

## **VII ENVIRONMENTAL IMPACT ASSESSMENT (EIA)**

### **7.1 EIA**

1. Main purpose of Environmental Impact Assessment (EIA) of the Study is to evaluate environment impact of the Short term plan. Necessary items such as impact on water quality and terrestrial ecology, evaluated as "Significant Effects" in the check list for IEE in Chapter X of Part II, will be examined further in the following sections.

### **7.2 Impact on Air, Noise and Smell**

#### **7.2.1 Field Survey and Analysis on Existing Conditions**

##### **(1) Air Quality Survey**

2. The Study Team conducted an air quality survey by the following method.

- Location: 3 points (Figure 7-2-1) :

1. Vicinity of the crossing of Calle Diablo and Calle Puerto
2. Vicinity of the crossing of Calle Diablo and Ave. Gaillard
3. Southern end of Calle Rousseau in Diablo

- Number of Sampling: 9 samples

3 samples (one each for morning, noon and evening) per day for one day survey duration at each point.

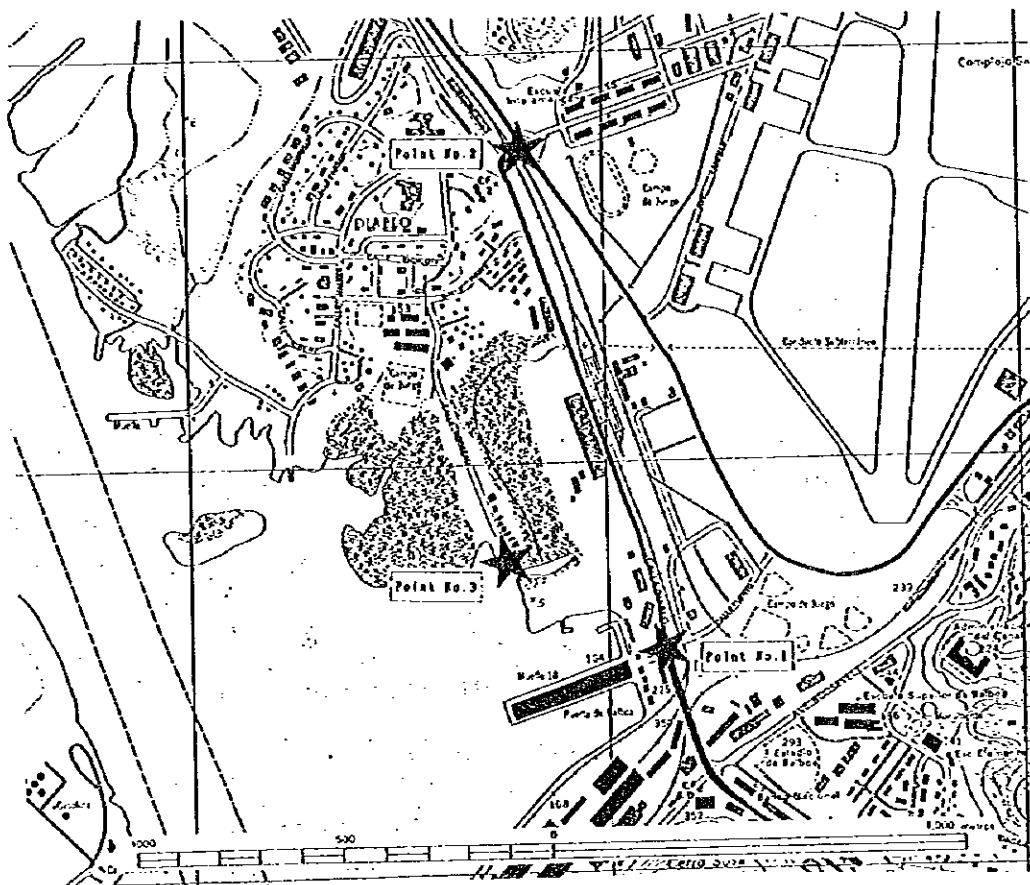
$3 \text{ samples} \times 3 \text{ points} \times 1 \text{ time} = 9 \text{ samples}$

- Field Survey:

Wind direction, Wind velocity, Temperature, Flux of insolation, and Cloud cover

- Examination in Laboratory:

9 samples for measurement of: Sulfur dioxide (SO<sub>2</sub>), Carbon monoxide (CO), Nitrogen dioxide (NO<sub>2</sub>) and Suspended particulate matter (SPM) (particles of 10 microns and smaller)



## (2) Results of Air Quality Laboratory Test

3. The results of air quality laboratory test are shown in Table 7-2-1.

a) SO<sub>2</sub>

The values of SO<sub>2</sub> vary from 0.003 ~ 0.011 ppm, which are good by Japanese environmental standards (an hour value: 0.1ppm).

b) CO

The values of CO vary from 1~8 ppm, and are good by Japanese standards (8 hour average:20ppm).

c) NO<sub>2</sub>

The values of NO<sub>2</sub> vary from 0.1~0.4 ppm, showing high values, 0.3 ppm of P-1 and 0.4 ppm of P-2 at noon. These high values, which exceed Japanese standards (24 hour average: 0.04~0.06ppm), were possibly caused by exhaust gas from vehicles running in front of measuring points P-1 and P-2.

d) SPM

The values of SPM vary from 0.010~0.034 mg/m<sup>3</sup>, and are good by Japanese standards (an hour value: 0.20 mg/m<sup>3</sup>).

Table 7-2-1 Results of Air Quality Laboratory Test

		SO <sub>2</sub>	CO	NO <sub>2</sub>	SPM
		ppm	ppm	ppm	mg/m <sup>3</sup>
P-1	Morning	0.005	3	0.1	0.015
	Noon	0.010	7	0.3	0.022
	Evening	0.006	5	0.1	0.022
P-2	Morning	0.005	3	0.1	0.020
	Noon	0.011	8	0.4	0.034
	Evening	0.005	4	0.1	0.017
P-3	Morning	0.004	2	0.1	0.010
	Noon	0.010	4	0.1	0.010
	Evening	0.003	1	0.1	0.010

### 7.2.2 Impact Evaluation

4. The impact of traffic to and from Diablo and Balboa will be evaluated here as estimated in IEE. In order to alleviate the traffic, new roads will be prepared as directly as possible to the principal highway and related roads will be improved by widening and so on as aforementioned in Chapter III of PART II and

## Chapter I of PART III.

5. Regarding existing Diablo residential area, its land use shall be changed from daily living base to port administration and related business. Sufficient space or greenbelt should be arranged along surrounding roads. The existing boundary area along the container terminal road, which is occupied by a playground of an old elementary school ( current APN headquarters ) and trees in flocks, should be maintained in good condition.

### 7.3 Impact on Water Quality

#### 7.3.1 Field Survey and Analysis on Existing Conditions

##### (1) Sea Quality Survey

6. The Study Team conducted a sea water quality survey by the following method.

- Location: 4 points in the Port of Balboa of which 2 points are shallower than 5 m and 2 points deeper than 5 m (Figure 7-3-1).
- Number of Sampling: 20 samples  
Sampling points shallower than 5 m: 2 samples × 2 layers (upper and lower) × 2 times (high and low tides)  
Sampling points deeper than 5 m: 2 samples × 3 layers (upper, middle and lower) × 2 times (high and low tides)
- Site Survey:  
Air and water temperature, Color, Odor, Taste and Transparency
- Laboratory Tests:  
pH, Number of coliform group, COD, N-hexane extracts, Dissolved oxygen (DO), SS, Total nitrogen (T-N) and Total phosphorus (T-P)

##### (2) Results of Water Quality Laboratory Test

7. The results of water quality laboratory test are shown in Table 7-3-1.

##### a) pH

The pH values vary from 7.3 to 7.9 and they are good.

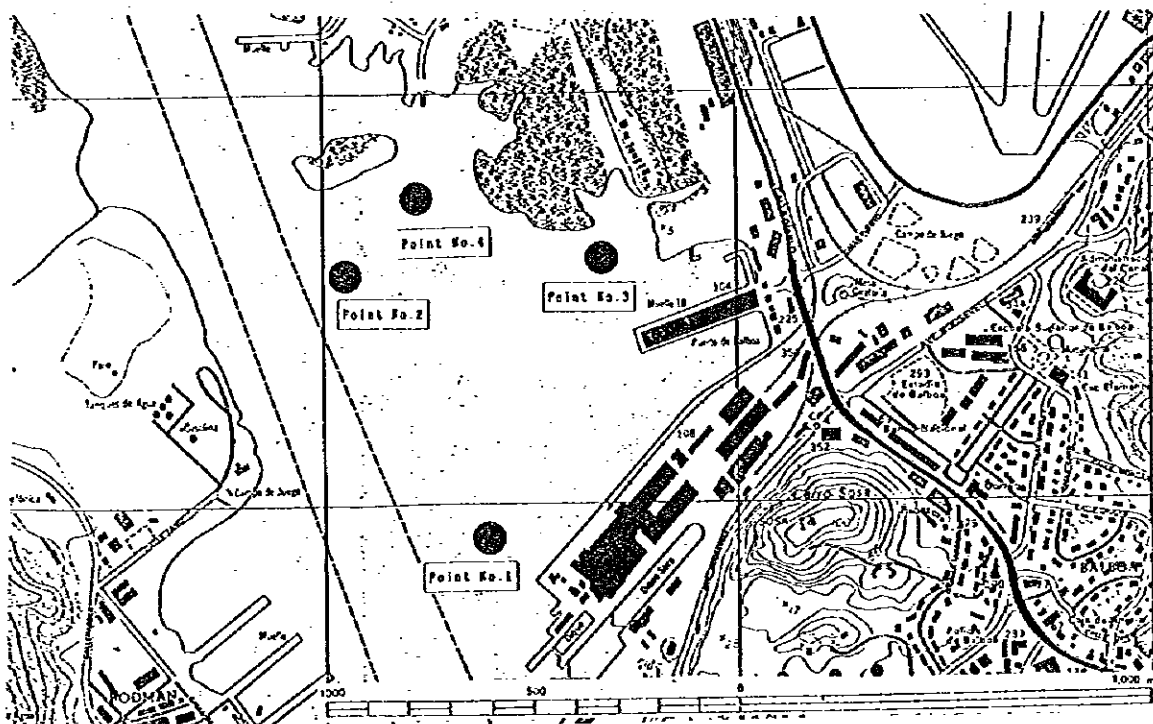


Figure 7-3-1 Water Quality Survey Points  
(By The Study Team, 3rd Dec. 1996)

b) Number of coliform group

According to the surveyed data, the P-3 and P-4 points are highly polluted with coliform bacteria originating from discharged water of the Crundu River. The values at these points are higher at high tide than the effluent standard,  $3.0 \times 10^5$  col/100ml from Ordinance No.35 of the Prime Minister's Office of Japan.

c) N-hexane extracts

The values of n-hexane extracts at P-2 and P-4 show high concentration. No n-hexane extracts were detected at the other two points.

d) Dissolved oxygen (DO)

The present level of DO is generally good except for the low values of P-4 at low tide.

e) SS

SS values of the samples are higher than the standard values (25mg/l~100mg/l) of river water of Japan. These high concentrations possibly came from the Crundu River discharge.

f) Total nitrogen (T-N)

The values of total nitrogen at P-1 and P-2 are higher than the standard values (0.2mg/l~1mg/l) of sea water of Japan.

g) Total phosphorus (T-P)

The values of total phosphorus at P-4 at high tide and at P-1 and P-2 at low tide are higher than the standard values (0.02mg/l~0.09mg/l) of sea water of Japan.

h) Air and water temperature, Color, Odor, Taste and Transparency

The air temperature was 28~31°C, and the water temperature was 27~28°C. The water color was dark gray in almost all parts of the port. The odor of the samples from P-3 near the mouth into which the Crundu River discharged was offensive. The taste of all the samples was middle salty. The transparency at all points was bad, 1.0m at Points 3 and 4 and 1.5m at Points 1 and 2.

### (3) Seabed Material Survey

8. The Study Team conducted a seabed material survey by the following method.

- Location: Same sampling points as the above Sea Water Quality Survey (Figure 7-3-1).

- Number of Sampling: 4 samples  
1 sample  $\times$  4 points  $\times$  1 time = 4 samples

Table 7-3-1 Results of Water Quality Laboratory Test

High tide									
Point	Layer	pH	Coliforms	COD	n-Hexane	DO	SS	T-N	T-P
			col/100ml	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
P-1	Upper	7.8	$3.6 \times 10^3$	1,500	$<0.1$	7.1	77	0.80	0.005
	Middle	7.9	$7.3 \times 10^3$	1,500	$<0.1$	7.1	67	2.80	0.009
	Lower	7.8	$1.3 \times 10^4$	1,400	$<0.1$	7.3	100	2.80	0.009
P-2	Upper	7.9	$6.7 \times 10^3$	1,400	$<0.1$	7.5	88	28.0	0.009
	Middle	7.9	$7.2 \times 10^3$	1,500	$<0.1$	7.5	110	1.40	0.018
	Lower	7.9	$7.5 \times 10^3$	1,400	1.20	6.9	49	2.80	0.094
P-3	Upper	7.6	$4.9 \times 10^5$	1,500	$<0.1$	6.6	110	0.00	0.000
	Lower	7.5	$5.2 \times 10^5$	1,500	$<0.1$	5.9	340	0.00	0.005
P-4	Upper	7.3	$2.3 \times 10^5$	1,500	1.40	6.6	460	0.00	4.600
	Lower	7.7	$3.2 \times 10^5$	1,300	$<0.1$	6.5	82	0.84	0.400
Low tide									
Point	Layer	pH	Coliforms	COD	n-Hexane	DO	SS	T-N	T-P
			col/100ml	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
P-1	Upper	7.5	$2.5 \times 10^3$	1,500	$<0.1$	5.4	81	0.00	0.800
	Middle	7.6	$1.9 \times 10^3$	1,500	$<0.1$	6.4	220	0.00	0.005
	Lower	7.6	$4.3 \times 10^3$	1,500	$<0.1$	5.8	66	0.00	0.380
P-2	Upper	7.7	$7.7 \times 10^2$	1,400	$<0.1$	8.4	84	0.00	0.030
	Middle	7.4	$2.2 \times 10^3$	1,400	0.3	6.5	180	0.62	2.400
	Lower	7.7	$3.0 \times 10^3$	1,500	1.2	9.2	92	0.00	0.380
P-3	Upper	7.4	$7.4 \times 10^3$	1,500	$<0.1$	9.1	91	0.92	0.000
	Lower	7.7	$3.1 \times 10^4$	1,500	$<0.1$	5.7	100	0.84	0.000
P-4	Upper	7.8	$2.8 \times 10^3$	1,500	$<0.1$	0.0	510	0.98	0.000
	Lower	7.7	$8.0 \times 10^3$	1,400	$<0.1$	4.0	200	0.00	0.000

- Field Survey:

Color of Sludge and Odor

- Laboratory Tests :

Alkyl mercury compound, Mercury and its compound, Cadmium and

its compound, Lead and its compound, Organophosphorus compound,

Chromium (VI) compound, Arsenic and its compound, Cyanide and PCB

#### (4) Results of Seabed Material Laboratory Test

9. The results of seabed material laboratory test are shown in Table 7-3-2. The marine sediments revealed that all samples correspond to loamy sediments, composed of silts and clays. Mercury and its compound, Lead and its compound, Chromium (VI) compound and Arsenic and its compound were detected. According to Japanese interim standards for removal of sediments including mercury and PCB, they are more than 25ppm (in rivers and lakes) and 10 ppm respectively. Thus, mercury and PCB existing in the port do not seem to be a serious problem. The presence of Alkyl mercury and Organophosphorus compound was not detected in any of the samples collected. Cadmium and its compound, and Cyanide show values of <1.0 ppm and <0.01 ppm respectively. The color of sludge at P-3 was black, while the others were dark gray. The odor at P-3 was bad.

Table 7-3-2 Results of Seabed Material Laboratory Test

	Unit:ppm			
	P-1	P-2	P-3	P-4
Alkyl mercury compound..	N.D	N.D	N.D.	N.D.
Mercury and its compound	1.0	1.8	0.8	<0.5
Cadmium and its compound	<1.0	<1.0	<1.0	<1.0
Lead and its compound	55	20	25	120
Organophosphorus compound	N.D.	N.D.	N.D.	N.D.
Chromium (VI) compound	30	25	30	15
Arsenic and its compound	7.5	4.5	7.5	7.0
Cyanide	<0.01	<0.01	<0.01	<0.01
PCB	<1.0	1.00	<1.0	<1.0

#### (5) The River Flowing into the Balboa Port

10. According to the surveyed data, the P-3 and P-4 points in the mouth of the Curundu River are highly polluted with coliform bacteria and other items of water quality originated in the discharged river water. Since the basin of the river is located in part of Panama City, a great amount of non-treated water from factories and houses is flowing into the river, The Curundu is a small river of scarce flow, that runs quickly, not only in the dry season but also in the rainy season (Table 7-3-3). When the peak runoff happens for a long time, the small river turns catastrophic, due to the high runoff that affects the urbanized areas of the small basin. Hence, the high rainfall of 1981, the second in relevance in the



past 25 year for this sector of the city, provoked one of the biggest floods ever experienced on the Curundu River and resulted in severe losses of materials and life.

**Table 7-3-3 Characteristics of the Curundu River**

<b>Drainage Area</b>	20.3
<b>Length</b>	8.2 km
<b>Runoff ratio</b>	0.75 (Canal zone) 0.90 (Urban areas of Panama City)

Source: Institute of Natural Studies, Natural Hazards and Risk Areas in Panama, 1990.

### **7.3.2 Impact Evaluation**

11. In the Short Term Plan stage, Diablo container terminal will be constructed as a new large scale port facility. However, well-equipped container terminals essentially have no significant pollution source and little impact on water quality of the surrounding area.

12. As aforementioned, inflow of pollutant from inland areas other than the port is assumed to be adversely affecting the water quality around the port. In this regard, at present, appropriate countermeasures such as introducing sewage processing system are under examination by all authorities concerned to clean up the Panama Bay including the port area. It is being coordinated by the Ministry of Health with international financial institutions such as IDB. APN is also involved. Related projects are expected to be realized as soon as possible.

## **7.4 Impact on Terrestrial Ecology**

### **7.4.1 Field Survey and Analysis on Existing Conditions**

#### **(1) Terrestrial Ecology Survey**

13. The Study Team conducted a terrestrial ecology survey by the following method..

- Location: Mangrove area at the proposed site and its vicinity (Diablo) (Figure 7-4-1).

- Method:
  - Inventory survey by biological experts :
    - Collection of existing data, Field survey on species of flora and fauna inhabiting the mangroves, Characteristics of constituent species of mangrove forests.
- Field Survey:
  - Terrestrial flora/fauna survey
  - Aquatic flora/fauna survey

## (2) Results of Terrestrial Ecology Survey

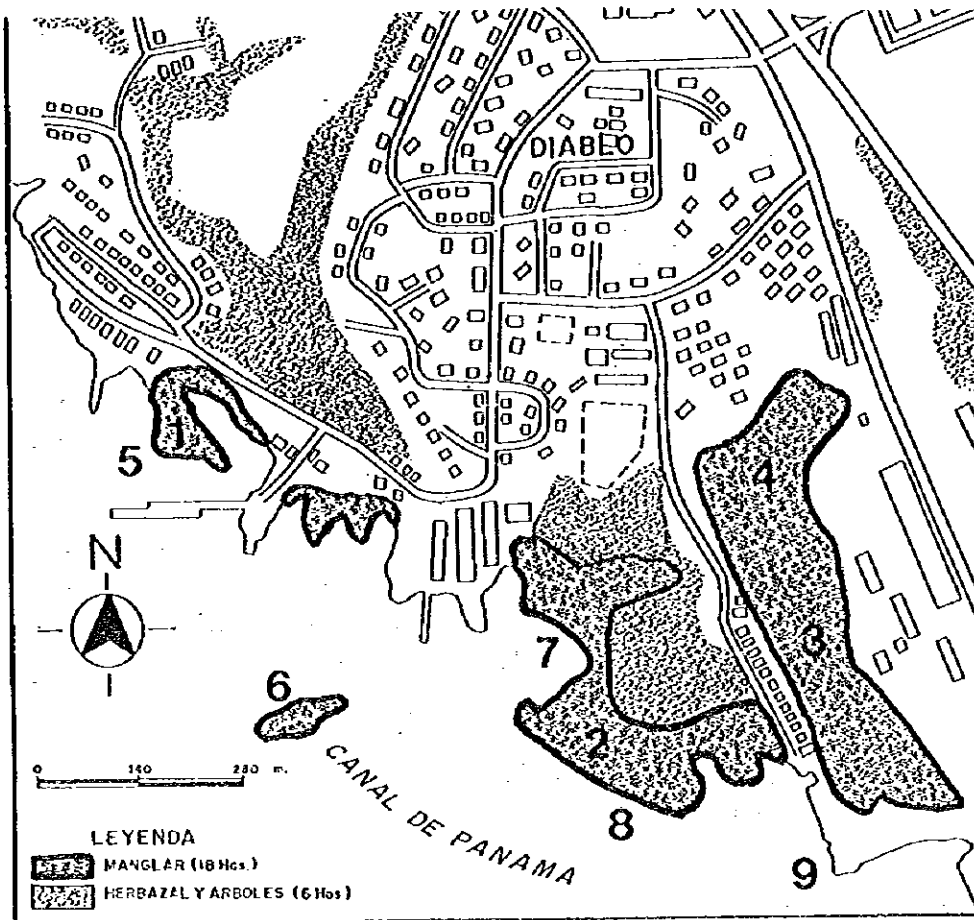
### a) Terrestrial flora

14. In accordance with aerial photographs, in 1965 the area of Diablo mangrove studied was 25 ha (Figure 7-4-2), and in 1995 it was 18ha (Figure 7-4-1).

15. Direct observations were made to determine the abundance and relative density, while diameter and height was measured to determine the structural characteristics of the vegetation. Plots of 0.10 ha were established, one in zone No.1, No.2 and No.3, and two in zone No.4 since this was the thickest mangrove woodland (Table 7-4-1).

Table 7-4-1 Abundance and Relative Density (%) of Species Existing in Each Plot of 0.10ha in Diablo Mangroves.

Family	Species	No.1	No.2	No.3	No.4-1	No.4-2
Rhizophoraceae	Rhizophora mangle	29 (15)	3 (10)	1 (2)		15 (20)
	Rhizophora racemosa					
Combretaceae	Laguncularia racemosa		2 (6)		9 (11)	10 (14)
	Canocarpus erecta					
	Avicennia germinans	1 (1)	11 (33)	24 (46)	18 (23)	3 (4)
Verbenaceae	Avicennia nitida					
	Pelliciera rhizophorae	161 (84)	17 (51)	27 (52)	52 (66)	46 (62)
Theaceae	TOTAL	191	33	52	79	74
	(%)	(100)	(100)	(100)	(100)	(100)



Terrestrial flora: No.1~No.4

Terrestrial fauna: No.1, No.3, No.4 and No.6

Aquatic fauna: No.5 ~No.9

Figure 7-4-1 Mangrove Area in 1995 and Sampling Points (No.1~No.9)

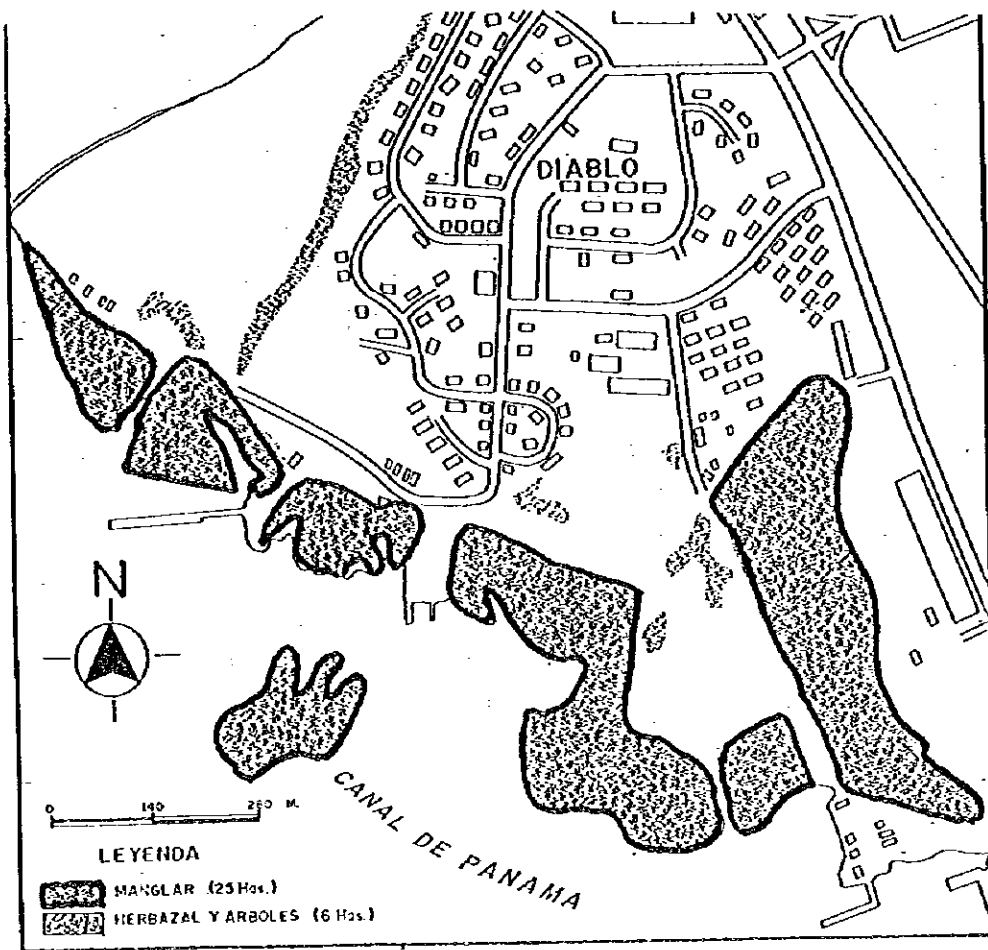


Figure 7-4-2 Mangrove Area in 1965

16. The Diablo mangrove woodland has the following vegetal association;

- Zone No.1

The distribution or association of the mangrove tree species is characterized by the almost complete prevalence of the *Pelliciera rhizophorae* (cypress mangle), both in the inner and outer mangrove, with the sporadic presence of the *Rhizophora mangle*.

- Zones No.2, No.3 and No.4

In the outside outer part there is a group of plants and small trees of *Rhizophora mangle* (red mangrove tree). This species colonizes at a shallow depth. In the inside inner part beyond the small *Rhizophora mangle* there are grown trees of this same species. These trees reach heights of up to 25m. Beyond the monospecific strip of *Rhizophora mangle* there are the *Avicennia bicolor* (black mangrove tree). This woodland may be monospecific, however, there are also *Laguncularia racemosa* (white mangrove tree).

- Insular Woodland -Zone No.6

This area is characterized by presenting a vegetal composition of *Rhizophora mangle* as the dominating species and a few trees of *Laguncularia racemosa*. The area plays an important role from the ecological point of view by serving as a resting or resting area for marine birds.

b) Valuable species of terrestrial flora

17. Neither endemic nor endangered species of mangrove trees were found in Diablo.

c) Aquatic flora

- Type of vegetation

The presence of incipient growth of benthic macrophytes was detected, mainly associated to the existing landing ramps within the area (Public at Diablo, Diablo Yacht Club and one close to Pier 18). Such growth is concentrated in the area between the tide and the ebb tide, where they form a slippery surface. Among them the Cyanophytes can be mentioned pertaining to the genera : *Microcoleus* sp., *Lyngbya* sp., *Oscillatoria* sp. and *Schizothrix* sp. During walks within the mangrove, dense growths of filamentous green algae were located interlaced between them, probably *Chaetomorpha* sp., covering the ground of the mangrove. Additionally, interlaced growths of red algae associations were located, mainly associated with the roots of the

mangrove trees, pertaining to the genders: *Bistrycha* sp., *Caloglossa* sp. and *Catenella* sp.

#### - Phytoplankton - Diversity, Dominating Species and Seasonability

The review of literature offers a perspective of phytoplankton population considering the presence of studies in nearby areas. Within the zone in question (including the Bay of Panama and entrance to the Panama Canal), the presence of two different conditions may be established : the rainy season (May-December) which tends to be warmer, with a reduction in salinity and masses of water with a lower content of nutrients, and the dry season (January-April), during which the rising of nutrients occurs due to north wind enriching all of the Bay of Panama (including the entrance of the Canal), bringing about a high productivity of the phytoplankton. A dominance of the diatomeas may be seen, with variations in the most abundant species: *Chaetoceros cinctus* (during the rainy season) and *Chaetoceros curvicutus* (during the dry season). In addition the red tide phenomenon sometimes takes place, with those waters locating at the entrance of the Canal, which may be seen up to pier 18, bringing about other phytoplanktonic organisms such as the Dynoflagellated: *Exuviaella compressa*, *Prorocentrum micans*, *Peridinium pellucidum* and *Gymnodinium catenatum*.

#### d) Valuable species of aquatic flora

There are no species of higher value, outside of the species associated with the red tide, such as the dynoflagellated *E. compressa*, *P. micans*, *P. pellucidum* and *G. catenatum* because of their potential in affecting marine life.

#### e) Terrestrial fauna

#### - MAMMALS

Assessed and/or trapped were a gray squirrel, a common opossum and a racoon (Table 7-4-2). The gray squirrel was assessed in several of the trips, in the afternoon (15h-17h), almost always in the upper canopy and showing great activity. It was always seen at the edge of the mangrove near the creek with fruit trees (almond, tamarind, etc.). However, it was also seen running around the branches of the treetops of the red mangrove tree. The record of a common opossum is based upon the capture of a female juvenile. It was caught in one of the live traps set in the mangrove woodland patch towards the western sector Roosevelt Street. The third record of mammal was a racoon or crabber cat, which was trapped in a fragment of mangrove near Barrios

Creek. The specimen was an adult male having a deep wound almost healed at the time in the rear quarter, maybe caused in confronting another racoon.

Table 7-4-2 Species of Mammals Assessed and /or Trapped

Family	Scientific Name	Common Name
Sciuridae	<i>Sciurus variegatoides</i>	Gray squirrel
Didelphidae	<i>Didelphis marsupialis</i>	Common opossum
Procyonidae	<i>Procyon cancrivorus</i>	Raccoon

#### - Birds

In addition to the birds during the field survey, other species are discussed that were not assessed, maybe because of lack of intensity or opportunities, but whose presence has been reported in previous studies of the Canal area and its vicinities. The study reports the presence of 23 families of birds having a total of 55 species. The family with the largest representation was Emberizidae with 10 species (18.2%). The presence of 14 species (25.4%) of birds was determined at the site considered as coastal or which in one way or the other maintain a certain relationship with the aquatic/marine environment. During the boat trip it could be seen that in the tree tops of the red mangrove trees at the small barren island, there was a large quantity of specimens of coastal species. Among them were the pelican, the marine crow or cormorant, but mainly a numerous group of juvenile forktail duck, easily recognized because of the white of their heads. Overflying the canal waters seagulls and small seagulls may be seen, which together with the pelicans, marine crows, and forktail ducks are in search of food, both in the surface and in deep waters. The outer zone of the Diablo mangrove is a resting place for coastal birds such as herons, pelicans and forktail ducks, and it also offers accessibility to the different types of food (insects, worms, fruit, etc.) and protects them from land predators such as the racoon and the opossum. It was obtained that of 55 species reported, 37 (67.2%) are resident birds and 18 (32.8%) are migratory.

#### - Amphibians and Reptiles

Regarding the amphibians group their species are not found in the mangrove, because the high permeability of their skin does not allow them to stand the high concentration of salt existing in the environment. In relation to the reptiles there are two families represented by four species (Table 7-4-3): the cayman seen in the shoreline of Barrios Creek, the black or mangrove

iguana, collected in a live trap and assessed in the area of Diablo landing, the orange head lizard and the common lizard.

Table 7-4-3 Species of Reptiles Assessed and /or Trapped

Family	Scientific Name	Common Name
Crocodylidae	Caiman crocodilus fuscus	Cayman (Alligator)
Iguanidae	Ctenosaura similis	Mangrove iguana
	Gonatodes albogularis	Orange head lizard
	Anolis sp.	Common lizard

#### f) Valuable species of terrestrial fauna

##### - Mammals

The racoon is considered by INRENARE (Res. Dir. 002-80) as an endangered species, mainly because of the loss of its habitat.

##### - Birds

Among the birds no species were distinguished as endangered, however the orange bearded parakeet (*Brotogeris jugularis*) of the Psittacidae family, is included in Appendix II of CITES because of its commercialization on an international level.

##### - Amphibians and Reptiles

The cayman is the only reptile species regarded as endangered in accordance with INRENARE (Res. Dir. 002-80). In addition, it is included in Appendix II of CITES as threatened by international trade.

#### g) Aquatic fauna

18. During the study (see Figure 7-4-1), 48 individuals of macro invertebrate were collected, belonging to three families, three genders and three species, the larger dominance was shown by the white shrimp, followed by the crab. The 624 fishes collected were grouped in 13 families, 14 genders, 16 species.

#### h) Valuable species of aquatic fauna

19. Within the area the royal shad (*T. atlanticus*) can be found as an endemic species. The endangered species include the american crocodile (*C. Acutus*), as well as the possibility of the presence of the manates (*T. manatus*) and the five species of marine turtles present in the Pacific of Panama, with the mulatto turtle



(*L. olivacea*) as the greater possibility.

#### 7.4.2 Impact Evaluation

20. As mentioned above, the field survey shows that the quantity of the important marine organisms is relatively low in the short-term project area. Regarding the small colonies of mangrove which will be removed, plantation of mangrove at the east area of Amador is expected to mitigate this loss. The details are explained in the following section of 7.7.2.

#### 7.5 Impact on Displacement of Villages and Facilities

21. According to ARI, all the local residences and facilities at Diablo, including an old school occupied by APN, are under control of ARI and now rented. The new Diablo container terminal of the Study will hardly involve this area.

22. The local residences there could be utilized as offices of port related business and industry at need as explained in Chapter III of PART II, thorough relocating the residents to other appropriate houses such as those to be reverted by the US. These facilities and related lands should not be sold for other purposes.

23. The relocation of PCC facilities around the port and port facilities with a concession, which are subject to the new port development plan, should be reconfirmed.

#### 7.6 Impact on Navigation Safety

##### 7.6.1 Capacity of Navigation Channel

24. Vessels calling at the port of Balboa inevitably use the navigation channel of the Panama Canal. It is necessary, therefore, to examine the impact on navigation safety for Canal transit vessels caused by the projects through increase of vessels calling at the port of Balboa.

25. The maximum impact on the Canal will be roughly evaluated by summing up the number of vessels calling at the port for cargo handling, since most of other vessels for ship supply or for cruising are assumed to be counted in this figure or the number of Canal transit vessels. As aforementioned, container

and bulk vessels will increase from 460 in 1995 to 520 in 2005 and 840 in 2015. Oil tankers will also increase approximately from 100 to 200. The total increase in 2005 will be about 100 vessels while that in 2015 will be 500.

26. On the other hand, transit volume of the Canal is limited by the capacity of locks and Gaillard Cut, and is said to be around 17,000 vessels after Gaillard Cut is widened by 2020. But when combined with the capacity of the new Canal, which is assumed to be in operation by 2020, the total capacity will be 34,400 vessels. Total number of vessels transiting the Panama Canal in 1995 was 15,136.

27. As aforementioned, the Canal has some capacity in reserve especially for the vessels not to transit locks and Gaillard Cut, and the number of vessels only calling at the port of Balboa is far less than the capacity of the channel. Therefore, the impact of the project on congestion of navigation channel of Panama canal will be negligible.

28. However, careful coordination is required between the new Canal construction and the projects of this Study since the area along the approaching waterway of the new Canal will be very active during the construction of the new Canal around the target year 2015 of the master plan of this Study as aforementioned in 1.4 of PART II.

#### 7.6.2 Water Area Use

29. It is important to examine whether port facilities will affect navigation safety of Canal transit.

30. Up to the master plan stage, basin and/ or channel for new container terminals at Diablo and Farfan are secured apart from the navigation channel with some area for operation of the Canal and no significant effect will be anticipated. It is desirable, however, to keep a close relationship with the Canal on detailed coordination and necessary measures for good water area use.

#### 7.6.3 Ship Wave

31. New container berths at Diablo are separate from the navigation channel (180 m at the nearest point) as those of the existing berths at Balboa and those at Rodman. Ship wave in front of container berth induced by Canal transit vessel at a low speed in the navigation channel has a negligible effect on container cargo handling at the container berth. Impact on navigation safety for Canal transit by

ship wave reflected at Diablo new container berths is also negligible.

32. The similar evaluation will be made for Farfan new container berths in the master plan stage, which are separate from the navigation channel ( 650 m at the nearest point ).

## **7.7 Impact on Other Environmental Aspect**

### **7.7.1 Marine Pollution**

33. One of the major adverse effects on surrounding environment induced through port activities is marine pollution such as oil spills and leakage from vessel. Such pollution is strictly prohibited, and necessary facilities and countermeasures should be established based on international treaties.

34. In this respect, the government of Panama ratified the convention entitled Prevention of Pollution of the Sea from Ships 1973 and the Protocol of 1978 ( MARPOL ) quickly by the Law No.1 of 1983. At present, however, only a small amount of oil or general waste has been disposed by an oil company or metropolitan sanitation division in their facilities out of the port, because of the absence of port reception facilities or lack of skilled manpower and equipment.

35. Since several years ago, the international organizations concerned such as IMO and World Bank have urged Panama to comply with MARPOL as soon as possible as one of the pilot countries in the Caribbean Sea area. APN is in charge of implementation, and has almost finalized a draft regulation for it, coordinating with other related authorities. It is expected to be put into practice in the near future.

36. On the other hand, oil spills and leakage sometimes take place accidentally during bunkering operation and so on. Such oil leakage is neither an unavoidable consequence of bunkering activities nor will they necessarily increase along with flourishing port activities. It can be prevented or decreased through efforts to improve bunkering facilities and increase safe and efficient operations, taking necessary measures such as inspections of calling vessels to prevent illegal disposal of bilge.

37. National Contingency Plan on Spill of Oil and Other Harmful Substance was prepared in 1991. It consists of the cooperation of PCC and existing oil

companies. The plan was drafted 1) to fight and control oil spills and dispersion of other harmful substances in the sea, 2) to protect ecosystem and natural resources and installations of socio-economic value, and 3) to establish the necessary mechanism of coordination and cooperation to utilize human, material and legal resources.

#### 7.7.2 Disposal of Dredged Material

38. The short-term development plan proposed in this Study involves dredging and reclamation of about 1.0 million m<sup>3</sup> and 1.2 million m<sup>3</sup>. However, the dredged materials will be composed of very soft sediments and unsuitable for reclamation. (For the reclamation, the disposed material from the Gaillard Cut widening project of the Canal might be utilized conveniently.) The dredged materials should be disposed of at the shallow sea between Chorrillo and Amador for reclamation. This reclamation can be used as the perimeter of Amador Golf Course and provided with mangrove plantation as the environmental mitigation measure.

39. The master plan also involves dredging and reclamation. For the container terminal development at Farfan, about 13 million m<sup>3</sup> of dredging and 1 million m<sup>3</sup> of reclamation will take place. The extra dredged materials can be used for the reclamation of the swampy area up to +7.0 m MLWS covering about 250 ha. Meanwhile, for the oil berth development offshore Amador, the required dredging is about 2.2 million m<sup>3</sup>. The dredged materials will be conveniently utilized for the expansion of Amador Golf Course planned by ARI. Along the expansion limit, mangrove plantation is to be planned for environmental mitigation as mentioned above.

40. As aforementioned, dumping of dredged material will be necessary during the construction work. Almost all the remaining can be used for the mitigation measures. Mitigation measures are extra actions necessary to reduce environmental impacts to an acceptable level. In this Study, a colony of mangrove larger than that removed at Diablo will be planted at the east side of Amador. This mangrove area will have the following effects:

- a) to dispose and recycle the dredged material as construction material
- b) to cover dirty layer at the bottom of the Panama Bay with clean material
- c) to plant mangrove at Amador as substitute for that at Diablo
- d) to create a good environment for marine organisms
- e) to create good fishing grounds or farm of shrimp, etc.

- f) to contribute to clean up of the Panama Bay through function of living filter
- g) to adjust the flood flow into the sea from inland during the rainy season
- h) to heighten the value of neighboring Amador tourism project of ARI by increasing greenery etc.

(Note)

It is desirable to take into consideration conditions of areas similar to those of the current Diablo mangrove (18ha), such as a calm swamp inlet with sources of fresh-water supply. An appropriate inner place will be secured with surrounded by the new golf course of ARI projects and the current waterfront of the Panama Bay. Inflow of rainwater from inland or water hazard in the new golf course will be utilized for water supply. The image of mangrove area for mitigation (approximate 50 ha) and its cross section are shown in Figure 7-7-1. In this figure, the configuration of landfill for the new golf course is a little modified but the size of the area will remain the same. Submerged breakwaters are set up as sheathing structure at the boundary of the mangrove area.

### 7.7.3 Employment

41. The project will increase employment on the whole. This impact can be evaluated from three different aspects.

#### a) Employment during Construction Term

42. The construction work of the project will produce a significant amount of jobs and indirect employment in related industries during the construction period.

#### b) Direct Employment of Terminal Operation

43. In the short term plan stage, facilities and activities at the port of Balboa will significantly increase, however, direct employment will not increase so much in total due to rationalization and improvement of efficiency of management and operation of the port.

#### c) New Employment Supported by Port Activity

44. The port development projects will support the expansion of Colon Free Zone and new Export Processing Zone (EPZ) on both the Pacific side and the Atlantic side. In addition, new employment will be created among related industries (for example, Maritime Complex as explained in Chapter V of PART II).

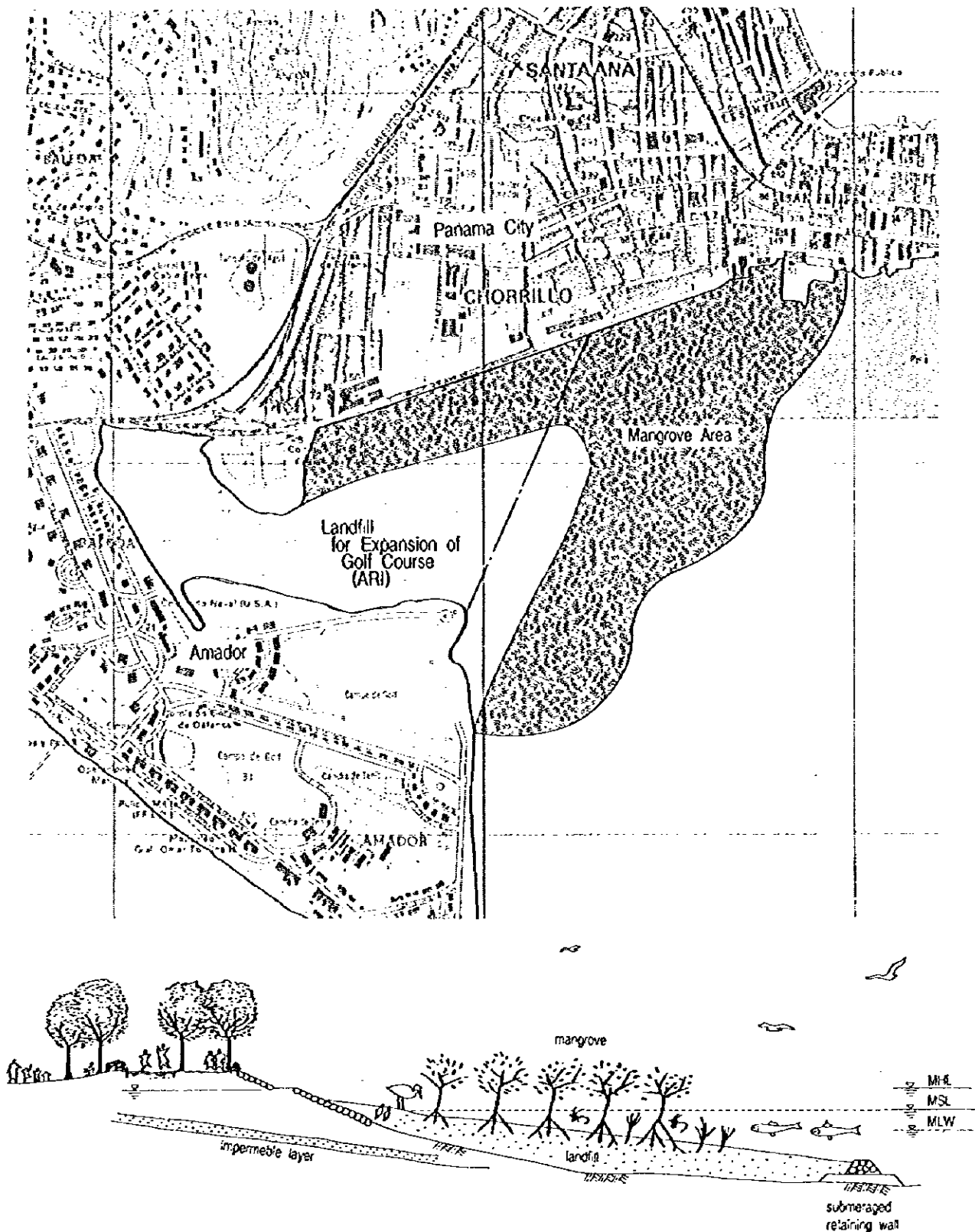


Figure 7-7-1 Image of Mangrove Area and its Cross Section

## 7.8 Overall Evaluation of Environmental Impact

45. The result of EIA is summarized as follows.

Table 7-8-1 The Result of EIA

Item	Result of Evaluation
Air, Noise and Smell Quality	No significant impact by Short Term Plan. Settled by making new roads and improving existing roads or arranging sufficient space or greenbelt.
Water Quality	No significant impact by Short Term Plan. Appropriate countermeasures such as sewage processing system in inland areas are expected to be realized as soon as possible by all authorities concerned.
Terrestrial Ecology	No significant impact by Short Term Plan New mangrove area will be created for mitigation.
Displacement of Villages and Facilities	No significant impact by Short Term Plan
Navigation Safety	No significant impact by Short Term Plan Careful coordination is required between the new Canal construction and the master plan of this Study.
Others	
Marine Pollution	No specific problem is anticipated.
Disposal of Dredged Material	No specific problem is anticipated. Dredged material is utilized for various purposes.
Employment	Remarkable effect is expected on the whole.

46. Impact of the project in the Short Term Plan on surrounding natural environment is small and negligible.

## VIII OVERALL EVALUATION

1. Viability of the Short Term Plan is evaluated from the various points of view mentioned in the preceding chapters.

### (1) Engineering Soundness

2. Basic structure of existing piers is in sound condition in spite of long term use of more than 70 years. They can be continuously used further with proper rehabilitation works.

3. The proposed construction site for new container terminals at Diablo is endowed with favorable conditions. The topographic, bathymetric and geotechnical conditions are suitable for constructing container berths. There is no serious current which affects berthing and de-berthing. The sedimentation rate of the basin is manageable; about 24 cm per year for which APN has conducted maintenance dredging to remove.

4. Water area in front of the construction site is sufficiently wide for ship maneuvering. It is geographically protected from wave intrusion and a breakwater is required.

### (2) Financial Viability

5. In the financial analysis, Chapter V, the financial condition of Balboa Port Office of APN and the National Government is examined after execution of the Short-term Plan including the concession with PPC.

6. The given conditions for the financial analysis are as follows;

- a) Expenses including the personnel expenses are sharply reduced.
- b) Brisk port activity will generate steady revenues.
- c) Terms of the contract with PPC, in which the National Government and APN receive high fixed and variable annuities and is not required to make any investment, are favorable.

7. After the concession, the financial condition of Balboa Port Office is assessed as preferable from the viewpoints of payability, productivity and operational efficiency, and that of the National Government is also assessed as satisfactory from the viewpoints of profitability. The net surplus from the



concession, namely the National Treasury receipts from Balboa Port including the revenues from PPC, are larger than before.

8. This good financial condition including the great net surplus will be supported by the reduced expenses, brisk port activity and profitable condition of the contract with PPC. The Short-term Plan can thus be carried into effect based on these forecasts provided that these given conditions are not changed.

### (3) Economic Feasibility

9. In the economic analysis, Chapter VI, EIRR is calculated from the benefit related to the container cargo, for example the transshipment and the transport cost for the overflow cargo. The EIRR is 19.2% in the low growth case and 21.3% in the high growth case. Moreover, even when costs increase by 10% and the benefits decrease by 10% in the sensitivity analysis, EIRR is 15.3% in the low growth case and 17.2% in the high growth case. This value is recognized as sufficiently high compared to similar projects. Therefore, the Short-term Plan is feasible from the viewpoint of the national economy.

10. The economic effects from this project are not only those related to the container cargo. The effects excluded in the calculation of EIRR are for example the effects related to non-the container ships, the increase of consumer demand and the promotion of regional development. This project can be expected to generate great economic effects.

### (4) Environmental Impact

11. The Diablo area, where a new container terminal is planned, is primarily under the administration of APN. There is no specific valuable natural asset which should be preserved.

12. Concerning the water quality of the surrounding area, activity of container terminal itself will not generate much pollutant, thus the impact of the Short Term Plan on the water quality is small and negligible. Inflows of pollutant from the city area will be well controlled by the sewage treatment plan regardless of the port projects.

13. A relatively large colony of mangrove will be planted at the east side of Anador to mitigate destruction of the small mangrove swamp at Diablo. This serves as a good environmental infrastructure for environmental preservation and

creation.

(5) Overall Evaluation

14. Based on comprehensive evaluation from various points of view including items mentioned above, the Short Term Plan is the best choice for improving the function of the port of Balboa. The result of overall evaluation is summarized in Table 8-5-1.

Table 8-1-1 Result of Overall Evaluation

Item	Result	Remarks
Engineering Soundness	Good	Project site is in good condition for construction.
Financial Viability	Good	Project has high profitability and greatly contribute to National Finance.
Economic Feasibility	Good	Project greatly contributes to the national economy.
Environmental Impact	Good	Project has no significant environmental impact . It's small and negligible.

# **EXECUTIVE SUMMARY**

## **EXECUTIVE SUMMARY**

### **Background and Objectives**

1. The port of Balboa is situated at the Pacific entrance to the Panama Canal. Even though its facilities are obsolete and the layout is not suitable for modern port operation, its strategic location as a transshipment hub for the Central and South America has attracted the attention of many shipping circles in recent years.
2. After the opening of MIT at Manzanillo and the transfer of Coco Solo Norte to Evergreen management, immediate rationalization of remaining terminals at Cristobal and Balboa has become imperative to Panama.
3. Under such circumstances, the Government of Panama requested Japan International Cooperation Agency (hereinafter referred to as "JICA") to conduct a feasibility study for Balboa port modernization. Accordingly, JICA, the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, has initiated the Study, in close cooperation with the authorities concerned of the Government of Panama.
4. Objectives of the Study are to cover formulation of both a master plan for the period up to 2015 and a short-term development plan within the framework of the master plan for the period up to 2005. The study includes not only physical facility planning but recommendations on the management, operation, utilization and organization for the Port of Balboa.
5. During the study period, negotiations for concession of port management at Balboa and Cristobal have progressed. At the end of 1996, the Government of Panama and Panama Ports Company (PPC) which is a subsidiary company of Hutchison International Port Holdings Limited reached an agreement on the contract for the concession.
6. The Final Report covers the short term and long term development program including a technical and economical feasibility analysis. After considering various alternatives, this report is based on an assumption that the port management and operation will be performed according to the concession agreement.

## **Master Plan**

### **General Concept**

7. The present port area at Balboa is limited in terms of a large scale development. Therefore, the existing port area may be used for the short term development. For the long term master plan, it is necessary to acquire a suitable location outside of Balboa area.

8. While the short term expansion will be deployed at Diablo area, future development space can be found at Farfan area.

9. The master plan should be coordinated with future canal alignment as well as the existing one.

### **Container Terminal**

10. Future volume of container traffic at Balboa is not only related to the growth rate of its past cargo handling trend or GDP of Panama, but also related to potential transshipment demand for Pacific Latin American ports. Such potential traffic is also closely related to the facility and service level offered at Balboa.

11. Potential traffic at Balboa is also related to the traffic through the canal. According to the latest information, traffic through the canal is growing steadily which is indicative of the general economic recovery in Central and South American countries in recent years.

12. Potential container traffic at Balboa in 2005 is estimated as 360,000 TEU for the low growth case and 510,000 TEU for the high growth case, and in 2015 as 760,000 TEU for the low growth case and 1,100,000 TEU for the high growth case. After the year 2000, approximately 80 % of the above container traffic volume will consist of transshipment containers.

13. In order to accommodate rapidly growing container traffic, full scale container terminal has to be developed at Diablo area. The new terminal at Diablo can accommodate two full size container berths with the capacity of approximately 600,000 to 800,000 TEU.

14. Since the area available at Balboa including Diablo is limited, additional capacity for container handling and other cargo must be secured at the other side

of the Canal. Considering necessary room for turning basin in front of the waterfront and the new canal alignment for the third lock development, the only possible choice for the future development site is in the Farfan area at the west side of the canal and south side of the American Bridge. The area is now used mainly as a dumping site of dredged materials as well as a military communication antenna yard. Its vast space with flat land will be not only suitable for a large scale container terminal but sufficient for an industrial complex.

15. Construction of this new terminal at Farfan area should be started well before 2015 to meet the demand. Moreover, this site may be allocated for a new terminal operator other than the concessionaire at Diablo if necessary. In such an event, opening of this terminal may be permitted at a much earlier time, even before the year 2010.

#### Other Terminals

16. Grain, automobile and breakbulk cargo will remain at Balboa for the foreseeable future. They have to be handled at the consecutive berths and the central pier located in the center of the existing port (piers No.14,15,16 and 18).

17. Ferries for islands and other small crafts will continue to use the piers at the back of the existing port (piers No.17 and 19). Relocation of the ferry terminal to Amador is not accepted in the Amador development plan contemplated by ARI.

18. A part of tuna boats now moored at Balboa will be moved to the Port of Vacamonte, located approximately 20 km west of Balboa. However, some of the large size tuna boats may continue to call Balboa.

19. At present, cruise ships principally call at the central pier located in the center of the port (pier No. 18). The north side of this pier will continue to accommodate these ships while a new cruise ship terminal is planned at Amador.

20. Quays for sand and gravel handling (pier No. 20) have to be relocated at the north of the new container terminal at Diablo.

21. The dry docks and accompanied facilities require some expansion in the future. Berthing facilities for ship repair at the neighboring berth (pier No. 8) are insufficient and use of other berths in the proximity will be necessary (use of No.7 and even No.14 will become necessary).

22. The berth at the south end of the existing port (pier No. 6) is used as an oil terminal as well as for other cargoes at present. In order to avoid possible fire hazard, oil and other cargoes should be separated at this terminal as soon as possible. An alternative oil terminal may be built at the south side of the American bridge in front of the tank farms. Also, Rodman US navy pier in front of Balboa area will become soon operational as another commercial oil terminal.

#### **Urgent Program**

23. The consecutive berths located in the center of the existing port (piers No.14,15 and 16) are being converted to a container terminal for temporary use. With installation of two gantry cranes and creation of some yard space by clearing the existing buildings and railway yard, annual capacity of up to 120,000 TEU will be obtained.

24. Because of the size and the form of the yard and also possible conflict with other types of cargo, this terminal is not suitable for efficient container operation. In order to recover lost traffic from MIT and to attract transshipment demand, container handling at this terminal should be carried out only until the terminal at Diablo becomes available.

#### **Short Term Plan**

25. A full scale container terminal will be constructed at Diablo district adjacent north to the existing port (Balboa district). Considering the area available on land and existence of hard rock at a relatively shallow level underground, excavation of this area has to be minimized. Consequently, a quay wall of 700 m in length and yard space of 500 meter in width will be the maximum size possibly secured in this area. This terminal will provide capacity of up to 800,000 TEU which is sufficient to cater for the high case traffic volume expected in the year 2005 or low case in the year 2015.

26. Because of the inadequate layout and conflict with other commodities and activities, the area used for the urgent scheme should not be used for the future container facility in principle.

27. The berths neighboring the existing dry docks (piers No.7 and 14) will be used for cereal, automobile and other types of general cargo handling for the time being. After completion of Diablo container terminal, these activities will be concentrated at the conventional berths to the north (piers No.15 and 16).

28. A 600 m long berth for cruise ships is contemplated at the west side of Amador area. This terminal will relieve congestion of Balboa basin. In order to secure safe navigation in front of the terminal, the new cruise ship berth should be parallel to the main navigation channel.

29. Dry docks of various sizes are located in the south part of the existing port (between piers No.7 and 14). The Panamax size dock, in particular, is the only repair facility of this size available along the Pacific coast of the American Continent from Mexico to Chile. Considering the future demand of the ship repair business, expansion of this facility may be required. Therefore, when the neighboring berth (piers No.14) is relieved from tentative container operation, the piers on the south (piers No.7 and 14) should be converted to the fitting berths attached to the dock yard. In the long term plan, additional dock yard with new Panamax size (same as the third lock size) may be necessary.

#### **Future Canal Alignment**

30. When the traffic through the canal requires the third lock construction, the alignment of the navigation channel needs to be shifted. This realignment requires removal of three piers (piers No.1, 2 and 3) at Rodman. The oil handling at these piers will also be moved to a new site. The new site will be located about 400 meters further south of the south pier.

31. At the completion of the third locks, the maximum size of vessels passing through the channel will become 150,000 tons and the width of the channel needs to be expanded. In this connection, the western side of the pier of American bridge and the tip of the Rampeolas at Farfan may have to be removed. This means renewal of American bridge. However, because construction of a new bridge involves a high cost and traffic through the channel at the early stage after the expansion of the channel will not be saturated with traffic, the bridge may be retained for a few more decade after completion of the third locks.

32. Use of the Pier No.6 for oil handling must be terminated with the new canal alignment because there will no longer be any distance separating the channel and the pier facing it (the pier No.6), which would make operations at the pier more dangerous.

33. The relocation of the above-mentioned berth and oil berths at Rodman may be executed as a part of the third locks construction project.



34. Construction material supply base and working craft quays for the third locks may be made available if Farfan terminal area is partially developed. The proposed container terminal will be developed at the northern part of the new Farfan area and the southern shore of Farfan will be made available for the working crafts as well as material supply berths during construction of the third locks.

### **Environmental Aspects**

35. The water quality at Balboa and its vicinity is contaminated by discharge of sewage water through Crundu River and Marea Salas river at the small mangrove swamp between Balboa district and Diablo district (north of Pier 18). The water quality will hardly be affected by the Project of the Study.

36. In order to mitigate destruction of the small mangrove swamp at Diablo by the Project, plantation of mangrove at the east side of Amador will serve the purpose.

37. No other significant effect on the environment by the Project is expected. Although effects of land filling or dredging are limited within a permissible scale it is important to keep the surveyed records and minimize effects of such works.

### **Port Administration**

38. The Port Authority of Panama (APN), which is the state-run port management body, manages and operates six major ports and several other secondary ports in this country, including the port of Balboa. APN inherited the port facilities at Cristobal and Balboa from Panama Canal Commission in 1979. These facilities are old and inadequate for modern containerized cargo handling. Because of their conventional operation system, the manpower which was also inherited from PCC is excessive for the container system.

39. In order to trim governmental expenditures, the Government of Panama has decided to privatize various government service sectors including APN and the Railway. Privatization has already been introduced to certain port functions such as dry docks, tug service and bunkering.

40. Full scale container terminal development at Manzanillo was initiated by a private operator, Manzanillo International Terminal (MIT), in 1994. MIT has not only absorbed much of the container traffic from

APN's Cristobal terminal but attracted additional traffic which otherwise would be handled by other Caribbean ports. Similar concession has been introduced to Coco Solo Norte.

41. Because of their vast potential to serve as hub ports for the region and because of the success of MIT, Cristobal and Balboa have attracted the attention of many international shipping lines and operators. After transfer of Coco Solo Norte to Evergreen management, remaining terminals at Cristobal and Balboa must immediately be rationalized to be competitive with other privatized terminals.

42. Panama Railway, which until today has been under state management, may not be suitable as a land transportation tool of port related cargo for such a short distance. Rail sidings in the port area are only obstructing efficient cargo handling operation rather than contributing to efficient clearance of cargo. Therefore, reform or privatization of the railway should be considered separately from the port operation.

#### **New Port Management System**

43. In July 1996, Hongkong International Terminals, Limited (HIT), an affiliate company of Hutchison International Port Holdings Limited, was selected for the concessionaire for Cristobal and Balboa terminal operation.

44. The Government of Panama grants in concession to the Panama Ports Company (PPC), which is a subsidiary company of HIT, the development, construction, operation, administration and management of designated area in the ports of Cristobal and Balboa. Most of the port workers and management staffs now employed by APN will be discharged and only a limited number of people will be re-employed by the new company.

45. The company will pay a fixed fee to the government and a variable fee to APN. The variable part corresponds to ten percent of the gross receipts by the activity of the company.

46. Even after introduction of concession system to most of the port facilities, APN is expected to function as an effective landlord of the port. Important functions include overall planning of the port in the country, both physical layout and functional coordination. APN is also responsible for collection of revenues from remaining concessionaires.

47. Emphasis should be placed on the functions of APN to control and supervise concessionaires and lessees, and liaison activities as well as establishment of monitoring system to secure revenues. Monitoring safety and pollution in the port area is also one of the important responsibilities of APN.

## **Project Evaluation**

### **Project Cost Estimates**

48. For the project cost, the short-term development and long-term development are considered. The passenger terminal planned at Amador, Rodman oil terminal and the railway related investments are excluded from the Project. Relocation of the oil terminals at Pier No, 1,2,3 and 6 accompanied by the future canal re-alignment is also excluded from the Project.

49. The short term project until 2005 is estimated as 208 million Balboas which includes 700 m long container berths at Diablo, 4 sets of gantry cranes and other necessary equipment.

50. The long term project until 2015 is estimated as 464 million Balboas including 700 m long quay for containers with adequate equipment at Farfan accompanied by necessary land reclamation and channel dredging .

### **Economic Analysis**

51. EIRR of the short-term development plan is assessed at 21.33 % in the high growth case and 19.17 % in the low growth case. The short-term plan provides sufficient return to the national economy even in the low growth case.

### **Financial Analysis**

52. Financial condition of the Project is analyzed from two different angles. One of the aspects is the financial position of the national government in relation to the Project. The other angle is the financial position of the PPC in relation to the Project.

53. APN provides existing port facilities to PPC for operation but legal ownership of such assets belong to APN. Also all facilities developed by the Company belong to the Company until the term of the contract expires. In return, the national government and APN receive annuities for these concession.

54. Receipts of the national government in relation to the Project will increase compared with the net-receipts from APN in the past as far as the rationalization of APN is enforced and conditions of the concession are faithfully fulfilled.

55. Financial position of PPC depends not only on the gross revenues but is also related to various cost elements. Based upon rough assumption and following conditions stipulated in the concession agreement, PPC will generate a net surplus after 2014 in the low growth case or close to the turn of the Century in the high growth case.

### **Conclusion**

56. As far as the rationalization of APN is enforced and conditions of the concession are faithfully fulfilled, the Project to rehabilitate Balboa port and development of new container terminals and other facilities at Diablo, Farfan and their vicinity is economically feasible and financially viable.

### **Recommendations**

57. Even though the prime objective of PPC is container terminal operation, other cargoes and ships should be able to use Balboa without impartial treatment. APN should continue to monitor its operation and, if necessary, coordinate port users and the operator.

58. The government of Panama and APN should not only provide service and fulfill their obligations under the concession contract but also extend every effort to promote activity of Balboa port by various channels of port selling opportunities.

59. APN should improve port statistics in order to secure revenues.

60. After the initial period of development at Balboa, the government should proceed to Farfan area development at the earliest opportunity.











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