12. Master Planning of the Coastal Channels and Ports Development

12.1 Short-term Development

There are 12 projects the JICA Study Team recommends to implement as the short-term development. Among these, only two channels should be provided with facilities related to the coastal shipping, namely Sichon and Songkhla. This conservative development is due to the fact that most of the channels are used by fishing vessels only and neither their number nor size are considered to increase in the near future. For Sichon, additional jetty and light beacon should be provided. For Songkhla, a coastal shipping terminal having one coastal berth and one Ro/Ro berth should be constructed to cope with the increasing cargoes as well as to promote inter-modal shift from road to coastal transport. More shore protection works should be provided for all the channels protected by dual jetties to mitigate the nearby beach erosion. Sand bypassing should be implemented at three channels, namely Bang Ra Pha, Tanyong Pao and Panare. Total cost for the short-term development including sand bypassing, but excluding engineering fee, physical contingency and VAT, is estimated at about 633.3 million Baht. (See Table 12.1)

12.2 Long-term Development

There are 10 projects the JICA Study Team recommends to implement as the long-term development. For Songkhla, the coastal shipping terminal should be expanded to have one each of additional berths of both coastal and Ro/Ro in line with the coastal shipping development. No physical shore protection is recommended, but sand bypassing should be implemented at 10 channels, namely Songkhla, Na Thap, Sakom, Thepha, Bang Ra Pha, Tanyong Pao, Panare, Bang Maruat, Sai Buri and Narathiwat. Total cost for the long-term development including sand bypassing, but excluding engineering fee, physical contingency and VAT, is estimated at about 481.5 million Baht. For the same reason previous by mentioned, no ambitious plan will be necessary for long-term development. (See Table 12.1)

TABLE 12. 1 Short and Long-term Development Project (year 2001 -2020)

	Coastal Channel	2001 (Present)			2001-2010			2011-2020		
		Channel Control Structure	Erosion Prevention Structure	Main Port Structure	Channel Control Structure	Erosion Prevention Structure	Main Port Structure	Channel Control Structure	Erosion Prevention Structure	Main Port Structure
1	**Songkhla (Harbour)**	Jetty & Breakwater		Cargo Wharf, Oil Jetties	Additional Jetty Plan	Detached Breakwater & Groin	Expansion Container Berth (HD, D/D), Additional Oil Jetty Facilities (PTT) Ro/Ro Berth/Coastal Berth (JICA)	Sand Bypassing 15,000m^3/year		Expansion Container Cargo Berth (HD, Phase II), Oil Jetty (PTT) Expansion Ro/Ro & Coastal Berth (JICA)
2	**Pak Phanang**			Public Fishing Jetties			Additional Oil Jetty Facilities (PTT)			
	New Sichon Plan							Breakwater (Southern Seaboard)		Deep Sea Port (Southern Seaboard)
3	**Pattani**	Dual Jetties		Private Fishing Jetties						
4	**Khanom (Outer & Inner Channel Sector 1&2)**			Cargo Wharf, Oil Jetty						
5	**Sai Buri**	Dual Jetties	Detached Breakwater, Revetment	Public Fishing Jetties		Additional Detached Breakwater, etc. (HD, beginning of construction in 2001)		Sand Bypassing 20,000m^3/year		
6	**Sichon**	Single Jetty		Public Fishing Jetties	Additional Jetty Plan, etc. (HD, F/S)	Additional Detached Breakwater, etc. (HD, F/S)				
7	**Khanom (Inner Channel Sector 3)**			Public Fishing Jetties						
8	**Narathiwat**	Dual Jetties	Groin (T-type)	Public Fishing Jetties		Improvement, Groin (T-type)		Sand Bypassing 15,000m^3/year		
9	**Tha Sala**	Dual Jetties	Detached Breakwater, Groin	Public Fishing Jetties, Mining Jetties		Groin (T-type), Improvement				
10	**Pak Nakhon**			Public Fishing Jetties						
11	**Na Thap**	Dual Jetties	Groin (L-type)			Improvement & Detached Breakwater		Sand Bypassing 10,000m^3/year		
12	**Sakom**	Dual Jetties	Detached Breakwater			Improvement & Detached Breakwater		Sand Bypassing 10,000m^3/year		
13	**Thepha**	Dual Jetties	Detached Breakwater			Improvement & Detached Breakwater		Sand Bypassing 15,000m^3/year		
14	**Panare**	Dual Jetties	Detached Breakwater		Improvement, Detached Breakwater, Sand Bypassing 50,000m^3			Sand Bypassing 50,000m^3/year		
15	**Bang Ra Pha**	Dual Jetties			Detached Breakwater & Sand Bypassing 50,000m^3			Sand Bypassing 50,000m^3/year		
16	**Tanyong Pao**	Dual Jetties			Detached Breakwater & Sand Bypassing 50,000m^3			Sand Bypassing 50,000m^3/year		
17	**Bang Ta Wa**	Revetment	Groin, Wave-dissipating Blocks			Groin (T-type), Improvement, Detached Breakwater				
18	**Bang Maruat**	Dual Jetties	Detached Breakwater			Improvement & Detached Breakwater		Sand Bypassing 50,000m^3/year		
19	**Tak Bai**	Dual Jetties	Groin							
20	**Laem Ta Chi (Pattani Outer Channel)**	Single Jetty								
21	**Pak Paya**									
22	**Pak Phun**									
23	**Pak Phaying**									
24	**Pak Duat**									
25	**Tha Mak**									
26	**Khlong Tung Ca**									
27	**Khlong Tu Yong**									
28	**Ban Sai Samo**									
29	**Ru Sa Mi Lae**									
30	**Ta Lo Lae Weng**									

Note:

: JICA Recommended Project

(HD, F/S): Feasibility Study by Hpoubour Department

(HD, D/D): Detail Design by Hpoubour Department

(PTT): Petroleum Authority of Thailand

(Southern Seaboard): The Southern Seaboard Development Committee

Shore protection work like detached breakwater will be re-examined

13. Short-term Development of Songkhla Port

13.1 General Cargo Demand

The JICA Study Team forecasts the general cargo demand for the short-term development in 2010 is from 433,000 to 528,000 tons. The team estimated this by inputting actual cargo volume in 1999 into the study results obtained by Office of Maritime Transport Promotion Committee (OMPC). The private coastal shipping berths on the Songkhla Lake, located at the congested city proper, are capable of handling up to 350,000 tons per year. Since the expansion of private piers is prohibited in the water zone, and since without expansion the cargo handling capacity cannot be increased, one new general cargo berth is required to handle the cargoes exceeding the capacity of the existing private berths.

13.2 Ro/Ro Cargo Demand

The team also forecasts that the general cargoes to be transported by truck in 2010 between the Study Area (Songkhla, Pattani and Narathiwat provinces) and Eastern Seaboard (Laem Chabang Port, Map Ta Phut Port) will be about 297,000 tons. Assuming about half of the cargoes can be shifted from the road to coastal transport, the team concludes about 150,000 tons could be transported by Ro/Ro ships in 2010, if efficient maritime transport services are provided at a competitive price. One Ro/Ro berth is, therefore, taken into account for the short-term development of Songkhla Port

13.3 Selection of Site

The site for the coastal shipping facilities is planned adjoining to the exiting international container terminal (Chaophaya Terminal International Co., Ltd., CTI) but on its east side along the navigation channel to the lake. The main reasons for the selection are to avoid the expansion area for the international container terminal and the archaeological preservation area, and to minimize the maintenance dredging for the new berths. The navigational channel to the Songkhla Lake is deepest and free from sedimentation in front of the new coastal terminal. The reclamation area is laid out to avoid the archaeological fortress submerged nearby water area. An access bridge is provided over the archaeological city moat (see Tables 13.1 and 13.2).

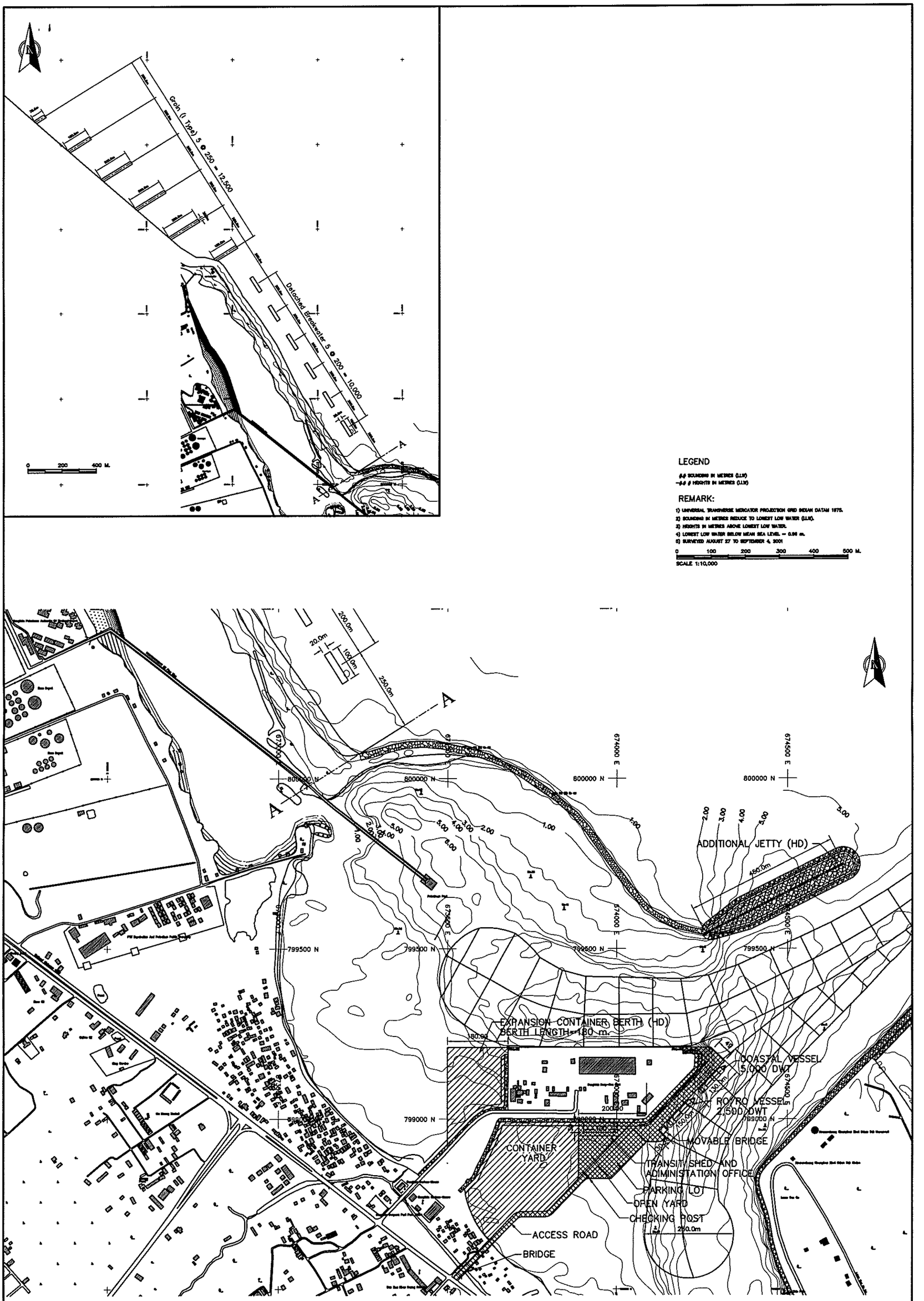


Figure 13.1 Short-term Development Plan for Songkhla Port (Year 2010)

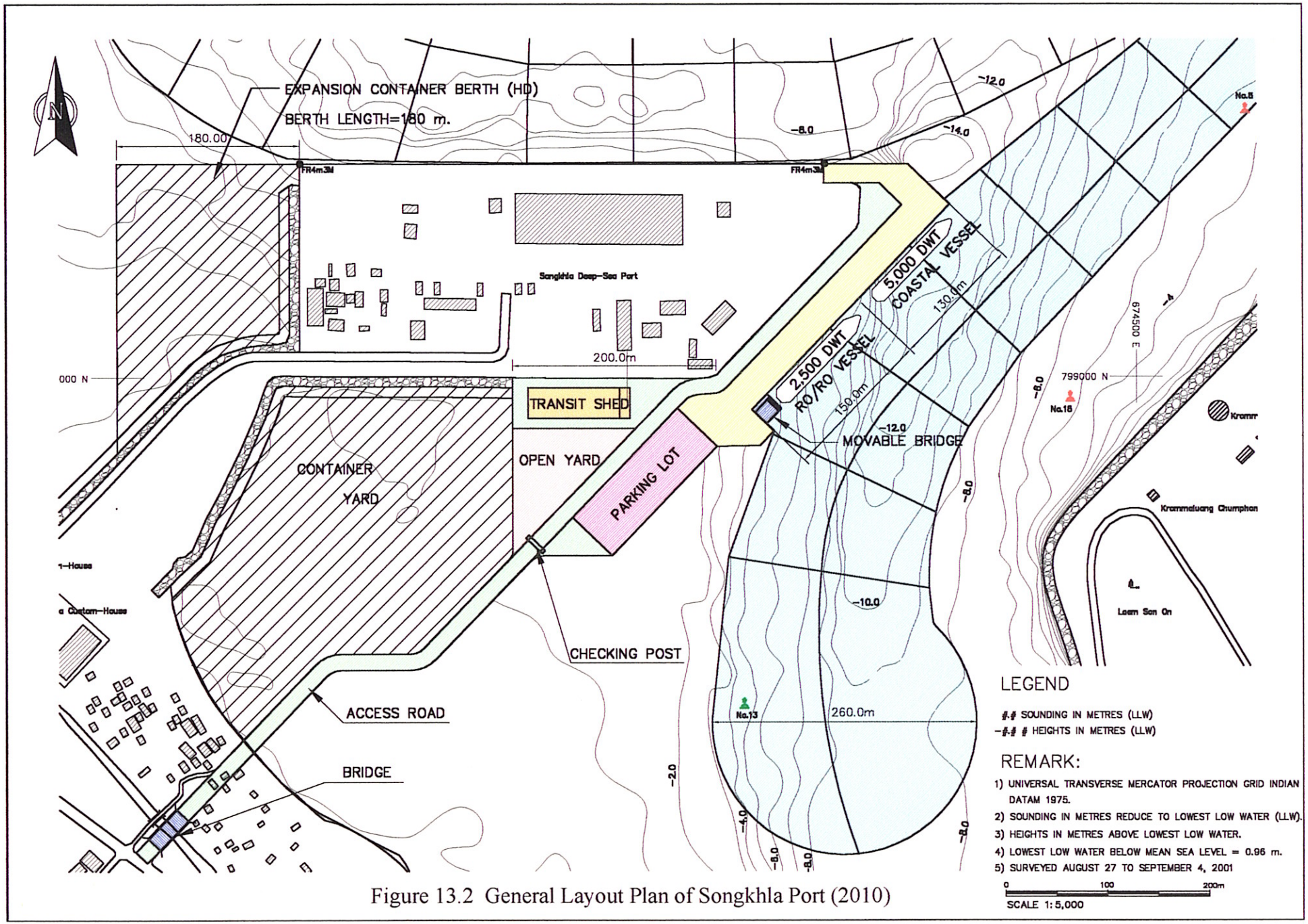


Figure 13.2 General Layout Plan of Songkhla Port (2010)

13.4 Design Vessels

Taking into account the tendency that secondhand vessels are likely to be purchased when they are economical for its size, the JICA Study Team suggests that the design vessel to be accommodated at the new general cargo berth should be 5,000 DWT. Meanwhile for the Ro/Ro vessel, the team suggests the berth be designed to accommodate a 2,500 DWT Ro/Ro vessel that a local shipping line is going to operate between Bang Saphan port and Leam Chabang port.

13.5 Port Facilities

For handling general cargoes of 300,000 tons per year and Ro/Ro cargoes of 150,000 tons per year and for accommodating 5,000 DWT cargo vessels and 2,500 DWT Ro/Ro vessels, the following facilities are to be provided as the short-term development:

- Coastal shipping berth (130 m long and 7.5 m deep)
- Ro/Ro berth (150 m long and 6.5m deep) equipped with Movable Bridge
- Transit Shed (2,700 m^2 floor), Administration Bldg. (600 m^2 floor)
- Open Yard (7,050 m^2), Parking lots (7,500 m^2), Access Road, Access Bridge, Gate, Utilities

The total project cost is about 420 million Baht and construction will take about four years.

13.6 Economic Analysis

Economic benefits of savings in transport costs and road maintenance costs are treated as quantitative benefits. Meanwhile, the project cost consists of the initial investment cost, operation cost and maintenance cost.

Thousand Baht

Year	2010	2015	2018
Benefits of Saving in Transport Cost:	80,630	145,583	189,859
Benefits of Saving in Road Maintenance Cost:	12,378	18,329	22,347
Operation Cost:	16,027	24,007	29,400
Maintenance Cost:	3,864	3,864	3,864

Based on the costs and benefits above, the economic analysis concludes that the EIRR of the coastal terminal development is computed at 22.0%; the benefit over cost ratio (B/C ratio) is 1.87; and the net present value (NPV) is 240.27 million Baht when the discount rate of 12% is taken into account. It is concluded that the coastal terminal development is worth being implemented from the viewpoint of the national economy of Thailand.

13.7 Financial Analysis

A port service fee level, as a key determinant of the revenue, was assumed in such a way that a comparative advantage of port users against road users in terms of transport costs can be assured: that is, 120 Baht/ton for general and container cargoes; and 40 Baht/ton for Ro/Ro cargoes. The cost for the operation and maintenance are estimated referring to existing port activities. Based on these assumptions, the financial analysis reveals a negative FIRR (financial internal rate of return) of -2.3% within the 25 years time horizon, meaning that the coastal terminal development could not be justified from the financial standpoint without a substantial resource involvement of the government sector through a subsidy or another form of special grant for local economy stabilization purpose. In order to make the coastal terminal development financially feasible, more or less 80% of the initial investment costs need to be covered with the subsidy.

A sensitivity test also indicates that in order to obtain more than 12% FIRR, a condition with 30% revenue increase and 50% cost reduction is necessary when no subsidy components are taken into account.

13.8 Recommendations

Considering the results of the economic analysis, the coastal terminal development at Songkhla Port is worth being implemented from the viewpoint of the national economy, because the computed EIRR of 22.0% is much higher than the opportunity cost of capital (12%) in the current Thai economy. The development will yield not only such a great economic saving in transportation costs, but also bring qualitative benefits from reduced road traffic congestions, a decrease of road traffic accidents and improvement of road environmental conditions. It can also be said that the coastal terminal development at Songkhla Port will improve the coastal shipping system in the region, thereby contributing to the improvement of an economically effective inter-modal system over the Kingdom.

For the implementation of the development, in consideration of the difficulty in its financial feasibility, an optimal scheme of PPP (Public and Private Partnership) should be explored. A viable scheme is proposed that the government sector constructs the facilities with the subsidy equivalent to 80% of the total investment cost, while the private sector assumes the responsibility for the operation and maintenance, introducing a revenue sharing system where the private operator can gain a 15% return on its investment in the long-term and pay the government sector 21% of the total revenue collected from the port service fees. A cashflow analysis implies that by receiving the 21% of the shared revenue, the government sector will be able to manage soundly the debt service of long-term loans with less than 7% interest rate for the remaining 20% of the

initial investment funds as well as short-tem loans to fill annual deficits within the 25 years time horizon.

It is consequently recommended that the coastal terminal development at Songkhla Port should be implemented with a strong support of the government sector to facilitate the local economy, and that the optimal PPP scheme as proposed here should be further pursued for the commercial operation and to be financially sustainable over the long-term.

14. Short-term Development of Sichon Channel

14.1 Necessity of Another Jetty

The Sichon channel accommodates 1,327 fishing vessels, the third largest number among the CDC II management channels after Pattani and Songkhla. The existing single jetty was constructed in 1996. Since then, sediment deposit has taken place near the jetty and the shallow seabed in the channel hampers ship maneuvering. During the storm in 1999, the single jetty probably augmented wave intrusion to the fishing village. Therefore, provision of one more jetty is required to prevent the channel from shoaling and protect the village from waves during storms.

14.2 Recommended Project

The new jetty is planned identical to the existing jetty, namely, rubble mound type of jetty in parallel to the existing one with 700 m length and 4 m crown elevation. In addition, provision of four units of light beacons is recommended for safety navigation at night. The total project cost is about 86 million Baht and construction will take about 1.5 years. (See Figure 14.1)

14.3 Economic Analysis

Benefits which the project will generate are savings in fuel consumption, savings in prevention of loss of marine catches due to reduction of waiting time to enter the channel, and savings in channel dredging cost. The economic analysis conclude that EIRR is 5.6%, Benefit over Cost Ratio (B/C ratio) is 0.61and Net Present Value (NPV) is -19,718,000 Baht when the discount rate of 12% is taken into account. No financial analysis was conducted since it is obvious that navigation channel does not produce any revenue fees from the fishermen. From the results of economic analysis, the project is not economically feasible. However, the overall improvement in social stability in the community through job creation and income generation by promoted fishing activities may give additional reason to implement the project.

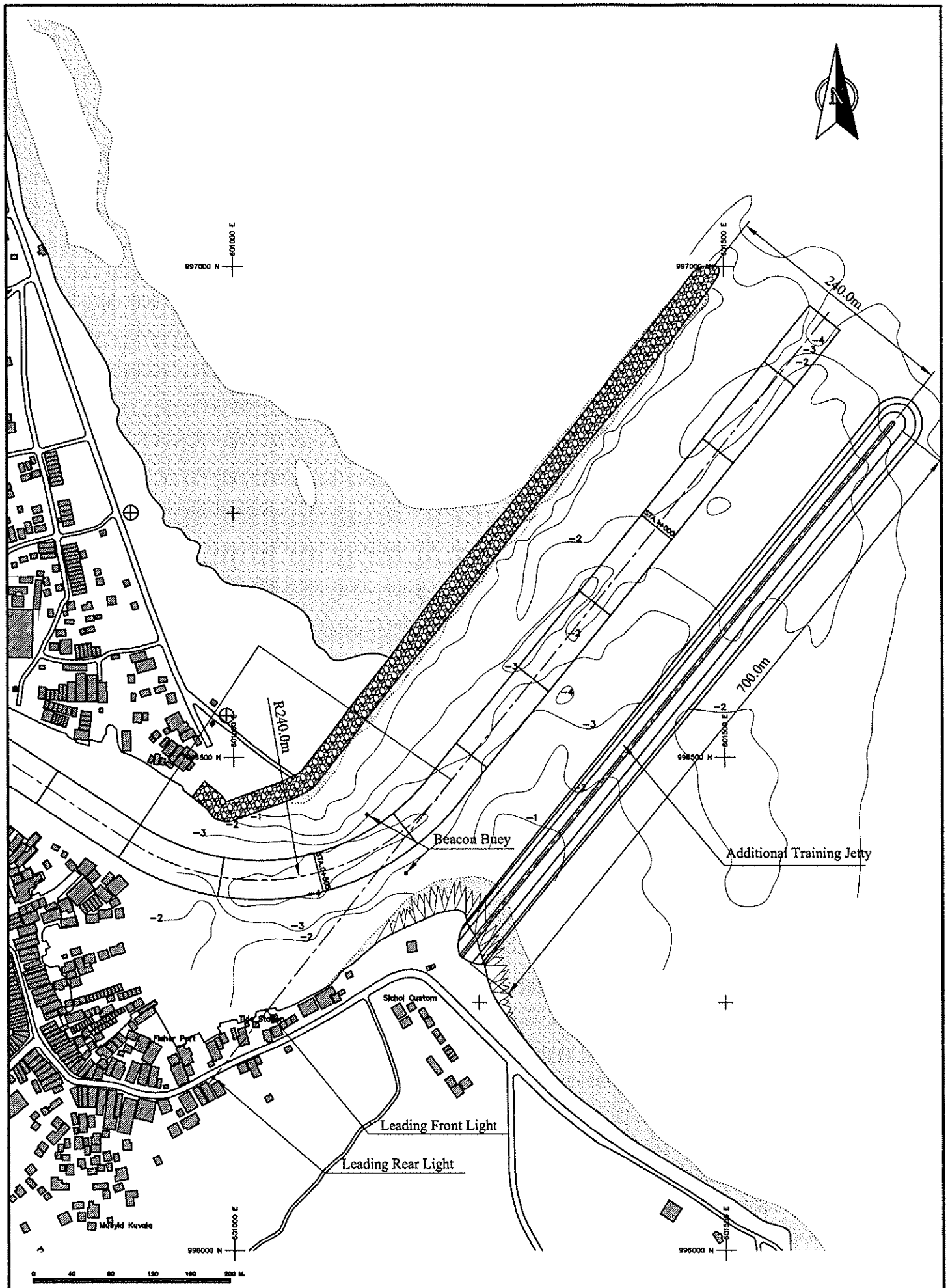


Figure 14.1 General Layout of Additional Training Jetty in Sichon

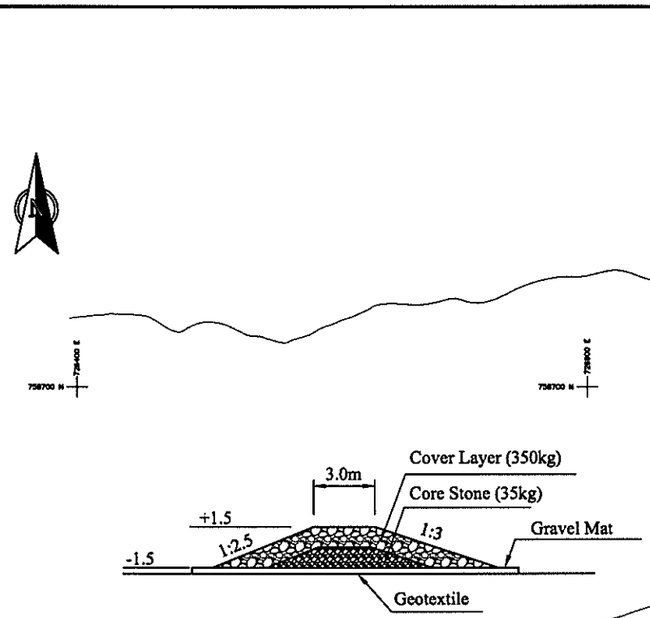
15. Short-term Development of Bang Ra Pha Channel

15.1 Recommended Project

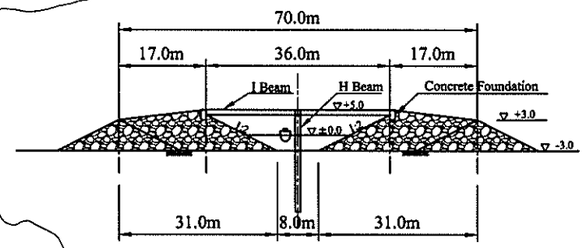
The littoral drift is so predominant at Bang Ra Pha coast that the newly built dual jetties have already trapped a considerable amount of deposition on the upstream side of the drift. The navigational channel obviously needs to be protected from shoaling. The JICA Study Team conducted a numerical simulation of the coastal changes generated by the jetties. Based on the simulation results and actual phenomena in other similar channels, extension of the jetties and sand bypassing were compared to each other. The team concluded that sand bypassing is more economical than the jetty extension. The extension of the jetties requires 4 times as many detached breakwaters as sand bypassing. The recommended project, therefore, consists of sand bypassing of 50,000 m^3 per year and construction of four detached breakwaters. The cost for six years is estimated to be about 48 million Baht. (See Figure 15.1)

15.2 Economic Analysis

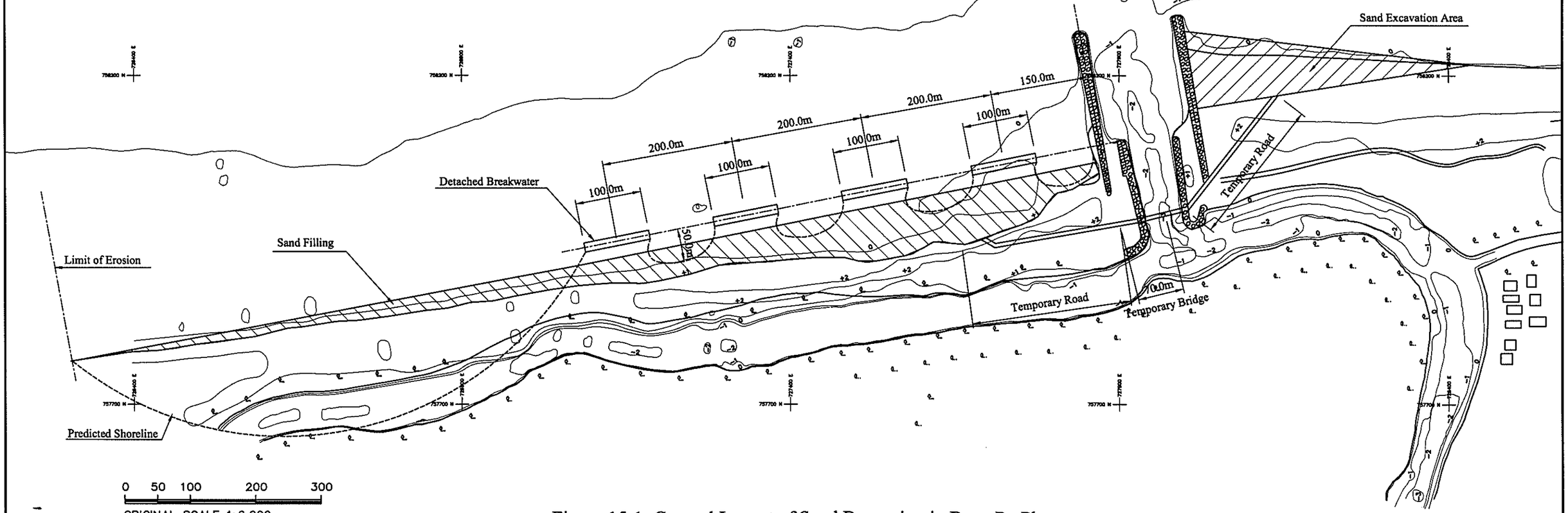
Benefits which the project will generate are the elimination of landing ships on seashore, reduction transport time and prevention of loss of catch. As there are only 110 small fishing boat, the economic analysis concludes that EIRR is not available. Benefit over Cost Ratio (B/C ratio) is 0.16 and Net Present Value (NPV) is about minus -26,457,000 Baht when the discount rate of 12% is taken into account. No financial analysis was conducted since it is obvious that navigation channel does not produce any revenue fees from the fishermen. From the results of economic analysis, the project is not economically feasible. However, taking such qualitative benefits as the aspect of the overall securing of social stability in the community through job creation and income generation by keeping fishery activities into account, the project is considered to be worthy. The project should be considered as the social welfare for municipal fishing village.



Detached Breakwater



Temporary Bridge Section



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16. Technical Transfer

16.1 Technical Transfer in Dredging Operation

During the first and second Thailand visits by the Study Team, dredging operations for C-25, C-37 and H-12 were greatly improved as follows:

Dredger	Major improvement	Results of improvement
C-25 and C-37	1) Control of adequate dredging velocity by diffuser arrangement at the end of discharge pipe 2) Cutter position arrangement in Pak Phanang Channel	- More than double dredging output - Decreasing of fuel consumption by 30-40% - Decreasing of engine trouble to almost zero
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16.2 Seminar

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- Dredging Improvements of Navigational Channels
- Forecast of Coastal Changes by Numerical Simulation Models
- Intermodal Shift of Transport from Land Transport to Sea Transport

In the seminar, HD officials and JICA team members as well as JICA advisory Committee members and OMPC officials presented eight papers. The presentation was followed by comments and discussions by about 80 participants.

16.3 Counterpart Training

From November 4 to 17, 2001, counterpart training was conducted on "Dredging Management and Measures against Coastal Erosion in Japan". The goal of this training course was to reinforce dredging management techniques of the trainees and improve their knowledge on countermeasures against coastal erosion.

13.4 Design Vessels

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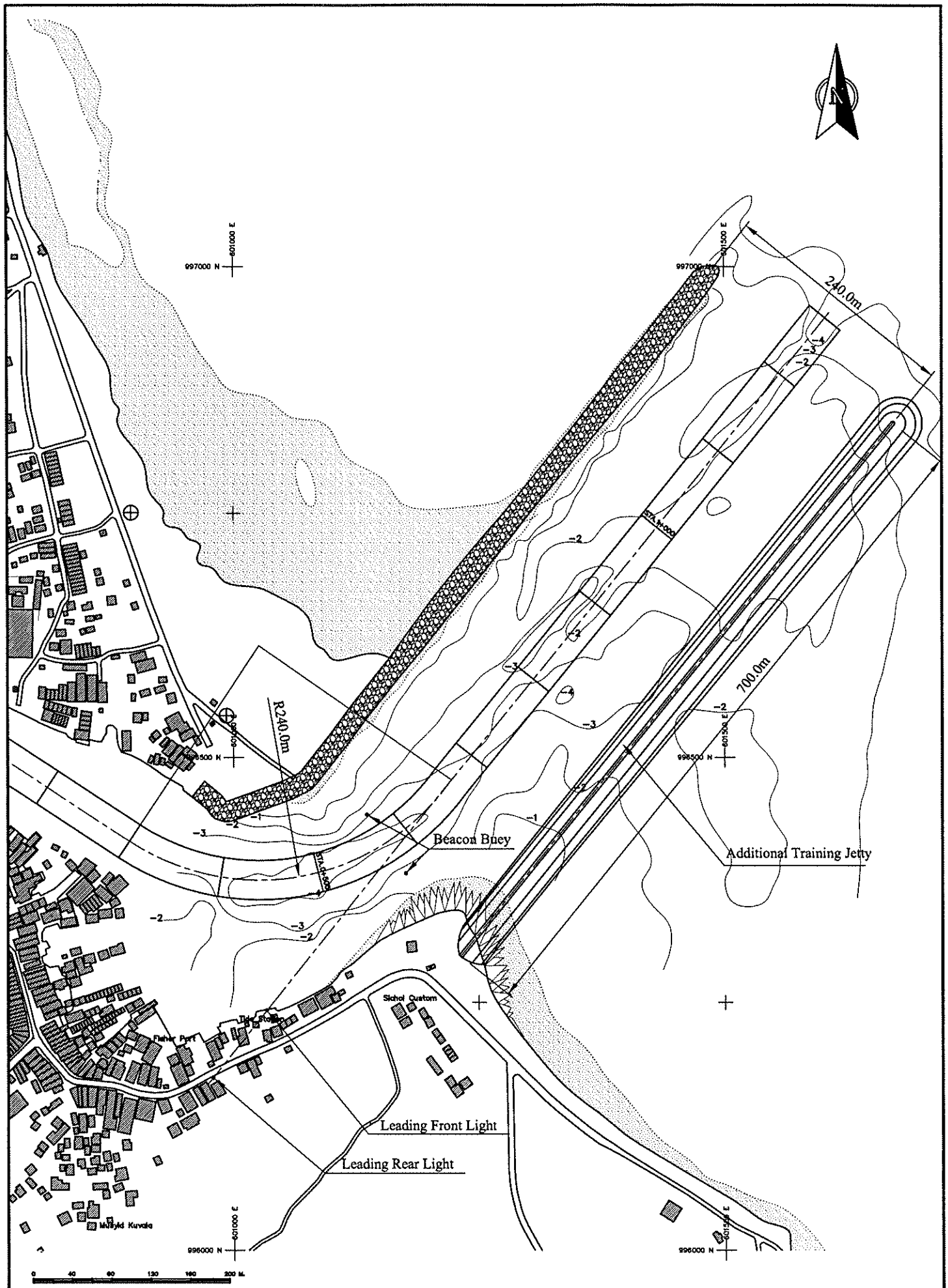

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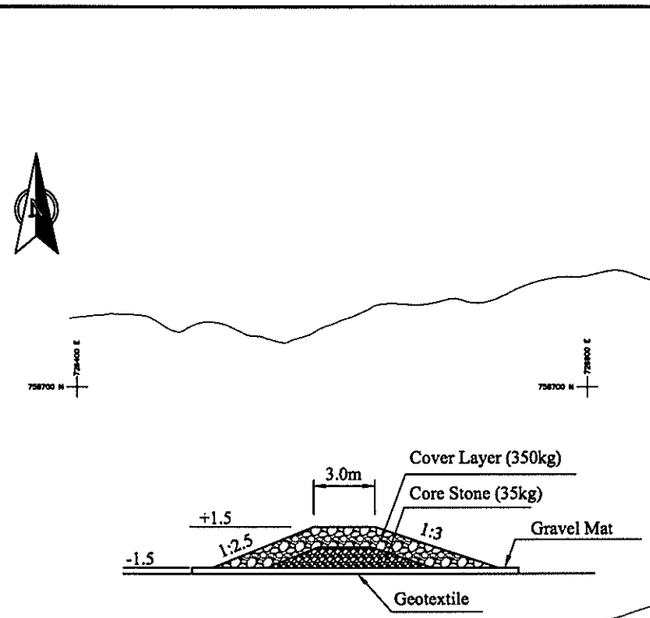
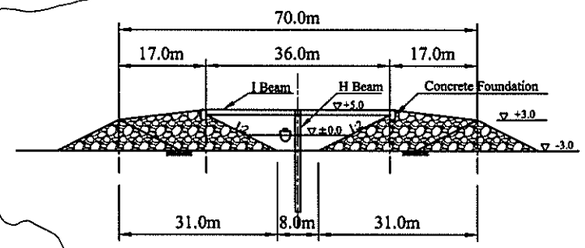
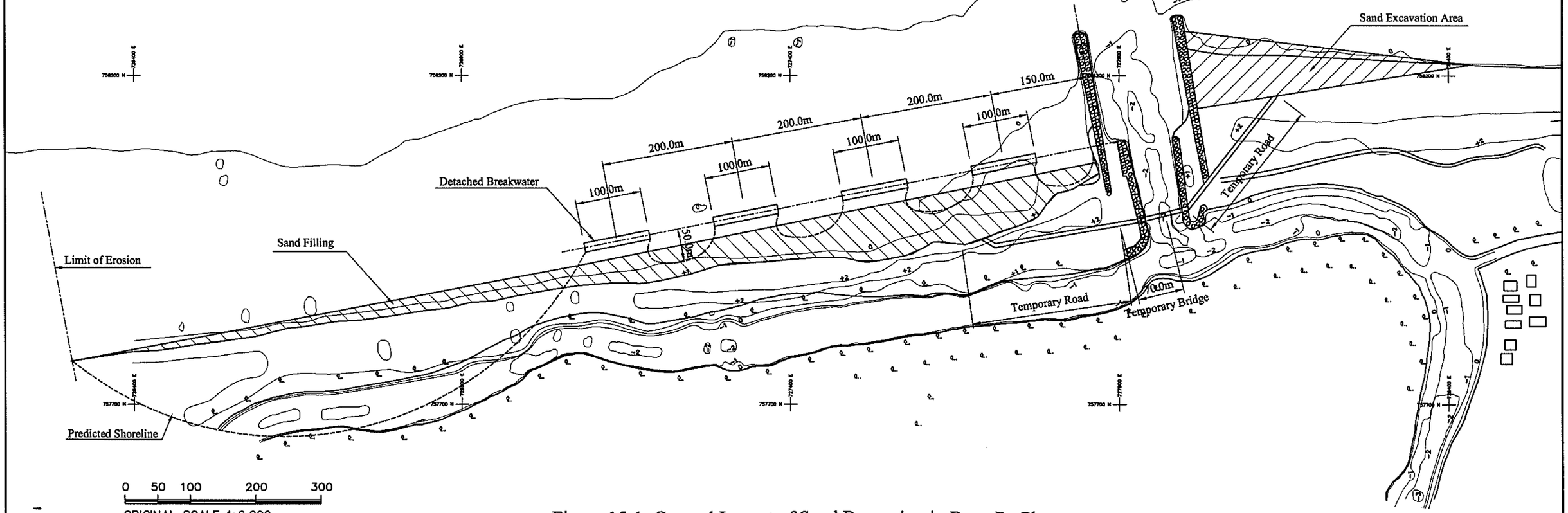


Detached Breakwater



Temporary Bridge Section



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- Dredging Improvements of Navigational Channels
- Forecast of Coastal Changes by Numerical Simulation Models
- Intermodal Shift of Transport from Land Transport to Sea Transport

In the seminar, HD officials and JICA team members as well as JICA advisory Committee members and OMPC officials presented eight papers. The presentation was followed by comments and discussions by about 80 participants.

16.3 Counterpart Training

From November 4 to 17, 2001, counterpart training was conducted on "Dredging Management and Measures against Coastal Erosion in Japan". The goal of this training course was to reinforce dredging management techniques of the trainees and improve their knowledge on countermeasures against coastal erosion.