3.3.6 Design of the Major Structures

The main facilities for the Master Plan of the new port are designed in the previous chapter (see, 2.5.10). In this section, two alternatives of the breakwater, that is, rubble mound type and caisson type are proposed and investigated technically and economically.

The rubble mound type needs a big amount of core stones and these materials can be obtained from the quarry in the hinterland of the new port. As core stones can be provided from the land side by end-on system ("forward" method) adding the dredged materials, the rubble mound would be formed easily.
However, the caisson type breakwater is composed of both the rubble mound and the caisson. Construction and setting of the caisson need the caisson yard and many kinds of working vessels, and the setting of the caisson should be done carefully at the right location on the sea. The construction method is complicated and the construction schedule should be controlled exactly.
Nevertheless, sometimes the caisson type is cheaper than the rubble mound type depending on the site condition. Above all, in the case of deep water depth the caisson type tends to be cheaper due to the reduction of stone volume.

In the case of new port, construction costs of breakwaters are compared by planned depth. The results indicate the construction costs of both types are almost equivalent as shown in Table 3.3.6-1.
Although both structural types are feasible technically, the rubble mound type is preferable due to its easy construction.

The standard cross sections of the breakwater shown in Fig. 3.3.6-1, -2 are selected as two alternatives for comparison.

Table 3.3.6-1 Comparison of Construction Costs of Breakwaters

Depth (m)	Rubble Mound Type	Caisson Type	
		w/o Concrete Blocks	W/ Concrete Blocks
-15	200	190	240
-12	150	140	190
-10	120	120	-
-8	100	100	-

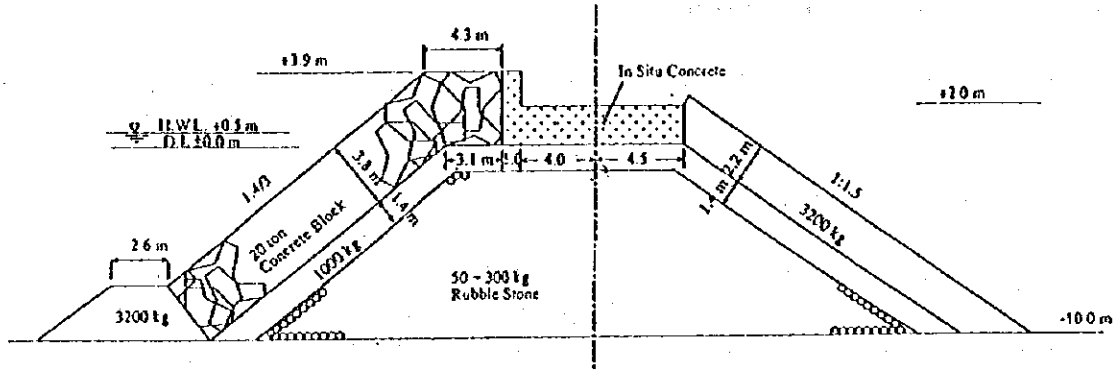

Figure 3.3.6-1 Standard Cross Section of Breakwater Rubble Mound Type (-10.0m)

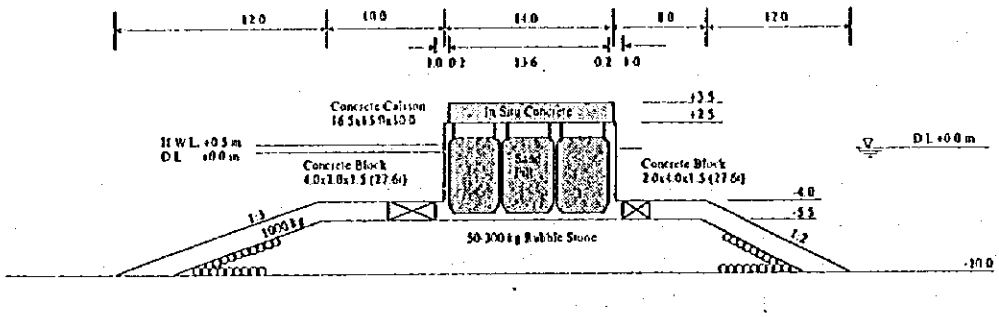

Figure 3.3.6-2 Standard Cross Section of Breakwater Caisson Type (-10.0m)

3.3.7 Design of Cargo Handling Equipment

(1) Phosphate Terminal

The phosphate which is mainly transported by trains from producing area will be stored in silo which is located at port area and will be loaded to ship through loaders.

1) Silo
Reinforced concrete type silo will be constructed at the behind of phosphate berths and its capacity is 169,000 t.(3,530 t/bin x 48 bins)

2) Loaders
Two units of phosphate loaders which is 400 t/h each will be installed on the each phosphate berth respectively and four units will be installed totally.

3) Others handling equipment
Wagon unloading equipment and others handling equipment such as belt conveyors,chain conveyors bucket elevators , dust collection equipment and other required equipment will be equipped at the terminal.

(2) Cement clinker

The cement clinker which is mainly transported by train from producing area will be stored in transit sheds which is located behind of the berth and will be loaded to ship through loaders.

1) Loaders
Two sets of cement clinker loader which is 350 t/h each will be installed on the cement clinker berth.

2) Belt conveyors for receiving and discharging
Two lines of overhead belt conveyor with tripper car for storing and an underground belt conveyor for discharge will be installed in each shed respectively.

3) Others handling equipment
Wagons and trucks unloading equipment and minor handling equipment(bulldozers shovel loader) will be equipped at the terminal.

(3) Pellet

The imported pellet which are unloaded by unloaders are stored in open yard through stacker cum reclaimers and will be mainly discharged by wagon to steel mill.

1) unloaders
Two sets of unloaders(500 t/h each) are installed on the pellet berth.

2) Stacker cum reclaimers
Three sets of stacker cum reclaimers (500 t/h each) are installed in the open yard and they can stacking or discharging the imported pellet.

3) Belt conveyors and wagon and truck loading equipment
Belt conveyors for unloaders, stacker cum reclaimers, wagon and truck loading and other and wagon and truck loading equipment will be equipped.

(4) Scrap

Three units of double link type level luffing cranes(11t) will be equipped for handling from/to ship, seven units of mobile cranes(65t) for yard handling and seven units of trailers for yard handling.

(5) Sulphur Terminal

The sulphur which is mainly transported by train from producing area will be stored in transit sheds which is located behind of the berth and will be loaded to ship through movable ship loaders.

1) Movable ship loaders
Three units of movable ship loaders which is 150 t/h each will be equipped on the sulphur berth.

2) Belt conveyors
One line belt conveyor for receiving from wagon and three lines overhead conveyors for storing in transit sheds will be installed.

3) Minor handling equipment
Seven units of shovel loaders and nine units of trucks will be equipped for handling in shed and between shed and apron.

(6) Oil cokes

All handling equipment for oil cokes are movable type and there are no fixed type handling equipment. Three movable ship loaders, three shovel loaders and nine trucks will be equipped for yard handling and loading to ship.

(7) Fertilizer

The bulk fertilizer which is transported by train(mainly) from producing area will be stored in transit sheds which is located behind of the berth and will be loaded to ship through movable ship loaders. Bagged fertilizer will be handled at general

cargo berth using mobile cranes and forklift trucks.

1) Movable ship loaders
Three units of movable ship loaders which is 150 t/h each will be equipped on the fertilizer berth.

2) Belt conveyors
One line belt conveyor for receiving from wagon and three lines overhead conveyors for storing in transit sheds will be installed.

3) Minor handling equipment
Three units of shovel loaders and nine units of trucks will be equipped for handling in sheds and between shed and apron.

Remarks: All tire-mounted minor handling equipment at the scrap berth, sulphur terminal, oil cokes berth and fertilizer terminal will be used in common with another berth. Then the net procured number of equipment shall be decided on the cargo volume of each cargo.

3.3.8 Implementation Program

The construction quantities for main facilities in the new port area are shown in Table 3.3.8-1.

Implementation schedule is largely restricted by the dredging and reclamation. Planned dredging areas consist of upper sand layer and lower rock layer. Rock dredging of around 2,111,000 m^3 and sand dredging of around 2,192,000 m^3 are planned.

Reclamation volume reaches up to 12,748,000 m^3. Although dredged materials are used for the reclamation, reclamation materials of around 8,445,000 m^3 are necessary furthermore. These materials are planned to be supplied from the neighboring water areas by using the pump cutter dredgers. After the completion of the detailed design in 1998, the construction of the port facilities is to start in 1999 and be completed by the end of 2003.

The construction schedule is shown in Fig. 3.3.8-1.

Table 3.3.8-1 Construction Quantities

Facilities	Unit	Quantities
Breakwater	m	2,730
Main Breakwater	m	1,950
Sub-Breakwater	m	780
Dredging:	m^3	4,302,950
Rock	m^3	2,111,105
Sand	m^3	2,191,845
Reclamation	m^3	12,748,000
Wharf:	m	2,640
-14m	m	1,120
-12m	m	480
-10m	m	740
-4.5m	m	300
Revetment	m	2,090
Pavement	m^2	2,153,050
Railway	m	12,550
Road	m	4,100
Utilities	L.S.	1

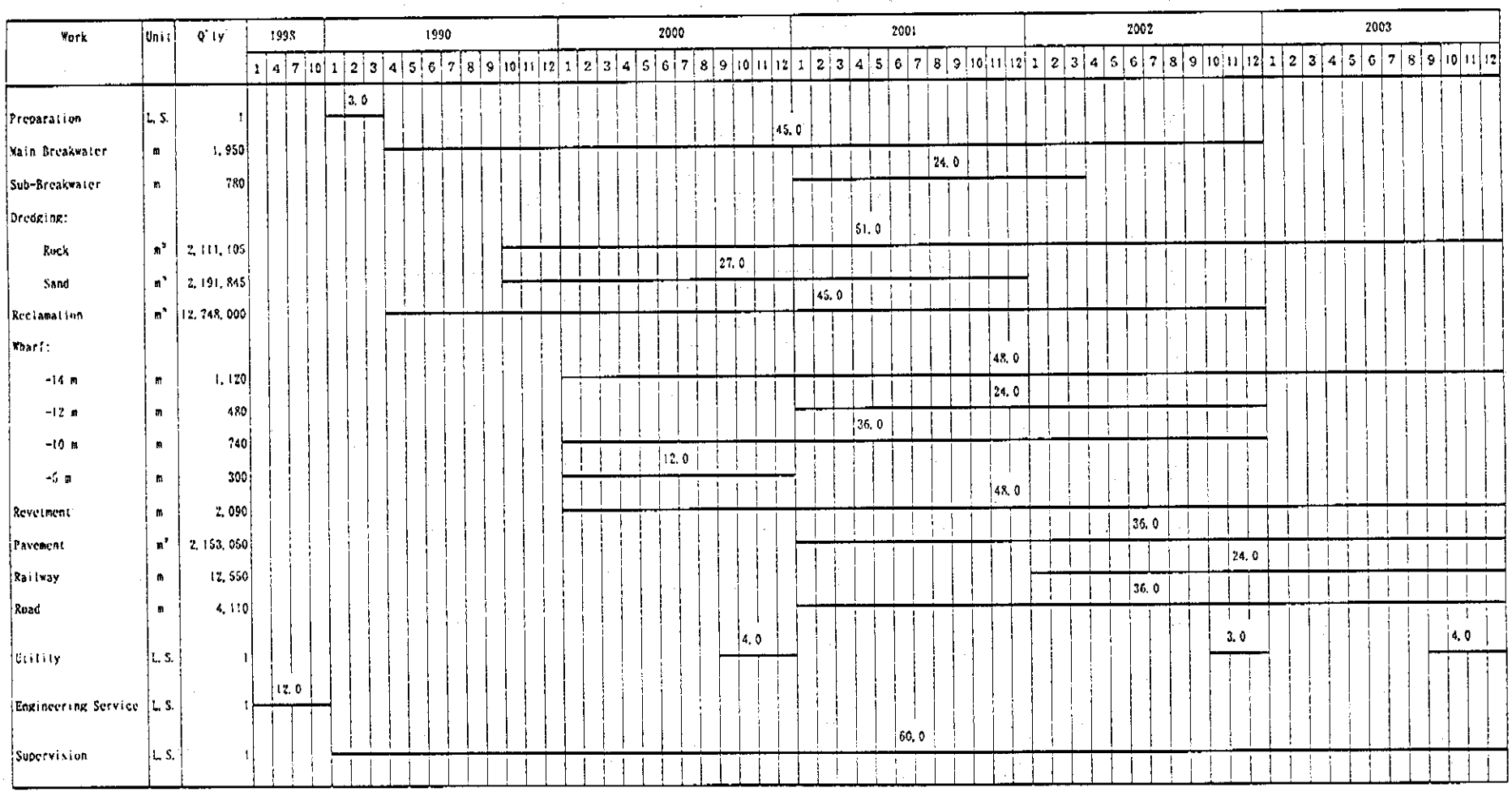

Figure 3.3.8-1 Construction Schedule for New Port

3.3.9 Cost Estimation

(1) Unit Price of Main Facilities

The cost estimate is carried out, and the unit price of main facilities are shown as below:

(2) Total Cost

The total cost of Short-Term Plan is estimated as around 19,345 Millions S.P, and is tabulated in Table 3.3.9-1.

(3) Yearly Investment

The yearly investment based on the implementation program in Chapter 3.3.8 is shown Table 3.3.9-2.

Facilities	Unit	Unit Price		
		F.C	L.C	Total
Dredging Wharf(-14m)(Rock)	S.P/m^3	1,000	0	1,000
Pellet(-14m)	S.P/m	350,000	898,000	1,248,000
Fertilizer(-12m)	S.P/m	380,000	800,000	1,100,000
General Cargo(-10m)	S.P/m	170,000	690,000	860,00
Loader				
Phosphate(400t/h)	1,000 S.P/Unit	54,600	0	54,600
Pellet(500t/h)	1,000 S.P/Unit	210,000	0	210,000
Scrap(11t)	1,000 S.P/Unit	117,600	0	117,600
Silo				
Phosphate(Concrete)	1,000 S.P/Unit	0	420,000	420,000

Table 3.3.9-1 Total Cost of New Port

NEW PORT

No.	Facilities	Unit	Q'ty	Unit Cost (S.P)			Cost (Unit: 1,000 S.P)		
				F.C	L.C	Total	F.C	L.C	Total
A	Civil Works				19,345,112				
1	Breakwater								
	Main Breakwater	m	1,950	0	1,225,000	1,225,000	0	2,388,750	2,388,750
	Sub Breakwater	m	700	0	980,000	980,000	0	686,000	686,000
	Breakwater (Small Vessel)	m	80	130,000	510,000	640,000	10,400	40,800	51,200
	Sub-Total						10,400	3,115,550	3,125,950
2	Dredging								
	(Rock)	m^3	2,111,105	1,000	0	1,000	2,111,105	0	2,111,105
	(Sand)	m^3	2,191,845	350	0	350	767,146	0	767,146
	Sub-Total						2,878,251	0	2,878,251
3	Reclamation								
	(Reclamation)	m^3	7,870,000	0	300	300	0	2,361,000	2,361,000
	(Add. Recla)	m^3	575,000	0	250	250	0	143,750	143,750
	Sub-Total							2,504,750	2,504,750
4	Wharf								
	Pellet(-14m)	m	280	350,000	898,000	1,248,000	98,000	251,440	349,440
	General Berth(-10m)	m	185	170,000	690,000	868,000	31,450	127,650	159,100
	Scrap(-10m)	m	185	170,000	690,000	868,000	31,450	127,650	159,100
	Clinker(-14m)	m	280	350,000	898,000	1,248,000	98,000	251,440	349,440
	Fertilizer(-12m)	m	240	380,000	800,000	1,180,000	91,200	192,000	283,200
	Phosphate(-14m)	m	560	350,000	898,000	1,248,000	196,000	502,858	698,888
	General/Coke(-10m)	m	370	170,000	690,000	860,000	62,900	255,300	318,200
	Sulphur(-12m)	m	240	380,000	800,000	1,180,000	91,200	192,000	283,200
	Small Vessel(-4.5m)	m	300	136,000	474,000	610,000	40,800	142,200	183,000
	Sub-Total						741,008	2,042,560	2,783,560
5	Revetment								
	(1)	m	650	0	800,000	800,000	0	520,000	520,000
	(2)	m	270	0	200,000	200,000	0	54,000	54,000
	(3)	m	450	350,000	898,000	1,248,000	157,500	404,100	561,6000
	(4)	m	270	0	160,000	160,000	0	43,200	43,2000
	(5)	m	450	0	128,000	128,000	0	57,600	57,6000
	Total of Revetment						157,500	1,078,900	1,236,4000
6	Apron/Yard/Open Space								
	(Pavement)	m^2	1,343,050	0	750	750	0	1,007,287	1,007,287
	(Add. Pave)	m^2	810,000	0	750	750	0	607,500	607,500
	Sub-Total						0	1,614,788	1,614,788
7	Railway	m	12,550	0	1,664	1,664	0	20,883	20,883
8	Road	m	4,100	0	1,200	1,200	0	4,920	4,920
9	Mobilization	LS	1	5,000,000	0	5,000,000	5,000	0	5,000
	Total of Civil Works						3,542,251	10,382,351	13,924,601
B	Building								
1	Storage	m^2	66,300	0	10,000	10,000	0	663,000	663,000
2	Phosphate Silo (Concrete)	LS	1	0	420,000,000	420,000,000	0	420,000	420,000
3	Machinery Tower	LS	1	0	115,500,000	115,500,000	0	115,500	1115,5000
	Total of Build						0	1,198,500	1,198,500
C	Utilities	LS	1				0	272,011	272,011
D	Cargo handling Equipment								
	Total of HE	LS	1				3,200,000	0	3,200,000
E	Port Service Facilities	LS	1				130,000	20,000	150,000
F	Physical Conti/Engineering	LS	1				360,000	240,000	600,000
G	Grand Total						7,482,151	12,112,861	19,595,012

Table 3.3.9-2 Yearly Investment Schedule

(Unit:1,000 S.P.)

Items	1998		1999		2000		2001		2002		2003		Total	
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C
Civil Works			738,430	2,076,000	758,430	2,076,000	758,430	2,076,000	758,430	2,076,000	758,430	2,078,351	3,792,150	10,382,351
Buildings								399,500		399,500		399,500	0	1,198,500
Utilities										136,000		136,011	0	272,011
Port Service Facilities											130,000	20,000	130,000	20,000
Cargo Handling Equipment							494,600		1,000,900		1,704,500		3,200,000	0
Physical Contingency and Engineering Fee	60,000		60,000	48,000	60,000	48,000	60,000	48,000	60,000	48,000	60,000	48,000	360,000	240,000
Grand Total	60,000	0	818,430	2,124,000	818,430	2,124,000	1,313,030	2,523,500	1,819,330	2,659,500	2,652,930	2,681,862	7,482,150	12,112,862
Investment	60,000		2,942,430		2,942,430		3,836,530		4,478,830		5,334,792		19,595,012	

3.3.10 Economic Analysis

(1) Costs of the Projects

The items that should be considered as costs of the projects are construction costs, maintenance and operation costs and renewal investment costs.

(2) Benefits of the Projects

If the new port is not constructed, it is the reasonable to assume that the cargoes which are planned to be handled in the new port would have to be handled in Tartous Port because those cargoes are handled there now. Therefore, in the "Without" case, the handling cargoes of Tartous Port combined with the cargoes handled in New Port are set as objects of economic analysis. After calculating the combined benefits, the benefits of New Port are estimated by subtracting the substantial benefits of Tartous Port from the combined benefits.
In the "Without" case, transit cargoes in export are not handled, and the size of vessels and the working efficiency of cargo handling are not the same as in the "With" case.
The items that should be considered as benefits of the projects are savings in waiting costs of ships and savings in water transportation costs by enlargement of ship size.

Table 3.3.10-1 Costs and Benefits by the projects

(Unit: Million SP)

Cost		Bnefit		
Item	Cost	Item	Year	Benefit
Construction	18,797.7	Ship Waiting	2004	3,284.8
Maintenance	380.7		2010 & over	3,386.8
Renewal: 7years	728.4	Ship Size	2004	701.9
17years	1,518.3		2010 & over	784.1
		Total	2004	3,986.7
			2010 & over	4,170.9

(3) Evaluation of the Projects

Economic evaluation of a project is carried out by calculating EIRR. The EIRR of the short-term plan was calculated as 14.8 %. EIRR of this project exceeds 10 %, which is considered to be the general standard evaluating the project. Therefore, the short-term plan is feasible from the viewpoint of the national economy.

3.3.11 Financial Analysis

3.3.11.1 Purpose of the Financial Analysis

See chapter 3.1.14.1

3.3.11.2 Methodology of the Financial Analysis

See chapter 3.1.14.2

3.3.11.3 Prerequisites of the Financial Analysis for the New Port

(1) Scope of the Financial Analysis

See chapter 3.1.14.3

(2) Prerequisites of the Financial Analysis for the New Port

1) Project Life
Taking into account the conditions of the long-term loans and the service lives of the port facilities, the project life for the financial analysis is determined as 35 years from the beginning of the project including four years of detailed design and construction of the port facilities.

2) Base Year
See chapter 3.1.14.3.(2)2)

3) Fund Raising
See chapter 3.1.14.3.(2)3)

The following table shows the weighted average interest rate of the funds for investments when above funds are applied.
Average Interest Rate

Average Interest Rate	4.28 %

4) Cargo Handling Volume
See chapter 17.2.1 - 17.2.7

(3) Expenditure

1) Maintenance and Repair
The annual maintenance and repair costs for the port facilities are calculated as follows:

Infrastructure : 1% of the construction cost

Equipment : 2% of the procurement cost

The planned facilities will start to be operated from the year 2004.

2) Personnel Cost and Administration Cost
See chapter 3.1.14.3.(3) 3)

3) Depreciation
See chapter 3.1.14.3.(3)3)

(4) Revenue

See chapter 3.1.14.3.(4)

(5) Tax

See chapter 3.1.14.3.(5)

3.3.11.4 Appraisal of Project

3.3.11.4.1 Viability of Project

(1) Financial internal Rate of Return (FIRR)

This exceeds the weighted average interest rate of funds.

W. Ave. Interest Rate	New Port
4.28 %	7.69 %

(2) Sensitivity Analysis

Sensitivity analysis is conducted to examine the impact of unexpected future changes. (For example, cargo volume or construction cost) The following cases are envisioned.

1) The project costs increase by 10%.
2) The revenue decrease by 10%.
3) The project costs increase by 10% and the revenue decrease by 10%.

< Result of Sensitivity Analysis >

Case	New Port
Base Case	7.69 %
1) Cost +10 %	6.77 %
2) Revenue -10 %	6.48 %
3)Cost +10 % & Revenue -10 %	5.61 %

< Prerequisites of Tariff >

New Port	1)Handling fees 2)Charges from Vessels 3)Storage fees All these are based on the *current tariff standard.

Note : * Issued Oct. 24th, 1995.

All the cases exceed the weighted average interest rate.

(3) Evaluation

Judging from the above analysis, New Port is regarded as financially feasible under the current tariff.

3.3.12 Environmental Impact Assessment

The IEE showed that an EIA was necessary. Some data was available but insufficient for the EIA and so further surveys were carried out. The existing seawater quality, seabed sediment quality, freshwater quality and air quality were assessed. An ecological survey was conducted to ascertain the existing flora and fauna.

The area is composed of a sand and rock foreshore with low sand dunes. The hinterland is mainly agricultural land for vegetables and cereals. The main north south road to Lebanon forms a boundary between the coastal strip and the agricultural area. The main residential areas are Hamidie and Shatalarab to the north and Al Kharabeh to the south. The population density is low. To the south of the area is the small river which forms the boundary with Lebanon. To the east is a small wetlands area. It is not designated as a Specially Protected Area for ecological reasons. The main highway and railway line are located some 5km from the site.

The existing water quality and sediment quality were assessed by the site survey. In general the water quality was good. There are no sources of pollution in the area. The suspended sediments in the seawater were high due to the heavy rainfall. The sediment analysis showed that heavy metals were not present in large amounts. Mercury and arsenic were not detected.

Air Quality was assessed at three locations near the site. Naturally occurring dust levels were very high due to the strong winds which were blowing at the time of the survey. This is a common occurrence.

The new port will have two breakwaters enclosing a frontage of 1.8 km. Reclamation will be constructed out to a distance of 1.1 km. Some dredging will be necessary. Access roads and the railway line connections will be located on the eastern and northern side of the main road.

The existing ambient air quality is highly variable due to the high winds which can occur. Dust levels can naturally be very high. Dust control measures are recommended on all dusty cargo handling plant. If this is implemented to a standard of 99.9% efficiency then dust nuisance is not expected to occur.

Existing water quality is moderate to good although not extremely high. Biological contamination and high levels of suspended solids occur. Dredging will cause some increase in turbidity. This is not considered significant as the marine environment is not considered ecologically sensitive.

If additional material is required for reclamation this must be obtained from a local source. The effect of this can be similar to quarrying and can be disruptive. The

location of borrow pits should be approved by the port authority at the time of construction.

The flora and fauna that may be affected by the development has been assessed. The western area has little natural shelter from trees and bushes and the soil is not fertile. The species diversity and number of creatures is low. The ecological value is low. The eastern area has a more diverse population of flora and fauna. However this is mainly domestic animals with few naturally occurring species. The area is almost completely changed from its natural state due to the activities of man for farming.

The land is productive with the exception of the central area which is flooded in wintertime. This flooded area provides a lagoon for several thousand seagulls and some migratory birds. But it is of moderate ecological value.

Economically, the western area is of little value for agriculture. The eastern area is of high value with the exception of the lagoon area in the centre. The area is used during both summer and winter. The total income from the area used for hothouses is approximately 250,000 US dollars per year.

The planned activities at the new port that may have significant impacts are dust generation, dredging, quarrying of material for reclamation, acquisition of agricultural land for roads and railway, and the construction activities. The degree of these impacts has been examined and where appropriate mitigation measures have been recommended.

The site is considered suitable for the site of the new port. There are no environmental reasons why the project should not proceed and the proposal is considered feasible.

3.4 Port Management and Operation in the Short-term Plan

3.4.1 New Port Administrative Body

(1) Organization

1) The Conception of the Newly Established Port Corporation
The organization of the new port corporation is based on the following premises.

① The new port corporation reclaims necessary land and prepares the infrastructure including the fundamental facilities.
② The state-owned companies operate each terminal. They are in charge of the usual maintenance and repairs.
③ In principal, the new port corporation makes the port plan and prepares the fund for the renewal investment and the renewal design
④ The new port corporation ordinarily adjusts the port activities and the allotments of tugs. It also operates the public berth and maintains and repairs facilities of the port.

2) Proposed Organization of the New Port Corporation
The administrative section of the new port corporation succeeds in the preparatory organization for the opening. Basic staff members of administration are relatively fixed, whereas the other sections' number of personnel, for instance the section in charge of cargo handling, increases as the cargo volume increases. However the expected volume of general cargo is not so much and computerized system should be adopted from the beginning. Therefore personnel number of the new port corporation should be kept to a minimum at the first stage.

3.4.1.1 Latakia Port

A) Basic Concept on Organization of Cargo Handling in the Short-term Plan

a) Conventional Break Bulk Berths and Grain Terminal
The basic concept on organization of cargo handling at break bulk berth and grain terminal in Latakia Port in the Short-term Plan is the same as that in the Master Plan.

b) Container Terminal
The only difference in Major functions between the Master Plan and the Short-term Plan is the repairing of containers. Because there is no repair shop in the Short-term Plan, containers can't be repaired at the container terminal.

B) Number of Cargo Handling Workers(including Drivers of Cargo Handling Equipment) for Conventional General Cargo.
There are about 1,400 cargo handling workers and 850 drivers of cargo handling equipment for conventional general cargo in the Short-term Plan.

C) Number of Employees at Grain Terminal in the Short-term Plan
Organization of Grain Terminal at Latakia Port in the Short-term Plan is the same as that in the Master Plan. Therefore, the number of employees at grain terminal in the Short-term Plan is the same as in the Master Plan.

D) Number of Employees at Container Terminal in the Short-term Plan
The number of employees at the container terminal in the Short-term Plan is decided considering the changes in the organization and in the number of cargo handling equipment.

The number of employees at container terminal in Latakia Port in the Short-term Plan is shown in Table 3.4.1.

Table 3.4.1 Required Number of Employees at Container Terminal in the Short-term Plan

unit:persons

Section	Employees
Maneger of Container Terminal Division	1
Administration Department	10
Operation Department	168
Maintenance Department	12
C. F. S. Department	16
Total	207

3.4.1.2 Tartous Port

A) Basic Concept on Organization of Cargo Handling

a) Conventional Break Bulk Berths and Grain Terminal
The basic concept on organization of cargo handling at break bulk berth and grain terminal in Tartous Port in the Short-term Plan is the same as that in the Master Plan.

b) Multi-purpose Terminal
The difference in major functions between the Master Plan and the Short-term Plan is as follows:
-In the Master Plan, the terminal is exclusively used for containers. In the Short-term Plan, the terminal is used for containers and conventional break bulk cargoes.
-In the Master Plan, the terminal has a repair shop for container boxes. However, there is no repair shop in the Short-term Plan, therefore, the container box can't be repaired at the terminal.

B) Number of Cargo Handling Workers(including Drivers of Cargo Handling Equipment) for Conventional General Cargo.
There are about 1,200 cargo handling workers and 750 drivers of cargo handling equipment for conventional general cargo in the Short-term Plan.

C) Number of Employees at Grain Terminal in the Short-term Plan
Organization of grain terminal at Tartous Port in the Short-term Plan is the same as that in the Master Plan. Therefore, the number of employees at grain terminal in the Short-term Plan is the same as in the Master Plan.

D) Number of Employees at Multi-purpose Terminal in the Short-term Plan
The number of employees at the multi-purpose terminal in the Short-term Plan is decided considering changes in the organization and in the number of cargo handling equipment at the container terminal in the Master Plan.

The number of employees at the multi-purpose terminal in Tartous Port in the Short-term Plan is shown in Table 3.4.2.

Table 3.4.2 Required Number of Employees at Multi-purpose Terminal in Tartous Port in the Short-term Plan

unit:person

Section	Employees
Manager of Mutipurpose Terminal Department	1
Administration Section	9
Operation Section	116
Maintenance Section	10
Shed Section	14
Total	150

3.4.1.3 New Port

In the Short-term Plan, packing style, cargo handling system, cargo handling productivity and number of berths are almost the same as those of the Master Plan. There is not so much difference in the cargo handling volume per commodity between the Master Plan and the Short-term Plan.

Therefore, the number of cargo handling workers in the Short-term Plan is almost the same as that in the Master Plan.

3.4.2 Human Resources Development in the Short-term Plan

3.4.2.1 Cargo Handling Operation

For the personnel at a control office, it is necessary to invite several foreign experts to assist in on-the-job training. For the operators of newly introduced cargo handling equipment, manufacturers generally dispatch operational instructors in the beginning of the operations. They will transfer operational skills mainly by on-the-job training using machines newly procured. Prior to on-the-job training, it is advisable to teach the theory of the newly introduced technology in the various fields for the employees by experts. Once personnel of the new terminals obtain the above technology of cargo handling operations from foreign experts, some of them could in turn become instructors for new comers who will be recruited or transferred from other sections thereafter.

3.4.2.2 Training of Computer Operation

(1) On-line Operation of Terminal Computer of Port Network System

The company compiling programs and setting up net work systems should dispatch instructors to every section where terminal computers are installed. Participants of the course need to become instructors at their sections for other employees.

(2) Off-line Operation of Terminal Computer

Computers can change manual work at administration section more efficiently. Therefore all the staff members of administrative section have to be able to operate computers. On-the-job training is the most effective method to learn how to operate a personal computer.

3.4.2.3 Administration Work

For human resource development for administration staff, it is recommendable to dispatch high level personnel to other advanced foreign ports whose administrative work are very efficient. After returning home, they have to inform other staff members of administration section. Important thing is that visiting foreign ports would be the motivation to improve work more efficiently.

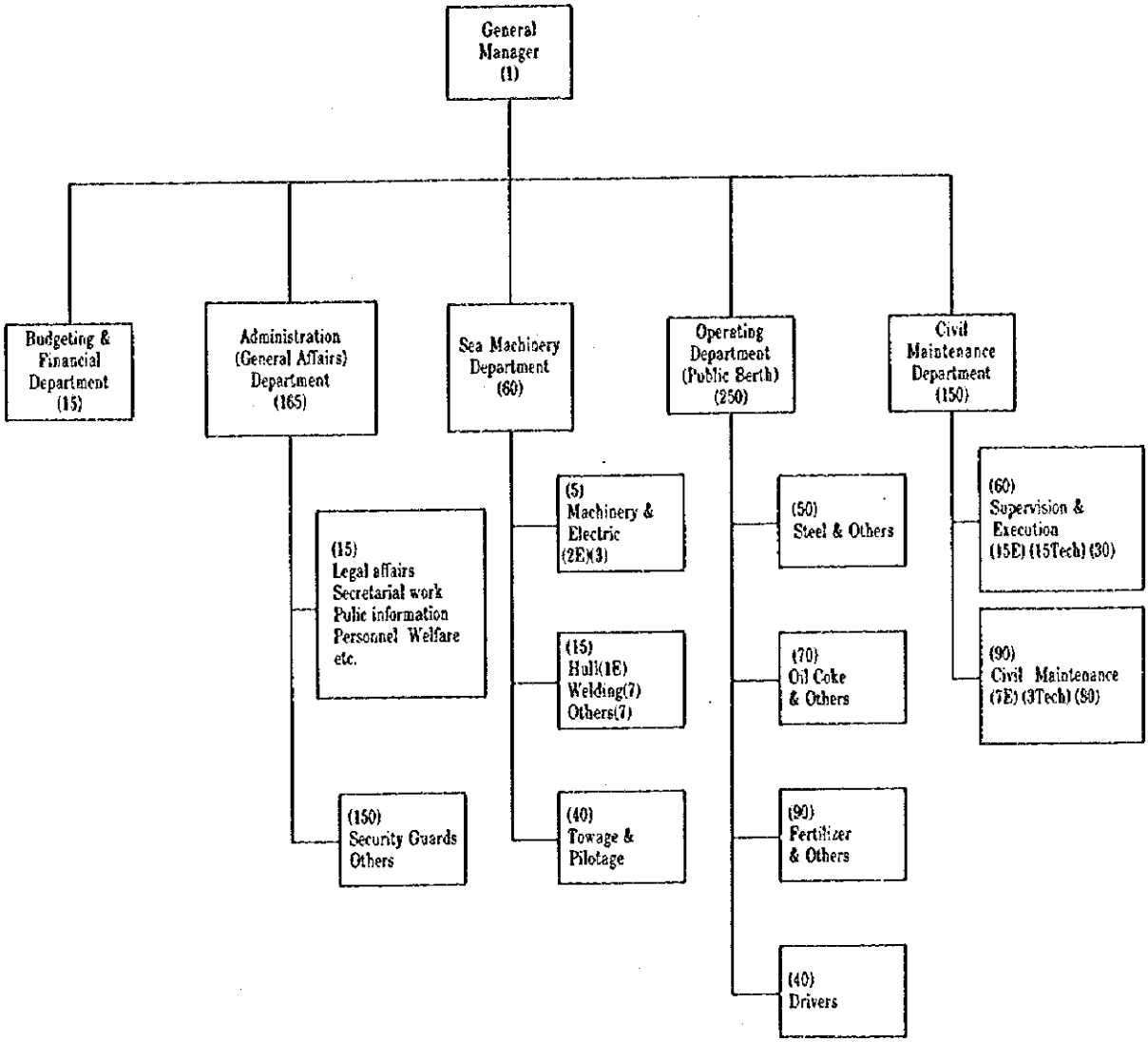

Figure 3.4.1 Proposed Organization of the New Port Corporation

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. Necessity of Development of the Study Ports

1.1 Latakia Port

The volume of cargo through Latakia Port has shown a considerable increase recently and is expected to continuously increase for the future.

1. Along with a long-term program of gradual economic liberalization which has been under way since the late 1980's including the Law No.10 for Encouragement of Productive Investment enacted in 1991, the Syrian economy has achieved stable growth since the late 1980's (the average annual growth rate of Gross Domestic Product (GDP) from 1987 to 1993 is 5.3%). From 1987 to 1994, the volume of cargo which passed through Latakia Port recorded average annual increase rates of 10.7% in imports and 19.8% in exports, with 2.4 million tons in imports and 500,000 tons in export in 1994.

2. The volume of cargo through the port is expected to continuously increase in future; projected volumes in the years of 2003 and 2010 are 6.6 million tons and 10.8 million tons, respectively.

There is a shortage or nonexistence of the required cargo-handling machines at present, resulting in inefficient cargo-handling operations.

3. Due to the lack of port facilities and equipment to receive the port cargo, especially cargo-handling equipment, swift, economical and safe cargo-handling operations within the port are impossible. Even with the present demand costly ocean-going vessels are forced to berth for long times, or risk damage to cargo.

It is necessary to develop Latakia Port to resolve the present problems and meet increasing demand for the port.

4. Thus, to resolve the present problems in Latakia Port and meet increasing demand for the port in the foreseeable future under the worldwide renovations of maritime transport and port business, it is necessary to develop Latakia Port. The matters are outlined by type of cargo-handling as follows:

(1) Container-Handling

Despite the recent sharp increase in the number of containers through Latakia Port, quay-side container cranes have not yet been installed, causing inefficient container-handling and consequent long berthing times of costly container vessels.

5. Although, in 1994, the number of containers which passed through the port amounted to around 134,000 TEUs (an increase of 13.9% over the preceding year), quay-side and rail-mounted container gantry cranes have not yet been installed at the container terminal in the new port area. Containers are mainly discharged/loaded from/onto container vessels by using ship cranes/derricks which have a lower container-handling productivity compared with that of a quay-side crane. This results in longer berthing times for costly container vessels.

6. Within the container marshaling yard behind the quays Nos 13-15, straddle carriers which can not receive/hand container boxes directly from/to ship cranes/derricks due to the insufficient reach lengths are used, and hence, forklift trucks are needed to hand over the boxes between ship cranes and straddle carriers. Container boxes are also lifted directly onto/from tractor-trailer units by ship cranes, then/before being hauled to/from stacking places within the marshaling yard. These complicated or inefficient container-handling yard operations are also contributing to longer berthing times of container vessels.

The modern container terminal operation system is not yet introduced into Latakia Port.

7. In addition to the insufficient container-handling machines mentioned above, containers are received/delivered from/to shipping lines alongside a container vessel based on "berth terms" or "F.O. (free out) terms" contract between shipping lines and consignees/consignors; the modernized container receipt/delivery system is not yet adopted in which containers are received/delivered from/to shipping lines at a gate of a container terminal wholly controlled by a terminal operator that takes full responsibility for handling and storing containers after receipt or before delivery at the gate (referred to as "the closed terminal operation system"). The closed terminal system enables swift container-loading/unloading onto/from a costly container vessel by making a loading/unloading plan before a vessel arrival based on an adequate yard plan and inventory control of container boxes.

It is necessary to modernize the existing container terminal in the stage of the Short-Term Plan, then, to establish a full-scale new container terminal in the stage of the Master Plan.

8. Thus, to resolve the present problems mentioned above, meet a continuously increasing demand in container-handling and achieve economical, safe and reliable operations for the port users, it is necessary to modernize the existing container terminal at the new port area in the stage of the Short-Term Plan through the introduction of the closed terminal system and preparation of the required container-handling machines. Then, it is necessary to establish a full-scale new container terminal with a spacious yard, sufficient water depth and sufficient container-handling machines to meet the future demand in the stage of the Master Plan.

(2) Grain-Handling

Notwithstanding that a large amount of grains is required to be handled at Latakia Port, the grain-handling capacity of its existing grain terminal is much lower than required.

9. The year of 1995 was a rich harvest year and around 2 million tons of cropped wheat is required to be exported through the existing two ports, Latakia and Tartous by the next harvest season. In parallel to the export, grains mainly comprising maize are also required to be imported during the same period (in 1994, 582,000 tons through the two ports). The yields of grains are expected to increase in future owing to the extension of irrigated areas.

10. Notwithstanding that a large amount of grains is required to be handled at the two ports, the total grain-handling capacity of the existing grain terminals of the two ports is much lower than the required one. The grain terminal of Latakia Port whose hinterland is fertile farmlands has only shiploaders (two units of nominal capacity of 150 tons/hr each) connected with silos of 35,000 ton storage capacity. Hence, imported grains in bulk are directly unloaded onto trucks through portable pneumatic unloaders of 100 tons/hr capacity each, hauled to the silos and then stored, resulting in long berthing times of grain carriers and costly dock-side operations. Even in case of exports, loading capacity of the existing shiploaders is very small and obsolete, and moreover a water depth of 8.5m (MSL) along the existing grain dolphin is very shallow, which can narrowly receive a grain carrier of 10,000 DWT in full loaded condition, because those facilities were designed and constructed in 1956 when vessels were smaller.

It is necessary to construct a new grain terminal first and then modernize the existing terminal.

11. Hence, to meet the demand for grain-handling, it is necessary to modernize grain-handling in Latakia Port. Considering that the present grain-handling operations at the existing terminal can not stop without a substitute terminal, it is proposed to construct a new terminal first, then modernize the existing terminal in the stage of the Short-Term Plan so as to utilize the existing facilities as much as possible.

(3) Handling of Conventional Cargo

The quay-side cranes installed in the old port area need to be renewed.

12. The quay-side cranes installed in the old port area are already obsolete or out of order, since they were built in 1957. Hence, they need to be renewed.

It is necessary to construct additional general cargo berths in the stage of the Master Plan.

13. The existing berths at the old port area and the new port area for handling conventional cargo is sufficient to receive the cargo for the time being. In the stage of the Master Plan, however, despite the anticipated progress of containerization, it is forecast that a considerable volume of general cargo in break-bulk still needs to be received in the stage of the Master Plan. To make the most of the existing conventional berths, half of berths with spacious open yards behind them in the new port area need to be allocated for long and/or heavy cargoes mainly comprising iron/steel and wood products on priority basis. Hence, existing conventional berths usable to general cargo in break-bulk in the stage are limited to berths in the old port area and the remaining half of the new port area. Thus, to meet the forecast demand in the stage, it is necessary to construct additional general cargo berths.

(4) Passenger Service

It is necessary to shift the passenger terminal to a place close to the outside common road by constructing a new terminal with a passage for passengers in view of safety.

14. The existing passenger terminal which was constructed in 1963 is placed on the berth at the old port area without a passage connected to the outside of the port to separate the flows of passengers and cargo. Hence, it is necessary to shift the passenger terminal to a place close to the common road running outside the port by constructing a new terminal with a passage specialized for passengers in view of safety.

1.2 Tartous Port

The volume of imports through Tartous Port has shown a steady increase recently and is expected to continuously increase for the future. As to exports through the port in the future, grains are expected to replace phosphate rock as the major export cargo.

15. Along with the economic growth in Syria since the late 1980's as mentioned previously, the volume of cargo which passed through Tartous Port from 1987 to 1994 recorded an average annual increase rate of 6.2% in imports or 2.6 million tons in 1994. The volume of exports in the same period followed the fluctuation of phosphate rock shipment, decreasing to 830,000 tons from 1.6 million tons till 1993 and then gradually recovering.

16. The volume of cargo through the port is expected to continuously increase for the future; the volumes to pass in the years of 2003 and 2010 are estimated as 4.5 million tons and 7.6 million tons, respectively. As to exports through the port in the future, grains are expected to replace phosphate rock as the major export cargo from the stage of the Short-Term Plan.

There is a shortage or nonexistence of the required cargo-handling machines at present, causing inefficient cargo-handling operations.

17. As to the existing port facilities to receive the port cargo, there is a shortage or nonexistence of them, especially in cargo-handling machines even to meet the present demand, the same as at Latakia Port. In addition, Tartous Port has a problem of phosphate dust emission.

It is necessary to develop Tartous Port to resolve the present problems and meet increasing demand for the port.

18. Thus, to resolve the present problems in Tartous Port and meet increasing demand for the port in the foreseeable future, it is necessary to develop Tartous Port. The matters are outlined by type of cargo-handling as follows:

(1) Container-Handling

Quay-side cranes for handling containers are not yet installed in Tartous Port. In addition, the container marshaling yard is allocated at the bottom of the pier, not behind the berths of the pier. This contributes to time-consuming operations and consequent longer berthing times of costly container vessels.

19. Although, the degree of containerization of the cargoes which pass through Tartous Port still remains at a modest level, the number of containers has recently shown a steady increase, reaching around 23,000 TEUs of containers through the port in 1994, an increase of 7.2% from the preceding year.

20. At Tartous Port, containers are mainly discharged/loaded from/onto container vessels by using ship cranes/derricks and as mentioned previously, their container-handling productivity is much lower compared with that of a quay-side crane. In addition, the container marshaling yard is not allocated just behind the berths of the pier, but placed adjacent to the bottom end of the pier. In the marshaling yard, straddle carriers are used, but they can not approach the dock-side. Thus, tractor-trailer units are used to haul container boxes between the dock-side and the marshaling yard where straddle carriers receive/hand over containers from/to the tractor-trailer units. Container boxes are lifted directly onto/from tractor-trailer units by ship cranes/derricks. These complicated and time-consuming operations are contributing to low container-handling productivity and consequent longer berthing times of costly container vessels.

It is necessary to modernize the current container-handling by the preparation of a multi-purpose terminal in the stage of the Short-Term Plan, then to convert the terminal to a full-scale new container terminal in the stage of the Master Plan.

21. Thus, to resolve the present problems mentioned above and meet a continuously increasing demand in container-handling, it is necessary to modernize the current

container-handling. In the stage of the Short-Term Plan, the number of containers is forecast to still remain at the modest level and therefore it is premature to establish a full-scale container terminal. In a transitional period towards the establishment of the full-scale container-terminal, it is necessary to prepare a multi-purpose terminal to handle both containers and long and heavy products as iron and steel, then to convert the terminal to a full-scale new container terminal in the stage of the Master Plan.

(2) Phosphate-Handling

Despite the recent recovery of phosphate rock export, the shortage of phosphate-handling capacity at Tartous Port often induces the refusal of purchase offers of phosphate rock.

22. A great part of the phosphate rock produced in Syria has been exported. The volume of exported phosphate rock peaked in 1988, recording 1,763,000 tons, mainly shipped from the phosphate terminal at Tartous Port. Since then to 1993, export of phosphate rock in Syria has shown a continuous downward trend, presumably caused by the political and economic chaos in Eastern Europe and Russia which were major importers of Syrian phosphate rock. Hence, the company is now extending its market of phosphate export to Western Europe in addition to its old trade partners, Eastern Europe and Russia. Thus, the volume of phosphate rock exported through Tartous Port bottomed out in 1993, and has been increasing gradually since then. The phosphate company, however, is facing the shortage of phosphate shipment capacity due to the shortage of silo capacity and locomotives/railway wagons. To extend the market of phosphate to the Western Europe, presently, phosphate must be stored in silos separately before shipment, according to ten degrees of quality, whereas phosphate was classified into only one degree in the past when the Eastern Europe and Russia were major importers, resulting in the shortage of silo storage capacity and consequent refusal of purchase offers from importers.

It is strictly required to prevent the current dust emissions from the existing phosphate terminal at Tartous Port.

23. In the meantime, phosphate dust which is harmful to both humans and agriculture is often emitted from the phosphate terminal through its operations due to the use of facilities designed without considering prevention and collection of phosphate dust. The terminal facilities of the first stage were built in 1972 and hence are already obsolete. It is strictly required to prevent dust emissions.

It is necessary to transfer phosphate-handling from Tartous Port to the new port so as to resolve the dust emission problem in the Short-Term Plan, then, to convert the existing phosphate terminal to an additional grain terminal in the stage of the Master Plan.

24. From the above, in the stage of the Short-Term Plan, it is necessary to transfer phosphate-handling from Tartous Port to the new port to be created in south Hamidieh so as to resolve the dust emission problem which currently affects urban areas in Tartous and lift the limitation of the phosphate shipment capacity due to the shortage of the existing terminal at Tartous Port. It is necessary to convert the existing phosphate terminal to an additional grain terminal to cope with the increasing volume of grain export to the future in the stage of the Master Plan.

(3) Handling of Conventional Cargo

Some of the quay-side cranes installed on the pier A need to be renewed.

25. Some of the quay-side cranes installed on the pier A are obsolete or out of order, and therefore need to be renewed.

It is necessary to construct additional general cargo and Ro-Ro berths.

26. Despite the anticipated progress of containerization, it is forecast that a considerable volume of general cargo in break-bulk discharged/loaded from/onto general cargo vessels will pass through the port even in the stage of the Short-Term Plan. In the meantime, Ro-Ro traffic is expected to be encouraged in the foreseeable future as it was until 1981. To cope with the increasing volume of those cargoes, it is necessary to construct additional berths.

(4) Passenger Service

It is necessary to shift the passenger terminal to a place close to the outside common road by constructing a new terminal with a passage for passengers in view of safety in the stage of the Master Plan.

27. The existing passenger terminal is placed on the berth of the pier A without a passage connected to the outside of the port to separate the flows of passengers and cargo. Hence, it is necessary to shift the existing passenger terminal to a place close to the common road running outside the port by constructing a new terminal with a passage specialized for passengers in view of safety in the stage of the Master Plan.

1.3 The New Port

It is necessary to create a new port at an adequate place to receive the considerable amount of bulk cargoes forecast to be generated in the future. Tartous Port, adjacent to densely-populated residential areas, is not suitable for this cargo.

28. Because Tartous Port is adjacent to densely-populated residential areas and its space for expansion is limited, the port is not suitable to receive dusty bulk cargoes which include phosphate rock, cement clinker, iron pellet and scraps. The volume

of these cargoes to be handled in the years of 2003 and 2010 are estimated as 7.2 million tons and 8.1 million tons. Hence, to receive such a considerable amount of bulk cargoes, it is necessary to create a new port at an adequate place.

The current problem of phosphate dust emission in Tartous will be resolved by shifting the existing phosphate terminal from Tartous Port to the new port.

29. The new port will resolve the current problem on phosphate dust emission in Tartous by transferring the existing phosphate-handling facilities from Tartous Port to the new port.

The new port is indispensable to back up the manufacturing and mining industries in the southern part of Syria.

30. Spread throughout the southern part of Syria, are port-related manufacturing and mining industries including phosphate mines, cement-making factories and a iron and steel making factory. In addition to the present operations of the industries, several projects of the industries are on-going or on the verge of being materialized. Hence, the new port is indispensable to back up the industries through importing raw or intermediate materials or exporting their final products or by-products.

The new port could be a gateway for the transit cargoes mainly from/to Iraq in the foreseeable future.

31. In Iraq, phosphate mines are situated in Akashat near the border between Iraq and Syria. On the other hand, sulfur mines are situated in Mosul which is near the above border as well. Sulfur is also produced as a by-product of petroleum refineries. There are several major petroleum refineries in Kirkuk and Baiji in the northwest part of Iraq. Sulfur and phosphate rock are major exports of Iraq. Before the close of the border in 1981, Iraq intended to ship these bulk cargoes through Tartous Port and made a formal request to Syria. Instead of Tartous Port, the new port could be a gateway for those transit cargoes in the foreseeable future.

2. Master Plan (Target Year: 2010)

2.1 Latakia Port

(1) Container-Handling

It is proposed to establish a full-scale new container terminal north of the existing terminal.

32. The Master Plan is formulated with a target year of 2010. In that year, the number of containers to be handled at the container terminals is estimated as 712,000 TEUs. To receive the forecast container traffic, it is proposed to establish

a full-scale new container terminal north of the existing terminal by the year 2010 together with an increase in container-handling capacity of the existing container terminal.

It is proposed to modernize the existing container terminal.

33. To receive the forecast number of container with the least capital investment for the above new terminal, it is proposed to increase the present container-handling capacity of the existing container terminal as much as possible by modernization through the preparation of required container-handling machines including dock-side container gantry cranes and the relocation of the yard facilities including ground slots, terminal gate, and a terminal control office.

It is proposed to introduce a closed terminal operation system in the container terminals.

34. It is proposed to introduce a closed container terminal system in which a container terminal is controlled by a terminal operator that takes the full responsibility of receipt, storage and delivery of containers at the terminal by conducting yard planning and inventory control of containers which is indispensable for a modernized container terminal.

(2) Grain-Handling

It is proposed to construct a new grain terminal on the 12-A berth at the new port zone.

35. In the year 2010, the volume of grains to be handled at grain terminals is estimated as 1.64 million tons with 1.2 million tons in export and 440,000 tons in import. To receive the forecast grain volume, it is proposed to construct a new grain terminal equipped with shiploaders/unloaders and silos on the No12-A berth at the new port area.

It is proposed to modernize the existing grain terminal at the old port area to meet the total requirement of grain-handling together with the establishment of the new terminal at the new port area.

36. It is proposed to modernize the existing grain terminal at the old port area to meet the requirement of loading/unloading grains totalling 1.66 million tons together with the establishment of the new terminal. To improve the current inefficient and dusty operations of grain-unloading without direct connection with silos, it is planned to install unloaders connected with silos through belt conveyors. The construction of a new berth with sufficient water depth along side is also planned.

(3) Handling of Conventional Cargo

It is proposed to construct additional general cargo berths northeast of the new port area.

37. It is proposed to construct additional general cargo berths northeast of the new port area to meet the total forecast volume of 1.39 million tons of general cargo in break-bulk through Latakia Port in 2010.

It is proposed to renew obsolete quay-side cranes installed on the old port area.

38. It is proposed to renew obsolete quay-side cranes built in 1957 and installed in the old port area.

(4) Passenger Service

It is proposed to construct a new passenger terminal behind the berth No.7.

39. It is proposed to construct a new passenger terminal behind the berth No.7. The terminal will have a direct access to the outside common road running parallel to the port limits. A passage bridge for passengers is planned to connect the terminal and the berth.

(5) Construction Cost

40. The total construction cost of the Master Plan is roughly estimated as 13.24 billion S.P.

(6) Initial Environmental Examination

There are no overriding environmental reasons why the planned activities should not proceed and a full EIA and remedial measures in environmental aspect are not considered necessary.

41. In the construction of the new container terminal and additional general cargo berths north of the new port area and the modernization of the existing grain terminal at the old port area, capital dredging is necessary for the creation of the access channel and basins. Dredged materials will be dumped into an enclosed embankment which will be constructed at the site for the development, and then will be covered with high quality land soil, thereby eliminating the risk of leakage into the sea after being dumped even if seabed materials to be dredged are partly contaminated. There are no other intended construction activities that may have environmental impacts.

42. On the other hand, as to environmental impacts induced by cargo-handling operations, the handling of containers and general cargo is essentially pollution-free.

Emission of grain dust could be suppressed to a permissible extent by taking appropriate measures including the installation of dust collectors and covered belt conveyors; the current dusty grain-handling operations will be remarkably improved by the proposed project.

2.2 Tartous Port

(1) Container-Handling

It is proposed to modernize the existing container terminal.

43. The number of containers to be handled at container terminal in 2010 is estimated as 200,000 TEUs. To receive the forecast container traffic, it is proposed to modernize the existing container terminal through the introduction of required container-handling machines including quay-side container gantry cranes and rail-mounted transfer cranes to be installed on the yard behind the berths and the relocation of the yard facilities including ground slots, terminal gate, and a terminal control office.

It is proposed to introduce a closed terminal operation system in the container terminals.

44. It is proposed to introduce a closed container terminal system controlled by a terminal operator that takes the responsibility of receipt, storage and delivery of containers at the terminal by conducting yard planning and inventory control of containers which is indispensable for a modernized container terminal.

(2) Conversion of the Existing Phosphate Terminal to a Grain Terminal

It is proposed to shift current phosphate-handling to the new port.

45. It is proposed to shift phosphate handling at Tartous Port from Tartous Port to the new port to be created in south Hamidieh so as to resolve the dust emission problem which currently affects urban areas in Tartous and lift the limitation of the phosphate-handling capacity of the existing terminal.

It is proposed to convert the existing phosphate terminal to a grain terminal and general cargo/Ro-Ro berths.

46. In the year 2010, the volume of grains to be handled at Tartous Port is estimated as 1.46 million tons with 800,000 tons in export and 660,000 tons in import. To receive the forecast grain volume, it is proposed to convert the existing phosphate terminal to an additional grain terminal. By reclaiming the bottom of the existing phosphate pier, general cargo and Ro-Ro vessels will be received as well as grain carriers.

(3) Handling of Conventional Cargo

It is proposed to construct additional general cargo and Ro-Ro berths behind the south breakwater.

47. It is proposed to construct additional general cargo and Ro-Ro berths by reclamation behind the south breakwater to meet the forecast volume of 2.33 million tons of general cargo in break-bulk as a total in 2010.

It is proposed to renew obsolete quay-side cranes installed on the pier A.

48. It is proposed to renew obsolete quay-side cranes installed on the pier A.

(4) Passenger Service

It is proposed to construct a new passenger terminal at the bottom of the general cargo berths southeast of the port.

49. It is proposed to construct a new passenger terminal at the bottom of the berths southeast of the port. The terminal will have a direct access to the outside common road.

(5) Construction Cost

50. The total construction cost of the Master Plan is roughly estimated as 2.80 billion S.P.

(6) Initial Environmental Examination

There are no overriding environmental reasons why the planned activities should not proceed and a full EIA and remedial measures in environmental aspect are not considered necessary.

51. In the construction of additional general cargo and Ro-Ro berths in touch with the south breakwaters, dredging is not necessary and there are no intended construction activities that may have environmental impacts.

52. The intended shift of the phosphate terminal to the new port should bring significant environmental improvements in the area around the port.

2.3 The New Port

(1) Preparation of a Phosphate Terminal

It is proposed to prepare a phosphate terminal.

53. It is proposed to prepare a phosphate terminal at the New Port to shift phosphate-handling from Tartous Port to the New Port. The volume of phosphate rock to be shipped in 2010 is estimated as 4.1 million tons containing 3.1 million tons of Syrian products and one million tons of transit cargo from Iraq. Shiploaders are planned to be installed together with silos connecting them by belt conveyors.

(2) Preparation of a Cement Clinker Terminal

It is proposed to establish a cement clinker terminal.

54. It is proposed to prepare a cement clinker terminal at the new port to back up export promotion for cement-making factories which are in operation or will be established in the near-term. The volume of cement clinker to be shipped in 2010 is estimated as one million tons. Shiploaders are planned to be installed together with sheds connecting them by belt conveyors.

(3) Preparation of a Pellet Terminal

It is proposed to prepare a pellet terminal.

55. It is proposed to prepare a pellet terminal at the new port for the new iron/steel making factory with direct reduction furnaces to be established in Al-Zara. The volume of pellets to be discharged in 2010 is estimated as 1.25 million tons. The terminal is planned to be equipped with unloaders specialized for iron ore in pellets and stackers and reclaimers to be installed in pellet storage yards behind the berth.

(4) Preparation of a Scrap Terminal

It is proposed to prepare a scrap terminal.

56. To produce iron/steel at the existing factory with electric furnaces or the new factory, it is necessary to provide scraps in the process of manufacturing. According to the production plan, some portion of required scraps must be provided from abroad. Hence, it is proposed to prepare a scrap terminal. The volume of scraps to be discharged in 2010 is estimated as 200,000 tons. To unload scraps from vessels efficiently, quay-side cranes of electric magnet type specially designed for scrap-handling is planned to be installed together with a spacious back yard.

(5) Preparation of a Sulfur Terminal

It is proposed to prepare a sulfur terminal.

57. To ship sulfur from sulfur mines in Iraq located near the border between Syria and Iraq in the future, it is proposed to prepare a sulfur terminal. The volume of sulfur to be shipped in 2010 is estimated as 500,000 tons. Sheds are planned to be

installed to store sulfur.

(6) Preparation of a Fertilizer Terminal

It is proposed to prepare a fertilizer terminal.

58. In Syria, it is expected that domestic production of phosphatic fertilizer will exceed its domestic consumption in the future owing to anticipated operations of a new fertilizer plant in Palmyra. The volume of fertilizer to be exported in bulk in 2010 is estimated as 480,000 tons. Hence, to export surplus fertilizer, a specialized terminal equipped with sheds is proposed to be prepared.

(7) Preparation of Public Berths

It is proposed to prepare public berths.

59. In addition to the above-mentioned terminals for exclusive use for specified bulk cargoes, it is planned to prepared public berths to receive miscellaneous cargo vessels which can not adequately be received by the above berths. Petroleum coke could be shipped from the public berth. On the other hand, nitrogenous fertilizer needs to be imported to narrow the gap between domestic production and consumption in Syria even in the future as it is at present. Such fertilizer which is expected to be imported in bag could also be received at the public berths. In addition furnace bricks, ferro-alloy, etc. for steel-making industry are also imported through the public berth.

(8) Selection of Suitable Site for the New Port

It is proposed to establish the New Port south of Hamidieh.

60. In the site selection for the New Port, the Syrian coast was assessed according to navigational accessibility by both sea and land, costs of both construction and operations, certainty of land acquisition and environmental impact caused by the new port project. Finally, south of Hamidieh was selected as the optimum site among alternatives.

(9) Construction Cost

61. The total construction cost of the Master Plan is roughly estimated as 19.35 billion S.P.

(10) Initial Environmental Examination

The IEE showed that an EIA was necessary and this was carried out.

62. Available environmental data on the new port area was limited and so surveys

were carried out. Impacts could occur from dust, dredging and port-related road traffic. An EIA was considered necessary and was carried out.

2.4 Management, Operations and Institutional Matters

63. To establish the New Port smoothly, it is proposed to organize a new port company which is responsible for the construction and administration of the port. In management and operations, it is proposed to adequately control the number of employees by classification to meet the future requirements for the ports. The control could be implemented effectively through the development of human resources of the port companies. The human resources will be developed through both on-the-job-training by competent specialists and basic training in the field of port.

LATAKIA PORT MASTER PLAN

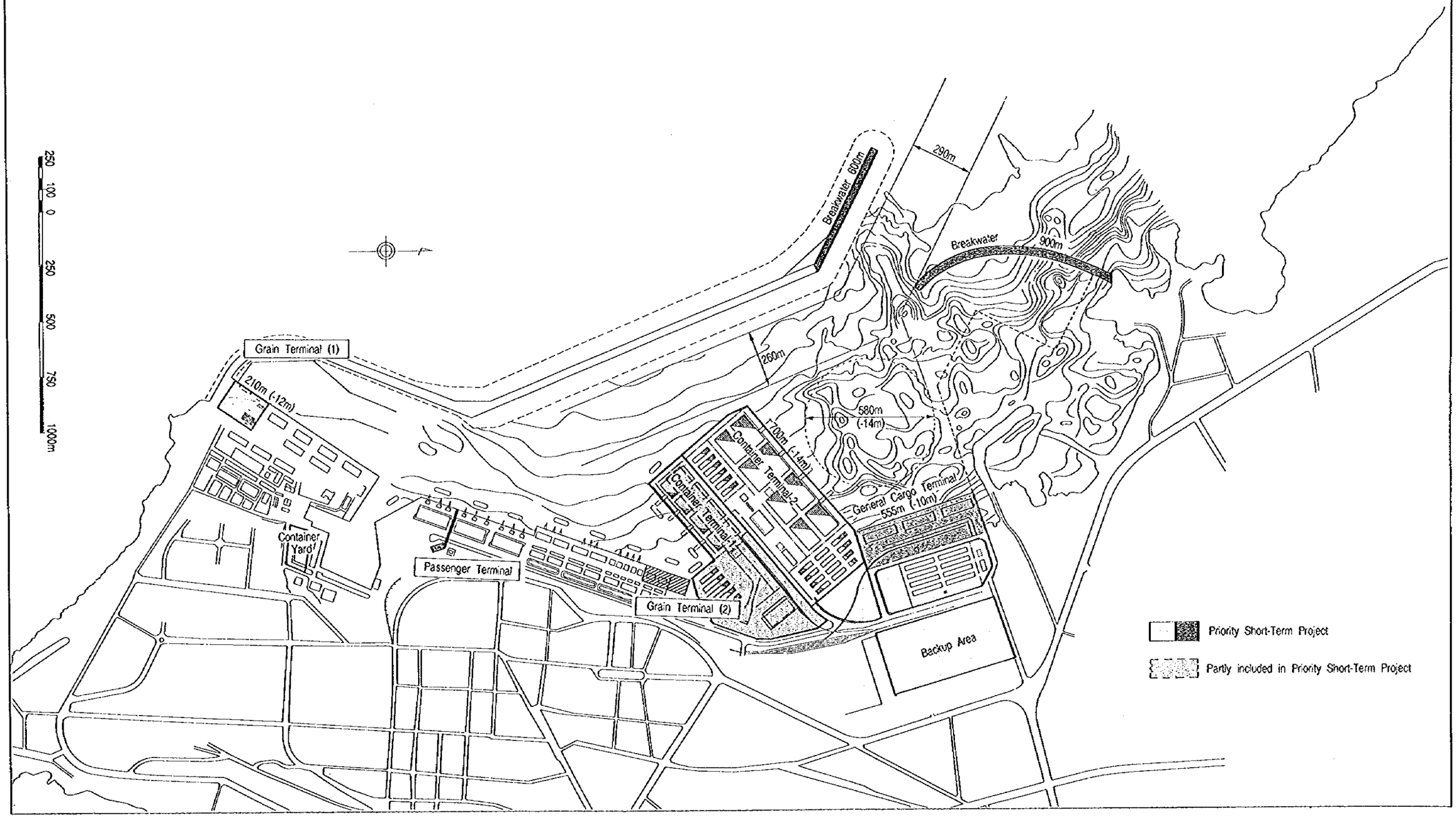

Fig. 1 Master Plan for Development of Latakia Port

TARTOUS PORT MASTER PLAN

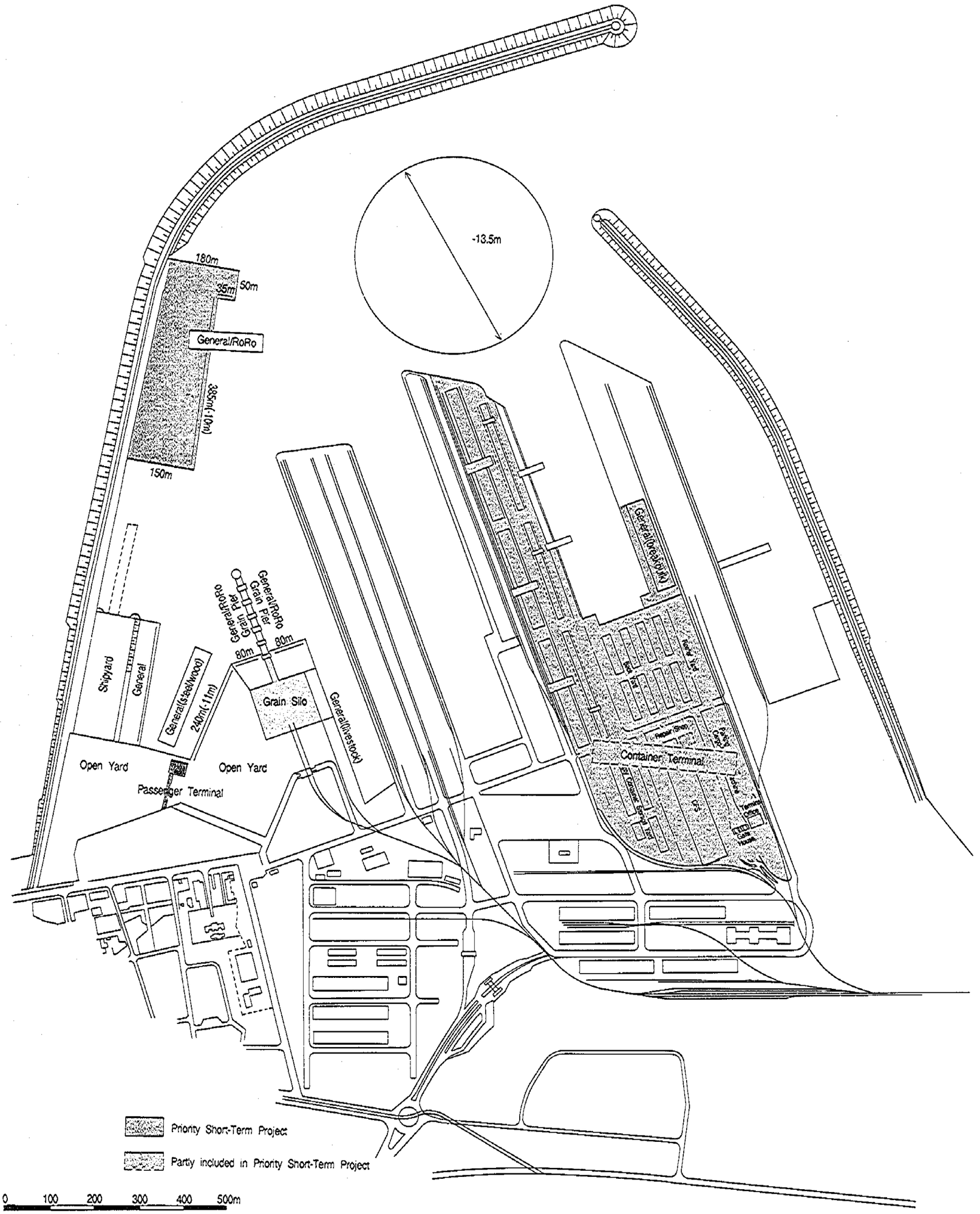

Fig. 2 Master Plan for Development of Tartous Port

TARTOUS PORT MASTER PLAN

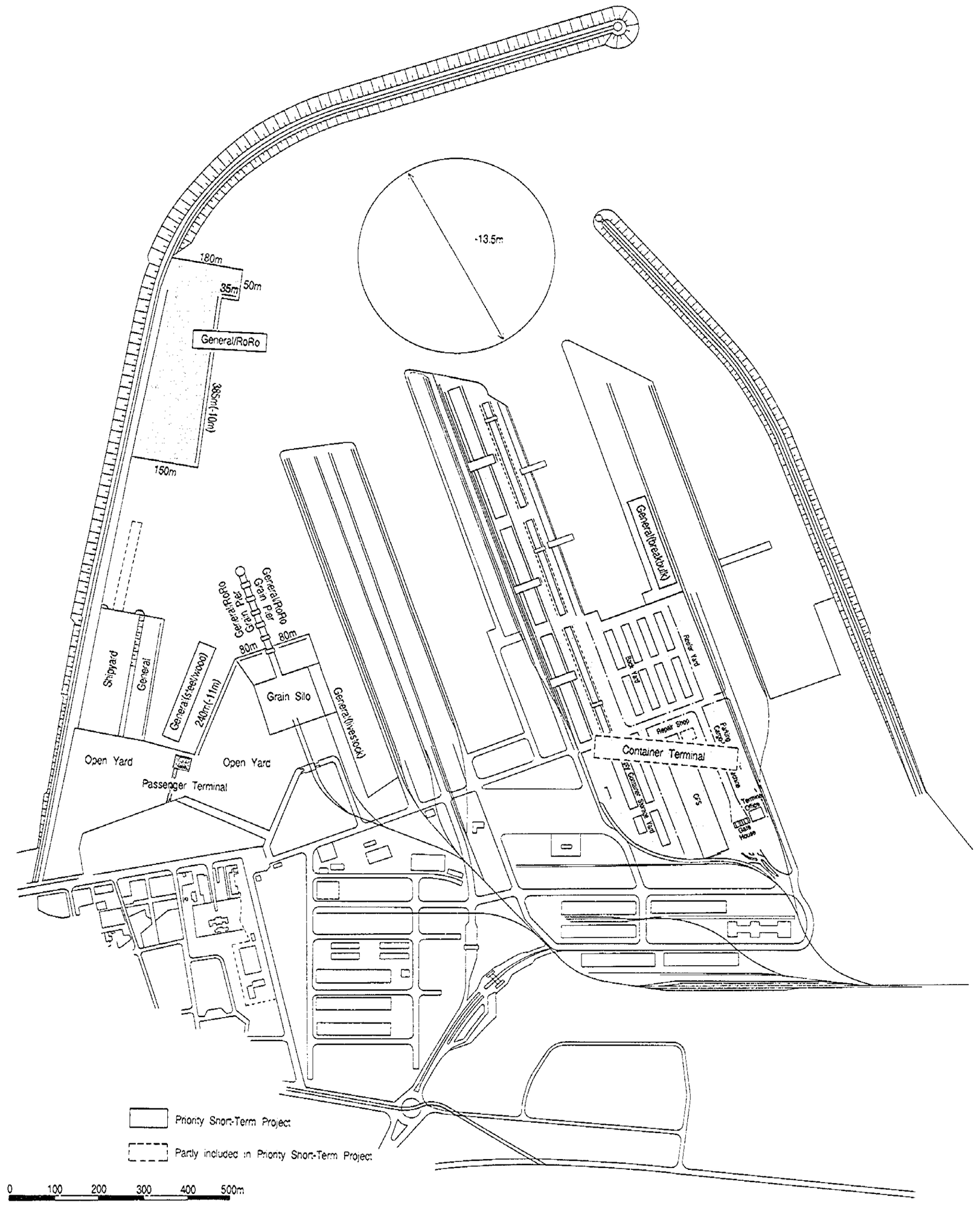

Fig. 2 Master Plan for Development of Tartous Port

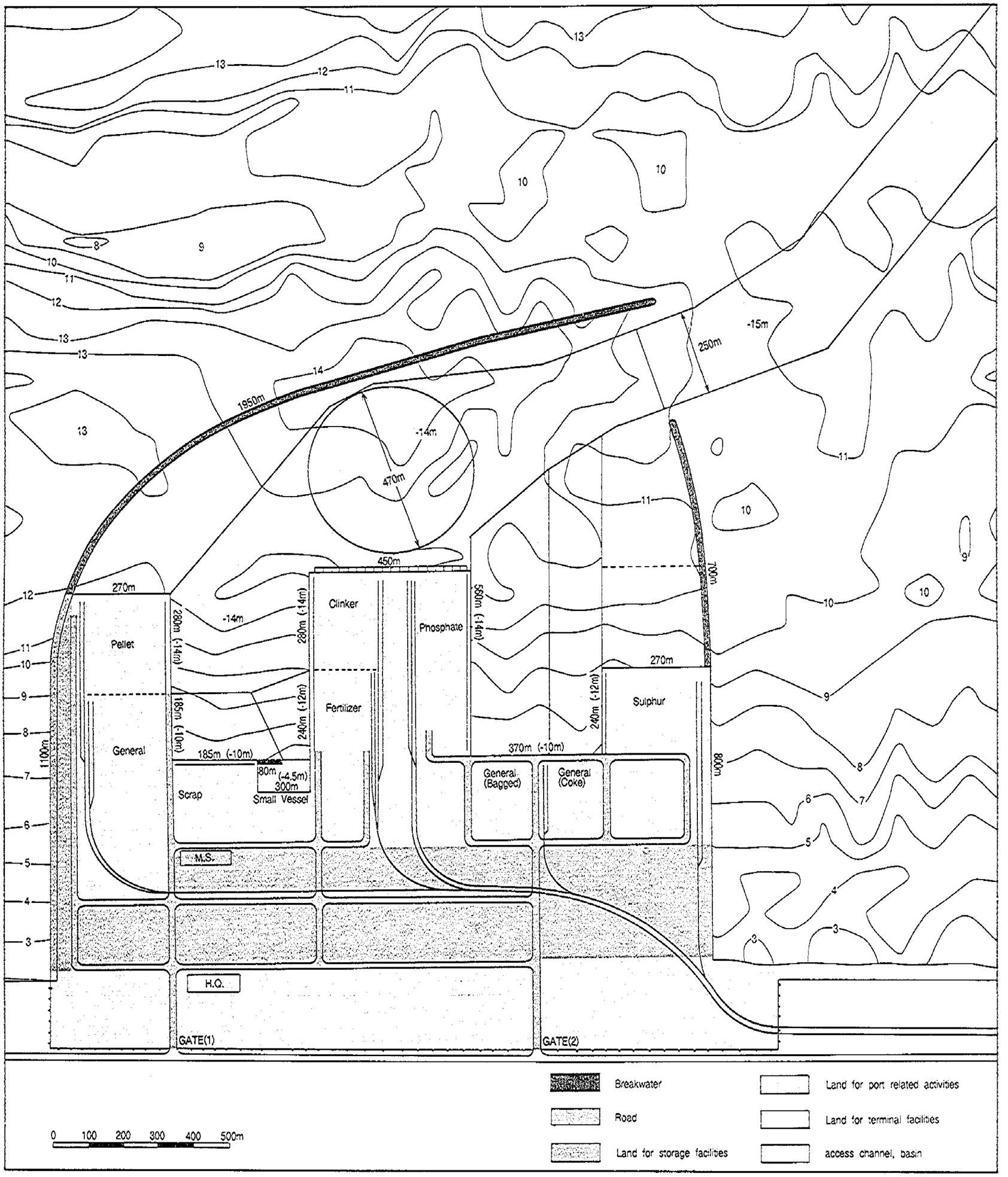

Fig. 3 Master Plan for Development of The New Port

3. Short-Term Plan (Target Year: 2003)

3.1 Latakia Port

(1) Container-Handling

It is proposed to modernize the existing container terminal.

64. The Short-Term Plan is prepared as a first-phase plan for the development of Latakia Port with a target year of 2003. In that year, the number of containers to be handled at the container terminal is estimated as 316,000 TEUs. To receive the forecast number of container traffic, it is proposed to modernize the existing container terminal through the preparation of required container-handling machines including quay-side container gantry cranes and the relocation of the yard facilities.

It is proposed to introduce a closed terminal operation system in the container terminal.

65. It is proposed to introduce a closed container terminal system in which a container is controlled by a terminal operator that takes the full responsibility of receipt, storage and delivery of containers at the terminal.

(2) Grain-Handling

It is proposed to construct a new grain terminal on the 12-A berth at the new port zone.

66. In the year 2003, the volume of grains to be handled at grain terminals is estimated as 1.66 million tons with 1.4 million tons in export and 260,000 tons in import. To receive the forecast grain volume, it is proposed to construct a new grain terminal equipped with ship loaders/unloaders and silos on the No12-A berth at the new port area.

It is proposed to modernize the existing grain terminal at the old port area to meet the total requirement of grain-handling together with the newly established terminal at the new port area.

67. It is proposed to modernize the existing grain terminal at the old port area to meet the requirement of loading/unloading grains totalling 1.66 million tons together with the new terminal mentioned above. It is planned to install unloaders connected with silos through belt conveyors. The construction of a new berth with sufficient water depth along side is also planned.

(3) Handling of Conventional Cargo

It is proposed to renew obsolete quay-side cranes installed on the old port area.

68. It is proposed to renew obsolete quay-side cranes built in 1957 and installed in the old port area.

(4) Passenger Service

It is proposed to construct a new passenger terminal behind the berth No.7.

69. It is proposed to construct a new passenger terminal behind the berth No.7. The terminal will have a direct access to the outside common road running parallel to the port limits. A passage bridge for passengers is planned to connect the terminal and the berth.

(5) Construction Cost

70. The total construction cost of the Short-Term Plan is estimated as 4.91 billion S.P.

(6) Economic Analysis

The proposed development project with the EIRR of 18.9% is considered to be economically justifiable.

71. A comparison between the "Without-Project" case and the "With- Project" case was carried out to evaluate the feasibility of the project for development of Latakia Port proposed in the Short-Term Plan from the viewpoint of the national economy of Syria. In the comparison, the economic rate of return (EIRR) is used to evaluate the measurable economic benefits compared with the economic costs. The main economic benefits of the project are savings on off-shore waiting and staying costs of vessels calling at the port from the development project. The resulting EIRR is estimated as 18.9% exceeding the general criterion to assess the economic justifiability.

(7) Financial Analysis

The proposed development project with the FIRR of 14.07% is considered to be financially feasible.

72. The financial revenues are generated from port charges based on the tariff proposed to cover capital investment and operational costs by referring to the current tariff level. In case of container-handling, the proposed tariff is lower than the neighboring ports facing the East Mediterranean Sea, proving sufficient competitiveness. The resulting financial rate of return (FIRR) of the project is

estimated as 14.07% which exceeds the weighted average interest rates of assumed fund raising plans and hence the projects are considered to be financially feasible.

(8) Environmental Consideration

There are no overriding environmental reasons why the planned activities should not proceed and a full EIA and remedial measures in environmental aspect are not considered necessary.

73. In the modernization of the existing container terminal, capital dredging is necessary for the deepening of the basin in front of the berths at the old port area. Dredged materials will be dumped into an enclosed embankment which will be constructed at the site of the new berth for grain-handling. There are no other intended construction activities that may have environmental impacts.

74. On the other hand, emission of grain dust could be suppressed to a permissible extent by taking appropriate measures including the installation of dust collectors and covered belt conveyors; the current dusty grain-handling operations will be remarkably improved by the proposed project.

3.2 **Tartous Port**

(1) Container-Handling

It is proposed to prepare a multi-purpose terminal.

75. The number of containers to be handled at the port in 2003 is estimated as 72,000 TEUs. Judging from the number of containers, it seems to be still early to establish a full-scale container terminal at the pier B as proposed in the Master Plan. In a transitional period towards the establishment of the full-scale container terminal at the same pier, it is proposed to prepare a multi-purpose terminal to handle both containers and long and heavy products. It is planned to prepare quay-side gantry cranes and rail-mounted transfer cranes to be installed behind the berths.

(2) Shift of the Existing Phosphate Terminal to the New Port

It is proposed to shift phosphate-handling from Tartous Port to the new port.

76. It is proposed to shift phosphate handling at Tartous Port from Tartous Port to the new port so as to resolve the dust emission problem which currently affects urban areas in Tartous and lift the limitation of the phosphate-handling capacity of the existing terminal.

(3) Handling of Conventional Cargo

It is proposed to construct additional general cargo and Ro-Ro berths in touch with the south breakwater.

77. It is proposed to construct additional general cargo berths by reclamation in touch with the south breakwater to meet the forecast volume of 1.84 million tons of general cargo in break-bulk as a total in 2003.

It is proposed to renew obsolete quay-side cranes installed on the pier A.

78. It is proposed to renew obsolete quay-side cranes installed on the pier A.

(4) Construction Cost

79. The total construction cost of the Short-Term Plan is estimated as 2.02 billion S.P.

(5) Economic Analysis

The proposed development project with the EIRR of 19.8% is considered to be economically justifiable.

80. The main economic benefits of the project are savings on off-shore waiting and staying costs of vessels calling at the port from the development project. The resulting EIRR is estimated as 19.8% exceeding the general criterion to assess the economic justifiability.

(6) Financial Analysis

The proposed development project with the FIRR of 7.76% is considered to be financially feasible.

81. The financial revenues are generated from port charges based on the tariff proposed to cover capital investment and operational costs by referring the current tariff level. The resulting financial rate of return (FIRR) of the project is estimated as 7.76% which exceeds the weighted average interest rates of assumed fund raising plans and hence are considered to be financially feasible.

(7) Environmental Consideration

There are no overriding environmental reasons why the planned activities should not proceed and a full EIA and remedial measures in environmental aspect are not considered necessary.

82. As to the construction of additional general cargo and Ro-Ro berths in touch with the south breakwaters, dredging is not necessary and there are no intended construction activities that may have environmental impacts.

83. The intended shift of the phosphate terminal to the new port should bring significant environmental improvements in the area around the port.

3.3 The New Port

(1) Preparation of a Phosphate Terminal

It is proposed to prepare a phosphate terminal.

84. It is proposed to prepare a phosphate terminal to shift phosphate-handling from Tartous Port to the new port. The volume of phosphate rock to be shipped in 2003 is estimated as 3.2 million tons containing 2.2 million tons of Syrian products and one million tons of transit cargo from Iraq. Shiploaders are planned to be installed together with silos connecting them by belt conveyors.

(2) Preparation of a Cement Clinker Terminal

It is proposed to establish a cement clinker terminal.

85. It is proposed to prepare a cement clinker terminal at the new port to back up export promotion for cement-making factories which are in operation or will be established in the near-term. The volume of cement clinker to be shipped in 2003 is estimated as 1.1 million tons. Shiploaders are planned to be installed together with sheds connecting them by belt conveyors.

(3) Preparation of a Pellet Terminal

It is proposed to prepare a pellet terminal.

86. It is proposed to prepare a pellet terminal at the new port for the new iron/steel making factory with direct reduction furnaces to be established in Al-Zara. The volume of pellets to be discharged in 2003 is estimated as 1.25 million tons. The terminal is planned to be equipped with unloaders specialized for iron ore in pellets and stackers and reclaimers to be installed in storage yards behind the berth.

(4) Preparation of a Scrap Terminal

It is proposed to prepare a scrap terminal.

87. To produce iron/steel at the existing factory with electric furnaces or the new factory, it is necessary to provide scraps in the process of manufacturing. According

to the production plan, some portion of required scraps must be provided from abroad. Hence, it is proposed to prepare a scrap terminal. The volume of scraps to be discharged in 2003 is estimated as 200,000 tons. To unload scraps from vessels efficiently, magnet type cranes specially designed for scrap-handling is planned to be installed together with spacious back yard.

(5) Preparation of a Sulfur Terminal

It is proposed to prepare a sulfur terminal.

88. To ship sulfur from sulfur mines in Iraq located near the border between Syria and Iraq in the future, it is proposed to prepare a sulfur terminal. The volume of sulfur to be shipped in 2003 is estimated as 500,000 tons. Sheds are planned to be installed to store sulfur.

(6) Preparation of a Fertilizer Terminal

It is proposed to prepare a fertilizer terminal.

89. As to phosphatic fertilizer, it is expected that domestic production will exceed domestic consumption in Syria in the future owing to anticipated operations of a new fertilizer plant in Palmyra. The volume of fertilizer to be exported in bulk in 2003 is estimated as 510,000 tons. Hence, to export surplus fertilizer, a specialized terminal equipped with sheds is proposed to be prepared.

(7) Preparation of Public Berths

It is proposed to prepare public berths.

90. In addition to the above-mentioned terminals for exclusive use for specified bulk cargoes, it is planned to prepared public berths to receive miscellaneous cargo vessels carrying petroleum coke, bagged nitrogenous fertilizer ferro-alloy, etc.

(8) Construction Cost

91. The total construction cost of the Short-Term Plan is roughly estimated as 19.60 billion S.P.

(9) Economic Analysis

The proposed development project with the FIRR of 14.8% is considered to be economically justifiable.

92. The main economic benefits of the project are savings on bulk cargo transport costs generated from the establishment of the New Port. If the New Port is not created, bulk cargo must pass through mainly Tartous Port, resulting in serious

congestion at Tartous Port. In addition, some cargo is forced to be diverted to the ports in neighboring countries with costly land transport costs. The resulting EIRR is estimated as 14.8% exceeding the general criterion to assess the economic justifiability.

(10) Financial Analysis

The proposed development project with the FIRR of 7.69% is considered to be financially feasible.

93. The financial revenues are generated from port charges based on the tariff proposed to cover capital investment and operational costs by referring the current tariff level. The resulting financial rate of return (FIRR) are estimated as 7.69% which exceeds the weighted average interest rates of assumed fund raising plans and hence is considered to be financially feasible.

(11) Environmental Impact Assessment

The EIA has identified possible impacts from dust and traffic and recommended remedial measures. Apart from these impacts which can be controlled to acceptable levels there are no environmental reasons against this project proceeding.

94. The EIA showed that natural background dust levels in the area are high. Dust control is recommended on the handling equipment and this should ensure that dust does not create nuisance. No heavy metals were detected in sediments and dredging should not cause problems. The area is not ecologically sensitive. New access roads are recommended. There are no major environmental objections to the project.

3.4 Management and Operations

It is proposed to organize a new port company which is responsible for the construction and administration of the New Port.

95. It is proposed to organize a new port company which is responsible for the construction and administration of the port. It is also proposed to adequately control the number of employees by classification through the development of human resources of the port companies.

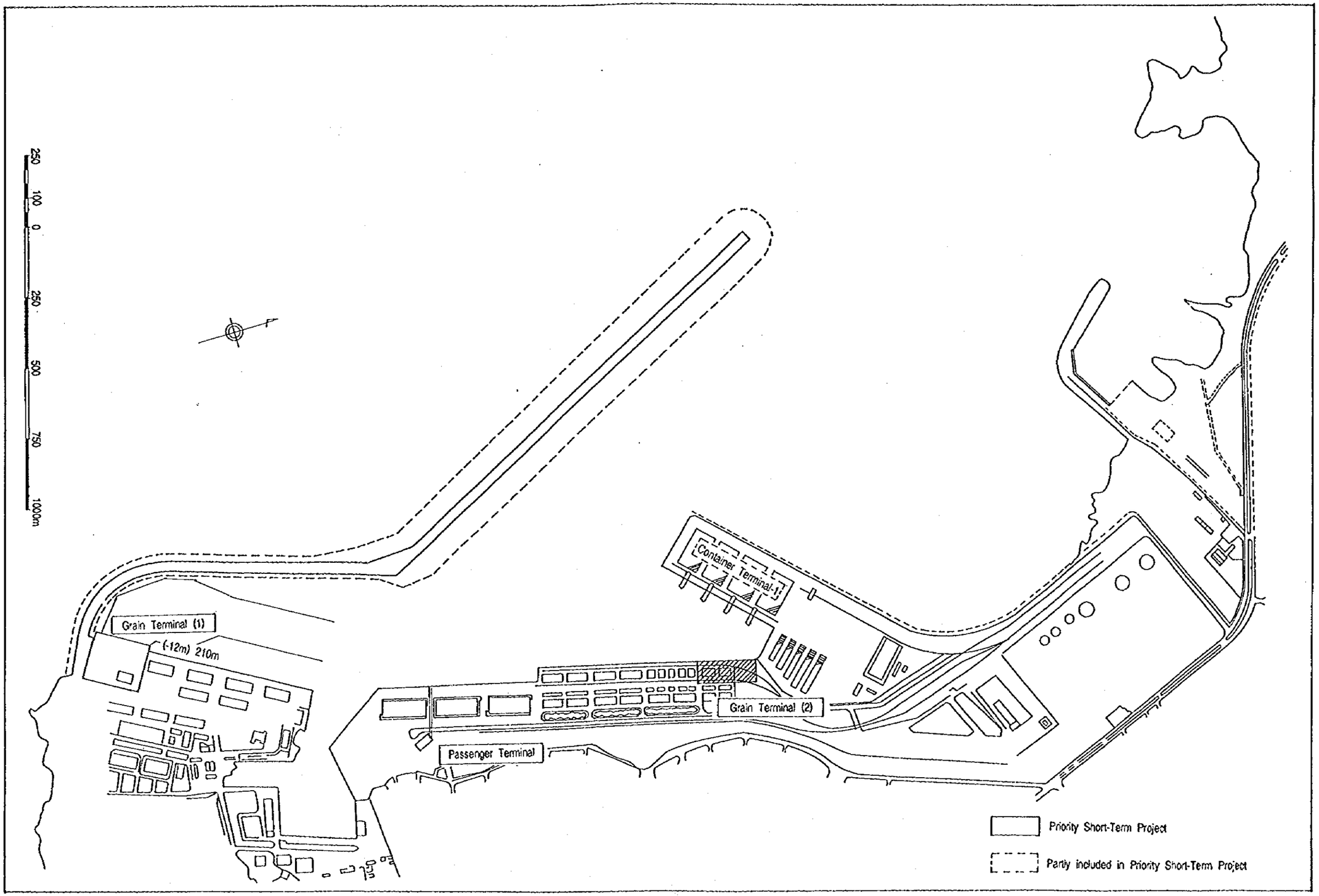

Fig. 4 Short-Term Plan for Development of Latakia Port

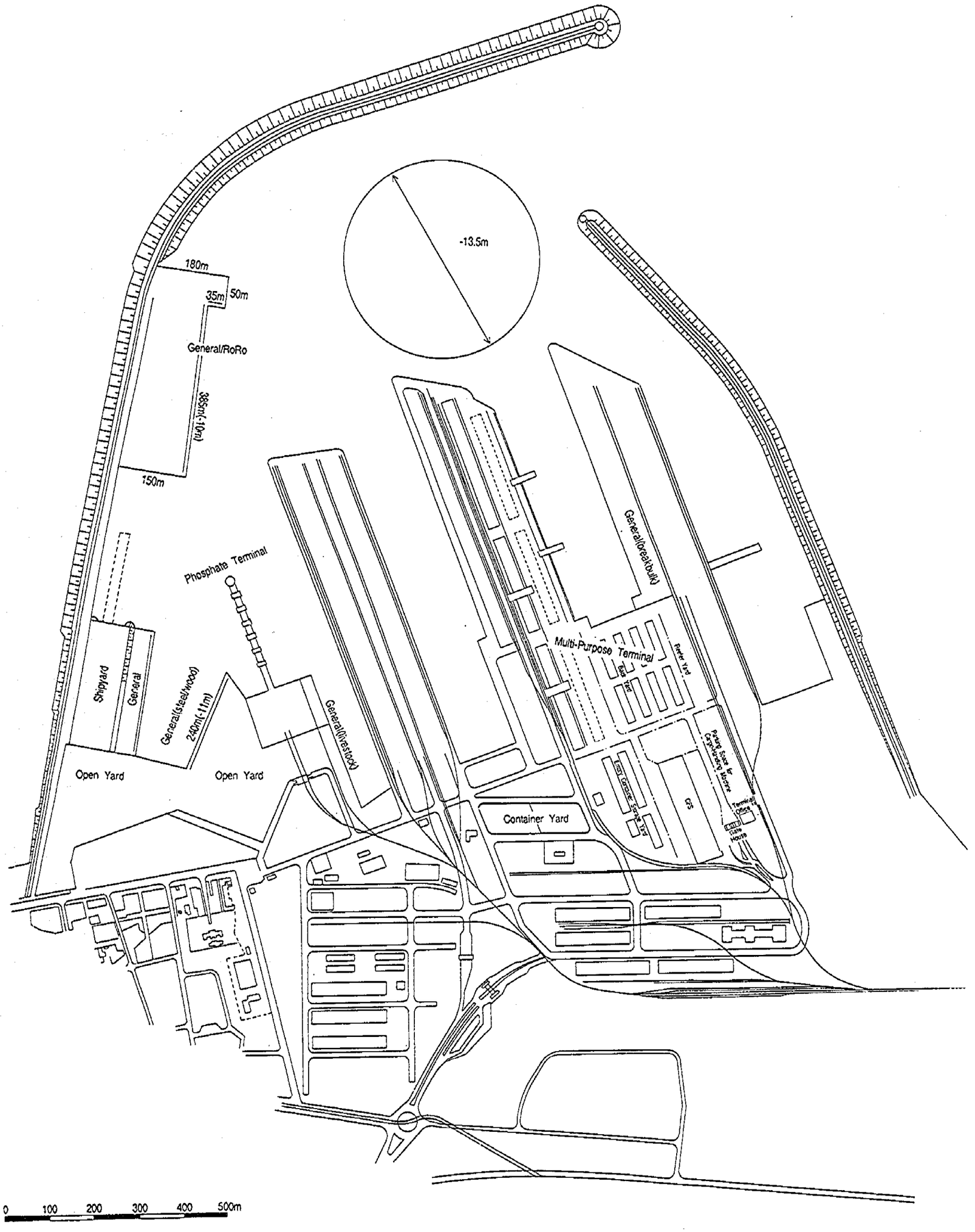

Fig. 5 Short-Term Plan for Development of Tartous Port

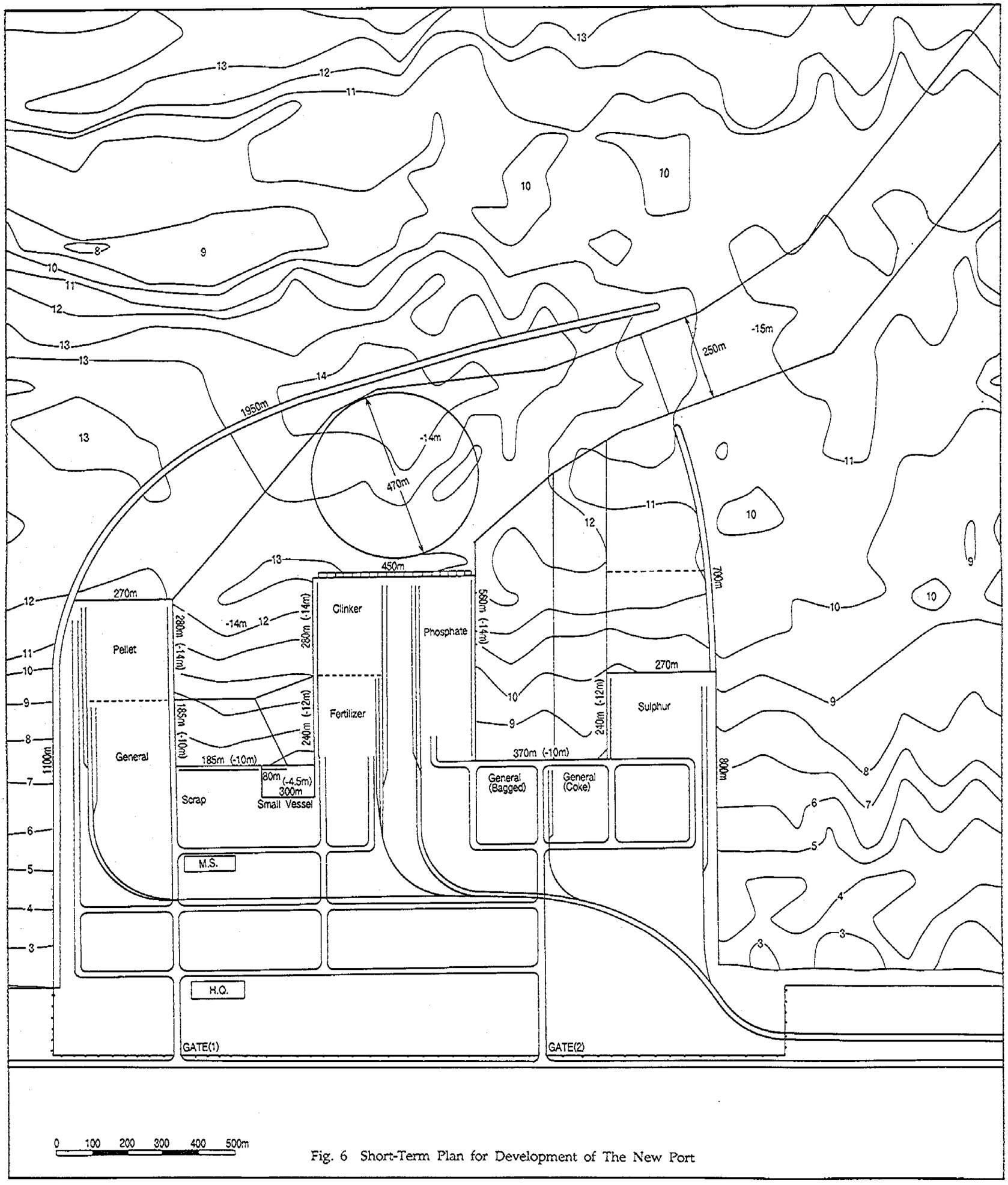

Fig. 6 Short-Term Plan for Development of The New Port

RECOMMENDATIONS

In accordance with the results of the study, it is recommended that the Government of Syria implement the development project of the three study ports, Latakia Port, Tartous Port and the New Port for bulk cargo, to contribute to the Syrian economy. The project is divided into two phases: the first phase project is that proposed in the Short-Term Plan with the target year 2003 and the second phase project is that to be completed by the target year 2010 of the Master Plan.

1. The First Phase Project

1.1 Latakia Port

The main components of the first phase project of Latakia Port are summarized as follows:

(1) Modernization of the existing container terminal

1) Procurement of container-handling equipment

- 4 quay-side container gantry cranes
- 11 straddle carriers

2) Construction of upper-structures

- Terminal control office
- Gate house

3) Introduction of a closed terminal operation system

(2) Construction of a new grain terminal on the 12-A berth at the new port area

1) Procurement of grain-handling equipment

- 2 units of shiploader/unloader

2) Construction of silos of 65,000 ton capacity

(3) Modernization of the existing grain terminal at the old port area

1) Procurement of grain-handling equipment

- 2 units of shiploader/unloader

2) Construction of a new berth : length of 210 m and water depth of 12 m

(4) Procurement of equipment for handling conventional cargo

- 12 rail-mounted portal jib cranes (old port area)

(5) Construction of a new passenger terminal behind the berth No.7 at the new port area

1.2 Tartous Port

The main components of the first phase project of Tartous Port are summarized as follows:

(1) Preparation of a multi-purpose terminal

1) Procurement of equipment for handling containers and heavy conventional cargo

- 2 multi-purpose quay-side gantry cranes
- 2 rail-mounted container transfer cranes

(2) Construction of additional general cargo and Ro-Ro berths behind the south breakwater: total berth length of 385 m and water depth of 10 m

(3) Procurement of equipment for handling conventional cargo

- 3 rail-mounted portal jib cranes (south of pier A)

1.3 The New Port for Bulk Cargo

The main components of the first phase project of the New Port are summarized as follows:

(1) Preparation of a phosphate terminal

1) Procurement of phosphate-handling equipment

- 4 shiploaders
- Receiving facilities from railway wagons and trucks

2) Construction of silos of 169,000 ton capacity

3) Construction of berths: total length of 560 m and water depth of 14 m

(2) Preparation of a cement clinker terminal

1) Procurement of cement-handling equipment

- 2 shiploaders
- Receiving facilities from railway wagons and trucks

2) Construction of sheds of 90,000 ton capacity

3) Construction of a berth: length of 280 m and water depth of 14 m

(3) Preparation of a pellet terminal

1) Procurement of pellet-handling equipment

- 2 unloaders
- 3 units of stacker/reclaimer
- loading facilities onto railway wagons and trucks

2) Construction of storage yard of 180,000 ton capacity

3) Construction of a berth: length of 280 m and water depth of 14 m

(4) Preparation of a scrap terminal

1) Procurement of scrap-handling equipment

- 3 level luffing cranes of electric magnet type

2) Construction of storage yard of 17,500 ton capacity

3) Construction of a berth: length of 185 m and water depth of 10 m

(5) Preparation of a sulphur terminal

1) Procurement of sulphur-handling equipment

- Receiving facilities from railway wagons

2) Construction of sheds of 55,000 ton capacity

3) Construction of a berth: length of 240 m and water depth of 12 m

(6) Preparation of a fertilizer terminal

1) Procurement of fertilizer-handling equipment

- Receiving facilities from railway wagons and trucks

2) Construction of sheds of 66,000 ton capacity

3) Construction of a berth: length of 240 m and water depth of 12 m

(7) Construction of public berths: total berth length of 555 m and water depth of 10 m

(8) Preparation of infra-structures for common use

- Main breakwater : length of 1,950 m
- Sub breakwater : length of 700 m
- Access channel : breadth of 180 m and water depth of 15 m
- Basins : water depth of 10-14 m
- Siding railways
- Access roads
- Port administration office
- Maintenance shop for cargo-handling equipment
- Navigational aides and port service boats

1.4 Management and Operations

(1) Latakia Port and Tartous Port

1) Adequate control of the number of employees by classification

2) Development of human resources through both on-the-job-training and basic training

(2) The New Port

1) Establishment of a new port company to construct and administrate the new port

2) Development of human resources

2. The Second Phase Project

2.1 Latakia Port

The main components of the first phase project of Latakia Port are summarized as follows:

(1) Establishment of a new full-scale container terminal north of the existing terminal

1) Procurement of container-handling equipment

- 4 quay-side container gantry cranes
- 13 straddle carriers

2) Construction of infra-structures

- berths: length of 700 m and water depth of 14 m
- Marshaling yard: 700 m x 350 m
- Stuffing/unstuffing yard
- Off-dock empty container storage yard

3) Construction of upper-structures

- Container freight station (CFS)
- Terminal control office
- Gate house
- Repair shop for container-handling equipment
- Maintenance shop for container boxes

(2) Preparation of additional general cargo berths northeast of the new port area

1) Construction of berths: total berth length of 555 m and water depth of 10 m

2) Procurement of cargo-handling equipment

- 9 rail-mounted portal jib cranes

(3) Preparation of infra-structures

- Main breakwater : length of 600 m
- Sub-breakwater : length of 900 m
- Access channel : Breadth of 290 m and water depth of 15 m
- Basins : water depth of 10-14 m
- Siding railways
- Access roads

2.2 Tartous Port

The main components of the second phase project of Tartous Port are summarized as follows:

(1) Establishment of a full-scale container terminal north of the pier B

1) Procurement of container-handling equipment

- 1 rail-mounted container transfer crane
- 3 tire-mounted container transfer cranes

2) Construction of upper-structures

- Terminal control office
- Gate house
- Repair shop for container-handling equipment

3) Introduction of a closed terminal operation system

(2) Procurement of equipment for handling conventional cargo

- 3 rail-mounted portal jib cranes of (north of pier A)

(3) Conversion of the existing phosphate terminal to a grain terminal and general cargo/Ro-Ro berths

(4) Construction of a new passenger terminal at the bottom of the general cargo berths southeast of the port