port cargo transportation.
		Soils	Soil composition	Soil contamination by fuel and other wastes	Implement a fuel, oil, solid and liquid waste management plan including the conduct of surveillance of vessels and port water quality monitoring.	Comply with established oil and other pollution control regulations.
		Environmental quality	Marine water	Variations in physical and chemical factors	Control measures in concordance with national and international marine policies related with port and marinas management (MARPOL).	Comply with established oil and other pollution control regulations.
		Marine fauna	Marine species (composition and dynamics)	- Reduction in species composition - Dynamics alteration (species stratification and distribution)	Comply with ANAM[1] and AMP[2] regulations on nature conservation, navigational safety and coastal environmental protection.	Ensure implementation of port water pollution control measures to facilitate continuous natural recovery.
		Socio-economic and cultural	Demography	Increase in immigration	Reinforcement of public services infrastructures for port operational activities.	The project should be incorporated in the promotion and creation of public services.
			Employment	Creation of direct eventual jobs	No mitigation measures are needed due to the fact that the effect is positive and economically beneficial.	Conduct regular training programs to ensure continuous skill development of operational personnel
			Basic utilities	Increase in basic services demand, specifically security	Support the reinforcement of infrastructure and police personnel conditions to guarantee security.	Coordinate with competent institutions concerned to social security.
			Sanitation	Increase of liquid and solid wastes	Support reinforcement of sanitary infrastructure to meet the sanitation demand.	Coordinate with competent institutions concerned to sanitation.
			Ethnic groups, traditions and costumes	Changes in traditions and costumes	Evaluate the mechanisms for conservation, preservation and integration of costumes and traditions.	Establish and maintain close socio cultural relations with ethnic groups.

[1] Autoridad Nacional del Ambiente (National Environmental Authority) [2] Autoridad del Marítima de Panamá (Panama Maritime Authority)

20. CONCLUSIONS AND RECOMMENDATIONS

20.1 Conclusions

(1) Socio-economic Framework

The long-term GDP forecasts published by the World Bank and other international organizations institutions and the "Economic Statistics" published by Office of General Comptroller have been reviewed. On the basis of the review and comparison, the GDP growth rates have been forecast for every five years from 2005 through 2024:

From	To	GDP Growth rate
2005	2009	4.3 %
2010	2014	4.5 %
2015	2019	4.6 %
2020	2014	5.1 %

The average share of the primary sector of GDP over the past 10 years is 8.3 %, while those of the secondary and the tertiary sectors are 16.3 % and 75.4 %, respectively.

Taking into consideration the growth potential of the primary and the secondary sectors and the government policy as well as the on-going programs to promote agricultural sector in the central and western regions, the study team assumed that the primary and the secondary sector will grow at a higher rate than the tertiary sector, and in the coming years the GDP share of the two sectors will also be expanded. The sector shares in GDP estimated are as follows:

Year	GDP share (%)		
	Primary	Secondary	Tertiary
up to 2002	8.3	16.3	75.4
2009	8.3	16.3	75.4
2014	8.8	16.6	74.2
2019	9.2	16.8	74.0
2024	9.5	17.5	73.0

On the basis of the weighted GDP share in the coming years, the GDP in 2024 has been forecast to grow up to USD 24.4 billion, from USD 10.5 billion in 2003 (1996 constant value). GDP per capita also is estimated to grow to USD 5,813 from USD 3,427 in 2002. The estimates of regional GDP the provinces are also presented.

The population will grow to 4.19 million in 2024 from 2.95 million in 2000.

(2) Demand Forecasts

International trade

On the basis of the GDP forecast, the cargo volumes have been forecast. The import dry cargoes in 2024 will be 23.36 million tons consist of liquid bulk 19.86 million tons, Dry bulk cargoes 1.96 million tons, and container cargoes 1.54 million tons. The export cargo volumes will be 2.47 million tons consisting of dry bulk 450,000 tons and containers 2.02 million tons.

In 2024, the volumes of the container cargoes for transshipment and for the Colon Free Zone will be 42.85 million tons and 5.43 million tons respectively.

Domestic trade

The traffic of domestic shipping has been estimated at the major local ports and compared with the capacity of the existing port facilities. In general, the existing port facilities will be able to accommodate the cargo volumes.

(3) Existing Issues in Port Sector

1) Existing port network

There are about 100 ports in Panama including national and private ports. These ports are classified into three categories on the basis of their functions: International ports, domestic ports and fishing ports. The ports are further classified on the basis of the commodities handled and the relations with other ports as follows:

International Ports	:	International container ports, International tourism ports, and Industrial ports.
Domestic ports	:	Regional hub ports, local hub and feeder ports
Fishing ports	:	Base and fish processing ports, home ports

The study analyzed the roles, functions and the relationship among these ports, and illustrated the port network visually.

2) Outstanding issues

The handling capacity of the port facilities was evaluated for the year 2024.

i) International Ports

a. Oil and Oil Products

Import oil and oil products volume in 2024 will increase three times to 6.3 million tons. They will be handled at the private ports, which will cope with future demand to increase their handling capacity.

b. Dry Cargo

Banana	:	Future export volume will remain constant and there will be no shortage of the handling facilities.
Wheat, feed	:	A new terminal at Port of Cristobal, which will be operated by private enterprises, will open soon.
Fertilizer	:	Fertilizer will be imported at Aguadulce and Pedregal Ports, which have enough handling capacity in future, and by trucks from Costa Rica.
Breakbulk	:	Cars will be imported at Balboa Port and Mansanillo International Terminal, and other breakbulk will be handled at Cristobal Port, based on the evaluation of the handling capacity by the Study Team.
Clinker	:	A new bulk terminal opened at Bahia Las Minus Port.
Container cargoes	:	Container cargo to/from the domestic market is less than 10 % of the transshipment container cargo and the former has higher priority than the latter due to higher handling charge. The transshipment container cargo volume in 2024 will be over 4 million TEUs, and thus present handling capacity of the container terminal in Balboa and Colon will be insufficient.

ii) Domestic Ports

La Palma	:	La Palma Port will have the role as the local hub port with the newly constructed inter-modal port facilities, which have enough handling capacity for cargo and passenger ships plying to other coastal communities.
Coquira Port	:	The port will handle cargoes to the islands in Gulf of Panama after closure of the Fiscal Pier of Panama. Therefore, a new berth for 200 GRT vessels will be needed.
Fiscal Pier of Panama	:	The port will be closed in future due to the urban planning by Panama city and passenger crafts will move to other terminals like the one in Amador.
Balboa Port	:	The passenger terminal will move to Amador and the bulk terminal move to Cristobal Port.
Vacamonte Port	:	Fishery products in Panama will remain in future. So, the port will have enough capability to handle fishery products from foreign tuna ships and domestic fishing ships.

Mensabe and Mutis Ports : The ports have been utilized by the local fishing ships and the existing facility has enough capacity for the future.

Armuelles Port : The facility is too old and not usable. Presently foreign tuna ships use the damaged pier but they may move to other ports in Costa Rica unless proper services are provided.

Bocas del Toro and Almirante Ports :

The ports have a ferry berth but not a passenger boat berth.

iii) Issues to be considered in master planning

a. International Ports : Balboa Port should be specialized for international trade, mainly container cargo handling and as a result, a bulk cargo terminal will be needed at Canal Area. According to information from grain dealers, a new bulk terminal has been planned at Cristobal Port.

b. Domestic Ports : La Palma will soon be interconnected with Pan-American Highways via inter-modal link. With this improved transport network, the port should take an active role to facilitate and promote local industries by providing a suitable environment for new business establishment.

c. Fiscal Pier of Panama : The port will be closed based on the urban planning by the Panama city.

3) Port administration and management system

AMP was created in 1998. Basically, it inherited the roles and functions of APN. AMP is a unified body of various maritime competencies from different institutions such as managing of marine and coastal resources from the Ministry of Commerce and Industry (MICI), education and training of seafarers from the Ministry of Education, registry of merchant marine vessels from the Ministry of Economy and Finance (MEF), and absorbing APN on port matters (after privatization of major ports).

Having inherited from APN, the organic law of AMP prescribes that Directorate General of Ports and Auxiliary Industries is responsible for the following tasks:

a. Planning and execution of the development on the maritime network
b. Construction, improvement, extension and maintenance of the commercial ports for public use
c. Management of ports without management and operation bodies
d. Management of the state ports
e. Execution of the procedure and supervision on concessions for the state ports
f. Improvement of the facilities for navigation, maneuvering and mooring on the state ports
g. Execution of cargo handling, movement, custody and delivery by AMP/concessionaires

h. Establishment of port tariff
i. Improvement of services to the ports and auxiliary industries

The primary mission of AMP prescribed in the organic Law is to prepare the National Maritime Strategy, which was approved and published in 2003. The National Maritime Strategy states the basic policy guidelines of Panama.

The approved key strategies are defined as general basic objectives in two categories (namely, Primary and Secondary Strategic Objectives).

The Primary Strategic Objectives (Administration field):

1) The general directions of institutional security and compliance with international regulations
2) Efficient and effective measures for competitive market
3) Enhancement of investment and innovation for strengthening physical and intellectual capital
4) Protection and security synergy, inter-sector relationships, marketing activities for new opportunities of maritime business
5) Formation and execution of a program of national and international communication,
6) Conservation of environment and labor regime.

The Secondary Strategic Objectives (Support of the sustainable socio-economic development):

1) Creation of new job opportunities, upgrading labor force quality and productivity
2) Stimulating investment for required infrastructure, sustainable marine resource management and social responsibility
3) Improving security, hygiene and health of the laborers, and enhancing good governance for the maritime sector.

The National Maritime Strategy describes in the second item of the second strategic objective that AMP should conduct port master planning and feasibility study of developments. Thus, this JICA study will be used for AMP to make action plans for the development of the national port system.

(4) Port Development Strategy

The basic direction of the development of the national port system has been defined as follows:

a. Successful achievement of sustainable economic development
b. Alleviation of income gap and poverty
c. Mitigation of socio-economic regional disparities
d. Environmental preservation of land/water areas and assurance of social security

The study has identified the areas to be focused in the Long-term Port Development:

a. Development of the container ports at the Canal Area to meet future container traffic and facility requirements

b. Development of a tourist port in Bocas del Toro
c. Construction of a new multipurpose port in Chiriqui
d. Development of Port of Coquira in the Panama province
e. Establishment of a local hub in the water transport network in La Palma

In addition, the study also identified the approaches that AMP should take for the improvement of port administration and management as follows:

a. AMP head office:

- To establish financial resources, human resources and maritime safety, and improvement of port administration and management functions

b. Local ports:

- To coordinate closely with a local society and local industries, especially on the regional development
- To coordinate consistently with AMP head office and the other government organization concerned
- To adopt private finance and know-how for port management and operation
- To coordinate function for various administrative activities required for a smooth and effective operation of privatized international container terminals.

(5) Nationwide Port Development Plan

1) Maintenance and repair of the existing port system

The existing port system can sustain international trade in 2024 with the continuous maintenance of the existing facilities, on the assumption that fertilizer will be imported by trucks from Costa Rica and import/export cargoes in the Chiriqui economic zone will be transported by land to the ports in the Panama city and Colon.

Following activities are forecast on the domestic trade in Panama up to year 2024.

a. Pan-American Highway in the Darien province will be fully paved and the ferry service between Ports of Quimba and La Palma will be opened to traffic.

b. Fiscal Pier of Panama will be closed soon. Therefore, cargo transportation between the Darien and Panama provinces, which depends on sea transportation at present, will most probably switch to land transportation.

c. At Bocas del Toro and Almirante Ports, there are no suitable port facilities for passengers in these two ports. This situation has an adverse effect on the tourism environment.

With the new inter-modal port facilities, La Palma will have the role as the local hub port, where cargo and passenger ships are plying to other coastal communities.

On the other hand, Coquira Port should be developed as a port to the islands in Gulf of Panama after closure of the Fiscal Pier of Panama. This sea route is necessary for inhabitants in the islands and should be secured by the central government in the future.

AMP is responsible for the maintenance and the management of port infrastructures in order to continue international and domestic shipping services, so that the cargo and passenger transportation network in Panama will have sound development up to 2024. Maintenance and management cost for the major local ports has been estimated to be USD 801,100 for annual maintenance and USD 665,470 for repairs, which is a one-time expenditure.

Among other works, outstanding elements of the expenditure are:

a. Repair of deck of the wharf at Aguadulce Port
b. Replacement of the floating wharf at Taboga Port
c. Maintenance dredging at Pedregal, Mutis, Aguadulce, and Vacamonte Ports
d. Security facilities at Vacamonte Port

2) Strengthening AMP's practical port management

a. Consciousness building for senior officials in AMP:

Ports should be managed considering regional development and promotion of the maritime industries, not for making a profit from concession contracts.

b. Procurement of funds necessary for maintenance of local ports

Public ports, which are socio-economic infrastructures of the nation, should be developed and maintained by the central government in consideration of budget requirements, cost, tariff amendment, promotion of private participation through concessions, grant, and other possible ways.

c. Reconfirmation of the role of port administration

i) To implement basic services, which include maintenance of port facilities, security, safety, fire fighting, waste disposal etc, to port users as a first person in charge

ii) To execute port basic services, which include coordination with the related organizations and promotion of private participation by concession contracts

iii) To clarify various laws, regulations and procedures

iv) To establish the port management system in which port users' requests are reflected

d. Coastal management

Utilized conditions for coastal areas should be clarified, regulations of water pollution for example.

e. Management of marine resources: Monitoring of fishery products

f. Improvement of statistics: Port statistics, fishery products, etc.

(6) Master Plan for Selected Ports

The following four ports have been selected for the master plan study aiming at their respective objectives:

1) Bocas del Toro

The development objective is to renovate and improve the gateway to the international tourist resort as follows:

a) Provision of a passenger terminal at Bocas del Toro and Almirante

- Restoration of the suitable tourism environment in the port area
- Assurance of a safe transport
- Supervision and protection of management bodies for passenger crafts
- Encouragement of the tourism related industries

b) Improvement of cargo transportation services to isolated islands

- Assurance of regular and safety operations on ferry services

c) Restoration of the Bocas del Toro city with the port development as a leading part

- Regulating the coastal use and pollution control management

2) New Chiriqui Port

The development objective is to enhance the industrial development in Chiriqui area as follows:

a) Local economy promotion based on cost saving of transportation for import/export commodities
b) Creation of new industries and employment, and provision of a base port to tuna ships, for example, cargo transport to the southern part in Costa Rica, support to Baru Free Zone

3) La Palma Port

The development objective is to establish a socio-economic center in the coastal area by providing fish landing facilities as follows:

a) Provision of market access for local fishermen
b) Reinforcement of commercial fishing efficiency
c) Promotion of local industries such as value-added industries, shrimp processing, wood processing
d) Conservation of marine resources

4) Coquira Port

The development objective is to ensure transport services to isolated islands and coastal areas.

The project cost as well as the Economic Internal Rate of Return have been estimated as follows:

Port	Project cost	Share	EIRR
Bocas del Toro & Almirante	USD 4.56 million	7.1 %	20.7 %
Chiriqui	USD 49.8 million	77.8 %	15.4 %
Coquira	USD 2.3 million	3.7 %	13.9 %
La Palma	USD 7.3 million	11.4 %	16.4 %
Total	USD 64.0 million	100.0 %	

The proposed master plans for the four selected ports are evaluated to be economically feasible.

It is concluded that potential adverse environmental effects caused by the project execution and its subsequent operation of the port terminals in all the objective ports for the master plan are manageable and hence not significant. Still, the most important port operational environmental requirement is proper waste management. Although dredged material management for the new Chiriqui Port is the most significant environmental issue concerning the construction works of the project, deep sea disposal of dredged material is a feasible option in consideration of the availability of vast deep sea waters in the vicinity and further from the project area and also due to the non-contaminating nature of the dredged material.

(7) Short-term Developments in master plans

The feasibility study on the short-term developments has been carried out for the selected four ports with the target year 2014. Except for La Palma, the short-term developments for each port are recommended to implement the whole scale of the master plans. La Palma Port development project is better implemented in two phases, and the feasibility of the first phase is examined.

The project costs of Bocas del Toro, Chiriqui and Coquira are the same as those estimated for the master plans but not in economic cost. The first phase of La Palma Port has been estimated to amount to USD 6.36million.

Project costs are finance by the government either by grant or loan with the interest rate of 3 %. The financial analysis calculated the FIRR for each port as follows:

Name of Port	Managing Entity	FIRR	Type of funding			
			Government Expenditure	Equity	Loan	Grant
Bocas del Toro	AMP	10.7 %	10 %		90 %	
Chiriqui	SPC[1)]	9.8 %		40 %	60 %	
Coquira[2)]	Private	11.3 %			100 %	
La Palma	AMP	12.7 %			10 %	90 %

Note 1) SPC denotes the Special Purpose Company that shall be established by Public and Private Partnership

2) The financial analysis focus only the facilities invested by the private operator who will construct the facilities on land or 43.2 %of the total project cost. The rest of 56.8 % shall be paid by public as the government expenditure.

In the table, the definitions of the types of funding are as follows:

Government Expenditure;	Simple expenditure by the government. The managing entity need not to pay pack or to maintain the value as equity
Equity;	The managing entity need not to pay back the capital or interest, but need to maintain the value. Thus depreciation is done on equity.
Loan;	The managing entity should pay back the amount together with interest with the loan period
Grant;	The amount is not paid back. Depreciation is not considered either.

The four projects are all evaluated to be financially feasible from the view point of the managing entiry.

The operation schemes recommended for the four ports are:

Bocas del Toro : The whole ports should be managed by AMP. RoRo terminal is to be operated by AMP, while the operation of the passenger terminal may be operated by a cooperative under concession contract.

Chiriqui : The whole port shall be managed and operated by a Special Purpose Company, which is established by the public and private partnership where the government and private firms contribute each share both in equity and loan. The share between the government and private shall be determined through the negotiation between the two parties. In general, it seems to be realistic to assume that government should shoulder a larger portion than private partner.

Coquira : The whole port should be managed by AMP. The marine facilities are constructed by the government and concessioned to a private operator at a reasonable fee, while the land facilities are invested and operated by a private firm.

La Palma : This project requires public funds in the form of a grant. Thus, AMP shall manage and operate the port. However, port operation can be performed by a cooperative of fishermen under concession contract.

20.2 Recommendations

Summing up the discussions above, the study team recommends the followings:

Recommendations presented hereunder focus on the administration and management of AMP, and present four different targets: (1) to realize the mission and vision of AMP, (2) to implement the nationwide port development plan, (3) to authorize the Master Plan and (4) to implement the priority project.

20.2.1 For the Realization of the Mission and Vision of AMP

(1) Institutional Strengthening Plans of AMP for the Execution of the Assigned Tasks Prescribed in its Organic Law

AMP should take the following actions for the strengthening its institutional capacity

1) Compliance with the international treaties and conventions related to maritime sector.
As the delegate of Panama to IMO, AMP should take the initiative in the supervision of the ports and ships calling Panamanian ports. To meet the urgent requirements of compliance with ISPS Code, AMP may rely on the technical support of a foreign consultant as well as the financial support of the privately operated ports in the Canal Area. AMP is yet to be responsible to supervise ports and ships to prepare their security plans. For the national ports that are open to international trade, AMP has the full responsibility to prepare the security plan. Above all, AMP is responsible to disseminate the treaties and conventions to the maritime sector.

2) Promotion of the private investment in the port related businesses

a. AMP should make the procedure of awarding concessions more transparent and to grant the concession on a timely basis.

b. Marketing of the potential business areas for private investment and the elaboration of programs to support the private investment have to be performed. AMP should work together with agencies concerned to formulate land use plans in order to secure land and water areas for the future expansion of port related activities. Suitable areas should be placed in the land use plan for container terminal expansion in Canal Area in the future.

c. Legislative and cooperative support of the private firms who are investing in public port services. The construction of a bulk terminal in Cristobal Port is an example. The bulk terminal operation is not simply for the private business, but also beneficial for consumers.

d. AMP inherited the role of the Port Authority of Panama. It should send delegates to international conferences on Port communities such as the International Association of Ports and harbors (IAPH), the International Navigation Association (PIANC, intergovernmental), the International Cargo Handling Co-ordination Association (ICHCA), International Association of Cities and Ports (IACP), American Association of Ports Authority (AAPA), etc. It is also the responsibility of AMP to be the liaison of port sector with the international port business community.

e. For the further promotion of the business activities in Colon, AMP should make efforts to realize the improvement of the Panama –Colon Highway

3) Strengthening of coordinating functions with the agencies concerned

a. CIQ procedures

The custom, immigration and quarantine procedures still need further improvement. AMP should take the initiative in the coordination among the agencies for the smooth transaction of cargoes. This is especially needed in the Colon Port Complex.

b. Communication with the port users

Formal and informal communication channel between the port management and the users should be established. AMP should take action to hold regular meetings with the maritime community such as forum and port advisory committee. Such regular meetings will provide AMP with opportunities to sound out and recognize the movement of the maritime business communities.

c. Guidelines for the maintenance of navigation channel

While the concession contracts require the concessionaires of the port in Canal Area to maintain the port facilities and the access channels, AMP is responsible to determine the dimensions of the access channel on the basis of the port safety and efficiency of the ship maneuvering. AMP should prepare channel maintenance plans in coordination with the Panama Canal Authority.

4) Promotion of local ports and the human resource development

a. Public relations to propagate the activities and development plan of the local ports, and the availability of the facilities, land and water areas for lease and concession.

b. Coordination with maritime schools is needed to make the curriculum more suitable to meet the labor market demand.

5) Promotion of the private investment in the domestic shipping business

AMP is responsible not only for the port system, but also to secure regular shipping services in domestic sea routes. RoRo ferry terminals at La Palma and Quimba Ports will need a ferry operator when the intermodal facilities are completed. In the same manner, the ferry services between Bocas del Toro and Almirante and coastal shipping services covering San Blas and Darien are vital for the coastal communities. AMP should keep making efforts to upgrade the shipping services of these sea routes as well as securing their safety.

Above all, the following are the areas that AMP should give higher priority:

6) Upgrading the productivity of routine work of AMP

a. Data / Information Transmission

Upgrading of the information/data-transmission system of AMP should be given a high priority. On the long-term agenda, a comprehensive electronic data exchange system should be installed to cover all the offices of AMP for data/information collection and transmission. The system will contribute to establish the identity of the organization.

b. Publicity and Archives of Basic Documents

AMP is responsible for the dissemination of matters concerning international treaties and conventions, Panamanian laws, rules and regulations of AMP to the public. It is also the responsibility of AMP to make announcements of procurement, recruitment, etc. It is recommended to publish an official gazette or bulletin for the purpose of public relations. Also it might be useful to open an internet home page showing the activities of AMP and important items for the maritime business circle in day to day business.

In the long history of the organization and its predecessors, AMP inherited and has produced many important instruments and documents in the course of its activities. In addition to these official instruments and documents, AMP keeps records of statistics, accounts and assets, design and constructions, concessions, licenses, accidents etc. If the organization keeps these records or their synopsis in good order and in a manner easy to search, the archives of the records will help AMP in the assessment of the past activities and in planning its future activities by providing reference of past experience, with records and evidences. This is especially true for the concession contracts.

7) Internal Matters

a. Improvement of Budgetary System

It is vital for AMP to ensure the budget for the development and proper maintenance and operation of the national port system.

Proper consideration should be given to practices in the present budget system where the expenditures for the repair and maintenance are classified as 'Capital Expenditure', which has to undergo careful examination by MEF since many of these works are simply routine in nature, or merely restoration from a natural disaster. The value of the asset does not increase after the works have been completed. It is reasonable to account for these works as current expense rather than capital expenditure.

b. Human Resource development

A short-term program should aim at making proper deployment of human resources and to improve the quality of work. Elements of the plan should include the following:

- To review the work of each section (central and local) and make suitable arrangement plan for personnel
- To redeploy among the port sector of AMP by transferring over-manned Administradors to Capitania to places needing personnel
- To redeploy personnel in the headquarters as appropriate, particularly reducing over-manned supporting level and transferring them to the frontline
- In the initial stage of training scheme, start training the existing personnel for upgrading the quality of their work. It may make possible to carry out 'on-the-job' training
- To recruit personnel as appropriate.

Long-term program should aim to achieve best-qualified workers. The plan should include the following, among others:

- To upgrade the recruit system with the view to obtain professional and expert resources, particularly in the fields of port management, civil engineering and electronics high technology
- To invite applicants openly
- To draft and start training in specific field such as management, electronic devices, security in ports, etc.
- To establish transparent promotion system with the view to enhance morale of personnel as professionals.

(2) Strengthening of the Port Management Functions of Local Port Offices

1) General Plan

The implementation of the nationwide port development plan requires funds. In addition to the improvement measures of budgetary system, some drastic changes in the policy of AMP may be required.

a. Policy Change of AMP

At present, it seems that the principal role of AMP is to raise revenue by awarding concessions to private firms, and that the functions of port to support and promote the socio-economic activities in the regions have not been given proper consideration. In fact, the revenue that AMP earned from the port sector well exceeded the expenditures to cover operation and maintenance cost.

The study team identified the national ports that formulate the national port network and will support the national economy over the coming decades. The cost required for the enhancement and maintenance of the port infrastructure has been estimated. AMP should change its policy from revenue earning to a new policy that aims at maximizing the national profits and providing proper port services.

For the port infrastructure, it should be noted that the Panamanian government has sold out in terms of concession all the properties having commercial value to private firms: Balboa and Cristobal Ports, and other port infrastructure in Colon and Bahia Las Minas are the examples. What is left behind in the hand of AMP is not attractive enough for private firms to think of starting a new concession business out of the facilities and spaces. Therefore, AMP has to make effort now to improve its property to attract for private investors. Concession is not the objective, but one of the schemes that public and private sectors jointly work towards a goal.

b. Funds needed for the enhancement and maintenance of port infrastructure

It is the vital role of AMP to implement all the enhancement and maintenance work listed in Table 10.2.4 to keep the national port system operational. To this end, AMP should make all possible efforts to secure the funds needed for the implementation of the plan such as: budget-making, streamlining the expenditure, revision of tariff, promotion of private investment through concession, etc.

c. Roles of the port administration

AMP should reconfirm the roles and functions of the port administration to provide basic services. While AMP awards concession to private firms to provide various services in the port, it has the responsibility to provide itself (or provide through the concession contract) the basic port services such as management of the facilities, security, safety, fire fighting, garbage collection.

AMP is also responsible for the service performance of the contract firms. The concession contact does not excuse AMP from the responsibility to the port users who are paying the charges for the basic port services.

To this end AMP should do the following:

- Ensure the basic port services by coordinating with the agencies concerned, such as local government, police and fire station, and by awarding concessions to private firms
- Disseminate the rules, regulations and procedures to the port users through periodic circulation of public relation brochures as well as to speed up the procedures
- Establish formal and informal communication with the port users to achieve user-friendly port management

While the major ports in Canal Area are operated by private operators who have the great concern about the compliance with the international treaties and conventions, other local ports have another concern. The most serious security problem in these ports is the protection of the public and private properties within the port area from crimes such as robberies. The firefighting system is insufficient. In these cases, AMP has the responsibility to initiate the action for security.

d. Coastal zone management

It is very necessary for the integrated coastal management of AMP to prepare an inventory of the existing concessions. The process of the awarding concessions should be transparent, and conditions of awarding concessions such as the compliance with the pollution control regulations also clearly stated in the concession contract.

e. Port statistics

The port statistics of the national port system that AMP presently possesses covers only the past seven years and lacks the continuity during the transition period from APN to AMP. Port statistics are very important not only for the monitoring of the current performance of the port system, but also for assessing the economic activities of the whole country. The port statistics also exhibit the history of the economic growth of the country. Any changes appearing in the yearly variation of port traffic reflects those changes occurring in the economic activities. This implies that, if a drastic change is observed in the annual port traffic volumes, the statistical data may include errors.

The port statistics is of course vital information for the planning of national port system. Thus, keeping correct record of port traffic is one of the most important roles of the port offices of AMP. At those ports where the fishing boats dock, the port offices should also gather the statistics of unloaded volume of marine products: yearly variation of the unloaded volumes of marine products is the most useful information to assess if the marine resources are being exhausted.

20.2.2 For the Implementation of the Nationwide Port Development Plan

(1) AMP organization at the ports in Canal Area

The field offices of Cristobal and Balboa are expected to play the role as the catalyst and so they must fulfill increasing requirements: currently these two offices have difficulties to fulfill their roles due to shortage of human resources. To cope with this situation, there are three possible alternatives as described below. The study team assessed the third alternative is the most practical.

First alternative is to create an independent port authority that governs Balboa and Cristobal, or two authorities as the case may be. This is the most adequate form for the execution of the task imposed on the port administrations, because it is located at the site to determine problems by itself. There are many examples among world major ports managed by independent port authorities (not necessarily financially independent). However there are some difficulties in the establishment of such an independent port authorities. For one thing, it usually takes considerable time to enact a new regime within the financial and social environment. In addition there is a risk, in particular, whether the new organ would be able to recruit necessary staff to execute functions of the port authorities. If staff shortage occurs, the organ will be less workable than at present. Also, the functions of AMP and new port authority(s) become duplicated, and for bringing the new organ's ability into full play, most of the AMP's powers and functions should be transplanted to the new organ.

Historically, the revenue earned through the port administration at the ports in canal area have subsidized the maintenance and operation costs of other local ports. Therefore, the establishment of port authorities of Colon and Balboa may result in the loss of the administrative power of AMP, especially from the financial viewpoint to maintain the whole national port system including local ports.

Second alternative is to have ACP execute the functions. At this moment, among the relevant decentralized organs, only ACP furnishes sufficient resources in terms of finance and manning. For this reason, ACP could take this work. However, it appears of some doubt that ACP is allowed to take such extra burden under the ACP Law.

Third alternative is to augment AMP's Capitania in terms of budget and personnel enough for meeting the responsibility as port administration body. In addition, considering the fact that AMP was created only a few years ago, and is now in the process of consolidation, this scheme may have two advantages. First, directorates concerning merchant marine and seafarers school of AMP would provide the labor for the new security task, since both directorates are responsible to domestically enforce the revised SOLAS and ISPS Code. Second, AMP's Capitania, Balboa and Cristobal, if augmented by enough budget and expertise, may act as local core of administration with functions now requested. Augmenting may take time to realize, but for the moment this alternative will be the quickest way to fulfill the increasing requirements.

(2) Major local ports

Most of port infrastructure of these national ports were constructed and rehabilitated during the period of late 1970s to early 1980s when APN was the administrating and operating the whole port system that included the principal ports in Canal Area. APN was a centralized port authority and was able to financially support the cost needed for the development and operation of the local ports out of the revenues raised from the operation of its principal ports: namely, Balboa and Cristobal Ports.

Since its creation, it has been the policy of AMP to promote private investment in port infrastructure. Thus, most of the national ports have been waiting for private investors who are interested to operate the ports under concession contract. In fact, some port infrastructure in Bahia Las Minas Port successfully found private investors and a new bulk terminal has started its operation.

However, it is unrealistic to assume that all other national ports will be able to find private investors to take over the responsibility of spending the cost required for the operation of the national port system, including the repair and maintenance costs. Taking into considerations the important roles of the local national ports in the regions, AMP has the responsibility to assure the funds required to keep the major local ports in proper shape. Private investment in the port related services may be possible provided that AMP will keep maintaining the basic port infrastructure over the coming decades.

The administrators of the AMP local offices have to play the role as the liaison between AMP Headquarters and the local business community. The port administrators are the key players in promoting the participation of the local firms in port related services.

(3) Other smaller national ports

In Panama, there are more than 80 smaller ports. They are either the home ports of local fishing boats or the commercial ports of the coastal community. The development of those ports that are mainly used by the local fishing boats is highly dependent on the policy of AMP in the fishing sector and the development of these ports should be discussed separately from this study.

With respect to those ports serving for the domestic shipping, the study team assesses that AMP should include the following ports in the nationwide port development plan:

Ports in Darien, San Blas, islands in Gulf of Panama, Bocas del Toro and coastal area in western area of Azuero Peninsula. It is most important for AMP to assure the regular shipping services as well as the development and maintenance of the port infrastructure. This is especially true for the coastal sea routes in Darien, San Blas and Islands. In the light of establishing the nationwide sea transport network, the current study focuses on the development of the local hub ports, such as La Palma, Coquila, and Bocas del Toro, because the smaller local ports cannot function without ensuring the local hub port functions properly.

AMP should first gather the information of shipping services in the coastal sea routes. Then it should start talks with the ship operators and coastal communities to identify the most suitable services and to find out how AMP, private ship operators and local communities can participate in the promotion and improvement of shipping services. Workshops among the stakeholders will provide valuable information for AMP to draw up the plan for the future improvement of the local port system.

20.2.3 Steps to realize the Master Plans for the Selected Ports

AMP should take steps to realize the development master plans for the selected ports. This is a part of the realization of its mission and the National Maritime Strategy.

(1) AMP, the leading agency

AMP is the leading agency to realize the master plan. The realization of the master plans requires the change of the policy of AMP and some amendment of current financial rules. It is the vital role of AMP to take initiatives and to coordinate the agencies concerned to have the master plans authorized by the government as the national projects. Above all, AMP should change its policy as "Authority" so that it proactively promotes private participation in the port infrastructure development by establishing suitable environment for the private investment. To this end, AMP should take part in the investment together with the private sector.

(2) Enhancement of public investment program

For the realization of these projects, considerable amount of public fund is indispensable to shoulder initial cost for the development of port infrastructure. This holds true for not only port development but also all the development of the basic infrastructure of the country.

AMP should make efforts to enhance national investment and loan programs that encourage further the public investment for infrastructure development. To this end, the collaboration with the ACP, the Ministry of Public Works and others government agencies responsible for the basic national infrastructure is vital.

(3) Start of the project

The four projects have been proposed as the Master Plans. However, there are a lot of things to be done by AMP. Therefore, AMP should take actions at the soonest opportunity.

All the four projects need to be implemented urgently:

Bocas del Toro; The popularity of the place among the tourists should be maintained and the on-going Sustainable Development Project should achieve the goal,

Chiriqui; Without the new port, Chiriqui economic zone will be included in the economic zone of Costa Rica, and the opportunity to integrate various plans of various institutions will be lost

because the each institutions tends to proceed individually without coordination. Tuna boats that are looking for better services are important clients for the realization of the whole project,

Coquira; The lifeline port for the communities in the remote islands,

La Palma; Marine resource is in danger of exhaustion. Without regional activity center, Darien Province will remain undeveloped.

(4) Respective ports

1) Bocas del Toro/Almirante

AMP Headquarters should take the following steps.

First of all, AMP Headquarters should start discussions 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:

i) 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 issues such as the collection scheme of passenger terminal charges on the tourists and 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.

ii) Clarifying the existing situation of the private use of seashore

a. To make a full inventory of the existing concession contracts that AMP and APN have 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 seashore near the project sites and construction permissions issued by other agencies.

c. Through the coordination with agencies concerned, to clarify the procedure and guidelines of awarding new concessions and permission to use seashore in the future.

iii) Finalizing the infrastructure development plan

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

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.

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

i) 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.

ii) Regular meeting of the forum

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

2) Chiriqui Port

Steps to be taken by AMP Headquarters

First of all, AMP should approve the project and then formulate task forces in its Headquarters and field office. The task force in the Headquarters will coordinate with the agencies of the central governments for the authorization of the project. The task force should also take responsibility for the public relations, especially the propagation of the project proposal to the Maritime Chamber, in particular the terminal operators and transport logistics industries both based in Panama and in the world. One of the most important roles of the task force is to find private firms who are interested in participating in the business in the new Chiriqui port.

It is quite likely that the new Chiriqui port will be managed by a special port management body that would be jointly established by public and private. Therefore, the task force should make necessary preparation to establish the legal base to formulate such a special port management body.

Steps to be taken by the field office

Presently, AMP has two local port offices at Pedregal and Armuelles Ports. Because of the proximity of the location of its office to PTP and BFZA, the Administrator of Armuelles Port should play a role as the liaison between AMP and these two institutions. It is also the responsibility of the Administrator of Armuelles Port to coordinate with the municipality and the communities, to interface the project with the urban development plan of the Municipality of Puerto Armuelles.

It is also vital to continue public relations with the local industries in whole Chiriqui Province, an additional field office should be established at David.

Administrator of Pedregal Port Office, with the collaboration with the Headquarters and the task force established in David, should start marketing the new uses of the existing Pedregal Port when the new Chriqui Port starts operation, the existing Pedregal Port can be used for other activities. Possible alternative roles of Pedregal Port are marinas for pleasure boats and home port of fishing boats.

3) Coquira Port

Steps to be taken by AMP Headquarters

i) Acquisition of right of way

For the realization of the project, AMP should confirm the right-of-way if it implements the project itself. Another alternative approach is to let a private firm construct and operate a new wharf under a concession contract. For the latter approach, some incentives including financial assistance are needed to encourage private companies in the port operation business. In addition, AMP should take all the possible measures to maintain the tariff at a reasonable level.

ii) Public and Private Partnership

Another possible way to clear the right-of-way issue is to seek a PPP (Public-Private Partnership) scheme since water areas are public property while land areas consist of both public and private properties. Thus, the port facilities constructed in the water area can be financed by public, while those facilities on land can be financed by private firms who have the right-of-way.

There are various schemes of PPP that can be employed for this project. A concession of the port facilities on the water area is one of the examples. To establish a joint venture between AMP and private firm is another example. AMP should examine which scheme is more practical and should make necessary legal and administrative arrangements to implement the scheme.

iii) Redeployment of labor among the port offices

When the new facilities of Coquira Port are operational, the port may need additional labor force, while Office of Panama Port requires only limited number of staff members because of the closure for cargo handling. Thus, the redeployment of labor force is necessary. In addition, AMP should also take into consideration the port workers presently employed for the cargo handling at Panama Port who are losing their job due to the port closure.

iv) Assurance of shipping and logistic services

In the course of authorization of the project, AMP should first propagate the project to all the shipping companies and logistics firms, in particular those that are currently providing services at Panama Port. It is the responsibility of AMP Headquarter to ensure that the shipping services will continue between Coquira Port and the islands and that the logistics service will start operation at Coquira Port.

Once again, if necessary, AMP should examine the possible incentives to those private firms that will start business at the port.

Steps to be taken by the Local Port Offices of Coquira Port

The port office of Coquira Port should play a role as the liaison between AMP Headquarters and the local institutions and communities.

4) La Palma Port

Steps to be taken by AMP Headquarters

i) Review of the existing policy and regulations

So far, it has been the government policy to centralize the shrimp processing industry at Vacamonte Fish Port for the promotion of the Fish Port. Therefore, AMP needs to review and, if necessary, make necessary amendments of rules and regulations in order to allow the establishment of shrimp processing business in other places. A full explanation of the change of policy should be given to shrimp processing firms, especially those based on Vacamonte Port.

ii) Incentives to the commercial fishing boats to move to La Palma

To encourage the relocation of the commercial fishing boats to La Palma, AMP should provide better service to the users of La Palma Port than those who remain in Vacamonte Port. All the possible incentive measures should be taken.

iii) Interfacing with Darien Sustainable Development Plan

AMP should coordinate MEF and other agencies concerned to interface the project with the on-going Darien Sustainable Development Plan.

iv) Public relations

AMP should propagate the project as well as the inter-modal services between La Palma and Quimba to the public to promote the transport service along the Pan-American Highways. In addition, it should announce its policy for the promotion of the intra-regional coastal shipping with the regional hub port at La Palma.

AMP should also organize forums among the local artisan fishermen. The participation of the local fishermen is also indispensable in the stage of the finalization of the development plan, in particular the operational scheme of the fish port facilities.

v) Formulation of urban development plan of La Palma

AMP should start talks with the local agencies, including the local governments and various ministries concerned, to formulate the urban development plan at La Palma. The preparation of the land use plan should be started at the earliest opportunity for the establishment of activity center with the maximum use of the space generated by the relocation of the airport and also of the existing AMP port facilities.

In line with the Municipal Development and Decentralization Program, the municipality should be the lead agency in the preparation of the urban-planning. AMP should act proactively in support of the municipality in coordination with the Darien Project Office of MEF, MIVI and IPAT and so on.

vi) Security

When the fishing port is operational, the security of public and private properties, such as buildings and equipment, is the most important to protect these properties from robbery. AMP should coordinate with the National Police to establish a security system in the port area.

Security system for the whole municipality is also important to encourage private firms to consider business in La Palma.

Steps to be taken by the Local Port Offices of La Palma Port

i) Coordination with the agencies concerned

The Administrator is the liaison between the Headquarters and the local agencies. Being the Liaison, the Administrator should be the focal point in the communications between the local communities and the AMP Headquarters, and all the information of the progress in the Headquarters should be propagated to the local communities and vice versa.

ii) Regular meeting

Administrator should hold forums among local fishermen and local agencies regularly, to discuss outstanding issues related to the project.

20.2.4 Implementation of the Priority Projects

(1) Individual Port

1) Bocas del Toro

i) Consensus opinion for the projects

Whether Bocas del Toro will continue to attract tourists highly depends on the steps taken by AMP. It is recommended for AMP to take the following steps. First of all, AMP should

keep in touch with the local communities, local and national governments, those who are involved in tourism business, and so on. AMP should hold forums regularly to reach consensus opinion on the project including facility layout, detailed design of the structure, the operational scheme of the passenger terminal and tariff to be charged to the users, among others.

ii) Ensure public funding

While AMP itself requests and negotiates with the central government for the necessary funds, it should coordinate with other agencies concerned for the collaboration to realize the project and for the improvement of other infrastructure and services such as road, communications, water supply and sewage, and waste treatment and garbage collection. In addition, it is most important for AMP to disseminate that the project is intended to develop a port for the local people and industry and that the local community should also appeal to the government via other possible routes.

iii) Operating body of the passenger terminal

While AMP is currently responsible for the operation of RoRo Ferry wharf, it should make efforts to establish a separate management body for the passenger terminal by either a concession contract with a private firm or a cooperative of stakeholders. It is also important to encourage local industries to participate in the project both financially and technically.

iv) Security and safety

It is the responsibility of AMP to take all possible measures to ensure the security and safety in the ports and ships. Thus, AMP should assess the vulnerability to crimes and prepare a security enhancement program.

v) Facility design

For the facility design of Bocas del Toro and Almirante Port, no difficulties are anticipated except dealing with a seismic force, whose coefficient of effective peak acceleration is 0.21. Also, the complex building should be designed suitably as the gateway of the tourist resort.

During construction of the new facilities, a temporary ferry ramp should be built not to disturb present ferry operations.

2) Chiriqui

i) Administrative matters

The public-private partnership is the key element of the project. Organizing the stakeholders of the project is the most important role of AMP. Since the multi-purpose wharf constructed for public use, it is recommended that a SPC, which will be financed by the government and stakeholders, should be established to manage and operate the whole port. The government

should shoulder the funds needed for the construction cost of the breakwaters, access channels and basin, while the private sector should shoulder the cost of the construction of the wharves.

On the basis of the financial analysis from the viewpoint of SPC management, 40% of total cost should be financed as equity while the rest of 60% should be finance by loan. The portions of the equity and loan that should be financed by public or private sectors shall be determined through the negotiations between the both parties. Thus the amount to be financed by the government is not fixed at this stage. It seems to be realistic to assume that the total amount shouldered by the government in both equity and loan should cover the costs for the breakwater, channel and basin.

AMP has the responsibility to regulate the SPC in the same manner as it is administrating the major international port in Canal area. In addition, it has also an important responsibility to participate in the management of the SPC as one of the major shareholders.

ii) Facility design

The study team has made site reconnaissance survey along the coast of Chiriqui Gulf. It was the assessment of the study team through the survey that almost all the coast line except the vicinity of Puerto Armuelles are not suitable for the port construction due to heavy siltation or huge sand dune.

As waves propagate into the shore, the waves change their direction and heights due to the refraction caused by the sea bead topography. For the case of Puerto Armuelles coast, waves decrease the heights. In addition, breakwaters will give a chance to display their diffraction effect to the full.

At Chiriqui Port, breakwaters are designed to maintain the calmness in harbor, facilitate cargo loading and unloading, ensure the safety of ships during navigation or anchorage, and protect mooring facilities. The level of seismicity is large, the 2nd in Panama, and its coefficient of effective peak acceleration is 0.24. Therefore, the attention on seismic force should be paid for to the detailed design of port facilities.

3) Coquira

i) Administrative matters

The key items for the realization of Coquira Port are:

a. To arrange the public funds
b. To invite a private firm to operate the port under a concession contract.

While AMP negotiates with the private operator the conditions of concession, it should pay due consideration to the quality of the services provided and the level of the tariff charged to port users.

ii) Facility design

The Quay of Coquira Port shall be situated on the river and if the quay structure will disturb the flow of river, configuration of riverbed and riverbank in upstream and downstream should be changed. To avoid such phenomena, attention should be paid the detailed design of quay and revetment structures.

4) La Palma

i) Administrative matters

AMP has the responsibility in organizing the passenger ship operators, local fishermen and local communities. Therefore, it is recommended that cooperatives of fishermen should operate the fish port. Monitoring the daily fish catch should be carried out by the cooperatives. When the new port facilities are built, the work of AMP local office will expand and more manpower will be needed. It is recommended to utilize the human resources locally available such as the cooperatives of passenger boat operators and the cooperatives of local fishermen. AMP should try to outsource the manpower rather than simply increase the number of its staff.

ii) Facility design

The very soft subsoil layer in La Palma site is about 20 m thick. Soft-ground-stabilization method, which is to prevent the circular slip failure, is necessary and the same attention should be paid for the detailed design of the rubble mound.

Design consideration will be required not to obstruct the river water flow and sediment transport passing by the structures. It is recommended that the part of approach connecting shoreline and ramp for artisanal fishing boats is designed with the piled pier structure.

(2) Environmental Impact Assessment

Potential adverse environmental effects consequent to the construction and subsequent operation of all four short-term port development projects are manageable. Still, concerning operation of all port facilities, due care in adherence to the port operational management requirements focused on ship and port terminal waste management, in particular enforcement of MARPOL regulations and its Annexes, is of utmost important to mitigate potential long-term adverse environmental effects of port operation.

Currently the most significant source of pollution in coastal waters of most short-term project development areas is the runoff of untreated wastes consequent to the land based miscellaneous anthropogenic activities that are essentially unrelated to the port operational activity. Accordingly, it is recommended to undertake necessary improvement measures targeting the wastes of land origin as the highest priority in the relevant project areas of Bocas Del Toro, Almirante, Puerto Armuelles and La Palma. Moreover, it is emphasized that waste

management improvement measures need to be undertaken independently irrespective of the status of implementation of these port development projects.

In fact improper management of wastes of land based anthropogenic activities being the principal cause of coastal water environmental degradation is a nationwide environmental issue to be addressed.

The construction works of the port in Chiriqui involve dredging and subsequent dredged material management works. This dredging and dredged material disposal works would adversely affect the aquatic life, in particular the benthic organisms inhabiting the seabed having very little mobility, for a considerable period of time. However, in the long-term the aquatic life in the areas including benthic organisms is expected to recover naturally. Accordingly, any potential adverse effects consequent to this dredging and dredged material disposal works are assessed as only of medium term and have no significant long-term adverse effects.