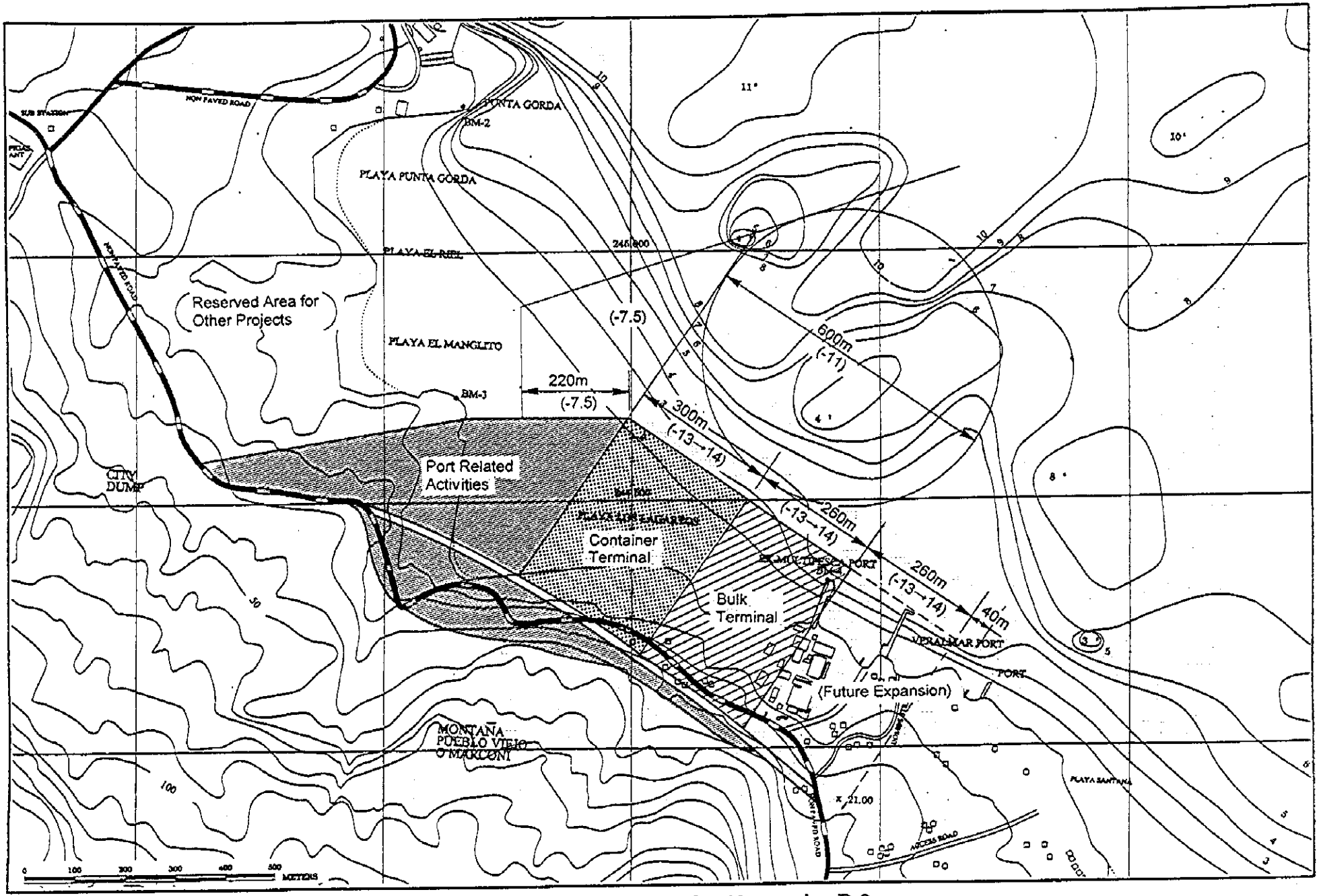


Figure 18-3-3 Layout Plan for Alternative B-3

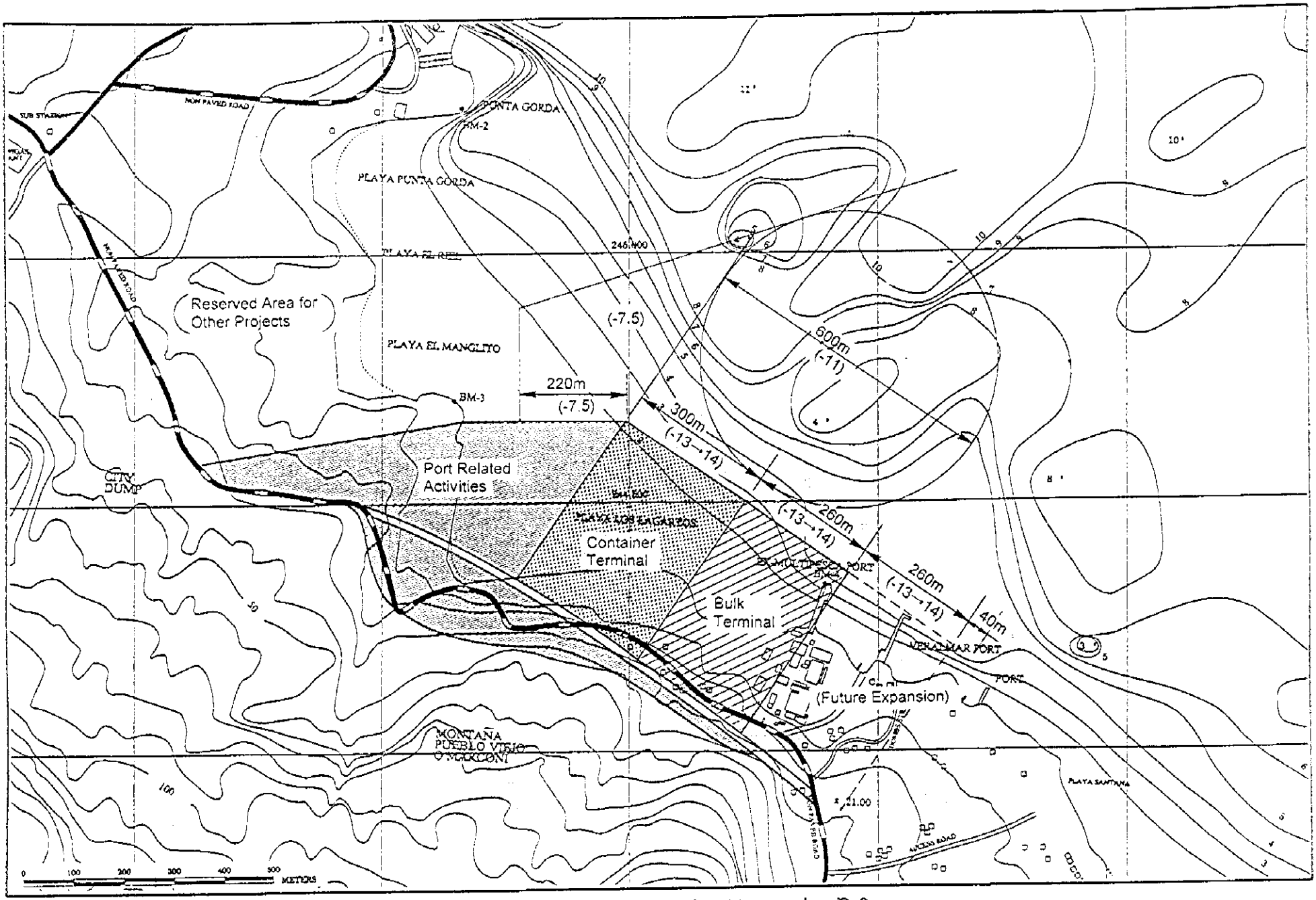


Figure 18-3-3 Layout Plan for Alternative B-3

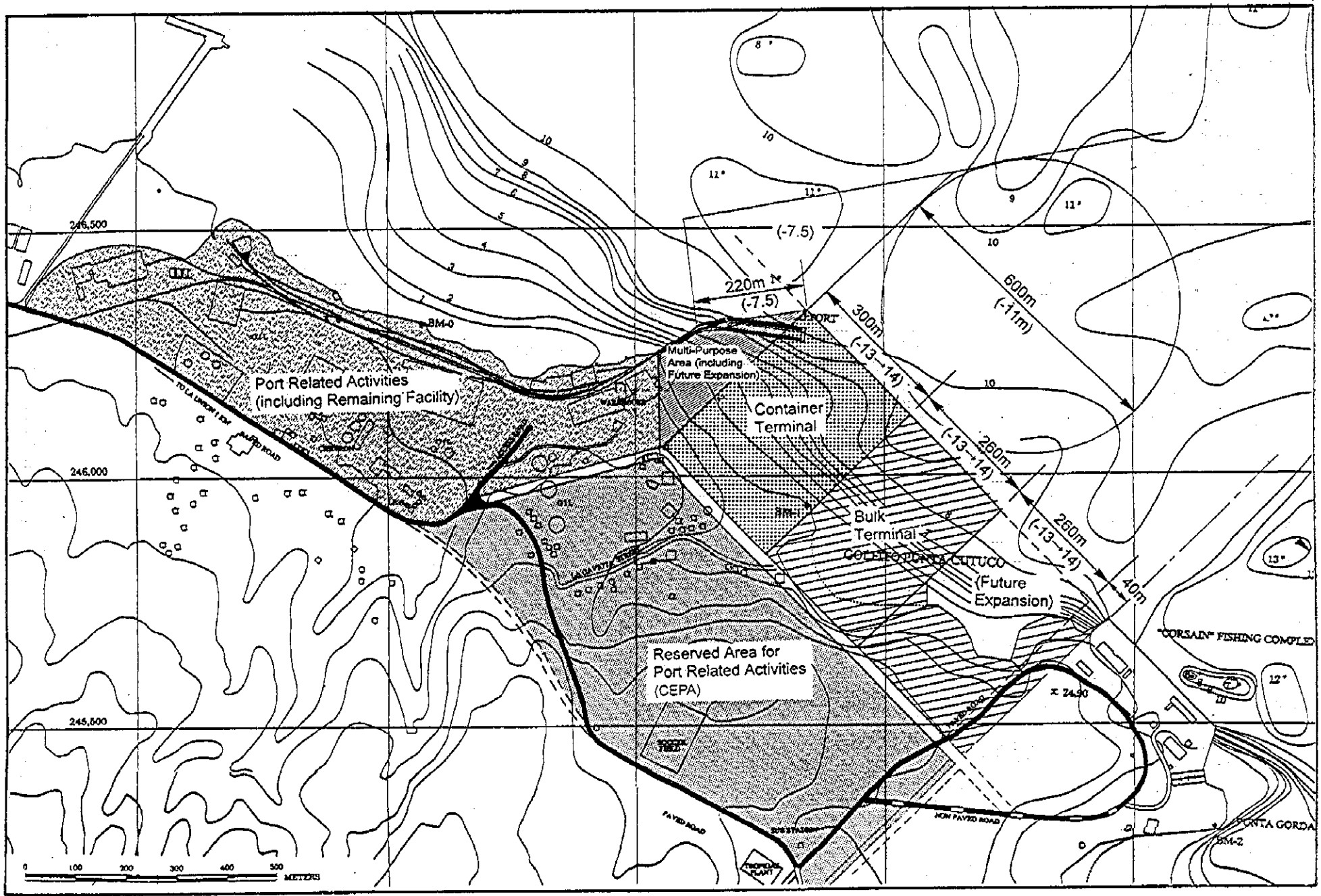


Figure 18-3-4 Layout Plan for Alternative C-3

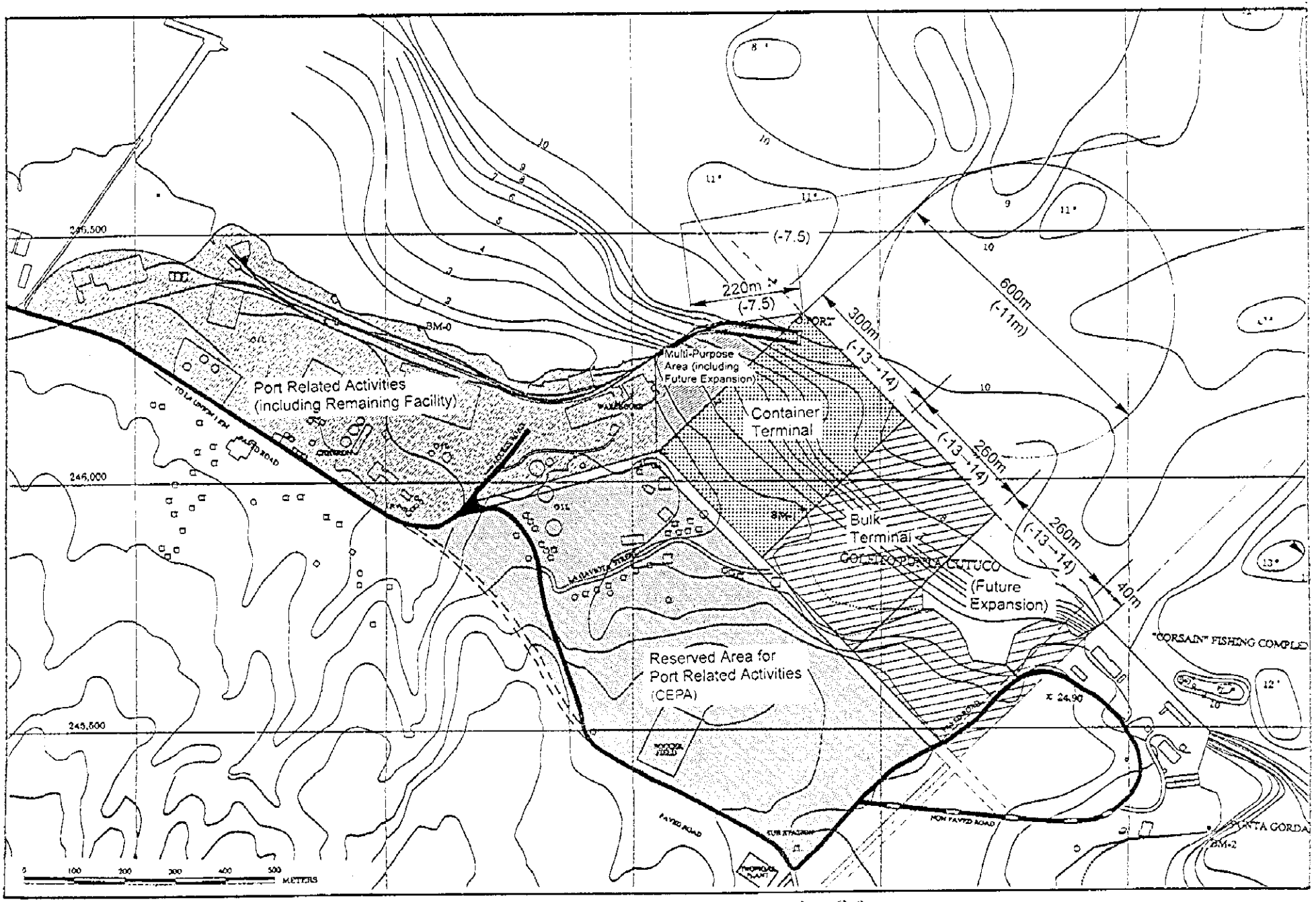


Figure 18-3-1 Layout Plan for Alternative C-3

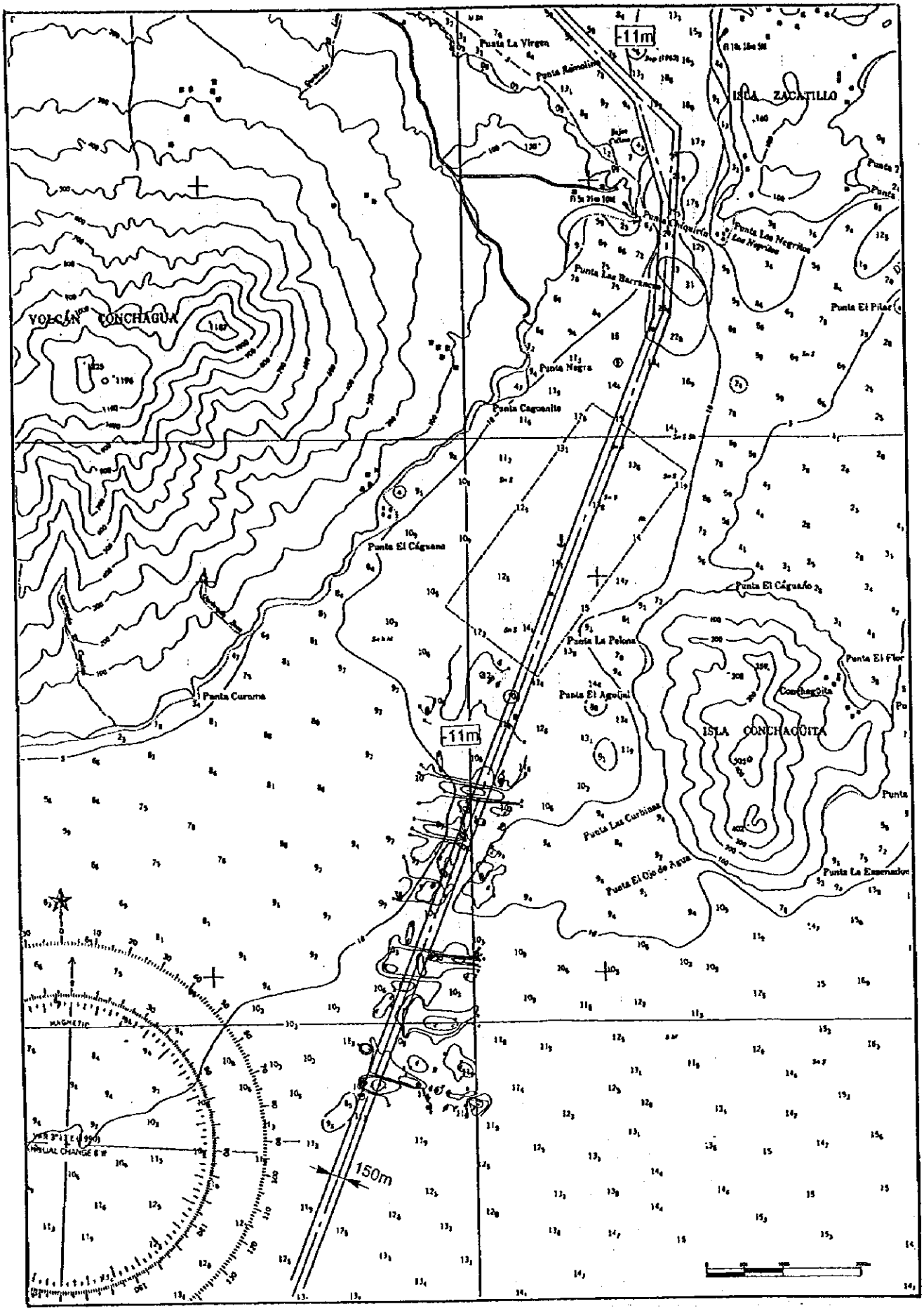


Figure 18-3-5 (a) Entire Plan of the Channel (outside the Bay of La Union)

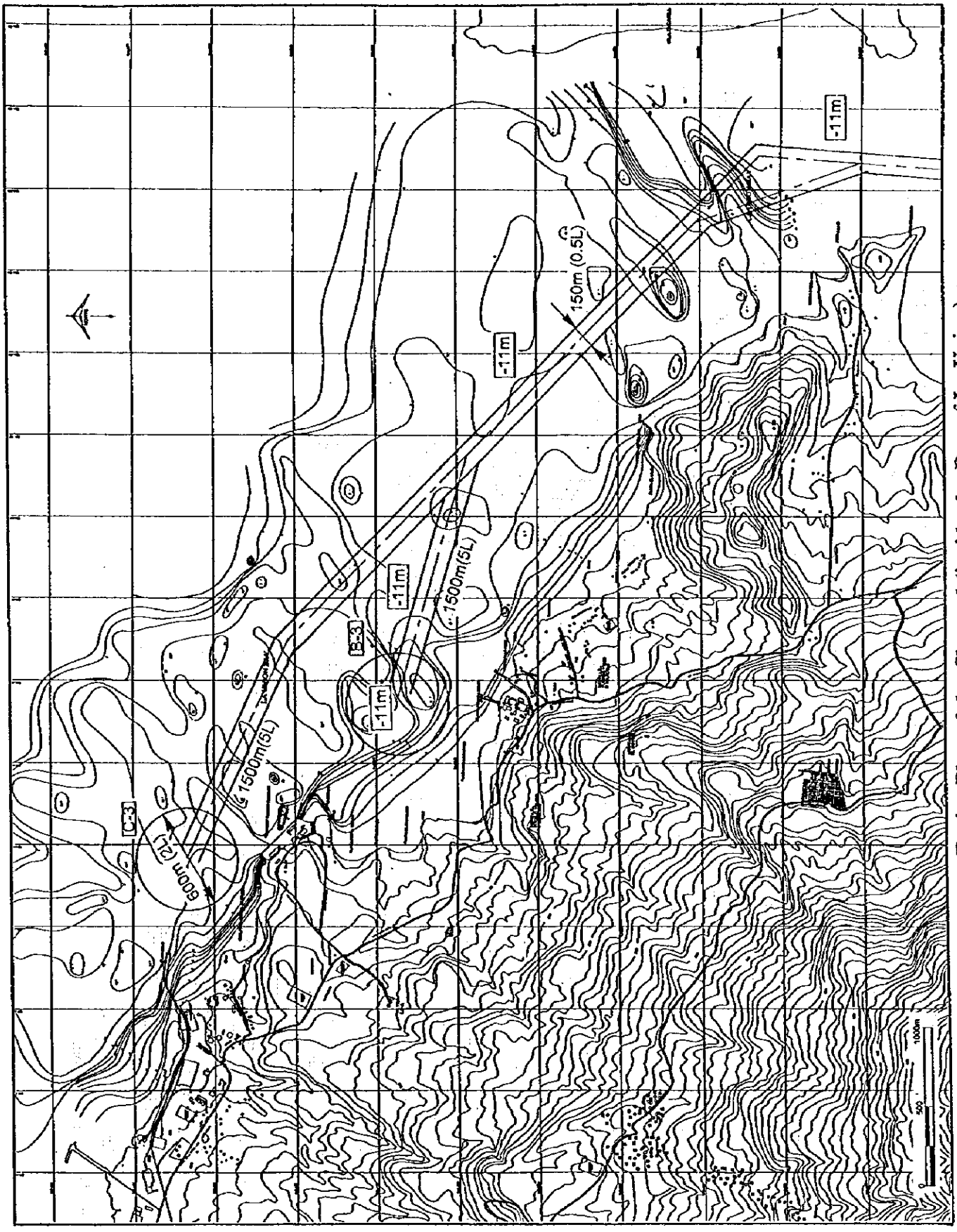


Figure 18-3-5 (b) Entire Plan of the Channel (inside the Bay of La Union)

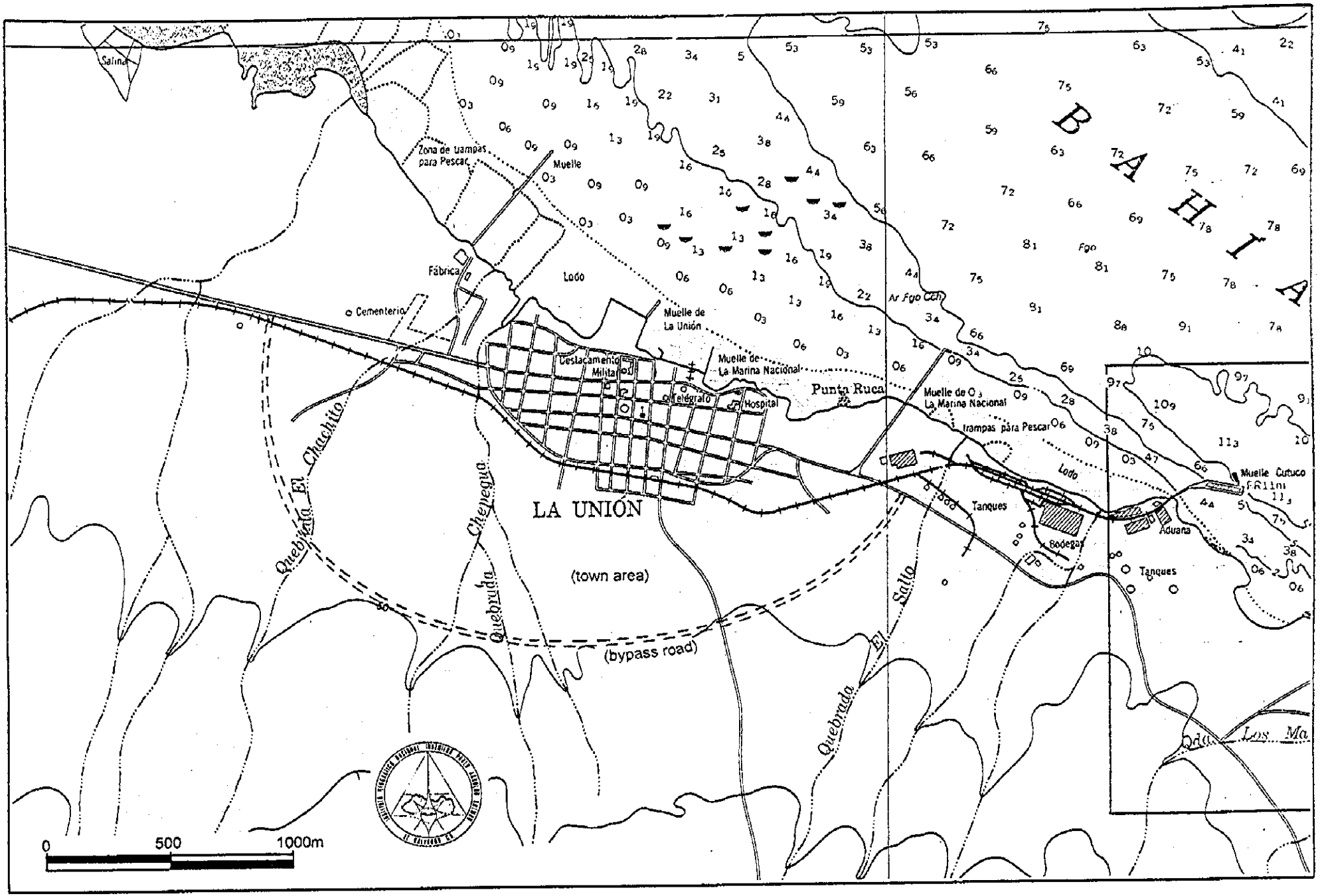


Figure 18-3-6 Rough Alignment of the Bypass Road

19. PRELIMINARY DESIGN

19.1 Natural Conditions of the Project Sites

1. Location, oceanographic characteristics and geological characteristics of alternative sites, B-3, C-3, and of outer channel are summarized below.

19.1.1 Location, Oceanographic Characteristics and Geological Characteristics of Alternative Site B-3

(1) Location

1. The coastal area between Punta Gorda Port and private jetties at Montana Pueblo Viejo O Marcon is divided into two eastern and western areas by a valley which locates at the deepest point of this area. (See 5.4.2) The western area is the national land and the eastern area is the private one. Alternative B-3 (560mx400m) consists of the part of this private land and its front water area.

2. The hinterland of the site B-3 is one of the skirts of Volcan Conchagua and steeply falls into the sea. There are three private jetties for fishery next to the east side of the site, and one of those jetties is included in the site B-3.

3 Existing road that passes through the site B-3 must be replaced behind the site. The water depths of the front line of the site B-3 are comparatively shallow indicating around –3m.

(2) Oceanographic Characteristics

1) Tides

4. The following tidal levels are observed at La Union based on the chart datum (C.D.L.)

- Mean High Water Spring (M.H.W.S.) +3.05m
- Mean High Water Neap (M.H.W.N.) +2.44m
- Mean Low Water Neap (M.L.W.N.) +0.61m
- Mean Low Water Spring (M.L.W.S.) +0.03m

2) Waves

5. La Union Bay is well sheltered by many isles and capes, and consequently all the waves invading from the Pacific Ocean to the Bay are expected to be less than 0.3m in height. Wave caused by strong wind is quite small because of short fetch of maximum 9 km in E direction and seldom blowing of strong wind. (5.4.3) So, water area of the project sites and approach channel in the Bay have sufficient calmness.

3) Currents

6. Maximum current velocity observed just at site B-3 is up to 2 knots. The current condition does not significantly affect the ship maneuvering in the channel but the ships should be cautious when approaching to the berth. (5.4.3)

4) Water depth and Sedimentation

7. B-3 has water area shallower than -5m locationally, and seabed condition seems to be stable. (5.4.3(5))

(3) Geological Characteristics

1) Typical cross section

8. Typical cross section of the site B-3 in the short-term plan is shown in Figure 19.1.1. Subsoil condition of the site is supposed as follow.

-	Water depth		±0.0m to -3.0m
-	Hard layer	depth	±0.0m to -9.5m
		N value	>50
-	Clayey strata	thickness	0.0m to 6.5m
		N value	1 to 2

2) Settlement of the soft clay strata

9. The final settlement of the above clayey stratum after filling (loading) of the reclamation materials is estimated to be about 0.4m to large extent requiring the period from 200 days to 300 days for 90 % consolidation. There is no consolidation settlement within the area of wharf because of

excavation of strata and replacement by sand. In the planned yard area, overlay will be needed.

19.1.2 Location, Oceanographic Characteristics and Geological Characteristics of Alternative Site C-3

(1) Location

10. Alternative Site C-3 (560mx400m) locates at the Punta Cutuco Bay including the existing jetty of Cutuco Port. Although this bay is shallower than –5m, the water in front of the bay deepens sharply until around –10m or more. Behind the Punta Cutuco Bay, the foothill of the Volcan Conchagua stretches, and, there exist foothills of 10m in elevation at the backside of the site C-3.

11. All the land in the site is national own. But, there are some private houses besides buildings owned by Cutuco Port Authority. The water depths of the front line of the site C-3 are comparatively deep indicating –9m.

(2) Oceanographic Characteristics

1) Tides

12. The following tidal levels are observed at La Union based on the chart datum (C.D.L.)

- Mean High Water Spring (M.H.W.S.) +3.05m
- Mean High Water Neap (M.H.W.N.) +2.44m
- Mean Low Water Neap (M.L.W.N.) +0.61m
- Mean Low Water Spring (M.L.W.S.) +0.03m

2) Waves

13. La Union Bay is well sheltered by many isles and capes, and consequently all the waves invading from the Pacific Ocean to the Bay are expected to be less than 0.3m in height. Wave caused by strong wind is quite small because of short fetch of maximum 9 km in E direction and seldom blowing of strong wind (5.4.3) So, water area of the project sites and approach channel in the Bay have sufficient calmness.

3) Currents

14. Maximum current velocity observed just at site C-3 is up to 2 knots. The current condition does not significantly affect the ship maneuvering in the channel but the ships should be cautious when approaching to the berth. (5.4.3)

4) Water depth and Sedimentation

15. C-3 has a sufficient water area deeper than -9m, and seabed condition seems to be stable. (5.4.3(5))

(3) Geological Characteristics

1) Typical cross section

16. Typical cross section of the site C-3 in the short-term plan is shown in Figure 19.1.2. Subsoil condition of the site is supposed as follow.

-	Water depth		±0.0 to -9.5m
-	Hard layer	depth	±0.0m to -18.0m
		N value	>50
-	Clayey strata	thickness	0.0m to 2.0m
		N value	1 to 4
-	Sandy silt strata	thickness	0.0m to 6.5m
		N value	30 to 50

2) Settlement of the soft clay strata

17. The final settlement of the above clayey stratum after filling (loading) of the reclamation materials is estimated to be about 0.2m to large extent requiring the period of 100 days for 90 % consolidation.
There is no consolidation settlement within the area of wharf because of excavation of strata and replacement by sand. In the planned yard area, overlay will be needed.

19.1.3 Outer Channel of La Union Bay

(1) Water Depths

18. Comparing the bathymetric map (5.5km x 1.4km) by the Study Team in December 1997 with the existing chart map (GOLFO DE FONSECA, BAHIA DE LA UNION AND APPROACHES, 1980), the followings are characterized. (See, Figure 19-1-3)

- Locationally, some decreases up to 1.0m and some increases up to 2.0m are observed, but there are not remarkable and uniform changes.
- It is concluded that the large-scale sedimentation is not recognized in the period of last 17 years in this area.

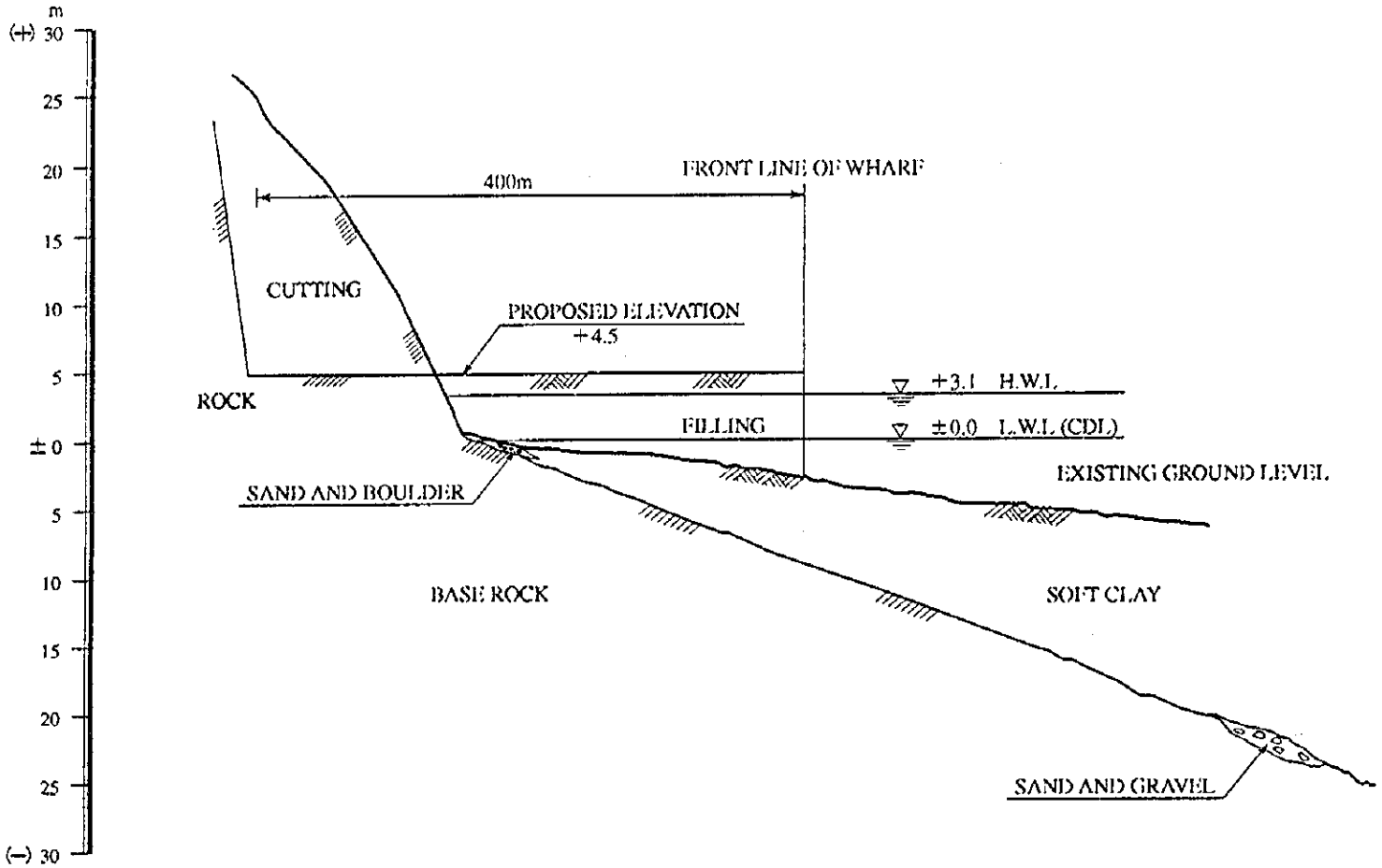


Figure 19-1-1 Typical Cross Section of Proposed Yard Behind The Wharf (site B-3)

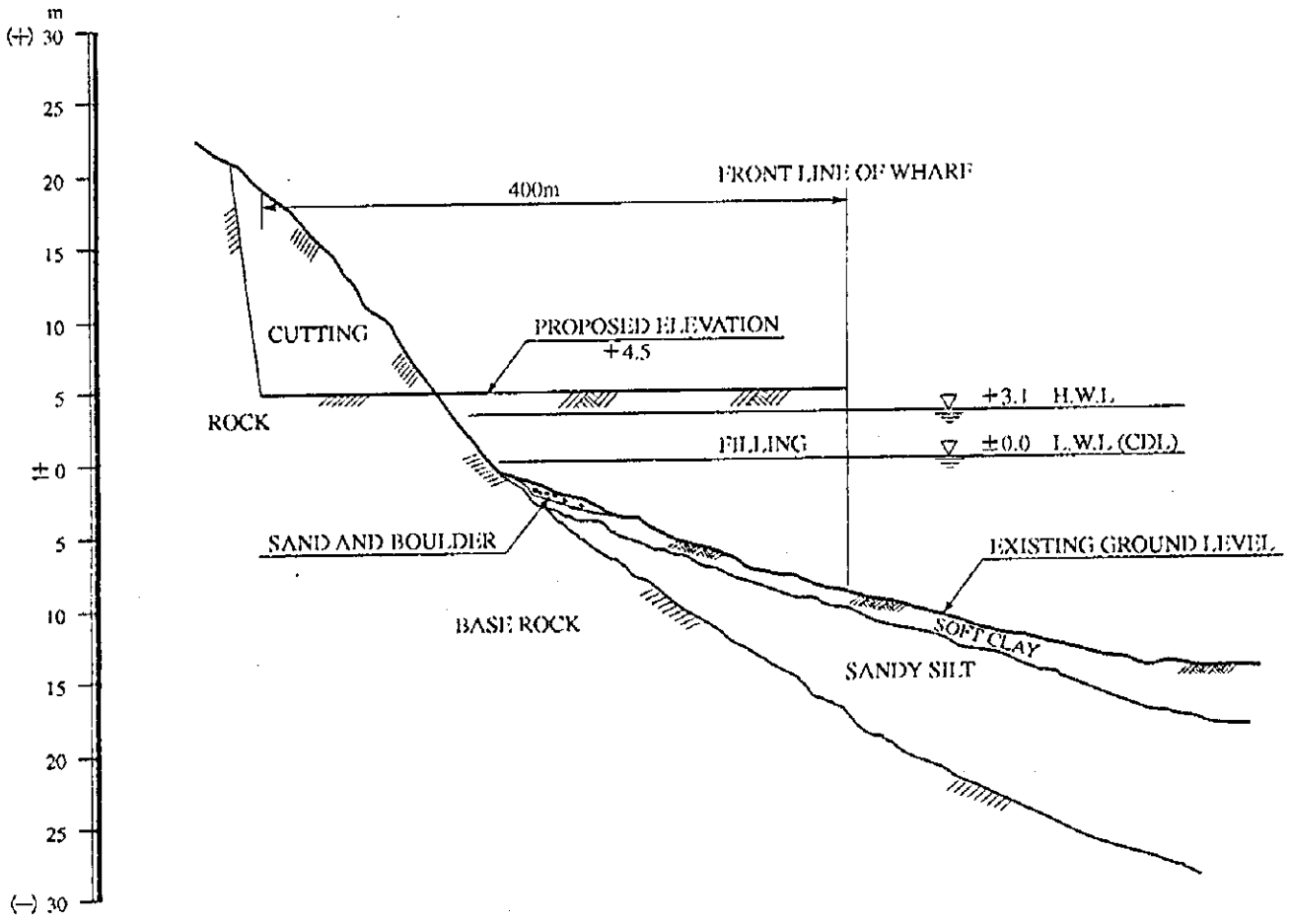


Figure 19-1-2 Typical Cross Section of Proposed Yard Behind The Wharf (site C-3)

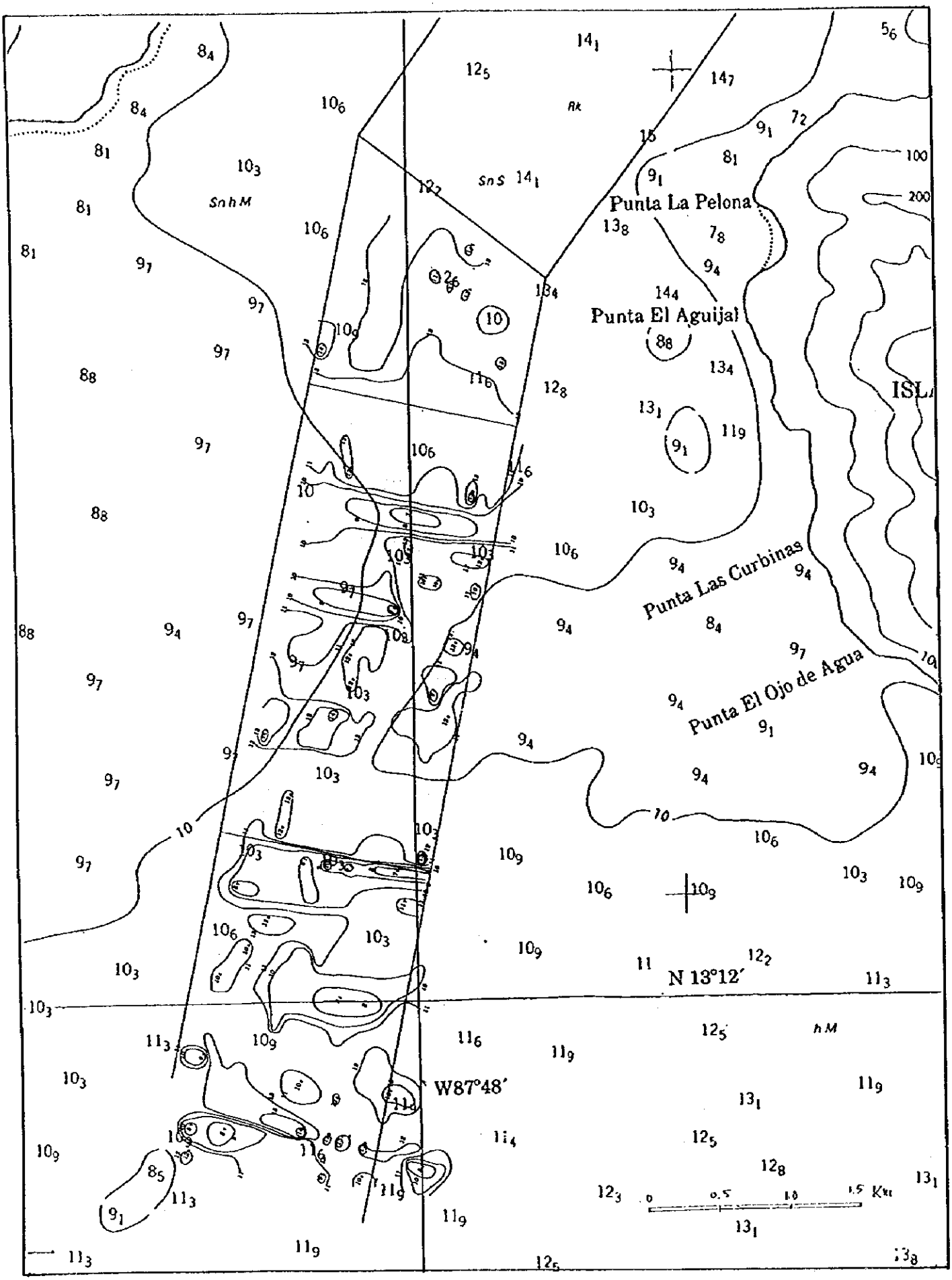


Figure 19-1-3 Comparison of the Bathymetric Map with the Existing Chart

19.2 Preliminary Design

1. In the short-term plan of the Port of La Union, the following main port facilities are planned by the year 2005. Preliminary designs of container berth, bulk berth, passenger berth and yard are described in this section.

Table 19-2-1 Planned Facilities in the Short-Term Plan

Facilities	Unit	Short-Term Plan
Container Berth (-13m)	m	300
Bulk Berth(-13m)	m	260
Passenger Berth (-7.5m)	m	220
Pavement	m2	127,000

(1) Design Conditions

2. Design conditions for the mooring facilities are set as follows.

Table 19-2-2 Design Conditions for Container Berth / Bulk Berth /Passenger Berth

Items	Design Conditions		
	Container Berth	Bulk Berth	Passenger Berth
Planned Ship	40,000DWT	50,000DWT	5,000GT
Planned Water Depth(m)	-14.0 *1	-14.0 *1	-7.5
Berth Length(m)	300	260	220
Crown Height(m)	+4.5	+4.5	+4.5
H.W.L.(m)	+3.1	+3.1	+3.1
Seismic coefficient	0.15	0.15	0.15

*1) capable of being deepened up to –14.0m in future

3. Design soil conditions at the planned sites (C-3, B-3) are set as follows. (Refer to 12.1.1 (2))

Table 19-2-3 Design Soil Conditions (C-3)

Stratum	Symbol	Soil Characteristics	N-value	Unit Weight (t/m3)
Sandy silt/Sand stratum	SP	Sandy silt/ Silty sand	30-50	1.80
Gravel/Sand stratum	SP+G	Gravel and sand	>50	1.80

Table 19-2-4 Design Soil Conditions (B-3)

Stratum	Symbol	Soil Characteristics	N-value	Unit Weight (t/m3)
Clayey stratum	OL	Clay with silt, soft to very soft, high plasticity.	0	1.45
Sandy silt/Sand stratum	SP	Sandy silt/ Silty sand	30-50	1.80
Gravel/Sand stratum	SP+G	Gravel and sand	>50	1.80

4. Following design surcharge and live loads are presumed for the berths.

Table 19-2-5 Design Surcharge Loads

Items		Concrete Caisson Type		Concrete Block Type
Conditions	Surcharge	Container Berth	Bulk Berth	Passenger Berth
Ordinary Condition	Surcharge	Within crane: 1t/m2 Out of crane: 3t/m2	3t/m2	2t/m2
	Live Load	Container Crane	-	-
Earthquake Condition	Surcharge	Within crane: 1t/m2 Out of crane: 3t/m2	1.5t/m2	1t/m2
	Live Load	Container Crane	-	-

5. Live loads are assumed as follows.

Container Crane:

Table 19-2-6 Wheel Load

(Unit:ton/wheel)

Position		Water Side		Land Side	
Direction		Vertical	Lateral	Vertical	Lateral
Condition	In service	36	3.0	35	3.0
	Out of service	33	3.5	45	3.5
	Earthquake	48	3.7	48	3.7

(2) Structural Design

1) Container Berth/ Bulk Berth

6. In the case of Alternative C-3, the depths of hard layers for container berth / bulk berth are expected between the depth –17 and -27m. So, the concrete caisson type is chosen for the deep-water berths. These berths will be constructed by the following order. (See, Figure 19-2-1)

i. Dredging until hard layers
ii. Sand displacement from –17m to hard layers
iii. Construction of rubble stone mound from –14m to –17m
iv. Setting of concrete caisson
v. Rubble backfilling

7. On the other hand, in the case of Alternative B-3, as the hard layers are expected at the depth –9.5m, hard layers should be removed until –17m depth. The berths will be constructed by the following order.

i. Dredging until –17m
ii. Construction of rubble stone mound from –14m to –17m
iii. Setting of concrete caisson
iv. Rubble backfilling

8. The design of gravity type quaywall is preferably made according to the following sequence.

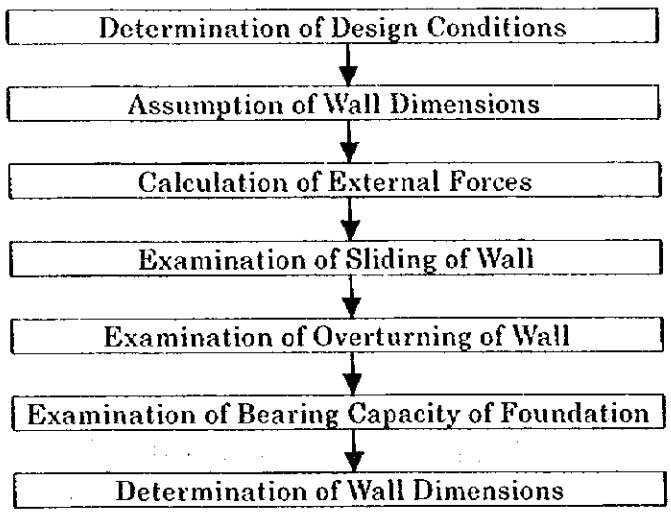


Figure 19-2-1 Design Flow of Gravity Type Quaywall

a) External Forces and Loads acting on Wall

As the external forces and loads acting on the wall of gravity type quaywall, the followings are considered.

- Surcharge
- Dead weight of wall
- Earth pressure
- Buoyancy
- Seismic force
- Tractive forces of ships

b) Examination Concerning Sliding of Wall

The safety factor against sliding of a gravity type quaywall shall satisfy the following formula.

$$F \leq \frac{fW}{P}$$

where;

W : The resultant of vertical forces acting on the wall (tons)
P : The resultant of horizontal forces acting on the wall (tons)
f : Coefficient of friction between the bottom of the wall and the foundation
F : Safety factor

The safety factor should be 1.2 or more in ordinary condition and 1.0 or more in extra condition.

c) Examination Concerning Overturning of Wall

The safety factor against overturning of a gravity type quaywall shall satisfy the following formula.

$$F \leq \frac{Wt}{Ph}$$

where,

W : The resultant of vertical forces acting on the wall (tons)
P : The resultant of horizontal forces acting on the wall (tons)
t : Distance from the application line of the resultant force of

the vertical forces acting on the wall, to the front toe of the wall (m)

h : Height from the application line of the resultant force of the horizontal forces acting on the wall, to the bottom of the wall (m)

F : Safety factor

The safety factor should be 1.2 or more in ordinary condition and 1.0 or more in extra condition.

d) Examination of Bearing Capacity of Foundation

In the both cases of alternatives B-3 and C-3, as the gravel/sand stratums are used for the foundation, the bearing capacity is expected sufficiently. There is no possibility of circular slip on the foundation because of hard stratum and sand replacement.

e) Result of Stability Calculation

According to the standard cross sections shown in Figure 19-2-2, the safety factors for sliding (S.F.1) and the safety factors for overturning (S.F.2) result in the Table 19-2-7. These figures show the sufficient stability against sliding and overturning.

Table 19-2-7 Safety Factors of Berths

Case	Container Berth		Bulk Berth	
	S.F.1 for Sliding	S.F.2 for Overturning	S.F.1 for Sliding	S.F.2 for Overturning
Ordinary Condition	2.5	3.1	2.5	3.0
Earthquake Condition	1.0	1.3	1.0	1.3

2) Passenger Berth

9. Concrete block type is adopted for the passenger berth next to the bulk berth. The standard cross section of the passenger berth is shown in Figure 19-2-3. The safety factors result in the Table 19-2-8. These figures show the sufficient stability against sliding and overturning.

Table 19-2-8 Safety Factors of Passenger Berth

Case	S.F.1 for Sliding	S.F.2 for Overturning
Ordinary Condition	1.9	1.2
Earthquake Condition	1.0	1.0

3) Yard Pavement

10. Asphalt concrete pavement is planned for yard. The standard cross section of the bituminous pavement is shown in Figure 19-2-3.

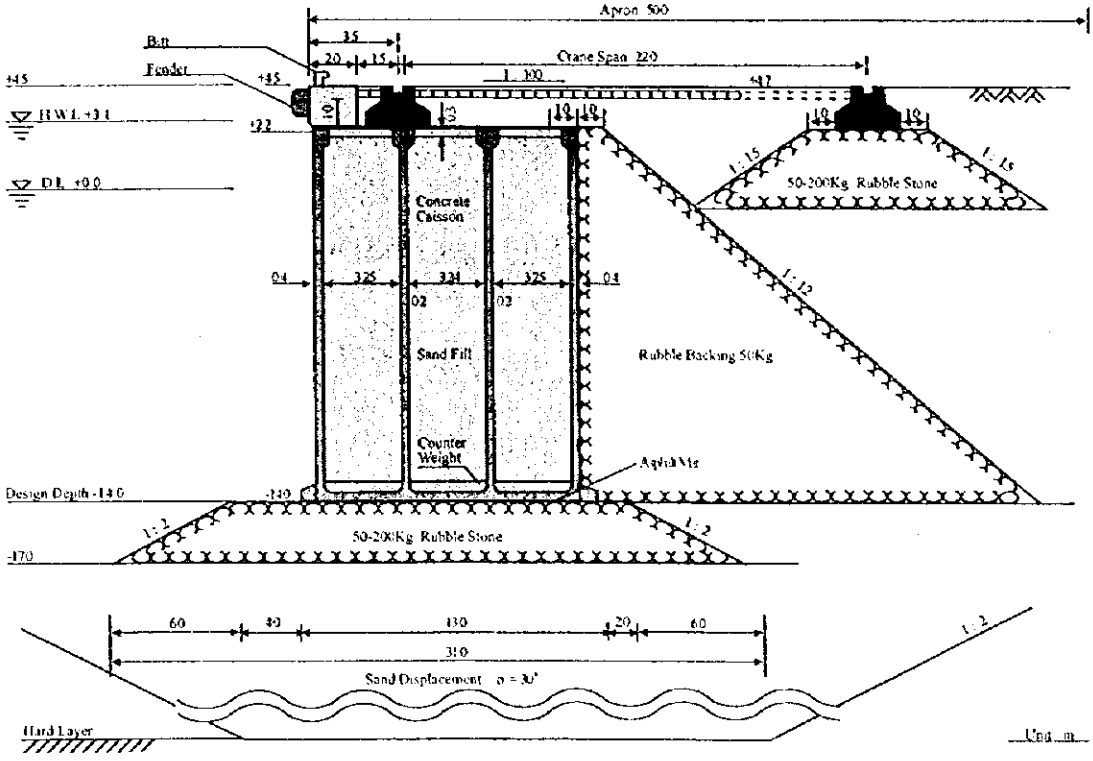


Figure 19-2-2 Concrete Caisson Type Container / Bulk Berth (-14m)

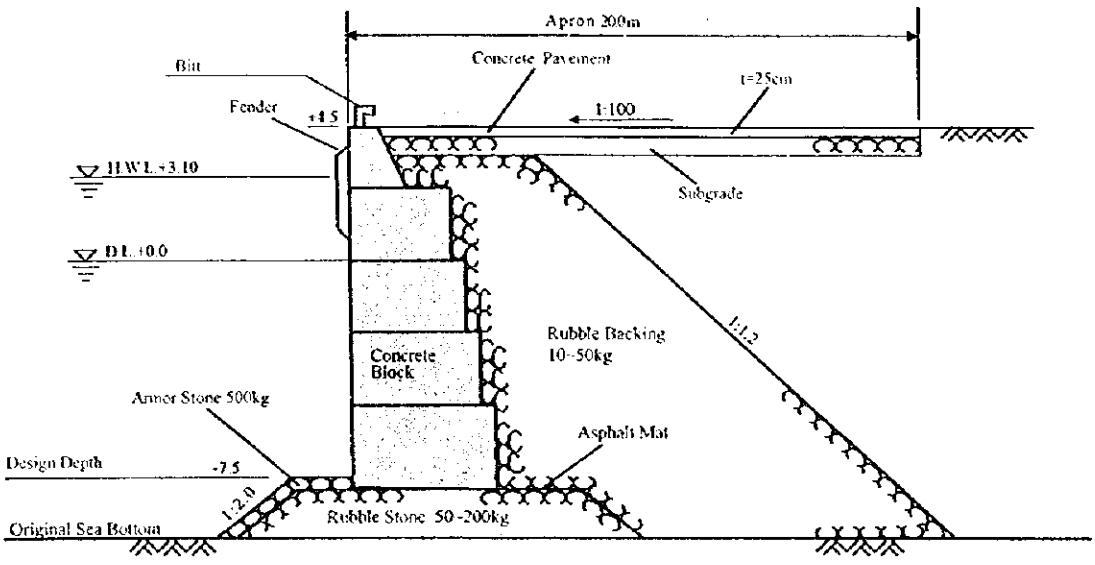


Figure 19-2-3 Concrete Block Type Passenger Berth (-7.5m)

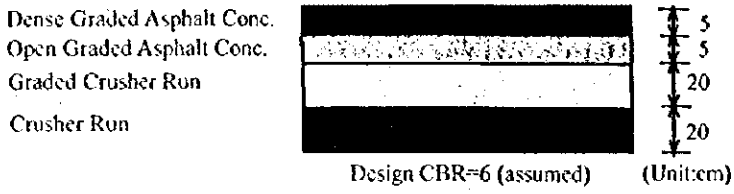


Figure 19-2-4 Standard Cross Section of Yard

20. IMPLEMENTATION WORK PLAN AND COST ESTIMATE

20.1 Implementation Work Plan

20.1.1 General

1. As discussed in Part II, the proposed development of port of Cutuco should be realized as soon as possible to solve the facility shortage problem of La Union Province. In due consideration of the above-mentioned situation, the target date for completion of the project is set to be the end of December, 2004. Almost 6 years would be required to complete the project from the commencement of the detailed engineering design to the completion of construction works in Figure 20-1-1, Implementation Schedule for Short Term Development.

2. Moreover, the construction schedule for short term development is shown in Figure 20-1-2.

3. The construction plan, method and equipment described herein are developed by assuming that the major construction works will be performed by international and local contractors to be selected through an international and local competitive bidding. The selected contractors are regarded to be fully capable of employing modern construction method taking consideration of local conditions, managing proper and sufficient equipment to complete the construction works in accordance with the proposed time schedule.

4. The implementation of the proposed project consists of the following components.

(1) Detailed designs and preparation of tender documents
(2) Financial arrangement
(3) Pre-construction procedures
(4) Construction of Container Berth
(5) Construction of Bulk Berth

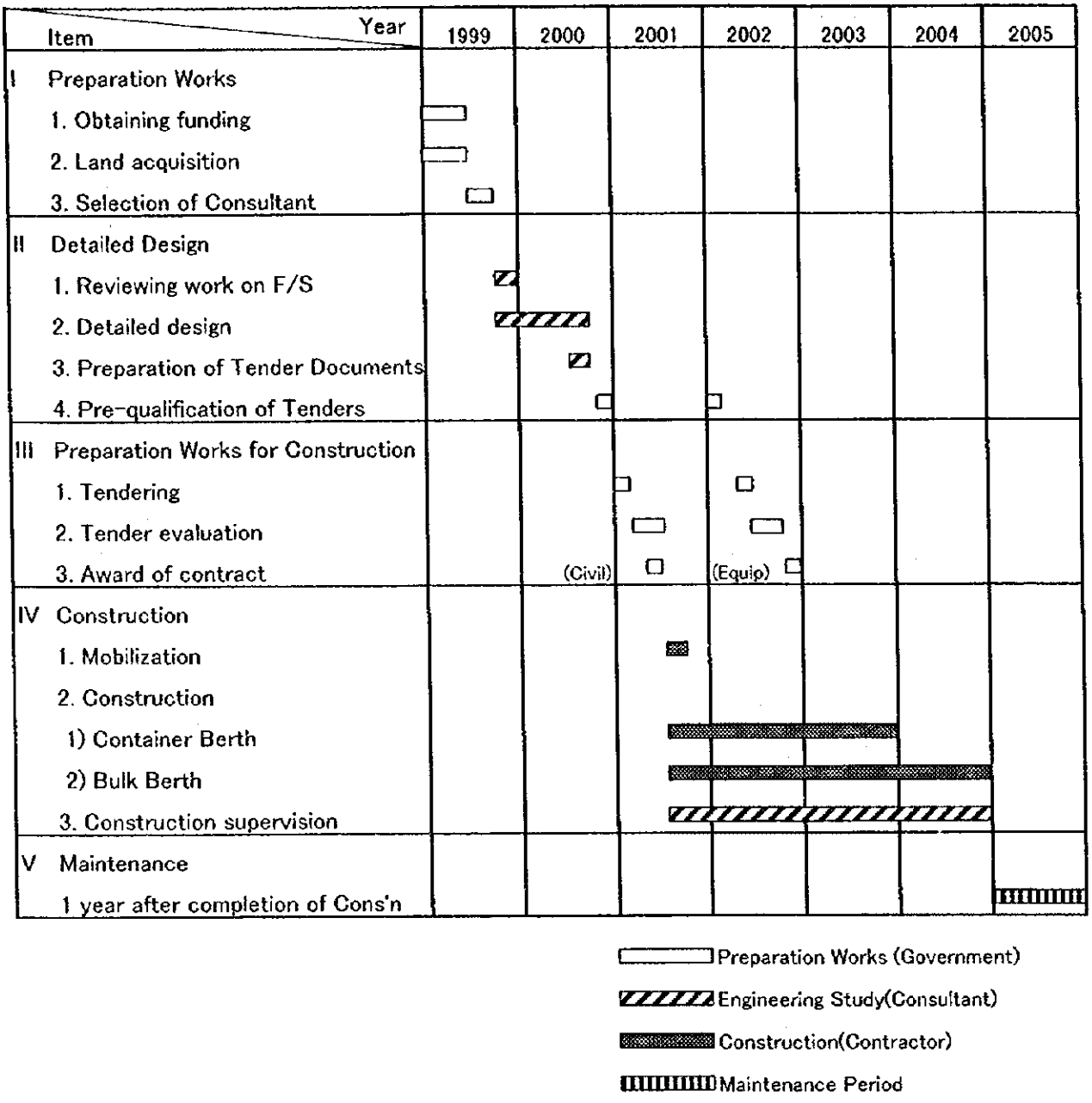


Figure 20-1-1 Implemention Schedule for Short Term Development

Facility	Main Work Item	Unit	Year / Quantity	2000 JF	MA	MJ	JA	SO	ND	2001 JF	MA	MJ	JA	SO	ND	2002 JF	MA	MJ	JO	SO	ND	2003 JF	MA	MJ	JA	SO	ND	2004 JF	MA	MJ	JA	SO	ND	2005 JF	MA	MJ	JA	SO	ND
	Mobilization	L.S	1																																				
Container Berth	Excavation for bed	cu.m	123,650																																				
	Sand Replacement	cu.m	11,950																																				
	Foundation Rocks	cu.m	24,275																																				
	Concrete Caisson Wharf	cu.m	12,523																																				
	Backfilling	cu.m	65,340																																				
	Apron	cu.m	3,375																																				
	Crane Foundation	cu.m	1,002																																				
	Installation of Fender	no	15																																				
	(Passenger Berth)																																						
	Foundation Rocks	cu.m	3,358																																				
	Concrete Blocks	cu.m	8,160																																				
	Backfilling Stone	cu.m	30,549																																				
	Apron	cu.m	1,045																																				
	Revetment	cu.m	1,665																																				
	Land Reclamation	cu.m	865,130																																				
	Asphalt Pavement	cu.m	31,500																																				
	Building	sq.m	3,900																																				
	Utilities	L.S	1																																				
Bulk Berth	Excavation for bed	cu.m	241,000																																				
	Sand Replacement	cu.m	96,250																																				
	Foundation Rocks	cu.m	33,375																																				
	Concrete Caisson Wharf	cu.m	11,091																																				
	Backfilling	cu.m	56,628																																				
	Apron	sq.m	2,925																																				
	Installation of Fender	no	13																																				
	Land Reclamation	cu.m	867,740																																				
	Asphalt Pavement	sq.m	27,300																																				
	Building	sq.m	4,400																																				
	Utilities	L.S	1																																				
Channel	Channel & Basin Dredging	cu.m	2,189,743																																				
	Navigation Aids	L.S	1																																				
Road	Access Road	sq.m	15,000																																				
Equipment	Loading Equipment	L.S	1																																				
	Tug Boat	L.S	1																																				

Figure 20-1-2 Construction Schedule for Short Term Development

20.1.2 Detailed Designs and Preparation of Tender Documents

5. The objectives of the engineering services are to collect and update additional data and information including the feasibility study report and to review and analyse the findings and recommendation for optimization of the plan, to conduct detailed topographic surveys and geological / geotechnical investigations, to prepare design report, pre-qualification and tender documents complete with specifications and drawings, cost estimates and detailed implementation program for the project.

6. The works under this item are scheduled to be conducted from September, 1999 to August, 2000.

(1) Detailed designs and preparation of tender documents for Phase 1, Civil works and building works.

(2) Detailed design and preparation of tender documents for Phase 2, Loading equipment.

20.1.3 Financial Arrangement

7. Upon completion of the feasibility study on the project, the Government of El Salvador will start a financial arrangement for the implementation of the project.

8. The financial arrangement should be made by an executing agency of the project, including Government budget allocation, internal and external loan, etc.

9. The external loan arrangement will take more than half year including a project appraisal by a financing institution, pledge of loan or an exchange of note, and signing of a loan agreement. The pledge of loan is a commitment of the financing institution to provide a loan for the implementation of the project.

20.1.4 Pre-Construction Procedures

10. The pre-construction procedures will follow the detailed designs and preparation of tender documents in the following time schedule.

(1) Phase 1: Civil and Building Works (2000~2001)

a. Pre-qualification, Advertisement
b. Pre-qualification
c. Pre-qualification, Evaluation
d. Pre-qualification, Approval
e. Tender calling
f. Tender close
g. Tender evaluation
h. Contract negotiation and contracting

(2) Phase 2 : Loading Equipment (2002)

a. Pre-qualification, Advertisement
b. Pre-qualification
c. Pre-qualification, Evaluation
d. Pre-qualification, Approval
e. Tender calling
f. Tender close
g. Tender evaluation
h. Contract negotiation and contracting

20.1.5 Construction of Phase 1 Works

11. The construction time schedule for the Phase 1 and the time schedule for procurement of loading equipment for the Phase 2 is proposed as follows.

Phase 1 Civil and Building Works (2000~2004)

- Container Berth
- Revetment provided mooring facility for passenger boats
- Land Reclamation(1st stage)
- Asphalt Pavement(1st stage)
- Building(1st stage)
- Bulk Berth
- Land Reclamation(2nd stage)
- Asphalt Pavement(2nd stage)
- Building(2nd stage)
- Dredging

Phase 2 Loading Equipment (2003)

-Gantry cranes
-Transfer cranes
-Tractor
-Chassis

20.1.6 Proposed Contract Phases

12. The construction works will be mainly conducted under a contract system through international and local competitive bidding in compliance with the government regulations and guidelines of the financing organization.

13. The project is planned to be implemented in two (2) Phases

(1) International Competitive Bidding

a. Civil and Building Works
b. Procurement of Loading Equipment

(2) local Competitive Bidding

It will be applied some parts of civil work.

20.1.7 Dredging Requirement

14. The project consists of concrete works, earth works such as dredging and reclamation, pavement and building., etc for construction of the new port. In these works, the work which is affecting environment will be dredging a navigation channel and dumping dredged materials on sea. Therefore, reasonable method shall be proposed herein to mitigate environmental impact for the dredging works.

15. The existing navigation channel will be improved from 150m width and –11m deep and turning basin will be dredged to –11m. On the basis of the proposed navigation plan, the dredging requirements have been estimated as 1568 thousand cu.m for Inner Navigation Channel, 279 thousand cu.m for Port Basin and 343 thousand cu.m for Outer Navigation Channel.

(1) Dumping in La Union Bay

16. The possible dumping area for the channel / basin-dredged material would be either in La Union bay or outside of the bay. The possible dumping site in La Union bay, where a wide expanse of water area with a natural water depth ranging from – 4m to –5m as shown in Figure 20-1-3. The planned size of this dumping area is about 1 million sq.m (1,000m long* 1,000m width). Assuming that the possible dumping height is 2 m, the net pocket volume would be 2 million cu.m approximately.

17. Dredged materials will come from the inner navigation channel and port basin, so that it would be more economical to dump the dredged materials in and around the bay instead of ocean site as shown in Figure 20-1-4. The hauling distance from the channel to the proposed area is as far as 4 km.

18. The environmental aspects should be more carefully taken into account, in terms of environmental constraints, the dumping in the bay will be little magnitude of environmental problems due to calm water area and current velocity concerned, most preferably in the bay.

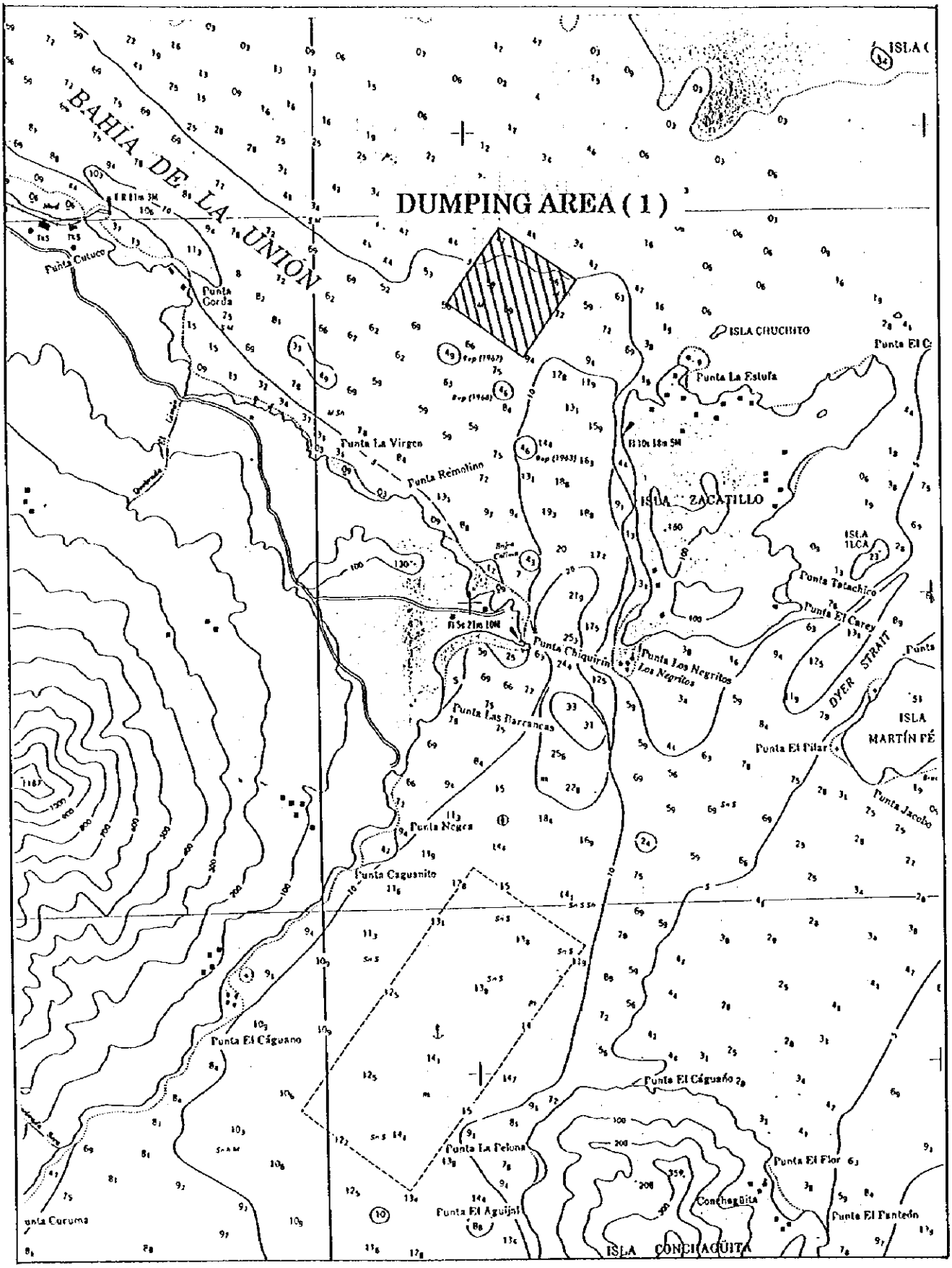


Figure 20-1-3 Location of Dumping Area (1)

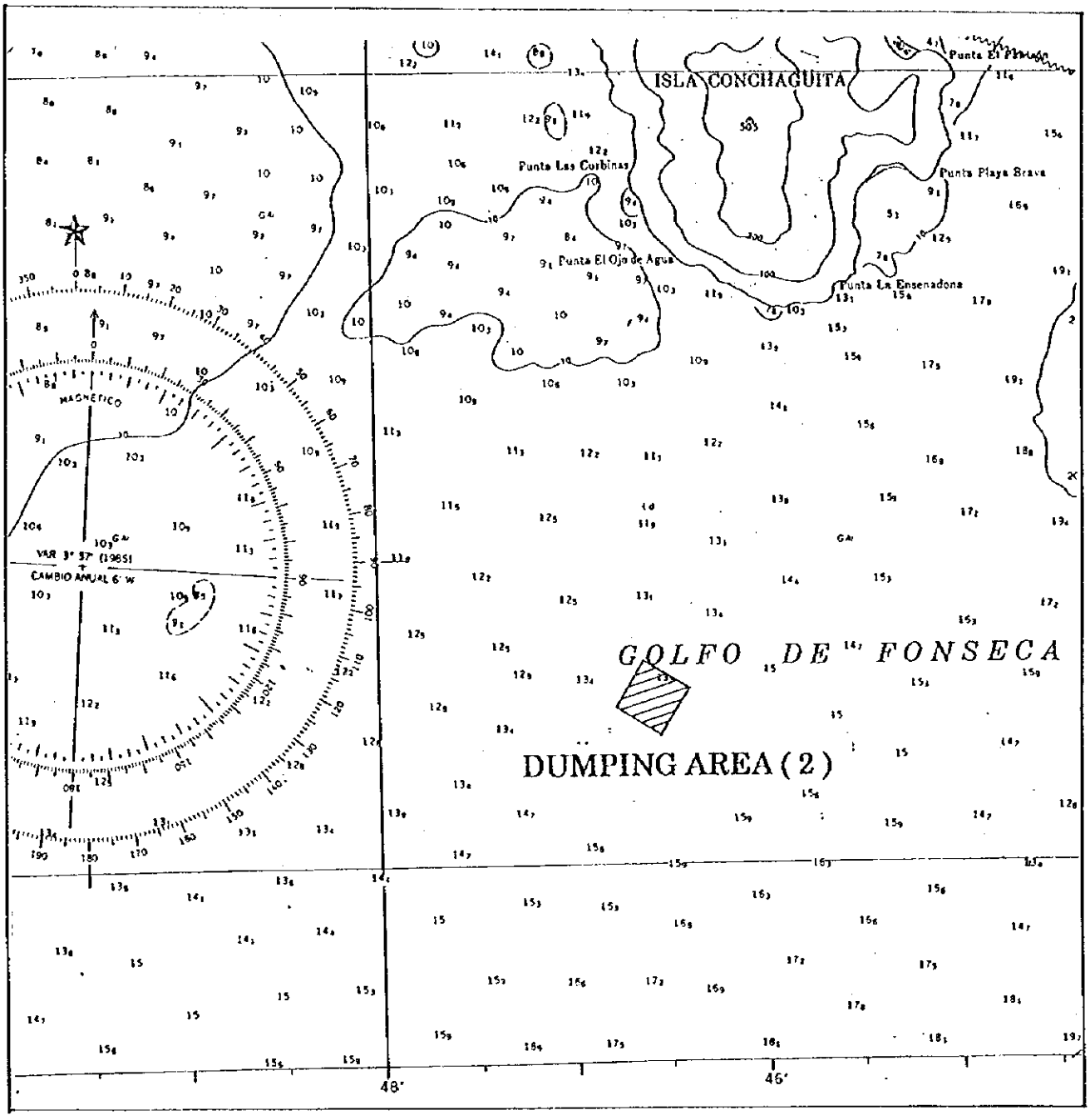


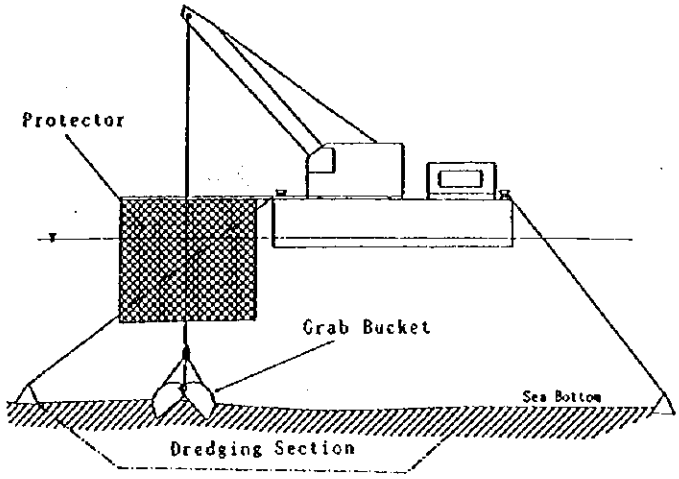
Figure 20-1-4 Location of Dumping Area (2)

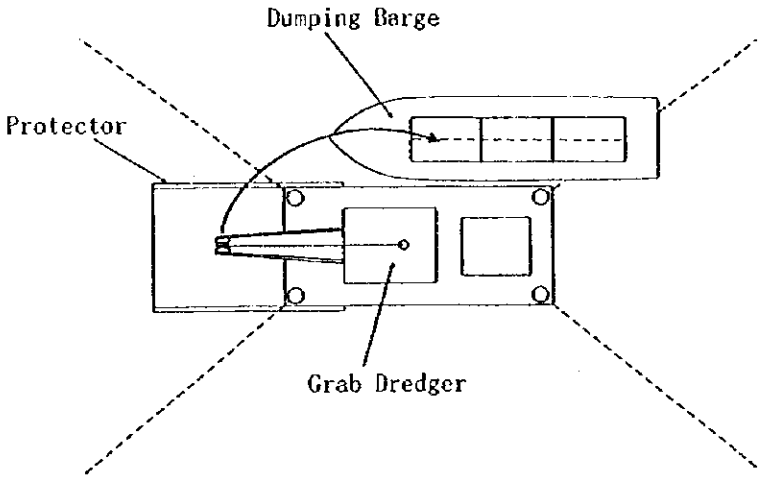
(2) Method of Dredging / Dumping Operation mitigating Environment Impact

19. The nature of the materials to be dredged is usually a major factor in the choice of dredger. According to the geological data, the materials to be dredged in the channel area include mainly non-cohesive silt and clay.

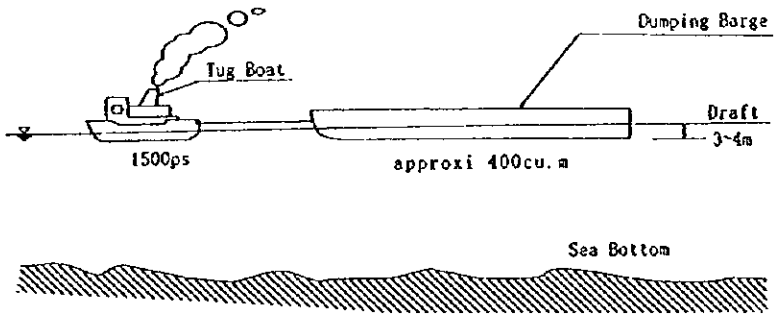
20. The grab dredger is frequently used to dredge clays of all strength soil and the mud grab, which has jaws of flat plate with no teeth for use for mud and soft clay. It would be more appropriate to try to reduce the pollution caused by the dredgers rather than select them as to how much pollution they cause. In this case, it is most preferable to prepare a silt-retaining curtain being placed around the dredging site to contain the area of turbidity as shown in Figure.

21. The water treatment in the dumping site is comparatively easy due to water content rate of materials which cause less environmental problem in dredging, transport and dumping operation. Turbidity control can be managed by installing silt protecting curtains, considering local oceanographic and hydrographic conditions, anchoring/wiring requirement would be minimal, so that the working space at the dredging site will be minimal.



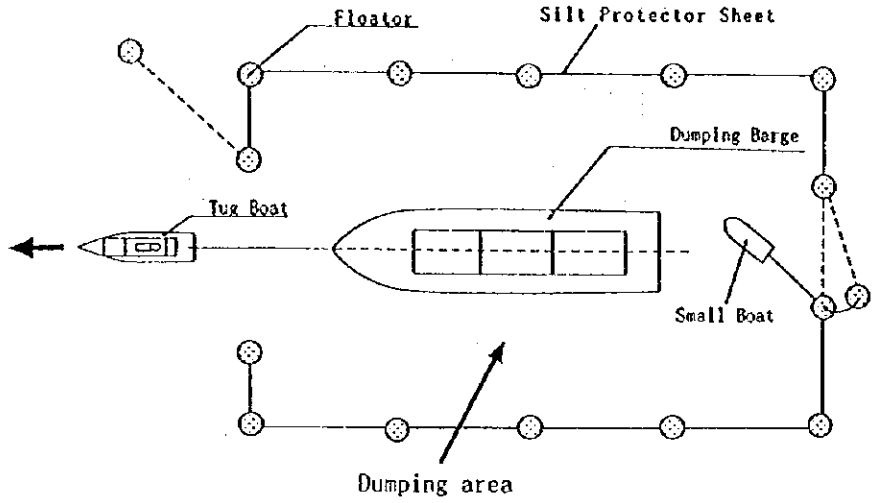


(a) Dredging Method by Grab Dredger

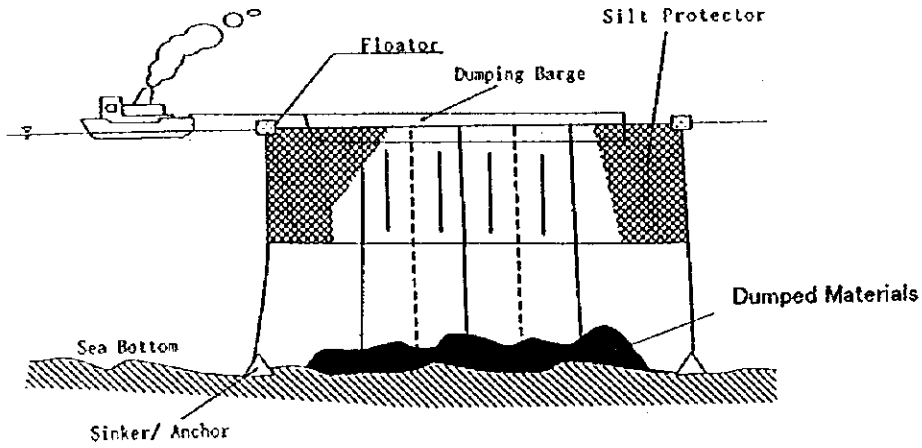


(b) Traffic Situation for Discharge Soil

Figure 20-1-5 Dredging Method & Transportation



(a) Traffic Situation for Discharge Soil



(b) Dumping Situation on sea

Figure 20-1-6 Dumping Situation of Dredged Materials

20.2 Cost Estimate

20.2.1 Construction Cost

1. Construction cost for the implementation of the project is estimated on the basis of the preliminary design and the proposed construction plan and schedule. As to the unit cost indicated in the feasibility study, it is revised and reduced the price considering update data and additional information against Master Plan, for example, to supply materials from borrow pit located in adjacent of the site., etc for cost reduction as well as improvement of precision of the cost estimate. Consequently, the construction costs are estimated approximately 94 million US Dollars and the basic conditions applied for the cost estimates are presented below:

a.) The construction cost of the project is divided into the direct costs for mobilization, main civil works, building works, road including detour for La Union city and indirect costs for administration expenses for the contractor, engineering services and contingencies.

b.) Construction cost

The construction cost for short term development (C-3) is approximately 94 million US$ as shown in Table 20-2-1.

(1)	-14m Container Berth	23 million US$
(2)	-14m Bulk Berth	19 million US$
(3)	Channel / Basin	7 million US$
(4)	Navigation Aids	1 million US$
(5)	Road / Detour	4 million US$
(6)	Loading Equipment / Tug Boat	23 million US$
(7)	Other	17 million US$

The construction cost for short term development (B-3) is approximately 101 million US$ as shown in Table 20-2-2.

(1)	-14m Container Berth	25 million
(2)	-14m Bulk Berth	18 million US$
(3)	Channel / Basin	10 million US$
(4)	Navigation Aids	1 million US$

(5)	Road / Detour	5 million US$
(6)	Loading Equipment / Tug Boat	23 million US$
(7)	Other	19 million US$

c.) Yearly Investment Schedule

The yearly investment schedule of construction cost for foreign and local currencies is estimated on the basis of the construction schedule. The yearly investment schedule for short term development (C-3) is shown in Table 20-2-3.

On the other hand, the yearly investment schedule for short term development (B-3) is similar against (C-3) pattern.

Table 20-2-1 Construction Cost for Short Term Development (C-3)

Channel & Turning Basin Depth: -11m (UNIT : US$)

FACILITY		Feasibility Study (Short Term)				Unit Cost				Total (FC+LC)
Place	Category	Main Work Items	Detailed Work Items	Unit	Quantity	FC	LC	FC	LC	
Container Berth	Wharf	Removal of Soft Soil	Excavation	cum	118,880	3.1	0.0	367,908	0	367,908
		Sand Replacement		cum	27,905	2.2	3.6	61,391	100,458	161,849
	L=300m	Foundation Rocks		cum	14,700	39.4	6.7	579,180	98,490	677,670
		Concrete Caisson	Manufacture	cum	12,523	169.8	157.7	2,126,405	1,974,877	4,101,283
		ditto	Transportation	no	17	1,404.0	9.8	23,868	167	24,035
		ditto	Installation	no	17	3,413.4	12.7	58,028	216	58,244
		ditto	Sand Filling	cum	52,499	4.4	7.2	230,996	377,993	608,988
		Backfilling Stone		cum	65,340	11.9	4.5	777,546	294,030	1,071,576
		Crown Concrete		cum	3,518	0.5	107.1	1,759	376,778	378,537
		Apron Concrete		cum	3,375	6.2	89.9	20,925	303,413	324,338
		Crane Foundation of Land Side		cum	1,002	79.4	117.0	79,559	117,234	196,793
		Installation of Fender		no	15	102,085.4	170.5	1,531,281	2,558	1,533,839
		Installation of Mooring Bit		no	15	33,753.7	2.5	506,306	38	506,343
		Laying Rail		meter	580	139.8	21.5	81,084	12,470	93,554
	Passenger Berth	Foundation Rocks		cum	3,358	39.4	6.7	132,305	22,498	154,804
		Concrete Block		cum	8,180	48.8	77.0	398,208	628,320	1,026,528
		Backfilling Stone		cum	30,548	11.9	4.5	363,533	137,471	501,004
		Apron Concrete		cum	1,045	6.2	89.9	6,479	93,946	100,425
		Installation of Fender		no	11	51,350.6	85.3	564,857	938	565,795
	Tompo'y Revet't	Foundation Rocks		cum	1,665	39.4	6.7	65,601	11,156	76,757
		Backfilling Stone		cum	1,680	11.9	4.5	19,992	7,560	27,552
		Concrete Block		cum	585	48.8	77.0	28,548	45,045	73,593
	Land Reclamation	Land Reclamation		cum	970,105	2.1	3.9	2,033,221	3,787,413	5,820,634
	Pavement	Pavement		cum	31,500	102.2	0.2	3,219,300	6,300	3,225,600
	Building	Building		sq.m	3,900	61.5	92.3	239,850	359,970	599,820
	Utilities	Utilities		ls	1			876,106	437,787	1,313,873
	(1) Sub Total							14,198,235	9,193,099	23,391,334
Bulk Berth		Removal of Soft Soil	Excavation	cum	212,607	3.1	0.0	659,082	0	659,082
		Sand Replacement		cum	67,363	2.2	3.6	148,199	242,507	390,705
	Main Wharf	Foundation Rocks		cum	13,020	39.4	6.7	512,988	87,234	600,222
		Concrete Caisson	Manufacture	cum	11,091	169.8	157.7	1,883,252	1,749,051	3,632,303
	L=260 m	ditto	Transportation	no	15	1,404.0	9.8	21,060	147	21,207
		ditto	Installation	no	15	3,413.4	12.7	51,201	191	51,392
		ditto	Sand Filling	cum	45,396	4.4	7.2	204,142	334,051	538,194
		Backfill Stone		cum	56,628	11.9	4.5	673,873	254,826	928,699
		Crown Concrete		cum	3,116	0.5	107.1	1,558	333,724	335,282
		Apron Concrete		cum	2,925	6.2	89.9	18,135	262,958	281,093
		Crane Foundation of Land Side		cum	868	79.4	117.0	68,919	101,556	
		Installation of Fender		no	13	102,085.4	170.5	1,327,110	2,217	1,329,327
		Installation of Mooring Bit		no	13	33,753.7	2.5	438,798	33	438,831
	Land Reclamation	Land Reclamation		cum	987,740	2.1	3.9	1,822,254	3,384,186	5,206,440
	Pavement	Pavement		cum	27,300	102.2	0.2	2,790,060	5,460	2,795,520
	Building	Building		sq.m	4,400	61.5	92.3	270,600	406,120	676,720
	Utilities	Utilities		ls	1			544,562	358,213	902,774
	(2) Sub Total							11435792.8	7,522,471	18,958,264
CHANNEL	Dredging	Channel Dredging		cum	1,910,598	3.1	0.0	5922853.8	0	5,922,854
	Dredging	Turning/Berth Pocket	e	cum	265,000	3.1	0.0	821,500	0	821,500
	Navigation Aids	Navigation Aids	5nos	ls	1			831000	92,000	923,000
	(3) Sub Total							7575353.8	92,000	7,667,354
ROAD	Access Road	Access Road		sq.m	45,000	23.0	54.0	345,000	810,000	1,155,000
		Detour	La Union City	sq.m	30,000	25.8	60.2	774,000	1,806,000	
	(4) Sub Total							1,119,000	2,616,000	3,735,000
	(1)~(4) Total	Total						34,328,381	19,423,570	53,751,952
Mobilization				LS	1			3,432,838	1,942,357	5,375,195
	(5) Sub Total							3,432,838	1,942,357	5,375,195
	(1)~(5) Total							33,751,220	21,365,927	59,127,147
Engineering Fee				LS	1			3,778,122	2,136,593	5,912,715
								41,537,342	23,502,520	65,039,862
Contingency				LS	1			4,153,734	2,350,252	6,503,986
Loading Equip't				LS	1			18,932,000	0	18,932,000
Tug Boat		3000HPx2 ships		LS	1			3,845,154	0	3,845,154
	Total							68,469,230	25,852,772	94,322,002

Table 20-2-2 Construction Cost for Short Term Development (B-3)

(UNIT : US$)

Place	Category	Main Work	Detailed Item	Unit	Quantity	Unit Cost		Amount		Total
						FC	LC	FC	LC	
Container	Dredging	Removal of Soft Soil		cu.m	290,745	3.1	0.0	901,310	0	901,310
Berth	West Revetment	Foundation Rocks		cu.m	28,724	39.4	6.7	1,131,726	192,451	1,324,176
	Container Wharf	Foundation Rocks		cu.m	25,725	39.4	6.7	1,013,565	172,358	1,185,923
		Sand Replacement		cu.m	156,690	2.2	3.6	344,718	564,084	908,802
	L=300 m	Concrete Caisson	Manufacture	cu.m	12,523	169.8	157.7	2,126,405	1,974,877	4,101,283
		ditto	Transportation	no	17	1,404.0	9.8	23,868	167	24,035
		ditto	Installation	no	17	3,413.4	12.7	58,028	216	58,244
		ditto	Sand Filling	cu.m	52,499	4.4	7.2	230,996	377,993	608,988
		Backfilling Stone		cu.m	66,745	11.9	4.5	794,265	300,353	1,094,618
		Crown Concrete		cu.m	3,518	0.5	107.1	1,759	376,778	378,537
		Apron Concrete		cu.m	3,375	6.2	89.9	20,925	303,413	324,338
		Crane Foundation of Land Side		cu.m	1,002	79.4	117.0	79,559	117,234	196,793
		Installation of Fender		no	15	102,085.4	170.5	1,531,281	2,558	1,533,839
		Installation of Mooring Bit		no	15	33,753.7	2.5	506,306	33	506,343
		Laying Rail		meter	580	139.8	21.5	81,084	12,470	93,554
	Land Reclamation	Land Reclamation		cu.m	1,081,290	2.1	3.9	2,270,709	4,217,031	6,487,740
	Pavement	Pavement		cu.m	31,500	102.2	0.2	3,219,300	6,300	3,225,600
	Building	Building		sq.m	3,900	61.5	92.3	239,850	359,970	599,820
	Utilities	Utilities		ls	1			728,783	448,914	1,177,697
	(1) Sub Total									24,731,637
Bulk	Dredging	Removal of Soft Soil		cu.m	225,680	3.1	0.0	699,608	0	699,608
Berth	East Revetment	Foundation Rocks	L=145m	cu.m	6,848	39.4	6.7	269,811	45,882	315,693
	Main Wharf	Foundation Rocks		cu.m	22,785	39.4	6.7	897,729	152,660	1,050,389
		Sand Replacement		cu.m	208,234	2.2	3.6	458,115	749,642	1,207,757
		Concrete Caisson	Manufacture	cu.m	11,091	169.8	157.7	1,883,252	1,749,051	3,632,303
	L=260 m	ditto	Transportation	no	15	1,404.0	9.8	21,060	147	21,207
		ditto	Installation	no	15	3,413.4	12.7	51,201	191	51,392
		ditto	Sand Filling	cu.m	46,396	4.4	7.2	204,142	334,051	538,194
		Backfill Stone		cu.m	59,117	11.9	4.5	703,492	266,027	969,519
		Crown Concrete		cu.m	3,116	0.5	107.1	1,558	333,724	335,282
		Apron Concrete		cu.m	2,925	6.2	89.9	18,135	262,958	281,093
		Crane Foundation of Land Side		cu.m	868	79.4	117.0	68,919	101,556	170,475
		Installation of Fender		no	13	102,085.4	170.5	1,327,110	2,217	1,329,327
		Installation of Mooring Bit		no	13	33,753.7	2.5	438,798	33	438,831
		Laying Rail		m	500	139.8	21.5	69,900	10,750	80,650
	Land Reclamation	Land Reclamation		cu.m	442,545	2.1	3.9	929,345	1,725,926	2,655,270
	Pavement	Pavement		cu.m	27,300	102.2	0.2	2,790,060	5,460	2,795,520
	Building	Building		sq.m	4,400	61.5	92.3	270,600	406,120	676,720
	Utilities	Utilities		ls	1			555,142	307,320	862,462
	(2) Sub Total									18,111,689
Channel	Dredging	Channel Dredging		cu.m	1,871,750	3.1	0.0	5,802,425	0	5,802,425
	Dredging	Turning&Berth Pocket	*	cu.m	1,364,949	3.1	0.0	4,231,342	0	4,231,342
	Navigation Aids	Navigation Aids		LS	1			831,000	92,000	923,000
	(3) Sub Total									10,956,767
Road	Access Road	Access/Detour		sq.m	27,000	23.0	54.0	621,000	1,458,000	2,079,000
	Detour	La Union City		sq.m	30,000	25.8	60.2	774,000	1,806,000	2,580,000
	(4) Sub Total									4,659,000
	Total									
Mobilization				LS	1			3,922,218	1,923,691	5,845,909
	(5) Sub Total									5,845,909
Engineering Fee				LS	1			4,314,440	2,116,060	6,430,500
	Total									
Contingency				LS	1			4,745,884	2,327,666	7,073,550
Loading Equip't				LS	1			18,932,000	0	18,932,000
Tug Boat		3000HP+2 ships		LS	1			3,846,154	0	3,846,154
	Grand Total							74,992,876	25,604,330	100,597,206
Land Acquisition				ha	13	0	5,714	0.0	76,568	
								74,992,876	25,680,897	100,663,773

Table 20-2-3 Yearly Investment Schedule (C-3)

Channel & Turning Basin : -11m

FACILITY		Feasibility Study (Short Term)				Unit Cost				Total (FC+LC)	1999	2000	2001	2002	2003	2004	Total
Place	Category	Main Work Items	Detailed Work Items	Unit	Quantity	FC	LC	FC	LC								
Container	Wharf	Removal of Soft Soil	Excavation	cu.m	118,680	3.1	0.0	367,908	0	367,908			220,745	147,163			367,908
		Sand Replacement		cu.m	27,905	2.7	3.6	61,391	100,458	161,849				161,849			161,849
	L=300m	Foundation Rocks		cu.m	14,700	39.4	6.7	579,180	98,490	677,670				677,670			677,670
		Concrete Caisson	Manufacture	cu.m	12,523	169.8	157.7	2,126,405	1,974,877	4,101,283			820,256	2,050,642	1,230,385		4,101,283
		ditto	Transportation	no	17	1,404.0	9.8	23,868	167	24,035				14,138	9,897		24,035
		ditto	Installation	no	17	3,413.4	12.7	58,028	216	58,244				34,261	23,983		58,244
		ditto	Sand Filling	cu.m	52,499	4.4	7.2	230,996	377,993	608,988				304,494	304,494		608,988
		Backfilling Stone		cu.m	65,340	11.9	4.5	777,546	294,030	1,071,576				375,052	696,524		1,071,576
		Crown Concrete		cu.m	3,518	0.5	107.1	1,759	376,778	378,537					378,537		378,537
		Apron Concrete		cu.m	3,375	6.2	89.9	20,925	303,413	324,338					324,338		324,338
		Crane Foundation of Land Side		cu.m	1,002	79.4	117.0	79,559	117,234	196,793					196,793		196,793
		Installation of Fender		no	15	102,085.4	170.5	1,531,281	2,556	1,533,839					1,533,839		1,533,839
		Installation of Mooring Bit		no	15	33,753.7	2.5	506,306	38	506,343					506,343		506,343
		Laying Rail		meter	580	139.8	21.5	81,084	12,470	93,554					93,554		93,554
	Passenger Berth	Foundation Rocks		cu.m	3,358	39.4	6.7	132,305	22,499	154,804			154,804				154,804
		Concrete Block		cu.m	8,160	48.8	77.0	398,208	628,320	1,026,528				1,026,528			1,026,528
		Backfilling Stone		cu.m	30,549	11.9	4.5	363,593	137,471	501,064				501,064			501,064
		Apron Concrete		cu.m	1,045	6.2	89.9	6,479	93,946	100,425					100,425		100,425
		Installation of Fender		no	11	51,350.6	85.3	564,857	938	565,795					565,796		565,795
	Tempoly Revet't	Foundation Rocks		cu.m	1,665	39.4	6.7	65,601	11,156	76,757				76,757			76,757
		Backfilling Stone		cu.m	1,880	11.9	4.5	19,992	7,560	27,552				27,552			27,552
		Concrete Block		cu.m	585	48.8	77.0	28,548	45,045	73,593				73,593			73,593
	Land Reclamation	Land Reclamation		cu.m	970,105	2.1	3.9	2,037,221	3,783,410	5,820,630				2,910,315	2,910,315		5,820,630
	Pavement	Pavement		cu.m	31,500	102.2	0.2	3,219,300	6,300	3,225,600					3,225,600		3,225,600
	Building	Building		sq.m	3,900	61.5	92.3	239,850	359,970	599,820					599,820		599,820
	Utilities	Utilities		ls	1			676,106	437,767	1,113,873					1,113,873		1,113,873
	(1) Sub Total							14,198,235	9,193,100	23,391,334	0	0	1,195,805	8,381,018	13,814,516		23,391,339
Bulk Berth	Main Wharf	Removal of Soft Soil	Excavation	cu.m	212,607	3.1	0.0	659,082	0	659,082			263,633	395,449			659,082
		Sand Replacement		cu.m	67,363	2.7	3.6	148,199	242,507	390,705				390,705			390,705
		Foundation Rocks		cu.m	13,020	39.4	6.7	512,988	87,234	600,222				600,222			600,222
		Concrete Caisson	Manufacture	cu.m	11,091	169.8	157.7	1,883,252	1,749,051	3,632,303				1,089,991	2,542,612		3,632,303
	L=250 m	ditto	Transportation	no	15	1,404.0	9.8	21,060	147	21,207					21,207		21,207
		ditto	Installation	no	15	3,413.4	12.7	51,201	191	51,392					51,392		51,392
		ditto	Sand Filling	cu.m	46,396	4.4	7.2	204,142	334,051	538,194					538,194		538,194
		Backfill Stone		cu.m	56,628	11.9	4.5	673,873	254,826	928,699					928,699		928,699
		Crown Concrete		cu.m	3,118	0.5	107.1	1,558	333,724	335,282					201,169	134,113	335,282
		Apron Concrete		cu.m	2,925	6.2	89.9	18,135	262,958	281,093						281,093	281,093
		Crane Foundation of Land Side		cu.m	868	79.4	117.0	68,919	101,556	170,475						170,475	170,475
		Installation of Fender		no	13	102,085.4	170.5	1,327,110	2,217	1,329,327						1,329,327	1,329,327
		Installation of Mooring Bit		no	13	33,753.7	2.5	438,798	33	438,831						438,831	438,831
	Land Reclamation	Land Reclamation		cu.m	867,740	2.1	3.9	1,822,254	3,384,186	5,206,440					2,082,576	3,123,864	5,206,440
	Pavement	Pavement		cu.m	27,300	102.2	0.2	2,790,060	5,460	2,795,520						2,795,520	2,795,520
	Building	Building		sq.m	4,400	61.5	92.3	270,600	406,120	676,720						676,720	676,720
	Utilities	Utilities		ls	1			544,562	358,213	902,774						902,774	902,774
	(2) Sub Total							11,435,793	7,522,471	18,958,264	0	0	263,633	2,476,067	6,365,849	9,852,717	18,958,266
CHANNEL	Dredging	Channel Dredging		cu.m	1,910,598	3.1	0.0	5922853.8	0	5,922,854				3,553,712	2,369,142		5,922,854
	Dredging	Turning/Berth Pocket	"	cu.m	265,000	3.1	0.0	821,500	0	821,500					821,500		821,500
	Navigation Aide	Navigation Aids	Buoy	ls	1			831,000	92,000	923,000					923,000		923,000
	(3) Sub Total							7575353.8	92,000	7,667,354	0	0	0	3,553,712	4,113,642	0	7,667,354
ROAD	Access Road	Access Road		sq.m	15,000	23.0	54.0	345,000	810,000	1,155,000			1,155,000				1,155,000
		Detour	La Union City	sq.m	30,000	25.8	60.2	774,000	1,806,000	2,580,000					2,580,000		2,580,000
	(4) Sub Total							1,119,000	2,616,000	3,735,000	0	0	1,155,000	0	2,580,000	0	3,735,000
	(1)+(4) Total	Total						34,328,381	19,423,571	53,751,952	0	0	2,614,438	14,410,797	26,874,007	9,852,717	53,751,959
				LS	1			3,432,838	1,942,357	5,375,195			3,762,634			1,612,561	5,375,195
Mobilization																	
	(5) Sub Total							3,432,838	1,942,357	5,375,195	0	0	3,762,634	0	0	1,612,561	5,375,195
	(1)+(5) Total							37,761,219	21,365,928	59,127,147	0	0	6,377,072	14,410,797	26,874,007	11,465,278	59,127,154
				LS	1			3,776,122	2,136,593	5,912,715	1,100,000	1,900,000	766,911	803,927	937,914	401,963	5,912,715
Engineering Fee								41,537,341	23,502,521	65,039,862							0
				LS	1			4,153,734	2,359,252	6,503,986							0
Contingency				LS	1			18,932,000	0	18,932,000					18,932,000		18,932,000
Loading Equip't				LS	1			3,846,154	0	3,846,154					3,846,154		3,846,154
Tug Boat		3000HP*2 ships		LS	1												0
	Total							66,469,229	25,852,773	94,322,002	1,100,000	1,900,000	7,145,983	15,214,724	50,590,075	11,867,241	87,818,023

Contingency excluded 6,503,986

21. PORT ADMINISTRATION, MANAGEMENT AND OPERATION

21.1 Short Term Plan for Port Administration, Management and Operation of the Port of La Union

21.1.1 Terminal Management system

(1) System of Construction and Management

1. Ports are important infrastructure for the national economy and have a public character in general. Ports have to be controlled properly to preserve the national benefit and keep fair use for public. In principle, it is not desirable that only a limited number of persons use the port area exclusively. Port administration body has to define and control its port land and water area, port infrastructure and port facilities to function efficiently.

2. The Port of La Union is the only real container terminal in El Salvador. Containerization in El Salvador is now in the developing stage. It is expected that semi container ships or small full container ships operated by various shipping companies will call on the Port of La Union. This kind of container terminal should be open for public use.

3. At present, a concrete plan for eastern area regional development including establishment of EPZ's has not been drawn up yet. Port development and regional development are two sides of the same coin. Government should draw up a concrete eastern area regional development plan as well as road construction plan immediately. And then, these plans should be executed by the government. Government should create an environment where the private sector can easily participate in major eastern area projects such as EPZ as well as port activities.

4. It cost an enormous sum of money to construct the Port of La Union. Port administrative body has to coordinate the related projects such as EPZ and road construction plan also. Port developer has to keep these abilities and authorities.

5. Based on the above conditions, port activities such as cargo handling should be provided by private sector, but construction work and management should be left to the public sector. Therefore case B or C in the following table is recommended as the best construction and

management system.

Table 21-1-1 System of Construction and Management for the New Terminals

Case	Planning & Supervision	Construction			Operation		Remarks
		Channel Dredging	Site Development	Terminal Facilities	Administrative Operations	Cargo Handling	
A	Public	Public	Public	Public	Public	Public	
B	Public	Public	Public	Public	Public	*Private*	
C	Public	Public	Public	Public	*Private*	*Private*	
D	Public	Public	Public	*Private*	*Private*	*Private*	
E	Public	Public	*Private*	*Private*	*Private*	*Private*	BOT

(2) Establishment of the Port of La Union Office

6. As mentioned above, the Port of La Union container terminal should be open for public use. In case of using wharves, it is important to give priority to container vessels when traffic is heavy, that is, container vessels should be able to berth at bulk terminal at such times. The Port administration body has to strictly supervise use of the facilities to avoid exclusive use by a specific organization. For administration of port water area and land area, the same conditions apply. An exception is an oil tank and silo for bulk cargo which by their nature have limited users, as with the oil buoys in the port of Acajutla. These can be constructed and exclusively used by a private interest provided that the facilities do not obstruct proper port use.

7. From such points of view, it is also recommended that the new container terminal should be supervised by the public sector. Therefore public sector should newly introduce container terminal division in the Port of La Union Office to operate container terminal efficiently and effectively.

8. Administration organization of the Port of La Union should be established inside CEPA, because

1) CEPA has special know-how of port operation cultivated in the management of the Port of Acajutla.
2) CEPA has been financially independent from the government

except national railroad sector.

3) CEPA has the authority to control all facilities and the area related to port activities.

9. However, some adjustments to CEPA organization should be made as mentioned in 16.3.

10. In the stage of the long-term plan, public sector should allow private participation in terminal administration under the supervision of CEPA. In this case, one option may be to establish a joint corporation between shipping companies and/or cargo handling companies at ports. This company will make the container operation plan, and give directions to cargo handling entities to coordinate in-yard container operations.

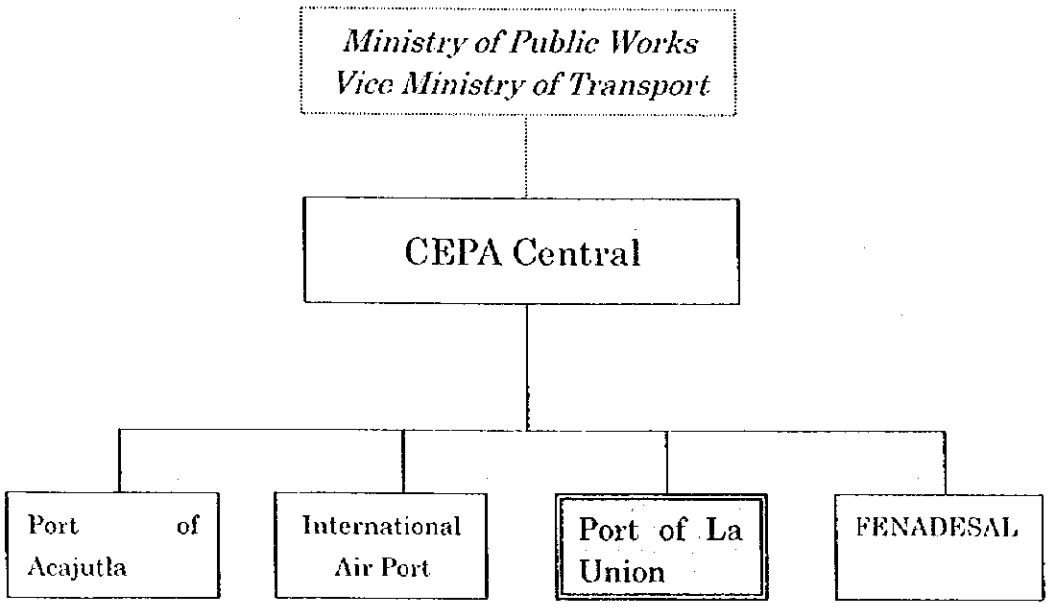


Figure 21-1-1 Relation between CEPA Central and the Port of La Union Office

21.1.2 Private Participation in Terminal Management

(1) Private Participation Policy

11. At present CEPA conducts almost all port related business including cargo handling service. Public sector is not always efficient in the field of service provision, because it is often difficult for public sector to be flexible in investment and personnel management. Public sector has a tendency not to increase the efficiency of services in general because of its nature. It should thus be provided by the private sector in principle.

a. Container Terminal /General Cargo Terminal

12. At the container terminal, uniform operation is normally preferable. Concerning the Port of La Union container terminal, however, they will be open to plural companies in principle. Therefore, there is a possibility that an organization which centrally controls container operation will be necessary at this terminal.

13. General cargo terminal is also normally has used by various users and handles a smaller amount of cargo compared with container terminal. Naturally, these terminals should be open to public use also.

b. Bulk Cargo Terminal

14. In the case of terminals for bulk cargo such as oil, grain and fertilizer, on-land facilities can be used by a specified entity, while the berth will be used by a few shipping companies. Therefore, the berth should be open to public use. CEPA may lease limited land area to the specified entities, and allow them to construct on-land facilities such as tanks and silos if these facilities do not obstruct public use of the berths. In this case, the lease periods should be limited also.

Table 21-1-2 Scheme of Terminal Management System

Item	Container Terminal	Bulk Terminal
Supervising & Administrating	The Port of La Union Office (CEPA)	
Service	Open to Public (Mulitiple shipping companies)	Open to Public (A few shipping companies)
Channel, Quay and Yard	Constructed by Public Sector	
Quay Crane	Constructed by Public Sector	-0-
Warehouse	Constructed by Public/Private Sector	Constructed by Private Sector
Silo, Oil Tank	-0-	Constructed by Private Sector
Cargo Handling Service, Operation of Warehouses	Open Service Provided by Private Sector	Specified Service Provided by Private Sector

(2) Introduction of Private Participation for Port Service in the Short Term Plan

15. It is thought difficult to introduce above mentioned private sector participation all at once. In practice, private participation will be gradually introduced. One private participation scheme is shown below.

1) Cargo Handling Service, Operation of Warehouses

a) A private company which provides cargo handling service or operates warehouse should be introduced or established at first. Plural companies are most desirable. Licenses to make direct contracts with shipper and shipping companies and to conduct such services will be given to the companies.

b) It would be useful for the Port of Acajutla staff in charge of cargo handling works and administrative works to be moved to these companies in order to transfer the know-how of container handling. These companies will benefit from the knowledge of the actual port conditions that these employees will bring to the operation.

2) Pilot, Tug, Line Handling and Other Service

a) It is necessary to examine whether pilot, tug, line handling service business can be independently conducted or not given the scale of the Port of La Union. It seems unlikely that these services are conducted independently in the short term stage with the small number of calling vessels, so the section of the Port of La Union office should provide this service. In the long-term stage when the number of calling vessels increase, pilot, tug and cargo handling service can be provided by private companies.

b) It would also be useful for some of the Port of Acajutla pilot, tug, line handling personnel and clerk who administrate operational personnel to moved to these sections in order to transfer the know-how of these special services.

(3) Expected Role of the Port of La Union office in Private Participation

1) Supervision of Fairness as a Public Terminal

16. It is not desirable that only a limited number of persons use the port area exclusively. The Port of La Union office has to define and control its port area, port infrastructure and port facilities.

17. Port administration body has to strictly supervise use of the facilities to avoid exclusive use by a specific organization.

2) Training system for Operational Employees

18. Cargo handling service will be provided by the private sector. It will be important to further improve their technical ability to cope with modernized container handling operation. CEPA should examine the training system for operational employees to develop their ability to perform more quick and reliable cargo handling.

19. In the future, it will be effective to establish a public training center in the Port of La Union for port operational personnel to maintain and raise their competency. This center will provide the curriculums shown below.

1) Operation of cranes, lifts and tractor
2) Cargo handling operation such as Stevedoring and Slinging
3) Operation of information system for port operation

(4) Introduction of computerized container operating system

20. Since it will be difficult to introduce the total computer system right away, it will thus be necessary to start with a small scale computer system which has the following functions;

1) devising the stacking plan
2) determining container stacking location (address)
3) devising the sequence plan of loading and discharging

21. As the next step, the total computer system should be introduced. This system is actually divided into three systems

1) Terminal control system

22. This system includes the following two major programs.
Marshalling yard program, functions of which are as follows;
- determination of export container location
- determination of import container location
- determination of change of location, introduction and revision
- storage container list inclusive of container location and status
Gate control program, functions of which are as follows;
- inbound container control
- outbound container control

2) Terminal planning system

23. This system includes the following three major programs:
Loading schedule program, functions of which are as follows;

- inputting and filing the number of loading container and their status
- preparing preliminary plans
  bay plan
  stowage plan
  schematic plan
  sequence check list etc.

- finalization/revision of preliminary plans
- calculation of weight/height of center of gravity of the ship/cargo combination/monitoring/and others
- monitoring of operation

Discharging schedule program, functions of which are as follows;

- inputting and filing the number of discharged containers and their status
- preparing preliminary plans
  schematic plan
  sequence check list
  rehandling list
- monitoring of operation

Program for optimal handling equipment procedure

3) Documentation system

24. This system finalizes all the information processed and/or developed in the system described above. Preparing documentation to submit to the parties concerned and filing the necessary information for CEPA statistics can be carried out in this system.

21.1.3 Expected Business of the Port of La Union Office

1) Expected Business of the Port of La Union Office

25. Considering above factors, expected business of the Port of La Union office is shown below.

Table 21-1-3 Expected Business of the Port of La Union Office

Category		Short Term	Long Term
Supervision of Port Activity	Port Promotion	O	O
	Ownership of Major Facilities	O	O
	Supervision of Port Service and Charge	O	O
	Collection of License Charge	O	O
	Employees Training system	O	O
	Port Activity Statistics	O	O
Administrative Operation	Administration of Facilities	O	Private
	Control of Docking & Undocking	O	Private
	Permission of Berth & Yard Use	O	Private
Cargo Handling Service	Container Yard Operation	Private	Private
	CFS Operation	Private	Private
	Stevedoring	Private	Private
	Warehousing	Private	Private
	Sifting or Moving	Private	Private
	Collection of Handling Charge	Private	Private
	Maintenance of Facilities	Private	Private
Other Service	Tug	O	Private
	Pilotage	O	Private
	Line Handling	O	Private
	Water Supply	O	Private
	Bunkering	O	Private
	Waste Disposal	O	Private
Security Service	Navigation Safety	MOP(MOD)	MOP(MOD)
	Guarding	O	O
	Fire Fighting	O	O
Administrative Service	Custom	Custom Office	Custom Office
	Immigration	Immigration Office	Immigration Office
	Quarantine	Quarantine Office	Quarantine Office

26. The administration service such as custom, immigration and quarantine should be provided by the government. At present navigation safety service is provided by MOD, however as mentioned in 21.3.1, navigation safety service, at least for the commercial vessels, desirable to be transferred to MOP which would be in charge of overall maritime transportation policy.

2) Organization Table, number of workers

27. Organization table of the Port of La Union Office in the short-term plan is shown below.

Table 21-1-4 Organization table of the Port of La Union Office in short term Plan

Section	Function
Manager	Overall Control of Office Business
Vice-manager	Responsible Person in Charge of Port Promotion
Planning Dept.	
General Affair Sec.	
General Affair	Organization, General Affair
Personnel	Personnel, Training
Finance	Finance
Port Promotion Sec.	
Sub-Chief	Person in Charge of Port Promotion
Port Promotion	Port Promotion Strategy, Port Sales, Port Planning
Service & Tariff	Improvement of Service, Competitive Tariff
Statistics	Strategic Statistics System
Business Dept.	
Administration Sec.	
Administration	Control of Docking & Undocking, Permission of Berth or Yar
Supervision	Supervision of Cargo Handling, Yard Operation
Port Service Sec.	
Water Area Service Sec.	Pilotage, Tug, Waste Service
Port Service Sec.	Water Supply, Bunkering, Line Handling
Security Sec.	
Security	Guarding
Fire Fighting	Fire Fighting, Life Saving
Terminal Facility Dept.	
Construction Sec.	
Designing	Supervision of Designing of Civil Works
Construction	Supervision of Construction and Maintenance of Civil Works
Facility Sec.	
Mechanical F.	Supervision of Mechanical Facilities
Electrical F.	Supervision of Electrical Facilities

28. Estimated number of employees and workers at the Port of La Union in the short term plan is follows.

Table 21-1-5 Estimated Number of Workers and Employees at the Port of La Union in the Short-term Plan

Category	Terminal		Total	Remarks
	Container	Bulk		
Port of La Union Office	100		100	Public Sector
Cargo handling, Warehousing Service	150	200	350	Private Sector
Total	450			

21.2 Expected Roles of CEPA in the Short Term Stage

(1) Supervision of Private Participation

1. Considering the various difficulties which must be overcome to successfully establish the Port of La Union office operational sector, CEPA needs to

a) forecast future demand and supervise the private companies management to prevent deficits,
b)introduce a proper competitive environment into port business and
c)adjust conflicting interests.

(2) License

2. After private participation is introduced into the port service sector, private companies should be supervised properly to realize proper, fair and efficient port activities. Following types of business require an official license.

a) Cargo handling, warehousing business in port area
b) Tally clerk
In addition, permission is required when setting the cargo handling charge.

3. It is realistic that CEPA supervise these companies and issues licenses because CEPA is well acquainted with these businesses; also there is no other proper organization in El Salvador. Therefore, the Government should give CEPA the legal power to issue these licenses. Without this scheme, private participation can not be realized.

(3) Operation System of New Terminal at the Port of La Union

4. New terminal at the Port of La Union should be open to public use. However, it is better that control of container handling in the yard is centralized to ensure efficient utilization of the yard. While it is necessary to maintain public use, it is difficult to operate a container terminal efficiently when container terminal user changes one after another. Good operation system is necessary to solve this problem.

5. Alternative terminal operation systems are shown below. Coordination between related entities is necessary before an operation system can be finalized

1) Establishment of an Association to act as Terminal Operator

a) Though the terminal is open to public use, actually the terminal will be used by only a limited number of companies. Therefore, an association comprising all companies which will use the terminal might be established. CEPA licenses this entity to use the terminal, or leases the terminal to them.
b)CEPA puts the entity under an obligation to provide services to all shipping companies in an impartial manner. The entity operates this terminal solely, makes contracts with shipping companies, handles containers.
c) It will be better if this entity assigns berths to ships under supervision of CEPA
d) There is a possibility that CEPA has to play a leading role in establishing this entity because private companies show no intention of establishing such an entity at this stage.

2) License Charge for Contract Between Private sector and Public sector

6. There are three types of charges as shown below in general.

(a)Flat rate type

7. The owner(lessor) gives the user(lessee) the right to use fixed assets for a specific period in exchange for a fixed amount money.

(b)Mini-max rate type

8. The owner gives the user the right to use fixed assets for a specific period in exchange for a variable amount of money. There is a minimum and

a maximum amount of money depending on the volume of activity.

(c)Shared revenue type

9. The owner gives the user the right to use fixed assets for a specific period in exchange for a variable amount of money. In this case there is no limit to the amount of money, even though there is a minimum.

10. Concerning (a) flat rate type, both lessor and lessee can easily forecast the financial condition. The lessee may be able to generate excess profit if he can collect cargo of more than a certain level. This system can educe the power of the private sector. The lessor has to fix the charge at a level which the lessee can recover the total cost and earn profits. The demerit is that if cargo turnover could not reach a certain level, only the lessee would suffer a loss.

11. Concerning (b) mini-max rate type, the lessee in this case may also be able to generate excess profits if he can collect cargo of more than a certain level. This system can draw out the power of the private sector. But the lessee is always subject to checks on its cargo turnover or revenue by the lessor.

12. Concerning (c) shared revenue type, revenues of both lessor and lessee increase if cargo turnover increases. The demerit is that even if the lessee makes efforts to increase revenue, a certain share of it is drawn up. Furthermore, the lessee is always subject to checks on its cargo turnover or revenue by the lessor. It is difficult for both sides to forecast the financial condition. In this system, even if the lessee can not collect a large volume of cargo, he is only obliged to pay the stipulated percentage of his revenue. This could make it difficult for the lessor to manage the port soundly.

13. CEPA has to examine which type of leasing scheme is better. It should be borne in mind, that (a) or (b) might be the better selection for the lessor and lessee to begin with, utilizing the private sector's power to increase cargo turnover. Systems (a) and (b)give lessee an incentive to collect cargo, raise the morale of the employees, and would contribute to the future prosperity of the port of La Union. System (c), which might be more attractive to the private sector, should probably be avoided in the early stage to prevent a monopoly from arising. This danger exists because the lessee is not actually obliged to collect any cargo

14. It may be necessary for CEPA to provide the lessee with favorable condition in the first stage such as by offering a reasonably low flat rate or mini-max rate. But CEPA must be careful when setting this kind of charge. This kind of incentive sometimes makes the lessee too dependent on an indulgent lessor. After setting the charge at such a low level, to subsequently raise the tariff sometimes becomes difficult in actual practice. It is important that revision procedure clause be included in the contract.

21.3 Other Significant Matters of the Port of La Union Development Plan

21.3.1 Expected Role of Government Related to Maritime Activity

(1) Major Role of Government

1. Maritime transport sector should provide safe and reliable services to all users and contribute to the promotion of national citizen welfare.

2. To this end, governmental organization in charge of maritime activity should control following issues mainly.

1) Formulation of national maritime transportation policy
2) Drafting of laws and regulations concerning modernization of maritime activity
3) Supervision, instruction and promotion of maritime transportation business
4) Promotion of construction and building of maritime transportation infrastructure and facilities
5) Compilation of statistics concerning maritime activity
6) Indemnity concerning maritime transportation
7) International affairs concerning maritime transportation
8) Establishment of technical standards concerning maritime transportation
9) Development of technology concerning maritime transportation

(2) Outline of Major Administrative Authority

3. Among above mentioned issues, supervision, instruction and promotion of maritime activity business, and promotion of construction and

building of maritime transportation infrastructure and facilities will become more important issues in the future.

1) Supervision, instruction and promotion of maritime activity business

4. Maritime transportation services have a public character in general. To provide safe and reliable maritime transportation services to national citizens, the government has to supervise the maritime transportation business. Following items should be mainly controlled by the government.

a) Licensing of maritime transportation business
b) Licensing of maritime transportation fee and charge that greatly affects the national citizen
c) Financing construction and building of important maritime transportation facility
d) Administration of maritime transportation business to realize safe and reliable maritime transportation services and promote consumer benefit
e) Vitalization of maritime transportation industry
f) Education, training and certification of seamen
g) Administration of environmental affairs concerning maritime activity

2) Other Control

5. In addition to the above mentioned issues, the national government should control the following affairs.

a) License of reclamation of public water area, permission of usage
b) Water traffic control
c) Registration and inspection of ships
d) Ship officer certification, issuing seamen book
In particular Water traffic control safety service should be transferred from MOD to MOP which would be in charge of overall maritime transportation policy.

21.3.2 Marketing Policy

(1) Port Promotion Strategy

6. Port promotion or sales is one of the most important fields of activities for attracting port users. CEPA Marketing Department, which is supposed to be in charge of port promotion, however, does not seem very active in pursuing potential clients. Since competition among the neighboring ports in collecting container cargoes will be much tighter in future, sales activities of CEPA become vital in this particular field. In this respect, the following actions are recommended in securing an adequate level of revenues from users at the Ports of La Union.

1) Establishment of port promotion strategy focusing on the most effective target groups of users.

2) Under the systematic action program, CEPA staff should call for sales at shipping companies or shippers, through active appeals in getting their understanding on the real merits of utilization of the Port of La Union.

3) It is useful for effective sales activities to prepare an attractive brochure in which the sales points including various advantages and merits for the target users are clearly explained.

4) To hold seminars to introduce the Port of la Union to shippers of various countries is another effective way to assist the promotion activities.

(2) Tariff

7. Financial system based on economic principles should be established to realize financially sound port management and operation. CEPA should set its tariff at a proper level to obtain sufficient income to maintain sound financial condition and to make the necessary investment.

8. On the other hand, tariff should be set taking levels of neighboring ports into consideration to attract more port users. CEPA should vigilantly monitor and analyze tariffs of neighboring ports and revise its tariff when necessary. In particular, tariffs related to shipping companies must be reduced. If the tariff structure is not competitive with other ports, it will be

difficult to attract more users.

9. The following points should be considered in terms of the port tariff structure.

- The tariff structure should contribute to the efficiency of cargo handling, such as to discount a charge when cargo is carried from yard within a given period of time.
-The revenue from the tariff can cover costs for construction, management, maintenance and repair.
-The tariff should be relational in correspondence with the service provided.
-The tariff structure and the way of imposition should be as simple as possible.

(3) Promotion of Eastern Area Regional Development

10. The development of the Port of La Union should be planned according to the strategy for introducing port related industry and stimulating regional development. It is thus necessary to consider the relationship between regional development and port activity

11. At present, around the Port of La Union a concrete plan of eastern regional development has not been drawn up yet. Government should draw up a concrete plan of eastern regional development as well as road construction plan immediately. And then, these plans should be executed by the government. Government should create an environment where the private sector can easily participate in major eastern area projects such as EPZ as well as port activities.

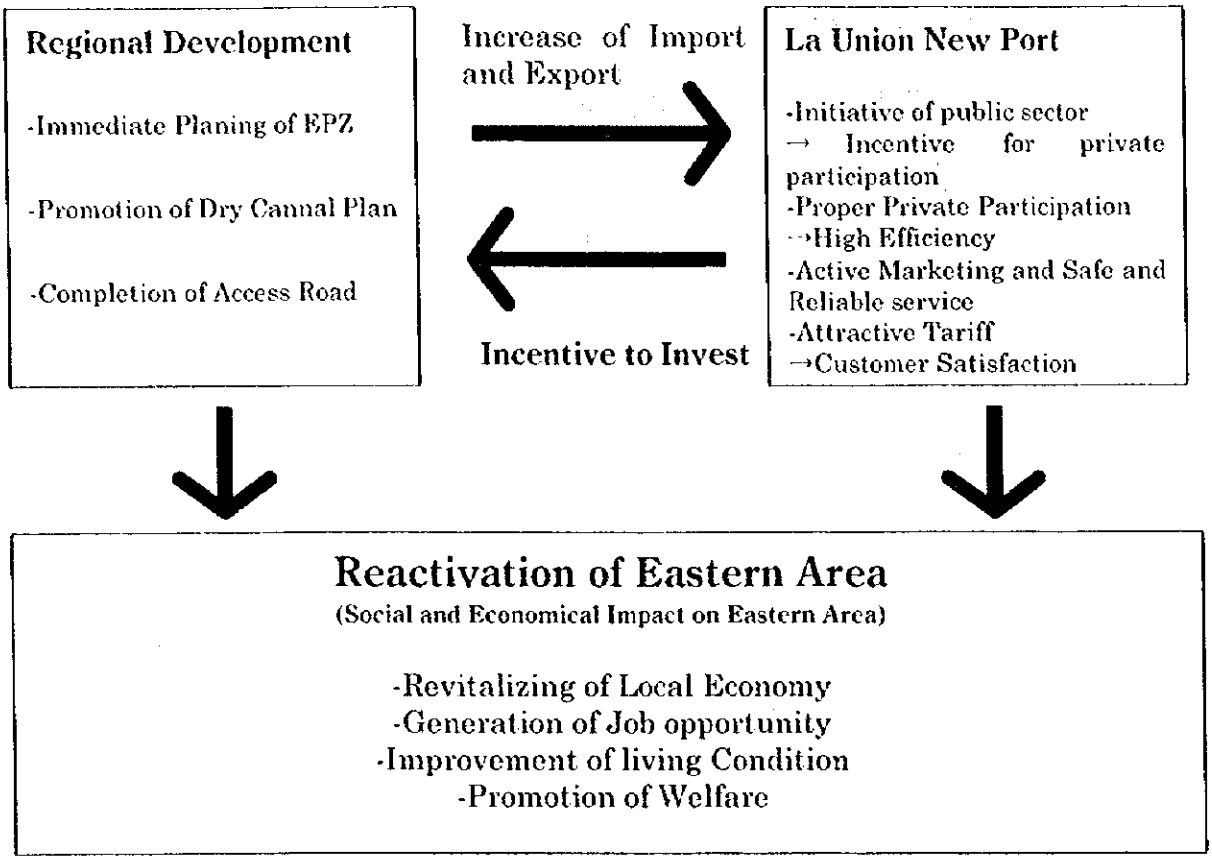


Figure 21-3-1 The Relationship between the Regional Development, La Union New Port and Social and Economical Impact on Eastern Area

22. ECONOMIC ANALYSIS

22.1 Purpose and Methodology

22.1.1 Purpose

1. The purpose of the economic analysis is to appraise the economic feasibility of the Short-term plan for the port development from the viewpoint of the national economy.

22.1.2 Methodology

2. An economic analysis will be carried out according to the following method. Short-term plan will be defined and it will be compared to the "Without" case. All benefits and costs of it in market price for the difference from "Without" case will be calculated and it will be converted to the economic price. All benefits and costs are evaluated using economic prices in the economic analysis based on the border price concept. The procedure used for economic analysis is shown in Figure 22-1-1

3. The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the feasibility of the project. The EIRR is a discount rate in which net present values of costs and the revenue during the project life are considered equal.

22.2 Prerequisites of Analysis

22.2.1 Base Year

1. The "Base Year" in the cost estimation of construction and benefits calculation, 1997 is set as the "Base Year" of the study.

22.2.2 Project life

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

22.2.3 Foreign Exchange Rate

3. The exchange rate adopted for this analysis is US$ 1.00 = 130 ¥ = colon 8.75.

22.2.4 "With" and "Without" case

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

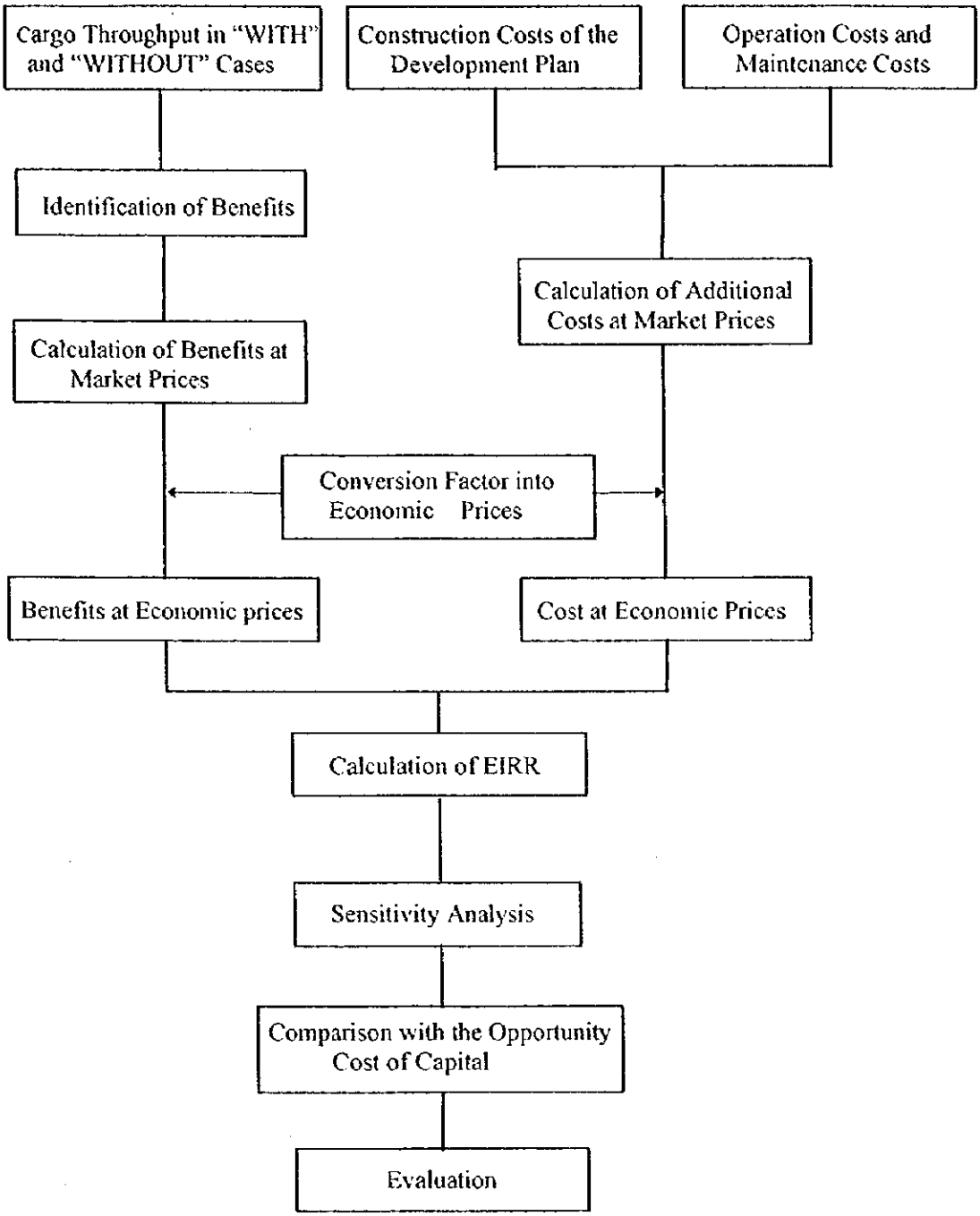


Figure 22-1-1 Procedure of the Economic Analysis

1) No investment is made for the construction of a new port in La Union.
2) When handling volume of container cargo from/to El Salvador exceeds the handling capacity of Acajutla port, the containers which can not be handled in Acajutla port are assumed to be handled in Quetzal port of Guatemala.
3) A small scale of investment is made in Acajutla port coinciding with the increment of handling volume of general cargo, liquid bulk cargo and dry bulk cargo.

5. To convert Acajutla port into competitive container terminal, it is necessary to construct a large scale breakwater and new container wharves with a container stacking area equivalent to the neighboring foreign ports. Therefore, the total investment in Acajutla port would likely be equal or higher than the investment in La Union. In addition, investment in Acajutla port will widen the economic gap between the Western region and the Eastern region. But, the Eastern regional economic development will be accelerated as a result of the investment in La Union.

6. Appraisal of new port development in La Union from 4 alternatives port development plans which increase Salvadoran coastal ports cargo handling capacities is attached in APPENDIX 1.

22.3 Economic Pricing

22.3.1 Methodology

1. The purpose of the economic analysis is to examine the value of the project, that is to see if it represents an optimum allocation of resources in the national economy.

2. In general, the values of goods quoted at market prices do not always represent the true value of those goods from the viewpoint of the national economy. The local currency portion of the goods and materials at market prices often includes customs duties, and the labor cost at market prices is often influenced by a minimum wage system in the country. Therefore, economic pricing should be conducted for the economic analysis in order to exclude these influences.

3. There are several way for economic pricing to be conducted. In this Study, the prices of domestic goods and services are modified to border prices in an effort to determine a more rational valuation. These border prices are generally intended to represent the international market values, or the world prices, of these goods and

services.

4. The market prices are changed to border prices by various conversion factors such as Standard Conversion Factor (SCF), Conversion Factor for Consumption (CFC) and so on.

22.3.2 Method of applying Conversion Factors

5. In general, all the costs and benefits are divided into labor, tradable goods and non tradable goods. And labor is further classified into skilled labor and unskilled labor. The economic prices of tradable goods are expressed in CIF and FOB value for import goods and export goods respectively.

(1) Standard Conversion Factor (SCF)

6. The standard conversion factor is used to determine the economic price of certain goods which cannot be directly revalued at border prices. These goods include most non-traded goods and services. The standard conversion factor is expressed by the following equation.

$$SCF = \frac{I + E}{(I + Di) + (E - De)}$$

where, I : Total amount of imports in CIF
E : Total amount of exports in FOB
Di : Total amount of import duties
De : Total amount of export subsidies

7. In this Study, the SCF 0.973 is adopted according to the past records of trade and customs as shown in Table 22-3-1.

Table 22-3-1 Calculation Result of SCF and CFC

million US$

year	1992	1993	1994	1995	1996	1997	Average
Export Value	795.6	1,032.1	1,249.3	1,652.0	1,788.4	2415.9	
Import Value	1,854.5	2,156.9	2,573.9	3,329.1	3,221.8	3739.1	
Import Tax	99.6	137.6	171.0	199.0	163.1	145.9	
Export Subsidy	7.5	6.6	27.9	62.0	68.6	80.9	
Import consumer goods Value	489.1	525.0	597.7	802.3	792.1	917.9	
Import Tax for consummer goods	28.8	30.9	38.3	56.8	65.6	61.7	
SCF (ratio)	0.966	0.961	0.964	0.973	0.981	0.990	0.973
CFC (ratio)	0.944	0.944	0.940	0.934	0.924	0.937	0.937

Source : Central Bank

(2) Conversion Factor for Consumption Goods (CFC)

8. This conversion factor is used to convert the market prices of consumption goods into the border prices. The conversion factor for consumption goods is usually calculated in the same manner as the SCF, replacing total imports and exports by those of consumption goods only. However, there is no data available regarding total amount of export consumer goods and total amount of exports subsidies for consumer goods, and thus only import consumer goods value and import tax for consumer goods are taken into account for calculation. In this Study, CFC 0.937 is adopted according to the past records of trade and customs as shown in Table 22-3-1.

(3) Conversion Factor for Labor

1) Conversion Factor for Skilled Labor

9. The economic cost of skilled labor is obtained by multiplying its market prices by the Conversion Factor for Consumption (CFC), assuming that the market mechanism is functioning properly. However, as these are domestic costs or market costs, they are converted into border prices by multiplying the market wages by the conversion factor for consumption goods.

Conversion Factor for skilled labor

= Market wage rate × CFC = 1 × 0.937 = 0.937

2) Conversion factor for Unskilled Labor

10. It is often assumed in a simplified manner that the economic cost of unskilled labor is equal to the per capita income of the agricultural sector which is relatively elastic in its use of labor and where wages are normally lowest. The conversion factor for unskilled labor is calculated as follows.

Conversion Factor for Unskilled Labor

$$= \frac{Opportunity\ Cost}{Nominal\ Wage} \times CFC$$

$$= 45.77 / 48.15 \times 0.937 = 0.891$$

Where, Opportunity Cost : Estimate agricultural workers cost
6,722.8 million colon / 598,738 / 365 × 1.488 = 45.77 colon
: 6,722.8 million colon Agriculture sector GDP in 1992
: 598,738 Agriculture sector population 1992
: 1.488 Consumer price index 1997 (1992 = 1.00)
: 48.15 Basic labor cost per day in Chapter 8 Table 8-2-1 (colon)

3) Conversion Factor for Foreign Labor

11. Specific consideration should be given to foreign labor, whether it is skilled or unskilled. Since foreign workers have a strong tendency to remit most of their earnings to their own homes, the economic cost of foreign labor should be treated just like that of imported goods and services. Therefore, in this study it is assumed that the conversion factor for foreign labor is 1.00.

22.4 Costs of the Projects

22.4.1 Kinds of Costs

(1) Construction Costs

1. Construction costs are divided into such categories as civil costs and mechanical costs. Main mechanical costs are purchasing of handling equipment. Civil costs and mechanical costs are estimated in Chapter 20.

(2) Renewal Costs

2. The renewal investment costs for facilities and equipment after their useful lifetimes are considered. Expected lifetime of gantry crane is 15 years and

other equipment is 10 years.

(3) Maintenance Costs

3. The costs of maintaining the port facilities is assumed to be fixed portion (1 % of structure, 4 % for handling equipment) of the original construction costs excluding the costs of dredging and reclamation costs.

(4) Operation Costs

4. Operation costs are divided into personnel costs and administration costs. Administration costs are 30 % personnel costs.

22.5 Benefits of the Project

22.5.1 Kinds of Benefits

1. The development of the new port will greatly contribute to the national economy of El Salvador. Considering the "With" and "Without" case, the following items are identified as major benefits of the development plan for the new port from the viewpoint of the national economy. As benefits brought about by the short term plan of the study port, the following items are identified.. In this study, the monetary benefits of items 1), 2), 3) and 4) are calculated. However, 5) and 6) contribute to regional economic development of Eastern region.

1) Savings in land transportation costs.
2) Savings in handling costs of container on foreign ports
3) Earnings of foreign currency from transit container cargo handling
4) Earnings of foreign currency from land transportation of foreign container cargo.
5) Generation of job opportunities
6) Promotion of regional economic development
7) Savings in interest of cargo costs

22.5.2 Calculation Method of Benefits

(1) Savings in land transportation cost (Benefits from Transport)

2. In the "Without" case, when the container cargo volume exceeds the handling capacity of Acajutla port, the container cargoes from/to El Salvador which can not be handled in Acajutla port are assumed to be handled in Quetzal port of

Guatemala. And then these cargoes are to be transported to El Salvador by land transportation. In the "With" case, all El Salvadoran container cargoes can be handled at the new port and Acajutla port.

3. As to conventional cargoes, the transport distance to/from Acajutla port is necessarily long in the "Without" case, but in the "With" case, conventional cargoes will be handled at the closest port, either Acajutla or La Union.

4. This savings in land transportation cost is a benefit.

Savings in land transportation costs
= "Without case" Σland transport cargo volume × cost −
"With case" Σland transport cargo volume × cost

(2) Savings in Handling Cost of Container in Foreign Ports (Benefits from Container Handling)

5. In the "Without" case, when the volume of container cargo from/to El Salvador exceeds the handling capacity of Acajutla port, the containers which can not be handled in Acajutla port are assumed to be handled in Quetzal port of Guatemala. In the "With" case, this revenue would not be lost to foreign port, since they could be handled in Salvadoran ports.

Savings in handling costs of container in foreign port
= Difference in container handling cargo volume in El Salvador port between "With" and "Without" case
× Container cargo handling cost in El Salvador port (unit cost)

(3) Earnings of Foreign currency from Transit Container Cargo Handling (Benefits from Transit Container Cargo Handling)

6. In the "With" case, the foreign currency earnings from handling of transit container cargo from/to southern part of Honduras is expected since La Union new port is competitive. The benefits that will accrue from the projects can be calculated by the following formula.

Earnings of foreign currency from transit container cargo handling
= Transit Container Cargo Volume
× Handling cost of transit container cargo

(4) Earnings of Foreign Currency from Land Transportation of Transit Container Cargo (Benefits from Transport)

7. In the "With" case, foreign currency earnings from land transportation of transit container cargo from/to southern part of Honduras is expected. The benefits that will accrue from the projects can be calculated by the following formula.

Earnings of foreign currency from land transportation of transit cargo
= Transit Cargo Volume × 1/2 × Land Transportation cost of container cargo

22.6 Evaluation of the Projects

22.6.1 Calculation of the EIRR

(1) Calculation of the EIRR

1. The economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the economic feasibility of the project. The EIRR is a discount rate in which net present value of costs and revenues during the project life are considered equal. It is calculated by using the following formula..

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

where, n : Period of economic calculation (project life)
Bi : Benefits in i-th year
Ci : Costs in i-th year
r : Discount rate

2. Summary of calculation result of EIRR base case are shown in Table 22-6-1 and Table 22-6-2 , 22-6-3, 22-6-4 and 22-6-5 show calculation details.

Table 22-6-1 Summary of EIRR Calculation Base Case

	Case1	Case2
B-3	17.3%	16.1%
C-3	18.2%	17.0%

(2) Sensitive Analysis

3. In order to determine whether the project is feasible when certain conditions change, a sensitivity is made for the following three alternatives.

Case A : The costs increased by 10 %
Case B : The benefits decreased by 10 %
Case C : The costs increased by 10 % and the benefits decreased by 10 %

4. The sensitive analysis for the three alternative is calculated by using above formula as the base case and the results are shown in Table 22-6-6 shows summary of sensitivity analysis.

Table 22-6-6 Summary of Sensitivity Analysis

	B-3		C-3	
	Case1	Case2	Case1	Case2
Case A	15.9%	14.8%	16.8%	15.6%
Case B	15.7%	14.7%	16.6%	15.5%
Case C	14.4%	13.4%	15.2%	14.2%

22.6.2 Net Present Value and Benefit Cost Ratio

5. On the assumption that discount rate is 8%, 10% and 12%, the Net Present Value (NPV) and the Benefit Cost Ratio (BCR) of short-term development plan is summarized in Table 22-6-7 and 22-6-8.

Table 22-6-7 Summary of Net Present Value

unit : 000 US$

	B-3		C-3	
Discount rate	Case 1	Case 2	Case 1	Case 2
8%	117,000	102,000	122,000	107,000
10%	72,000	60,000	76,000	65,000
12%	41,000	32,000	46,000	37,000

Table 22-6-8 Summary of Benefit Cost Ratio

Discount rate	B-3		C-3	
	Case 1	Case 2	Case 1	Case 2
8%	2.03	1.90	2.13	1.99
10%	1.72	1.60	1.81	1.68
12%	1.47	1.36	1.55	1.44

22.6.3 Evaluation

6. There are various views concerning the appropriate EIRR level used to guide the judgment as to whether a project is feasible or not. The leading views is that the project is feasible if the EIRR exceeds the opportunity cost of capital. The standard value of EIRR of IBRD and IDB for social-infrastructure project is said to be 12%. As for this project, even though the economic calculation only takes into account the items which are quantified, the EIRR over 12%. Therefore, this short term development project is viable from the viewpoint of national economy.

22.6.4 Other Economic Effects

7. In this section, economic benefits which are not included in the calculation of EIRR are explained. Generation of job opportunities and promotion of regional economic development are much contribute to development of Eastern region.

(1) Benefits of Generation Job Opportunities

8. A vast number and type of jobs are generated and required around the La Union new port, once development of a new port begins. Shipping and related industries are referred to called as port-related industries. Banking, insurance, commercial, manufacturing, construction are referred to called as port-dependent industries. Furthermore, the employment of construction workers during the construction period of La Union new port will arise. According to the research of Kobe port Authority in Japan, 6 to 7 times of job opportunities are created as port-related and port-dependent industries by port operation.

1) Construction Period

9. During the construction period around 400 daily workers are necessary .

2) Port Management and Operation

10. According to Chapter 21, around 100 and 350 workers are necessary for new port operation and cargo handling respectively.

3) Port related industry and dependent industry

11. Based on the actual data of 6 existing EPZ's in El Salvador, the new 100ha EPZ will requires labor force of more than 10,000.

(2) Promotion of Regional Economic Development

12. Following economic effects are expected to each sectors

1) Agriculture

13. Presence of the port facilitates the increase of the fertilizer import volume, as a result, primary production volume will increase. In addition, new infrastructure will accelerate the export of agricultural products .

2) Industry

14. Factories located in the port area such as EPZ's can enjoy the full benefit of reduced transportation cost for getting materials and shipping products. Procurement of a huge volume of materials and equipment for new port construction and redevelopment of the eastern region will activate construction related industries.

3) Service

15. Activation of commerce by increase of type of commodity and volume . It is worth noting that the eastern region will be able to take advantage of many well-trained workers who gained valuable experience in the United States during the civil conflict. These workers are especially suited to the service sectors.

(3) Savings in Interest of Cargo Costs

16. In accordance with the implementation of the project, the total land transportation time will be greatly decreased. According to the reduction of land transportation time under " With" case, interest of cargo will be decreased. This

means that shippers gain back invested capital earlier and opportunity of investment will increase.

Table 22-6-2 EIRR calculation Case 1 Short Term B-3

Base Case	17.3%	
Sensitivity Analysis A	15.9%	Cost 10% increase
Sensitivity Analysis B	15.7%	Benefit 10% decrease
Sensitivity Analysis C	14.4%	Cost 10% increase, Benefit 10% decrease

	year	Initial cost	Renewal cost	Mainte cost	Operation cost	Cost Total	Benefit Total	Benefit - Cost	Net Present Value (NPV) Benefit	Cost	Benefit - Cost
1	1999	1,210,000			114,000	1,324,000	0	-1,324,000	0	1,324,000	-1,324,000
2	2000	2,090,000			114,000	2,204,000	0	-2,204,000	0	1,879,556	-1,879,556
3	2001	8,771,001			114,000	8,885,001	0	-8,885,001	0	6,461,672	-6,461,672
4	2002	24,096,788			114,000	24,210,788	0	-24,210,788	0	15,015,510	-15,015,510
5	2003	52,162,375			178,000	52,340,375	0	-52,340,375	0	27,682,908	-27,682,908
6	2004	11,391,766	0	1,117,552	2,245,750	14,755,069	8,229,965	-6,525,104	3,712,074	6,655,181	-2,943,107
7	2005		0	1,245,688	2,245,750	3,491,438	14,525,492	11,034,054	5,587,187	1,342,921	4,244,215
8	2006		0	1,245,688	2,245,750	3,491,438	17,054,386	13,562,947	5,594,253	1,145,277	4,448,977
9	2007		0	1,245,688	2,245,750	3,491,438	19,583,280	16,091,841	5,478,166	976,684	4,501,482
10	2008		0	1,245,688	2,245,750	3,491,438	22,112,344	18,620,905	5,275,070	832,910	4,442,161
11	2009		0	1,245,688	2,245,750	3,491,438	24,641,237	21,149,799	5,013,023	710,300	4,302,724
12	2010		0	1,245,688	2,245,750	3,491,438	27,170,131	23,678,693	4,713,816	605,739	4,108,078
13	2011		1,112,000	1,245,688	2,245,750	4,603,438	29,699,025	25,095,586	4,394,069	681,094	3,712,975
14	2012		0	1,245,688	2,245,750	3,491,438	32,227,919	28,736,480	4,066,311	440,527	3,625,784
15	2013		3,846,000	1,245,688	2,245,750	7,337,438	34,756,983	27,419,544	3,739,850	789,508	2,950,342
16	2014		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	3,421,328	320,376	3,100,952
17	2015		5,148,000	1,245,688	2,245,750	8,639,438	37,285,410	28,645,972	2,917,685	676,060	2,241,626
18	2016		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	2,488,182	232,996	2,255,187
19	2017		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	2,121,905	198,697	1,923,208
20	2018		13,784,000	1,245,688	2,245,750	17,275,438	37,285,410	20,009,972	1,809,546	838,416	971,130
21	2019		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	1,543,168	144,504	1,398,665
22	2020		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	1,316,004	123,232	1,192,772
23	2021		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	1,122,279	105,091	1,017,188
24	2022		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	957,072	89,621	867,451
25	2023		3,846,000	1,245,688	2,245,750	7,337,438	37,285,410	29,947,972	816,184	160,618	655,566
26	2024		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	696,036	65,177	630,859
27	2025		1,112,000	1,245,688	2,245,750	4,603,438	37,285,410	32,681,972	593,535	73,286	520,289
28	2026		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	506,197	47,401	458,796
29	2027		5,148,000	1,245,688	2,245,750	8,639,438	37,285,410	28,645,972	431,681	100,025	331,656
30	2028		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	368,135	34,472	333,662
31	2029		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	313,943	29,398	284,545
32	2030		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	267,728	25,070	242,658
33	2031		0	1,245,688	2,245,750	3,491,438	37,285,410	33,793,972	228,317	21,380	206,937
34	2032		1,112,000	1,245,688	2,245,750	4,603,438	37,285,410	32,681,972	194,707	24,039	170,668
35	2033		-3,527,000	1,245,688	2,245,750	-35,562	37,285,410	37,320,972	166,045	-158	166,203
	Total	99,721,930	31,581,000	37,242,519	68,006,500	236,551,949	975,708,967	739,157,018	69,853,537	69,853,537	-0

EIRR= 17.3%

Table 22-6-3 EIRR calculation Case 2 Short Term B-3

Base Case	16.1%	
Sensitivity Analysis A	14.8%	Cost 10% increase
Sensitivity Analysis B	14.7%	Benefit 10% decrease
Sensitivity Analysis C	13.4%	Cost 10% increase, Benefit 10% decrease

	year	Initial cost	Renewal cost	Mainte cost	Operation cost	Cost Total	Benefit Total	Benefit - Cost	Net Present Value (NPV) Benefit	Cost	Benefit - Cost
1	1999	1,210,000			114,000	1,324,000	0	-1,324,000	0	1,324,000	-1,324,000
2	2000	2,090,000			114,000	2,204,000	0	-2,204,000	0	1,897,622	-1,897,622
3	2001	8,771,001			114,000	8,885,001	0	-8,885,001	0	6,586,482	-6,586,482
4	2002	24,096,788			114,000	24,210,788	0	-24,210,788	0	15,452,649	-15,452,649
5	2003	52,162,375			178,000	52,340,375	0	-52,340,375	0	28,762,648	-28,762,648
6	2004	11,391,766	0	1,117,552	2,245,750	14,755,069	8,412,181	-6,342,888	3,980,143	6,981,219	-3,001,077
7	2005		0	1,245,688	2,245,750	3,491,438	14,525,492	11,034,054	5,917,236	1,422,304	4,491,932
8	2006		0	1,245,688	2,245,750	3,491,438	16,381,768	12,890,330	5,745,751	1,224,589	4,521,162
9	2007		0	1,245,688	2,245,750	3,491,438	18,238,044	14,746,606	5,507,599	1,054,359	4,453,240
10	2008		0	1,245,688	2,245,750	3,491,438	20,094,491	16,603,052	5,224,673	907,792	4,316,880
11	2009		0	1,245,688	2,245,750	3,491,438	21,950,767	18,459,328	4,913,939	781,600	4,132,339
12	2010		0	1,245,688	2,245,750	3,491,438	23,807,013	20,315,604	4,588,635	672,950	3,915,686
13	2011		1,112,000	1,245,688	2,245,750	4,603,438	25,663,319	21,059,880	4,258,816	763,939	3,494,878
14	2012		0	1,245,688	2,245,750	3,491,438	27,519,595	24,028,156	3,932,024	498,860	3,433,164
15	2013		3,846,000	1,245,688	2,245,750	7,337,438	29,376,041	22,038,603	3,613,811	902,644	2,711,166
16	2014		0	1,245,688	2,245,750	3,491,438	31,232,317	27,740,879	3,308,067	369,806	2,938,261
17	2015		5,148,000	1,245,688	2,245,750	8,639,438	33,076,885	24,437,446	3,016,426	787,868	2,228,558
18	2016		0	1,245,688	2,245,750	3,491,438	34,921,452	31,430,014	2,741,943	274,139	2,467,804
19	2017		0	1,245,688	2,245,750	3,491,438	36,766,227	33,274,788	2,485,497	236,031	2,249,466
20	2018		13,781,000	1,245,688	2,245,750	17,275,438	36,766,227	19,490,788	2,139,987	1,005,521	1,134,466
21	2019		0	1,245,688	2,245,750	3,491,438	36,766,227	33,274,788	1,842,507	174,970	1,667,537
22	2020		0	1,245,688	2,245,750	3,491,438	36,766,227	33,274,788	1,586,380	150,648	1,435,732
23	2021		0	1,245,688	2,245,750	3,491,438	36,766,227	33,274,788	1,365,857	129,706	1,236,151
24	2022		0	1,245,688	2,245,750	3,491,438	36,766,227	33,274,788	1,175,989	111,676	1,064,313
25	2023		3,846,000	1,245,688	2,245,750	7,337,438	36,766,227	29,428,788	1,012,515	202,068	810,447
26	2024		0	1,245,688	2,245,750	3,491,438	36,766,227	33,274,788	871,765	82,786	788,979
27	2025		1,112,000	1,245,688	2,245,750	4,603,438	36,766,227	32,162,788	750,580	93,979	656,602
28	2026		0	1,245,688	2,245,750	3,491,438	36,766,227	33,274,788	646,242	61,369	584,873
29	2027		5,148,000	1,245,688	2,245,750	8,639,438	36,766,227	28,126,788	556,408	130,746	425,661
30	2028		0	1,245,688	2,245,750	3,491,438	36,766,227	33,274,788	479,062	45,493	433,568
31	2029		0	1,245,688	2,245,750	3,491,438	36,766,227	33,274,788	412,467	39,169	373,298
32	2030		0	1,245,688	2,245,750	3,491,438	36,766,227	33,274,788	355,130	33,724	321,406
33	2031		0	1,245,688	2,245,750	3,491,438	36,766,227	33,274,788	305,763	29,036	276,727
34	2032		1,112,000	1,245,688	2,245,750	4,603,438	36,766,227	32,162,788	263,259	32,962	230,297
35	2033		-3,527,000	1,245,688	2,245,750	-35,562	36,766,227	36,801,788	226,663	-219	226,883
	Total	99,721,930	31,581,000	37,242,519	68,006,500	236,551,949	930,225,245	693,673,296	73,225,135	73,225,135	-0

EIRR= 16.1%

Table 22-6-4 EIRR Calculation C-3 Short term Case 1

Base Case	18.2%	
Sensitivity Analysis A	16.8%	Cost 10% increase
Sensitivity Analysis B	16.6%	Benefit 10% decrease
Sensitivity Analysis C	15.2%	Cost 10% increase, Benefit 10% decrease

	year	Initial cost	Renewal cost	Mainte cost	Operation cost	Cost Total	Benefit Total	Benefit - Cost	Net Present Value (NPV) Benefit	Cost	Benefit - Cost
1	1999	1,210,000			114,000	1,324,000	0	-1,324,000	0	1,324,000	-1,324,000
2	2000	2,090,000			114,000	2,204,000	0	-2,204,000	0	1,864,260	-1,864,260
3	2001	7,809,673			114,000	7,923,673	0	-7,923,673	0	5,669,128	-5,669,128
4	2002	16,567,397			114,000	16,681,397	0	-16,681,397	0	10,095,250	-10,095,250
5	2003	53,019,560			178,000	53,197,560	0	-53,197,560	0	27,231,479	-27,231,479
6	2004	12,883,889	0	1,127,780	2,245,750	16,257,420	8,229,965	-8,027,455	3,563,464	7,039,241	-3,475,780
7	2005		0	1,256,583	2,245,750	3,502,333	14,525,492	11,023,159	5,319,859	1,282,705	4,037,154
8	2006		0	1,256,583	2,245,750	3,502,333	17,054,386	13,552,052	5,283,239	1,084,980	4,198,259
9	2007		0	1,256,583	2,245,750	3,502,333	19,583,280	16,080,946	5,131,502	917,733	4,213,768
10	2008		0	1,256,583	2,245,750	3,502,333	22,112,344	18,610,010	4,901,045	776,268	4,124,778
11	2009		0	1,256,583	2,245,750	3,502,333	24,641,237	21,138,904	4,619,674	656,608	3,963,066
12	2010		0	1,256,583	2,245,750	3,502,333	27,170,131	23,667,798	4,308,593	555,394	3,753,199
13	2011		1,112,000	1,256,583	2,245,750	4,614,333	29,699,025	25,084,691	3,983,646	618,939	3,364,708
14	2012		0	1,256,583	2,245,750	3,502,333	32,227,919	28,725,585	3,656,501	397,366	3,259,135
15	2013		3,816,000	1,256,583	2,245,750	7,348,333	34,756,983	27,408,649	3,335,573	705,208	2,630,365
16	2014		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	3,026,650	284,303	2,742,347
17	2015		5,148,000	1,256,583	2,245,750	8,650,333	37,285,410	28,635,077	2,560,101	593,951	1,966,149
18	2016		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	2,165,469	203,409	1,962,059
19	2017		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	1,831,668	172,054	1,659,614
20	2018		13,784,000	1,256,583	2,245,750	17,286,333	37,285,410	19,999,077	1,549,322	718,300	831,022
21	2019		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	1,310,499	123,099	1,187,399
22	2020		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	1,108,489	104,124	1,004,365
23	2021		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	937,619	88,073	849,545
24	2022		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	793,088	74,497	718,590
25	2023		3,846,000	1,256,583	2,245,750	7,348,333	37,285,410	29,937,077	670,836	132,211	538,625
26	2024		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	567,428	53,300	514,128
27	2025		1,112,000	1,256,583	2,245,750	4,614,333	37,285,410	32,671,077	479,961	59,399	420,562
28	2026		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	405,976	38,135	367,842
29	2027		5,148,000	1,256,583	2,245,750	8,650,333	37,285,410	28,635,077	343,396	79,669	263,727
30	2028		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	290,463	27,284	263,179
31	2029		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	245,689	23,078	222,610
32	2030		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	207,817	19,521	188,296
33	2031		0	1,256,583	2,245,750	3,502,333	37,285,410	33,783,077	175,782	16,512	159,271
34	2032		1,112,000	1,256,583	2,245,750	4,614,333	37,285,410	32,671,077	148,686	18,401	130,285
35	2033		-3,527,000	1,256,583	2,245,750	-24,667	37,285,410	37,310,077	125,766	-83	125,850
	Total	93,580,519	31,581,000	37,568,701	68,006,500	230,736,720	975,708,967	744,972,247	63,047,798	63,047,798	0

EIRR= 18.2%

Table 22-6-5 EIRR Calculation C-3 Short term Case 2

Base Case	17.0%	
Sensitivity Analysis A	15.6%	Cost 10% increase
Sensitivity Analysis B	15.5%	Benefit 10% decrease
Sensitivity Analysis C	14.2%	Cost 10% increase, Benefit 10% decrease

	year	Initial cost	Renewal cost	Mainte cost	Operation cost	Cost Total	Benefit Total	Benefit - Cost	Net Present Value (NPV) Benefit	Cost	Benefit - Cost
1	1999	1,210,000			114,000	1,324,000	0	-1,324,000	0	1,324,000	-1,324,000
2	2000	2,090,000			114,000	2,204,000	0	-2,204,000	0	1,882,981	-1,882,984
3	2001	7,809,673			114,000	7,923,673	0	-7,923,673	0	5,783,580	-5,783,580
4	2002	16,567,397			114,000	16,681,397	0	-16,681,397	0	10,402,499	-10,402,499
5	2003	53,019,560			178,000	53,197,560	0	-53,197,560	0	28,342,104	-28,342,104
6	2004	12,883,889	0	1,127,780	2,245,750	16,257,420	8,412,181	-7,845,239	3,828,988	7,399,921	-3,570,933
7	2005		0	1,256,583	2,245,750	3,502,333	14,525,492	11,023,159	5,648,608	1,361,972	4,286,636
8	2006		0	1,256,583	2,245,750	3,502,333	16,381,768	12,879,435	5,442,600	1,163,598	4,279,002
9	2007		0	1,256,583	2,245,750	3,502,333	18,238,044	14,735,711	5,176,772	994,119	4,182,653
10	2008		0	1,256,583	2,245,750	3,502,333	20,094,491	16,592,157	4,872,960	849,324	4,023,636
11	2009		0	1,256,583	2,245,750	3,502,333	21,950,767	18,448,433	4,547,792	725,619	3,822,174
12	2010		0	1,256,583	2,245,750	3,502,333	23,807,043	20,304,709	4,213,970	619,931	3,594,039
13	2011		1,112,000	1,256,583	2,245,750	4,614,333	25,663,319	21,048,985	3,880,913	697,799	3,183,115
14	2012		0	1,256,583	2,245,750	3,502,333	27,519,595	24,017,261	3,555,480	452,495	3,102,985
15	2013		3,846,000	1,256,583	2,245,750	7,348,333	29,376,041	22,027,708	3,242,534	811,111	2,431,423
16	2014		0	1,256,583	2,245,750	3,502,333	31,232,317	27,729,984	2,945,307	330,281	2,615,026
17	2015		5,148,000	1,256,583	2,245,750	8,650,333	33,076,885	24,426,551	2,664,932	696,938	1,967,993
18	2016		0	1,256,583	2,245,750	3,502,333	34,921,452	31,419,119	2,403,748	241,076	2,162,672
19	2017		0	1,256,583	2,245,750	3,502,333	36,766,227	33,263,893	2,162,125	205,963	1,956,162
20	2018		13,784,000	1,256,583	2,245,750	17,286,333	36,766,227	19,479,893	1,847,208	868,500	978,708
21	2019		0	1,256,583	2,245,750	3,502,333	36,766,227	33,263,893	1,578,160	150,335	1,427,825
22	2020		0	1,256,583	2,245,750	3,502,333	36,766,227	33,263,893	1,348,298	128,438	1,219,860
23	2021		0	1,256,583	2,245,750	3,502,333	36,766,227	33,263,893	1,151,917	109,731	1,042,186
24	2022		0	1,256,583	2,245,750	3,502,333	36,766,227	33,263,893	984,138	93,749	890,390
25	2023		3,846,000	1,256,583	2,245,750	7,348,333	36,766,227	29,417,893	840,797	168,047	672,750
26	2024		0	1,256,583	2,245,750	3,502,333	36,766,227	33,263,893	718,334	68,428	649,906
27	2025		1,112,000	1,256,583	2,245,750	4,614,333	36,766,227	32,151,893	613,708	77,023	536,684
28	2026		0	1,256,583	2,245,750	3,502,333	36,766,227	33,263,893	524,320	49,946	474,374
29	2027		5,148,000	1,256,583	2,245,750	8,650,333	36,766,227	28,115,893	447,952	105,394	342,558
30	2028		0	1,256,583	2,245,750	3,502,333	36,766,227	33,263,893	382,707	36,457	346,251
31	2029		0	1,256,583	2,245,750	3,502,333	36,766,227	33,263,893	326,965	31,147	295,819
32	2030		0	1,256,583	2,245,750	3,502,333	36,766,227	33,263,893	279,342	26,610	252,732
33	2031		0	1,256,583	2,245,750	3,502,333	36,766,227	33,263,893	238,656	22,734	215,922
34	2032		1,112,000	1,256,583	2,245,750	4,614,333	36,766,227	32,151,893	203,895	25,590	178,305
35	2033		-3,527,000	1,256,583	2,245,750	-24,667	36,766,227	36,790,893	174,198	-117	174,314
	Total	93,580,519	31,581,000	37,568,701	68,006,500	230,736,720	930,225,245	699,488,524	66,247,324	66,247,324	0

EIRR= 17.0%