CHAPTER 7 REVISED MASTER PLAN

7.1 Fundamentals of the Master Plan

In order to secure efficient port operations, South Harbor will continue to be used for the exclusive handling of foreign trade cargo except for some containerized cargoes which will be handled at M.I.C.T.

Regarding the allocation of functions between South Harbor and M.I.C.T., M.I.C.T. will mainly accommodate non-self-sustaining full container vessels and some self-sustaining full container vessels.

Based on the role of South Harbor and the countermeasures to solve the major problems, the basic strategies for the Master Plan with a target year of 2005 are as follows.

1) Effective Cargo handling

Currently, the cargo handling productivity of Manila Port is low, especially in the case of handling bulk cargo at Anchorage. Besides, due to the outdated arrangement of facilities at piers, productivity is restricted to some extent.

In order to solve these problems, the study team proposes (1) to introduce a mechanical handling system for grain cargo, (2) to transfer part of the loose cargoes at Anchorage to pier, and (3) to widen aprons and to modify the use of facilities at the port.

2) Rehabilitation of old port facilities

Most of the facilities at South Harbor were constructed after World War II and are very old.

Based on technical observations in the field and research on pier utilization, the facilities are classified into three categories as follows:

(i) facilities which must be improved urgently
(ii) facilities which must be improved by 1995
(iii) facilities which must be improved by the target year of the Master Plan, 2005.

Based on the above categorization, a step plan for the improvement of port facilities is designed.

3) Container cargo handling at South Barbor

At present MICT is expanding and the Phase II construction will be completed in 1988.

Based on our study, the team recommends that all full container cargo and some portion of self-sustained container cargo be finally transferred to M.I.C.T. for efficient cargo handling, effectively using the port facilities at Manila port.

4) Preferential berthing

Cargo with a sizable amount of volume like containers, iron and steel products and timber which are often carried by specialized ship should be given berthing priority at specific piers to raise the cargo handling efficiency of these cargoes.

5) Safety

Port safety must be guaranteed. Laborers, vessels and cargoes must all be kept safe. It is natural to also consider the port facilities themselves. The safety factor must be considered during port facility development. Fortunately, there have been no major marine accidents at the port. However, as some of the port facilities are significantly deteriorated, the safety of these facilities must be checked carefully.

Based on the above concepts, the future foreign trade cargo volume of South Harbor is forecast as shown in Table 7.1.

Table 7.1 Estimated Foreign Trade Cargo Volume by Packing Type by Area

(1,000 tons)

Year / Area	Loose		Container		Bulk		Liquid		Total	
	Imp	Exp	Imp	Exp	Imp	Exp	Imp	Exp	Imp	Exp
1985										
S.H. Pier	530	138	669	447	214	7	22	5	1435	597
Anchorage	408	1	1	3	891	45	86	87	1386	136
MICT	3	2	526	321	-	-	-	-	529	323
Total	941	141	1196	771	1105	52	108	92	3350	1056
1990										
S.H. Pier	451	176	329	199	235	34	-	-	1015	409
Anch.	254	-	-	-	1043	-	209	80	1506	80
MICT	-	-	1315	798	-	-	-	-	1315	798
Total	705	176	1644	997	1278	34	209	80	3836	1287
1995										
S.H. Pier	541	223	343	189	296	34	-	-	1180	446
Anch.	220	-	-	-	1404	-	262	80	1886	80
MICT	-	-	1942	1074	-	-	-	-	1942	1074
Total	761	223	2285	1263	1700	34	262	80	5008	1600
2000										
S.H. Pier	580	285	382	210	375	34	-	-	1337	529
Anch.	154	-	-	-	1765	-	333	80	2252	80
MICT	-	-	2554	1404	-	-	-	-	2554	1404
Total	734	285	2936	1614	2140	34	333	80	6143	2013
2005										
S.H. Pier	701	364	510	268	477	34	-	-	1688	666
Anch.	102	-	-	-	677	-	425	80	1204	80
Grain Terminal	-	-	-	-	1597	-	-	-	1597	-
MICT	-	-	3410	1796	-	-	-	-	3410	1796
Total	803	364	3920	2064	2751	34	425	80	7899	2542

7.2 Overall Evaluation of Existing Facilities at South Harbor

(1) The repair of the slabs at the end of pier 3 and at the backup area of berth No.4 is absolutely necessary.

(2) Pier 5 is in the best condition structurally of all the pier but the open storage area at the pier is insufficient. Sheds K and L are in very poor condition.

(3) As far as pier 9 is concerned, it is not necessary to make any urgent repairs, but some portions of the slab will have to be repaired eventually. The narrowness of the quay apron also lowers cargo handling productivity to some extent.

(4) It may not be possible to continue to handle container cargoes at pier 13 because the structure is seriously damaged. However, minimum urgent repairs of part of the slab may be necessary to continue handling containers for the time being.

(5) Pier 15 has suffered the most damage next to pier 13. However, it will be relatively easy to repair this pier because the damage is concentrated at the base of the pier and in the central pier area.

(6) Container yard CY-01 will be paved.

7.3 Revised Master Plan

7.3.1 Analysis of Existing Port Capacity

This section analyzes whether or not the present capacity of the Port will be sufficient to accommodate the estimated future cargo demand by means of simulation tests.

The results of the simulation tests are shown in Table 7.2.

In order to evaluate the capacity of the mooring facilities the following criteria are considered.

① The berth occupancy ratio should be 0.6 - 0.7.

② The desirable ratio of waiting time to mooring time is 10% or less.

③ The desirable waiting time per ship is less than half a day, with a maximum of one day.

Judging from these criteria, the existing mooring capacity of South Harbor will reach its limit to accommodate the projected demand in the year 1995.

Table 7.2 Results of Simulation Tests (Existing capacity)

Facility	1995				2005			
	Average Berth Occupancy Ratio (%)	Ship Waiting Ratio (%)		Per Ship Waiting Time (hours)	Average Berth Occupancy Ratio (%)	Ship Waiting Ratio (%)		Per Ship Waiting Time (hours)
		*Waiting Ships to Ship Entry	Waiting Time to Mooring Time			*Waiting Ships to Ship Entry	Waiting Time to Mooring Time	
Pier 3 -Berths 3 and 4	50.3	19.4	29.6	9.1	79.2	64.5	230	74.3
Others	63.7	18.3	10.1	6.6	85.0	56.6	80.3	53.8
Total		18.6	13.5	7.3		58.6	112	60.3

Note: *The ratio of "Waiting ship to ship entry" is equal to the number of vessels that are waiting for berths over the total number of vessels at the port, including those vessels which are waiting for berths and those vessels that are presently at berth.

7.3.2 Preparation of alternative plans

Based on the fundamental planning concepts and the proposed scale of the master plan, four alternative plans are prepared based on the maximum utilization of the limited space of S.H. (Fig. 7.1 - 7.4)

Alternative plan-1

The basic ideas of this plan are:

1) To continue to utilize the existing container handling facilities at pier 3 and the related facilities located nearby.

2) To establish a grain terminal at the west end of M.I.C.T.

Alternative plan-2

The basic ideas of this plan are:

1) To establish a grain terminal at pier 3 where land area for a storage facility is available.

2) To conduct container cargo handling at pier 15 because there is an available container yard located close to pier 15.

Alternative plan 3

The basic idea of this alternative plan are:

1) To reclaim the water area between piers 13 and 15 to efficiently utilize pier 13 and to provide a sufficient back-up area.
2) To concentrate on preferential use berths to improve cargo handling efficiency.

Alternative plan 4

The basic idea of this plan is to reconstruct pier 13 to provide sufficient cargo handling capacity at the port.

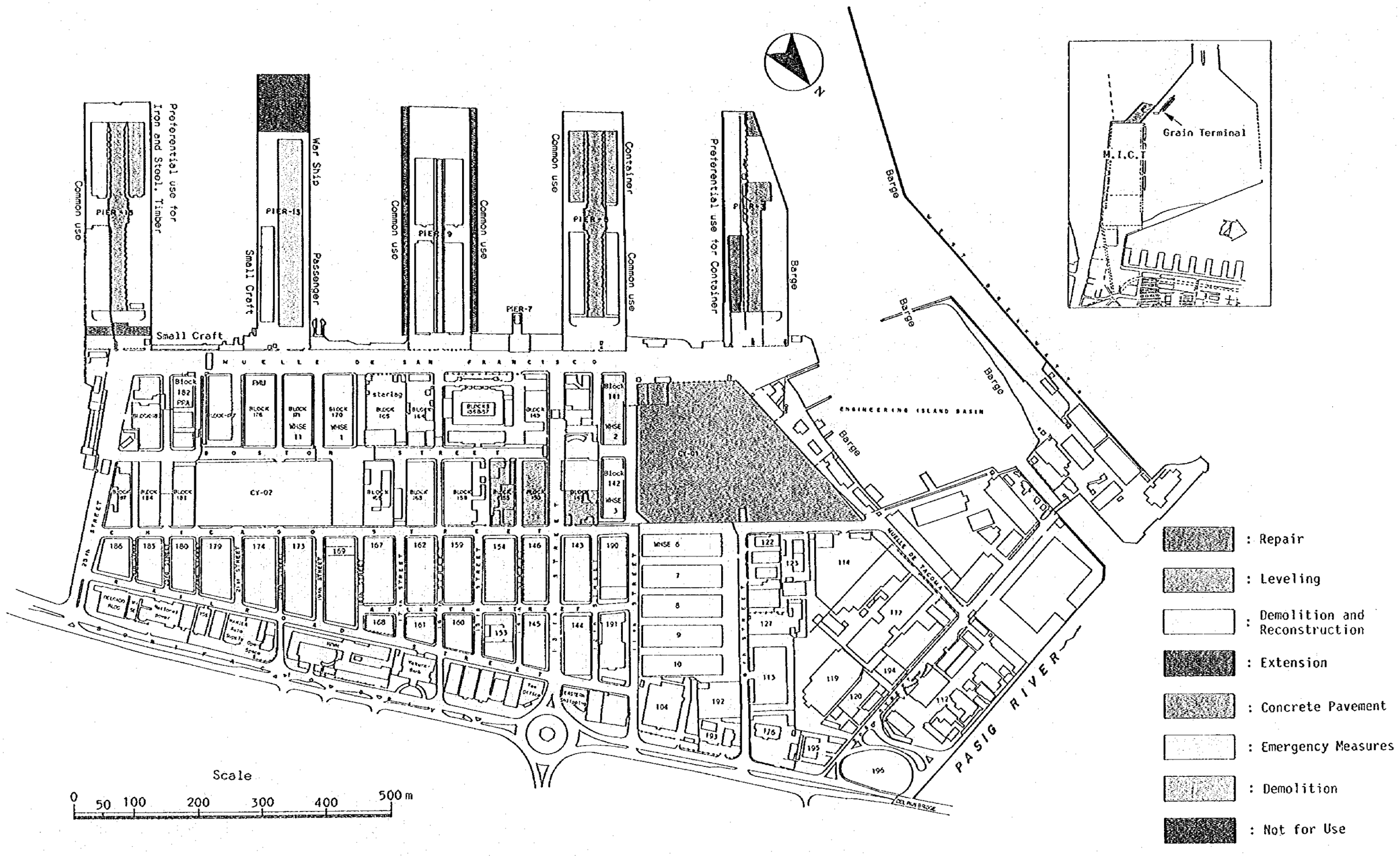


Fig. 7.1 Alternative Plan - 1

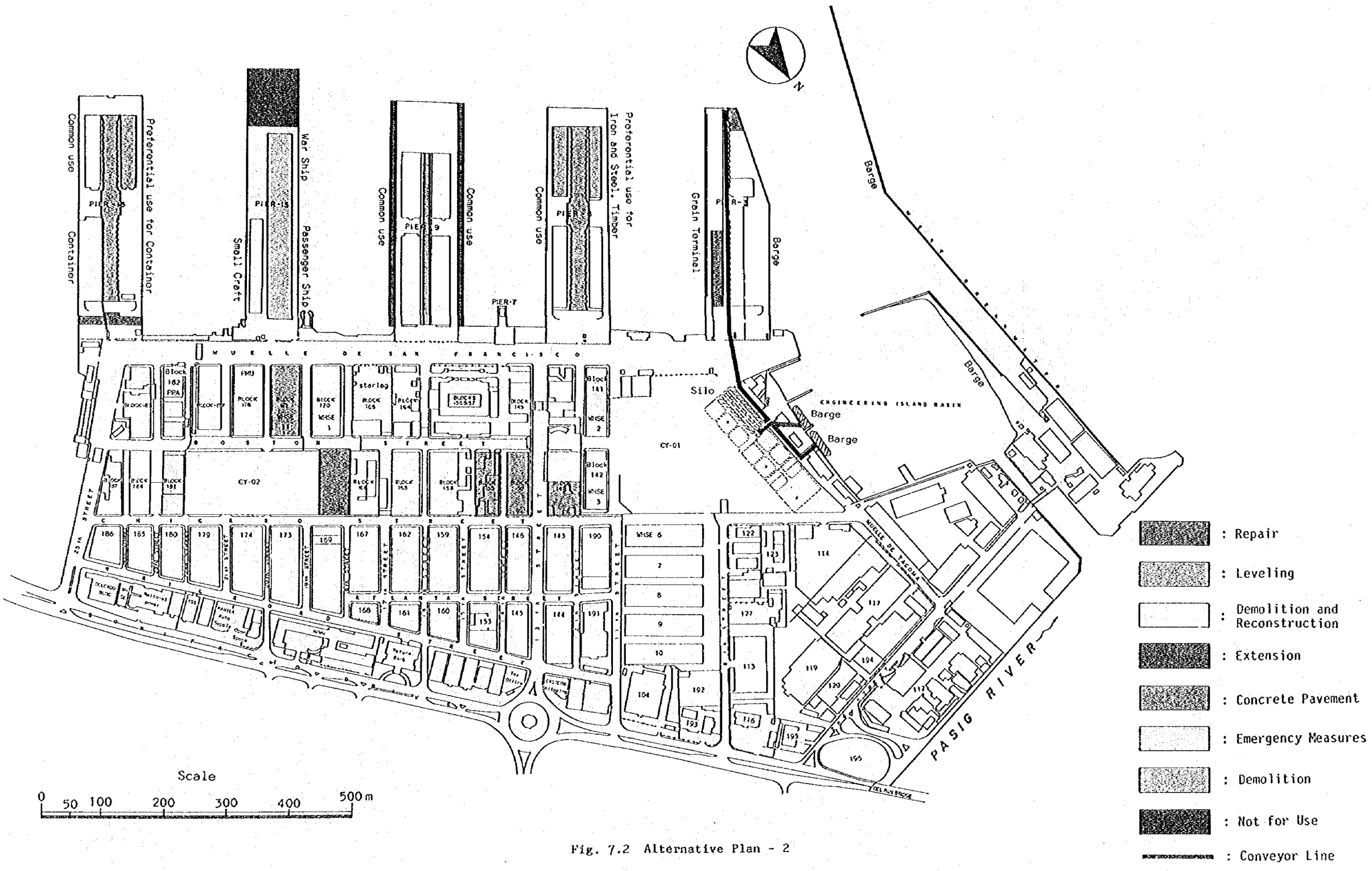


Fig. 7.2 Alternative Plan - 2

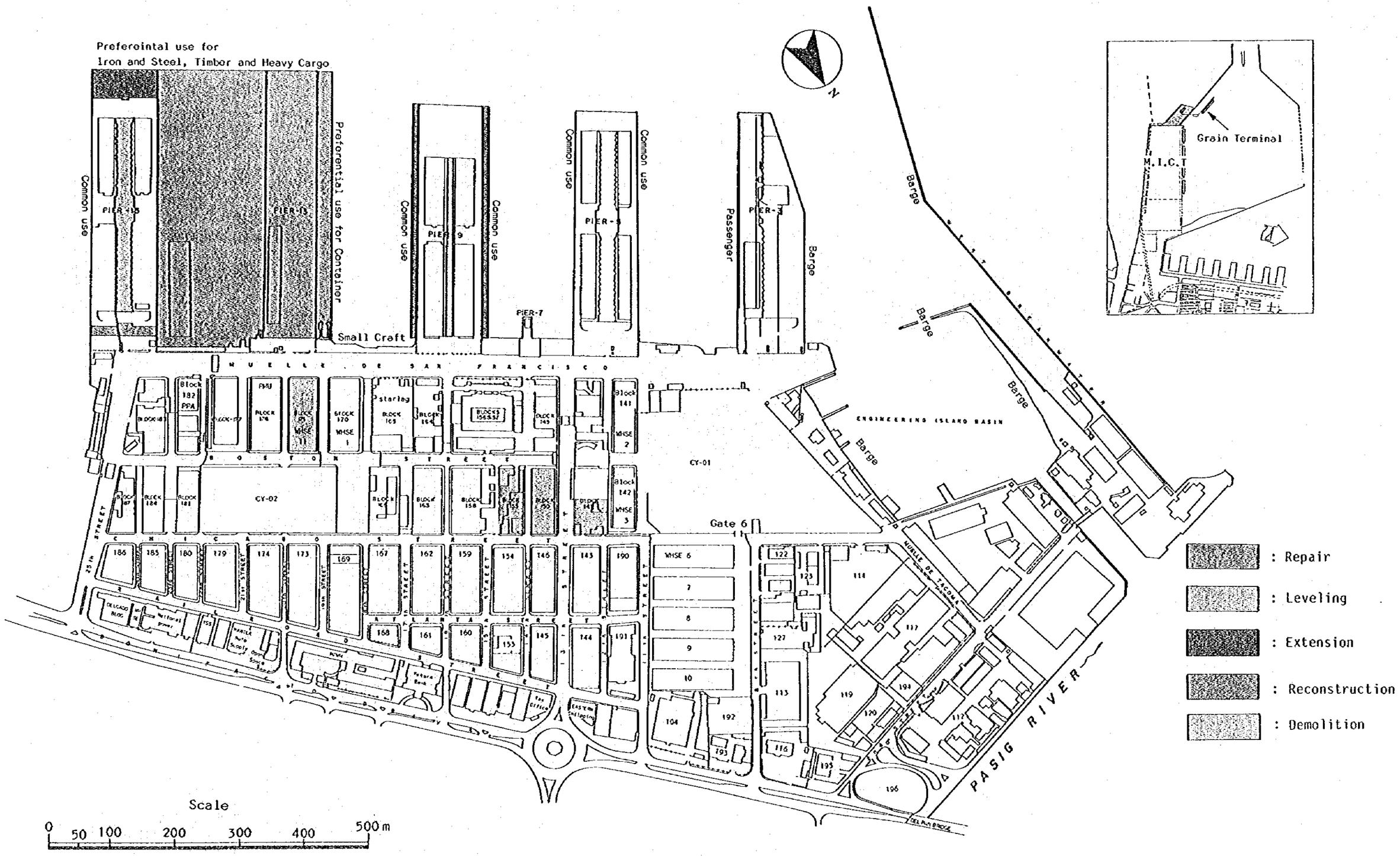


Fig. 7.3 Alternative Plan - 3

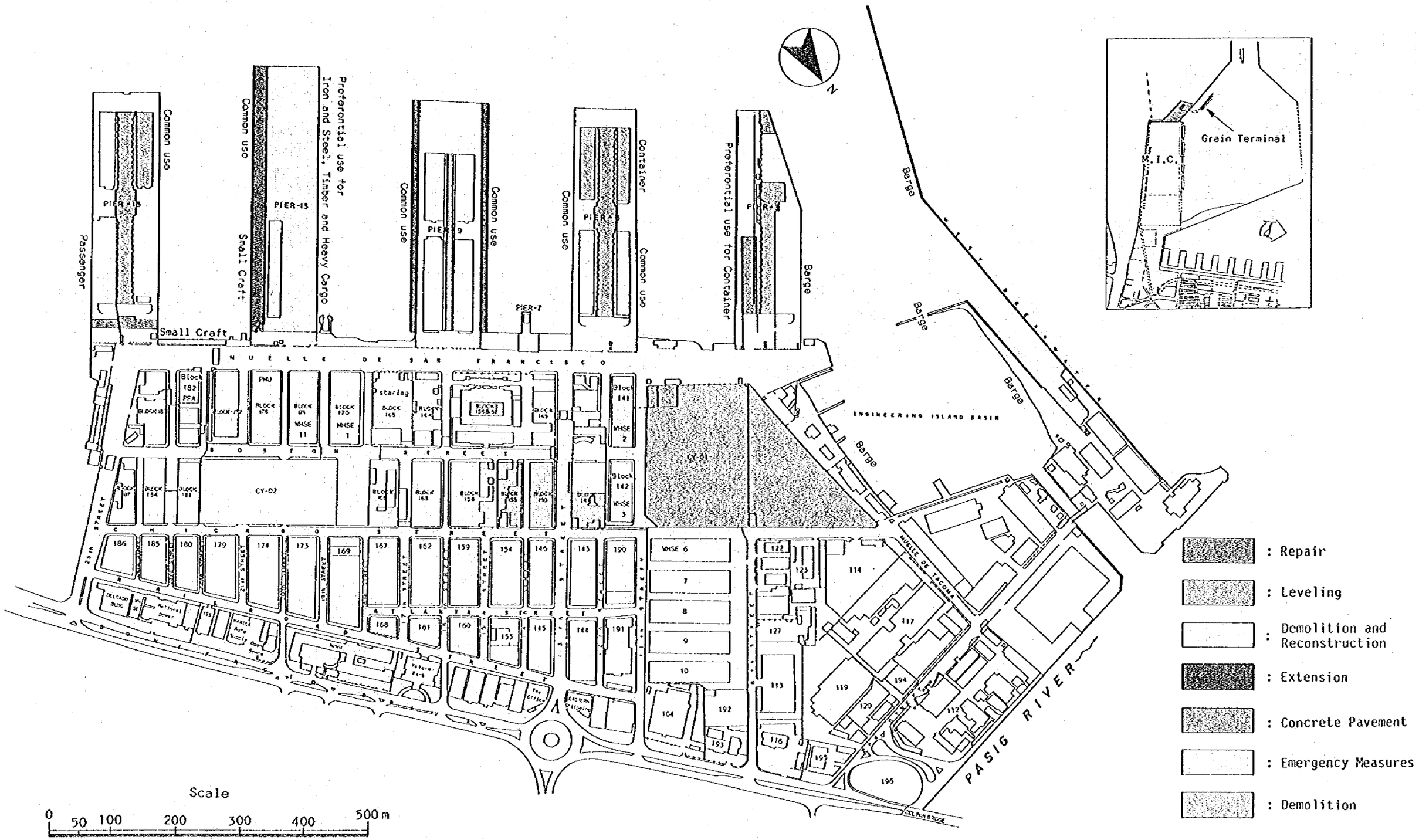


Fig. 7.4 Alternative Plan - 4

7.3.3 Evaluation of the Alternative Plans

The alternative plans are evaluated based on the following criteria.

(i) Land Use
Ease with which cargo can be stored or transported from the standpoint of users and quality of the arrangement of facilities and roads, especially the container yard.

(ii) Operation of facilities
Effectiveness with which port facilities and cargo handling equipment can be operated.

(iii) Total construction cost
The total construction cost should be minimized considering budgetary constraints.

(iv) Investment timing
Minimization of investment and maximization of effect while conforming to the requirements of early construction and early start of service.

(v) Adaptability to changing conditions
Possibility of altering the plan to adapt to changing circumstances.

(vi) Potential for future development
Availability of room for future expansion in order to meet future demand after 2005.

The results of the evaluation are shown in Table 7.3.

Table 7.3 Evaluation of the Alternative Plans

Item	Evaluation			
	Plan 1	Plan 2	Plan 3	Plan 4
Land Use	○	△	○	○
Operation of the facilities	○	○	◎	◎
Total Construction Cost	◎	◎	△	△
Investment Timing	○	○	△	△
Adaptability to Changing Conditions	△	△	◎	○
Potential for Future Development				
Future Development	○	○	○	○
Overall Evaluation	◎	○	△	△

Key ◎ Excellent
○ Ordinary
△ Some problems

Based on Table7.3, plans 3 and 4 cost too much, so simulation tests are only excuted for plans 1 and 2.

The results of the simulation tests are shown in Table 7.4.

Judging from the results of the simulation tests, case 1 is selected as the most appropriate plan.

Table 7.4 Results of the Simulation Tests

Mooring Facility Code	Case 1				Case 2			
	Average Berth Occupancy Ratio (%)	Ship Waiting Ratios (%)		Per Ship Waiting Time (hours)	Average Berth Occupancy Ratio (%)	Ship Waiting Ratio (%)		Per Ship Waiting Time (hours)
		*Waiting Ships to Ship Entry	Waiting Time to Mooring Time			*Waiting Ships to Ship Entry	Waiting Time to Mooring Time	
A	34.4	3.8	3.4	0.6	44.1	36.8	41.3	18.8
B	52.7	13.5	6.6	3.1	58.3	22.3	12.4	6.6
C	55.1	13.9	4.3	3.0	64.1	21.6	8.8	6.2
D	64.3	12.1	4.8	3.0	70.0	20.3	11.4	7.1
E	64.6	7.8	3.7	1.9	71.9	16.7	9.8	5.1
F	35.3	9.4	4.3	2.1	35.7	8.5	8.0	1.4
G	43.6	18.7	4.8	3.8	52.5	21.6	11.2	5.8
Total		9.4	4.6	2.1		18.3	13.4	5.9

Notes: *The ratio of "waiting ships to ship entry" is equal to the number of vessels that are waiting for berths over the total number of vessels at the port, including those vessels which are waiting for berths and those vessels that are presently at berth.

7.3.4 Land Use Plan

It is most important to make the best possible land use plan for the limited area behind the piers. The port land area should be used more effectively. The land use plan is designed to promote effective cargo movement and increased port related business activities. The main direction of the plan is outlined below.

1) The location of Government-related buildings like B.O.C., M.P.W.H. and P.P.A. will not change in the future.

2) The port-related urban business area where the bank and the electronic power co. are located along Bonifacio drive will remain basically unchanged in the future.

3) A parking area for cargo vehicles and for vehicles with business inside the port should be prepared.
Blocks 155, 185 and 195 should probably be demolished to create a wider parking area.

4) Increase and rearrangement of storage facilities should be considered.

   (a) Some portion of the additional port zone area should be used for warehousing.

   (b) It might be preferable to use container yard CY-02 as an open storage yard.

   (c) It might be preferable to reserve a parking area for chassis, trailers and other handling machines in blocks 114 and 122.

   (d) There are many long-staying seized cargoes in warehouses 6, 7, 8, 9 and 10. The effective use and rearrangement of warehouse 6-10 should be considered to best utilize the limited back-up space.

5) The main access roads to the piers are 25th St., 16th St. and 13th St., and the main lateral roads are San Francisco St., Chicago St. and Railroad St.

Jeepneys should be restricted to Railroad St. and 11th St.

6) It might be preferable to reserve the area which is now sequestered by the Government for future development.

The land use plan in 2005 is shown in Fig. 7.5.

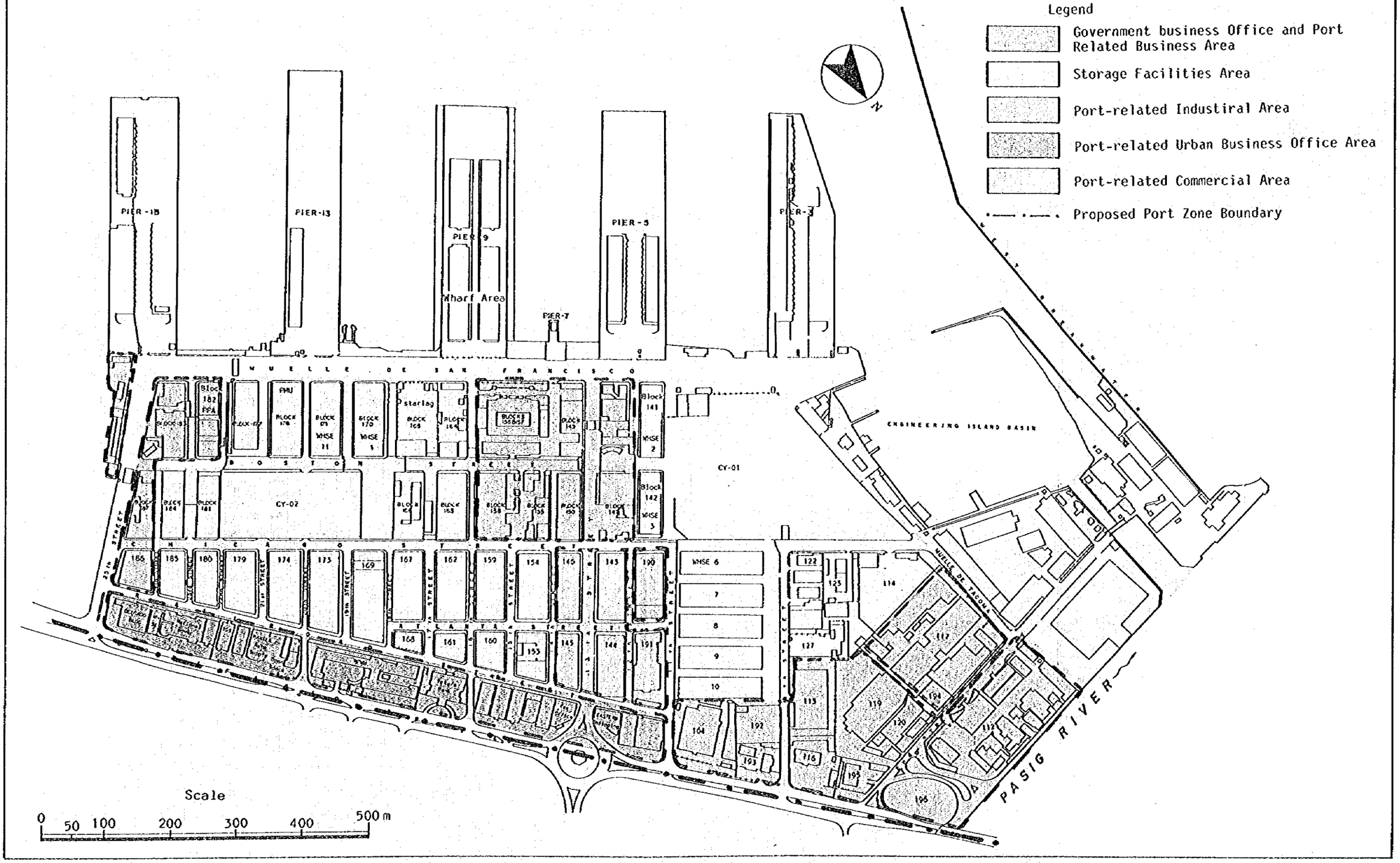


Fig. 7.5 Land Use Plan in 2005

7.3.5 Land Access

Traffic surveys were carried out at four intersections and two gates for eleven days. The traffic survey results and traffic forecasts are shown in Tables 7.5-7.7. Based on the data, the following conclusions can be drawn.

1) Roads

As shown in Table 7.5, in 1995, the VC ratio will exceed 1.0 but will not exceed 1.5. This means that, some roads will be congested during peak hours, but they will not be so heavily crowded, and not for so many hours.

Thus, it is not necessary to take immediate measures in 1995.

2) P-Burgos/Roxas Blvd Intersection

In 2005, the VC ratio of some roads will exceed 1.5. Especially, Roxas Blvd, Bonifacio Drive, and P. Burgos Street will be heavily congested for many hours each day.

This congestion will depend on the capacity of the P-Burgos/Roxas Blvd Intersection, not on the capacity of Bonifacio Drive, so some improvements will be required at this intersection (See Table 7.6).

Judging from the high saturation ratio (1.966), small improvements (e.g., modification of the traffic light system) will not be able to fundamentally resolve this congestion.

Thus, it will be necessary to construct a two level crossing or a road tunnel as recommended in the Master Plan drawn up in 1978.

3) Anda Circle

Generally, intersections with traffic lights have a larger capacity than rotary type intersections, and the former are safer than the latter.

Thus, rotary intersections are usually converted to intersections with traffic lights in advanced nations.

Actually, Anda Circle is heavily congested all day long, and many traffic accidents are reported there.

Therefore, Anda Circle should be reshaped into a rectangular intersection with traffic lights as recommended in the Master Plan drawn up in 1978.

4) Gates

As shown in Table 7.7, Gate 1 and Gate 4 have a sufficient capacity to

accommodate the projected traffic volume in 1995. Therefore no additional gate lanes will be necessary in that year.

But toward 2005, both gates will have reached their capacity, and so, one additional gate lane for each gate will become necessary

Table 7.5 Volume Capacity Ratio (1986-2005)

Sec No.	Section Name	No. of lanes	Est. Road Capacity		VC Ratio (Peak hour)		
			ADT Pcu/day	Peak hr Pcu/hr	1986	1995	2005
1	Roxas Blvd.	6	54,000	5,400	1.12	1.44	1.91
2	A. Bonifacio Drive	6	54,000	5,400	1.25	1.46	1.97
3	"	6	54,000	5,400	1.08	1.21	1.65
4	"	6	54,000	5,400	0.74	0.95	1.23
5	"	6	54,000	5,400	0.78	1.01	1.31
6	"	6	54,000	5,400	0.76	1.00	1.30
7	Raxas Bridge (Del Pan)	6	54,000	5,400	0.77	1.03	1.33
8	Katigbak Drive	4	36,000	2,880	0.44	0.59	0.77
9	P. Bargos Street	6	54,000	5,400	0.98	1.30	1.71
10	25th Street	4	36,000	2,880	0.82	0.63	1.00
11	13th Street	4	36,000	2,880	0.93	0.68	0.88
12	Aduana	4	36,000	2,880	0.99	1.09	1.41
13	Gate 1 (25th St.)	4	36,000	2,880	0.28	0.26	0.57
14	Gate 4 (13th St.)	4	36,000	2,880	0.11	0.06	0.22

Table 7.6 Saturation Ratios at Intersections

	1986	1995	2005
(A) Intersection P. Burgos-Roxas Blvd	1.197	1.463	1.966
(B) Intersection Bonifacio Drive -25th street	0.704	0.717	1.009
(C) Anda Cirtcle			
1) Rotary	-	-	-
2) Rectangular intersection (M/P)*1	0.670	0.823	1.069

Note: *1 Rectangular intersection recommended in the Master Plan drawn up in 1978.

Table 7.7 Gate Capacity Check *1

	1986		1995		2005	
	IN	OUT	IN	OUT	IN	OUT
(1) Gate 1						
1 Hourly traffic	25	117	22	105	50	234
(No./hr)	(20)	(91)	(17)	(82)	(39)	(182)
2 Checking Time	0.75	1.0	0.75	1.0	0.75	1.0
(min)						
3 Required lenes	0.3	2.0	0.3	1.8	0.9	3.9
	(0.3)	(1.5)	(0.2)	(1.4)	(0.5)	(3.1)
4 No. of lanes						
available	2	2	2	2	2	2
5 No. of lanes to						
be built	0	0	0	0	0	1
(2) Gate 4						
1 Hourly traffic	126	-	113	-	252	-
(No./hr)	(84)	-	(76)	-	(168)	-
2 Checking Time	0.75	-	0.75	-	0.75	-
(min)						
3 Required lanes	1.6	-	1.4	-	3.2	-
	(1.1)	-	(0.95)	-	(2.1)	-
4 No. of lanes	2	-	2	-	2	-
available						
5 No. of lanes	0		0		1	
to be built						

Note: *1 Figures without parentheses stand for peak hour traffic, and those in parentheses stand for average hour traffic.

CHAPTER 8 THE SHORT-TERM REHABILITATION PLAN

The major short-term goals for the development of the Port of Manila by 1995 include rehabilitation of dilapidated facilities and improvement of operations.

The notable problems are the superannuation and obsolescence of facilities and the low productivity of cargo handling, especially of anchorage.

So, the Short-term Plan is designed to address these problems and thus improve the overall situation at the port.

The major items of the Short-term Plan are as follows:

① To repair the damaged portions of existing facilities to maintain the existing capacity.

② To improve wharf facilities to raise the cargo handling productivity and improve the overall cargo flow at the piers. These works include the widening of aprons and the enlargement of open storage areas at the piers.

③ To improve the cargo handling productivity at Anchorage, especially through the introduction of floating pneumatic unloaders and the reallocation of some cargoes to pierside handling.

Based on these goals and the reults of engineering inspections, the Short-term Rehabilitation Plan is proposed as shown in Fig. 8.1.

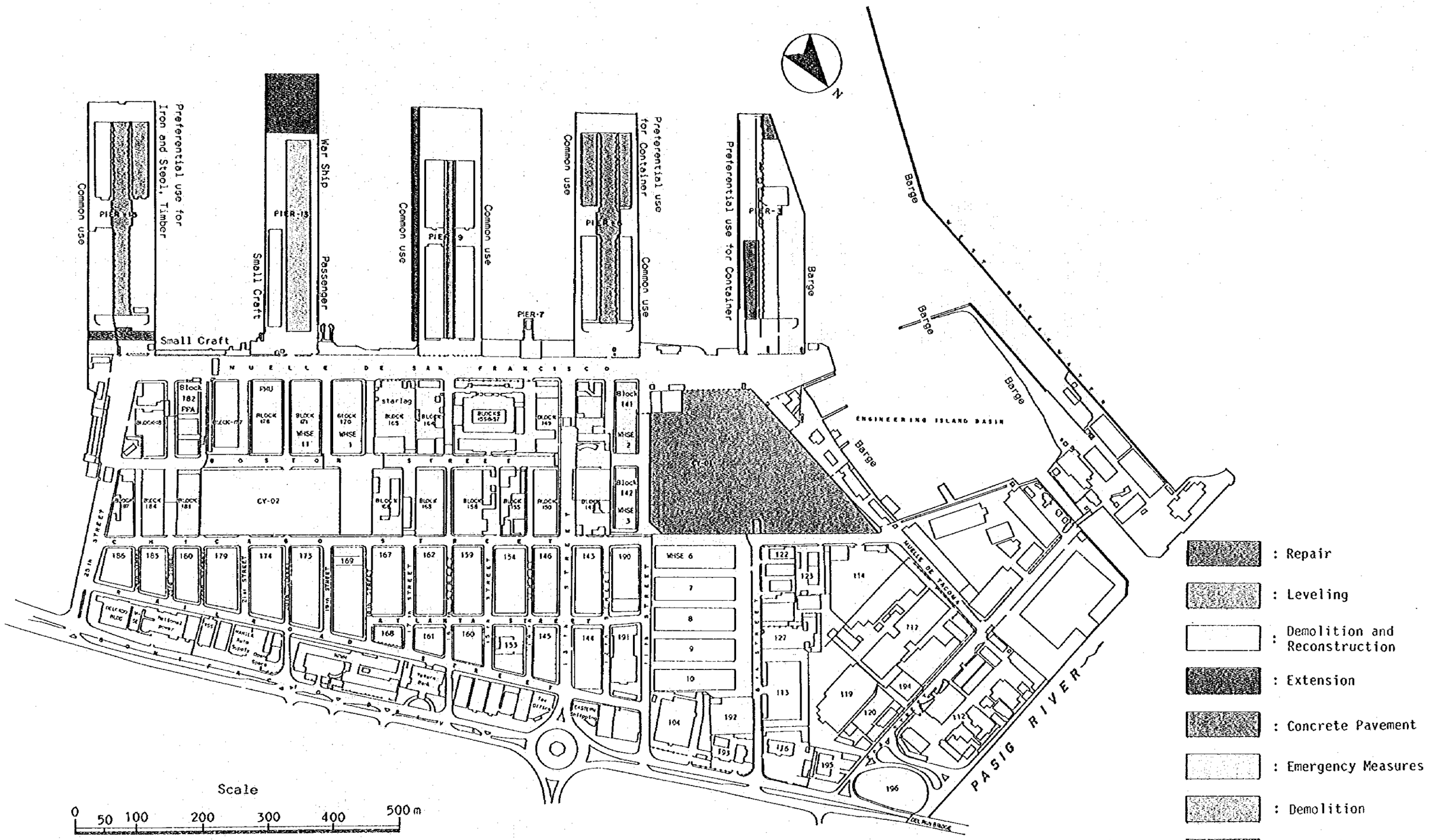


Fig. 8.1 Short-Term Rehabilitation Plan

CHAPTER 9 DESIGN, COST ESTIMATION AND CONSTRUCTION SCHEDULE

The design conditions for the rehabilitation plan are shown in Table 9.1. The soil conditions for the structural design are shown in Table 9.2.

The proposed structures for each Alternative Plan were designed using these conditions as shown in Figs. 9.1 through 9.3.

The construction schedule and rough cost estimation are shown in Tables 9.3 through 9.5

Table 9.1 Design Conditions

1) Tide Level

M.H.H.W ..... M.L.L.W + 0.98 m

M.H.W ..... M.L.L.W + 0.838m

M.S.L ..... M.L.L.W + 0.462m

M.L.W ..... M.L.L.W + 0.101m

(M.L.L.W means Mean Lower Low Water)

2) Seismic Coefficient

for new structures ... Kh = 0.15*1

for existing ..... Earthquake-proof improvement structures will not be conducted.

3) Maximum Berthing Ship Size for Structural Design*2

Type of Ship	Dead Weight Tonnage(tf)	Length Overall (m)	Molded Breadth (m)	Full Draft (m)
General Cargo Ship	25,000	184	24.9	10.6
Container Vessel	25,000	220	28.2	10.5

4) Berthing Velocity

v = 0.10 m/sec

5) Water Depth of the Berth

D = 10.5 m (M.L.L.W - 10.5 m)

6) Crown Height of the Quay Wall

H = M.L.L.W + 4.0 (approximately)

7) Surcharge Load on the Wharves

Distributed load

Ordinary ..... 2.0 tf/m^2

Extraordinary ..... 0.5 tf/m^2

Wheel load

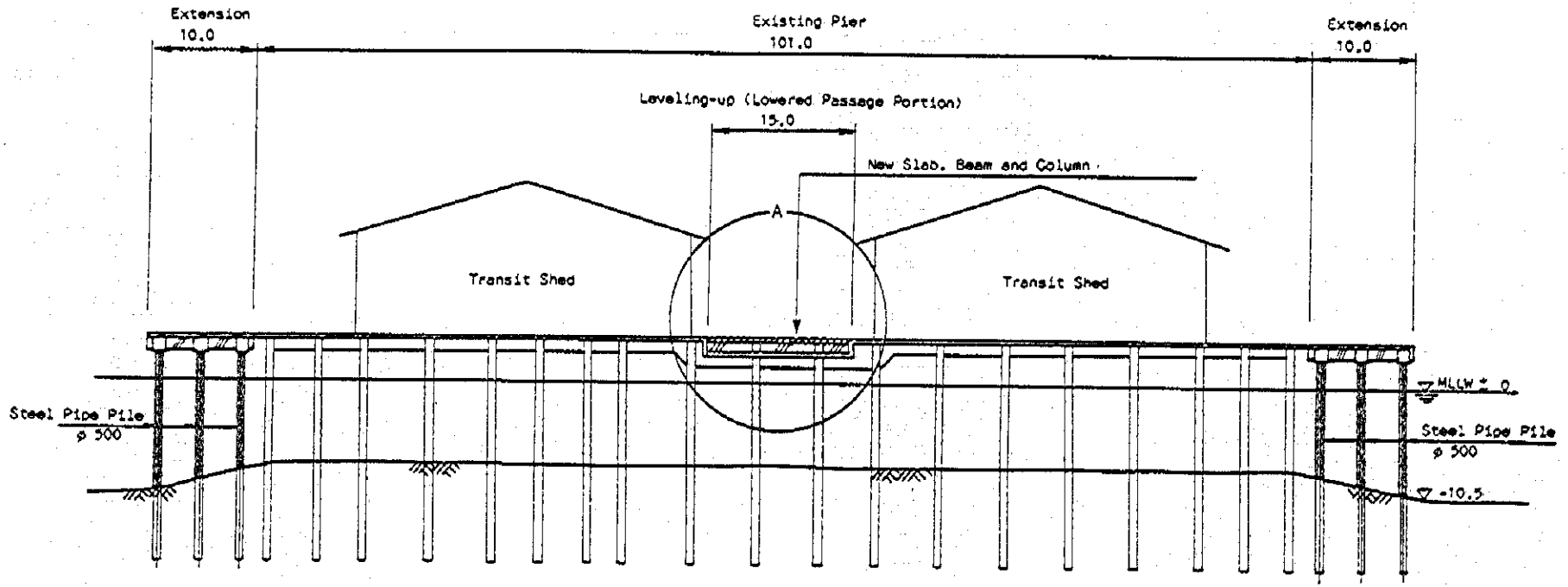
Trailer for a 40 ft container

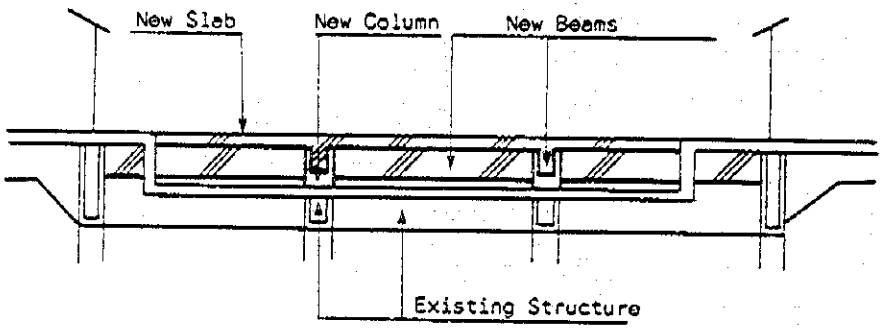
*1 Based on the National Structural Code of the Philippines, Vol. 1 (Third edition 1986). See Appendix 9.2.1.

*2 The maximum size of vessels/ships which can enter South Harbor during the high water period.

Table 9.2 Design Soil Conditions

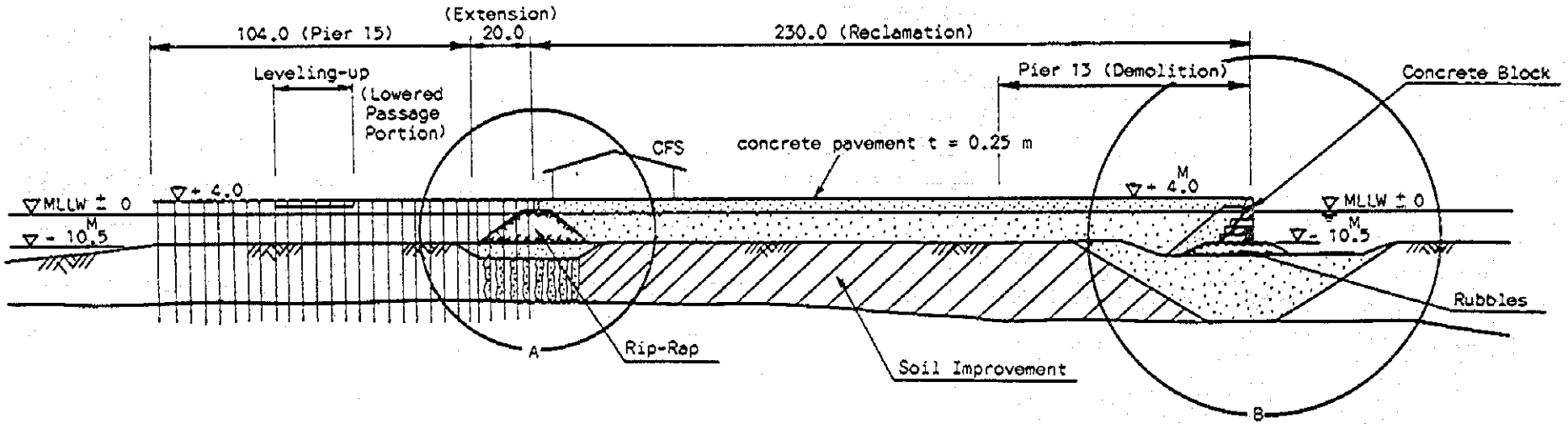
Depth below Sea Bottom Level (m)	Symbol	Soil Characteristics	N-value/qu(Unconfined (SPT) compressive Strength;kgf/cm^2)	Unit Weight (tf/m^3)
0 to 20	Ac	Silty Clay	qu=0.05 qu=0.05 + 0.042x(z-4) (z; depth in meter)	1.45
20 to 30	As	Fine Sand	N = 10	1.80
30 to 40	Dg	Sandy Gravel Gravelly Sand	N = 30	1.80
40 over	Tsc	Tuff Sand Mud Stone	N = 50	1.80

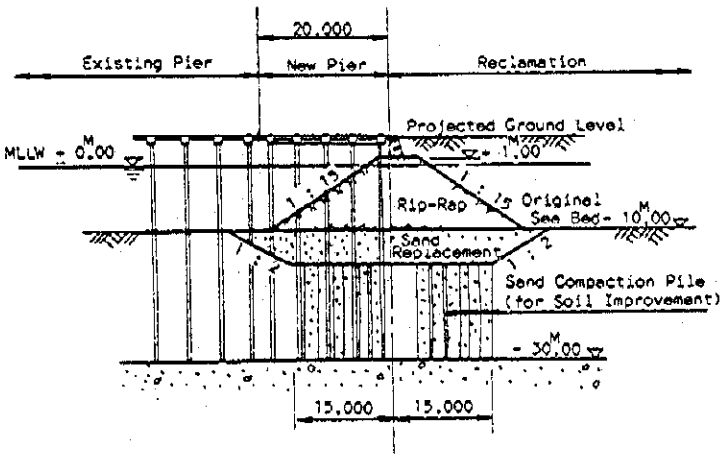




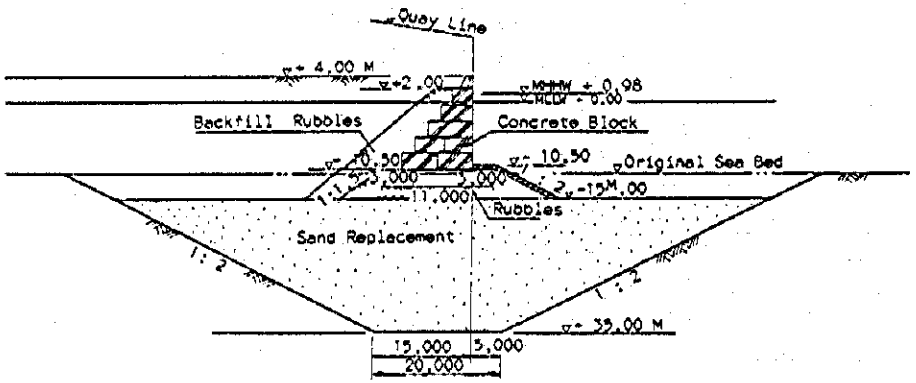
Detail A

Fig. 9.1 Proposed Section for Pier 9





Detail A



Detail B

Fig. 9.2 Proposed Section for Pier 13/15 (Alternative 3)

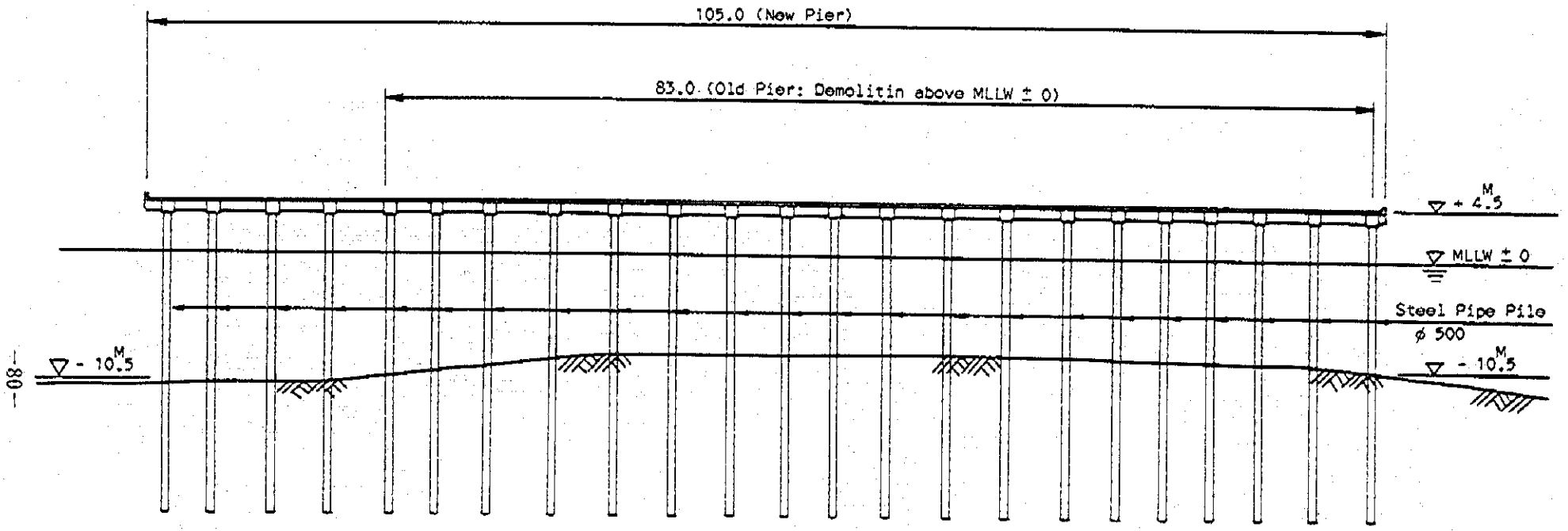


Fig. 9.3 Proposed Section for Pier 13 (Alternative 4)

Table 9.3 Construction Schedule (Short-Term Rehabilitation Plan)

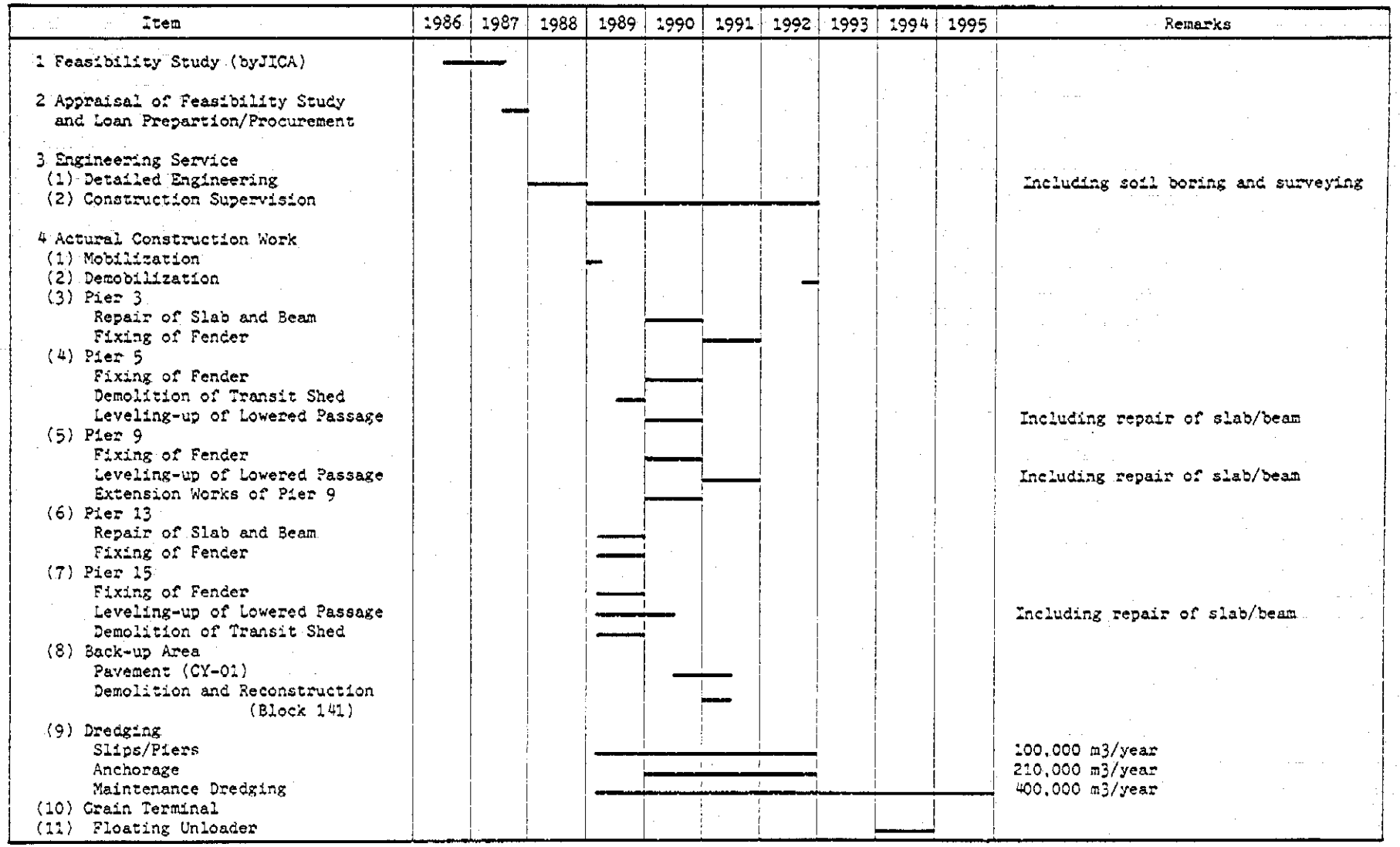


Table 9.4 Tentative Construction Schedule (Master Plan)
(1986 - 2005)

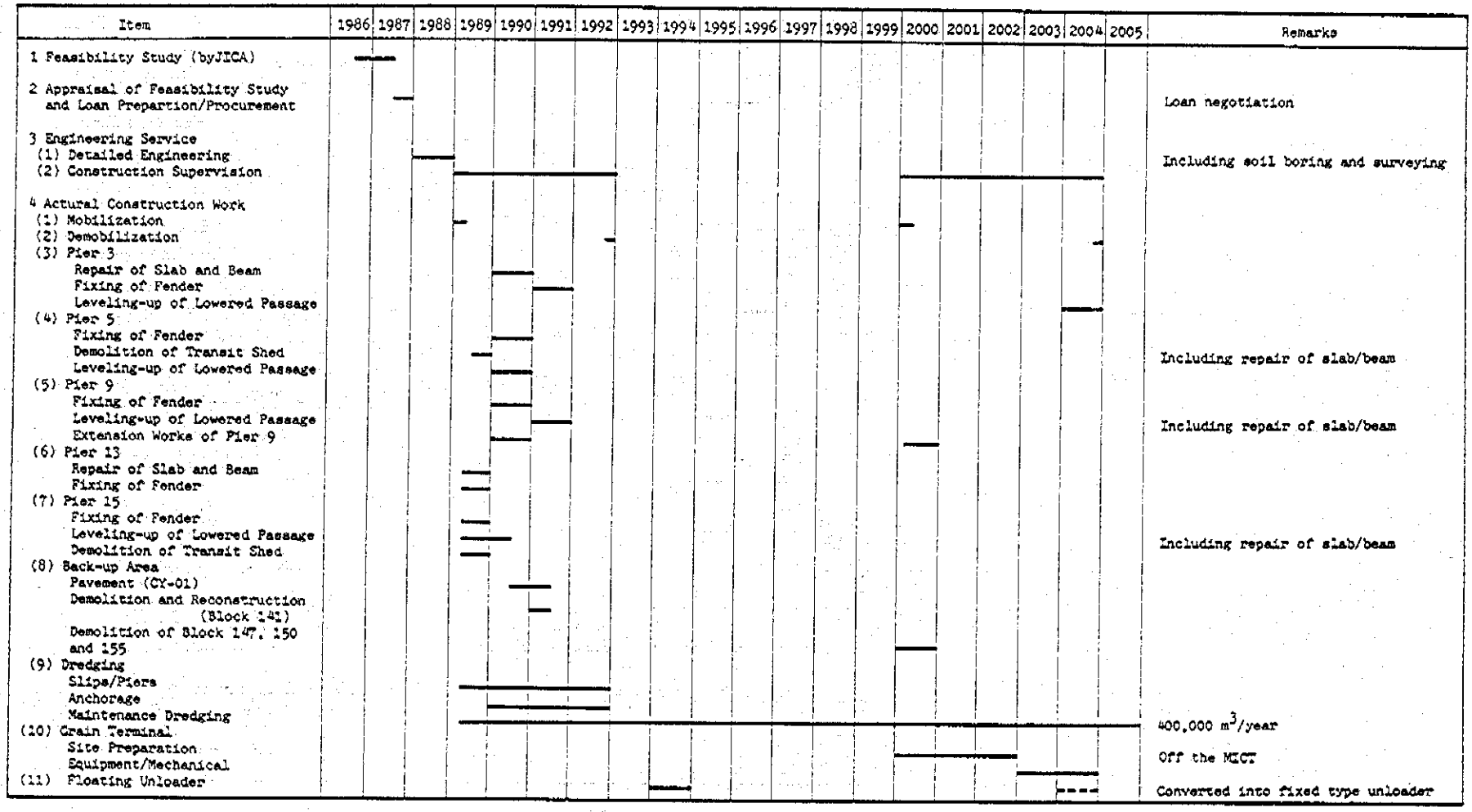


Table 9.5 Rough construction cost Estimate (Short-Term Development Plan)
(1988 - 1994)

(In 1,000 Pesos, $1=₱20.5=¥154)

Work Items	Unit	Quantity	Cost			Remarks
			Local Portion	Foreign Portion	Total	
1.Pier 3						
Slab and Beam	m^3	354	2,150	1,570	3,720	
Slab	m^3	680	2,803	2,047	4,850	
Fender (V-500)	p'ce	18	1,819	5,401	7,220	
Fender (V-300)	p'ce	19	1,287	3,823	5,110	
Leviling-up (Center)	m^3	2,700				Constructed in 2004
Sub-total			8,059	12,841	20,900	
2.Pier 5						
Fender (V-500)	p'ce	36	3,641	10,809	14,450	
Fender (V-300)	p'ce	6	405	1,205	1,610	
Leveling-up (Center)	m^3	5,250	30,422	17,488	47,910	
Domolition of Transit Shed	block	2	6,920	1,080	8,000	2,930m^2x2
Sub-total			41,388	30,582	71,970	
3.Pier 9						
Fender (V-500)	p'ce	18	1,819	5,401	7,220	
Fender (V-300)	p'ce	6	405	1,205	1,610	
Leveling-up (Center)	m^3	3,850	22,307	12,823	35,130	
Extension Works	m	380	24,987	42,183	67,170	
Sub-total			49,518	61,612	111,130	
4.Pire 13						
Slab and Beam	m^3	345	2,098	1,532	3,630	
Fender (V-500)	p'ce	38	3,843	11,407	15,250	
Fender (V-300)	p'ce	5	337	1,003	1,340	
Sub-total			6,278	13,942	20,220	
5.Pier 15						
Slab and Beam	m^3	620	3,768	2,752	6,520	
Fender (V-500)	p'ce	36	3,641	10,809	14,450	
Fender (V-300)	p'ce	6	405	1,205	1,610	
Leveling-up (Center)	m^3	4,530	26,250	15,090	41,340	
Demolition of Transit Shed	block	1	3,468	542	4,010	2,900m^2
Sub-total			37,532	30,398	67,930	
6.Back-up Area						
Pavement (CY-01)	m^2	55,000	16,186	21,634	37,820	
Demolition and Reconstruction (Block-141)	block	1	22,728	6,152	28,880	3,500m^2
Demolition (Block 147, 150 and 155)	block	3				Demolished in 2000
Sub-total			38,914	27,786	66,700	

Rough construction cost Estimate (Short-Term Development Plan)
(1988 - 1994)

(in 1,000 Pesos, $1=₱20.5=¥154)

Work Items	Unit	Quantity	Cost			Remarks
			Local Portion	Foreign Portion	Total	
7.Dredging						
Slips/Piers	m^3	400,000	2,200	17,800	20,000	
Anchorage	m^3	620,000	3,410	27,590	31,000	
Sub-total			5,610	45,390	51,000	
8.Grain Terminal						
Floating Unloader	set	2		(220,000)	(220,000)	Introduced in 1994
Site Preparation	L.S.	1				Constructed in 2000 through 2002
Civil Work and Equipment/Mechanical	L.S.	1				Construction in 2003 and 2004
9.Engineering Fee						
Detail Engineering			4,927	27,923	32,850	Except Item 8
10.Total A			192,226	250,474	442,700	Items 1 - 7,9
11.Contingency A			19,222	25,078	44,300	10% of Item 10
12.Grand Total A			211,448 (43%)	275,552 (57%)	487,000	in 1,000 Pesos

N.B. In case of introduction of Floating Pneumatic Unloader, the following cost shall be added to the above Grand Total A

13.Floating Unloader			-	220,000	220,000	Refer to Item 9
Engineering Fee			-	18,000	18,000	
Total B			-	238,000	238,000	
14.Grand Total			211,448 (29%)	513,552 (71%)	725,000	Grand Toatl A+Total B

Note: 1. Above cost estimate is based on the survey as of Aug.'86
2. The following costs/fees are not included (Refer to App. 9.6.2)
   1) repair/improvement cost for West and South Breakwaters
   2) maintenance dredging cost (400,000m^3/year)
   3) price escalation from Aug.'86 through Jun. '87
   4) withholding and contractor's taxes (5% of the total contract ammount)
   5) supervising fee
   6) repair/improvement of navigation aids
3. Dredging areas are shown in App. 9.6.3.

CHAPTER 10 ADMINISTRATION AND OPERATIONS

10.1 Administrative Recommendations

Based on the analyses of the present situation of the port, the following items are recommended for improvement of the port administration.

1) Basic structure and responsibility for the port administration

It is basically recommended to maintain the existing administrative structure of the Port. However, a clear cut delineation of responsibility and authority for port security and traffic control in the port area should be formulated in close coordination with customs officials.

2) Appropriate coordination of port services

There are many activities and services at the port, and they are closely related with each other. So, harmonious coordination is essential to realize efficient port operation. For this purpose, a great deal of planning, a timely information system and appropriate supervision of each activity are required.

3) Improvement of human resources

The development of human resources including both officials and port workers, and especially the training of coordinators and supervisors, is the key for successful port operation. Fundamental knowledge of the entire operational flow, the relationship among the many port activities, and the promotion of ethics should be included in the educational programs for port workers and managers.

4) Improvement of port statistics

PPA and the individual port management units have various useful source documents and prepare some statistical reports. However, the present port statistics in some categories are insufficient.

Judging from the volume of traffic passing through the Port of Manila, it is recommendable to introduce an electronic computer for the processing of port statistics.

5) Simplification of formalities and administrative procedures

To expedite the clearance of cargoes, the port administration body should make an effort to simplify the formalities and procedures in close

cooperation with customs officials.

6) Improvement of maintenance work

Poor maintenance of port facilities and handling equipment directly reduces the working capacity, resulting in a lower overall operating efficiency. Thus, maintenance and repair work must be sufficient. In particular, inspection and maintenance work for preventing trouble should be conducted on a regular basis.

10.2 Proposed Operation System

10.2.1 Improvement measures

Based on the analyses of the present operational problems, the following basic measures are proposed to improve the efficiency of the cargo handling operations and the traffic flow:

① Some of the cargoes which are presently handled at Anchorage should be transferred to pierside handling.

② A preferential berthing system is being adopted for berth allotment at the Port of Manila.

③ The improvement of cargo handling machines and the rearrangement of physical facilities at the wharf are proposed to raise the efficiency of cargo handling.

④ To significantly improve the cargo handling efficiency for grain, the introduction of floating unloaders at Anchorage is recommended in the Short-term. Considering the average discharging volume of grain per ship, two floating pneumatic unloaders with a capacity of 400t/hrs each should be provided.

10.2.2 Future Cargo Handling Productivity

The future cargo handling productivity by cargo mode at the Port of Manila is estimated as shown in Table 10.1 considering the improvement measures.

Table 10.1 Cargo Handling Productivity at the Port of Manila

Cargo Type	Item	Actual	Future
(At Piers) Loose (break bulk) cargo	Average handling performance Real operating time rate working conditions	44 t/hour ship 0.8 2.9 gangs/ship (average) ship gear	51 t/hour ship 0.85 3 gangs/ship (average) ship gear
Container self-sustaining ships	Average handling performance Real operating time rate working conditions	16 units/hour ship 0.7 2 gangs/ship ship gear or ship-tainer	18 units/hour ship 0.85 2 gangs/ship ship gear or ship-tainer
non-self-sust. ships	Average handling performance Real operating time rate working conditions	32 units/hour ship 0.7 2 gangs/ship gantry crane	No operation at South Harbor
Timber	Average handling performance Real operating time rate Working conditions	39 t/hour ship 0.85 2.6 gangs/ship ship gear	60 t/hour ship 0.85 3 gangs/ship ship gear
Iron & steel	Average handling performance Real operating time rate Working conditions ship gear	45 t/hour ship 0.75 2.5 gangs/ship ship gear	80 t/hour ship 0.85 2.5 gangs/ship
Bagged fertilizer (actually handled at anchorage)	Average handling performance Real operating time rate Working conditions	70 t/hour ship 0.75 3.5 gangs/ship ship gear	85 t/hour ship 0.85 3.5 gangs/ship ship gear
Bulk (except grain)	Average handling performance Real operating time rate Working conditions	78 t/hour ship 0.8 3 gangs/ship ship gear	84 t/hour ship 0.85 3 gangs/ship ship tear
(At Anchorage) Loose (break bulk) cargo	Average handling performance Real operating time rate Working conditions	28 t/hour ship 0.75 3 gangs/ship ship gear with grab	28 t/hour ship 0.75 3 gangs/ship ship gear with grab
Bulk (except grain)	Average handling perfomance Real operation time rate Working conditions	65 t/hour ship 0.60 3 gangs/ship ship gear with grab	65t/hour ship 0.60 3 gangs/ship shipgear with grab
Grain (wheat, soybean meal)	Average handling performance Real operating time rate Working conditions	88 t/hour ship 0.60 4 gangs/ship ship gear with grab	480 t/ship gross hour 2 pneumatic unloaders with a capacity of 400 t/hour each
Liquid	Average handling performance Real operating time rate Working conditions	670 g/ship gross day Suction pump	700 t/ship gross day Suction pump

Note: (1) Actual figures show the 1985 data calculated from "Worksheet per vessel activity" (PPA)
(2) The real operating time rate shows the ratio of real operating time to total working time including *standby/idle time caused by weather conditions, lack of equipment, waiting for cargo, meals,* accidents, etc.
(3) Gross hours equal real operation time plus idle time.

10.2.3 Cargo Handling Equipment Requirements

Considering the fluctuation of ship arrivals and the requirement of additional equipment to compensate for repair and maintenance works, the cargo handling equipment requirements are estimated based on the type and number of cargo handling machines required for each cargo operation per ship.

Table 10.2 Required Cargo Handling Equipment in 1995

Equipment	Capacity	Number	Remarks
Forklifts	2 - 3 t	110 - 130	
	15 t	2 - 4	heavy cargo handling
	30 t	2 - 4	container handling
Mobile Cranes	10 - 30 t	2 - 3	heavy cargo, irregularly sharped cargo handling.
Shifters	35 t	4 - 6	container handling at C.Y.
Prime Movers		15 - 25	container handling
Container Chassis		25 - 35	container handling
Pneumatic Unloaders	400 t/hr	2	grain handling
Payloaders	3.5 m^2	6 - 8	bulk handling both on piers and on ships
Hoppers		4 - 6	bulk handling on piers

CHAPTER 11 ECONOMIC ANALYSIS

11.1 Purpose and Methodology

The purpose of the economic analysis is to appraise the economic feasiblity of the Short-term Rehabilitation Plan from the viewpoint of the national econmy. The economic internal rate of return (EIRR) based on cost-benefit analysis is used to appraise the feasibility of the project.

11.2 Benefits and Costs

A cost-benefit analysis is conducted on the difference between the "With" and "Without" investment cases.

11.2.1 Benefits

The following three items are identified as tangible benefits in this report.

1) Savings in Ships' Staying Costs

Investment in improved port facilities will reduce the staying time of ships (the waiting time for berth space and the time for loading and unloading cargo), and this cost reduction is identified as a major benefit of the project.

2) Savings in Cargo Handling Costs

Improvements of port facilities and port operation systems will reduce the cargo handling costs and the difference of these costs between the "With" and "Without" cases is identified as another benefit of the project.

3) Savings in Time Costs

The reduction of ships' staying period due to the implementation of the project will bring about savings in usance interest as goods and funds will be turned over faster. This reduction is identified as the savings in time costs.

11.2.2 Costs

As for costs, construction costs and maintenance costs are estimated.

11.3 Economic Pricing

"Economic pricing" is used to examine the economic value of all costs and benefits to evaluate the project from the economic viewpoint. The market prices are changed to border prices using various conversion factors after excluding transfer items.

11.4 Results of Economic Analysis

11.4.1 Economic Internal Rate of Return (EIRR)

The EIRR of the Short-term Rehabilitation Plan, using 30 years as the period of economic calculation, is estimated to be 18.46 %. Various sensitivity analyses are then performed as follows.

Case	EIRR (%)
Base Case	18.46
Case A: Increase in Costs by 10%	17.46
Case B: Decrease in Benefits by 10%	17.36
Case C: Increase in Costs by 10% and Decrease in Benefits by 10%	16.40

11.4.2 Results

The Short-term Rehabilitation Plan is judged to be feasible from the viewpoint of the national economy based upon the EIRR of the project as well as the uncountable benefits arising from the project.

CHAPTER 12 FINANCIAL ANALYSIS

12.1 The purpose of the financial analysis is to evaluate:

1) The financial viability of the operating entity responsible for the Short-term Rehabilitation Plan.
2) The profitability of the Short-term Rehabilitation Plan itself.

12.2 Financial viability of PPA

Based on the projected financial statements (balance sheet, income statement and statement of source and application of funds) and analyses of various financial ratios calculated from the financial statements, the projected financial condition of the project is favorable, and the project will not adversely affect the finances of PPA.

The revenue will be sufficient to cover the operating costs, the interest on loans and depreciation costs.

12.3 Financial internal rate of return (FIRR)

(1) The profitability of the project itself is appraised based on the FIRR. For the calculation of the FIRR, constant prices (e.g.1986) are used and incremental revenues and costs refrect the "with" and "without" comparison.

(2) Prerequisites of the FIRR calculation

① Increase in port tariff rate

1988 30% increase

1989 25% increase

② Incremental revenues

(i) Port operation revenue from additional cargo handled beyond the optimum cargo handling capacity in 1995 under the "without" case.

(ii) Port operation revenue from additional ship calling beyond ship calling in 1995 under the "without" case.

(iii) Revenue from cargo-handling contractors by the additional cargo handled beyond the above capacity.

③ Incremental cost

(i) Construction cost

(ii) Maintenance cost

(iii) Tax on the incremental revenue

④ Savings from higher maintenance cost under the "without" case than under the "with" case.

(3) Result of FIRR calculation

The FIRR of this project is 7.69% for the base case, which exceeds the weighted average cost of capital (3.1%).

Sensitivity tests were conducted under the different assumptions.

The results are:

Case	FIRR(%)
Base Case	7.69
Case A: Increase in Costs by 10%	7.00
Case B: Decrease in Benefits by 10%	6.92
Case C: Increase in costs by 10% and Decrease in Benefits by 10%	6.25

12.4 Evaluation

Based on these results, the Short-term Rehabilitation Plan can be judged feasible in terms of the viability of PPA as well as the profitability of the project itself.