

VII PROJECT COST AND IMPLEMENTATION SCHEDULE

7.1 Preliminary Cost Estimate

(1) Assumptions

1. Table 7-1-1 shows the major facilities to be built to implement the development of Port of Balboa. Construction of these facilities are scheduled to meet the demands. The urgent improvement works, however, are currently being implemented partly and assumed to continue regardless of the concession contract of HIT.

2. For the short-term development, the construction costs are estimated for Alternative Plan-D3, D4 and D5. Among the alternatives, underwater rock excavation is the dominant element in estimating the construction cost. However, the quantities of the underwater rock excavation are very preliminary since they are based on only three borehole exploration.

3. For the long-term development, the construction cost is estimated only for Alternative Plan-F3 since this alternative involves much less quantity of underwater rock excavation than other alternatives. The difference of their construction costs are obvious.

4. The construction costs are estimated on the conceptual cross sections as shown in the previous chapter.

5. The construction costs of the access road and relocation of the existing road for the long-term developments at Farfan are considered as a part of the developments and included in the cost estimate.

6. Power supply, water supply and telecommunication to both the short-term and long-term development areas but outside the development areas are not included in the cost estimate.

Table 7-1-1 Major Facilities to be Built

Phase	Stage	Facilities	Target Year (Low Case)	Target Year (High Case)
Urgent Improvement	-	- Piers No. 6, No. 7, No. 14, No. 15, No. 16, No. 18 - Container Yard at Balboa - Cargo Handling Equipment	2000	2000
Short-Term Development	1	- Container Terminal with 350 m Berth - Cargo Handling Equipment - Access Road & Utilities	2001	2001
	2	- Container Terminal with 350 m Berth - Tuna Boat Berths - Sand/Gravel Landing Berths - Access Road & Utilities	2005	2003
Long-Term Development	1	- Container Terminal with 350 m Berth - Cargo Handling Equipment - Access Road, Road Relocation & Utilities - Oil Terminal Berth at Amador	2014	2009
	2	- Container Terminal with 350 m Berth - Cargo Handling Equipment - Utilities	2015	2015

(2) Quantities and Unit Prices

7. For the major quantities of construction works like dredging and reclamation, the topographic and bathymetric maps prepared by the JICA Study Team is used for the short-term development. For the long-term development, maps and bathymetric maps available with National Geographic Institute or PCC are used.

8. The unit rates of the dredging for each stage of each phase of the implementation of the development are varied according to the conditions, such as the total volume, soil characteristics, availability of and distance to the disposal area.

9. For the cost estimate purpose, the equipment prices are referred to the recently bidden prices.

10. Engineering service cost, 5 percent for civil works and 2 percent for equipment procurement, are taken into account.

(3) Tentative Cost Estimates

11. Summary of the cost estimates for the short-term and long-term developments are tabulated in Table 7-1-2 (Alternative Plan-D3 plus Alternative Plan-F3), Table 7-1-3 (Alternative Plan-D4 plus Alternative Plan-F3) and Table 7-1-4 (Alternative Plan-D5 plus Alternative Plan-F3).

Table 7-1-2 Preliminary Construction Cost (Alternative - D3)

Item No.	Description of Work	Unit	Quantity	Unit Rate	Total Amount
				(US\$)	(US\$)
A	Urgent Measures				
1	Improvement of Piers	ls.	1	45,000,000	45,000,000
2	Equipment				
	a. Panamax Container Quay-side Cranes	each	2	4,500,000	9,000,000
	b. Transfer Crane	each	3	1,000,000	3,000,000
	c. Reach Stackers	each	1	350,000	350,000
	d. Top Lifters	each	3	70,000	210,000
	e. Trailers	each	10	60,000	600,000
	f. Chassis	each	12	20,000	240,000
					13,400,000
	Urgent Measures, Civil Works				45,000,000
	Ditto, Equipment				13,400,000
	Ditto, Total				58,400,000
B	Short-Term Development				
1	Container Terminals (Diablo 1st Stage)				
1.1	Dredging (-12m)	cu.m.	1,850,000	2.0	3,700,000
1.2	Rock Dredging (-12 m)	cu.m.	330,000	200	66,000,000
1.3	Excavation & Fill	cu.m.	60,000	2	120,000
1.4	- 14m Quay	lm.	350	67,500	23,625,000
1.5	Pavement	sq.m.	110,000	150	16,500,000
1.6	Building	sq.m.	6,500	200	1,300,000
1.7	Electrical Works	ls.	1	1,600,000	1,600,000
1.8	Utilities Works	ls.	1	800,000	800,000
1.9	Access Road	lm.	450	2,000	900,000
1.10	Miscellaneous Works	ls.	1	5,730,000	5,730,000
					120,275,000
1.10	Post-Panamax Container Quay-side Crane	each	2	5,000,000	10,000,000
1.11	Transfer Cranes	each	3	1,000,000	3,000,000
					13,000,000
2	Container Terminals (Diablo 2nd Stage)				
2.1	Dredging (-12m)	cu.m.	1,300,000	2.0	2,600,000
2.2	Rock Dredging (-12 m)	cu.m.	230,000	200	46,000,000
2.3	Excavation & Fill	cu.m.	60,000	2	120,000
2.4	- 14m Quay	lm.	350	67,500	23,625,000
2.5	Pavement	sq.m.	123,000	150	18,450,000
2.6	Building	sq.m.	0	200	0
2.7	Electrical Works	ls.	1	400,000	400,000
2.8	Utilities Works	ls.	1	200,000	200,000
2.9	Access Road	lm.	0	2,000	0
2.10	Miscellaneous Works	ls.	1	4,670,000	4,670,000
					93,965,000
2.10	Post-Panamax Container Quay-side Crane	each	1	5,000,000	5,000,000
2.11	Transfer & Reinstall of Panamax Container Quay-side Crane	ls.	1	750,000	750,000
					5,750,000

Table 7-1-2 Preliminary Construction Cost (Alternative - D3)

Item No.	Description of Work	Unit	Quantity	Unit Rate	Total Amount
				(US\$)	(US\$)
3	Tuna Boat Berths (Balboa)				
3.1	Dredging (-7.5 m)	cu.m.	820,000	2.0	1,640,000
3.2	Rock Dredging (-7.5 m)	cu.m.	140,000	200	28,000,000
3.3	Excavation & Fill	cu.m.	5,400	2	11,000
3.4	- 7.5 m Quay	l.m.	540	50,000	27,000,000
3.5	Pavement	sq.m.	5,000	100	500,000
3.6	Access Road	l.m.	450	1,000	450,000
3.7	Electrical/Utilities/Miscellaneous Works	l.s.	1	2,880,000	2,880,000
					60,481,000
4	Sand/Gravel Landing Berth (Amador)				
4.1	Dredging (-4.0 m)	cu.m.	85,000	2.0	170,000
4.2	Rock Dredging (-4.0 m)	cu.m.	15,000	200.0	3,000,000
4.3	-4.0 m Quay	l.s.	120	30,000	3,600,000
4.4	Electrical/Utilities/Miscellaneous Works	l.s.	1	339,000	339,000
					7,109,000
5	Renovation of Pier No.18				
5.1	Passenger Terminal (3,000 m2)	sq.m.	3,000	150	450,000
5.3	Parking (6,800 m2)	sq.m.	6,800	50	340,000
5.4	Electrical/Utilities/Miscellaneous Works	l.s.	1	39,600	40,000
					830,000
6	Substitute Mangrove at Amador				
6.1	Soil Transport and fill	cu.m.	850,000	1	850,000
6.2	Submerged Dike	l.m.	1,200	550	660,000
6.3	Plantation	ha	14	4,500	63,000
					1,573,000
	Short-Term Development, Civil Works				286,233,000
	Ditto, Equipment				18,750,000
	Ditto, Total				304,983,000
C	Master Plan				
1	Container Terminals (Farfan) Stage 1				
1.1	Dredging (-14m)	cu.m.	11,890,000	3	35,670,000
1.2	Rock Dredging (-14m)	cu.m.	120,000	200	24,000,000
1.3	Excavation & Fill	cu.m.	60,000	2	120,000
1.4	- 15m Quay	l.m.	350	73,500	25,725,000
1.5	Pavement	sq.m.	110,300	150	16,545,000
1.6	Building	sq.m.	15,300	200	3,060,000
1.7	Electrical Works	l.s.	1	1,600,000	1,600,000
1.8	Utilities Works	l.s.	1	750,000	750,000
1.9	Access Road	l.s.	1	4,300,000	4,300,000
1.10	Miscellaneous Works	l.s.	1	11,180,000	11,180,000
					122,950,000
1.10	Container Quay-side Crane	each	2	5,000,000	10,000,000
1.11	Transfer Cranes	each	3	1,000,000	3,000,000
1.12	Reach Stackers	each	1	350,000	350,000
1.13	Toplifters	each	2	70,000	140,000
1.14	Trailers	each	10	60,000	600,000
1.15	Chassis	each	10	20,000	200,000
1.16	Other Equipment	l.s.	1	500,000	500,000
					14,790,000

Table 7-1-2 Preliminary Construction Cost (Alternative - D3)

Item No.	Description of Work	Unit	Quantity	Unit Rate	Total Amount
				(US\$)	(US\$)
2	Container Terminals (Farfan) Stage 2				
2.1	Dredging (-14m)	cu.m.	1,080,000	3	3,240,000
2.2	Rock Dredging (-14m)	cu.m.	55,000	200	11,000,000
2.3	Excavation & Fill	cu.m.	60,000	2	120,000
2.4	- 15m Quay	l.m.	350	73,500	25,725,000
2.5	Pavement	sq.m.	122,500	150	18,375,000
2.6	Electrical Works	l.s.	1	400,000	400,000
2.7	Utilities Works	l.s.	1	250,000	250,000
2.8	Access Road	l.m.	350	2,000	700,000
2.9	Miscellanies Works	l.s.	1	5,980,000	5,980,000
					65,790,000
2.8	Container Quay-side Crane	each	2	5,000,000	10,000,000
2.9	Transfer Cranes	each	3	1,000,000	3,000,000
2.10	Reach Stackers	each	1	350,000	350,000
2.11	Tophifters	each	2	70,000	140,000
2.12	Trailers	each	10	60,000	600,000
2.13	Chassis	each	10	20,000	200,000
2.14	Other Equipment	l.s.	1	500,000	500,000
					14,790,000
3	Oil Berth (Amador)				
3.1	Dredging (-12 m)	cu.m.	2,180,000	3	6,540,000
3.2	Platform	l.s.	1	3,000,000	3,000,000
3.3	Breasting Dolphins	each	2	1,000,000	2,000,000
3.4	Mooring Dolphins	each	2	500,000	1,000,000
3.5	-7.5 m Berth (130 m)	l.m.	130	50,000	6,500,000
3.6	-5.5 m Berth (100 m)	l.m.	100	40,000	4,000,000
3.7	Approach Trestle	l.s.	1	1,000,000	1,000,000
3.8	Electrical/Utilities/Miscellaneous Works	l.s.	1	2,400,000	2,400,000
					26,440,000
	Master Plan, Civil Works				215,180,000
	Ditto, Equipment				29,580,000
	Ditto, Total				244,760,000
	Total				608,143,000
	Engineering Cost				28,556,000
	Grand Total				636,699,000

Table 7-1-3 Preliminary Construction Cost (Alternative - D4)

Item No.	Description of Work	Unit	Quantity	Unit Rate (US\$)	Total Amount (US\$)
A	Urgent Measures				
1	Improvement of Piers	l.s.	1	45,000,000	45,000,000
2	Equipment				
	a. Panamax Container Quay-side Cranes	each	2	4,500,000	9,000,000
	b. Transfer Crane	each	3	1,000,000	3,000,000
	c. Reach Stackers	each	1	350,000	350,000
	d. Top Lifters	each	3	70,000	210,000
	e. Trailers	each	10	60,000	600,000
	f. Chassis	each	12	20,000	240,000
					13,400,000
	Urgent Measures, Civil Works				45,000,000
	Ditto, Equipment				13,400,000
	Ditto, Total				58,400,000
B	Short-Term Development				
1	Container Terminals (Diablo 1st Stage)				
1.1	Dredging (-12m)	cu.m.	840,000	2.0	1,680,000
1.2	Rock Dredging (-12m)	cu.m.	150,000	200	30,000,000
1.3	Excavation & Fill	cu.m.	60,000	2	120,000
1.4	- 14m Quay	l.m.	350	67,500	23,625,000
1.5	Pavement	sq.m.	110,000	150	16,500,000
1.6	Building	sq.m.	6,500	200	1,300,000
1.7	Electrical Works	l.s.	1	1,600,000	1,600,000
1.8	Utilities Works	l.s.	1	800,000	800,000
1.9	Access Road	l.m.	150	2,000	300,000
1.10	Miscellaneous Works	l.s.	1	3,800,000	3,800,000
					79,725,000
1.10	Post-Panamax Container Quay-side Crane	each	2	5,000,000	10,000,000
1.11	Transfer Cranes	each	3	1,000,000	3,000,000
					13,000,000
2	Container Terminals (Diablo 2nd Stage)				
2.1	Dredging (-12m)	cu.m.	1,210,000	2.0	2,420,000
2.2	Rock Dredging (-12m)	cu.m.	210,000	200	42,000,000
2.3	Excavation & Fill	cu.m.	60,000	2	120,000
2.4	- 14m Quay	l.m.	350	67,500	23,625,000
2.5	Pavement	sq.m.	123,000	150	18,450,000
2.6	Building	sq.m.	0	200	0
2.7	Electrical Works	l.s.	1	400,000	400,000
2.8	Utilities Works	l.s.	1	200,000	200,000
2.9	Access Road	l.m.	350	0	0
2.10	Miscellaneous Works	l.s.	1	4,360,000	4,360,000
					91,575,000
2.10	Post-Panamax Container Quay-side Crane	each	1	5,000,000	5,000,000
2.11	Transfer & Reinstall of Panamax Container Quay-side Crane	l.s.	1	750,000	750,000
					5,750,000

Table 7-1-3 Preliminary Construction Cost (Alternative - D4)

Item No.	Description of Work	Unit	Quantity	Unit Rate (US\$)	Total Amount (US\$)
3	Tuna Boat Berths (Balboa)				
3.1	Dredging	cu.m.	0	1.5	0
3.2	Excavation & Fill	cu.m.	0	2	0
3.3	- 7.5 m Quay	l.m.	180	50,000	9,000,000
3.4	Pavement	sq.m.	3,600	100	360,000
3.5	Access Road	l.m.	50	1,000	50,000
3.6	Electrical/Utilities/Miscellaneous Works	l.s.	1	1,880,000	1,880,000
					11,290,000
4	Sand/Gravel Landing Berth (Amador)				
4.1	Dredging	cu.m.	170,000	2.5	425,000
4.2	- 4.0 m Quay (pontoon type 60 m)	l.s.	1	200,000	200,000
4.3	Electrical/Utilities/Miscellaneous Works	l.s.	1	31,250	31,000
					656,000
5	Renovation of Pier No. 18				
5.1	Passenger Terminal (3,000 m ²)	sq.m.	3,000	150	450,000
5.3	Parking (6,800 m ²)	sq.m.	6,800	50	340,000
5.4	Electrical/Utilities/Miscellaneous Works	l.s.	1	39,500	40,000
					830,000
6	Substitute Mangrove at Amador				
6.1	Soil Transport and Fill	cu.m.	850,000	1	850,000
6.2	Submerged Dike	l.m.	1,200	550	660,000
6.3	Plantation	ha	14	4,500	63,000
					1,573,000
	Short-Term Development, Civil Works				185,649,000
	Ditto, Equipment				18,750,000
	Ditto, Total				204,399,000
C	Master Plan				
1	Container Terminals (Farfan) Stage I				
1.1	Dredging (-14m)	cu.m.	11,890,000	3	35,670,000
1.2	Rock Dredging (-14m)	cu.m.	120,000	200	24,000,000
1.3	Excavation & Fill	cu.m.	60,000	2	120,000
1.4	- 15m Quay	l.m.	350	73,500	25,725,000
1.5	Pavement	sq.m.	110,300	150	16,545,000
1.6	Building	sq.m.	15,300	200	3,060,000
1.7	Electrical Works	l.s.	1	1,600,000	1,600,000
1.8	Utilities Works	l.s.	1	750,000	750,000
1.9	Access Road	l.s.	1	4,300,000	4,300,000
1.10	Miscellaneous Works	l.s.	1	11,180,000	11,180,000
					122,950,000
1.10	Container Quay-side Crane	each	2	5,000,000	10,000,000
1.11	Transfer Cranes	each	3	1,000,000	3,000,000
1.12	Reach Stackers	each	1	350,000	350,000
1.13	Toplifters	each	2	70,000	140,000
1.14	Trailers	each	10	60,000	600,000
1.15	Chassis	each	10	20,000	200,000
1.16	Other Equipment	l.s.	1	500,000	500,000
					14,790,000

Table 7-1-3 Preliminary Construction Cost (Alternative - D4)

Item No.	Description of Work	Unit	Quantity	Unit Rate (US\$)	Total Amount (US\$)
2	Container Terminals (Farfan) Stage 2				
2.1	Dredging (-14m)	cu.m.	1,080,000	3	3,240,000
2.2	Rock Dredging (-14m)	cu.m.	55,000	200	11,000,000
2.3	Excavation & Fill	cu.m.	60,000	2	120,000
2.4	- 15m Quay	l.m.	350	73,500	25,725,000
2.5	Pavement	sq.m.	122,500	150	18,375,000
2.6	Electrical Works	l.s.	1	400,000	400,000
2.7	Utilities Works	l.s.	1	250,000	250,000
2.8	Access Road	l.m.	350	2,000	700,000
2.9	Miscellaneous Works	l.s.	1	5,980,000	5,980,000
					65,790,000
2.8	Container Quay-side Crane	each	2	5,000,000	10,000,000
2.9	Transfer Cranes	each	3	1,000,000	3,000,000
2.10	Reach Stackers	each	1	350,000	350,000
2.11	Teplifters	each	2	70,000	140,000
2.12	Trailers	each	10	60,000	600,000
2.13	Chassis	each	10	20,000	200,000
2.14	Other Equipment	l.s.	1	500,000	500,000
					14,790,000
3	Oil Berth (Amador)				
3.1	Dredging (-12 m)	cu.m.	2,180,000	3	6,540,000
3.2	Platform	l.s.	1	3,000,000	3,000,000
3.3	Breasting Dolphins	each	2	1,000,000	2,000,000
3.4	Mooring Dolphins	each	2	500,000	1,000,000
3.5	-7.5 m Berth (130 m)	l.m.	130	50,000	6,500,000
3.6	-5.5 m Berth (100 m)	l.m.	100	40,000	4,000,000
3.7	Approach Trestle	l.s.	1	1,000,000	1,000,000
3.8	Electrical/Utilities/Miscellaneous Works	l.s.	1	2,400,000	2,400,000
					26,440,000
	Master Plan, Civil Works				215,150,000
	Ditto, Equipment				29,580,000
	Ditto, Total				244,730,000
	Total				507,559,000
	Engineering Cost				23,526,000
	Grand Total				531,085,000

Table 7-1-4 Preliminary Construction Cost (Alternative - D5)

Item No.	Description of Work	Unit	Quantity	Unit Rate	Total Amount
				(US\$)	(US\$)
A	Urgent Measures				
1	Improvement of Piers	l.s.	1	45,000,000	45,000,000
2	Equipment				
	a. Panamax Container Quay-side Cranes	each	2	4,500,000	9,000,000
	b. Transfer Crane	each	3	1,000,000	3,000,000
	c. Reach Stackers	each	1	350,000	350,000
	d. Top Lifters	each	3	70,000	210,000
	e. Trailers	each	10	60,000	600,000
	f. Chassis	each	12	20,000	240,000
					13,400,000
	Urgent Measures, Civil Works				45,000,000
	Ditto, Equipment				13,400,000
	Ditto, Total				68,400,000
B	Short-Term Development				
1	Container Terminals (Diablo 1st Stage)				
1.1	Dredging (-12m)	cu.m.	850,000	2.0	1,700,000
1.2	Reclamation	cu.m.	350,000	6	2,100,000
1.3	- 14m Quay	l.m.	350	67,500	23,625,000
1.4	Pavement	sq.m.	110,000	150	16,500,000
1.5	Building	sq.m.	6,500	200	1,300,000
1.6	Electrical Works	l.s.	1	1,600,000	1,600,000
1.7	Utilities Works	l.s.	1	800,000	800,000
1.8	Access Road (incl. bridge)	l.m.	520	2,400	1,248,000
1.9	Miscellaneous Works	l.s.	1	4,890,000	4,890,000
	Total				53,763,000
1.10	Post-Panamax Container Quay-side Crane	each	2	5,000,000	10,000,000
1.11	Transfer Cranes	each	3	1,000,000	3,000,000
					13,000,000
2	Container Terminals (Diablo 2nd Stage)				
2.1	Reclamation	cu.m.	820,000	6	4,920,000
2.2	- 14m Quay	l.m.	350	67,500	23,625,000
2.3	Pavement	sq.m.	123,000	150	18,450,000
2.4	Electrical Works	l.s.	1	400,000	400,000
2.5	Utilities Works	l.s.	1	200,000	200,000
2.6	Access Road	l.m.	350	2,000	700,000
2.7	Miscellaneous Works	l.s.	1	4,830,000	4,830,000
					53,125,000
2.10	Post-Panamax Container Quay-side Crane	each	1	5,000,000	5,000,000
2.11	Transfer & Reinstall of Panamax Container Quay-side Crane	l.s.	1	750,000	750,000
					6,750,000

Table 7-1-4 Preliminary Construction Cost (Alternative - D5)

Item No.	Description of Work	Unit	Quantity	Unit Rate	Total Amount
				(US\$)	(US\$)
3	Tuna Boat Berths (Balboa)				
3.1	Dredging	cu.m.	190,000	1.5	285,000
3.2	- 7.5 m Quay	l.m.	180	50,000	9,000,000
3.3	Pavement	sq.m.	3,600	100	360,000
3.4	Access Road	l.m.	240	1,000	240,000
3.5	Electrical/Utilities/Miscellaneous Works	l.s.	1	1,980,000	1,980,000
					11,865,000
4	Sand/Gravel Landing Berth (Amador)				
4.1	Dredging	cu.m.	170,000	2.5	425,000
4.2	- 4.0 m Quay (pontoon type 60 m)	l.s.	1	200,000	200,000
4.3	Electrical/Utilities/Miscellaneous Works	l.s.	1	31,250	31,000
					656,000
5	Renovation of Pier No.18				
5.1	Passenger Terminal (3,000 m ²)	sq.m.	3,000	150	450,000
5.3	Parking (6,800 m ²)	sq.m.	6,800	50	340,000
5.4	Electrical/Utilities/Miscellaneous Works	l.s.	1	39,500	40,000
					830,000
6	Substitute Mangrove at Amador				
6.1	Soil Transport and Fill	cu.m.	850,000	1	850,000
6.2	Submerged Dike	l.m.	1,200	550	660,000
6.3	Plantation	ha	14	4,500	63,000
					1,573,000
	Short-Term Development, Civil Works				121,812,000
	Ditto, Equipment				18,750,000
	Ditto, Total				140,562,000
C	Master Plan				
1	Container Terminals (Farfan) Stage 1				
1.1	Dredging (-14m)	cu.m.	11,890,000	3	35,670,000
1.2	Rock Dredging (-14m)	cu.m.	120,000	200	24,000,000
1.3	Excavation & Fill	cu.m.	60,000	2	120,000
1.4	- 15m Quay	l.m.	350	73,500	25,725,000
1.5	Pavement	sq.m.	110,300	150	16,545,000
1.6	Building	sq.m.	15,300	200	3,060,000
1.7	Electrical Works	l.s.	1	1,600,000	1,600,000
1.8	Utilities Works	l.s.	1	750,000	750,000
1.9	Access Road	l.s.	1	4,300,000	4,300,000
1.10	Miscellaneous Works	l.s.	1	11,150,000	11,150,000
					122,950,000
1.10	Container Quay-side Crane	each	2	5,000,000	10,000,000
1.11	Transfer Cranes	each	3	1,000,000	3,000,000
1.12	Reach Stackers	each	1	350,000	350,000
1.13	Toplifters	each	2	70,000	140,000
1.14	Trailers	each	10	60,000	600,000
1.15	Chassis	each	10	20,000	200,000
1.16	Other Equipment	l.s.	1	500,000	500,000
					14,790,000

Table 7-1-4 Preliminary Construction Cost (Alternative - D5)

Item No.	Description of Work	Unit	Quantity	Unit Rate	Total Amount
				(US\$)	(US\$)
2	Container Terminals (Farfan) Stage 2				
2.1	Dredging (-14m)	cu.m.	1,080,000	3	3,240,000
2.2	Rock Dredging (-14m)	cu.m.	55,000	200	11,000,000
2.3	Excavation & Fill	cu.m.	60,000	2	120,000
2.4	- 15m Quay	l.m.	350	73,500	25,725,000
2.5	Pavement	sq.m.	122,500	150	18,375,000
2.6	Electrical Works	l.s.	1	400,000	400,000
2.7	Utilities Works	l.s.	1	250,000	250,000
2.8	Access Road	l.m.	350	2,000	700,000
2.9	Miscellanies Works	l.s.	1	5,980,000	5,980,000
					65,790,000
2.8	Container Quay-side Crane	each	2	5,000,000	10,000,000
2.9	Transfer Cranes	each	3	1,000,000	3,000,000
2.10	Reach Stackers	each	1	350,000	350,000
2.11	Toplifters	each	2	70,000	140,000
2.12	Trailers	each	10	60,000	600,000
2.13	Chassis	each	10	20,000	200,000
2.14	Other Equipment	l.s.	1	600,000	600,000
					14,790,000
3	Oil Berth (Amador)				
3.1	Dredging (-12 m)	cu.m.	2,180,000	3	6,540,000
3.2	Platform	l.s.	1	3,000,000	3,000,000
3.3	Breasting Dolphins	each	2	1,000,000	2,000,000
3.4	Mooring Dolphins	each	2	500,000	1,000,000
3.5	-7.5 m Berth (130 m)	l.m.	130	50,000	6,500,000
3.6	-5.5 m Berth (100 m)	l.m.	100	40,000	4,000,000
3.7	Approach Trestle	l.s.	1	1,000,000	1,000,000
3.8	Electrical/Utilities/Miscellaneous Works	l.s.	1	2,400,000	2,400,000
					26,440,000
	Master Plan, Civil Works				215,180,000
	Ditto, Equipment				29,580,000
	Ditto, Total				244,760,000
	Total				413,722,000
	Engineering Cost				20,335,000
	Grand Total				464,057,000

7.2 Implementation Schedule

(1) Assumptions

14. The construction schedule is worked out to meet the target year of each stage of each phase i.e. the construction and equipment procurement should be completed by the end of the previous year of each target year. Six schedules are prepared for both the alternatives and low- and high-case demands.

15. It is assumed that, for the existing facilities at Balboa, the improvement works currently being commenced will continue regardless of the concession contract between APN and HIT.

(2) Construction Phases and Stages

16. The development, both short-term and long-term, is divided into several stages of the developments. Their major components and target years are shown in Table 7-1-1.

17. For Alternative - D3, Figure 7-2-1 and Figure 7-2-2 show the construction schedule covering both the short-term and long-term developments for the low-case and high-case of the cargo demands respectively. For Alternative - D4, Figure 7-2-3 and Figure 7-2-4 similarly show the construction schedule. For Alternative Plan - D5, Figure 7-2-5 and Figure 7-2-6 show the schedule.

18. For Alternative - D3, Table 7-2-1 and Table 7-2-2 summarize the yearly disbursement of the construction expenses covering both the short-term and long-term developments for the low-case and high-case of the cargo demands respectively. For Alternative - D4, Table 7-2-3 and Table 7-2-4 similarly summarize the yearly disbursement of the construction expenses. For Alternative Plan - D5, Table 7-2-5 and Table 7-2-6 summarize the disbursement.

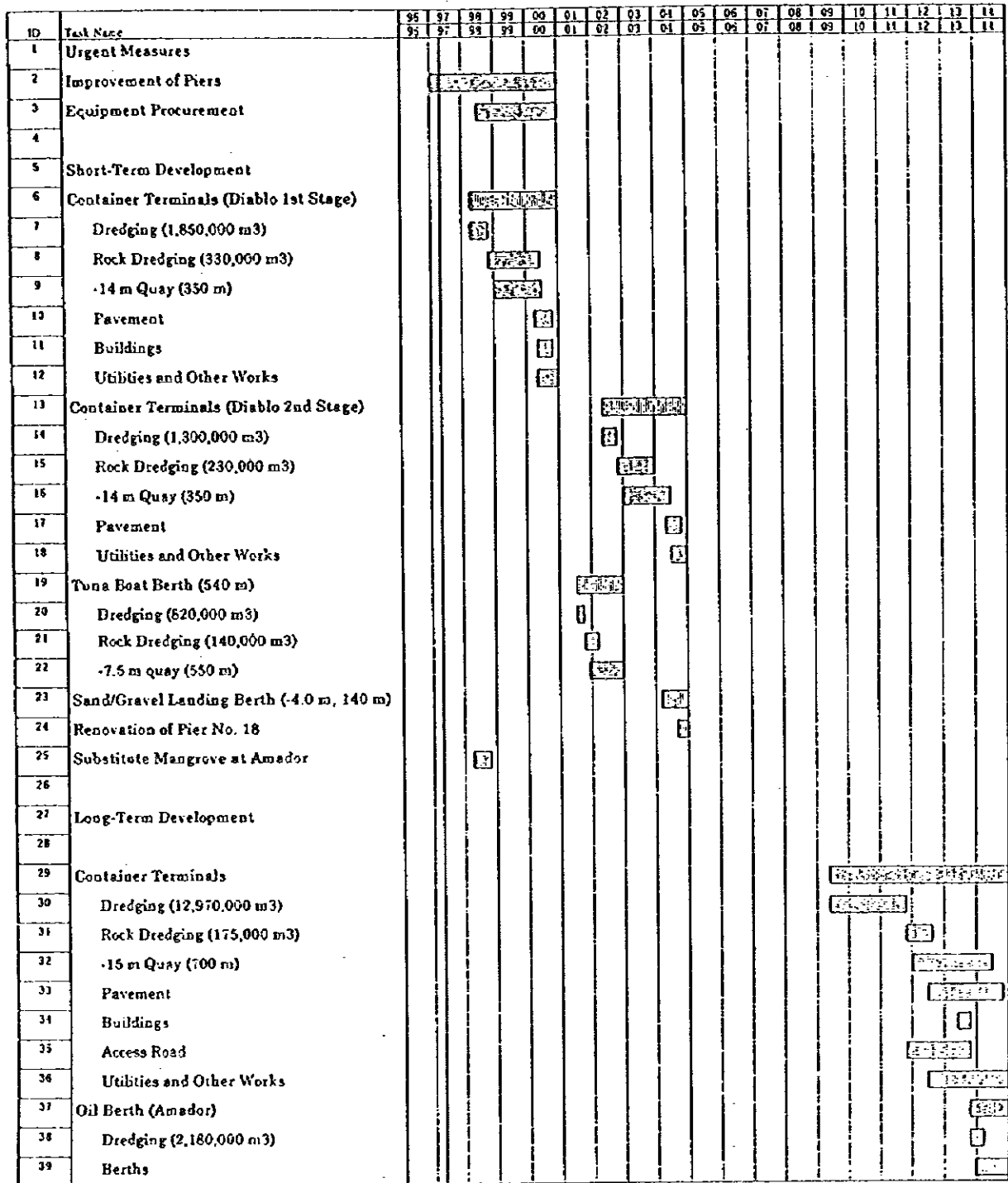


Figure 7-2-1 Construction Schedule of Alt. D3 (Low-Case Demand)

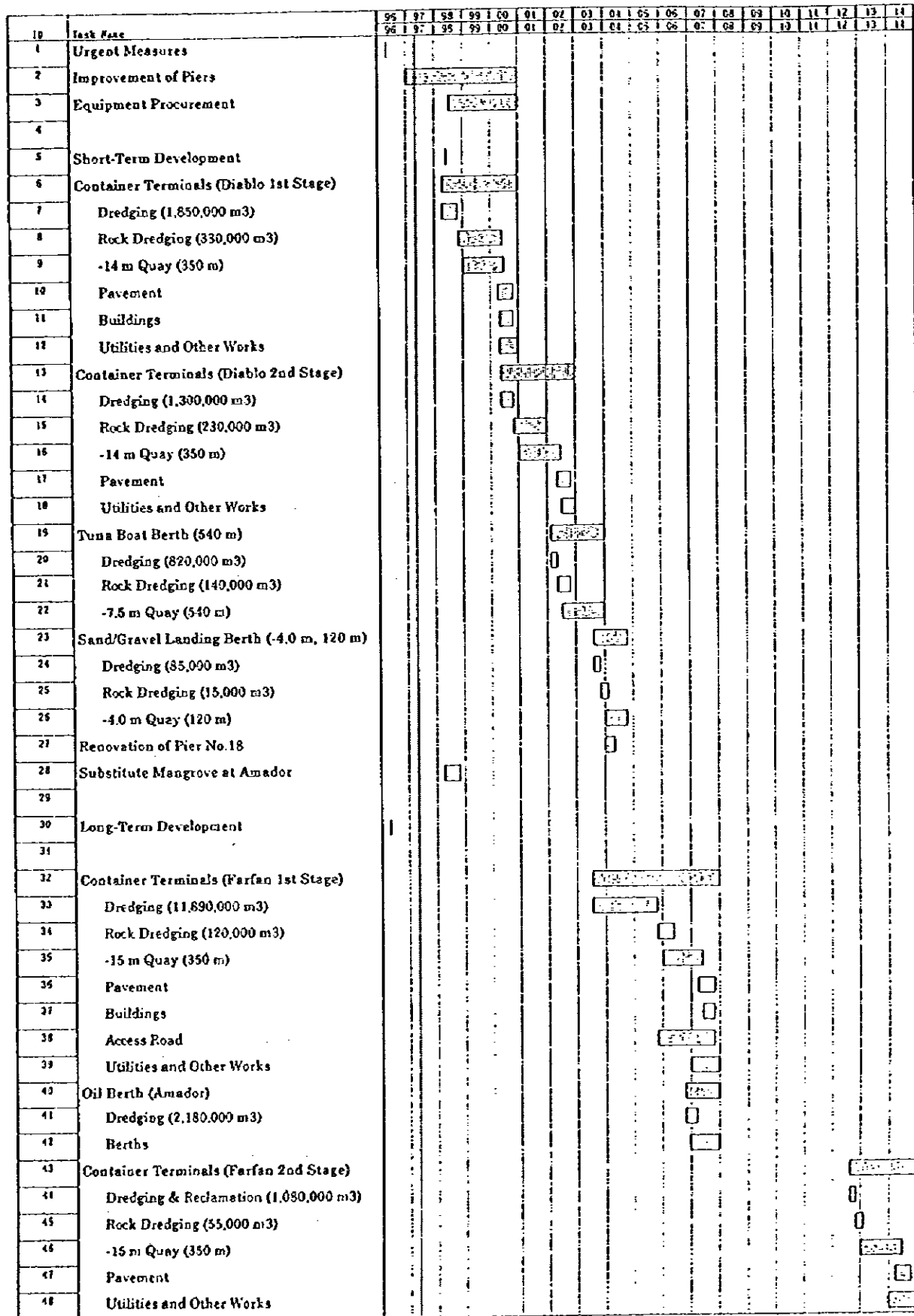


Figure 7-2-2 Construction Schedule of Alt. D3 (High Case Demand)

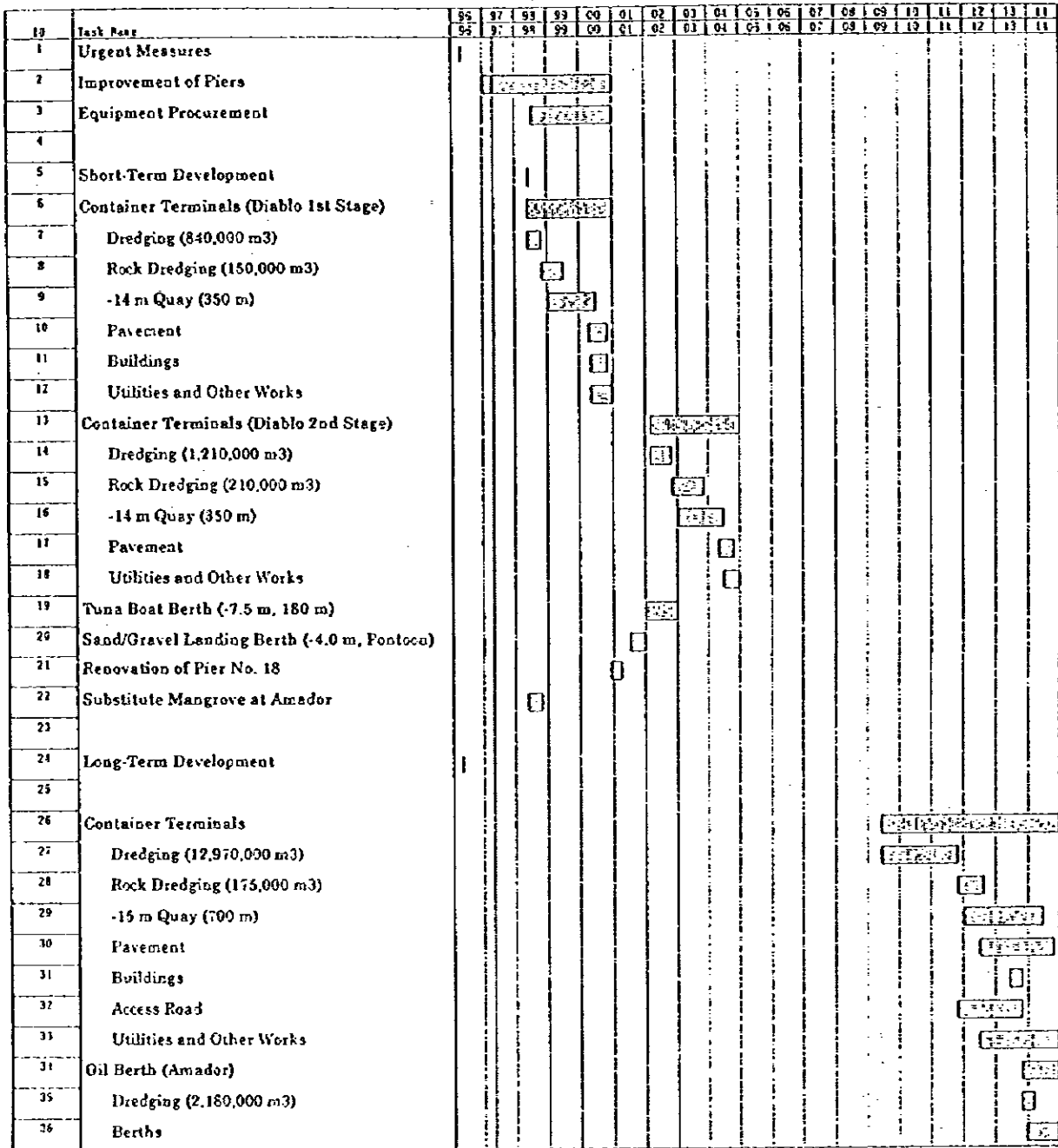


Figure 7-2-3 Construction Schedule of Alt. D4 (Low-Case Demand)

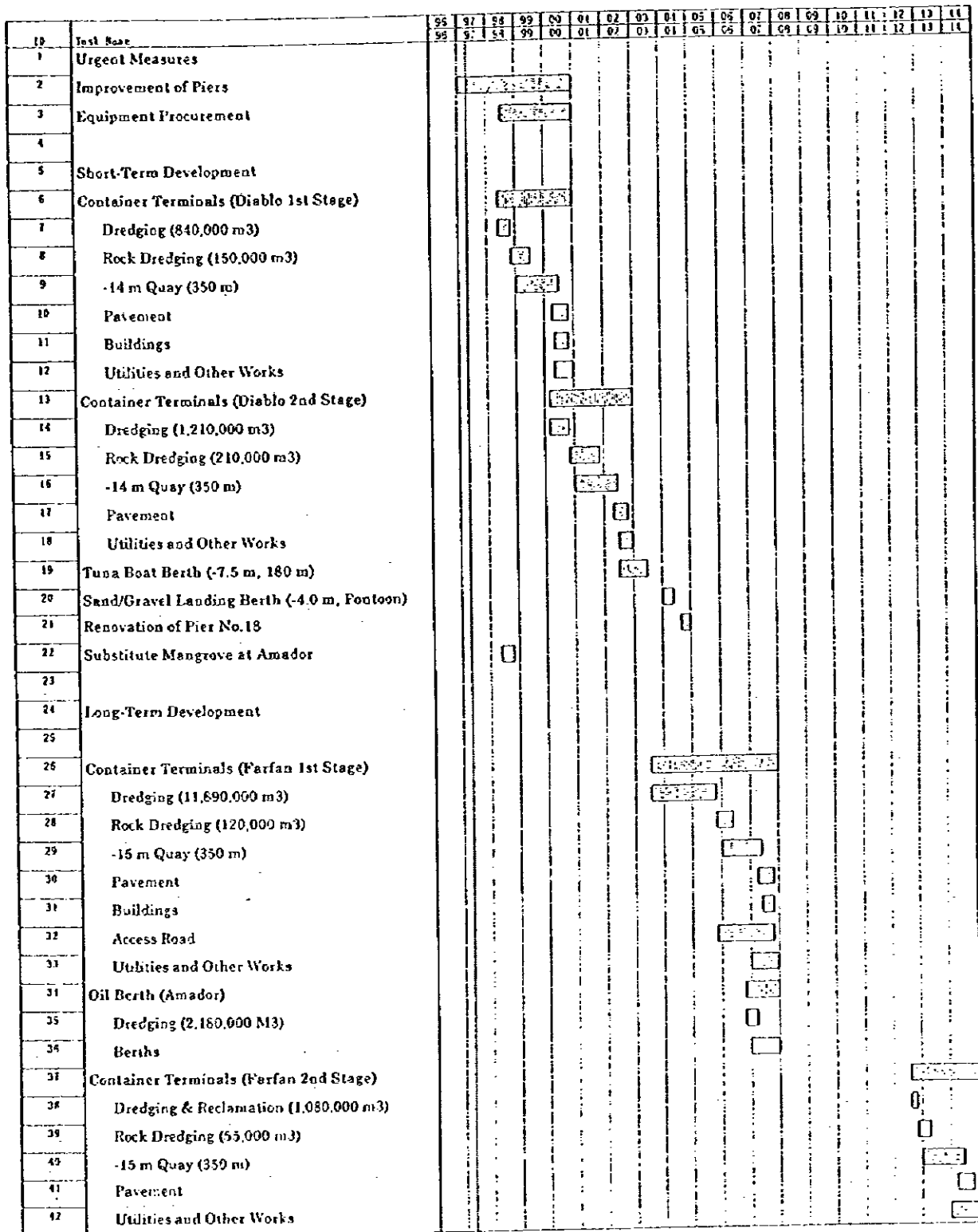


Figure 7-2-4 Construction Schedule of Alt. D4 (High-Case Demand)

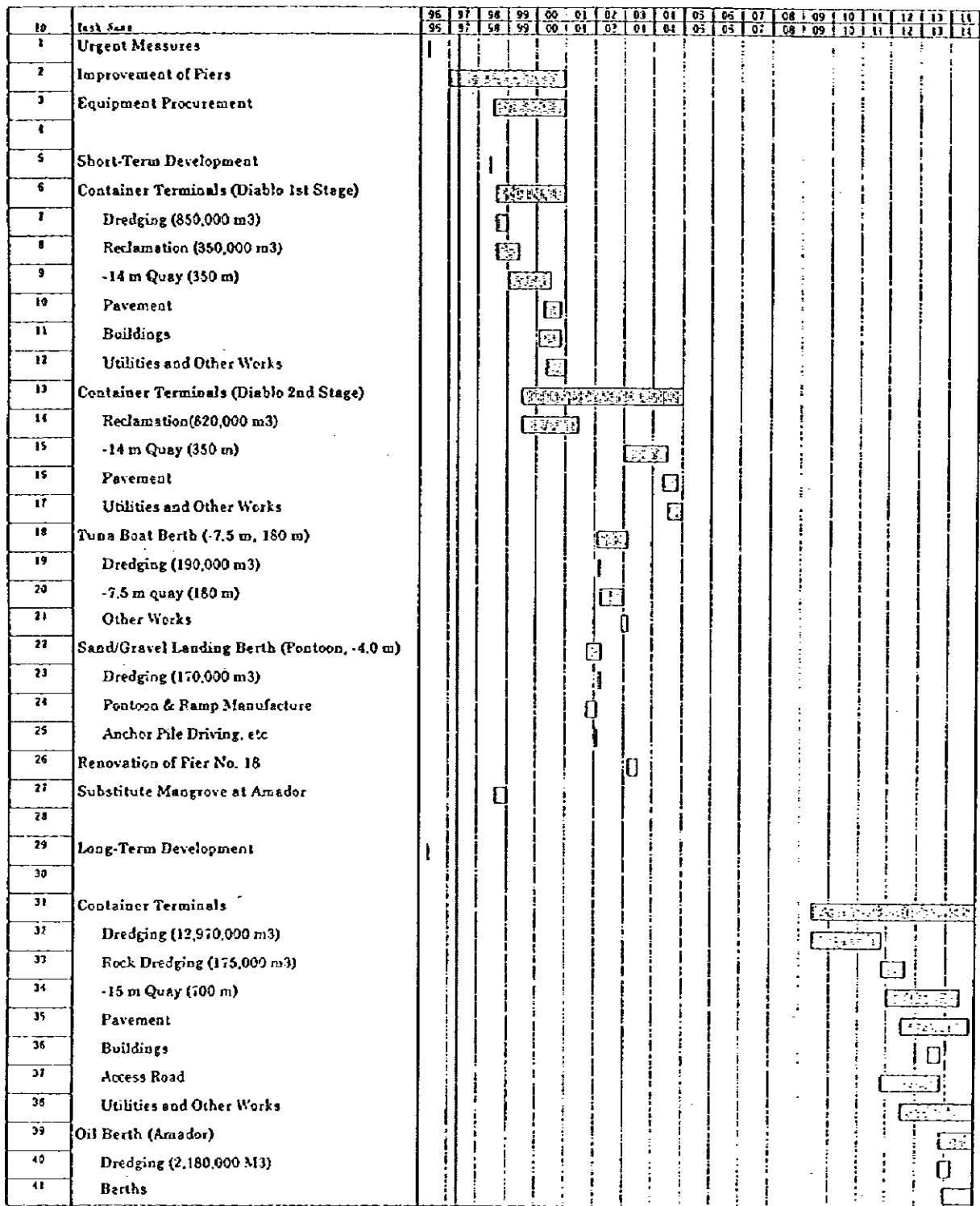


Figure 7-2-5 Construction Schedule of Alt. D5 (Low-Case Demand)

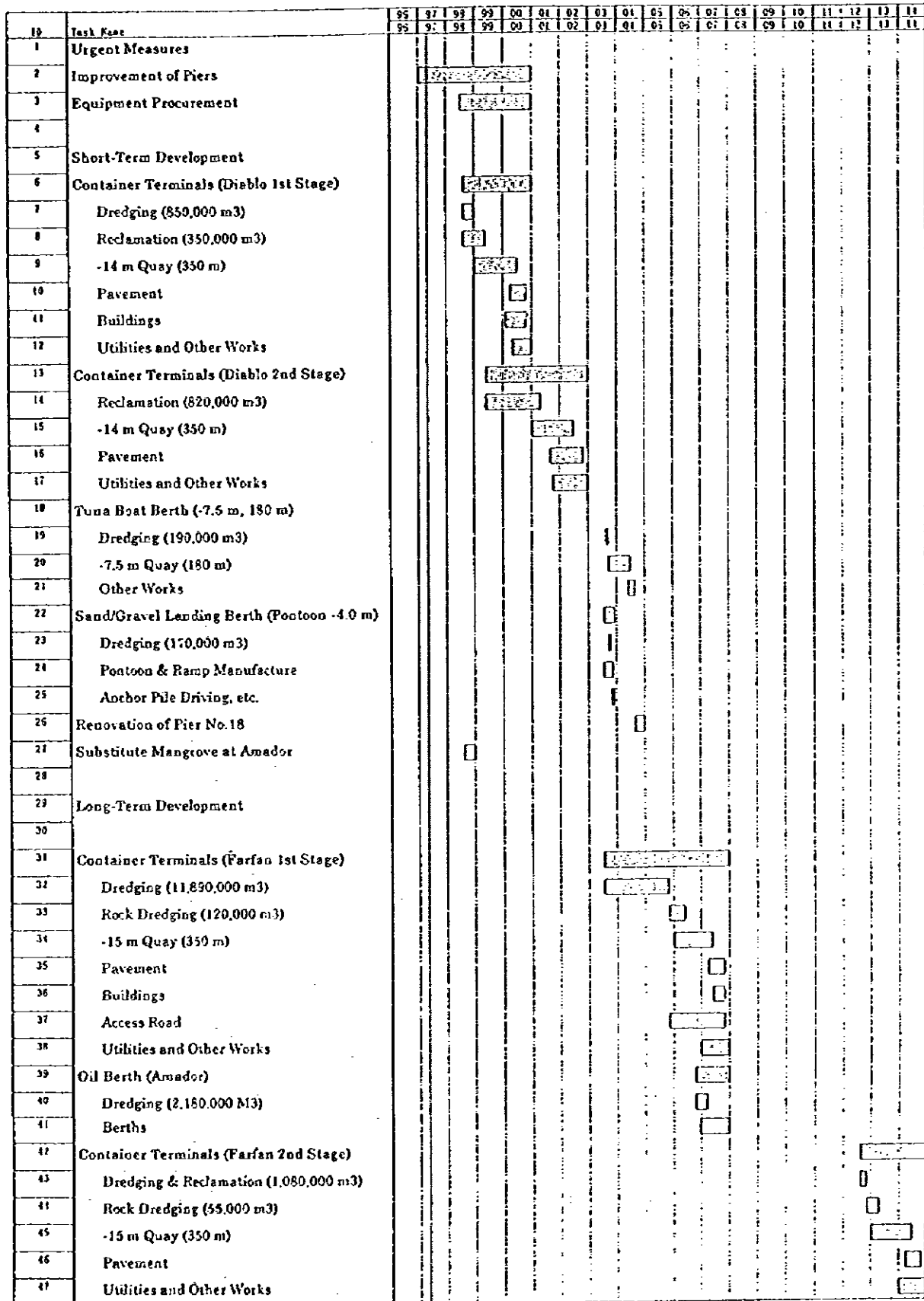


Figure 7-2-6 Construction Schedule of Alt. D5 (High-Case Demand)

Table 7-2-3 Yearly Disbursement of Alt. D4 (Low-Case Demand)

	Total Amount	1,977	1,978	1,979	2,000	2,001	2,002	2,003	2,004	2,005	2,006	2,007	2,008	2,009	2,010	2,011	2,012	2,013	2,014	
A. Urgent Measures	0.55																			
1. Investment of 1977	46,000,000	46,000,000																		
2. Equipment (single life time)	2,000,000	2,000,000																		
3. Equipment (multiple life time)	4,000,000	4,000,000																		
4. Subtotal	6,000,000	6,000,000																		
B. Short Term Development																				
1. Contingency Terminal (Double Life Time)	79,250,000	79,250,000	47,750,000	21,500,000																
2. Civil Works	10,000,000																			
3. Equipment (single life time)	5,000,000																			
4. Equipment (multiple life time)	5,000,000																			
5. Subtotal	25,000,000																			
C. Medium Term																				
1. Contingency Terminal (Double Life Time)	91,575,000						10,267,000	29,814,000	2,400,000											
2. Civil Works	5,250,000							7,000,000	11,250,000											
3. Equipment (single life time)	11,250,000							11,250,000	11,250,000											
4. Equipment (multiple life time)	6,000,000							4,000,000	4,000,000											
5. Maintenance of Port No. 13	1,575,000							1,575,000	1,575,000											
6. Subtotal	25,650,000						12,842,000	56,654,000	26,475,000											
D. Medium Term																				
1. Contingency Terminal (Single Life Time)	189,740,000																			
2. Civil Works	20,000,000																			
3. Equipment (single life time)	2,000,000																			
4. Equipment (multiple life time)	2,000,000																			
5. Oil Beach (Amortize)	244,700,000																			
6. Subtotal	656,440,000																			
E. Civil Works Sub-total	415,850,000	15,000,000	21,400,000	62,240,000	24,435,000	13,360,000	10,267,000	49,814,000	2,400,000											
6. Equipment (single life time)	20,000,000							11,250,000	11,250,000											
7. Equipment (multiple life time)	44,750,000							4,000,000	4,000,000											
8. Equipment (other life time)	15,000,000							15,000,000	15,000,000											
9. Maintenance of Port No. 13	1,575,000							1,575,000	1,575,000											
10. Subtotal	82,825,000							36,825,000	36,825,000											
Total	331,045,000	15,745,000	31,022,000	80,311,000	52,245,000	26,720,000	10,734,000	107,440,000	51,614,000											

Table 7-2-4 Yearly Disbursement of Alt. D4 (High-Case Demand)

Total Amount (US\$)	1,997	1,998	1,999	2,000	2,001	2,002	2,003	2,004	2,005	2,006	2,007	2,008	2,009	2,010	2,011	2,012	2,013	2,014
A. Urgent Measures																		
1. Improvement of Ferry	48,000,000	10,000,000	10,000,000	10,000,000	10,000,000													
Equipment (longer life time)	9,000,000	5,000,000	5,000,000	5,000,000														
Equipment (shorter life time)	4,000,000	2,000,000	2,000,000	2,000,000														
2. Equipment (shorter life time)	58,400,000	10,000,000	20,200,000	22,200,000														
B. Short Term Development																		
1. Container Terminal (Double Jet Stage)																		
Civil Works	72,700,000	7,200,000	47,700,000	34,000,000														
Equipment (longer life time)	10,000,000	6,000,000	6,000,000	6,000,000														
Equipment (shorter life time)	3,000,000	1,900,000	1,900,000	1,900,000														
2. Container Terminal (Double Jet Stage)																		
Civil Works	91,070,000	64,470,000	64,470,000	29,040,000														
Equipment (longer life time)	6,700,000	700,000	700,000	700,000														
Equipment (shorter life time)	11,900,000	6,000,000	6,000,000	6,000,000														
3. Tugboat (shorter life time)	646,000	646,000																
4. Salvage Tugboat (Double)	830,000	830,000																
5. Salvage Tugboat (Double)	830,000	830,000																
6. Salvage Tugboat (Double)	830,000	830,000																
7. Submarine Inspection and Dredger	111,270,000	1,000,000	1,000,000	1,000,000	34,270,000	5,010,000	1,400,000											
8. Monitor (tug)																		
C. Monitor (tug)																		
1. Container Terminal (Porton Jet Stage)																		
Civil Works	177,000,000																	
Equipment (longer life time)	10,000,000																	
Equipment (shorter life time)	3,100,000																	
2. (C) (Porton Dredger)	29,200,000																	
3. Container Terminal (Porton Jet Stage)																		
Civil Works	86,700,000																	
Equipment (longer life time)	10,000,000																	
Equipment (shorter life time)	4,700,000																	
D. Container Terminal (Porton Jet Stage)																		
Civil Works Sub-total	472,870,000	16,600,000	24,470,000	63,740,000	35,446,000	64,670,000	29,276,000	16,600,000	21,376,000	30,437,000	31,034,000	42,246,000	14,964,000	0	0	0	0	0
Equipment (longer life time) Sub-total	22,291,000	760,000	1,210,000	2,134,000	1,672,000	5,024,000	1,481,000	1,000,000	1,627,000	1,627,000	2,161,000	2,741,000	741,000	0	0	0	0	0
Equipment (shorter life time) Sub-total	44,700,000	0	5,100,000	11,000,000	6,000,000	7,600,000	6,000,000	0	0	0	0	0	0	0	0	0	0	0
Equipment (longer life time) Sub-total	10,900,000	0	2,200,000	2,700,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equipment (shorter life time) Sub-total	1,200,000	0	1,000,000	1,300,000	16,000	100,000	0	0	0	0	0	0	0	0	0	0	0	0
Porton	601,060,000	16,770,000	31,100,000	41,100,000	41,707,000	72,394,000	35,781,000	18,370,000	23,443,000	31,110,000	32,044,000	42,450,000	23,216,000	0	0	0	0	0
Total	7,120,000	32,850,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000	24,770,000

Table 7-2-5 Yearly Disbursement of Alt. D5 (Low-Case Demand)

Total Amount	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
0.55																			
A. Upkeep Activities																			
1. Improvement of Piers	16,000,000	16,000,000	16,000,000	16,000,000															
2. Equipment (longer life time)	9,000,000	9,000,000	9,000,000	9,000,000															
3. Equipment (shorter life time)	4,500,000	4,500,000	4,500,000	4,500,000															
4. Equipment (shorter life time)	26,400,000	26,400,000	26,400,000	26,400,000															
B. Short Term Development																			
1. Container Terminal (Double Jet Slip)	62,700,000	10,700,000	21,600,000	21,600,000															
2. Civil Works	10,000,000		6,000,000	6,000,000															
3. Equipment (longer life time)	2,000,000		1,600,000	1,600,000															
4. Equipment (shorter life time)	26,700,000		10,700,000	28,000,000	28,000,000														
5. Container Terminal (Double Jet Slip)	63,100,000		1,400,000	2,400,000	6,100,000	13,700,000	19,700,000	13,700,000											
6. Civil Works	6,100,000																		
7. Equipment (longer life time)	11,800,000																		
8. Equipment (shorter life time)	1,600,000																		
9. Sited/Crane/ Landing berth (Double)	1,600,000																		
10. Renovation of Pier No. 18	1,600,000																		
11. Submarine Manoeuvre at Anchor	73,700,000		1,000,000	1,000,000	2,400,000	2,400,000	2,400,000	8,400,000	24,400,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000	18,000,000
C. Marine Plan																			
1. Container Terminal (Double)	188,700,000																		
2. Civil Works	20,000,000																		
3. Equipment (longer life time)	9,200,000																		
4. Civil Works (Anchor)	26,400,000																		
5. Civil Works Subtotal	381,900,000	18,000,000	27,000,000	37,900,000	23,900,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000
6. Equipment (longer life time)	19,100,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	7,000,000
7. Equipment (shorter life time)	44,700,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000	31,300,000
8. Equipment (longer life time) Subtotal	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000	11,900,000
9. Equipment (shorter life time) Subtotal	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
10. Equipment (longer life time) Subtotal	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
11. Equipment (shorter life time) Subtotal	404,000,000	18,700,000	28,000,000	38,000,000	24,000,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000	24,400,000
Total	948,000,000	55,900,000	73,000,000	101,600,000	64,600,000	64,600,000	64,600,000	64,600,000	64,600,000	64,600,000	64,600,000	64,600,000	64,600,000	64,600,000	64,600,000	64,600,000	64,600,000	64,600,000	64,600,000

Table 7-2-6 Yearly Disbursement of Alt. D5 (High-Case Demand)

	Total Amount	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
A. Upstream Measures																			
1	Investment of Years	46,000,000	16,000,000	16,000,000	16,000,000														
2	Equipment (longer life time)	9,000,000	3,000,000	6,000,000															
3	Equipment (shorter life time)	4,400,000	2,200,000	2,200,000															
4	Equipment (shorter life time)	68,400,000	16,000,000	20,000,000	25,000,000														
B. Shorefront Development																			
1	Container Terminal (Phase 1st Stage)	68,763,000	19,763,000	21,600,000	21,600,000														
2	Crane Work	10,000,000																	
3	Equipment (longer life time)	3,000,000																	
4	Equipment (shorter life time)	3,000,000																	
5	Equipment (shorter life time)	66,763,000	19,763,000	21,600,000	25,000,000														
C. Container Terminal (Phase 2nd Stage)																			
1	Crane Work	60,192,000																	
2	Equipment (longer life time)	2,760,000																	
3	Equipment (shorter life time)	2,760,000																	
4	Crane Work	11,968,000																	
5	Equipment (shorter life time)	62,000,000																	
6	Standard Landing Bunch (Quarries)	490,000																	
7	Renovation of Pier No. 13	3,673,000																	
8	Subsiding Maintenance at Abutment	73,795,000																	
9	Shoring Pier																		
D. Container Terminal (Phase 3rd Stage)																			
1	Crane Work	122,960,000																	
2	Equipment (longer life time)	10,000,000																	
3	Equipment (shorter life time)	4,700,000																	
4	Crane Work	79,440,000																	
5	Equipment (shorter life time)	184,140,000																	
E. Container Terminal (Phase 4th Stage)																			
1	Crane Work	25,790,000																	
2	Equipment (longer life time)	10,000,000																	
3	Equipment (shorter life time)	4,730,000																	
4	Crane Work	60,192,000																	
5	Equipment (shorter life time)	10,000,000																	
6	Equipment (shorter life time)	60,192,000																	
F. Total																			
1	Crane Work	361,562,000	16,000,000	27,328,000	28,328,000	28,328,000	28,328,000	28,328,000	28,328,000	28,328,000	28,328,000	28,328,000	28,328,000	28,328,000	28,328,000	28,328,000	28,328,000	28,328,000	28,328,000
2	Equipment (longer life time)	10,000,000																	
3	Equipment (shorter life time)	4,700,000																	
4	Crane Work	79,440,000																	
5	Equipment (shorter life time)	184,140,000																	
6	Standard Landing Bunch (Quarries)	490,000																	
7	Renovation of Pier No. 13	3,673,000																	
8	Subsiding Maintenance at Abutment	73,795,000																	
9	Shoring Pier																		
G. Total																			
1	Crane Work	7,120,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000	17,850,000
2	Equipment (longer life time)	6,000,000																	
3	Equipment (shorter life time)	2,326,000																	
4	Crane Work	7,120,000																	
5	Equipment (shorter life time)	2,326,000																	
6	Standard Landing Bunch (Quarries)	490,000																	
7	Renovation of Pier No. 13	3,673,000																	
8	Subsiding Maintenance at Abutment	73,795,000																	
9	Shoring Pier																		

VIII ADMINISTRATION, MANAGEMENT AND OPERATION OF BALBOA PORT ON A MASTER PLAN

8.1 Expected Roles and Organization of APN Concerning Balboa Port

8.1.1 Port management and operation of Balboa toward the 21st century

(1) Introduction

1. Balboa Port, the one and only container-handling port on the Pacific side in Panama, has introduced a privatized cargo operation under concession contract with HIT.

2. Even though Balboa is strategically located at the Pacific coast and in the vicinity of the population center, full scale container terminal operated by Manzanillo International Terminal (MIT) and another privatized operation introduced to Coco Solo Norte by Evergreen might absorb some of the container cargo being handled at Balboa Port. Balboa Port should take this opportunity of HIT's terminal operation to be competitive with other neighboring modernized ports in and outside of Panama on maritime trades. To this end, it is indispensable to realize efficient port management and operation, aiming at inexpensive, speedy and reliable services.

(2) Basic policies

3. Basic policies required for efficient and strategic port management and operation are as follows.

- a) Establishment of efficient management and operation system to prevent monopoly and to maintain impartial usage of the port facilities.
- b) Realization of management and operation which facilitates efficient cargo handling and aims for the pursuit of economical port activities.

(3) Management and Operation Issues at Balboa Port toward the 21st Century

4. Issues to be considered in consideration of the aforementioned policy on port management and operation are as follows.

- a) In reference to "How APN should be coordinated with private sectors on

port management and operation at the Balboa Port", APN should define its roles and strive to reform the present organization.

- b) Considering conditions under the terminal operation concession at the Balboa Port, the organization of Balboa Administration Office should be reconsidered and its expected roles should be defined.
- c) Paying attention to conditions not only of privatized operation by HIT in Balboa Port, but also to conditions after reversion of the Panama Canal in 1999, efficient management system for the control of water area, land area and port facilities should be prepared..

8.1.2 Expected Roles and Organization

(1) APN Central Office

1) Expected Roles

- a) Establishment of the system to supervise concessionaires

5. As an administrative agency, APN has to determine its policy on the roles it should play at Balboa Port after introduction of privatized operation, and to make its stance clear to concessionaires. It is also necessary for APN to establish a system to communicate with concessionaires - the matters that are associated with contracts should be determined directly between APN Central Office and concessionaires while ordinary adjustment may be conducted by the Administration Office of Balboa Port - and also establish systems hereby instructions and approval can be given.

6. Furthermore, it is necessary to urgently establish a system to check volumes of cargo handling (research and statistics) which are directly linked to collection of charges. In addition, APN should have legal authority to investigate this matter if necessary.

- b) Management and operation of other areas

7. It is necessary to establish policies at an early stage regarding the areas not covered by the concession at this time: for example, how to deal with services etc. that are provided by the private sectors at present under the lease contract, and how APN should manage and operate in the next development stage (Farfan

district etc. is included) including possible new concessions by other terminal operators.

- c) Management and operation of the water area, the land area and port facilities

8. It is needless to say that management of the water area, the land area and port facilities should be conducted in an efficient manner in accordance with the authorized plan. Points that should be noted in management thereof are as follows:

- a. Management of the water area

9. If control of the water area is not made properly, smooth access to the yard of cargo handling will be impossible, and an "efficient port", which is one of the important attributes of an "attractive port", cannot be realized.

10. At present, a vessel berthing at Balboa port must submit to regulations of PCC when she enters the canal area, while activities inside of the port, for example, installation of maritime facilities such as the light house, placement of buoys, navigational control security, etc., are controlled by different administrative agencies.

11. Exclusive use or general use of the water area of the port should be strictly regulated by the administrative agency by setting the rule that use of the water area should be subject to approval of the administrative organization of the port regardless of the type of activities. As to the control of vessel movement from the canal area to port, on the other hand, APN is required to establish unified and flexible management system to realize smooth access, in cooperation with PCC and other agencies.

- b. Management of the land area

12. APN does not the coastal area of the country, but owns the land area in the neighborhood of the port (limited to the area for port activities). Therefore, the land area is under the control of APN.

13. For the future, however, more systematic management is required. For concessional development by HIT and for subsequent development plans in the future, APN should possess the function to check the development plans of areas

even where APN holds no property. Furthermore, it is likely that as Balboa Port and the neighboring area continue to develop, some degree of control over various activities even outside of APN's control will be required to attain the overall target of the port which is directly linked to national interests.

14. At the same time, for its practical effect, it is recommended that APN should have legal authority on the above mentioned monitoring system.

c. Management of the port facilities

15. Development and improvement plans of the port facilities should be implemented so that all ports in Panama may have their own roles and functions in a harmonized manner. Budgets including funds for maintenance and repair works should be established based on plans.

d) Establishment of a system to facilitate close communication with the Administration Office of Balboa Port

16. Depending the degree of privatization at Balboa Port, the Administration Office of Balboa Port will control concessionaires, and give guidance to them, and collect charges from them at the site. APN Central Office should establish a system to facilitate closer communication with the Administration Office of Balboa Port than before so that enough communication with them may be secured.

e) Enhancement of marketing activities and statistical system

17. In order to properly manage and operate the water area, the land area and the port facilities, it is definitely important to estimate the future cargo demand and incorporate the data into development, management and maintenance strategies of the port.

18. The present statistical system focuses on compilation of historical data into reports. In the future, however, it is necessary to estimate cargo handling volume of the port in consideration of growth of domestic and foreign economies, maritime trends of the world (the structure of world trade and current conditions of major liner services) and resultant development of ports, and to feed such data back to marketing activities and development of ports. Details related to this item are mentioned in "Organization".

2) Organization

19. The organization of APN should be drastically revised so that APN may play the roles as specified in the preceding item.

a) Management of the organization

20. APN Central Office has six divisions of executive level :Administration, Finance, Port Service, Engineering, Planning and Marketing & Commercialization Divisions. Almost all activities required for management and operation of the port are covered by above Divisions.

21. However, the problem is whether or not a network or system will be devised so that above Divisions may effectively respond to diversifying port activities as a result of privatization etc. Considering future port activities into 21st century, APN needs the following organizations:

a. "Strategic Organization" that is required to compete with neighboring ports of Central and South American countries;

22. Realization of "Strategic Organization" requires enhancement of activities, such as marketing, promotion and statistics/information processing that provides data to support marketing and promotional activities. Marketing & Promotion Division and Statistics Division will be always required to implement concerted activities in close coordination with each other. All data that are required for marketing strategy should be collected by the Port Administration Office.

23. However, present activities are not necessarily conducted in an efficient and systematic manner. In the future, APN Central Office will be required to grasp the current conditions of cargo handling at each port using the computer network: in particular, data for destinations, shippers, sea routes, contents of cargo and volume should be inputted, and data by sea route, data by cargo type and data by final place of consumption should be outputted on a real-time basis to be used as supporting data for strategic activities as aforementioned.

24. For promotional activities, preparation of annual reports and leaflets, and dispatch of port promotion missions are commonly implemented by every modernized port but the novelty of such activities has been lost. In the future, therefore, promotional activities will be required that focus on differences from other ports by specifically providing data regarding advantageous points on freight,

transit time, service frequency, etc. of Balboa Port will be required. Marketing & Communication Division should be further enhanced taking above points into consideration.

b. "Flexible and Systematic Organization" that can immediately respond to needs of the times;

25. "Flexible and Systematic Organization" will need enhanced ability of Marketing Division to collect information. This is simply because plans where strong points and potentials of each port are considered should be established based on scientific forecast of future needs and "development, management and maintenance plans" as mentioned above. Therefore, Marketing & Communication Division and Planning Office should implement concerted activities. Furthermore, organizational change by consolidating both organizations may be recommended.

26. In the case of the Budget Office which presently belongs to the Planning Office, we would like to propose that Budget Office should be transferred to the Financial Office in consideration of its close relationship.

c. "Collaborative Organization" that can attain the target of the port in collaboration with the private sector after operation of the port is privatized.

27. In order to realize "Collaborative Organization", a certain Division should solely control all concessioners and lessors of facilities, and function as a unified liaison office for communication and coordination activities.

28. In most cases, Concession Department is only conducting coordination activities for private lessees based on lease contracts at present. However, Concession Department should have the function to fully control port activities of private sector based on major concession contracts that are being concluded at Balboa and Cristobal Ports at present.

29. Both ports need to drastically change their organizations including rationalization after privatization. A special division should be established to deal with these matters.

b) Personnel management

a. Number of Personnel

30. Although APN Central Office has less than 700 staffs at present, further study is needed to determine the appropriate number of staffs in the rationalization process. Because it was decided to privatize Balboa and Christobal Ports, however, a significant reduction in the number of staffs will be required centering on the Operational Division. Considering future cargo volume to be handled at the ports of Panama in comparison with corresponding foreign modernized ports, the number of staffs of APN should be reduced to some extent.

31. Executive level staffs who constitute 80% of the total number of approximately 500 employees at Balboa Port will be deleted from the number of APN employees as a result of privatization. This will also hold true for Cristobal Port.

b. Transfer and promotion

32. Effective allocation of personnel will require early introduction of merit rating system. It is important to establish a merit rating system to help objectively evaluate strong points, ability, etc. of each staff, and to allocate staffs to divisions in a fair manner where they can display their abilities based on such merit rating.

33. As competition among domestic and foreign ports intensifies, strategic port activities and efficient organizational management, where manpower is effectively utilized by allocating the right person to right the job, are required.

34. The Port Administration Office and APN Central Office should exchange staffs more frequently in the future, although such exchange is less frequent now as a result of privatization. In order to increase frequency of exchange of staffs, however, difference in labor conditions such as wage levels between both organizations, which is posing a bottleneck at present, should be firstly resolved.

c. Personnel training system

35. All personnel training for administrative staffs of APN are now conducted by letting staffs participate in training courses organized by related ministries or other related organizations. These training courses may be ideal for obtaining

general knowledge of management, operation, etc. However, it will be increasingly important to provide training courses focusing on "what would be required of APN to develop ports in Panama in an intensifying competitive environment" as aforementioned.

36. Basic concepts for planning these training courses that are directly linked to activities of APN will be summarized into two points as follows:

- Each staff should be made conscious of the growing crisis when competition among ports intensifies and work toward conducting effective promotional activities.
- More effective organization should be established in which costs are reduced as much as possible.

d. Working conditions

37. The largest obstacle for APN to provide fair working conditions is the fact that there exist different wage systems for those who began to work before Balboa and Cristobal Ports were returned from PCC in 1986 and those who began to work after the return of ports. We hope that this problem can be peacefully resolved by consultation with concessionaires and labor unions taking the opportunity of privatization of operations.

(2) The Administration Office of Balboa Port

1) Expected Roles

- a) Establishment of liaison office to communicate with concessionaires and establishment of collaboration system

38. As for the matters that are directly related to contents of contracts, certain responsible Division of APN Central Office will be the liaison office to communicate with concessionaires. However, activities that are related to normal cargo operations will be directly controlled by the Port Administration Office. In particular, activities to supervise cargo handling volume that will be directly reflected in collection of charges will become important responsibilities of the Port Administration Office. Standardized cargo handling volume for collection of charges from concessionaires should be grasped on a real-time basis through information processing using LAN.

b) Control of incoming and outgoing vessels at Balboa Port

39. At present, Administration Office of Balboa Port is controlling incoming and outgoing vessels in cooperation with PCC. Even after wharf operation is privatized, it is recommended that the Administration Office as a public sector organ continue to be responsible for this matter because of its close relationship to safety.

40. As for procedures for incoming and outgoing vessels, a system should be established so that procedures may be controlled efficiently in a unified manner.

c) Enhancement of related services to vessels

41. As aforementioned, Balboa Port is expected to play not only a role as a cargo handling base but a role as an important "rest house" for vessels. Therefore, it is recommended that a network system be established so that various services such as bunkering, water supply, dry dock, launch, etc., may be offered flexibly because needs for such services are expected to increase with development of the port.

d) Enhancement of the system to collaborate with APN Central Office

42. Although the whole organization of the Administration Office of Balboa Port will be retrenched, it is necessary to enhance the system to report problems etc. to APN Central Office from time to time.

2) Organization

43. Depending on its degree, as a result of privatization of cargo operations, various activities related to cargo handling (berth and shed allotment, cargo operation, mooring, etc.) that were conducted by staffs of the Port Administration Office in the past will be transferred to the new company. It is also determined that some activities such as launch service and water supply service will be privatized. It is necessary to drastically change the organization so that the organization may be rationalized.

44. Emphasis should be placed on the following two activities when implementing organizational change. Public sector should continue to be responsible for these matters:

- a) Activities to control and supervise concessionaires and lessees, and liaison activities, as well as establishment of a system for sure and efficient collection of charges;
- b) Activities that are closely related to national interests such as security and pollution control that may be increasingly important as a result of privatization.

8.2 Privatization at Balboa Port

(1) Purpose of Privatization

45. The port operation under APN at Balboa Port is not very efficient and this is characterized by the low cargo-handling productivity (approximately 5.5 boxes per hour per gang for container) and superfluous employees (approximately 500 employees at Balboa Port).

46. In general, introducing the principal of competition improves efficiency. This is one of the main benefits of privatization.

47. The main reasons for privatization in Panamanian ports for "the concession" are as follows:

- ① Saving government expenses
- ② Efficient port operation
- ③ Minimizing government or political interference
- ④ Eliminating redundant government employees

48. According to the purpose of the concession at Panamanian ports, the government expenditure for Ports should be reduced by concessions. However, it is assumed that the annual net income of the government of Panama after the privatization at Manzanillo Port will not exceed the net income before privatization. The reasons are as follows: ① Number of government employees before and after privatization is the same. ② The amount of money received by the government from the concessionaire did not exceed the net profit before privatization. Therefore, the amount of the concession fees of "the concession" should exceed the net profit of APN's Balboa Port before privatization.

49. In general, if a private company carries out all main activities at major ports in a country, there is a danger that the port activities of a country will be

monopolized. However, the project of "the concession" uses the present facilities in the first stage. The income of this project is smaller than a project for full scale container terminal because there are no full scale container terminals in this project of "the concession". Therefore, the economic base of this project should be made by moving from dock Nos.14,15 and 16 to the Diablo area for the container terminal. There are two major ports in Panama, namely Balboa and Cristobal (including ports of Coco Solo Norte and Manzanillo). Furthermore, when the new concession for the container terminal at Farfan area is started, a new concessionaire(different from the concessionaire at Balboa port) will be introduced. Therefore, even if all major functions are carried out by the concessionaire of "the concession" at Balboa Port, there is no fear that port activities will be monopolized by one concessionaire.

(2) Style of Concession

50. The style of concession contract is generally BOT(Build, Operate and Transfer). The period of the contract is 20 or 30 years in general and a contract of concession for port development must contain the following items:

- ① The concessionaire should perform the development, construction, operation, administration and management of the area designate pursuant to the provisions of the contract.
- ② When the contract is terminated, all of the facilities which are constructed by the provisions of the contract become the property of the principal contractor(in general, Government agency).
- ③ The concessionaire must pay the amount designate to the principal contractor(in general, Government agency) in accordance with the provisions of the contract.

51. There are some cases in which the private sector performs the operation, administration and management of the port after the public sector has constructed almost all necessary facilities of the project. The private sector then makes payments to the public sector under a lease contract. Care must be taken not to confuse a concession contract with a lease contract.

52. There are two types of concession in general:

- ① All of the construction works are implemented by the concessionaire.
- ② The most basic infrastructures are constructed by the public sector while the remainder are constructed by the concessionaire. For example, in a port development concession, dredging, reclamation and construction of quay wall are carried out by the public sector and the remainder, namely pavement of yard and construction of

buildings and installation of cargo handling equipment is carried out by the concessionaire.

53. As for the style of "the concession", the private company, namely the concessionaire, firstly constructs the infrastructures and superstructures at "the concession" area. The ownership of those facilities is moved to APN from the concessionaire after the contract is terminated. The concessionaire operates the facilities during the contract period with the payment of concession fees based on the contract.

Table 8-2-1 Basic Type of Port Development Concession

Type of Concession	Construction of infrastructures	Construction of Superstructures	Administration, operation and management
①	Private	Private	Private
②	Public	Private	Private

54. Privatization of port activities is being widely practiced throughout the world.

55. However, many problems have occurred such as:

- 1) Excessive competition has weakened the position of the laborer and working conditions have been affected. (Chile)
- 2) The high income section of the port authority had been privatized. The low income section was left to the authority, and it became necessary for the authority to receive a subsidy from the government. (Malaysia)
- 3) Some private company had a concession. Then, the company monopolized the port activities. As a result, the efficiency of port activities was reduced and the cost was increased. (Philippines)

56. The problems of privatization in Panama:

[For concessionaire]

- The concessionaire must collect the transshipment container cargoes because these are the major containers for the concessionaire. If the concessionaire can not collect a sufficient number of transshipment containers, the cumulated surplus of the concessionaire will not move from minus to plus during the contract period of "the concession".
- Promotion of port activities must be maintained.

[For government]

- Watching and leading system, for example, for the activities of concessionaire, must be established by the government .

(3) Condition of Operation

57. At present, the area of "the concession" is used not only by break bulk cargo ships(including container cargo ships) but also by grain ships, car carriers, passenger ships, ferry boats and fishing boats. Until construction of some substitutive facilities, this situation will remain unchanged, because Balboa Port will have to accommodate vessels other than container ships and conventional break bulk cargo ships.

58. According to the contract of "the concession", the concessionaire will serve all above ship types. It is possible that berths of the concessionaire would be occupied for long periods of time by grain ships and fishing boats, which would have a negative effect on the income of the concessionaire since the berthing time and cargo handling cost of grain ships are longer and lower, respectively, if compared with items of container ships and grain ships. Therefore, care must be taken to ensure that non-container ships do not have a disadvantage for berthing and cargo-handling.

59. At Balboa Port, there are approximately 60 private companies, offering a variety of services such as storage for break bulk cargo, storage for container, storage and cargo-handling for solid break bulk cargo, liquid break bulk cargo, operation of dry dock yards, port services such as water supply, supply for consumer goods for ships, leisure industry, that had contracts with APN.

60. After contract of "the concession" is finalized, there are two kinds of operation systems for private companies at Balboa Port:

- ① Private companies at Balboa Port will continue operations according to the contract between each company and the Government of Panama.
- ② The former contractor of private companies at Balboa Port, the Government of Panama, will be replaced by the concessionaire of "the concession".

61. According to the above environment of operation, the operating body of "the concession" must give care to the following matters.

- 1) Maintaining the high cargo handling efficiency.

- 2) Reducing the number of employees by mechanization and rationalization.
- 3) Acquiring a large volume of transshipment container cargo by reducing operation expense.
- 4) Avoiding labor disputes and accidents to ensure port activities are not interrupted. .
- 5) Eliminating berth waiting time through effective berth assignment.

62. Container cargo at Farfan Area accounts for most of the cargo handling volume. Therefore, in particular, the following three conditions are important for the port operation.

- 1) Port activities must not be halted.
- 2) Cargo handling must be highly efficient for quick dispatch of container ships.
- 3) Reliable container sorting must be carried out with no damage to cargo or pilferage.

63. Transshipment port(mother port) can be established outside of Panama. Therefore, if the above conditions are not met, transshipment cargoes will move to another port.

(4) Necessity of New Container Terminal

64. Comparing the income of concessionaire between the cargo handling of container ship and non-container ship(for example conventional break bulk ships, dry cargo ships), the income generated from non-container ships is lower than that from container ships, in general.

65. This can be clearly demonstrated as follows. For cargo handling of container ships with quay side container cranes, it is assumed that the cargo handling productivity, average ratio of loaded container to total handling container and average cargo volume per container boxes are approximately 20 boxes per crane per hour, 60 % and 10 tons per box, respectively, and the cargo handling productivity per hour per crane is approximately 120 tons per hour per crane. In general, cargo handling productivity of conventional break bulk ship per gang per hour for iron products and general cargo is approximately from 60 to 70 tons and from 30 to 50 tons, respectively. Comparing the productivity per gang per hour of conventional break bulk ship for iron products and general cargo and container ship with quay side container crane, the productivity of the conventional break bulk ship for iron products and general cargo is approximately from 50 % to

60% and from 20% to 40% of the cargo handling productivity of container ship, respectively.

66. As to the cargo handling workers, if a quay side container crane is installed at Balboa port, the number of workers per gang for container handling can be reduced to about 60% of the present number of workers per gang, namely to about 18 workers. According to the information of Balboa Port, the standard number of cargo handling workers per gang for conventional break bulk ship is approximately 21 workers.

67. Based on the above, the cargo handling income generated from conventional break bulk ship is less than by container ship. Even if the purchase cost and repair costs are considered, container cargo handling is more profitable for the concessionaire.

68. Joint use of the same terminal for container ships, dry bulk ships and conventional break bulk ships would result in less efficient cargo handling than exclusive use by one type of ship. For example, if the container ships and grain ships are berthed at the same terminal, container trailers and trucks for grain would cross one another inside the terminal and at the approach road near the terminal. If the container ships and conventional break bulk ships are moored at the same terminal, the distance between the apron of the quay and the transit shed would be long in some cases. Therefore, the cargo handling efficiency is reduced if different kinds of ships are served at the same terminal.

69. The calling grain ships should be berthed at Dock Nos.14, 15 and 16 because no large ships will be moored at Dock No.6. The volume of grain consumption will increase as the Panamanian economy and population grow. Therefore, the tonnage of grain ships will increase because the volume of imported grain will increase according to the above reason. At present, grain ships are berthed at Dock Nos.6 and 14. However, as the number of calling container ships and ships entering the Panama canal increase, the tonnage of grain ships will increase. It is assumed that Dock No.6 will not be able to be used because there is not enough distance between the basin in front of the quay and the entrance channel of Balboa Port and the Panama canal. Therefore, if the number of ships through the channel is increased or the tonnage of berthing ships at Dock No.6 is increased, mooring and un-mooring of large ships would be very difficult and dangerous.

70. Because many kinds of ships(container ships, grain ships and car carriers) must use Dock Nos.14, 15 and 16, it is possible that calling container ships will sometimes be forced to wait for a berth. If the berth waiting frequency is increased, container ships, whose operational costs are high, will not call to Balboa Port. Therefore, the terminal operator should give priority for berthing to container ships. But, if the system of priority is too strong, the non-container ships will face extremely long waiting periods. Shipping companies of these ships may require compensation for the long waiting.

71. Thus all of the above represent negative conditions for the concessionaire, which is a private company, because all large non-container ships must be berthed at Dock Nos.14, 15 and 16 without profit.

72. It is assumed that the concessionaire(HIT) expects a considerable transshipment container cargo handling volume in the project of "the concession". A suitable container yard for a lot of transshipment containers can't be constructed just behind the docks Nos.14, 15 and 16. A tentative container terminal can be constructed at the area of these docks, but the area can not be modified to a full scale container terminal with a container yard capable of storing a lot of transshipment containers. Therefore, the function of container terminal should be moved from the area of Dock Nos.14, 15 and 16 to Diablo area, after construction of the new container terminal at Diablo area. If full scale container terminals can not be constructed at Diablo area in the early stage, it is assumed that the Port of Balboa will not be able to maintain its position as a mother port of container transportation.

73. Accordingly, full scale container terminals should be constructed at a new area(for example Diablo area) as soon as possible. After construction at the new area, concessionaire of "the concession" should operate non-container cargoes at the present facilities.

74. Dock No.14, 15 and 16 will be used to berth mainly conventional break bulk ships and large grain ships after the container terminal moves to the Diablo area. However, when the container terminal at Diablo is saturated, these berths can be temporarily used.

75. According to the demand forecast in Chapter 2, the new container terminal at Farfan area should be opened in 2009(High case). Therefore, the construction should be started in 2007. It is assumed that this project will be carried out by concession system with a concessionaire different from the one at Diablo area.

IX PRELIMINARY ECONOMIC ANALYSIS

9.1 Methodology

1. A preliminary economic analysis is conducted to appraise the economic feasibility of the master plan for the study ports must be conducted before a feasibility study on the short term plan can proceed.
2. The preliminary economic evaluation of a project should show whether the project is justifiable from the viewpoint of the national economy by assessing its contribution to the national economy.
3. An economic analysis will be carried out according to the following method. Master plan will be defined and it will be compared to the "Without" case. Benefits and costs of both cases will be calculated and evaluated.
4. The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the feasibility of the project. The EIRR is a discount rate which makes the costs and the benefits of the project during the project life equal.

9.2 Prerequisites of Analysis

(1) Base Year

5. The "Base Year" in the cost estimation of construction, 1996, is set as the "Base Year" for this study.

(2) Project Life

6. Taking into consideration the depreciation period of the main facilities of 30 years or more, the period of calculation (project life) in the economic analysis is assumed to be 30 years from the time construction is completed.

(3) Foreign Exchange Rate

7. The exchange rate adopted for this analysis is US\$ 1.00 =

B/1.00, the same rate as used in the cost estimation.

(4) "With" case

8. In an economic analysis, benefits are mainly brought about by improvements and expansions in handling capacity. Therefore, the "With" case scenario includes all improvements in productivity and all expansions of port facilities for the master plan.

(5) "Without" case

9. A cost-benefit analysis is conducted on the difference between the "With" and "Without" investment cases. In this study, the following conditions are adopted as the "Without" case.

- a) No investment is made for the port
- b) Container handling capacity of the existing terminal is estimated to be about 60,000 TEUs. The overflowed import-export container cargo is assumed to be handled at the Caribbean ports in Panama and carried by truck between Balboa and those ports. The overflowed transshipment container cargo is accounted as lost opportunity.
- c) As for the container terminal project, the size of vessels and the working efficiency of cargo handling are not the same as "With" case.
- d) Substantial reduction in the existing number of workers and other means to rationalize management are not put into force.

9.3 Costs of the Project

10. The items that should be considered as costs of the projects are construction costs, replacement investment costs, and operational costs. "Residual Value" is also considered as a negative cost in the final year of the project.

(1) Construction Costs

11. Construction costs are divided into such categories as civil costs and mechanical costs. Main mechanical costs are purchasing of

handling equipment.

(2) Replacement Investment Costs

12. As for handling equipment, replacement costs should be considered at the end of depreciation. The period of depreciation is twenty years for a gantry crane and ten years for other equipment.

(3) Operational Costs

13. The operational costs consist of personnel costs, repair and maintenance costs and other operational costs.

1) Personnel Costs

14. There is a surplus work force in the port of Balboa. To reduce this personnel costs, a substantial reduction in the existing labor force and other means to rationalize management are put into practice. And these costs include not only current costs but also temporary costs for the rationalization, namely the dismissal allowances.

2) Repair and Maintenance Costs

15. The repair and maintenance costs of the port facilities and equipment are estimated as a fixed proportion (1 % for structures, 4 % for handling equipment) of the original construction costs. Furthermore, the costs for maintenance dredging done once every five years are estimated

3) Other Operational Costs

16. Operational costs excluding personnel costs and repair and maintenance costs are estimated as a fixed proportion of the personnel costs. Its proportion is assumed to be about 11.4% based on the past records of Balboa Port.

17. Table 9-3-1 shows the calculated results of total costs of the master plan in 1997 - 2044. The costs of low growth case of cargo volume forecast are slightly different from the high growth case costs because of the times of investment.

Table 9-3-1 Total Costs of the Master Plan (1997-2044)
(thousand B/.)

Item/Case	Low Growth Case	High Growth Case
Construction	464,057	464,057
Replacement Investment	130,398	130,398
Operation	470,226	495,704
Residual Value	-38,614	-32,547
Total	1,026,067	1,057,612

9.4 Benefits of the Project

9.4.1 Benefit Items

18. As benefits brought about by the master plan of the study port, the following items are identified.

- a) Generation of foreign currency earnings from handling of transshipment container cargo
- b) Savings in the transport cost for import and export container cargo
- c) Savings in water transportation cost by enlargement of ship size
- d) Savings in mooring costs of ships by improved efficiency of container cargo handling
- e) Savings in existing operational costs
- f) Savings in waiting costs of ships by relieving port traffic congestion in the port
- g) Savings in interest of cargo costs
- h) Reduction of cargo damage and accidents at the port
- i) Promotion of regional economic development
- j) Increase in employment opportunities and incomes

19. Items a), b), c), d) e), f) and g) are considered countable and in this study the monetary benefits of items a), b), c) ,d)and e) are calculated.

9.4.2 Calculation of Benefits

(1) Generation of foreign currency earnings from handling of transshipment container cargo (Benefits from Transshipment)

20. Though the capacity of "Without" case will be 60 thousand TEUs, container traffic will increase to 0.7 - 1.1 million TEUs in 2015 in the "With" case. This means that foreign currency earnings in handling the balance of the container transshipment cargo volumes between both cases would be generated in the master plan.

21. In the "With" case, the container cargo handling capacity is determined by the quantity of the container handling facilities constructed following the master plan. The container transshipment cargo handled by this port is lost and the foreign currency earnings are also lost, when the cargo volume exceeds the capacity of the port facilities.

22. The benefit that will accrue from the projects can be calculated by the following formula.

Benefits from Transshipment

=Difference in handling cargo volume between "With" and "Without" cases

× Handling cost of transshipment container cargo (unit cost)

23. The foreign currency earning from handling of transshipment container cargo is assumed to be 75 Balboas (or US\$) per 1 Box. This unit cost is identical with the existing port tariff "Movement".

(2) Savings in the transport cost for import and export container cargo (Benefits from Transport)

24. When handling volume of the import-export cargo reaches the maximum volume of handling capacity of the port, the cargo which can not be handled in the port will be handled at the Caribbean ports in Panama through the Panama Canal and carried by truck between the Balboa and those ports. In accordance with the implementation of the projects, the above diversion is not necessary.

25. The benefit that will accrue from the projects can be calculated by the following formula.

Benefits from Transport

=Difference in handling import container cargo volume between "With" and "Without" cases

× (Tariff of the Canal + Ship cost) ÷ Loadage

+Difference in land transportation container cargo volume between "With" and "Without" cases

× Land transportation cost (unit cost)

26. The ship size assumed to carry excess cargo to the Caribbean ports through the Panama Canal is 22,000 DWT - 27,000 DWT because of the maximum size of ship coming alongside the existing -12m dept. quay. The scheduled raising of the Canal tariff, namely by 8.7% in 1997 and by 7.9% in 1998 is considered in this study. The cargo volume transported from Balboa to Colon or other areas of the Caribbean by land transportation is assumed to be 30% of all import-export container cargo volume.

(3) Savings in water transportation cost by enlargement of ship size & Savings in mooring costs of ships by efficient container cargo handling (Benefits from Ship Size & Improved Handling Efficiency)

27. The size of calling ships is becoming larger to capitalize on mass transportation. However, large ships call can not at existing shallow berths. The water transportation cost per ton/TEU of cargo will become cheaper by enlargement of ship size.

28. In accordance with the increased efficiency of container cargo handling, the ship mooring time for unloading/loading in the port will be greatly decreased. The reduction of the ship staying time under the "With" case is one of the major benefits of the projects.

29. In this study, the transport and handling of the container cargo are considered to calculate above two benefits. The benefits that will accrue from the projects can be calculated by the following formula.

Benefits from Ship Size & Improved Handling Efficiency
 = (Difference in water transportation cost between "With" and
 "Without" cases (unit cost)
 + Difference in mooring time between "With" and "Without"
 cases
 × Ship's staying cost (unit cost))
 × Import cargo volume

30. The ship size is assumed to be 35,000 DWT - 55,000 DWT in the "With" case and 22,000 DWT - 27,000 DWT in the "Without" case because of the maximum size of ship coming alongside the quay. The handling productivity is assumed to be 25 Boxes per hour per crane in the "With" case and 4.6 Boxes per hour per gang in the "Without" case.

(4) Savings in existing operational costs (Benefits from Operation)

31. Substantial reduction in the existing labor force and other means to rationalize management are put into practice in the "With" case. Therefore, new reasonable operational costs are calculated in this study. The existing operational costs excluding repair and maintenance costs are significantly reduced which is one of the benefits in this study.

32. Table 9-4-1 shows the calculated results of total benefits of the master plan in 1997 - 2044.

Table 9-4-1 Total Benefits of the Master Plan (1997-2044)
 (thousand B/.)

Item/Case	Low Growth Case	High Growth Case
Transshipment	1,950,194	1,961,126
Transport	644,755	963,027
Ship Size & Handling Efficiency	542,807	852,264
Operation	466,320	466,320
Total	3,604,076	4,242,736

9.5 Evaluation of the Project

9.5.1 Calculation of the EIRR

33. The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the economic feasibility of the

benefit analysis is used to appraise the economic feasibility of the project. The EIRR is the discount rate which makes the costs and benefits of a project during the project life equal. It is calculated by using the following formula.

$$\sum_{i=1}^n \frac{Bi - Ci}{(1+r)^{i-1}} = 0$$

where, n: Period of economic calculation (project life)

Bi: Benefits in i-th year

Ci: Costs in i-th year

r: Discount rate

34. Result of the EIRR calculation of the master plan is shown in Table 9-5-1.

9.5.2 Sensitivity Analysis

35. In order to determine whether the project is feasible when certain conditions change, a sensitivity analysis in which costs increase by 10% and the benefits decrease by 10% is made.

36. The sensitivity analysis is calculated by using above formula as the base case and the results are shown in Table 9-5-1.

Table 9-5-1 Results of EIRR Calculation of the Master Plan (%)

Case	Low Growth Case	High Growth Case
Base Case	16.13	16.44
Sensitivity	12.50	12.89

9.5.3 Evaluation

37. The leading view is that the project is feasible if the EIRR exceeds the opportunity cost of capital. In general, the opportunity cost of capital is considered to range from 8 % to 10 % according to the degree of development in each country. It is generally considered that a project with an EIRR of more than 10 % is economically feasible for

infrastructure or social service projects.

38. As for this project, even though the economic calculation only takes into account the items which are easily quantified, the EIRR exceeds 10%. Therefore, this master plan development project is feasible from the viewpoint of the national economy.

39. The benefits of the high growth case are greater than the in low case. However, there is not much to choose between the EIRR of both cases, because the investment of high growth case for developing the port is earlier than in the low case. Also, the investment costs including interest in high growth case are greater than in the low growth case.

X INITIAL ENVIRONMENTAL EXAMINATION (IEE)

1. Major sources of adverse effects of port development can be categorized into three types: (a) location of port; (b) construction; and (c) port operation, including ship traffic and discharges, cargo handling and storage, and land transport. Location of port connotes the existence of structures or landfills, and the position of the development site. Construction implies construction activities in the sea and on land, dredging, disposal of dredged materials, and transport of construction materials. Port operation includes ship-related factors such as vessel traffic, ship charges and emissions, spills and leakage from ships; and cargo-related factors such as cargo handling and storage, handling equipment, hazardous materials, waterfront industry discharges, and land transport to and from the port.

2. The impact of the project on each environmental aspect was evaluated using the check-list shown in Table 10-1-1. This check-list was prepared based on the international standard type often used by international financial organizations. It is also expected to cover the scope of work necessary for the comprehensive and fundamental law and related regulations on the conservation, treatment and utilization concerning the environmental resources in Panama.

3. Since the result of the evaluation of each item differs by its project site, the three major areas: Site-Balboa, Diablo, Farfan were assumed as principal project sites for the future port development. (Here, Balboa includes the area of a new oil terminal at Amador, and Farfan extends to the area of the existing Rodman Naval base.)

4. Each item on this list was evaluated for all these alternative sites. In case that an item is evaluated as "Significant Effect", the corresponding site is shown in "Remarks" columns. Taking this check list into consideration, a brief explanation of the evaluation of major environmental aspects is shown below:

(1) Air, Noise and Smell

5. New container terminal does not essentially affect air pollution, noise and smell by itself so much. New oil terminal will be connected directly to the tank farm without these kinds of impacts. Noise from the expansion of the dry dock is limited.

6. The current problem of dust and smell caused by old-fashioned

equipment for cereal handling should be solved together with the improvement of cargo handling system.

7. On the other hand, port oriented road traffic tends to contribute to such adverse impacts. It is thus desirable for port highways to be built away from residential areas.

(2) Current

8. According to a survey report in 1974, "The Panama Canal Pilot", no significant current was observed. The report states that there are virtually no currents at Docks 15, 16 and 18 (although there is a slight southerly set across the face of Dock 18 if there is a strong discharge from the Curundu River); the strongest currents can be found in the area between the end of Dock 14 and the east bridge abutment and across the face of all of the piers at Rodman; and there is a set onto Dock 6 during ebb tide and off the dock during flood tide.

9. The proposed plan of this Study, the geographical change of which might influence currents, is that at Diablo adjacent north to Pier 18. However, there is no need to investigate the effect on current in detail since the currents seems to be very weak around here as aforementioned.

(3) Water Quality

10. It is pointed out that a few small rivers flowing into the water area near Site - Diablo serve as drain of sewage, not yet disposed, mainly from the inland town area. As the drain is affecting the water quality of the port, the project to construct sewage disposal facilities in the city is expected to be carried out as soon as possible.

11. As to marine pollution prevention, the government of Panama ratified the convention entitled Prevention of Pollution of the Sea from Ships 1973 and the Protocol of 1978 (MARPOL) in 1983. Any discharge or escape of oil or other pollutant into Panamanian waters from any ship, an offshore installation, a pipeline and any place on land is subject to it.

(4) Terrestrial Ecology

12. The Balboa area has already been developed and the ecological importance of the land area is not great. At Diablo, however, there remain a small

colony of mangrove and wildlife might exist in the waterfront area.

13. Farfan is a area which has been almost fully developed as a dredging spoil dump of the Canal. Some birds of passage are observed on and off. The additional impact on the terrestrial ecology will not be significant.

(5) Coastal Marine Ecology

14. Since an inshore fishery does not exist around the port development area, there is no need to evaluate the effect on the fishery.

(6) Displacement of Villages and Facilities

15. The local residences at Diablo will be displaced as the case may be. They are all old and wooden, and have already been reverted by PCC. Ordinary people who rent them at present under the control of the government can be relocated if necessary. (For example, other houses to be reverted by the US will be available for them.)

16. In addition, the relocation of PCC facilities around the port and port facilities with a concession, which are subject to a new plan of port development, should be reconfirmed at need.

(7) Disposal of Dredging Spoil

17. The place and method for dumping dredging spoils will be examined to avoid environmental damage, in case that a great amount of dredging is needed for a deep port construction.

(8) Effect on Navigation Control

18. There is an access channel of the Panama Canal in front of the port development site. Many ships traverse this channel. An increase in the number of ship calls to the ports will make the navigation control more complicated. It is necessary to examine the possibility of serving all ships calling at the port without inducing adverse effects on Canal navigation.

Table 10-1-1 Check List for IEE

Checklist of Environmental Parameters for Port and Harbor Projects
For the Study on the Development Plan at the Port of Balboa

	Actions Affecting Environmental Resources and Values	Damage to Environment	Recommended Feasible Protection Measures	IEE			REMARKS
				No Significant Effect	Significant effect		
					Small (D2)	Moderate (D3)	
(A)	(B)	(C)	(D1)	(D2)	(D3)	(D4)	
A	Actions Affecting Coastal Marine Ecology						
1.	Location on harbor in fisheries reproduction zone	Loss of fisheries reproduction	Consider relocation of harbor site	*			
2.	Location of harbor in fisheries capture zone	Displacement of fishermen families	Relocation of fishing zones	*			
3.	Disposal of dredging spoils into fisheries reproduction zone	Loss of fisheries reproduction	Proper spoils disposal	*			
4.	Disposal of dredging spoils into coral beds	Loss of fragile/precious marine ecology	Proper spoils disposal	*			
5.	Oil spills/leakage within harbor which escape harbor area	Damage to marine ecology (fisheries/corals)	Improved routine and emergency control of oil leakage/spills	*			
6.	Oil spills from tankers on way to and from harbor	Damage to marine ecology (fisheries/corals)	Improved routine and emergency control oil leakage/spills	*			
B.	Actions Affecting Recreational/Resort/Beach Areas along Coastal Zone.	Deprecation of Recreation Areas by:					
1.	Location of harbor too close to recreational areas	Visible turbidity or discoloring of beach waters	Consider relocation of port or of resort	*			
2.	Escape of liquid and solid wastes from harbor ships/facilities area, especially floatables	Silt depositions along shoreline	Extraordinary attention to liquid/ solid waste management	*			
3.	Air pollutant emissions from harbor ships/facilities	Visible floatable wastes	Extraordinary attention to air pollution control		*		All
4.	Disposal dredging spoils which reach along shoreline.	Waste deposition along shoreline	Proper spoils disposal		*		Diablo Parfan
5.	Oil spills/leakage within harbor which escapes harbor area	Oil films on beach waters and shoreline	Improved spill/leakage control and improved emergency oil spill cleanup	*			
6.	Oil spills from tankers on way to and from harbor	Contamination of beach waters	Improved emergency oil spill cleanup	*			
C.	Action Causing Unacceptable Sanitation Conditions in Harbor	Unsanitary Harbor Environment including unacceptable environmental activities health hazards to port and ship workers					
1.	Inadequate provision of water supply to port facilities and ships		Extraordinary attention to water supply	*			
2.	Inadequate management of waste emissions from port facilities		Extraordinary attention to waste management from shore facilities	*			
(a)	liquid sanitary and industrial wastes	Destruction of harbor ecology		*			
(b)	solid sanitary and industrial wastes	hazards for pollution of coastal areas by escape of wastes from harbor		*			
(c)	gaseous emissions from shore industries			*			
3.	Inadequate management of wastes from ships	Similar to A 1,2,3,4, above	Extraordinary attention to management from ships	*			
(a)	liquid wastes, especially floatables, including bilge waters			*			
(b)	solid wastes, especially floatables, including garbage			*			
4.	Escape of oils within harbor	Similar to A 1,3,4, above	Improved routine and emergency controls of oil leakage and spills				
D.	Handling of Hazardous Cargoes within Harbor Especially	Similar to A 1,2,3,4	Extra Careful Attention in Design/ Operations				
1.	Dust Emissions (for example, handling of coal and cassava dusts)	Air pollution and explosion hazards	Proper air pollution control	*			
2.	Hazardous materials (inflammable, explosives, toxic substances)	Health and safety of workers and nearby residents	Proper control of hazardous materials	*			
E	Handling of Materials to and from Harbor						

1.	Traffic congestion	Airpollution and explosion hazards	Proper air pollution control	*	*		All
2.	Hazardous materials (flammable, explosives, toxics)	Health and safety of workers and nearby residents	Proper control of hazardous materials	*			
F.	Actions Affecting Local Socioeconomics						
1.	Inadequate housing for new population	Hazards for creating slums	Planning to prevent slum problems	*			
2.	Inadequate health precautions during construction (especially malaria)	Communicable disease hazards	Proper planning of construction worker facilities	*			
(a)	communicable disease hazards from imported workers/carriers)	Proper precautions during construction	spraying of workers camp for anopheline mosquito control	*			
(b)	inadequate water supply and sanitation for workers	provision for adequate facilities	provision for adequate facilities	*			
3.	Changes in land use patterns:						
(a)	displacement of agriculture	loss of agricultural values	appropriate resettlement	*			
(b)	displacement of villages	displacement of villages	appropriate resettlement		*		Diablo, Farfan(road)
4.	Excessive noise from harbor operations	Health of harbor workers and nearby residents	Adequate noise control	*			
G.	Actions Affecting Terrestrial Ecology						
1.	Adverse impact on local forest	Similar to A 1 to A 6 above	Similar to A1 to A6 above		*		Diablo
2.	Adverse effects on wildlife from loss in forest habit	(ditto)	(ditto)		*		Diablo
3.	Adverse effects on estuarine lagoons (fisheries, wildlife)	(ditto)	(ditto)		*		Diablo
II.	Actions Caused by Changes in Coastal Hydrology	Physical Damage to Coastal Facilities/ Ecology	Careful Project Design with Respect to Hydrology plus Protection Facilities.				
1.	Deposition along nearby coastal areas	Damage to shoreline properties	Proper engineering to avoid problem	*			
2.	Erosion along nearby coastal areas	(ditto)	(ditto)	*			
3.	Adverse effect on marine water quality	Damage to living conditions	(ditto)		*		All
I.	Actions Affecting Precious Historical/Culture/Religious Monuments/Sites	Loss or Damage to Resources	Relocation or Protection Measures				
1.	By displacement or submergence			*			
2.	By alternations in coastal zone hydrology/shoreline			*			
J.	Hazards from Access Roads/Traffic Living Harbor	Collision/Spill Hazards to Ships	Proper Design for Harbor Access	*			
K.	Navigation Hazards from Ship Entering or Leaving Harbor				*		All

CONCLUSIONS: No significant adverse environmental effect to be caused by project. No EIA needed.
 * Significant environmental impact as shown in columns D2, D3 and D4. Follow-up IEA needed.