development of port activities such as the increase of cargo volume and the mechanization of cargo handling.

- o the specialized berths for bulk cargoes should have enough water depth to cope with the calling of larger size vessels.

In addition to the above points, the plan must be economical in its construction cost and ensure efficiency in the implementation of construction program. This is most important in mapping out the short term development plan.

6-4 Port Planning

6-4-1 Master plan

To provide the required number of berths, three alternatives are proposed as shown in Figs. 6-4-1, 6-4-2 and 6-4-3.

The difference between the three alternatives is the layout of the three PPA berths to be constructed in the period of the short term development plan.

In Case 1, these three berths are laid out with length of 650 m along the natural coast-line between the existing PPA pier and AG & P pier as shown in Fig. 6-4-1.

In Case 2, they are prepared on a rectangular reclaimed area with a 280 m width and approximately a 200 m length as shown in Fig. 6-4-2.

In Case 3, a pier is proposed with a width of 50 m and a length of about 450 m accommodating two conventional berths on one side and one bulk carrier berth on the other side.

Case 1 was prepared giving preference to efficiency in cargo handling, while Case 3 gives prefrence to the maneuvering of vessels and their stability alongside the berths. Case 2 was prepared in order to meet both of these points to some extent. Comparison from several view points will be made later in 6-4-2.

As for the portion which is to be implemented beyond 1990, there is no difference between the three alternatives.

The face lines of the berths are arranged taking into account the depth contour lines and the conditions of reefs that have developed at the project site. They are located around the depth contour lines which correspond to the required water depth of each berth. Their directions are nearly north to south, the most favorable direction for the maneuvering of vessels as well as for their stability at berth, judging from the marine conditions in the Bay of San Fernando.

Such directions of berths will also serve to disperse the energy of invading waves, and in addition, a buffer pond is laid out to reduce the magnitude of wave energy. Further, some measures need to be taken in designing the structure of berths and revetments, in order to absorb invading waves, particularly, those at the time of typhoons.

The layout of berths was planned based on the following considerations.

1) PPA berths should be located adjacent to the area which is to be developed under the short term development plan, so as to simplify, the overall management of the PPA berths.
2) Cement handling berths should be located at a site where, if needed, deeper water berths can be easily designed.

3) Berths for ore carriers should be located at a site which is some distance from the mouth of the Bay, so as to make possible the easy maneuvering of large vessels.

4) Oil tanker berths should be located separately from other berths.

For reference, a smaller scale alternative plan can be prepared for the portion to be implemented beyond 1990. The plan handles the case just corresponding to the number of required berths in the target year of 2000, and as a result, has no reservation for future expansion (Fig. 6-4-4).

In this case, the outer shoreline of the reclaimed land and the site of the breakwater are moved 250 m shoreward. Following such changes in the outer demarcation of the port area, the construction cost can be reduced (Appendix 6-6). However, this plan lacks flexibility to meet the future development of port activities. As a rule, once a breakwater or shore revetment facing the ocean is completed, it is very difficult to expand the port facilities beyond them. This is why the smaller case, shown in Fig. 6-4-4, is not prepared as an alternative.

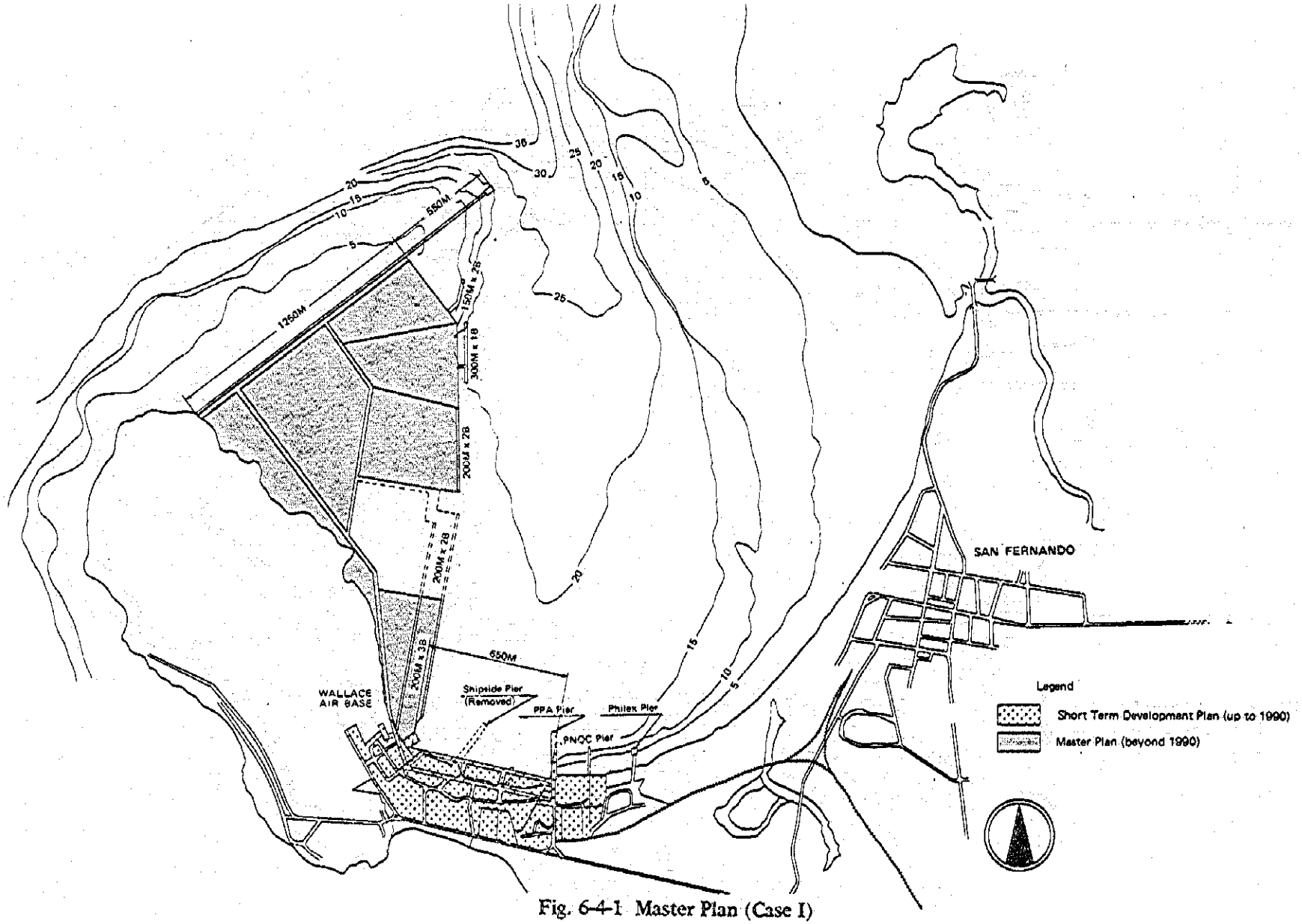


Fig. 6-4-1 Master Plan (Case I)

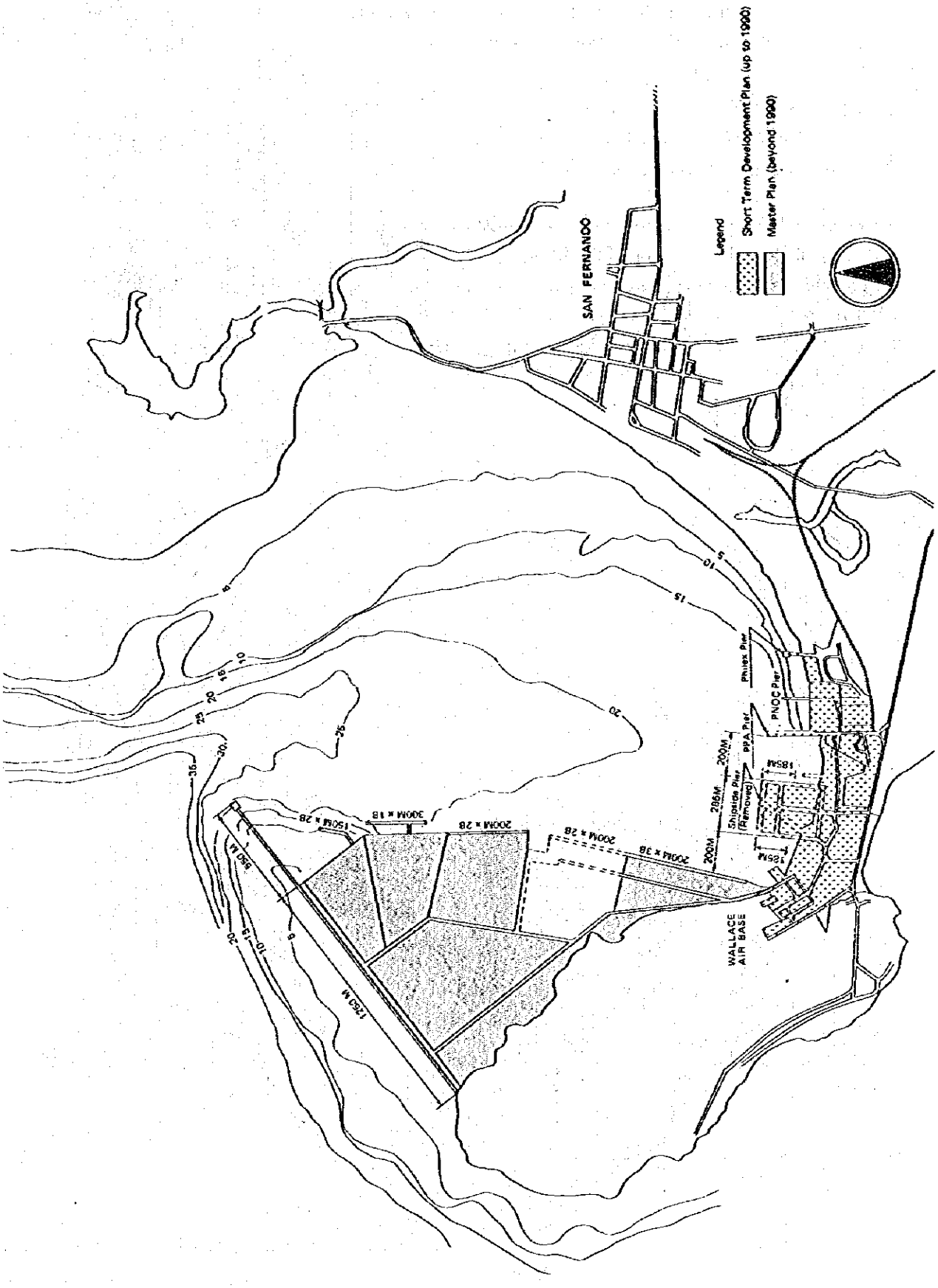


Fig. 6-4-2 Master Plan (Case 2)

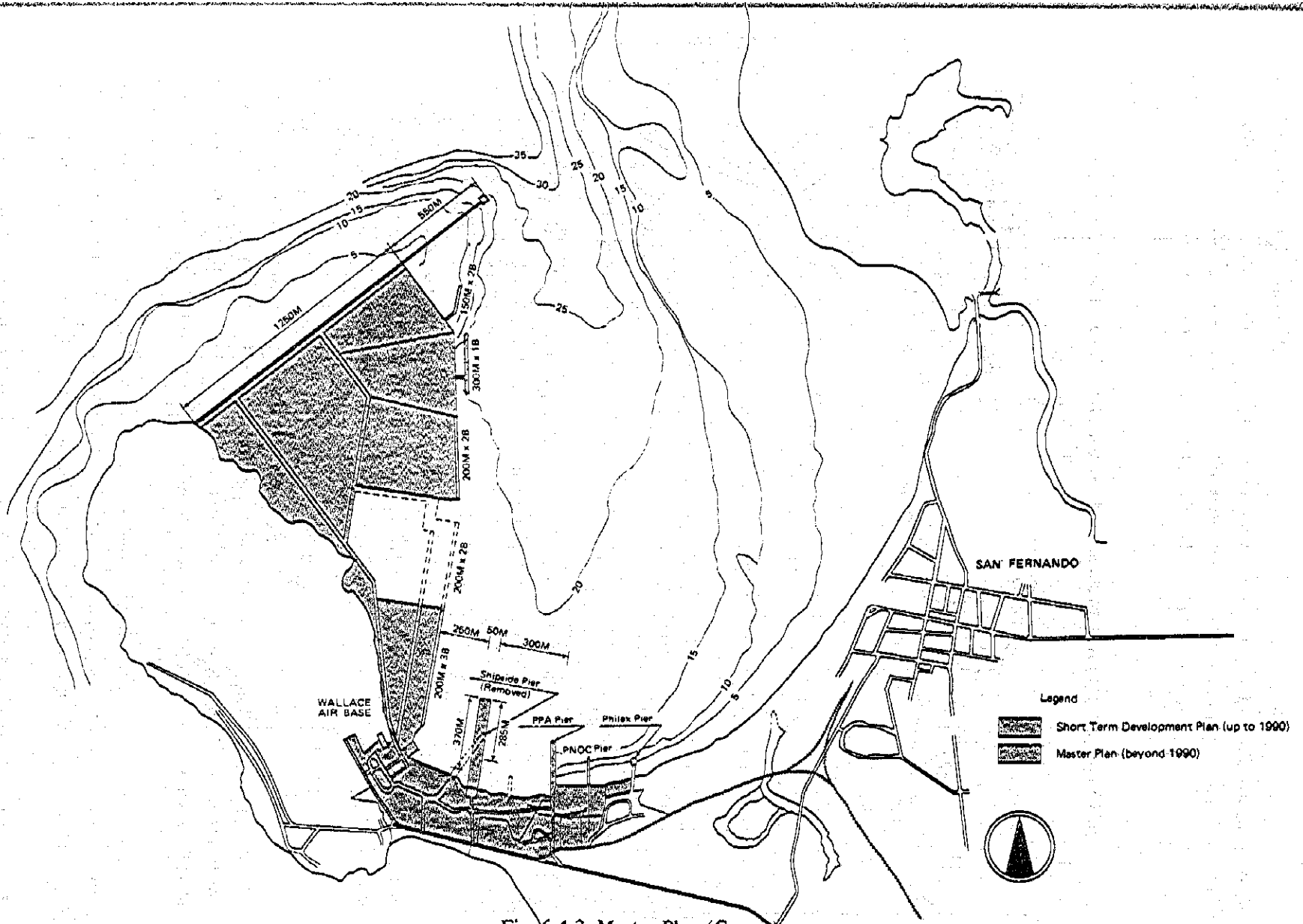


Fig. 6-4-3 Master Plan (Case 3)

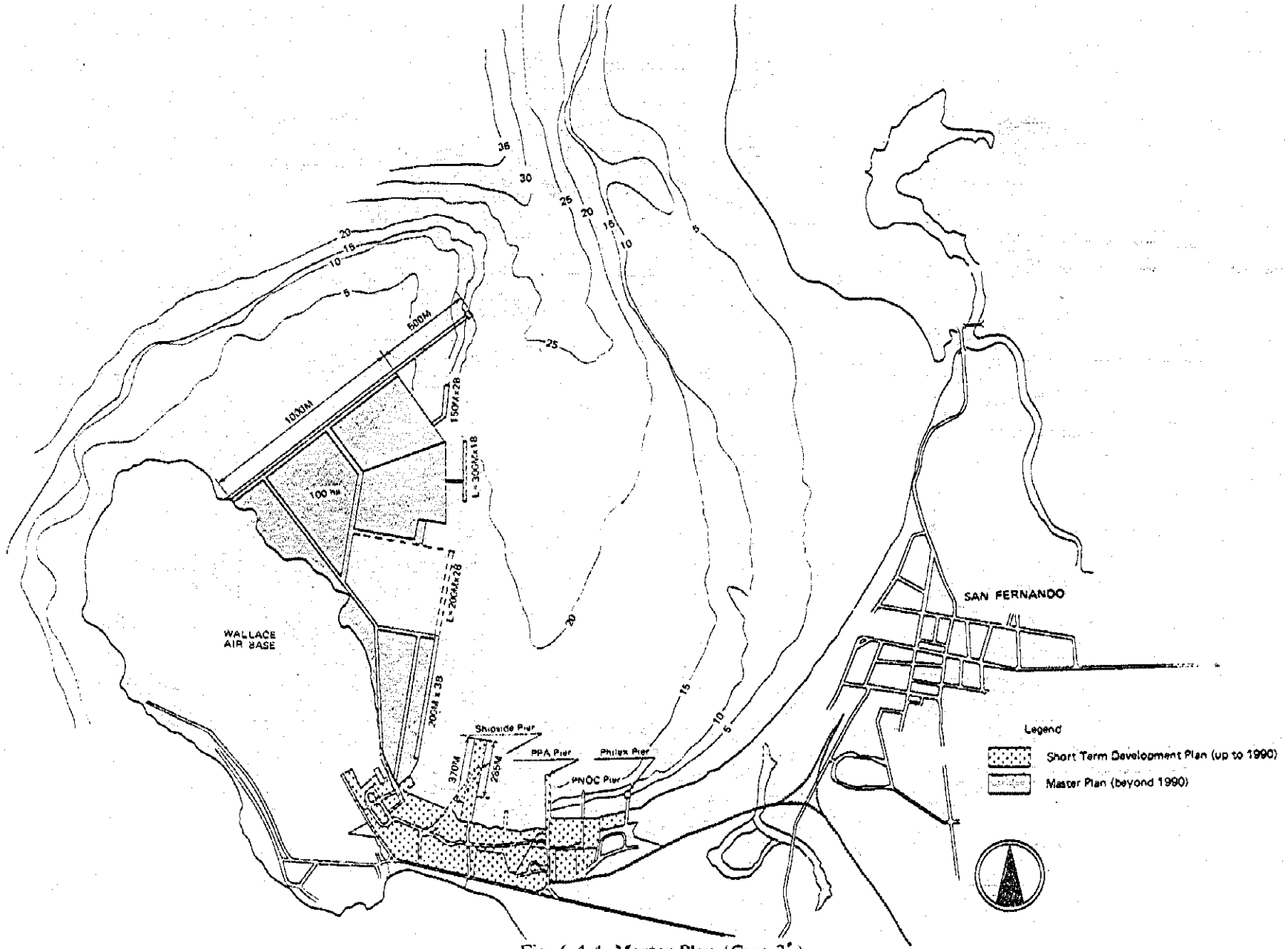


Fig. 6-4-4 Master Plan (Case 3')

6-4-2 Short term development plan

Comparisons are made from the following viewpoints on the portion which is to be constructed before 1990, the target year of the short term development plan. Figs. 6-4-5, 6-4-6 and 6-4-7 show the portion respectively, and Table 6-4-1 shows their outlines.

Table 6-4-1 Outline of the Alternatives for the Short Term Development Plan

	Case 1	Case 2	Case 3	Remarks
Number of Berths*				o PNOC pier is used for handling both coal and oil products o Shipside pier is removed
PPA	5	5	5	
Others	3	3	3	
Dimension of New Berth	Total length 650 m Depth of Water −10 – −14 m	Width 280 m Total length 830 m Depth of Water −10 – −14 m	Width 50 m Total length 900 m Depth of Water −10 – −14 m	
Land Area	45 ha	48 ha	40 ha	

Note: *) Refer to Table 6-2-5

(1) Maneuvering of vessels

From the viewpoint of maneuvering vessels, Case 3 is the most advisable layout of berths. The reasons are,

1) The direction of the pier nearly coincides with that of the channel in the harbour, which makes it possible for the vessel to come straight to the berth without making a turn before berthing.
2) The pier has sufficient basin space on each side.

Case 1 and Case 2 have the following disadvantage. As illustrated in Appendix 6-7, Case 1 and Case 2 propose berth layouts, some of which are parallel with the southern shoreline of the Bay. As a result, vessels coming to the berths are obliged to make a turn of nearly 90 degrees just before berthing.

(2) Influence of invading waves on vessels at berth

As explained in Chapter 3, in the monsoon season invading waves will frequently by observed in front of the project site. According to the theoretical calculation of wave height deformation, their heights will be in the range of 0.2 – 1.2 m, depending upon the deepwater wave heights and their directions.

Generally, in case of conventional ocean going vessels, waves with a height of more than 0.7 m, if coming at a right angle to the vessels alongside the pier, might cause rolling to such an extent that cargo handling can not be conducted, and in some cases the vessels can not stay at berth safely.

Due to the shortage of data on waves and winds, it is difficult to accurately estimate the

frequency of waves that affect the vessel at berth.

However, according to the observation record of winds in the South China Sea "Winds and Waves of the North Pacific Ocean", of the winds with a velocity of more than 20 knots, likely to cause 2.0 m waves off the Bay of San Fernando, 21% blow from the N and NW. This share is assumed to be higher in the monsoon season.

In addition, the information obtained from persons related with shipping in the Port of San Fernando and from the captains of Japan vessels who have visited the Port, indicated that there were many days when fairly high waves were observed in the Bay.

From these informations, it is reasonably supposed that waves with the estimated heights shown in Table 6-4-2 will, in the monsoon season, reach the project site at fairly high frequency.

Therefore, it is recommended that the berths should be planned to have the same direction as the invading waves. In this sense, Case 3 is most advisable and followed by Case 2.

Table 6-4-2 Estimated Heights of Invading Waves at Project Site

Height of deepwater wave
Ho 1/3 = 2.0 m

(m)

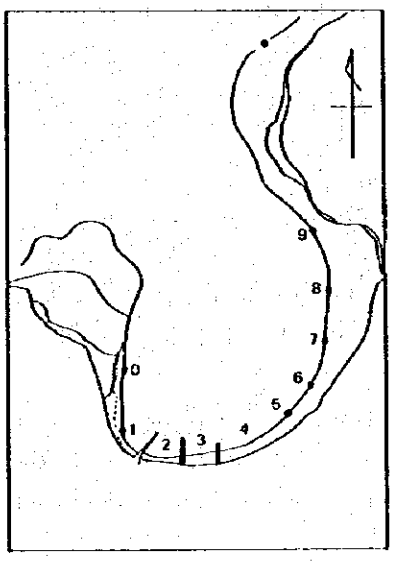
Point	Wave Direction		
	N	NNW	NW
0	0.3	0.3	0.3
1	0.3	0.3	0.2
2	0.4	0.3	0.3
3	0.5	0.5	0.5
4	0.4	0.4	0.4

Height of deepwater wave
Ho 1/3 = 4.1 m

(m)

Point	Wave Direction		
	N	NNW	NW
0	0.5	0.5	0.4
1	0.8	0.8	0.3
2	1.1	1.0	0.8
3	1.2	1.2	1.0
4	1.2	1.2	1.2

Note: The number in the column of point corresponds to the point number put in the following map.



(3) Efficiency of cargo handling

In Case 1, as the quay wall is located closely and parallel to the existing port area, cargo handling can be conducted efficiently between shipside and the transit sheds or the open storage yards.

In Case 2, as an area of about 80,000 m² is acquired by reclamation, efficient cargo handling can be expected if transit sheds and open storage yards of adequate space are located there. In Case 3, a little longer handling time is required between ship side and the transit sheds of the open storage yards.

In all these three cases, it is possible to make efficient use of the existing port area.

Thus, from the viewpoint of efficiency in cargo handling, it may be said that Case 1 and Case 2 are better than Case 3.

(4) Initial investment and construction plan

Estimate of construction cost was made as shown in Table 6-4-3 (Details are shown in Chapter 7). The cost is least for Case 1 and greatest for Case 3.

From the viewpoint of implementating the construction plan, Case 3 can be constructed more quickly than Cases 1 and 2, because Case 3 has a simple structure and no reclamation work. This is one of the most important points of view, because construction periods should be shortest as possible in order to avoid port congestion caused by removal of existing Shipside pier, which is pre-requisite for the construction of new facilities.

Table 6-4-3 Construction Costs for the Short Term Development Plan

	Cost (million ₱)	Structural Type	Construction Period
Case-1	241	Pile type	3.5 years
Case-2	298	Pile type	5 years
Case-3	258	Pile jetty type	3 years

Note: o These costs cover such construction works as pier/wharf, dredging, reclamation, transit shed, open storage yard, roads and engineering.
o These costs are calculated on the following exchange rate
$1 = ₱14 = ¥232
o Detailed data is shown in Table 7-3-2.

(5) Others (Flexibility)

These three alternatives are prepared to accommodate one bulk carrier of 50,000 DWT and two conventional ocean vessels of 15,000 DWT. However, due to physical conditions, the length of quay wall varies.

In terms of quay wall with a depth of more than −10 m (equivalent to conventional ocean going vessels), Case 3 has the longest one, and can accomodate four vessels. In this sense, Case 3 is more flexible for berth operation.

Table 6-4-4 shows the summary of the above-mentioned comparison. Each case has

advantages and disadvantages. However, if importance should be attached to safety in the maneuvering of vessels and stability of vessels of berth and to the amount of initial investment and the period of construction, Case 3 is superior to Cases 1 and 2. Table 6-4-5 shows the outline of the master plan (Case 3).

Table 6-4-4 Comparison of the Alternatives for the Short Term Development Plan

	Maneuvering of Vessel	Influence of Invading Waves on Vessel at Berth	Efficiency of Cargo Handling	Initial Investment and Construction Plan	Others (Flexibility)
Case 1	△	×	○	○	–
Case 2	△	△	○	×	–
Case 3	○	○	△	○	○

Note: ○: Excellent △: Some Problems ×: Poor

Table 6-4-5 Outline of the Master Plan (Case 3)

	Master Plan
Number of Berths PPA Others	16 (2) 8 (2) 8
Land Area (ha)	120 (20)
Length of Breakwater and Shore Revetment Facing Offshore (m)	1,800
Rough Construction Cost (million P)	1,400 (200)

Note: The figures in parentheses indicate amounts corresponding to the future expansion

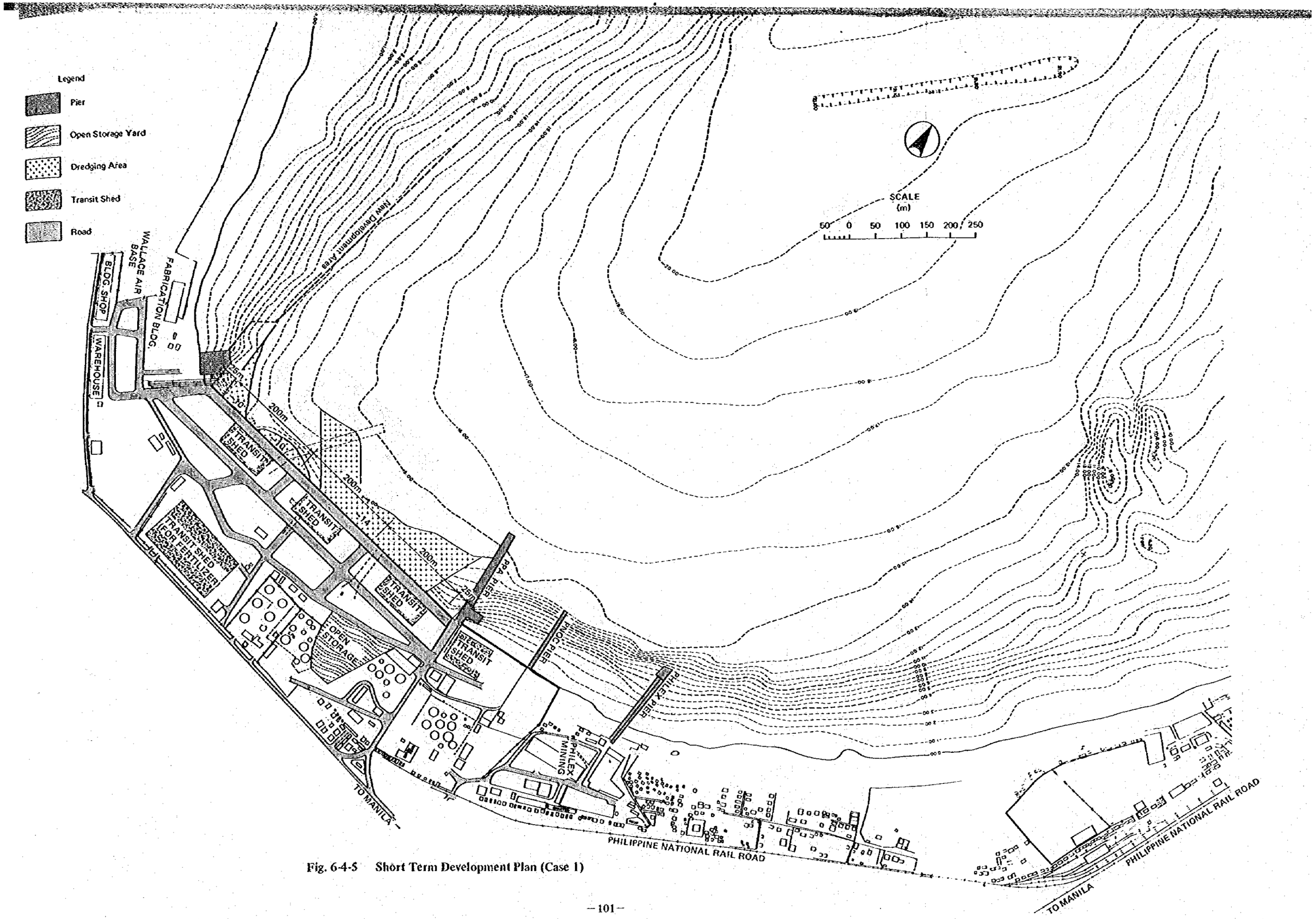


Fig. 6-4-5 Short Term Development Plan (Case 1)

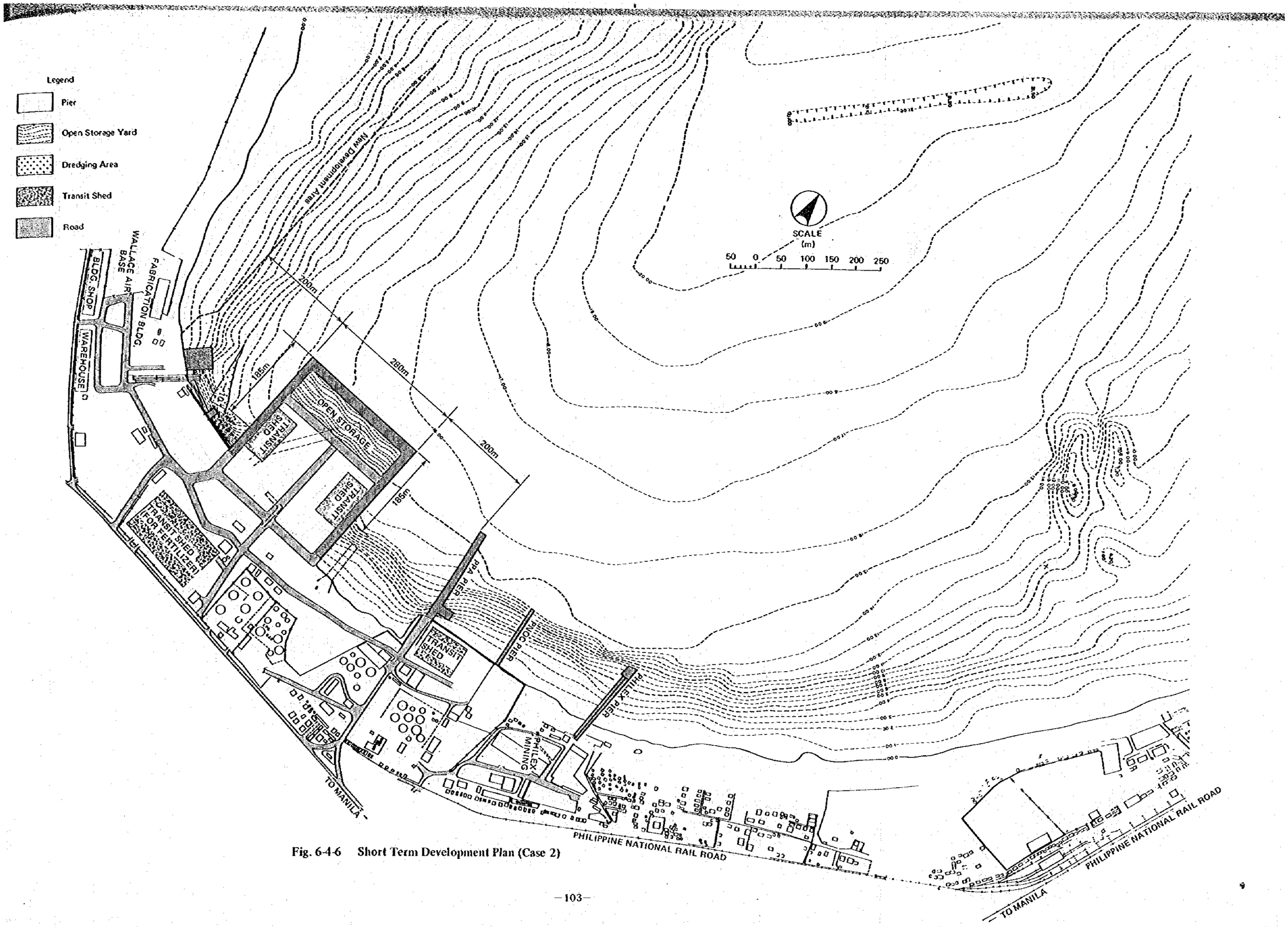


Fig. 6-4-6 Short Term Development Plan (Case 2)

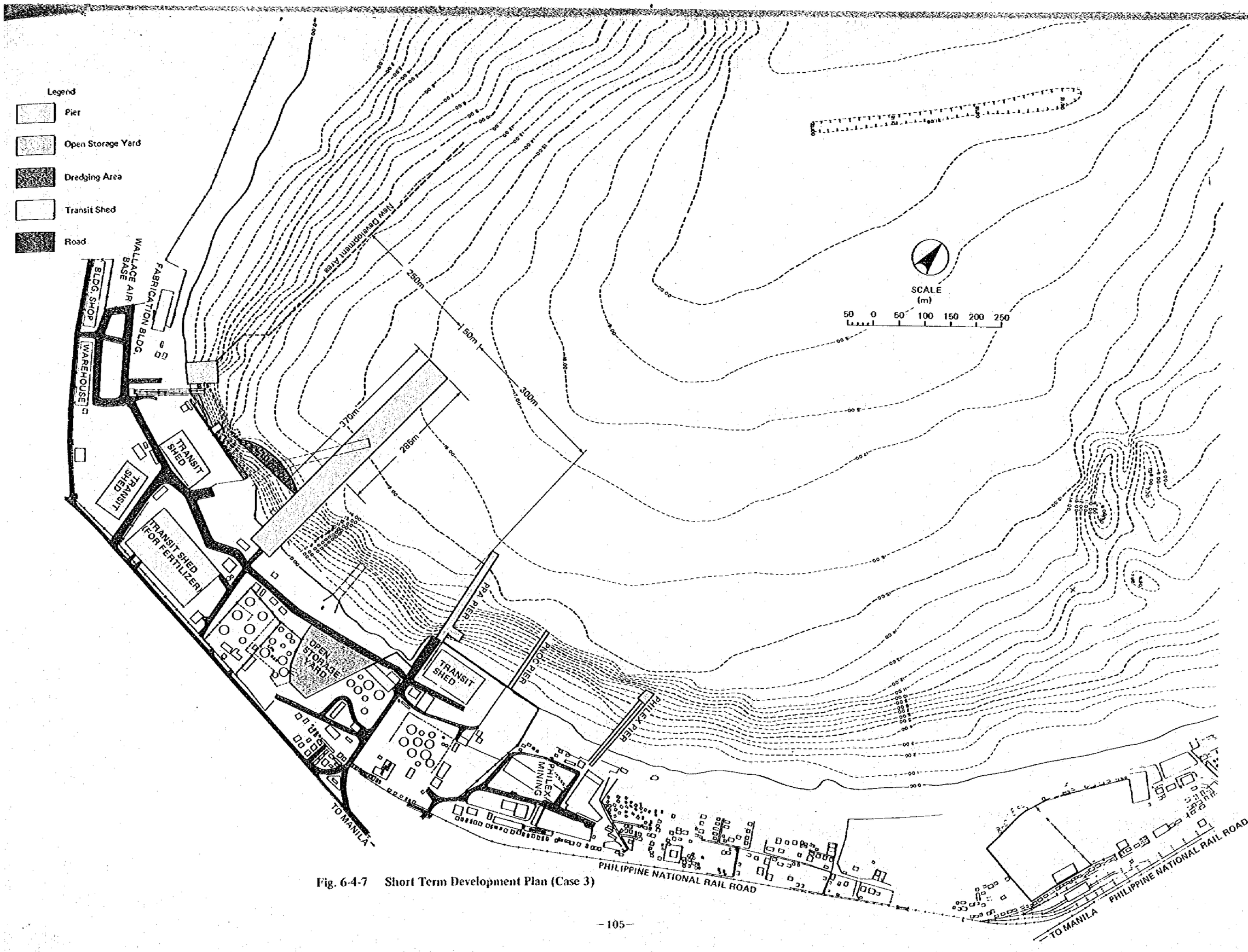


Fig. 6-4-7 Short Term Development Plan (Case 3)

6-4-3 Evaluation of the effects of the breakwater in the short term development plan

(1) Layout of the breakwater and rough estimation of its construction cost

The seabed slopes at the mouth of the Bay where the construction of the breakwater is proposed are highly complicated. The results of the recent sounding survey reveal that the seabed is almost flat from the west bay shoreline to the −5 m contour line. Beyond that, out to the −10 m contour line, the seabed slopes increase gradually but are not so steep. Then, the slopes become very steep and water depth quickly reaches more than −30 m. The seabed slopes from the east bay are assumed to have the same pattern.

Taking into account the above mentioned seabed slopes and the prevailing wave direction, the breakwater should extend from the western cape in NE direction in order to shield the project site.

Fig. 6-4-8 shows an example of the layout of a breakwater with a length of 1,800 m which was drawn to cover as much water area as possible. The water depth at the tip reaches −20 m. The roughly estimated cost of breakwater is about ₱190 million (May 1983 prices).

(2) Effect on invading wave height

As explained in Chapter 3, the deepwater waves that affect the marine conditions in the Port of San Fernando, come mainly from the N – NW direction. Their maximum heights, calculated in terms of the deepwater significant wave height of deepwater wave Ho 1/3, are assumed to be 7.0 m during typhoons (occuring aproximately every 30 years) and, 2.0 – 4.1 m in the monsoon season, depending upon the velocity of the offshore wind.

These deepwater waves change their directions and heights due to refraction and diffraction. According to the theoretical calculations of wave deformation conducted by applying the theory of refration and diffraction to two cases, one being the case that the breakwater illustrated in Fig. 6-4-8 was constructed and the other that the breakwater was not constructed, the heights of the invading waves are estimated as shown in Table 6-4-6.

The waves prevailing in the monsoon season usually affect the maneuvering of vessels and the loading and unloading of cargo. To give an example, in the case of a deepwater wave height of 4.1 m, the wave height at point 1 of the project site is 0.4 – 0.8 m depending upon the wind direction. This height may be reduced to 0.3 – 0.6 m by the construction of the breakwater. And when the deepwater wave height is 2.0 m, the wave height at point 1, which is calculated at 0.3 m, will be reduced to 0.2 m by the construction of the breakwater. This means that the breakwater has some effect on the safety of maneuvering vessels and cargo handling at the berths.

In the case of a typhoon which develops high waves from the N – NW directions, however, invading waves will maintain their height, even with the protection of a breakwater, to such an extent that the vessles will have to be detached from the berths.

From the above observation, it will be concluded that though the breakwater has some effect on the reduction of wave height and is therefore desirable for the safety and efficiency of port activities, the investment for the breakwater is not warranted in the period of the short term development plan, in the light of its construction cost and the number of calling vessels.

Table 6-4-6 Comparison of Estimated Heights of Invading Waves at Project Site

Ho 1/3 = 2.0 m (Height of deepwater waves)

Wave Direction: N (m)

Point	Without B/W	With B/W
0	0.3	0.2
1	0.3	0.2
2	0.4	0.3
3	0.5	0.4
4	0.4	0.3

Wave Direction: NNW (m)

Point	Without B/W	With B/W
0	0.3	0.2
1	0.3	0.2
2	0.3	0.2
3	0.5	0.3
4	0.4	0.2

Wave Direction: NW (m)

Point	Without B/W	With B/W
0	0.3	0.2
1	0.3	0.2
2	0.3	0.2
3	0.5	0.4
4	0.4	0.3

Ho 1/3 = 4.1 m (Height of deepwater waves)

Wave Direction: N (m)

Point	Without B/W	With B/W
0	0.5	0.4
1	0.8	0.6
2	1.1	0.9
3	1.2	0.9
4	1.2	0.9

Wave Direction: NNW (m)

Point	Without B/W	With B/W
0	0.5	0.4
1	0.8	0.6
2	1.0	0.8
3	1.2	0.8
4	1.2	0.7

Wave Direction: NW (m)

Point	Without B/W	With B/W
0	0.4	0.3
1	0.4	0.3
2	0.8	0.7
3	1.0	0.7
4	1.2	0.8

Ho 1/3 = 7.0 m (Height of deepwater waves)

Wave Direction: N (m)

Point	Without B/W	With B/W
0	0.9	0.7
1	1.9	1.5
2	2.3	1.7
3	2.7	2.0
4	2.4	1.7

Wave Direction: NNW (m)

Point	Without B/W	With B/W
0	0.8	0.9
1	1.6	1.5
2	2.2	1.6
3	2.8	1.8
4	2.8	1.6

Wave Direction: NW (m)

Point	Without B/W	With B/W
0	0.7	0.5
1	1.3	1.1
2	1.6	1.4
3	2.2	1.6
4	2.4	1.5

Note: As to the number of point, refer to the map in Table 6-4-2.

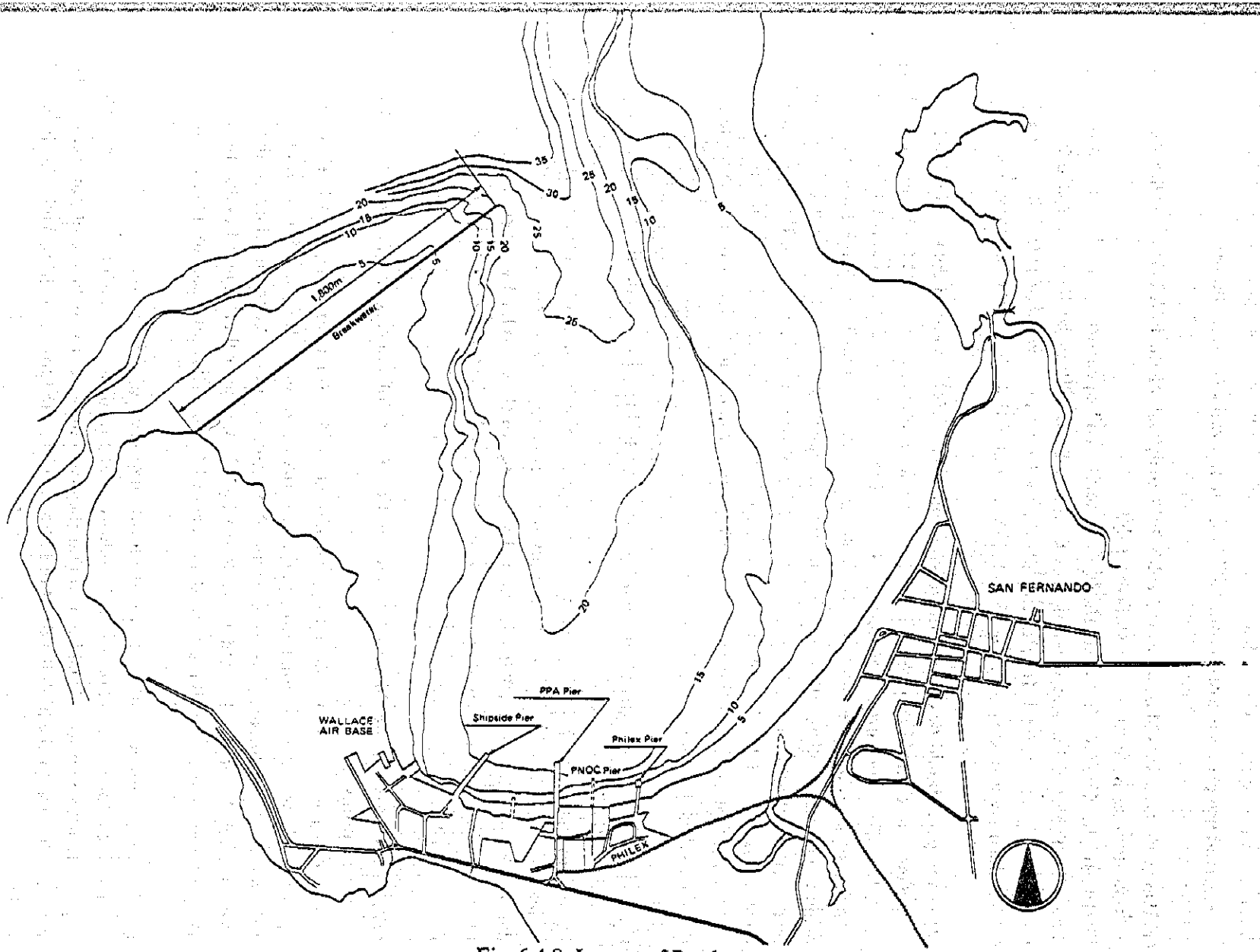


Fig. 6-4-8 Layout of Breakwater

6-5 Land Use Plan

The land use plan was worked out based on the following considerations;

(1) Adequate area should be allocated behind the quay wall of the PPA berths for the location of transit sheds, warehouses and storage yards.

The required areas for transit sheds, warehouses and open storage yards were estimated as shown in Tables 6-2-6 and 6-2-7 in this Chapter. Sufficient cargo handling space is essential for efficient port activities. Here in this plan, an area with the width of 150 – 300 m is reserved behind the quay wall as space earmarked for the transit and storage areas and for roads.

(2) Oepn space should be reserved in anticipation of the development of container services.

As mentioned in Chapter 5, there may be no need to have a specialized container berth until 2000. It is likely, however, that some portion of the cargo handled in this port will be shipped in containers. Therefore, at least one berth should be designed so as to have enough space just behind the quay wall to allow the installation of handling equipment. The required space for container handling varies according to the number of container vans handled per year and their handling system. It is advisable to reserve as large a space as possible to anticipate the future development of contaenerization. Some information on the dimensions of container terminals is given in Appendix 6-8.

(3) The site for the cement plant should be laid out taking into account the connection with its own berths.

In this plan, about 17ha of land is allocated for the location of a cement plant with the annual production capacity of 2,000,000 tons. This capacity is equivalent to the estimated demand balance between 1990 and 2000. The acreage of allocated land was determined based on the assumption that the productivity per unit area will be the same as that of the typical cement plant in Japan.

(4) Adequate spaces should be allocated for the storage of mineral ores (copper concentrates) and oil products.

As explained in 6-2-4, mineral ores require about 5ha for their storage yard. Therefore, by adding the spaces needed for roads, parking, offices and some allowance for future expansion, 15ha are allocated for the purpose of mineral ore storage areas. As to oil products, the required space for oil depot is estimated to be 8.3ha including space other than oil tanks. In this plan, 10ha are allocated to the oil products depot area with some allowance for future expansion.

(5) Some area should be allocated for the location of processing industries

The area for the location of such industries as metal, heavy machinery and some kind of export-oriented industries is laid out so that they can conveniently make use of port facilities and have easy access to the hinterland. About 35ha are allocated for their siting, including inner zone road.

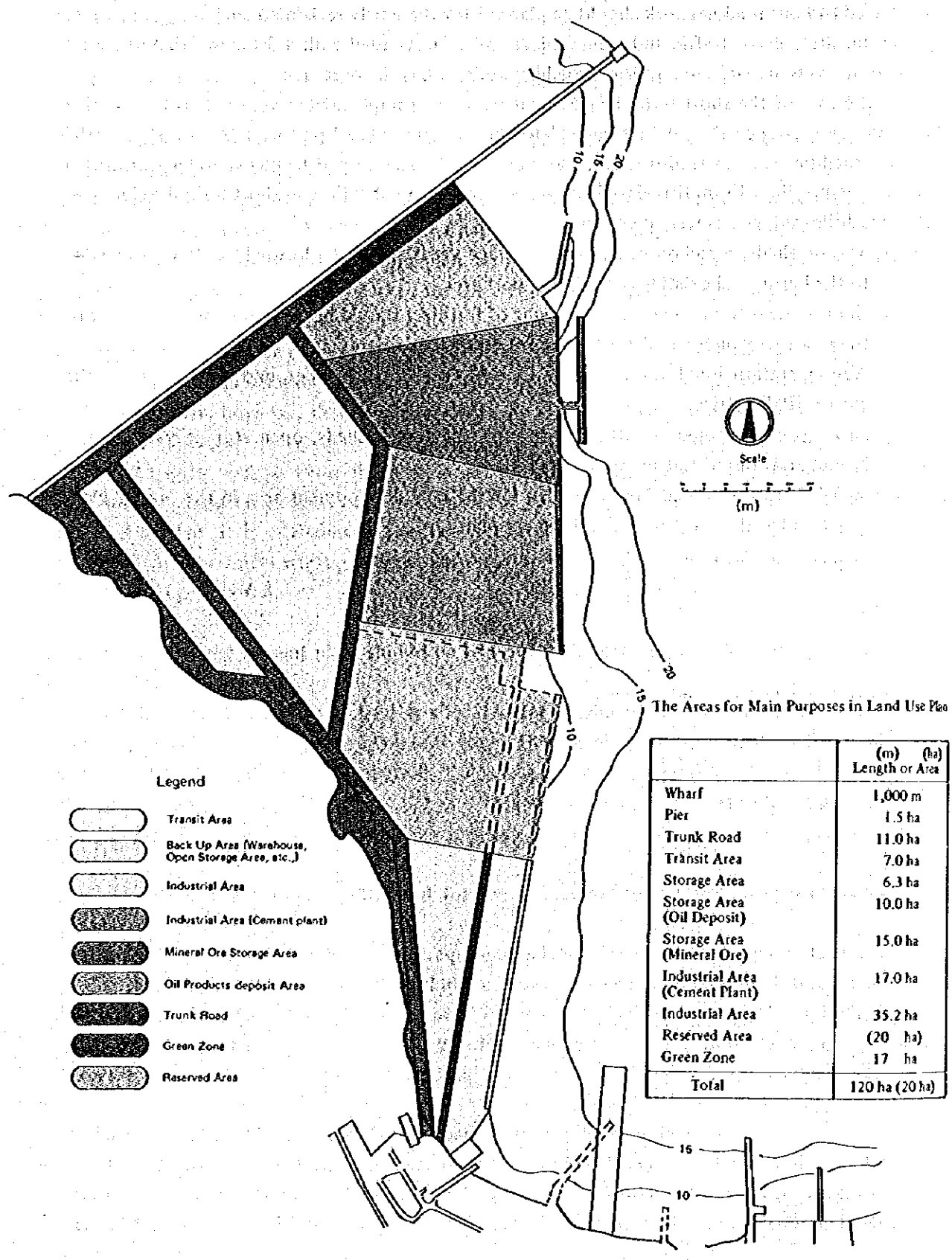
(6) A well laid out road network should be planned for the newly reclaimed land.

To facilitate cargo traffic and communications, a trunk road with a 30 m width and several inner zone roads are laid out to form a road network within the port area.

In the case of the short term development plan being implemented adjacent to the existing port area, importance should be attached to the effective use of past investment. That is, the existing facilities such as transit sheds, warehouses and roads should be incorporated in the plan as much as possible. From this viewpoint, in working out the land use in short term development plan, the following points were considered.

1) Transit sheds, warehouses and open storage yards should be located as close as possible to the berths and existing roads in the port ares.
2) Transit sheds to be used for the bagging of fertilizer should be located close to the foot of the new pier which handles 50,000 DWT fertilizer carriers.
3) Administration buildings should be located close to each other, and mostly around the existing PMU office.
4) Parking areas should be allocated around the transit sheds, open storage yards, warehouses and administration buildings.

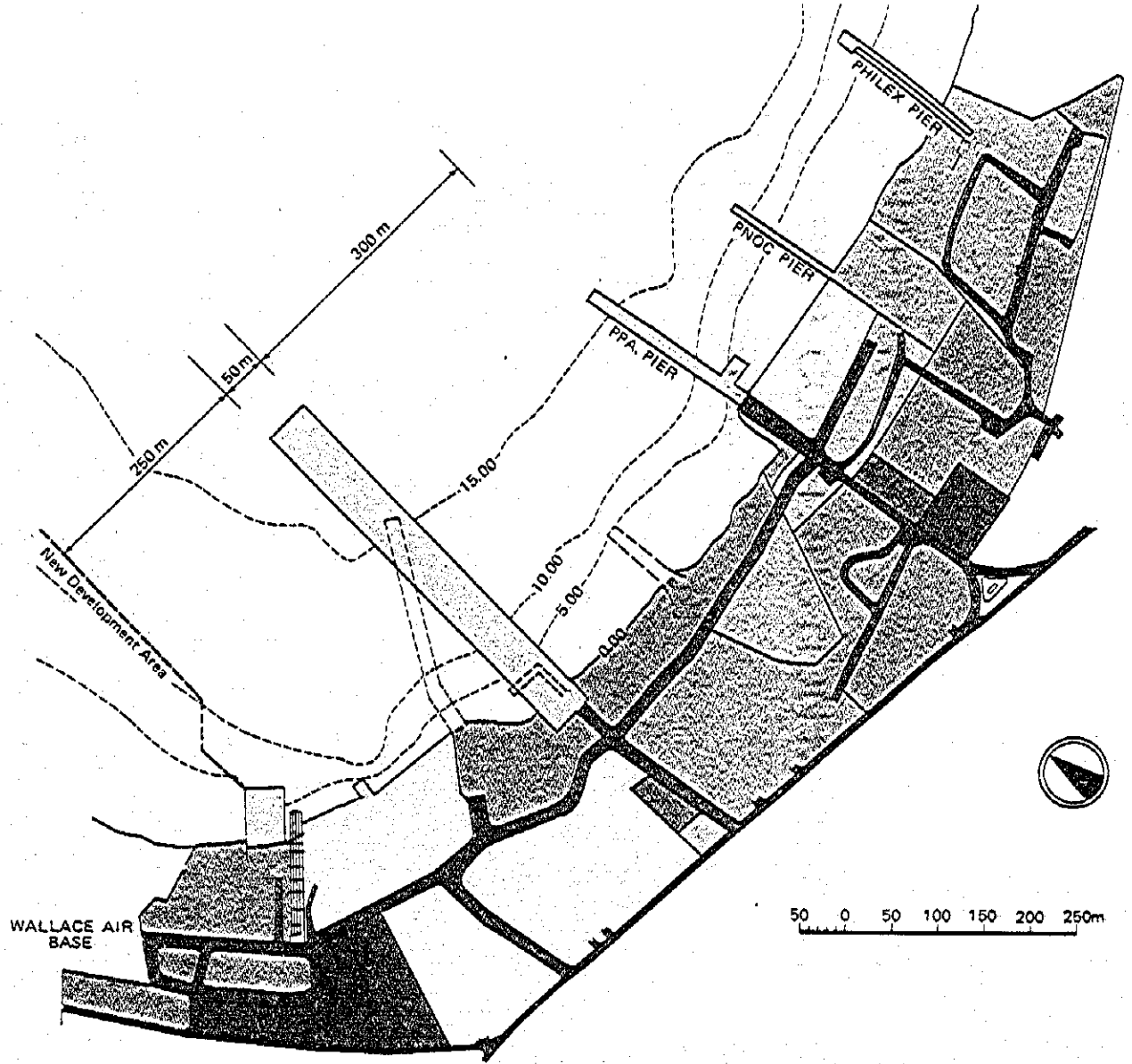
Fig. 6-5-1 is the proposed land use plan for the new development area in the master plan. Fig. 6-5-2 is that for the short term development plan.



The Areas for Main Purposes in Land Use Plan

	(m) (ha) Length or Area
Wharf	1,000 m
Pier	1.5 ha
Trunk Road	11.0 ha
Transit Area	7.0 ha
Storage Area	6.3 ha
Storage Area (Oil Deposit)	10.0 ha
Storage Area (Mineral Ore)	15.0 ha
Industrial Area (Cement Plant)	17.0 ha
Industrial Area	35.2 ha
Reserved Area	(20 ha)
Green Zone	17 ha
Total	120 ha (20 ha)

Fig. 6-5-1 Land Use Plan for New Development Area in Master Plan



Legend

- Pier
- Road
- Transit Area
- Storage Area (Open Storage)
- Storage Area (Warehouse)
- Storage Area (Oil Deposit)
- Administration Area
- Parking Area
- Others (Including Reserved Area)

The Areas for Main Purposes in Land Use Plan

(ha)

	Area
Pier	3.1
Road	4.1
Transit Area	8.0
Storage Area (Open Storage)	5.5
Storage Area (Warehouse)	2.5
Storage Area (Oil Depot)	6.0
Administration Area	1.3
Parking Area	0.5
Others (Including Reserved Area)	9.0
Total	40.0

Note: Total area includes the area covered under the Development-Right Grants given to the Shipside Inc. and the area belonging to the Oil Companies and the Philex Mining Corp.

Fig. 6-5-2 Land Use Plan for the Short Term Development Plan

CHAPTER 7

DESIGN, CONSTRUCTION METHODS AND COST ESTIMATE

CHAPTER 7 DESIGN, CONSTRUCTION METHODS AND COST ESTIMATE

In order to realize the various port plans mentioned in Chapter 6, the following main items will be studied in detail for the preliminary design;

(1) Design conditions

(2) Construction method/procedure

(3) Cost estimate

Other relevant conditions/restrictions will also be studied in this chapter.

7-1 Design Conditions

7-1-1 General outlook

The following Table 7-1-1 shows the preliminary design conditions. Some of these design conditions have been derived from the practical experiences the Team has had in designing various types of port and harbor facilities in Japan.

Table 7-1-1 Design Conditions

Tide level	HWL	MLLW + 0.910*
	MSL	MLLW + 0.372
	LWL	MLLW – 0.200
Deepwater design wave		
	N-NW direction	$Ho_{1/3}$ = 7.0 m
		$To_{1/3}$ = 11.0 sec
Seismic coefficient	0.15	
Shipsize	General cargo ship	15,000 DWT
	Bulk carrier	50,000 DWT
Water depth of the berth	MLLW–10m	(for 15,000 DWT)
	MLLW–14m	(for 50,000 DWT)
Crown height of the quay wall	MLLW + 3.0 m	MLLW +3.0 m
Surcharge load on the wharves		
	Open type wharf	Quaywall wharf
Ordinary	2.0 t/m²	3.0 t/m²
Extraordinary	1.0 t/m²	1.5 t/m²
Berthing velocity	0.15 m/sec	(for 15,000 DWT)
	0.10 m/sec	(for 50,000 DWT)
Design life time of structures	50 years	

7-1-2 Soil conditions

Judging from the description in Chapter 3, the following soil conditions are used for the preliminary design (Table 7-1-2).

Table 7-1-2 Design Soil Conditions

Elevation (m)	Soil Characteristics	Internal Friction/Cohesion	Unit Weight (t/m^3)
MLLW −5.0 – −13.0	Fine Sand	$\phi = 20°$	1.65
MLLW −10.0 – −32.0	Silty Sand	$\phi = 25°$	1.75
MLLW −10.0 – −45.0	Sandy Silt and Silty Clay	$C = 0.0075\ Z + 0.3$	1.65
MLLW −15.0 – −50.0	Silty Clay	$C = 0.0425\ Z + 0.3$	1.75

7-1-3 Tide level

The following Table 7-1-3 shows the various tide levels. Figures on the left side of the parentheses have been derived from the "Tide and Current Tables, Philippines, for the Year 1983" (Special publication No. 500) published by the Bureau of Coast and Geodetic Survey, Ministry of National Defence, Republic of the Philippines. The figures in the parentheses have been calculated by harmonic analysis of the four major tidal components observed at the Bay of San Fernando (Fig. 3-4-1).

The differences between all pairs of values are very slight, so that tide levels based on the Tables may be adopted for designing port and harbour facilities.

Table 7-1-3 Tide Levels

HWL	MLLW +0.910m (0.899m)
MSL	MLLW +0.372m (0.204m)
LWL	MLLW -0.200m (-0.072m)

7-1-4 Wave

The following are the significant deepwater wave height and period used for the preliminary design (Refer to 3-4-4 (1)).

$Ho_{1/3}$ = 7.0 m

$To_{1/3}$ = 11.0 sec

Direction N -- NW

7-1-5 Seismic coefficient

The seismic force due to an earthquake can be calculated on the basis of "National Structural

Code for Building". The formula to be applied is as follows:

$$V = Z \times K \times C \times W$$

where, V = Horizontal force due to earthquake
Z = Numerical coefficient related to the seismicity of region
K = Numerical coefficient related to the type of structure
C = Numerical coefficient for base shear
W = Weight of structure

According to the "Code", the numerical coefficient (Z) is based on the project area's Zone 1 classification (Fig. 7-1-1). Considering the subsoil conditions at the site, a value of Z = 1.2 – 1.4 has been adopted for the design numerical coefficient. The coefficients of K and C are usually derived from the dynamic analysis of the structures, and in most cases the figures (K x C) are in the range between 0.12 and 0.25. The above National Structural Code is established mainly for designing architectural rather than civil engineering structures, so that when considering the characteristics of seismic oscillation or the importance of structures, it is considered that, the lowest figure of 0.12 is sufficient for designing berthing structures.

Under these conditions, the horizontal force can be calculated as follows;

$$V = (1.2 - 1.4) \times 0.12 \times W$$
$$\fallingdotseq 0.15\ W$$

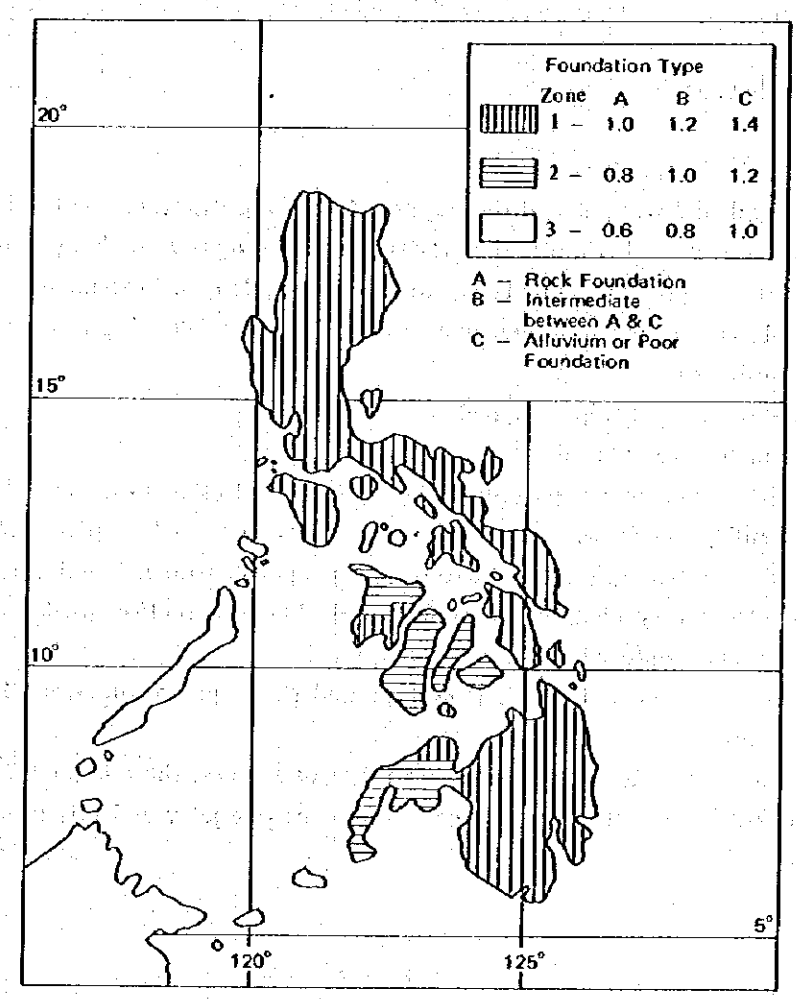


Fig. 7-1-1 Seismic Zones and Recommended Seismic Coefficients "Z"

7-1-6 Other design conditions

According to the oceanological observation at the Bay of San Fernando, no serious tidal current or littoral drift problems are expected to hinder the construction, operation and maintenance of the port and harbour facilities.

7-2 Study of the Main Facilities

7-2-1 Berthing structures

In deciding the type of berthing structures both in the master plan and in the short term development plan, the following conditions should be carefully considered.

(1) Soil conditions and the water depth
(2) Influence of waves
(3) Shipsize, types of vessels and cargo types
(4) Construction method, cost and schedule

Considering natural conditions (mentioned in Chapter 3) and the layout of port facilities (mentioned in Chapter 6), the following types of berthing structures will be studied for comparison in this section.

(1) Pile jetty type
(2) Pile type
(3) Sheet pipe pile type
(4) Gravity type
(5) Upright wave dissipating type

The advantages and disadvantages of these types of berthing structures are briefly outlined in Table 7-2-1. Just as shown in this table, the gravity and the upright wave dissipating wharves are apparently inferior to the pile jetty, pile type and sheet pipe pile type in some aspects. The latter types are more suitable than the former, when examined from the following view points;

(1) Simplicity of design
(2) Required construction equipment/technics
(3) Necessary construction period

However, the sheet pipe pile type costs a lot and has bad effects on wave reflection. This type requires backfilling work as soon as possible after the anchor plate (foundation) is completed and the high-strength steel tie-rods are properly arranged and set, because the bulkhead of sheet piles is very unstable or vulnerable during construction work and therefore is easily broken by highwaves before backfilling is completed.

As for wave reflection, both the pile jetty type and pile type are superior when compared with the other three types.

Hence, further study will be concentrated on those two types, the pile jetty and pile types.

Figs. 7-2-1 and 7-2-2 show the typical cross sections of pile jetty and pile types of berthing structures.

7-2-2 Pile jetty type

In Case 3 (Figs. 6-4-3 and 6-4-7), a pile jetty with 50 m wide will be constructed parallel to the existing PPA pier. The total length of the jetty is about 450 m. Steel pile piles with diameter 609.6 mm will be used for the foundation piles. They will be driven as deep as −30 m.

A causeway connects the shore end of the pile jetty to the land. Generally speaking this types of berthing facility is comparatively easy to construct because the construction procedure doesn't require special technics.

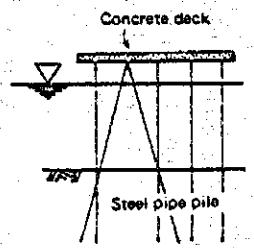
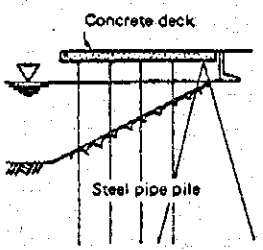
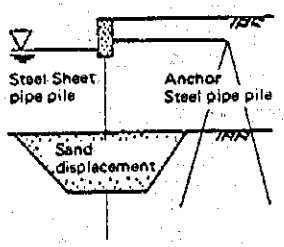
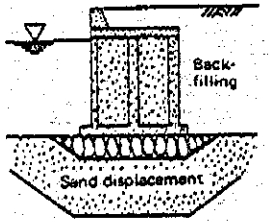
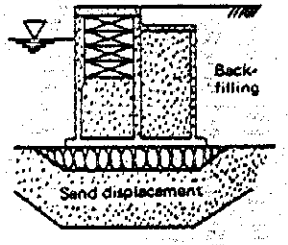
7-2-3 Pile type

In Case 2 (Figs. 6-4-2 and 6-4-6), a pile type with a 25 m width will be constructed. Its total length will be about 830 m, consisting of three quay walls. Two parts of them (about 250 m and 300 m long) will make right angles with the existing coast line. They are parallel to each other and the distance between them is about 280 m. The third quay wall (about 280 m long) will be arranged parallel to the present shoreline, connecting the perpendicular quay walls.

In Case 1 (Figs. 6-4-1 and 6-4-5), a pile type (25 m wide) will be constructed parallel to the shoreline. This type has two berths with water depths of −10 m (length 365 m) and −14 m (length 285 m) respectively.

In both cases, after driving the steel pipe piles, the rubble mound work, sandfilling, riprap foundation work and armor stone protection work will have to be executed before the concreting works are finished.

Table 7-2-1 Comparison of Berthing Structures

Type of Wharf	Pile Jetty Type	Pile Type	Sheet Pipe Pile Type	Gravity Type	Upright Wave Dissipating Wharf
Conceptual Figures					
Advantages	・Suitable for poor soil foundation ・Structurally simple, flexible and lightweighted ・No special construction method ・Cheaper than other types	・Suitable for poor soil foundation ・Efficient cargo handling with wide space	・Efficient cargo handling with wide space	・Efficient cargo handling with wide space ・No decay, durable	・Efficient cargo handling with wide space ・No decay, durable ・Capable of dissipating waves and reducing wave reflection to some extent
Disadvantages	・Difficulty of providing sufficient apron area	・Relatively complex construction sequence required ・Reclamation necessary	・Very unstable during construction work, especially against waves ・Backfilling necessary	・High soil bearing capacity required ・Backfilling necessary ・Heavy construction equipment required, such as floating docks/ cranes, prefablicating yard	・Backfilling necessary ・Difficult to prefablicate and handle because of complexity of the structure ・Comparatively expensive
Construction Speed	・Very fast	・Fast only for the wharf itself	・Normal	・Slow	・Slow

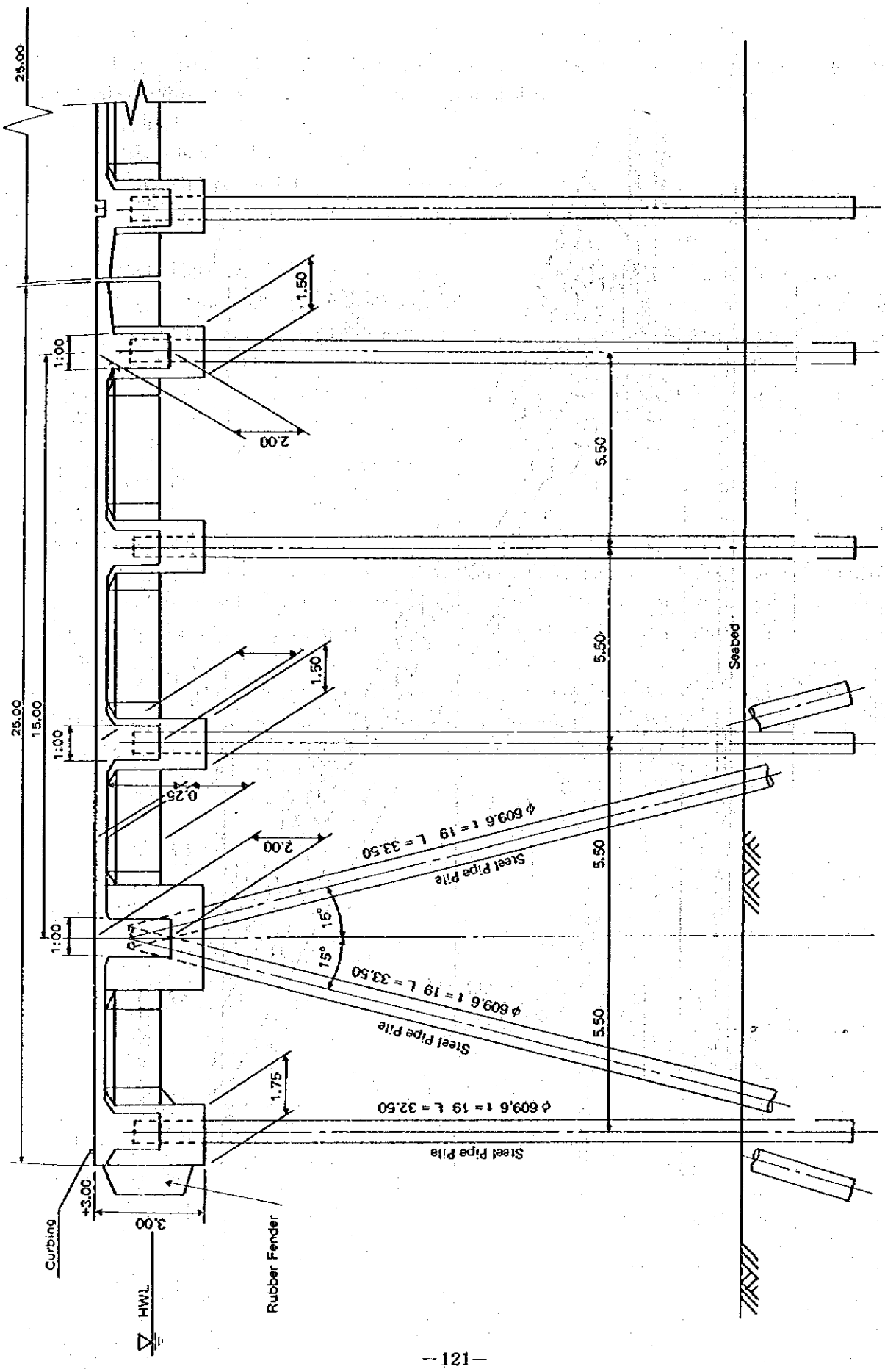


Fig. 7-2-1 Typical Cross Section of Berthing Structure (Pile Jetty Type)

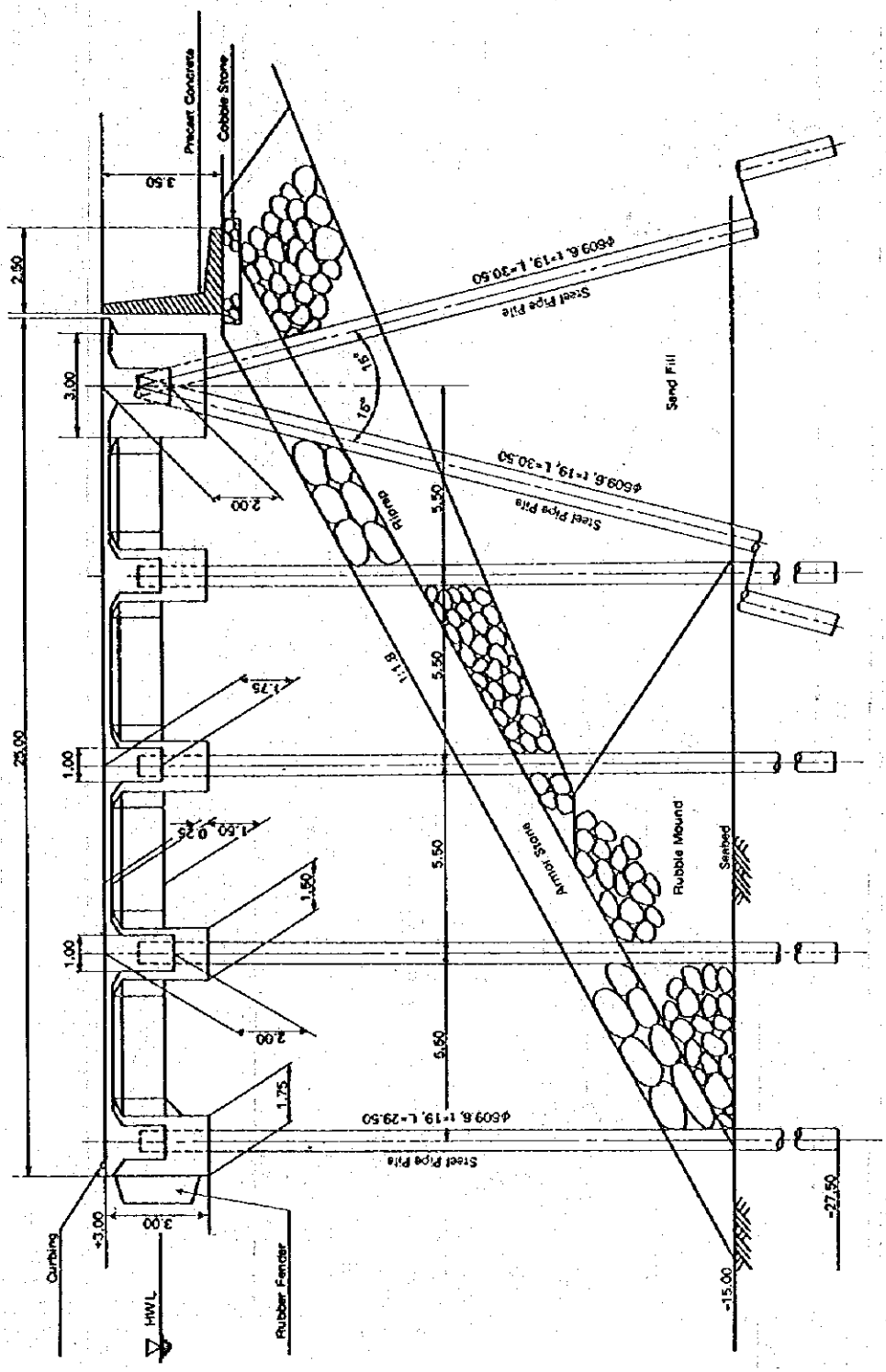


Fig. 7-2-2 Typical Cross Section of Berthing Structure (Pile Type)

7-2-4 Breakwater

The breakwater is planned for the master plan as mentioned in Chapter 6. Breakwaters are classified into three types according to their sectional shapes.

(1) Sloping breakwater

(2) Upright breakwater

(3) Composite breakwater

When needed in order to dissipate the force of waves, concrete blocks are used to armor these breakwater.

A sloping breakwater has been planned and designed in this study, because this type is easier and quicker to build with local materials, which can be cheaply procured. Other types of breakwaters require special, complex construction equipments such as work vessels, floating cranes/docks and big prefabricating yards.

Revetments will also be needed along both the northwestern edge of the reclaimed land and the shorelines of the oil and mineral ore storage area in the master plan. For these revetments, a sloping type is suitable for the same reasons mentioned. The above breakwater and the revetments are shown Fig. 7-2-3.

7-2-5 Cargo handling equipment

The installation of quay cranes for cargo handling work, is unprofitable and rather redundant in the short term development plan, mainly because of the investment efficiency. In the master plan (beyond 1990), however, special consideration should be paid to the design of port and harbour structures to allow the anticipated installation of cranes for future expansion, if the additional investment is reasonable. Therefore a rough cost estimate of the PPA berths in the master plan (beyond 1990) is carried out on the condition that they are designed to be capable of bearing the additional load of quay cranes on the wharves.

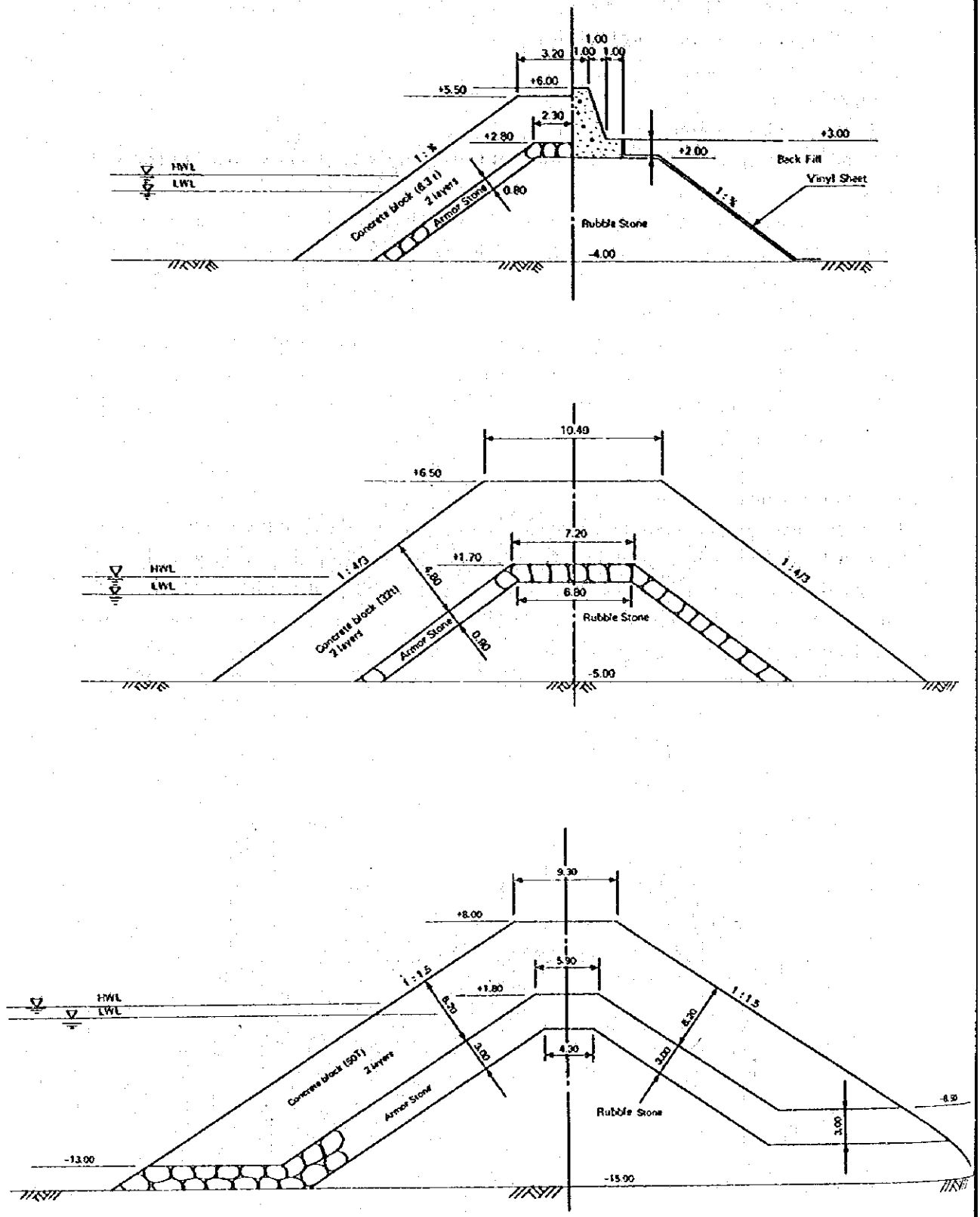


Fig. 7-2-3 Typical Cross Section of Breakwater and Revetment

7-3 Construction Methods and Cost Estimate

7-3-1 General

The construction methods and cost estimate in this study were prepared based on the following considerations. Construction materials, equipment and labors are procured in San Fernando and its vicinity as much as possible in order to achieve an economical construction cost and to ensure efficiency in the implementation of the construction program.

(1) Natural conditions

A port's construction schedule and cost are affected by natural conditions such as rainfall and the sea conditions at the site. In the case of the San Fernando Bay, the natural conditions are not particularly favorable for port construction between May and September because of much rainfall and rough sea conditions.

In this season, the number of days available for construction work is generally 18 days a month. During the rest of the year conditions are much better for construction work, so the average number of days available for construction work is estimated at 21 days a month throughout the year.

(2) Construction materials

Some of the construction materials, such as wood, sand, stone, cement and reinforcing bars can be procured in San Fernando and its vicinity. However, steel pipe piles, rubber fenders, bollards and some of the steel products will be imported from abroad because they can not be procured in the Philippines.

(3) Construction equipment

The onshore construction equipment, such as crawler cranes, buldozers, payloaders and dump trucks are available in San Fernando and its vicinity. Offshore equipment, such as pile driving barges, tug boats, flat barges are mobilized from Manila. However, there is no mixing plant available in the Philippines, so this must be brough in from abroad.

(4) Labor force

Most kinds of workers are easily employed in San Fernando and its vicinity. However some of the engineers are not available in the Philippines.

7-3-2 Construction schemes for major items

(1) New pier

1) Steel pipe piles

Steel pipe piles are produced abroad as single units of the designed length, and are painted with tar-epoxy having a thickness of 0.3 mm.

The thickness of the steel pipe pile is calculated in the following way. Out of a total span of 50 years, the cathodic protection lasts for a period of 20 years, thus as protection for the remaining 30 years, an extra thickness of about 10 mm is added to that needed for structural

reasons.

2) Pile driving

Pile driving is executed by a pilling barge equipped with a diesel pile hammer of 3.2 tons in ram weight. It is assumed that three piles are driven in a day. In this construction schedule, pile driving is executed by two piling barges. Each piling barge requires supporting equipment, such as a tug boat, a flat barge and an anchor boat.

(2) Removal of the Shipside pier

Prior to pile driving, the Shipside pier is to be removed. Wooden piles and beams will be pulled out by a crawler crane, starting at the pier's end and working back to the shore. These old piles and beams will then be carried outside the port area by dump trucks.

(3) Dredging

The dredging will be executed by crawler crane with a bucket, mounted on a flat barge. Dredged materials will be dumped by hopper barges outside the Bay.

(4) Transit sheds

Four transit sheds will be built in the backup area. These are steel frame structures and have a floor finished with concrete and a roof of asbestos cement slates.

(5) Roads

The total length of the planned roads is 2.6 km. Some of these road will be newly constructed and the existing parts widened. The road will be paved by concrete with a thickness of 25 cm over a base course 30 cm in thickness.

7-3-3 Construction schedule

Comparing the construction schedules for the three alternative short term development plans, the actual construction period for Case 3 is the shortest (24 month), following by Case 1 (30 months). At the least, 4 years will be needed to complete the work in Case 2 because of the huge amount of reclamation.

The detailed construction schedule for Case 3 is shown in Table 7-3-1. In this schedule, the additional soil investigations and detailed design will be concluded within the first 9 months of 1987 following which the tender, evaluation, and award will be executed by the end of the year.

Actual construction work will commence at the beginning of 1988, and will be concluded in 24 months.

As mentioned in 7-3-2(2), the existing Shipside pier will have to be removed before pile driving starts. The removal of the pier may cause a congestion of the Port. In order to alleviate such congestion, efforts should be made to shorten the construction period. In this sense, the new pier should be completed as early as possible. It might be preferable to adopt and alternate working hour schedule, such as a three-shift system, throughout this construction work.

Table 7-3-1 Construction Schedule for the Short Term Development Plan, Case 3

Item	Unit	Quantity	1987												1988												1989											
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1. New Pier																																						
(1) Steel Pipe Pile	ton	9,900																																				
(2) Pile Driving	pcs	1,100																																				
(3) Concreting Work	m^3	21,000																																				
(4) Fender and Bollard	Ls	1																																				
(5) Cathodic Protection	Ls	1																																				
(6) Abutment	Ls	1																																				
2. Removal of Shipside Pier	Ls	1																																				
3. Dredging	m^3	4,500																																				
4. Transit Sheds	m^2	32,000																																				
5. Open Storage Yard	m^2	12,000																																				
6. Roads	m^2	12,000																																				
7. Utilities	Ls	1																																				
8. Temporary Facilities	Ls	1																																				
9. Mobi/Demobilization	Ls	1																																				
10. Engineering Study	Ls	1																																				
11. Engineering Supervision	Ls	1																																				

7-3-4 Cost estimate

(1) The construction costs for the three alternative short term development plans

The construction costs for the three alternative short term development plans are shown in Table 7-3-2.

(2) Detailed construction costs for the short term development plan

The detailed construction costs for Case 3 is based on the following conditions.

1) The prices of construction materials, equipment and workers are based on the prices as of May 1983. However, the prices in foreign currency (Tables 7-3-2 and 7-3-3) are at the October 1983 exchange rates.
2) Exchange rate is $1 = ₱14 = ¥232
3) Customs duties for imported materials and equipment are not included in the cost estimate.
4) As for taxes, only the sales tax on domestic materials is estimated.
5) Inflation is not considered.
6) The prices and transportation cost of construction materials imported from abroad and the rental fees and mobilization costs of equipment brought in from abroad are estimated in foreign currency. The wages of some foreign engineers are also estimated in foreign currency.
7) The engineering fees are included for such items as the soil investigations, the engineering study and supervision.

The cost estimate under the above mentioned conditions amounts to ₱257,570,000. Details are shown in Table 7-3-3.

Table 7-3-2 Construction Costs for the Three Alternative Short Term Development Plans

(.000 ₱)

	Case 1			Case 2			Case 3		
	L.C.	F.C.	Total	L.C.	F.C.	Total	L.C.	F.C.	Total
1. New Pier/Wharf	67,269	84,132	151,401	84,702	99,479	184,181	58,823	129,024	187,847
2. Removal of the Shipside Pier	990	0	990	990	0	990	990	0	990
3. Dredging	11,550	0	11,550	252	0	252	315	0	315
4. Reclamation	9,900	0	9,900	38,646	0	38,646	0	0	0
5. Onshore Works	27,715	3,742	31,457	27,715	3,742	31,457	27,715	3,742	31,457
6. Mobilization and Demobilization	2,020	1,206	3,226	1,190	1,206	2,396	1,190	1,206	2,396
7. Engineering Study	5,972	4,454	10,426	7,675	5,221	12,896	4,460	6,690	11,150
8. Physical Contingency	12,542	9,353	21,895	16,117	10,965	27,082	9,349	14,062	23,415
Grand Total	137,958	102,887	240,845	177,287	120,613	297,900	102,842	154,728	257,570

Note: L.C. ..... Local Currency
F.C. ..... Foreign Currency

Table 7-3-3 Construction Cost for the Short Term Development Plan, Case 3

	Item	Unit	Quantity	Unit Price (₱)			Amount (,000 ₱)		
				L.C.	F.C.	Total	L.C.	F.C.	Total
1	New Pier	Ls					58,823	129,024	187,847
(1)	Steel Pipe Pile	ton	9,900	968	11,236	12,204	9,583	111,236	120,819
(2)	Pile Driving	pcs	1,100	9,250	0	9,250	10,175	0	10,175
(3)	Concreting Work	m^3	21,000	1,628.4	351.1	1,979.5	34,195	7,374	41,569
(4)	Fenders and Bollards	Ls	1				306	2,109	2,415
(5)	Cathodic Protection	Ls	1				3,554	8,292	11,846
(6)	Abutment	Ls	1				1,010	13	1,023
2	Removal of the Shipside Pier	Ls	1				990	0	990
3	Dredging	m^3	4,500	70	0	70	315	0	315
4	Transit Sheds	m^2	32,000	720	110	830	23,040	3,520	26,560
5	Open Storage Yard	m^2	12,000	20	0	20	240	0	240
6	Roads	m^2	12,000	304	16	320	3,648	192	3,840
7	Utilities	Ls	1				282	30	312
8	Temporary Facilities	Ls	1				505	0	505
9	Mobilization and Demobilization	Ls	1				1,190	1,206	2,396
10	Engineering	Ls	1				4,460	6,690	11,150
	Sub Total						93,493	140,662	234,155
11	Physical Contingency (10%)	Ls	1				9,349	14,066	23,415
	Grand Total						102,842	154,728	257,570

Note: L.C. ..... Local Currency
F.C. ..... Foreign Currency

(3) Rough construction cost for the master plan

The rough construction cost for the master plan (beyond 1990) is shown in Table 7-3-4. This cost covers such construction works as quay walls, piers, breakwater, revetments, reclamation, leveling and the trunk road. These costs are based on the same conditions as those in the short term development plan. Table 7-3-5 shows the construction schedule for the master plan.

In the implementation of the master plan (beyond 1990), further detailed study of engineering and port activities will be required.

Table 7-3-4 Rough Construction Cost for the Master Plan (beyond 1990)

Item	Unit	Quantity	Unit Price (.000 ₱)	Amount (.000 ₱)
1. PPA Berth	m	600	300	180,000
2. Cement Plant Berth	m	400	250	100,000
3. Ore Carrier Berth	m	300	260	78,000
4. Oil Tanker Berth	m	300	133	39,900
5. Breakwater	m	550	287	157,850
6. Revetment Facing the Ocean	m	1,250	57	71,250
7. Revetment Facing the Bay	m	800	86	68,800
8. Reclamation/Leveling	ha	120	1,750	210,000
9. Trunk Road	m^2	9,500	3.2	30,400
10. Engineering	Ls	1		46,800
Sub-total				983,000
11. Physical Contingency (15%)	Ls			147,400
Grand Total				1,130,400

Note: o Mobilization/Demobilization costs are included in each item.
o Reclamation material is procured from seabed.

Table 7-3-5 Construction Schedule for the Master Plan (beyond 1990)

Item	Unit	Quantity	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
			J	J	J	J	J	J	J	J	J	J
1. PPA Berth	m	600										
2. Cement Plant Berth	m	400										
3. Ore Carrier Berth	m	300										
4. Oil Tanker Berth	m	300										
5. Breakwater	m	550										
6. Revetment Facing the Ocean	m	1,250										
7. Revetment Facing the Bay	m	800										
8. Reclamation/Leveling	ha	120										
9. Trunk Road	m^2	9,500										
10. Engineering	Ls	1										

CHAPTER 8
ECONOMIC APPRAISAL

CHAPTER 8 ECONOMIC APPRAISAL

8-1 Purpose of Economic Appraisal

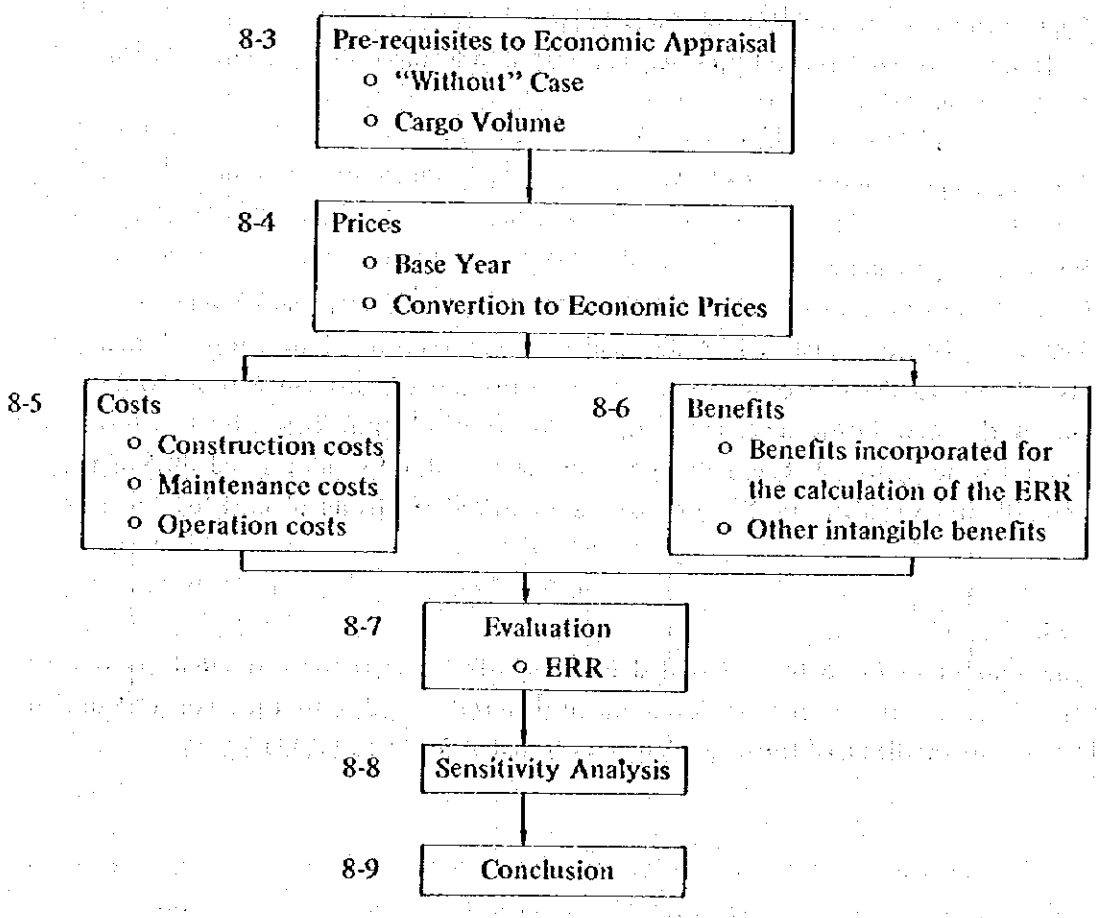
The purpose of this chapter is to appraise the economic feasibility of the short term development plan explained in Chapter 6.

The evaluation of a project should show whether the project is justifiable from the economic point of view by assessing its contribution to the national economy. Thus, the basic purpose of this chapter is to investigate the economic benefits as well as economic costs which will arise from the project and to evaluate whether the net benefits exceed those which could be derived from other investment opportunities (i.e. opportunity cost of capital).

8-2 Approach and Methodology

8-2-1 Approach

The following process is followed in making the economic appraisal. The figures in the chart indicate the section number where each subject is discussed.



8-2-2 Methodology

The economic internal rate of return (ERR) based on cost benefit analysis is used in order to appraise the feasibility of the project. In estimating the economic cost of the short term development plan, shadow rates are applied to foreign exchange rates and to unskilled labor wages to convert the market price estimations into true economic costs.

8-3 Pre-requisites to Economic Appraisal

8-3-1 "Without" case

A cost benefit analysis is conducted on the difference between "with" and "without" investment cases. In other words, incremental benefits and costs arising from the proposed investment are compared and it is examined whether or not the net benefits generated by the project exceed the cost of capital in the Philippines. Therefore, determining the "without" case is one of the key processes in economic appraisal.

In this study, after various possibilities are discussed, the following conditions are adopted as the "without" case.

- o No investment is made.
- o The Shipside area (the Shipside pier and its back up area) is taken over by PPA after the contract between the Shipside Inc. and the Philippine government expires in 1985.
- o The Shipside pier is not usable after 1990.
- o Handling of coal and oil products is transferred to the PNOC pier after its construction is completed.

8-3-2 Cargo volume

(1) Relevant cargo volume

Of the total future cargo volume projected in Chapter 5, only the volume to be handled at the PPA piers, i.e., the existing PPA pier and the short term development plan's newly designed pier is relevant to the economic appraisal. Since the econoic analysis is done to determine the impact of the new investment, the cargoes which are not influenced by this investment are irrelevant to the appraisal. From this point of view, coal, oil products and 80% of the mineral ores are all irrelevant because these cargoes are handled at private piers (PNOC pier and Philex pier).

(2) "With" case

The amount of cargo to be handled in the "with" case is the estimated cargo volume in Chapter 5 because the short term development plan is designed so that the Port of San Fernando will be able to ahndle all of the carge demand estimated for 1990 (Table 8-3-1).

Table 8-3-1 Projected Cargo Volume at PPA Piers

(.000 MT)

	1990 – 2019
Fertilizer (import-bulk)	150.0
Fertilizer (trans.-bulk)	210.0
Fertilizer (trans.-bag)	210.0
Cement (export)	400.0
Mineral Ores (export)	40.0
Others (import)	112.0
Others (inward)	48.0
Total	1,170.0

Source: Table 5-8-4

(3) "Without" case

The cargo volume for the "without" case is determined as the maximum handling capacity of the existing PPA pier because the Shipside pier is assumed to be unusable after 1990. The amount in excess of this maximum will have to be diverted to other ports. In this case, the Port of Manila is selected as the alternative port because all the sub-ports of PMU San Fernando are very small and incapable of accommodating ocean going vessels.

The economic costs for land transport of the diverted cargo compose one of the major benefits since these costs will be avoided by developing the Port of San Fernando.

In order to determine the maximum handling capacity, queuing simulations at various cargo volumes are made. In other words, the relationship among annual cargo volume, the berth waiting time and berth occupancy rate are simulated by computer.

The results are shown in Table 8-3-2.

Table 8-3-2 Results of Queuing Simulations

Annual Cargo Volume	Average Berth Waiting Time	Berth Occupancy Rates
(.000 MT)	(days/ship)	(%)
400	3.3	70
450	5.0	79
500	8.5	85

Source: Appendix 8-1

From past experience a berth occupancy rate of 70% or an average waiting time of 3 days is the ceiling. In other words, past beyond this point, shipping companies will be willing to divert their vessels to other ports.

Thus, a total cargo volume of 400,000 tons, for which volume the berth occupancy rate reaches 70%, is determined to be the maximum handling capacity of the "without" case. This total cargo volume is evenly distributed among the cargo categories so that the ratio of cargo volume handled in the "without" case to that in the "with" case is 400/1170 for every kind of cargo, i.e., all the cargoes will suffer equally in case the new pier is not constructed.

The following Table 8-3-3 gives the projected cargo volumes to be handled at the PPA piers for both "with" and "without" cases.

Table 8-3-3 Projected Cargo Volume for "With" and "Without" Cases

(,000 MT)

	With Case 1990 – 2019	Without Case 1990 – 2019	Difference
Fertilizer (import-bulk)	150.0	51.3	98.7
Fertilizer (trans.-bulk)	210.0	71.8	138.2
Fertilizer (trans.-bag)	210.0	71.8	138.2
Cement (export)	400.0	136.8	263.2
Mineral Ores (export)	40.0	13.7	26.3
Others (import)	112.0	38.3	73.7
Others (inward)	48.0	16.4	31.6
Total	1,170.0	400.0	770.0

Source: Table 5-8-4

8-4 Prices

8-4-1 Base year

All costs and benefits except the foreign exchange rate are expressed in the price of May 1983, at which time the price survey was conducted.

The foreign exchange rate, however, was devaluated significantly after the price survey;

May '83 ₱10.0/$ ⟶ June 23 '83 ₱11.0/$ ⟶ Oct. 5 '83 ₱14.0/$

Therefore, applying the foreign exchange rate of ₱10/$ as of May 1983 is no longer practical and the latest rates of ₱14/$ and ¥232/$ as of Oct. 5 1983 are used.

8-4-2 Method for converting to economic prices

Since the construction costs are estimated at market prices, it is necessary to re-evaluate them from the economic point of view. In this study, the exclusion of transfer items and the partial application of shadow prices are adopted.

(1) Exclusion of transfer items

Of the construction costs given in Chapter 7, the costs of imported materials and services, forming the foreign currency portion, do not include import duties or sales taxes. On the other hand, the local currency portion includes both sales tax and import duties, which are merely transfer items, appearing without consuming resources in the national economy. Therefore, they should be excluded from the construction costs.

(2) Shadow pricing

1) Shadow exchange rate

In order to calculate the real economic cost of the goods imported by the investment (short term development plan), the "real" economic exchange rate has to be applied.

In the Philippines, as well as in other developing countries, the official exchange rates do not reflect the scarcity value of foreign exchange. As a result, the cost of imports is held artifically low. Thus, NEDA* recommends the application of a shadow price of about 1.20 to all foreign exchange components arising from government projects. Accordingly, the foreign currency portion will be multiplied by 1.20 in this study.

2) Shadow wage rate of unskilled labor

NEDA also recommends taking into account shadow wages in the Philippines. Although minimum wages are set by Presidential Decrees, some wages actually paid do not correctly measure the real cost of labor. Although unskilled labor seems to be in excess supply, due to the minimum wage rate, actual wage rate will exceed the opportunity cost.

According to the guideline provided by NEDA, the economic price of unskilled labor should be 80% of the official price. In the present analysis, therefore, the wage rate for unskilled labor will be adjusted by multiplying the minimum wage by 0.8.

8-5 Costs

8-5-1 Construction cost

As mentioned in 8-4-2, the amount of investment, estimated at market prices in Chapter 7, has to be converted into economic prices.

Table 8-5-1 shows the application of the shadow wage for unskilled labor and the removal of transfer items such as customs duty and sales tax from the local currency portion of the construction costs.

Table 8-5-2 shows the application of the shadow exchange rate for the foreign currency portion.

Note: *) NEDA Policy Development Staff

Table 8-5-1 Local Currency Portion (Economic Prices)

(.000 ₱)

	Market Price	Adjusted Items				Economic Price			
	L.C. Total	Un-skilled at M.P.	Un-skilled at E.P.	Custum Duty at M.P.	Sales Tax at M.P.	L.C. Total	1987	1988	1989
	(a)	(b)	(c)=(bx0.8)	(d)	(e)	(f)=(a−b+c−d−e)			
Engineering	4,460	67	54	24	49	4,374	2,624	875	875
Dredging/Removal	1,305	27	21	66	66	1,167	0	886	281
Wharf	74,037	2,691	2,151	1,976	3,649	67,872	268	46,114	21,490
Transit Sheds	23,040	1,728	1,382	544	1,139	21,011	0	0	21,011
Total	102,842	4,513	3,608	2,610	4,903	94,424	2,892	47,875	43,657

Source: The market prices are taken from Table 7-3-3

Table 8-5-2 Foreign Currency Portion (Economic Prices)

(.000 ₱)

	Market Price				Economic Price			
	F.C. Total	1987	1988	1989	F.C. Total	1987	1988	1989
Engineering	6,690	4,014	1,338	1,338	8,029	4,817	1,606	1,606
Dredging/Removal	0	0	0	0	0	0	0	0
Wharf	144,518	401	137,158	6,959	173,420	481	164,589	8,350
Transit Sheds	3,520	0	0	3,520	4,224	0	0	4,224
Total	154,728	4,415	138,496	11,817	185,673	5,298	166,195	14,180

Source: The market prices are taken from Table 7-3-3

8-5-2 Maintenance costs

The maintenance costs for wharf and sheds are set to be 1.0% of the economic cost of the original investments.

Calculation of this amount is given in Table 8-5-3.

Table 8-5-3 Maintenance Costs

Facilities	Investment at Economic Cost*	Rates	Amount
	(.000 ₱)	(%)	(.000 ₱)
Wharf	241,292	1.0	2,413
Transit Sheds	25,235	1.0	252
Total	269,527	–	2,665

Source: *) Tables 8-5-1 and 8-5-2

8-5-3 Operation costs

The operation costs are composed of two components;

- o Personnel costs
- o Administrative costs

(1) Personnel costs

After the development of the port, an additional eight persons must be employed. The details about the proposed jobs for these eight persons are given in 9-5-2(1) and Appendix 9-2. The three security guards are assumed to be unskilled workers, but all others are skilled. Therefore, the shadow wage rate is applied only for the three guards.

₱25,850* x (5 + 3 x 0.8) = ₱191,290

(2) Administrative costs

Based on the analysis of historical data, the added administrative costs due to the development project, are assumed to be 33% of the figure for the additional personnel costs.

₱191,290 x 0.33 = ₱63,126

The total operation cost is derived by adding these two costs as given in Table 8-5-4.

Table 8-5-4 Operation Costs

(.000 ₱)

Cost components	Amount
Personnel costs	191
Administrative costs	63
Total	254

Note: *) 110% of the actual average personnel cost at PMU San Fernando in 1982 is used, Please refer to 9-5-2.

8-6 Benefits

8-6-1 General

Generally, government investment in port construction projects is of the highest importance in a country such as the Philippines which is composed of numerous islands and surrounded by the sea.

Besides, Region I, to which the Port of San Fernando belongs, is one of the depressed regions of the Philippines. In order attain the planned economic growth, development of industries has the highest priority, because development in agriculture, which has been accounting for a major portion of Region I's GRDP, is limited. Under such conditions, the development of sea transport, which can carry large amount of raw materials and finished products at lower cost, is of unquestionably high importance.

In addition, one of the aims in developing the Port of San Fernando is to promote the transhipment business between China and countries exporting fertilizer and other bulk chemicals, taking advantage of natural (deep water) and geographical (nearness to China) conditions. Thus, this development is expected to play the role of a "booster" for Region I.

In order to discuss this in more detail, the followings are identified as benefits arising from the short term development plan. Here, "tangible benefits" are those which can be evaluated in monetary terms and therefore can be taken into account in calculating the ERR. "Intangible benefits" are those which are difficult to evaluate in monetary terms.

Tangible benefits ..... Details are mentioned in 8-6-2

- o Savings in berth waiting costs
- o Savings in land transportation cost
- o Incremental value added arising from fertilizer transhipment

Intangible benefits ..... Details are mentioned in 8-6-3

- o Support in attracting foreign investors to the San Fernando EPZ and the Bacnotan Industrial Estate projects
- o Increase in employment opportunities
- o Impact on regional activities
- o Improvement of cargo handling efficiency and safety

8-6-2 Benefits included in the calculation of the ERR (tangible benefits)

(1) Cargo volume

"With" the investment, a total cargo of 1,170,000 tons will be handled using both the existing PPA pier and the New peir as shown in Table 8-3-2.

While, in the "without" case, this 1,170,000 tons of cargo is assumed to be allocated, as follows;

a) 400,000 tons will be handled at the existing PPA pier
b) 493,600 tons will be diverted to Manila
c) 138,200 tons of fertilizer transhipment will be done in Manila and other transhipment

ports

d) 138,200 tons of fertilizer transhipment will be lost to foreign ports.

The cargo allocations based on these assumptions are shown in Fig. 8-6-1.

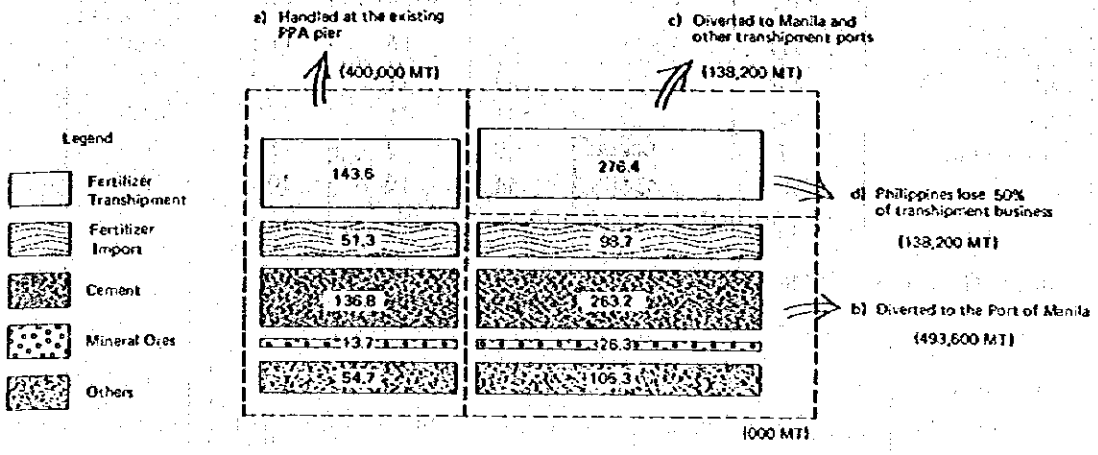


Fig. 8-6-1 Cargo Allocation in the "Without" Case

Out of all the benefits mentioned in the previous section, the three benefits classified as tangible are incorporated in the calculation of the ERR.

(2) Savings in berth waiting costs

Although only 400,000 tons of cargo are assumed to be handled at the existing PPA pier in the "without" case, the average waiting time of all ships will amount to 3.3 days (80 hours) compared with the 11 hours in the "with" case.

The cost associated with the difference in berth waiting time is a benefit of the development. This is calculated by multiplying three factors.

Saving in Berth Waiting Costs	=	Difference in Berth Waiting Time	x	Ship Costs (unit cost)	x	Share of Benefits belonging to the Philippines

1) Difference in berth waiting time

The average berth waiting time will be reduced by 69 hours (Table 8-6-1).

Table 8-6-1 Berth Waiting Time

	Berth Waiting Time (hrs)		No. of Vessels		Average Waiting Time (hrs)		
	With	Without	With	Without	With	Without	Diff.
Fertilizer (Bulk)	511	1,374	46	16	11.1	85.9	−75
Fertilizer (Bag)	246	796	30	11	8.2	72.4	−64
Cement	1,436	3,762	134	46	10.7	81.8	−71
Mineral Ores	75	133	5	2	15.1	66.5	−51
Others	580	1,434	54	19	10.7	75.5	−65
Total	2,849	7,499	269	94	10.6	79.8	−69

Source: Queuing Simulation

2) Berth waiting cost

The following two approaches can be used to estimate ship cost incured while waiting for a berth.

A. The prevailing ocean going vessel charter rate

B. Adding up each composite ship cost

The charter rates, however, fluctuate widely, reflecting the interest rate trends, and in turn influence the cost of building new ships, and thus the supply-demand situation.

Therefore, in determining the ship waiting cost, following three pieces of information are needed:

a) NTPP report

Based on approach B. mentioned above, NTPP estimated the per year cost of a 3,700 DWT ship was ₱5,016,000 (1980 prices).

This is converted to the monthly ship cost per DWT (1983 prices) and is listed in Appendix 8-2. The result is $12.2.

b) An interview with a Japanese shipping company

According to a Japanese shipping company, whose ships visit the Port of San Fernando, the monthly costs for such cargo ships range from $9 to $17 per DWT.

c) SSB (Shipping Statistics and Economics, May '83)

As shown in Appendix 8-3, the monthly charter rates per DWT for multidecker of 10,000 – 19,999 DWT have ranged from $5.5 to $13.0 in the past three and half years.

From these statistics, $13/month/DWT, which is the average of $9 and $17, as well as being almost the same as the NTPP estimation is taken as the average ship waiting cost. Although the SSE charter rates are not used, in order to know the sensitivity of the ship cost, a sensitivity test for the ship cost of $9.25/month/DWT, which is average of past charter rates, was added in 8-8-2.

3) Philippines' share of the benefits

The savings in berth waiting costs are primarily realized by the shipping company. For foreign ships, therefore, the benefits accrue to the foreign country.

However, some portion of these benefits should be returned to PPA, the investor of the development project. It is also possible for PPA to acquire some benefit by, for example, increasing the tariff because the service level at the port will be improved.

Therefore, in this study, 50% of savings in berth waiting costs for foreign ships are treated as benefits which accrue to the Philippines. As for Philippine flag ships, 100% of the savings are counted as benefits.

According to the past records, the percentages of national flag vessels by cargo are shown in Table 8-6-2. And these figures are used in calculating ERR.

Table 8-6-2 Percentage of Philippine Flag Vessels

(%)

Ship Type	Share
Fertilizer (Bulk)	10
Fertilizer (Bag)	20
Cement	50
Mineral Ores (PPA/Shipside)	15
Others	60

Source: PMU San Fernando, data by ship 1982

(3) Savings in land transportation cost

The savings in transportation cost are the avoided overland truck costs (benefits) due to the investment.

As mentioned in 8-6-2(1), 493,600 tons are assumed to be diverted to the Manila Port and transported by trucks between Manila and San Fernando. In calculating the benefits, the economic overland truck costs per ton-km are multiplied by the difference in distance of land transportation for the "with" and "without" cases.

Savings in Land Transportation Cost	=	A Economic Land Transportation Cost (per ton-km)	x	B Difference in Distance of Land Transportation

In this analysis, the following assumptions are implied.

- o The berth waiting times in the Ports of Manila and San Fernando (without case) are the same.
- o There is no additional cargo handling cost due to diverting

A. Economic land transportation cost

The cost of land transportation is calculated based on the cost estimation provided by NTPP for used (6-8 years old) 3 axle trucks. Since the cost is estimated in 1980 prices, it is adjusted by the consumer price index. The cost (1983 prices) is 62 centavos per ton-km. Details of the assumptions and calculations are shown in Appendix 8-4.

B. Difference in the land transportation distance

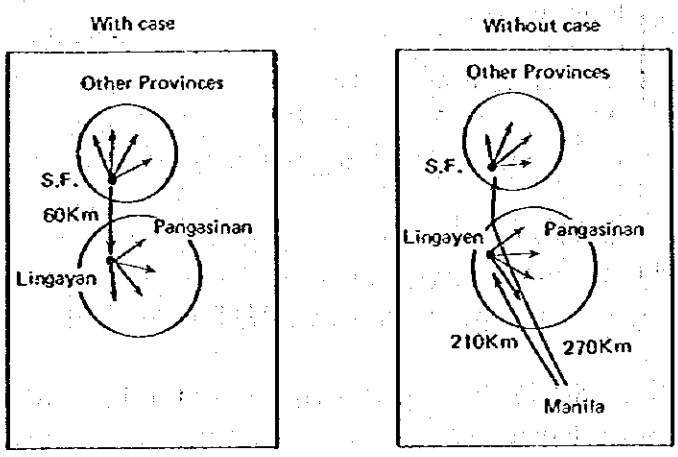
The "with" and "without" cases require differing land transportation distances. The differences in distance are determined by cargo based on the origins and destinations of each cargo.

Fertilizer

Pangasinan province has a large plain and 60% of the agricultural land in Region I is in Pangasinan. So, the fertilizer hinterland in Region I is divided into two areas, namely, Pangasinan, and the other provinces. The fertilizer to be consumed in Pangasinan is assumed to be transported to Lingayen and then distributed from there.

The rest, which is assumed to be consumed in provinces other than Pangasinan, is assumed to be transported to San Fernando and then distributed from there.

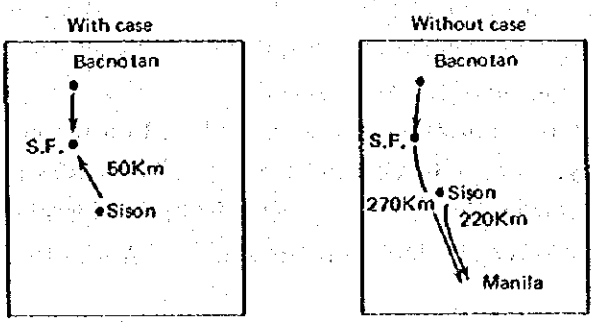
The volume to be consumed in each area is allocated based on existing agricultural land area (Appendix 8-5, A. Table 8-5-1).



Cement

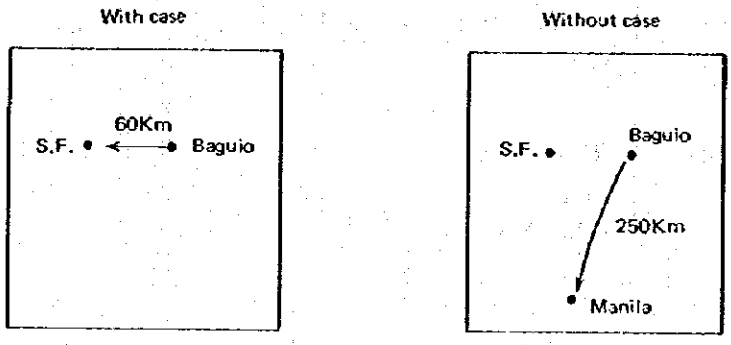
Based on production levels, 75% of all cement cargo is assumed to be exported from NCC and the rest from BCI. The NCC plant is located at Sison, which is 50 km south of San Fernando and 220 km from Manila. Therefore, even in the "with" case, the cement from NCC has to be transported 50 km by trucks. The difference between "with" and "without" case is 170 km.

For export from BCI, on the other hand, since it is located north of San Fernando, the net difference in truck transport distance is 270 km, which is the distance between San Fernando and Manila.



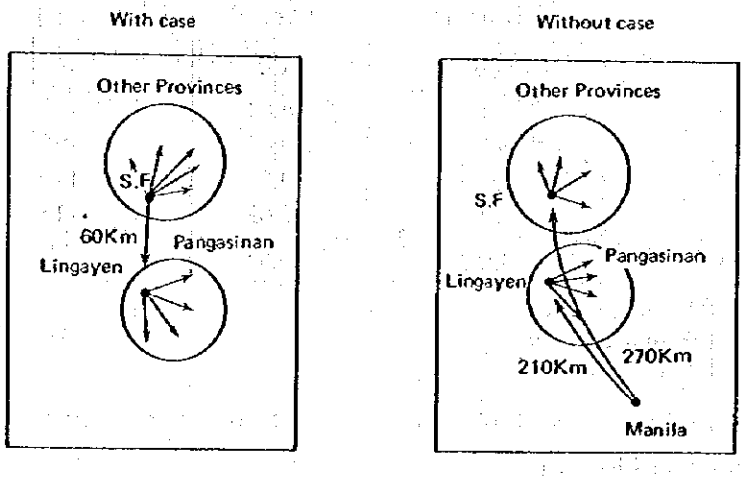
Mineral Ores

Most of the mineral ores handled at the Port of San Fernando are from Baguio, Benguet. In the "without" case, all mineral ores are assumed to be transported directly from Baguio to Manila (250 km). Just like cement, even in the "with" case there exists 60 km (Baguio → San Fernando) of land transport. Therefore, the benefit of the development is recognized as the difference, 190 km.



Others

For others, like fertilizer, Region I is divided into two areas, Pangasinan province and the other provinces. This time, however, cargo volume is allocated based on the population in those two areas. Lingayen and San Fernando are taken as the centers of these two areas. (Appendix 8-5, A. Table 8-5-2)



In summary, the average differences in the distance of the land transportation are determined shown as in Table 8-6-3.

Table 8-6-3 Reductions in Land Transportation

	Areas		Distance (km)			
	Name	(%)	W/O	With	Difference	Average
	(a)	(b)	(c)	(d)	(e)=(c−d)	(f)=(bxe)
Fertilizer	Pangasinan	59*	210	60	150	199
	Other Provinces	41*	270	–	270	
Cement	BCI	25	270	–	270	195
	NCC	75	220	50	170	
Mineral Ores	Benguet (Baguio)	100	250	60	190	190
Others	Pangasinan	46**	210	60	150	215
	Other Provinces	54**	270	–	270	

Source: *) Appendix 8-5, A. Table 8-5-1
**) Appendix 8-5, A. Table 8-5-2

Benefits arising from the reduction in land transportation cost are calculated as Table 8-6-4.

Table 8-6-4 Benefits of Reduced Land Transportation Costs

	Cargo Volume (.000 MT)	Cost (₱/t·km)	Average Distance (km)	Benefits (.000 ₱)
	(a)	(b)	(c)	(d)=(axbxc)
Fertilizer	98.7	0.62	199	12,178
Cement	263.2	0.62	195	31,821
Mineral Ores	26.3	0.62	190	3,098
Others	105.3	0.62	215	14,036
Total	493.6	0.62	–	61,133

Source: (a) Fig. 8-6-1
(b) Appendix 8-4
(c) Table 8-6-3

(4) Fertilizer transhipment

In case new investment is not made, 66% or 276,400 tons of the expected amount of fertilizer transhipment is assumed to be diverted to other ports.

As mentioned in Chapter 5, foreign ports such as Taichun and Singapore are competitive. Therefore, it is plausible to assume that, in case a new pier is not constructed, the Philippines will lose at least 50% of the fertilizer transhipment business to foreign ports and the rest (50%) will be diverted to other ports within the Philippines such as the Ports of Manila, Iloilo and Davao.

The economic benefit of handling this transhipment cargo is the amount of value added

within the Philippines arising from the transhipment.

The transhipment cost obtained from the interviews with experts in this field was $15 – 16/MT as shown in Chapter 5. However, not all of this is value added belonging to the Philippines. This cost is composed of the cargo handling cost, the ships' berth waiting and handling costs, cost of longer cruising days to drop by the transhipment port, port charges, and the profit of the consignee, etc.

Among these component costs, however, only the port charges and stevedoring/arrastre charges are taken into account as benefits since these costs are surely the economic benefits for the Philippines. The following charges are used for calculation.

Table 8-6-5 Wharfage, Arrastre and Stevedoring Charges of Fertilizer Transhipment

(₱/MT)

	Wharfage	Arrastre	Stevedoring	Total
Bulk	10.00	13.43*	6.38*	30.24
Bag	2.50	13.43*	7.32*	23.68
Total	–	–	–	53.92

Note: *) Overtime rates are applied for 16 hrs/24 hrs.
o Harbor and berthing fees are excluded in this calculation, because of their neglisibleness.

Source: Appendix 9-1

The benefits are calculated by using following equation.

Benefits	=	Amount of Three Charges	x	Transhipment Diverted to Foreign Ports

₱4,833,000 = ₱69.94 x 276,400 MT x $\frac{1}{2}$ x 50%

8-6-3 Other intangible benefits

(1) The attraction of foreign investors to the San Fernando EPZ and the Bactan Industrial Estate projects

As stated in 4-2-4, the new EPZ is planned about 6 km away from the Port of San Fernando. Although it is being postponed for another two years beyond its orginal timetable, the area still has high priority among the several EPZ candidate areas. According to the EPZ's feasibility study, approximately 40 factories with a total of 12,000 employees are expected to enter the EPZ.

Without the development, the Port of San Fernando will be operating at capacity simply maintaining the existing kinds of cargo. Therefore, factories which need ship transportation

require the development of the port as a pre-requisite to operations at the EPZ. Although it is extremely difficult to project how many of these factories will locate, there will surely be some. The value added by such companies is therefore an economic benefit of the development project of the Port of San Fernando.

(2) Increase in employment opportunities

In order to assess the benefits of additional employment arising from the project, construction employment during the port's construction period and the post-construction employment in the administrative and port operations sectors have to be differentiated.

1) Benefits from employment during the construction period

There is an excess supply of unskilled labor in Region I. The construction will increase the employment opportunities for those people who would be unemployed without the project. This employment effect is one of major benefits produced by the project.

Appendix 8-6 shows the required number of labores for the project. Table 8-6-6 is the yearly allocation of this employment effect.

Table 8-6-6 Yearly Allocation of the Employment Effect

(person-day)

	Total	1987	1988	1989
Total	86,400	1,600	28,800	56,000
Unskilled	72,100	1,000	23,200	47,900
Skilled	14,300	600	5,600	8,100

Note: *) Unskilled labor includes general persons, crew and assistant operators
**) Skilled labor includes some of carpenters, welders and foremen

2) Benefits from employment after the construction

Here, there are two different types of job which will be created after the construction.

- Loading/Unloading operations
- Port administration

a) Loading/Unloading operations

The amounts of arrastre and stevedoring needed to load and unload cargoes, which becomes possible due to constructing a new pier, are estimated as follows.

Table 8-6-7 Employment Effect in Loading/Unloading Cargoes

Year	Cargo Volume (.000 MT)	Cargo Handling Productivity (MT/person/day)	Employment Effect (000 person-day)
	(a)	(b)	(c)=(a÷b)
1990	1,170 – 400	1.5 x 8 hrs	64.2
2000	1,800 – 400	1.5 x 8 hrs	116.7

Note: The cargo handling productivity is estimated to be 125% of actual cargo handling productivity (1.2 MT/person/hr).

b) Port administration

The following eight persons will be needed in addition to the current employees in order to administer the developed port. Details of the future organization are discussed in 9-5-2(1) and Appendix 9-2.

Table 8-6-8 Employment Effect in Port Administration

Position	No. of Persons Needed
Legal Officer	1
Assistant Senior Engineer	1
Terminal Operation Assistant	2
Account Clerk	1
Security Guards	3

(3) Impact on regional activities

In addition to the already mentioned benefits such as;

- The promotion of the transhipment of fertilizer and other bulk chemicals
- The attraction of foreign investors to both the Bacnotan Industrial Estate and the San Fernando EPZ
- The increase in employment opportunities

port related industries, such as those shown in Table 8-6-9, especially the first group, will become more numerous in the areas adjacent to the Port due to the implementation of the project. This will be followed by growth in the second group, bank, retailer, wholesalers, restaurants and insurance companies, as well.

Table 8-6-9 Number of Industries (Establishment) and Service Firms in the District of Port of San Fernando (1978)

A.	First Group		
		Warehouse	0
		Stevedore	2
		Transportation	2,941
		Construction	15
B.	Second Group		
		Bank	19
		Retailer	3,530
		Wholesaler	129
		Restaurant	311
		Insurance	0
C.	Third Group		
		Name of Company	
	1.	Mining Co.	
	2.	Cement Co.	
		Bacnotan Consolidated Industries Incorporated	
	3.	Metal Products	
		Jacqveline R. Dygniangco	
		Raymundo Tabncol	
		Johnny Martiney	
		Jose B. Balingit	

Source: Regional Census and Statistics

(4) Improvement of handling cargo efficiency and safety

The existing piers are not long enough to accommodate fully loaded large vessels and their width is too narrow for efficient or safe cargo handling. Especially, the wooden Shipside pier is already 20 years aged and is now almost obsolete. There are many small slots or gaps caused by abrasion on the plates of the pier and it is almost impossible to handle cargo efficiently.

Furthermore there are no sufficient back-up facilities (transit sheds, etc.).

It is very difficult to assess in monetary terms the benefits of efficiency and safety in cargo handling. However, by construction of a new pier and other related facilities, safe and efficient cargo handling is easily ensured.

8-7 Evaluation

8-7-1 Pre-requisites for calculating the ERR

The lifespans of wharves and transit sheds are 50 and 30 years, respectively. Therefore, the economic cost/benefit evaluation has been carried out starting in 1983 (0-year) and ending in 2019 (the 30th year from the start of operations in 1990).

The residual value of investments in 2019 was not taken into account because the wharf will have been economically obsolete after 30 years, although it will still have 20 years of its

depreciation period left.

8-7-2 Results

The ERR of the project is 22.9% for the base case (Table 8-7-1). Usually the ERR is compared with the opportunity cost of the capital in the country. In the Philippines, almost all fasibility studies are adopting the rate of 15% as the cost of capital. This rate is a national economic paramater and the same rate of 15% should be applied to all project evaluations as a lower limit. From this point of view, this project can be judged as more than feasible.

Table 8-7-1 ERR (Base Case)
ERR = 22.9%

(000 P)

	1984	1985	1986	1987	1988	1989	1990-2019
Benefit Total	0	0	0	0	0	0	79,398
Savings in Waiting Time							13,432
Savings in Transpo. Cost							61,133
V.A. of Fertilizer Trabship							4,833
Cost Total	0	0	0	8,190	214,070	57,837	2,919
Construction Engineering				7,441	2,481	2,481	
Dredging				0	866	281	
Wharf				749	210,703	29,840	
Shed				0	0	25,235	
Maintenance							2,665
Operation							254
Benefit - Cost	0	0	0	-8,190	-214,070	-57,837	76,478
N P V	233,821	88,579	49,027	26,703	10,812	-522	
Discount Rate	10.0%	15.0%	17.0%	19.0%	21.0%	23.0%	

8-8 Sensitivity Analysis

8-8-1 Identification of cases

Since every project appraisal makes use of forecasting, various uncertain factors enter the projection. Therefore, several sensitivity tests are made to see if the project is justifiable when some of these factors are varied. The different assumptions for the sensitivity test are as follows;

Case A ..... The cargo volume in 1990 is decreased by 10%.

Case B ..... The construction cost is increased by 10%.

Case C ..... The peso exchange rate is decreased by 10%.

Case D ..... The ship cost is decreased by about 30%, that is, an average time charter rate ($9/month/DWT) is used.

8-8-2 Results

The results of sensitivity test are shown in Table 8-8-1. The details are given in Appendix 8-7.

Table 8-8-1 Sensitivity Analysis

(%)

Different Assumptions			ERR
Case A	Cargo Volume	10% decrease	20.3
Case B	Construction Cost	10% increase	21.0
Case C	Peso Exchange Rate	10% decrease	21.6
Case D	Ship Cost	30% decrease	22.0
Base Case			22.9

The sensitivity test reveals that among the four different assumptions the ERR is most sensitive to the 10% decrease in cargo volume. This change of cargo volume corresponds to the assumption that the GRDP of Region I will grow at a lower annual rate of 5.7% rather than 7.3% for the period 1983 – 1990. However, even the lowest ERR rate for the four tested cases exceeds 20%.

8-9 Conclusion

This short term development plan for the Port of San Fernando is judged to be more than feasible based on the ERR of the project as well as the intangible benefits arising from this project.

CHAPTER 9
FINANCIAL APPRAISAL

CHAPTER 9 FINANCIAL APPRAISAL

9-1 Purpose of Financial Appraisal

The purpose of this chapter is to appraise the financial feasibility of the short term development plan.

This appraisal is focused on the following two points.

1) Financial viability of the operating entity responsible for the short term development plan
2) Profitability of the short term development plan itself

9-2 Approach and Methodology

9-2-1 Commercial accounting system

PPA is authorized by Presidential Decree 857 to prescribe port tariff rates and raise necessary funds. Its accounting is based on a commercial accounting system. The individual PMUs, which together constitute PPA as a whole, also have its own financial statements. Accordingly, all data in this chapter including financial projections are calculated based on a commercial accounting system.

9-2-2 Operating entity

It is important to choose the appropriate entity in the light of financial analysis. The following were picked up as candidates;

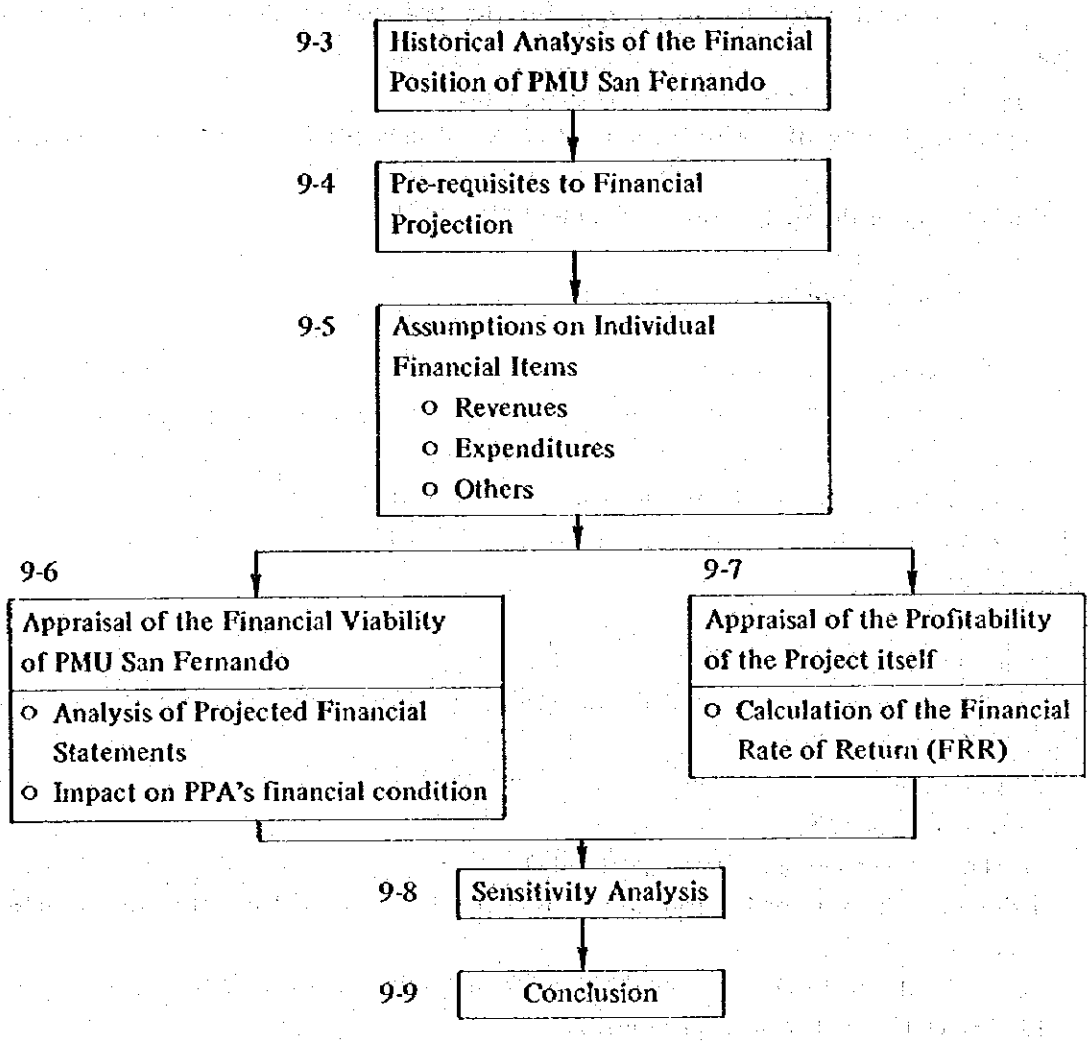
- PPA as a whole
- PMU San Fernando
- The Port of San Fernando (Base port only)

After due consideration of the following actual conditions, PMU San Fernando was selected as the operating entity.

1) The scale of construction under the short term development plan is too small to consider PPA as a whole as the operating entitity.
2) Each PMU actually functions not only as an administrative unit but as a revenue and cost center. It has its own financial statements.
3) The Port of San Fernando is the base port of PMU San Fernando and handles most of the PMU's total cargo throughputs. Accordingly, the figures of the PMU can be regarded as representing those of the base port.

9-2-3 Approach

The process of financial appraisal is designed as follows. The figures in the chart indicate the section numbers where each subject is discussed.



9-2-4 Methodology

The financial viability of PMU San Fernando with the project is appraised based on the projected income statement, cash flow statement and balance sheet. Return on net operating assets (ROA) and debt service ratio (DSR) are used to measure the impact of this project on PPA's financial condition. The profitability of the project itself is analyzed by using the financial internal rate of return (FRR).

9-3 Historical Analysis of the Financial Position of PMU San Fernando

The financial position of PMU San Fernando was reviewed to get data and informations necessary for financial projection.

The income statements and balance sheets for PMU San Fernando in the years 1979 – 82 are summarized in Tables 9-3-1 and 9-3-2.

9-3-1 Revenue from operations

(1) Comparison of revenue from operations in 1979 vs. 1982

The gross revenue for 1982 was ₱7.2 million, 2 times more than ₱3.4 million in 1979. This was largely due to changes in the following background.

- A port tariff increase of 60% and the corresponding arrastre/stevedoring tariff increase
- A cargo volume increase of 8%
- The increase in non-traditional income such as rental income, water sales

Table 9-3-1 Income Statement of PMU San Fernando, 1979 – 1982

(.000 P)

	1979 on 31 Dec.	1980 on 31 Dec.	1981 on 31 Dec.	1982 on 31 Dec.
Revenue from Port Operations	3,408	5,136	5,535	6,884
Charges against Vessels	768	884	1,082	1,390
Tonnage Dues	212	302	373	489
Entrance/Clearance	28	33	42	40
Berthing Charges	528	549	667	861
Charges against Cargoes	2,640	4,252	4,453	5,494
Wharfage	1,591	2,168	2,829	3,530
Storage Charges	53	80	–	13
Arrastre/Stevedoring	996	2,004	1,624	1,951
Non-traditional Income (Miscellaneous)	20	20	244	283
Water Sales	–	–	–	110
Rental	–	–	8	149
Others	20	20	* 236	24
Gross Revenue	3,428	5,156	5,779	7,167
Less; Reduction from Revenue	631	1,291	1,182	823
Net Revenue	2,797	3,865	4,597	6,344
Total Operating Expenses	1,643	1,888	2,697	3,543
Personnel Services	566	819	928	936
Rep. & Mainte. Port Facilities	386	246	859	1,616
Depreciation of Operating Assets	456	464	468	466
Amortization of Dredging	–	–	–	–
Other Administration Costs	193	298	299	308
Taxes & Licenses	42	61	143	217
Net Operating Income	1,154	1,977	1,900	2,801
Less; Other Charges	498	445	455	475
Amortization of Pre-operating Costs	498	445	445	445
Depreciation of Non-optig. Assets	--	–	–	–
Interests on Loans	** –	** –	10	30
Net Income	656	1,532	1,445	2,326
Operating Ratio	59%	49%	59%	56%
Return on Assets	8%	15%	15%	22%

Note: *) The others for 1981 include rental income and water sales.
**) There is no data available for interest paid on loans in 1979 and 1980.

Table 9-3-2 Balance Sheet of PMU San Fernando, 1979 – 1982

(.000 ₱)

	1979 on 31 Dec.	1980 on 31 Dec.	1981 on 31 Dec.	1982 on 31 Dec.
Assets				
Current Assets	838	1,179	1,768	1,909
Cash on hand and in banks	17	33	9	82
Accounts Receivable	735	1,081	1,314	1,207
Inventories	86	65	445	620
Fixed Assets	15,242	14,538	14,125	13,656
Non-depreciable Assets (Land = 1,341)	1,591	1,341	1,347	1,341
Total Depreciable Assets	22,026	23,032	22,081	22,084
(Building & Structure)	(21,660)	(21,660)	(21,660)	(21,660)
(Furniture, Fixture & Equip.)	(366)	(372)	(421)	(424)
Less; Accumulated Depreciation	8,375	8,835	9,303	9,769
Net Depreciable Assets	13,651	13,197	12,778	12,315
Deferred Charges	1,335	894	457	7
Pre-operating Expenditure	1,335	894	457	7
Deferred Dredging	–	–	–	–
Other Assets	–	23	0	0
Total Assets	17,416	16,634	16,350	15,572
Liabilities & Net Worth				
Current Liabilities	323	323	800	446
Accounts Payable	323	305	780	443
Trust Liabilities	–	18	20	3
Other Liabilities	75	94	104	* 798
Long Term Liabilities	–	–	–	–
Total Liabilities	398	417	904	1,244
Net Income for the Year	656	1,532	1,455	2,356
CO/PMU Clearing Account	16,362	14,685	13,991	11,971
Total Net Worth	17,018	16,217	15,446	14,327
Total Liabilities & Networth	17,416	16,634	16,350	15,572
Debt/Equity Ratio	2/98	3/97	6/94	8/92

Note: *) Of this amount, ₱606 thousand is supplies and materials charged to appropriation.

(2) Revenues by tariff item

Table 9-3-3 points out the following financial characteristics of PMU San Fernando.

- The PMU's revenue from storage charges was less than 1%.
- PMU's governmental arrastre income was 31% of the total, higher than the PPA average of 23%.

Table 9-3-3 Comparative Distribution of Revenue Items in 1982
– PMU San Fernando vs. PPA consolidated –

(.000 ₱)

	PPA consolidated		PMU San Fernando	
		%		%
Charges against Vessels	58,220	17	1,390	22
Entrance/Clearance	4,800	1	40	1
Berthing	37,300	11	861	13
Tonnage	16,120	5	489	8
Charges against Cargoes	266,940	78	4,671	74
Wharfage	160,790	47	2,707	43
Storage	26,730	8	13	0
Share in Arrastre/Stevedoring	79,420	23	1,951	31
Other Income	17,060	5	283	4
Total	342,220	100	6,344	100

The small revenue from storage charges has been attributed to the policy of PMU San Fernando to actively rent transit sheds and open storages to shippers and consignees (Northern Cement Corp., Commert etc.). This policy aims at stabilizing revenue from cargo storage.

The large portion of revenue from arrastre/stevedoring income comes from the fact that the government share in arrastre/stevedoring income had been rather high at the Port of San Fernando. In the Philippines, port charges are the same in every port under PPA. On the other hand, arrastre/stevedoring charges and the government percentage differ from port to port, based on the contract with the cargo handling contractors in each port. At the PPA pier in the Port of San Fernando, the government share had been 37% from July 1980 until November 1982 when the share was reduced to 10%. The share at the Shipside pier is presently 15%.

(3) Revenue by point of billing

No financial record showing revenue by point of billing was available for PMU San Fernando. In terms of cargo volume, however, Table 9-3-4 reveals the base port represents approximately two thirds of the total PMU cargo volume.

Table 9-3-4 Cargo Volume at Base Port and Others, 1980

(000 MT)

Port	Cargo Volume	
		%
Total	1,572	100
Base Port	1,031	66
PPA Pier	535	
Shipside Pier	301	
Philex Pier	193	
AG & P	1	
Sub-Ports & Private Ports	541	34
Currimao	22	
Sual	–	
Sulvec	–	
Acoje	125	
Masinloc (Benguet, Santos, Pertron)	394	
Others	–	

Source: Relevant statistics for Port District of San Fernando

(4) Reduction from revenue

Table 9-3-5 Shadow Revenue from Port Charge Exempted Cargo, 1979 – 1982

(%)

	1979	1980	1981	1982	PMU S.F. Average	PPA Total
Ratio of Shadow Revenue to Gross Revenue	18	25	21	11	19	7

It should be noted that the ratio of PMU's reduction from revenue to total revenue has been rather higher than PPA's average of 7% (Table 9-3-5). Major cargoes exempted from port charges have been cement export cargo and fertilizer import cargo. The former is privileged to be exempted from wharfage as an export promotion strategy. The latter is also exempted from this port charge when the importer is a government related entity.

9-3-2 Expenditures

(1) Operating expenses

Operating expenses may be classified into the following five items:

- o Personnel costs
- o Repair and maintenance costs for port facilities
- o Depreciation of operating assets
- o Other administrative costs
- o Taxes and Licences (3% tax paid on net operating revenue)

It should be noted that PMU San Fernando has no amortization costs for dredging because the Bay is deep enough for vessels.

(2) Other charges

Below are the principal "other" charges found in the PMU's income statement;

- o Amortization of pre-operating costs
- o Interests on loans

Almost all pre-operating costs have been amortized already. This will reduce the financial burden after 1983. As for interest on loans, they have been directly allocated to individual PMUs in accordance with the reasons for the loans. The actual figures for PMU San Fernando have been below 0.5% of the operating revenue which can be considered negligible.

The head office costs are not included in PMU's accounts.

9-3-3 Balance sheet

Cash on hand and in bank accounts, in 1982, was only P82 thousand and long-term debt is not shown in the PMU San Fernando accounts. This is because the raising and application of funds are not functions of PMU but of the PPA Central Office (CO). In fact, cash and funds are transferred between PPA and PMU using a CO/PMU clearing account, suggesting that this account represents investment by PPA in PMU.

9-3-4 Financial position

PMU's operating ratio in 1982 was 56% (Table 9-3-1), which was a little worse than the 50%, average of all the PMUs.

The return on operating assets, however, was 22% (Table 9-3-1) which was better than the 14%, average of all the PMUs.

PMU San Fernando has continued to be a supplier of funds to the PPA Central Office, in spite of the fact that some of the 19 PMUs have not yet become self-supporting.

There was no data available for the long-term debt of PMU San Fernando. However, the small amount of interest on loans implies that the debt accredited to the PMU is also small and negligible. The CO/PMU clearing account can be regarded as equity. Based on these assumption, the debt/equity ratio for 1982 was calculated to be 8/92 and is very favourable.

9-4 Pre-requisites to Financial Projection

(1) Return of the Shipside pier and evaluation of its assets

It is assumed that the Shipside pier, including port facilities and land, will be taken over by PPA in 1985 when the contract between the Shipside Inc. and the Philippine Government expires.

There was no reliable data available for the present asset value of the Shipside area. The Team found that the Shipside pier and its related port facilities were already superannuated and that its many warehouses could not be put to use because of the damage by the typhoon in 1982. Therefore, only the asset value of the land is taken into account in this analysis (Appendix 9-3 3. (2)).

(2) Removal of the Shipside pier and port operations

It is also assumed that the removal of the Shipside pier will not interfere with port operations.

(3) Estimation of the revenue from the sub-ports

Since the purpose of this analysis is to appraise the feasibility of the project, a constant revenue from the sub-ports, at the level estimated for 1984 in the "Budget Proposal 1983", is assumed in order to minimize the influences from the sub-ports.

(4) Inflation

In this analysis, revenue and expenditures are calculated at constant 1983 prices. Because, under the present economic conditions in the Philippines, no one can predict a reasonable inflation rate over a long period.

Instead, price escalation of construction costs is examined as one of the sensitivity analyses in 9-9.

(5) Foreign currency exchange rate

Below are the foreign currency exchange rates (Oct. 1983) used in this study.

$1.0 = ₱ 14.0

$1.0 = ¥232.0

The sensitivity analysis also examines the case of 10% decrease in the peso exchange rate.

(6) Continuation of balance accounts and the calculation period

PMU's financial balance, with the project, is assumed to carry over all the former assets and debts, including the assets presently belonging to the Shipside Inc.. Projected financial statements are calculated from 1984 to 2014. This is 25 years from 1990, when the new pier will start port operations, and is thought to be long enough to analyze the effects of the investment.

9-5 Assumptions on Individual Financial Items

9-5-1 Revenues

(1) New port tariff with 135% approved tariff increases

The new port tariff was approved by the President of the Philippines on June 27, 1983 and has been effective since August 1, 1983. This amendment includes not only an increase in rates but also the restructuring of the former complex schedule of charges. Details of the current port tariff are described in Appendix 9-1, while the rates applied to categories of cargoes are shown in Table 9-5-1.

Table 9-5-1 Schedule of Unit Port Charges

(₱/ton)

	Harbor	Berthing	Usage	Wharfage	Storage	Arrastre	Steve
Fertilizer (import-bulk)	0.29	0.14	0.00	10.00	3.20	1.01	0.48
Fertilizer (trans.-bulk)	0.29	0.14	0.00	2.50	0.00	1.01	0.48
Fertilizer (trans.-bag)	0.29	0.14	0.00	0.00	0.80	1.01	0.55
Cement (export)	0.29	0.14	0.00	5.00	1.60	1.01	0.55
Mineral Ores (export)	0.29	0.14	0.00	5.00	1.60	0.43	0.37
Others (import)	0.29	0.14	0.00	10.00	3.20	1.24	0.48
Others (inward)	0.00	0.00	0.00	0.70	2.40	0.54	0.51
Sub Total	---	---	---	---	---	---	---
Oil Products (inward)	0.00	0.00	0.00	0.35	0.00	0.00	0.00
Coal (inward)	0.00	0.00	0.00	0.35	0.00	0.00	0.00
Mineral Ores (export)	0.29	0.10	0.00	2.50	0.00	0.00	0.00
Sub Total	---	---	---	---	---	---	---
Grand Total	---	---	---	---	---	---	---

Note: Arrastre/stevedoring rates are already multiplied by the government share of 10%.

This amendment accompanied approval of a port tariff increase by a total of 135% in the following 6 steps;

1st step on August	1, 1983	15%
2nd step on October	1, 1983	20%
3rd step on April	1, 1984	20%
4th step on October	1, 1984	20%
5th step on April	1, 1985	30%
6th step on October	1, 1985	30%

The first and second steps have already been enforced. Revenues from port charges in this analysis are calculated in accordance with this schedule of tariff increases.

(2) Cargo volume forecast

The figures estimated in Chapter 5 are used as the cargo volume for 1990. The annual cargo volumes from 1984 to 1990 are shown in Table 9-5-2, and after 1990, the figures for 1990 are assumed to be maintained.

Table 9-5-2 Projected Cargo Volume at the Port of San Fernando

(,000 MT)

	1984	1985	1986	1987	1988	1989	1990-2014
Fertilizer (import-bulk)	98.2	106.8	115.8	124.7	133.6	142.2	150.0
Fertilizer (trans.-bulk)	70.5	84.6	101.4	121.7	146.0	175.1	210.0
Fertilizer (trans.-bag)	70.5	84.6	101.4	121.7	146.0	175.1	210.0
Cement (export)	165.2	191.4	221.8	257.0	297.9	345.2	400.0
Mineral Ores (export)	37.1	37.6	38.1	38.5	39.0	39.5	40.0
Others (import)	75.2	80.4	85.8	91.8	98.1	104.8	112.0
Others (inward)	32.2	34.4	36.8	39.3	42.0	44.9	48.0
Sub Total	548.9	619.8	701.1	794.7	902.6	1,026.8	1,170.0
Oil Products (inward)	382.5	371.3	360.4	349.9	339.6	329.7	320.0
Coal (inward)	83.6	100.3	120.4	144.5	173.5	208.3	250.0
Mineral Ores (export)	148.5	150.3	152.2	154.2	156.1	158.1	160.0
Sub Total	614.6	621.9	633.0	648.6	669.2	696.1	730.0
Grand Total	1,163.5	1,241.7	1,334.1	1,443.3	1,571.8	1,722.9	1,900.0

(3) Revenue from storage fees

Taking the followings into consideration, revenue from storage fees is not counted at all. Instead, the corresponding rental income is calculated.

1) There was no actual data available for cargo staying days, necessary to calculate the revenue from storage fees.
2) Unlike other ports where general cargoes are the main storage cargoes, transhipment cargoes account for a large share at the Port of San Fernando. So, actual data at other ports can't be substituted at the Port of San Fernando.
3) As previously mentioned in 9-3-1 (2), PMU has been actively renting transit sheds and open storages to shippers and consignees.

(4) The revenue from arrastre/stevedoring charges

As already explained, the government share at the PPA pier has been reduced from 37% to 10% since November 22, 1983. The government share of 10% is used in this analysis. As for the Shipside pier, the same figure of 10% is used in spite of the present 15% share because the Shipside pier is assumed to be taken over by PPA in 1985.

No arrastre/stevedoring income concerning oil products, coal, or mineral ores is counted since these cargoes will be handled through pipes or belt-conveyors at private piers.

(5) Reduction from revenue

All revenue from wharfage fees concerning cement export cargo are deducted from the gross operating revenue. This is because cargoes of BOI (Bureau of Investment) registered firms are exempted from these fees by Presidential Decree. Fertilizer import cargo, on the other hand, which had also been exempted from a wharfage due, are charged with wharfage fees in this analysis, so PPA has recently agreed with the FPA (Fertilizer and Pesticide Authority) that individual fertilizer companies should pay wharfage fees in cash, instead of having them credited by the Budget Commission, to the general account of PPA.

(6) Fund management income

No income from applications of the annual cash surplus are taken into account in this analysis.

9-5-2 Expenditures

The various categories of expenditures and the derivation of estimates in each category are explained below.

(1) Personnel costs

Expenses associated with personnel are calculated on the basis of the number of employees needed. In order to estimate the number of personnel, the future organization of PMU San Fernando was studied in consideration of projected cargo volume, allocation of facilities and so on. A conversation was also held with the port manager, covering the results of the analysis. As a result, the future organization and a personnel figure of 49 for 1990 were arrived at. Until 1990, the present number of 41 personnel is used. For reference, the assumed future organization is provided in Appendix 9-2.

As a per capita annual personnel cost, ₱25,850, 110% of actual average cost in 1982, is used.

(2) Repair and maintenance costs

The repair and maintenance costs of the existing port facilities are taken as 5% of the book value of the total gross depreciable assets. This rate is determined on the basis of PMU's actual records for the last four years, and reflects the current upward trend.

As far as new port facilities are concerned, those annual costs are forecast on an assessed percentage of the value of fixed assets requiring maintenance, i.e. 1% is assessed for both wharf and transit sheds.

(3) Other administrative costs

Other administrative costs are assumed to be 33% of the annual personnel costs. During the last four years, these costs have remained around 33% of the personnel costs.

(4) Taxes and licenses

The contractor's tax is 3% of net operating revenue. Income tax and taxes on real properties are omitted.

(5) Depreciation of operating assets

The annual depreciation of operating assets is computed by the straight line method with no residual value, in accordance with the PPA guide lines. The depreciation costs of the existing assets are calculated, using the actual records of 2.1% of the total gross depreciable assets. On the other hand, those costs of the new assets are obtained, using 1) the proposed amount of investment for the facilities, as given in Table 9-5-3 and 2) the following economic lives of them, as assessed by PPA for depreciation purposes;

Item	Service Life	Annual Depreciation Rate
Wharf	50 years	2.0%
Transit Shed	30 years	3.3%

Table 9-5-3 Construction Cost

($1.0 = ₱14.0)

(000 ₱)

	Total	1987	1988	1989
Total Costs	257,570	7,359	190,933	59,278
Local Currency Portion	102,842	2,944	52,437	47,461
Foreign Currency Portion	154,728	4,415	138,496	11,817
Wharf	218,555	669	187,713	30,173
Local Currency Portion	74,037	268	50,555	23,214
Foreign Currency Portion	144,518	401	137,158	6,959
Transit Shed	26,560			26,560
Local Currency Portion	23,040			23,040
Foreign Currency Portion	3,520			3,520
Engineering	11,150	6,690	2,230	2,230
Local Currency Portion	4,460	2,676	892	892
Foreign Currency Portion	6,690	4,014	1,338	1,338
Dredging	315			315
Local Currency Portion	315			315
Foreign Currency Portion	0			0
Removal of Shipside Pier	990		990	
Local Currency Portion	990		990	
Foreign Currency Portion	0		0	

Note: Physical contingency and other miscellaneous costs (2% of total costs) are regarded as a part of wharf.

(6) Amortization of dredging

The Port of San Fernando will not require any maintenance dredging as mentioned in 9-3-2(1). Only initial construction dredging costs of ₱315 thousand are amortized over five years.

(7) Amortization of pre-operating expenditures

The engineering and removal cost for the Shipside pier are capitalized as pre-operating expenditures. These costs are also written off over the five years after 1990. The annual amount is shown, with amortization, as a non-cash item.

(8) Interest on loans

Interest on existing loans is omitted because of the negligible amount. As for new loans, refer to the "fund raising item" in 9-5-3(1).

(9) Share of head office costs

2.5% of the head office costs is allocated to PMU San Fernando, based on the actual number of employees. Total head office costs increase 5% yearly from 1984 to 1990. The 1990 figure is adopted thereafter.

9-5-3 Others

(1) Fund raising

It is assumed that the foreign currency portion of the construction cost will be met by OECF. On the other hand, the local currency portion is to be covered by the internally generated funds of PPA.

The terms of foreign loans are determined as follows:

Maturity/Grace Period	—	30 years including 10 years grace period
Repayment	—	Repayment of principal once a year, commencing in 1977 and continuing to 2016
Interest Rate	—	3.5% annually

(2) Accounts receivable and accounts payable

Accounts receivable are computed on the basis that its amount will remain at 12% of the total net operating revenue during the period of calculations. In other words, it is assumed that the present level of 19% will be improved soon and that it will drop to the average level of the other PMUs.

Accounts payable are determined to be 20% of the cash operating expenses, reflecting the average actual records of PMU San Fernando for the last four years.

(3) Cash on hand and in banks

Amount of cash on hand and in banks is set at zero at the beginning of 1984. The annual cash surplus is added to this account.

9-6 Appraisal of the Financial Viability of PMU San Fernando

The projected income statement, the cash flow statement, and the balance sheet of PMU San Fernando are given in tables 9-6-1, 9-6-2 and 9-6-3 respectively.

Below are the results of analysis of the financial statements.

9-6-1 Projected income statement

(1) Projected revenue

Fig. 9-6-1 illustrates the projected revenue during the period from 1984 to 2014.

45% of the gross operating revenue will come from the approved tariff increases. It also shows that shadow income from exempted cargoes will remain as high as 15% of the gross operating revenue, exceeding the average of 7% of the other PMUs.

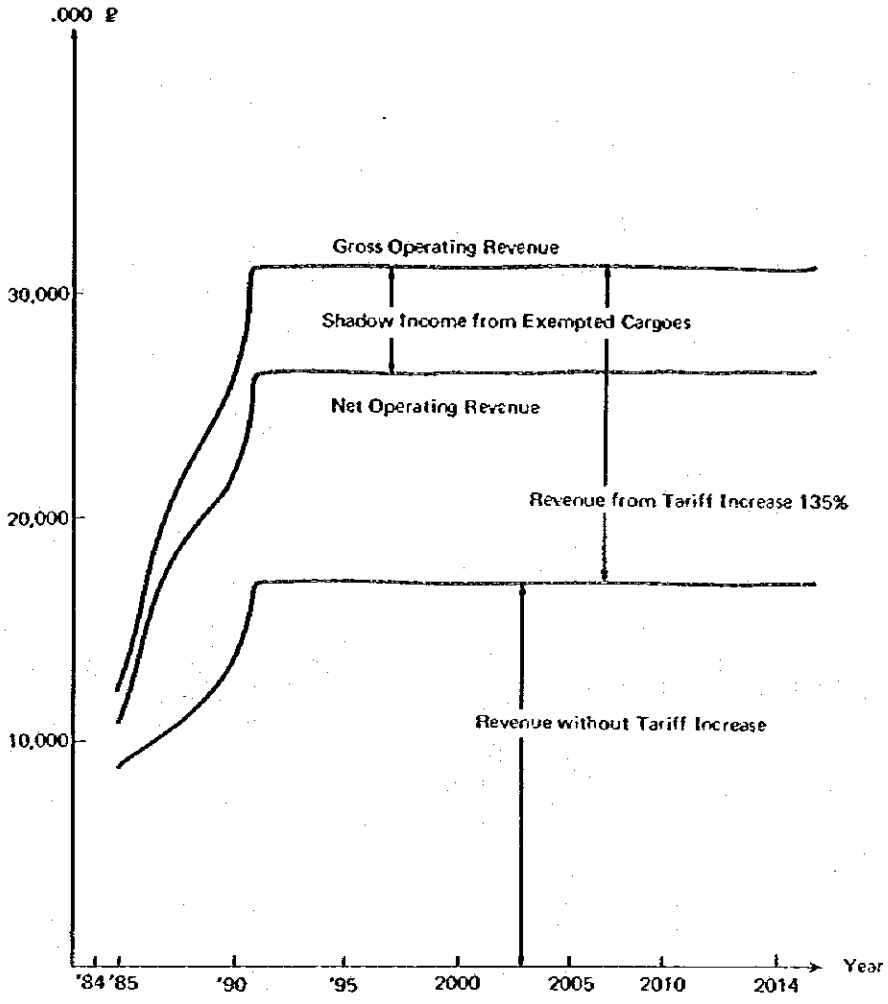


Fig. 9-6-1 Projected Revenue

Table 9-6-1 Projected Income Statement of PMU San Fernando

(.000 ₱)

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2005	2010	2014
Optg.Rev.from Base Port	7,286	8,034	8,714	9,725	10,666	11,883	15,495	15,495	15,495	15,495	15,495	15,495	15,495	15,495	15,495	15,495	15,495	15,495	15,495	15,495
Harbor Fee	473	524	583	655	736	827	934	934	934	934	934	934	934	934	934	934	934	934	934	934
Berthing Fee	1,172	1,378	1,441	1,746	1,888	2,216	2,027	2,027	2,027	2,027	2,027	2,027	2,027	2,027	2,027	2,027	2,027	2,027	2,027	2,027
Anchorage Fee	111	127	135	159	174	201	195	195	195	195	195	195	195	195	195	195	195	195	195	195
Usage Fee	112	117	122	126	145	147	141	141	141	141	141	141	141	141	141	141	141	141	141	141
Wharfage Fee	3,478	3,793	4,144	4,533	4,965	5,446	5,978	5,978	5,978	5,978	5,978	5,978	5,978	5,978	5,978	5,978	5,978	5,978	5,978	5,978
Storage Fee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Share in Arste/Steva Income	1,855	1,196	1,368	1,544	1,759	2,086	2,292	2,292	2,292	2,292	2,292	2,292	2,292	2,292	2,292	2,292	2,292	2,292	2,292	2,292
Water Sales	326	349	375	404	442	483	531	531	531	531	531	531	531	531	531	531	531	531	531	531
Rental	557	557	557	557	557	557	3,395	3,395	3,395	3,395	3,395	3,395	3,395	3,395	3,395	3,395	3,395	3,395	3,395	3,395
Optg.Rev.from Sub-Ports	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628	1,628
Port Charges	944	944	944	944	944	944	944	944	944	944	944	944	944	944	944	944	944	944	944	944
Share in Arste/Steva Income	684	684	684	684	684	684	684	684	684	684	684	684	684	684	684	684	684	684	684	684
Rev.from Port Tarif.Increas.135%	3,460	7,219	9,947	11,021	11,958	13,285	13,798	13,798	13,798	13,798	13,798	13,798	13,798	13,798	13,798	13,798	13,798	13,798	13,798	13,798
1st-Step on 1 Augt.1983 15%	944	1,031	1,185	1,225	1,328	1,467	1,533	1,533	1,533	1,533	1,533	1,533	1,533	1,533	1,533	1,533	1,533	1,533	1,533	1,533
2nd-Step on 1 Octr.1983 20%	1,258	1,375	1,474	1,633	1,770	1,956	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044
3rd-Step on 1 Apr1.1984 20%	944	1,375	1,474	1,633	1,770	1,956	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044
4rd-Step on 1 Octr.1984 20%	315	1,375	1,474	1,633	1,770	1,956	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044	2,044
5th-Step on 1 Apr1.1985 30%		1,547	2,211	2,449	2,656	2,934	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066
6th-Step on 1 Octr.1985 30%		516	2,211	2,449	2,656	2,934	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066	3,066
Gross Operating Revenue	12,374	16,881	20,293	22,374	24,244	26,716	30,920	30,920	30,920	30,920	30,920	30,920	30,920	30,920	30,920	30,920	30,920	30,920	30,920	30,920
Less: Reduction from Revenue	1,280	1,962	2,686	3,020	3,500	4,056	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700
Net Operating Revenue	11,093	14,920	17,684	19,354	20,744	22,660	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220
Cash Operating Expenses	2,847	2,961	3,044	3,094	3,136	3,194	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027
Personel Costs	1,060	1,060	1,060	1,060	1,060	1,060	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267	1,267
Rep.& Mainte.	1,104	1,104	1,104	1,104	1,104	1,104	3,555	3,555	3,555	3,555	3,555	3,555	3,555	3,555	3,555	3,555	3,555	3,555	3,555	3,555
Other Administrative Costs	350	350	350	350	350	350	418	418	418	418	418	418	418	418	418	418	418	418	418	418
Taxes & Licences	333	448	531	581	622	688	787	787	787	787	787	787	787	787	787	787	787	787	787	787
Non-Cash Charges	464	464	464	464	464	464	5,774	5,774	5,774	5,774	5,774	5,711	5,711	5,711	5,711	5,711	5,711	5,711	5,248	5,248
Depreciation of Optg.Assets	464	464	464	464	464	464	5,711	5,711	5,711	5,711	5,711	5,711	5,711	5,711	5,711	5,711	5,711	5,711	5,248	5,248
Amortization of Dredging							63	63	63	63	63									
Total Operating Expenses	3,310	3,425	3,508	3,558	3,600	3,657	11,801	11,801	11,801	11,801	11,801	11,738	11,738	11,738	11,738	11,738	11,738	11,738	11,274	11,274
Net Income from Operations	7,783	11,494	14,176	15,796	17,144	19,002	14,419	14,419	14,419	14,419	14,419	14,482	14,482	14,482	14,482	14,482	14,482	14,482	14,946	14,946
Fund Management Income	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Less: Other Charges	1,300	1,365	1,433	1,582	4,159	6,868	9,586	9,586	9,586	9,586	9,586	7,158	7,158	7,022	6,752	6,481	6,218	4,856	3,582	2,419
Amort.of Pre-Optg.Costs							2,428	2,428	2,428	2,428	2,428									
Interests on Loans				77	2,578	5,209	5,415	5,415	5,415	5,415	5,415	5,415	5,415	5,280	5,009	4,739	4,468	3,114	1,768	677
Share in Head Office Costs	1,300	1,365	1,433	1,505	1,580	1,659	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742
Net Income	6,483	10,129	12,742	14,214	12,986	12,134	4,834	4,834	4,834	4,834	4,834	7,325	7,325	7,460	7,731	8,002	8,272	9,626	11,444	12,527
Operating Ratio	29.8%	23.0%	19.8%	18.4%	17.4%	16.1%	45.0%	45.0%	45.0%	45.0%	45.0%	44.8%	44.8%	44.8%	44.8%	44.8%	44.8%	44.8%	43.0%	43.0%
Debt Service Ratio (times)	--	--	--	218.452	6.829	3.737	3.729	3.729	3.729	3.729	3.729	3.729	3.729	1.551	1.584	1.619	1.655	1.861	2.126	2.488
Return on Net Optg.Assets	67.0%	103.1%	132.6%	154.5%	175.7%	204.4%	11.2%	5.9%	6.0%	6.2%	6.3%	6.5%	6.7%	6.9%	7.0%	7.2%	7.5%	8.7%	10.9%	12.8%

Table 9-6-2 Projected Cash Flow Statement of PMU San Fernando

(.000 ₱)

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2005	2010	2014
Beginning Cash Balance	0	7,464	17,621	30,512	44,999	58,290	70,670	82,889	95,925	108,961	121,997	135,033	148,069	161,105	166,540	172,246	178,223	212,167	252,881	298,326
Cash From Internal Sources	11,491	14,460	17,352	19,154	20,577	22,430	24,837	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220
Net Fort Operating Revenue	11,893	14,920	17,684	19,354	20,744	22,660	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220
Fund Manegesent Incese	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accts.Receivable ,Beginning	1,560	1,331	1,798	2,122	2,323	2,489	2,719	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146
Accts.Receivable ,Ending	1,331	1,798	2,122	2,323	2,489	2,719	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146
Other Current Assets,Beginning	600	431	431	431	431	431	431	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387
Other Current Assets,Ending	431	431	431	431	431	431	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387
Cash From External Sources	0	8,074	0	7,359	190,933	59,278	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Foregin Available/Grants				4,415	138,496	11,817														
Equity Contributions		8,074		2,944	52,437	47,461														
Total Cash Inflow	11,491	22,534	17,352	26,513	211,510	81,708	24,837	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220	26,220
Cash Operating Expenses	2,847	2,961	3,044	3,094	3,136	3,194	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027	6,027
Share in Head Office Costs	1,300	1,365	1,433	1,505	1,580	1,659	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742	1,742
Debt Services	0	0	0	77	2,578	5,289	5,415	5,415	5,415	5,415	5,415	5,415	5,415	13,016	12,746	12,475	12,204	10,850	9,496	8,413
Investment	0	8,074	0	7,359	190,933	59,278	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accts.Payable ,Beginning	458	569	592	609	619	627	639	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205
Accts.Payable ,Ending	569	592	609	619	627	639	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205	1,205
Total Cash Outflow	4,027	12,370	4,461	12,026	198,219	69,328	12,618	13,184	13,184	13,184	13,184	13,184	13,184	20,785	20,515	20,244	19,973	18,619	17,265	16,182
Cash Inflow - Cash Outflow	7,464	10,157	12,891	14,487	13,291	12,380	12,219	13,036	13,036	13,036	13,036	13,036	13,036	5,435	5,706	5,977	6,247	7,601	8,955	10,038
Ending Cash Balance	7,464	17,621	30,512	44,999	58,290	70,670	82,889	95,925	108,961	121,997	135,033	148,069	161,105	166,540	172,246	178,223	184,470	219,768	261,836	308,364

Table 9-6-3 Projected Balance Sheet of PMU San Fernando

(.000 ₱)

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2005	2010	2014
Assets																				
Current Assets	9,226	19,842	33,864	47,752	61,210	73,819	87,422	100,458	113,494	126,530	139,566	152,602	165,638	171,873	176,779	182,756	189,883	224,301	266,369	304,897
Cash & Temporary Investment	7,464	17,621	30,512	44,999	58,290	70,670	82,889	95,925	108,961	121,997	135,033	148,069	161,105	166,540	172,246	178,223	184,470	219,768	261,836	300,364
Accounts Receivables	1,331	1,790	2,122	2,323	2,489	2,719	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146	3,146
Other Current Assets	431	431	431	431	431	431	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387
Fixed Assets	12,724	28,334	19,878	28,076	287,325	263,594	257,883	252,171	246,460	240,749	235,037	229,326	223,615	217,903	212,192	206,481	200,769	172,213	144,331	123,341
Land	1,341	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415	9,415
Work in Progress	0	0	0	669	188,382	245,115	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Depreciable Assets	22,084	22,084	22,084	22,084	22,084	22,084	267,199	267,199	267,199	267,199	267,199	267,199	267,199	267,199	267,199	267,199	267,199	267,199	267,199	267,199
Less Accum.Depreciation	10,701	11,165	11,629	12,092	12,556	13,020	18,731	24,443	30,154	35,865	41,577	47,288	52,999	58,711	64,422	70,133	75,845	104,401	132,284	153,274
Net Depreciable Assets	11,383	10,919	10,455	9,992	9,528	9,064	248,468	242,756	237,045	231,334	225,622	219,911	214,200	208,488	202,777	197,066	191,354	162,798	134,916	113,926
Deferred Charges	0	0	0	6,698	9,918	12,455	9,964	7,473	4,982	2,491	0	0	0	0	0	0	0	0	0	0
Pre-Operating Expenditure	0	0	0	6,698	9,918	12,140	9,712	7,284	4,856	2,428	0	0	0	0	0	0	0	0	0	0
Drferred Dredging	0	0	0	0	0	315	252	189	126	63	0	0	0	0	0	0	0	0	0	0
Total Assets	21,950	40,176	52,935	74,518	278,445	349,869	355,269	360,103	364,936	369,770	374,604	381,928	389,253	388,977	388,971	389,236	389,772	396,514	410,700	428,238
Liabilities & Net Worth																				
Current Liabilities	569	592	609	619	627	639	1,285	1,285	1,285	1,285	1,285	1,285	1,285	1,285	1,285	1,285	1,285	1,285	1,285	1,285
Long-Term Liabilities	0	0	0	4,415	142,911	154,728	154,728	154,728	154,728	154,728	154,728	154,728	154,728	146,992	139,255	131,519	123,782	85,100	46,418	15,473
Total Liabilities	569	592	609	5,034	143,538	155,367	156,013	156,013	156,013	156,013	156,013	156,013	156,013	148,197	140,461	132,724	124,988	86,385	47,624	16,678
Capital Contribution	14,898	22,972	22,972	25,916	78,353	125,814	125,814	125,814	125,814	125,814	125,814	125,814	125,814	125,814	125,814	125,814	125,814	125,814	125,814	125,814
Retained Earnings-Beginning	0	6,483	16,612	29,354	43,568	56,554	68,688	73,522	78,355	83,189	88,023	92,857	100,181	107,506	114,966	122,697	130,699	174,768	225,818	273,219
Added Net Income from Oprtn.	6,483	10,129	12,742	14,214	12,986	12,134	4,834	4,834	4,834	4,834	4,834	7,325	7,325	7,460	7,731	8,002	8,272	9,626	11,444	12,527
Retained Earnings-Ending	6,483	16,612	29,354	43,568	56,554	68,688	73,522	78,355	83,189	88,023	92,857	100,181	107,506	114,966	122,697	130,699	138,971	184,395	237,262	285,746
Total Net Worth	21,381	39,584	52,326	69,484	134,906	194,502	199,336	204,169	209,003	213,837	218,670	225,995	233,320	240,780	248,511	256,512	264,785	310,208	363,076	411,559
Total Liabilities & Net Worth	21,950	40,176	52,935	74,518	278,445	349,869	355,269	360,103	364,936	369,770	374,604	381,928	389,253	388,977	388,971	389,236	389,772	396,514	410,700	428,238

(2) Projected expenditures

Fig. 9-6-2 illustrates the projected expenditures and the income position. It indicates that, out of the total operating expenses, the depreciation of operating assets, and the repair and maintenance costs will have large shares of 48% and 30% respectively.

Interest on loans will constitute almost as great a financial burden as depreciation.

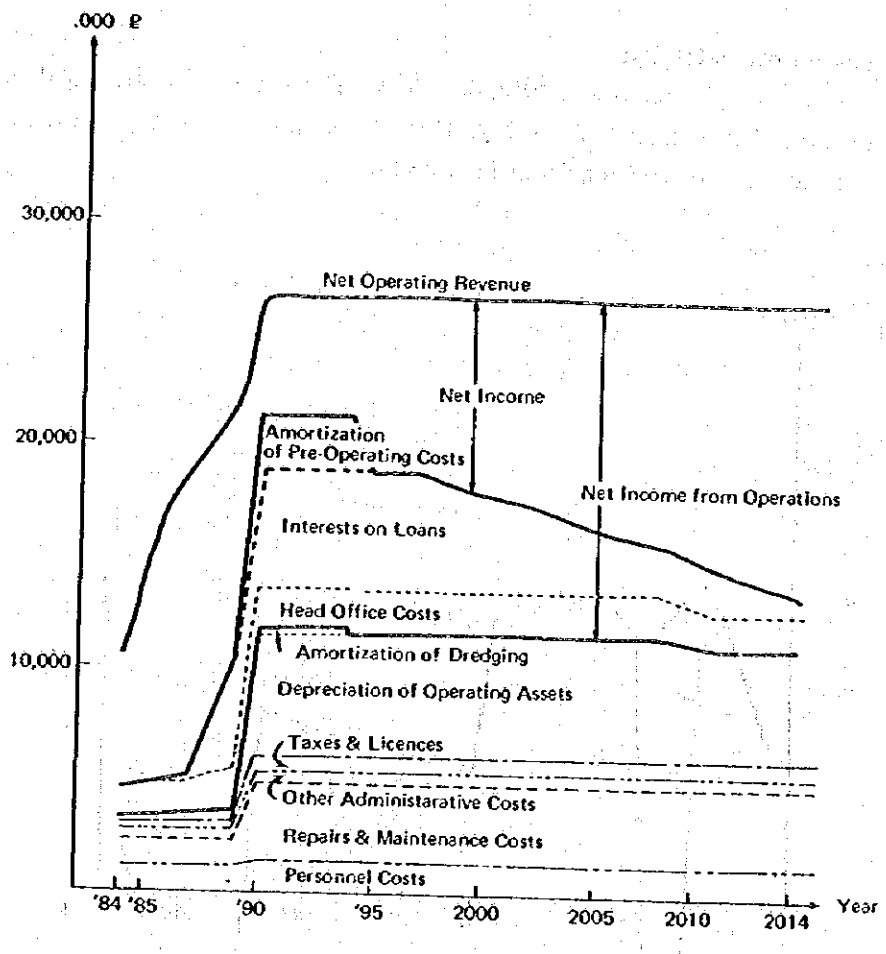


Fig. 9-6-2 Projected Revenue and Expenses

(3) Projected net income

Fig. 9-6-2 clearly shows that the net operating revenue will always exceed the total expenditures from the beginning of construction to the end of the period of calculation. Even during the five years after 1990, when amortization of pre-operating costs and interests on loans will impose the heaviest burden on the financial position, a net income of P4.8 million will be earned annually. Thereafter, net income will gradually increase in accordance with the decrease in interest payments.

9-6-2 Projected cash flow statement

Fig. 9-6-3 presents the projected annual cash surplus. The solid line is always above the base line where cash income just offsets cash outlay. This demonstrates that it will not be necessary for the Head Office to support working funds in any year.

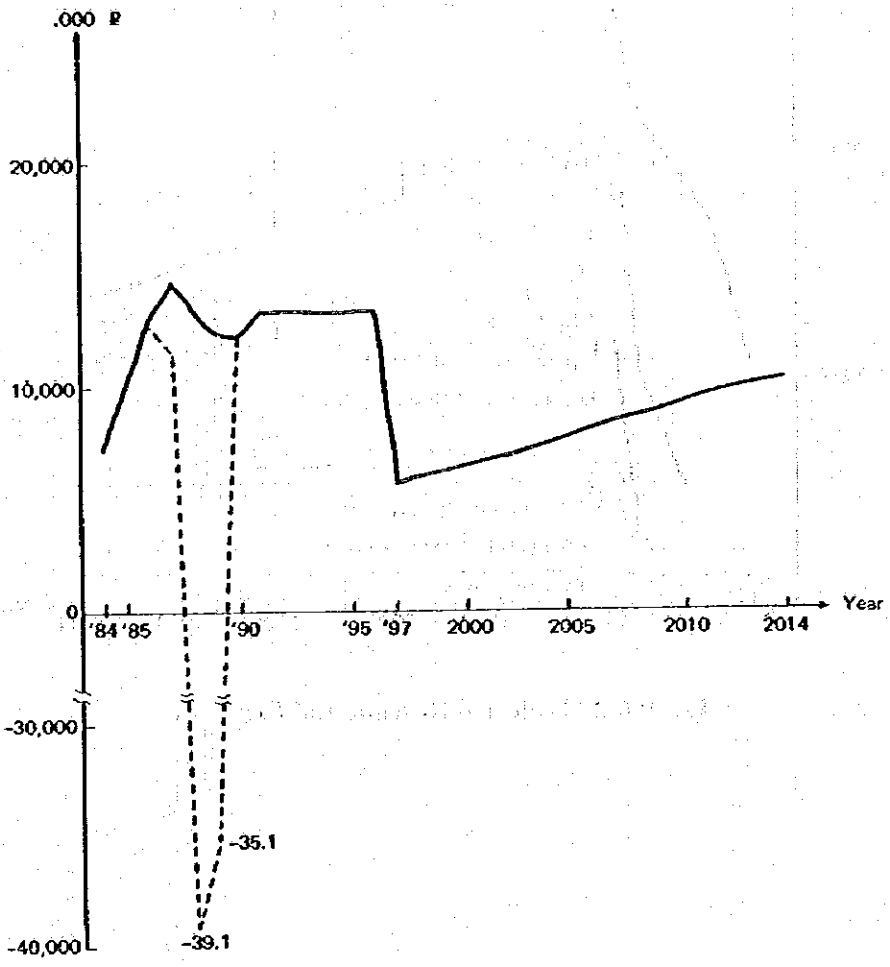


Fig. 9-6-3 Projected Annual Cash Surplus

Further, it means that PMU San Fernando will continue to supply surplus funds as it has done before.

The dotted line shows the change of annual cash surplus in case the whole of the local portion of the project costs is covered by the PMU's own funds. The line indicates fund shortages of ₱39.1 million and ₱35.1 million in 1988 and 1989 respectively. This cash shortage is the net amount to be supplied from the Head Office to finance the short term development plan of PMU San Fernando.

9-6-3 Ratio analysis

The projected financial condition with the project is ascertained by using some of the financial ratios.

(1) Operating ratio

As shown in Fig. 9-6-4, the operating ratio (operating expenses/net operating revenue) will drop annually until 1990 since the Shipside pier, which has already finished depreciation, will contribute to the decrease of expenses. After 1990, however, with the start of new pier operations, the ratio will creep at the level of 44%. Even at this level, the operating ratio will be improved over the present level of 55 – 60%.

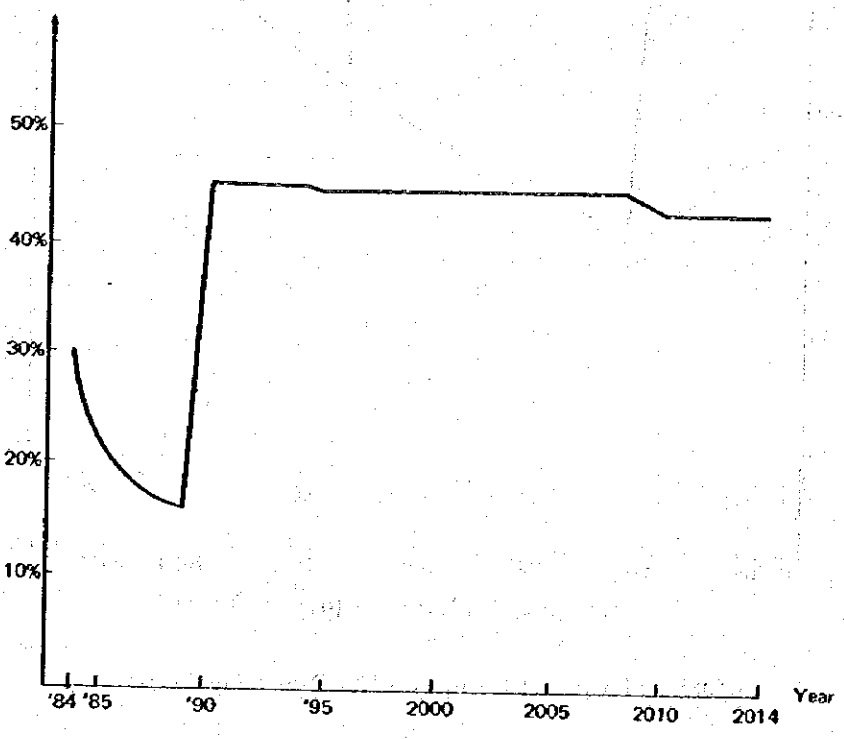


Fig. 9-6-4 Projected Operating Ratio

(2) Return on net operating assets (ROA)

Fig. 9-6-5 shows the trend of the projected ROA. It is difficult to point out what ROA percentage is generally desirable. Accordingly, in this analysis, 7% is used as a standard for appraisal, considering that PPA as a whole is required to keep this level by ADB and IBRD.

As shown in Fig. 9-6-5, PMUs projected ROA will be over 7% except for the first nine years of operations, and will rise gradually thereafter. Considering that the period during which it is below 7% is short and the degree of short fall is small, compared with the period and positive level thereafter, it is stated that the PMU, with the project, will preserve its earning power.

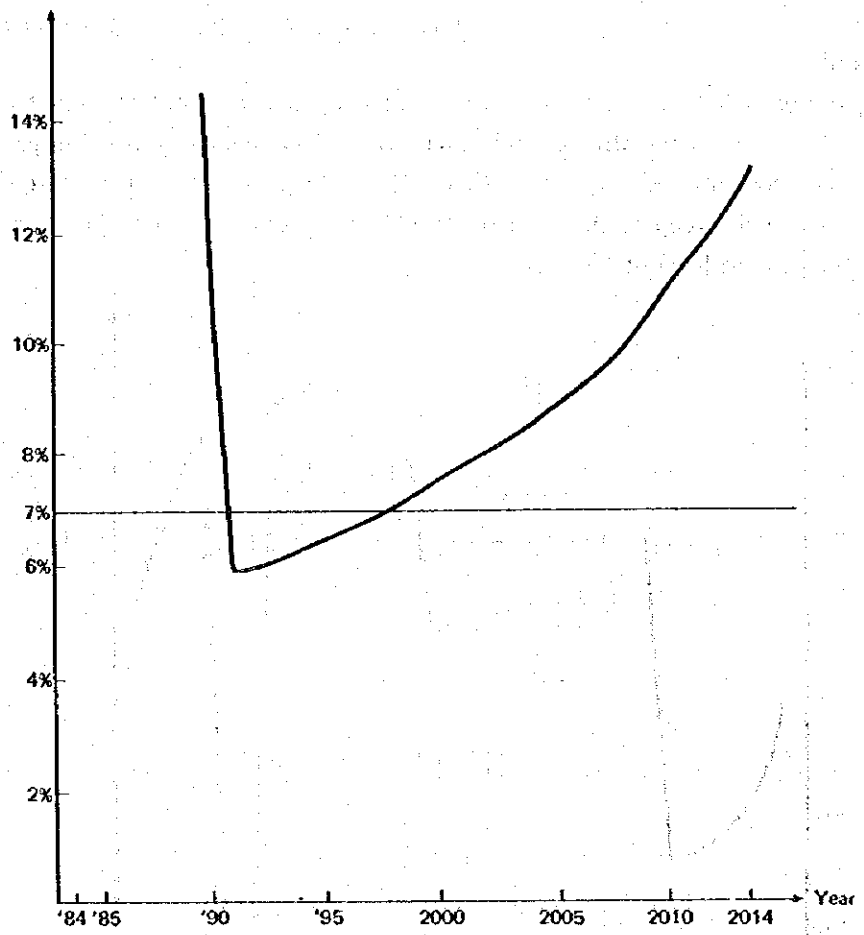


Fig. 9-6-5 Projected Return on Net Operating Assets

(3) Debt service ratio (DSR)

As shown in Fig. 9-6-6, the project debt service ratio will maintain a position far above 1.0 times during the project life.

Revenue after deducting operating cash outlay will sufficiently cover repayment of principal and interest every year.

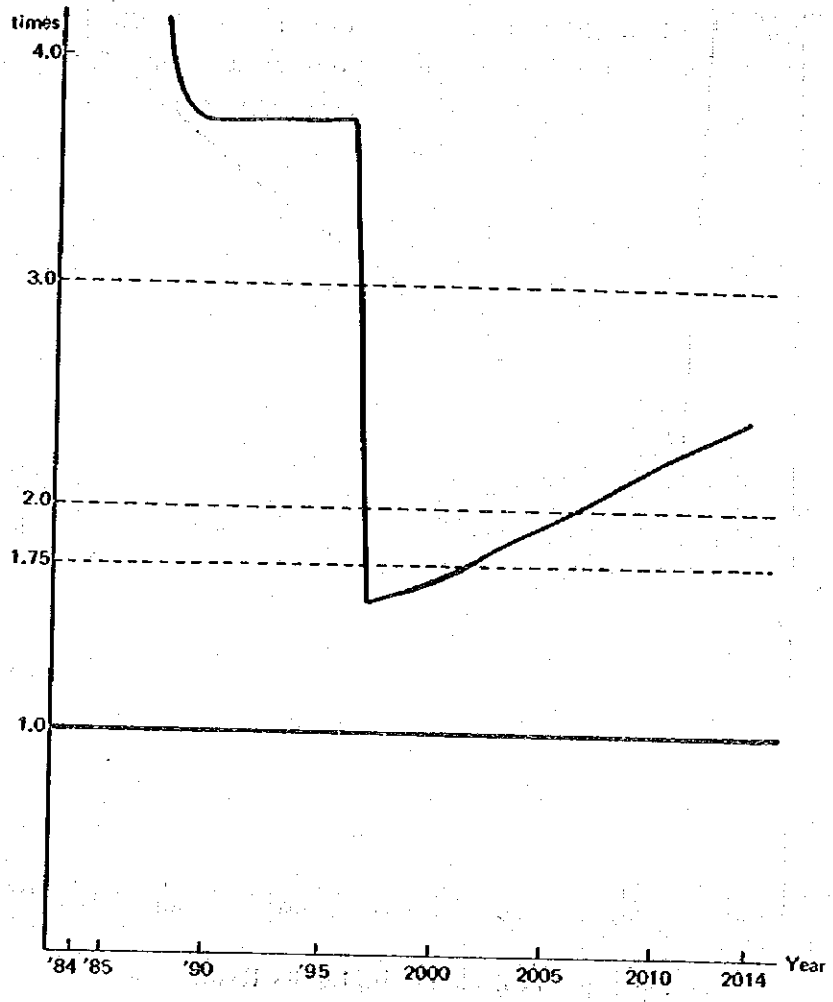


Fig. 9-6-6 Projected Debt Service Ratio

(4) Debt/Equity Ratio

Fig. 9-6-7 shows the trend of the projected debt/equity ratio. The ratio will always be above a level of 50/50, except in 1988 when most of the foreign loans will be raised. Thereafter, it will gradually rise and reach the present level by 2014. This means that PMU San Fernando will maintain a more than stable balance of debt and equity from the beginning to the end.

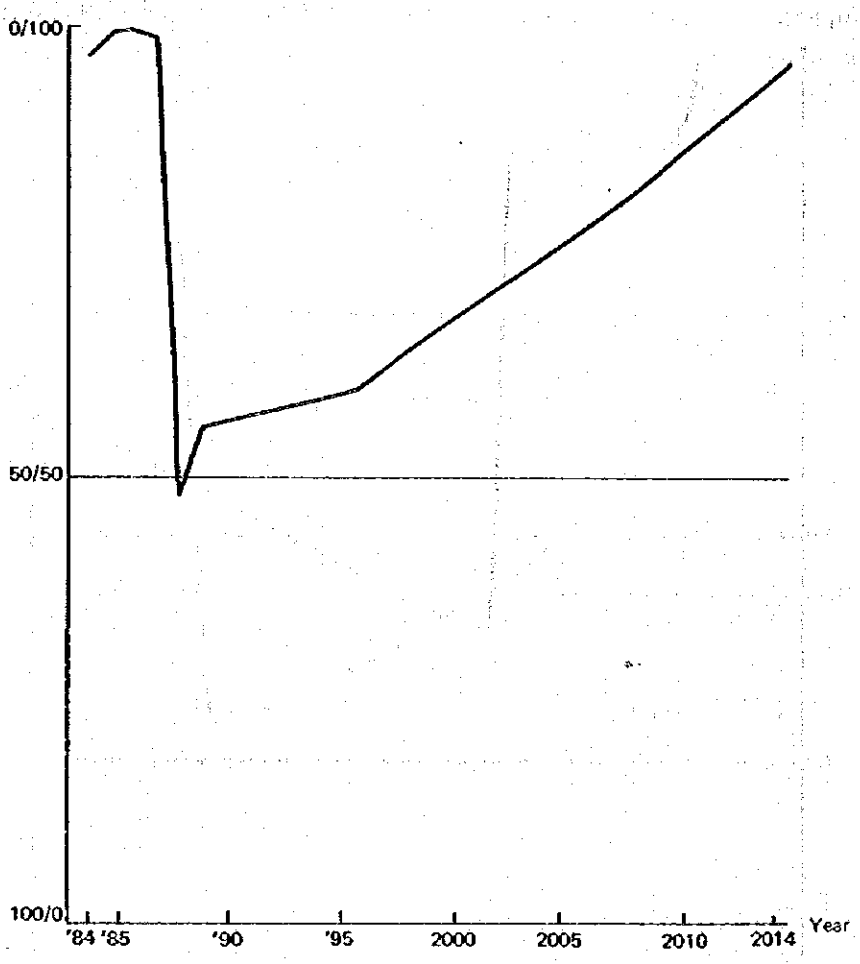


Fig. 9-6-7 Projected Debt/Equity Ratio

In summary, after the examination of financial statements and ratio analysis, PMU San Fernando, with this project, is concluded to be financially viable.

9-6-4 Impact of PPA's financial condition, with the project

As already explained in previous section, PPA, which is constituted by 19 PMUs, is required to keep its ROA above 7% and its DSR above 1.75 times determined by the loan agreements with ADB and IBRD. Accordingly, the impact on PPA's financial condition, with the project, is analyzed using the above-mentioned two financial ratios. For reference, assumptions used in calculation are based on the "Long Term Financial Projection of PPA" formulated by PPA itself, except for foreign exchange rate of 14 ₱/$. Details of assumptions are provided in Appendix 9-4.

Fig. 9-6-8 shows the PPA's ROAs, in both cases of with and without the project, respectively. Fig. 9-6-9 gives its DSRs. As shown in these Figures both financial ratios, with the project, will be always above the required levels throughout the project life. Accordingly, it can be stated that this project will not cause any serious financial problem on PPA.

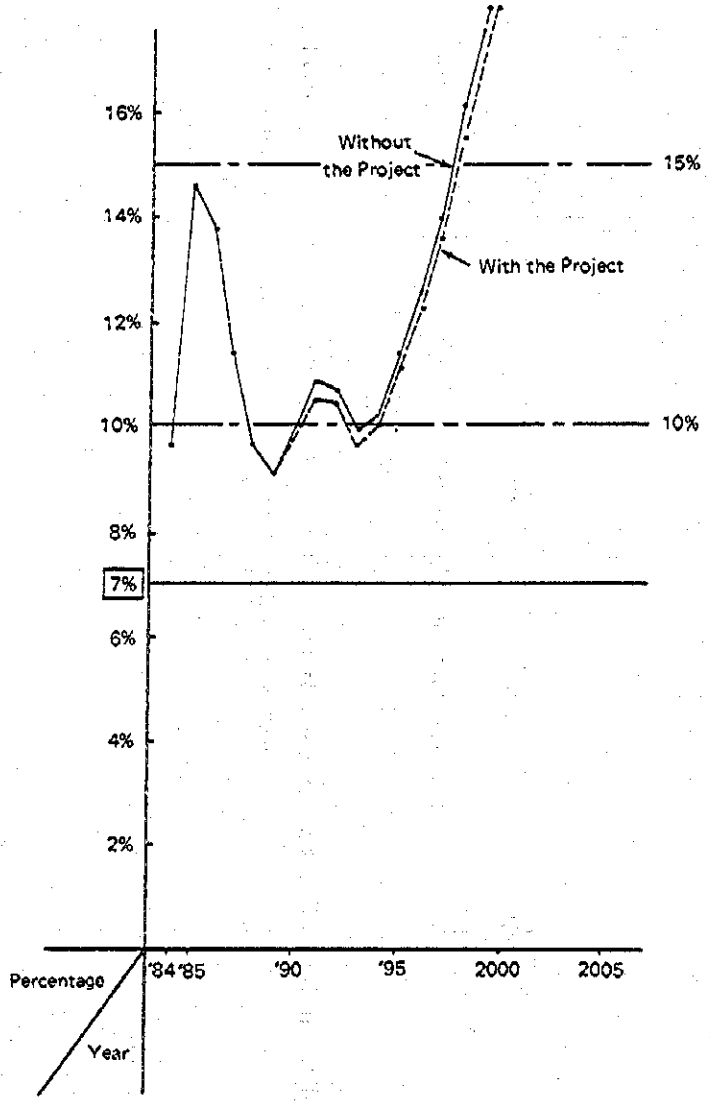


Fig. 9-6-8 Projected Return on Net Operating Assets of PPA

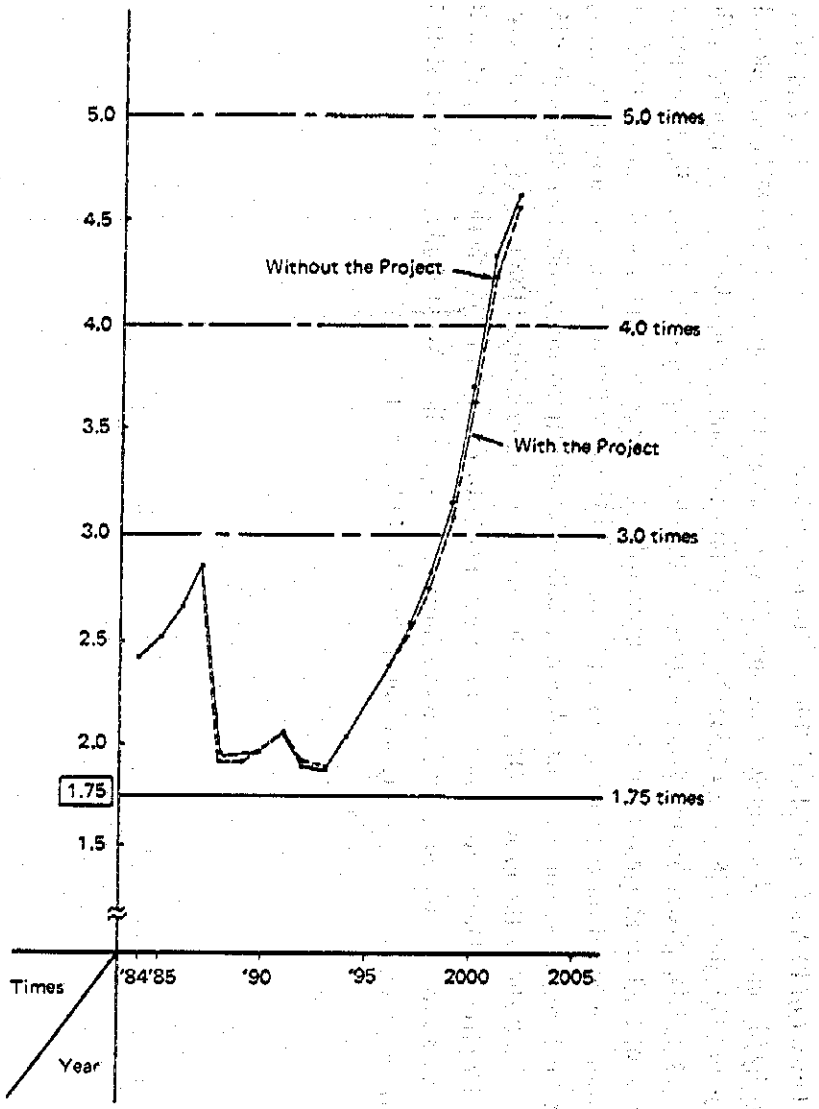


Fig. 9-6-9 Projected Debt Service Ratio of PPA

9-7 Appraisal of the Profitability of the Project itself

9-7-1 Financial internal rate of return (FRR) and the "without" case

The profitability of the project itself is appraised by the FRR method. For the calculation of the FRR, benefits are incremental revenues derived from the implementation of the project, while costs are construction cost, increments of maintenance and operation costs (including other administrative costs and taxes concerning the project).

The content of the "without" case has already been explained in detail in Chapter 8. Accordingly, only the differences from the "without" case of the ERR are pointed out as follows;

- o Market prices are used.
- o Incremental water sales are computed based on the difference in the number of vessels.
- o Incremental rental revenue comes from rental charges for new transit sheds and open storages.
- o Residual value of the wharf in 2019 is taken into account.

Table 9-7-1 FRR (Base Case)

FRR = 4.1%

(000 P)

		1984	1985	1986	1987	1988	1989	1990-2018	2019
Cash-In Total		0	0	0	0	0	0	17,210	17,210
Port Charges								5,376	5,376
Share in Arra. & Steve.								1,508	1,508
Rater Sales								224	224
Rental Income								2,844	2,844
Contrib. of Tariff Increase								7,257	7,257
Cash-Out Total		0	0	0	7,359	190,933	59,278	3,237	-84,165
Construction	Engineering				6,690	2,230	2,230		
	Dredging/Renov					990	315		
	Wharf				669	187,713	30,173		-87,422
	Shed						26,560		
Maintenance								2,451	2,451
Operation								270	270
Tax		0	0	0	0	0	0	516	516
Difference		0	0	0	-7,359	-190,933	-59,278	13,972	101,394
N P V		249,018	156,213	88,358	38,635	2,176	-24,518	-43,982	
Discount Rate		0.0%	1.0%	2.0%	3.0%	4.0%	5.0%	6.0%	

9-7-2 Results

The FRR of this project is 4.1%.

The desirable level of FRR varies, depending on time and place, or lender and borrower. For borrowers, the interest rate paid on raised funds is the lower limit.

In this project, 60% of the overall construction cost (i.e. the foreign portion) is assumed to be raised by loans with a 3.5% interest rate. Thus, the FRR is required to exceed 2.1%, which is the weighted average interest rate for all the project funds. Judging from this point of view, this project can be regarded as feasible.

9-8 Sensitivity Analysis

9-8-1 Identification of cases

Sensitivity analysis is made for the cases where the cargo volume and the peso exchange rate will decrease by 10%, while construction cost will increase by 10%. The different assumptions for the sensitivity test are as follows;

Case A assumming cargo volume decrease by 10%

Case B assumming construction cost increase by 10%

Case C assumming peso exchange rate decrease by 10%

9-8-2 Results

The FRR is computed for each case mentioned above.

The results are shown in Fig. 9-8-1. Every FRR exceeds the lower limit of 2.1%. Results of sensitivity analysis prove that each case would be feasible. In addition, they reveal what degree of influence on the FRR a contingency of each major factor would cause. According to results shown in Fig. 9-8-1, cargo volume, construction cost, and the peso exchange rate have greater influence in this order, when each factor is changed by 10%.

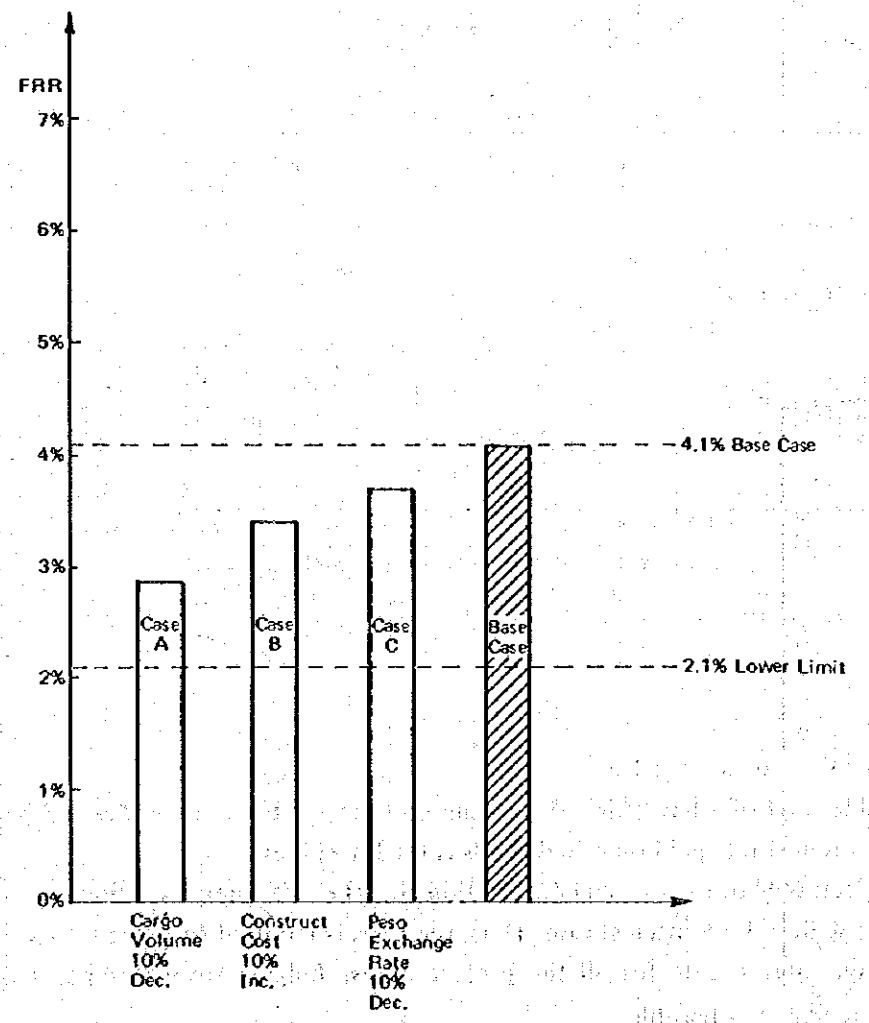


Fig. 9-8-1 Sensitivity Analysis

9-9 Conclusion

From the view point of the financial viability of PMU San Fernando and profitability of the project itself, this project can be regarded as feasible.