No.

BASIC DESIGN STUDY REPORT
ON
THE PROJECT
FOR
THE IMPROVEMENT OF NORTH DOCK OF PELELIU STATE
IN
THE REPUBLIC OF PALAU

JANUARY 2006

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to a request from the Government of the Republic of Palau, the Government of Japan decided to conduct a basic design study on the Project for the Improvement of North Dock of Peleliu State and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Palau a study team from August 7 to September 3, 2005.

The team held discussions with the officials concerned of the Government of Palau, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Palau in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Palau for their close cooperation extended to the teams.

January, 2006

Seiji Kojima
Vice-President
Japan International Cooperation Agency

January, 2006

Letter of Transmittal

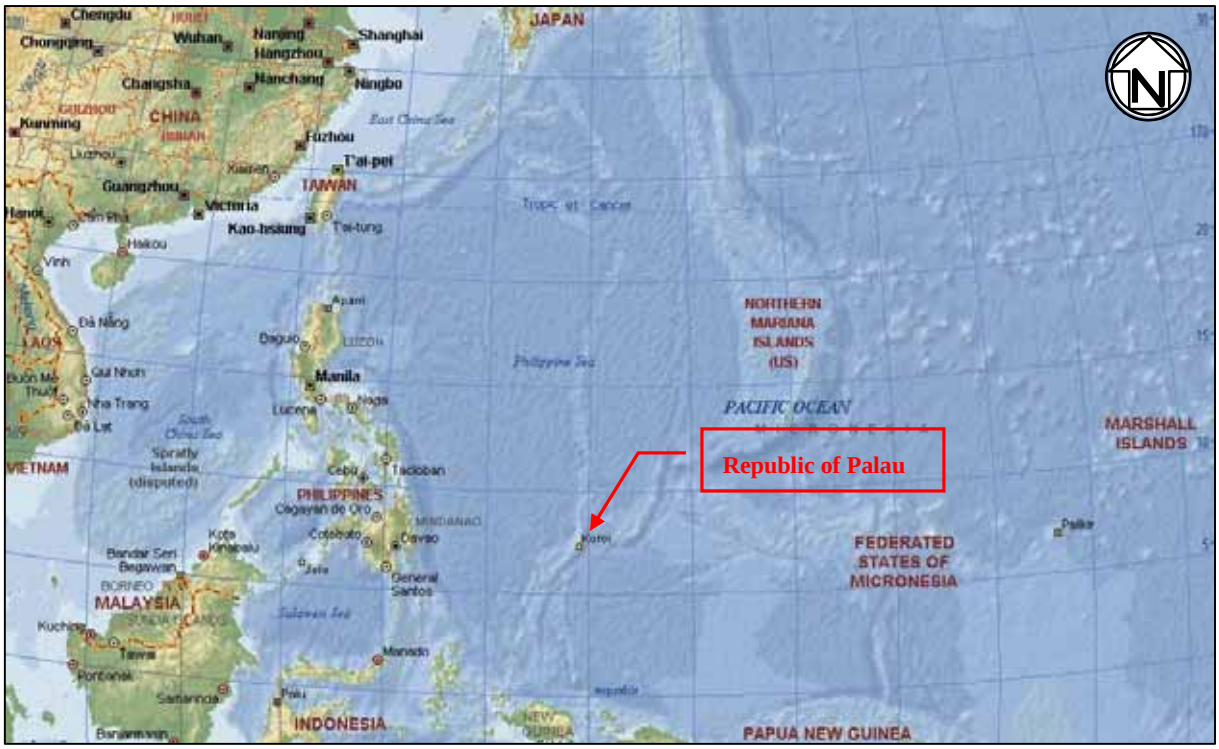
We are pleased to submit to you the basic design study report on the Project for the Improvement of North Dock of Peleliu State in the Republic of Palau.

This study was conducted by ECOH CORPORATION, under a contract to JICA, during the period from July 2005 to January 2006. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Palau and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

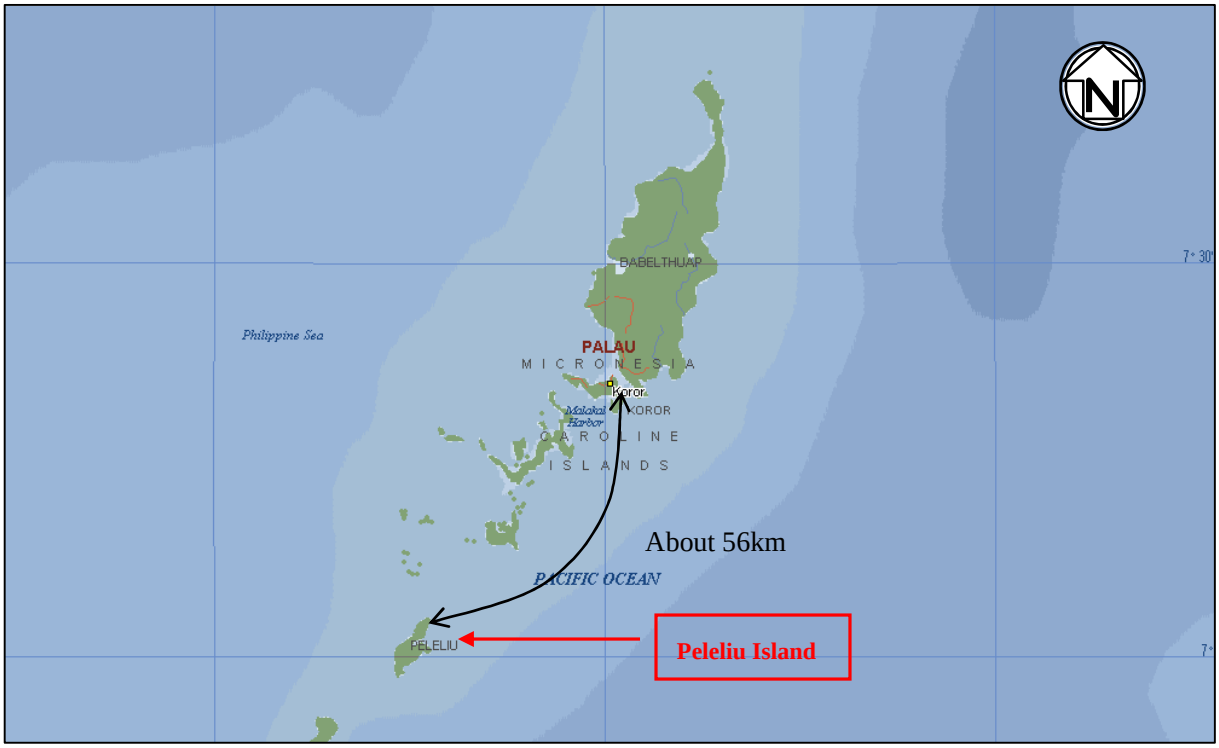
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

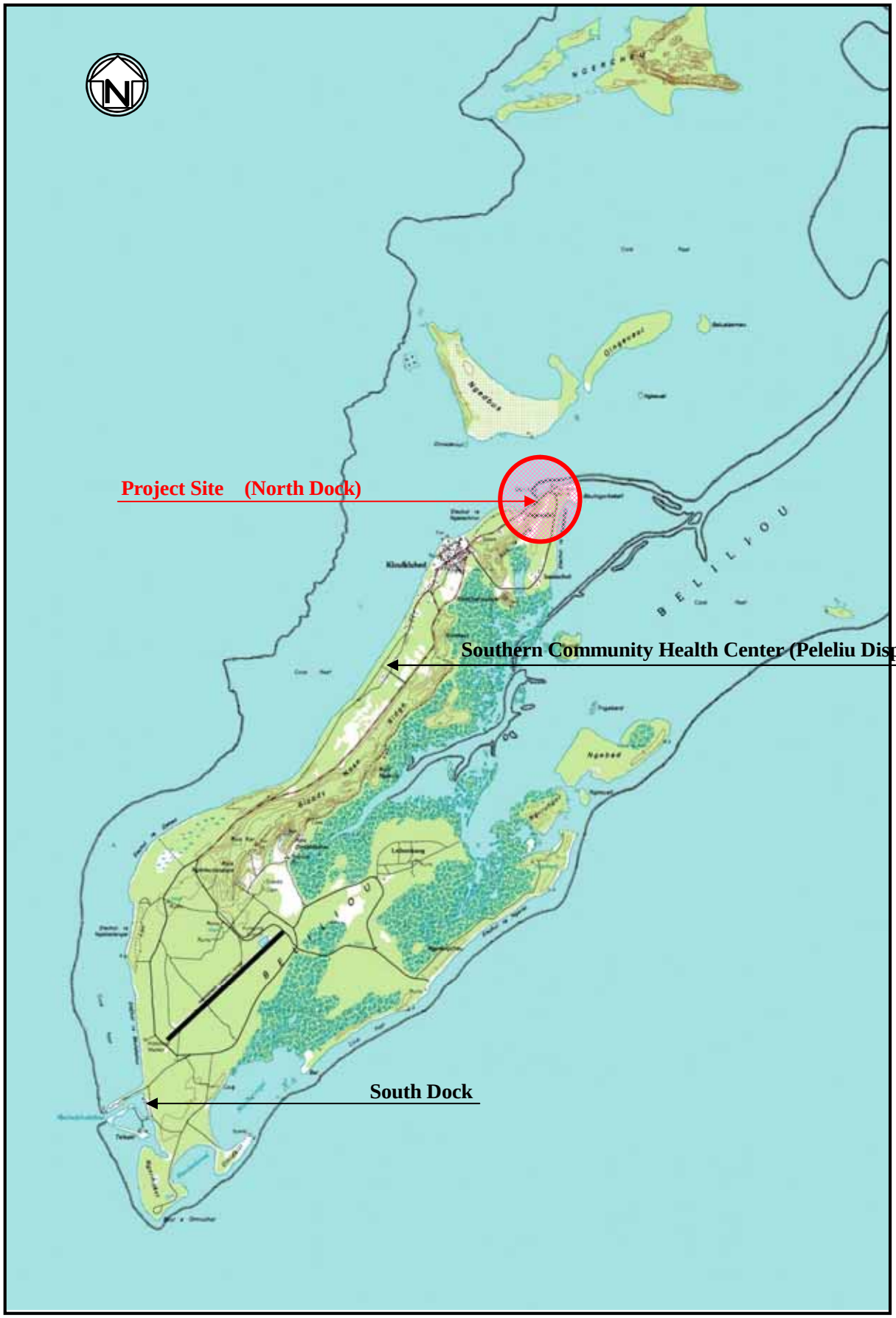
Masakiyo Muraoka
Chief Consultant,
Basic design study team on the Project for the Improvement of North Dock of Peleliu State in Palau
ECOH CORPORATION



Location of Republic of Palau



Location of Peleliu State



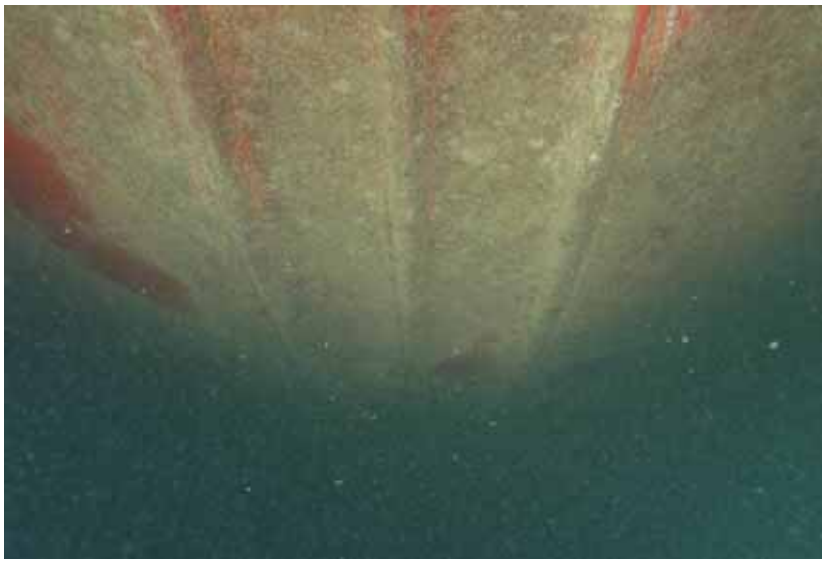
Location of the Project Site

Perspective Drawing (North Dock and Access Channel)

Perspective Drawing (Extension of North Dock)

	North Dock in Peleliu State (from west side)
	North Dock in Peleliu State (from south side)
	Access Channel of North Dock in Peleliu State

	On-board Investigation of ODESANGEL_DIL Loading Cars and Goods at Fishery Dock in Koror State
	Entering into access channel of North Dock in Peleliu State
	Eastern Side of North Dock in Peleliu State Unloading cars and goods at Natural Ramp-way

	RoRo cargo vessel at North Dock in Peleliu State ODESANGEL_DIL
	RoRo cargo vessel ODESANGEL_DIL Underwater photo of Vessel bottom (Scratching marks with sea bed)
	RoRo cargo vessel PELELIU STAR of Fishery Dock in Koror State

	Navigation Aid (Entrance of access channel) Daytime
	Navigation Pole (Turning Point No.16G) Daytime
	Navigation Pole (Turning Point No.16G) Late Afternoon

	East Coast of North Dock in Peleliu State Tree's roots have corrosion.
	East Coast of North Dock in Peleliu State Some trees show their roots because of serious corrosion by waves.
	West Coast of North Dock in Peleliu State Forwarding the shoreline in low tide.

East Coast of North Dock
in Peleliu State
Sinking Barge

Prospective Site for
Temporary Construction Yard

* It is private land.
* Utilizing agreement between the governor and land owner had been confirmed verbally.
* Trees will be removed when dredged sand will be dumped.

March, 2003
East Side of North Dock
in Peleliu State.

Boat ×7
PELELIU STAR:①

By the result of base line survey on August 21, 2005
North Dock(Ease side): Boat×10
North Dock(North - West side):Boat×21
NIPPON MARU, TAIRYO MARU, PELELIU STAR, ODESANGEL_DIL
Maximum number of persons in North Dock: 154 persons/hour (10:00a.m.)
Average number of persons in North Dock: 99.8 persons/hour
Total of passengers (arrival: 527 persons, departure 471 persons)

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Abbreviations

BFCA	Blilior Fisheries Cooperative
BOD	Biochemical Oxygen Demand
CDL	Chart Datum Line
COD	Chemical Oxygen Demand
DL	Datum Level
DO	Dissolved Oxygen
E/N	Exchange of Notes
EIA	Environmental Impact Assessment
EEZ	Exclusive Economic Zone
EQPB	Environmental Quality Protection Board
FRP	Fiber Reinforced Plastics
FY	Fiscal Year
GCP	Grassroots Cooperation Projects
GDP	Gross Domestic Product
GL	Ground Level
GNI	Gross Domestic Income
GT	Gross Tonnage
HBR	Hawaiian Belau Rock
HWL	Mean Monthly-Highest Water Level
JICA	Japan International Corporation Agency
JIS	Japan Industrial Standards
LED	Light Emitting Diode
LOA	Length Overall
LWL	Mean Monthly-Lowest Water Level
MHWN	Mean High Water Neap
MHWS	Mean High Water Spring
MLWN	Mean Low Water Neap
MLWS	Mean Low Water Spring
MSL	Mean Sea Level
NHHWL	Nearly Highest High Water Level
ODA	Official Development Assistance
OFCF	Overseas Fishery Cooperation Foundation
Ph	Potential of Hydrogen
PMA	Palau Maritime Authority
PNCC	Palau National Communication Cooperation
PPUC	Palau Public Utilities Corporation
PTC	Palau Transportation Company
RoRo	Roll-on Roll-off
SS	Suspended Solid
UNDP	United Nations Development Program

Summary

SUMMARY

1. Present Circumstances and Issues of the Sector in Recipient Country

The Republic of Palau, an island country, consisting of more than 200 islands with a total land area of 491 km^2 and total population of 19,129 people (by census 2000) is located at the center of western Pacific between 3°and 9°north latitude and 134°and 135°east longitude. Palau is seldom to be hit by typhoons because location of Palau is near the generating area of the tropical storm. The climate is divided into two typical seasons, namely the rainy season from June to October and the dry season from November to May. The weather conditions are the tropical oceanic climate of high temperature and high humidity with a mean temperature of 27 to 28, a mean humidity of 80 to 90% and an annual precipitation of 3,000 to 4,000 mm. Islands in Palau are consisted of raised coral. There are coral reefs around the islands and the geography is considered as the typical coral reefs which includes shallow area inside of reefs and steep slope into deeper sea. Palau had been under United States governance as UN trust territory since 1945, and autonomous government was established in 1981, finally, Palau attained independence in 1994 with entering into the Compact of Free Association with United States. Master plan 2020 was established in 1996 which is aiming for the conservation of tradition and nature, sustainable economic growth by development of private sector and fulfillment of equal society. GDP of Palau reached about 130 million US Dollars in 2002 and GNI per capita was recorded as 6,820 US Dollars in 2003. Breakdown of major industry in 1999 are consisted of trading (20%), tourism (11%), transportation and communication (9%), construction (7%) and fishery (3%). Fishery is divided into two, namely, the large scaled industrial fishery and small scaled fishery (artisanal and reef fishery). Fish catch by major scaled fishery invested by foreign countries becomes 80% of total catch and most of the catch is exported. National finance in Palau is dependent on the financial assistance by United States, however, the assistance will be terminated in 2009. Therefore, prompt economic independence is major issues for Palau now. Especially, the Government of Palau focused on the fishery and tourism as high capable industries to be developed by their own sustainable development in rural area can also be possible with its necessity. Moreover, the Government of Palau set the high priority to sustainable development of fishery in the framework of “National Master Development Plan 2020”.

Palau consists of 16 states with a total population of 19,129 (census 2000), about 70% of which is concentrated in Koror State. Thus, it is important for the other states suffering from weak economic foundations to strengthen and vitalize the relationship with Koror State with respect to the supply of fishery products and distribution activities of goods and commodities. In this way, they may be able to

breakaway from a self-sufficiency economic structure and facilitate regional development by enhancing the market economy. The project site is located in Peleliu State which is an island state located 56 km from Koror State the country's capital functions. Population of Peleliu State was recorded as 571 people (census 2000). Major industries of Peleliu State are tourism and fishery which has approximately 50 out-board motored small boats. Member of fishery cooperatives in Peleliu State is 31 people (Basic Design Study 2005). Fish catch in Peleliu State recorded 11 ton (2003) which was 4.8 % of total fish catch in small scale fishery in Palau. The fishing activities are carried out at North Dock in the state, located in the Northern part of Peleliu Island. North Dock plays an important role as the physical distribution base which is like the lifeline of Peleliu State. Government of Japan donated two of fishery grant aid projects to North Dock in the past and fishery facilities (administration building, ice making plant, water / oil supply facility and fish transporting boat), rehabilitation of pier, dredging of basin and access channel.

As the effects of past grant aid projects, activity of fishery is vitalized and vessel calling in North Dock has been increased in every year. However, in recent years, a number of issues have been identified. Contents of issues are described below.

(1) Shortage of berth causes long waiting time of fishing boats by the congestion in North Dock. Therefore, efficiency of handling of fish has been suffered.
(2) Water depth of DL-1.5m is to shallow for the operation of new RoRo cargo vessel since November 2004.
(3) Shortage of navigation aids has led the difficulty for safe navigation of boats in rough weather or in emergency cases.

2. Necessity of Requested Project and Components

Considering above mentioned back ground, the Government of Palau has requested a grant aid project to the Government of Japan to improve the access channel with navigation aids and expansion of the pier. The purpose of said request is to enhance the convenience of berthing the fishing boats, improve the efficiency of fish handling, settle the congestion of North Pier, secure the safety navigation and improve the efficiency of cargo handling in North Dock.

3. Dispatching the Mission

In response to the request made by the Government of Palau, the Japanese Government decided to carry out a basic design study for the project. And Japan International Cooperation Agency (JICA) on behalf of the Government of Japan has sent a study team to Palau with the schedule as indicated below.

(1) Basic Design Study Mission : August 7 to September 3, 2005

(2) Draft Report Mission : November 3 to November 8, 2005

Study, plan and design of the basic design study have been executed according to the result of said site survey.

4. Outline of Study Result and Contents of the Project

The study team held discussions with the officials concerned in the Government of Palau and the Peleliu State Government, and carried out a field survey of the project site. The basic design was accomplished by examining the project components and analyzing the field survey data during office works in Japan. According to the results of the works, the basic study was concluded that the improvement of requested facilities is justifiable as indicated below.

(1) Extension and rehabilitation of the pier

(2) Dredging of the access channel and basin

(3) Installation of the navigation aids

The planning and designing of the requested facilities are carried out adopting consideration for the living circumstance and nature of Peleliu State at the time of the base line survey in August 2005. Furthermore, North Dock supports not only fishing port activities such as preparations for fishing operation, idle berthing and landing of fish catches but also the other functions of embarkation and disembarkation of passengers and unloading of daily commodities, construction materials, fuel and others. At the planning and designing stages of the pier facility, the functions required for commercial port activities as a sole physical distribution base of the island state are included in addition to the fishing port functions. In this connection, the following concepts are fully taken into account. Effects of construction of facilities will be described below.

(1) Improvement of efficiency of fish handling works and convenience of fishermen in North Dock

(2) Improvement of navigable days of the RoRo cargo vessel by the dredging at access channel and basin

(3) Ensuring the safe navigation of the boats and vessels for their entering and departure from port by the installation of navigation aids

The facilities to be constructed in the project must be planned as an appropriate scale according to the grant aid project scheme, considering the project background, project objectives, natural conditions, maintenance systems and construction condition. Contents of the facilities are listed below.

Table-1 Scale and Contents of Planned Facilities

Facilities	Scale	Purpose	Remarks
Pier extension	Extension length: 41m	Berthing the RoRo cargo vessels and boats	41m is included 4m in length of ramp-way.
Ramp-way for landing	4m x 6m	Loading and unloading the cargo	
Concrete pavement	1,520 m^2	Concrete pavement for Apron	
Lights	3 Lights	For the works at berth	2 lights are newly installed. 1 existing light is transferred.
Rehabilitation of revetment in Western and Eastern sides of pier	Eastern revetment: 25m Western revetment: 29m	Reinforcement of the revetments	
Slipway	4m x 22.8m	for approach of boat and trailer to the sea	
Navigation Aids	1 navigation aid with light and 1 navigation pole	Install a navigation aid in the corner and a navigation pole in the entrance of the access channel	light with red colored LED or bulb
Embankment of Eastward of North Dock	L=34m	For preservation of coast	34m extension from existing revetment of North Dock
Dredging of water channel	Approximately 24,000m^3	DL-2.0m (approx. 4,900m) DL-2.5m (approx. 600m included to DL-2.0m area)	Dredging area for DL-2.5m will be sand trap.
Dredging of basin in front of new pier	Approximately 300m^3	Water depth DL-3.0m	
Dredging of existing basin	Approximately 1,700m^3	DL-2.0m	

5. Cost Estimation of the Project

In case of implementation of this project by the Japanese grant aid, the construction works take 15 months including detail design and tendering procedures. Cost will be estimated at approximately 581 million Japanese Yen for Japan side and 2.82 million Japanese yen for Palau side. It is necessary to carry out the maintenance

works for pier, revetment, access channel and navigation aids. Operation of the facilities and small scaled maintenance shall be executed by the Peleliu State Government and large scaled maintenance including maintenance dredging shall be executed by the National Government, especially by Ministry of Resources and Development. No personnel will be newly recruited in this connection.

6. Verification for Appropriateness of the Project

Implementation of the project will enable the RoRo cargo vessel, (ODESANGEL_DIL) fishing boats and other boats to safely call port and berth at any tide level and improve the efficiency of works at the pier. The following effects could be expected, so that it is concluded that the project is justified as appropriate as the grant aid project.

(1) Direct Effect

1) Benefit of fishing boats

Berth for fishing boats and other vessels will be sorted out due to the extension of berth with 41 m length. Each fishing boat or vessel can berth in order and congestion will be mitigated. Facilities will improve the safety and efficiency of unloading the catch from fishing boat.

2) Increase of navigable days by dredging

(a) Navigable days per year by full loaded RoRo cargo vessel will be improved from 44 days at present to 323 days (according to the tide table indicated in PNCC telephone guide in 2005) after dredging due to dissolubility of waiting time for the tide.

(b) Time passing the access channel by RoRo cargo vessel will be improved from 55 minutes at present to apploximately30 minutes.

3) Improvement for the safety of navigation by installation of navigation aids

Navigation aids will maintain the safer navigation of boats in rough weather or in emergency cases.

(2) Indirect Effect

1) Improvement for efficiency of fish handling and navigable days of vessels make stable supply of fish catch to Koror. Consequently, benefit of fishermen will be improved.

2) Dredging of basin and access channel and extension of pier will reinforce the lifeline of Peleliu State resident since their logistic is depended on the sea transportation.

3) The economy of Peleliu State will be vitalized by the development of fishery and the increase of passenger and cargo handling.

It is recommended that both Government of Palau and Peleliu State Government will be responsible for management and operation of the project facilities such as the pier and the access channel. Good maintenance should be taken to ensure

the effective use of the pier, the revetment, the access channel, the navigation aids and the accessories of pier with following points.

1) Appropriate Operation and Management

Proper guidance for fishermen and other users of the facilities will be required to ensure appropriate and smooth management and operation of the project facilities.

2) Appropriate Maintenance

Periodical sounding survey will be necessary to be carried out. When the depositing sand of the access channel and bathymetric change adjacent to the pier and revetment are observed, maintenance dredging should be immediately carried out by Ministry of Resources and Development.

3) Restriction on the Pier Use

Since the pier facility has been designed on the basis of the state-owned middle size fishing boat and other larger boats such as ODESANGEL_DIL, RoRo cargo vessel, any boats larger than the designed boat size must not use the Pier.

4) Restriction of Navigation along the Access Channel

Because of the limited width and depth of basin and access channel, it is quite difficult to approach and berth at the North Dock by larger vessel than ODESANGEL_DIL.

5) Bad Sea Condition

During bad sea condition, vessels must evacuate immediately to safe area.

6) Ship Accidents

In case of ship accidents in the access channel, the channel should be closed instantly. Therefore urgent recovery works will have to be taken to maintain the lifeline of Peleliu State.

7) Statistics on Fishery and Other Relevant Activities

The number of fishing operations, the amount of fish catches and the volume of fish shipped to Koror State will be recorded to compile fishery activity statistics. These statistics will be executed by the staff of Peleliu State Government.

8) Domestic Cooperation and Utilization of Capabilities of Local Contractor

It is recommended that monitoring bathymetric survey will be carried out with cooperation with Bureau of Land and Survey and Palau International Coral Reef Center. Also, it is recommended that maintenance dredging by local contractor in Palau because it will be economical.

9) Contriving for the facility utilization by Peleliu State

If inconvenience causes for access to slipway or berths after construction, Palau side needs to contrive for the convenient utilization by removing trees or huts neighboring the extended area.

Basic Design Study of
the Project for the Improvement of North Dock of Peleliu State

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(Main Report)

Chapter 1

Background of the Project

Chapter 1 Background of the Project

1-1. Background of Project and Project History

70% of the people of Palau are living in Koror State. Because of this social condition, it is important for rural states to make local logistics, including distribution of fish catch, to Koror and it enhances the economic growth and sloughs off the self-sufficient economy.

Peleliu State is located at 56km, 3 hours by vessel trip, from Koror which is capital city in Palau. Major traffic to Peleliu State is the marine transportation. Major industry of Peleliu State is the fishery. To promote fishery in Peleliu State has potential to be developed and will bring benefits not only to fishery industry but also to the improvement of living of local residents simultaneously.

Landing of fish catch is operated in North Dock located North part of Peleliu State. There are the facilities which were constructed by Japan's ODA in 1994 (Construction of fisherman's cooperative office and ice making machines) and 1999 (Reconstruction of pier of North Dock and dredging of Access Channel). These facilities are utilized well according to the observation of base line survey in August 2005. These facilities have some difficulties for smooth utilization by the reasons listed below.

(1) Length of the berth is not long enough.
(2) Front water depth of the berth is not deep enough.
(3) Tidal level effects the berthing.
(4) The berth is aging.

Also the access channel to North Dock becomes shallow partially with sand deposition. It limits the navigation of the vessels when it is low tide. What is worse, aging of navigation lights and poles in the access channel generates the difficulty of safe navigation. Accordingly, above mentioned difficulties blocked up the activation of logistics and the development of region in Peleliu State.

Considering such background in North Dock of Peleliu State, the Government of Palau has requested a grant aid project to the Japanese Government for development of Peleliu State to settle the issues.

In response to the request made by the Government of Palau, the Japanese Government decided to carry out a basic design study for the project. And Japan International Cooperation Agency (JICA) on behalf of the Government of Japan has sent a study team to Palau with the schedule as indicated below.

(1) Basic Design Study Mission : August 7 to September 3, 2005
(2) Draft Report Mission : November 3 to November 8, 2005

Study, plan and design of the basic design study have been executed according

to the result of said site survey.

1-2. Outline of the Project

The study team held discussions with the officials concerned in the Government of Palau and the Peleliu State Government, and carried out a field survey of the project site. The basic design was accomplished by examining the project components and analyzing the field survey data during office works in Japan. According to the results of the works, the basic study was concluded that the improvement of requested facilities is justifiable as indicated below.

(1) Extension and rehabilitation of the pier
(2) Dredging of the access channel and basin
(3) Installation of the navigation aids

The planning and designing of the requested facilities are carried out adopting consideration for the living circumstance and nature of Peleliu State at the time of the base line survey in August 2005. Furthermore, North Dock supports not only fishing port activities such as preparations for fishing operation, idle berthing and landing of fish catches but also the other functions of embarkation and disembarkation of passengers and unloading of daily commodities, construction materials, fuel and others. At the planning and designing stages of the pier facility, the functions required for commercial port activities as a sole physical distribution base of the island state are included in addition to the fishing port functions.

Plan and design of the project have been studied based on the mean value and actual data of base line survey at the site during basic design study.

The followings are outline of the project and contents of the requested components.

(1) Respective Target

Economy in Peleliu will be vitalized.

(2) Objectives of the Project

1) Improvement of Efficiency of Fish Handling and Convenience of Fishermen

Because of the extension of pier, berthing for fishing boats and other vessels will be sorted out and each fishing boat can berth smoothly by mitigation of the congestion. Facilities will improve the safety and efficiency of unloading the fish catch from fishing boat.

2) Increase of Navigable Days of Vessels by Dredging in the Basin and Access Channel

Navigable days per year by full loaded RoRo cargo vessel will be improved from 44 days at present to 323 days (according to the tide table indicated in PNCC telephone guide in 2005) after dredging due to dissolubility of waiting time for the tide. Increase of transportation fee including fish

transportation will be prospected after secure the stabilized schedule of navigation.

3) Securing of the safety navigation by installation of navigation aids

(3) Prospective Effects

1) Improvement of Efficiency of Fish Handling and Convenience of Fishermen

Berthing efficiency of fishing boats to North Dock will be developed. Efficiency and safety in unloading of fish catch will be secured, since berthing place of fishing boat and RoRo vessels are separated by pier extension of pier.

2) Increase of Navigable Days of Vessels by Dredging in the Basin and Access Channel

(a) Navigable days per year by full loaded RoRo cargo vessel will be improved from 44 days at present to 323 days (according to the tide table indicated in PNCC telephone guide in 2005) after dredging due to dissolubility of waiting time for the tide.

(b) Time passing the access channel by RoRo cargo vessel will be improved from 55 minutes at present to apploximately30 minutes.

(c) Navigation aids will maintain the safer navigation of boats in rough weather or in emergency cases. Accordingly, navigable days of RoRo cargo vessel will be improved.

(4) Indices of the Project Effects

1) Project Objective (Numerical Index) : Fishing boat can berth anytime at North Dock
: Increasing the navigable days to North Dock

2) Other Index: Shortening the navigation hours in the access channel

(5) Contents of Requested Components Grant Assistance

1) Components requested by the recipient country are described below.

(a) Extension of pier

(b) Dredging of the access channel, turning basin and basin in front of extended pier

(c) Installation of navigation aids

(d) Construction of ramp-way

(e) Construction of slipway

(f) Construction of fishermen’s assembly house

(g) Provision of materials and equipment for dispensary

2) Components borne by the recipient country are described below.

(a) Securing the land and sea for the project and obtaining the construction permits for marine construction works including dredging

(b) Implementation of environmental impact assessment

(c) Securing the land related to the project such as temporary yard, dumping yard, access road and etc.

3) Activity plan of the recipient country is described below.

(a) Securing necessary budget and personnel for management, operation and maintenance

(6) Project Site

The project sites for the facility construction in Peleliu State are described below.

1) North Dock in Peleliu State: Extension of pier and dredging of basin

2) Access Channel of North Dock: Dredging of access channel and installation of navigation aids

(7) Beneficiaries

Beneficiaries by the project implementation are approximately 14,000 residents of both Peleliu and Koror States including the fishermen, parties engaged in logistics in Koror State, tourists visiting to Peleliu State and others.

(8) Project Implementation Organizations in the Recipient Country

1) Responsible Agency

Ministry of Resource and Development

2) Responsible Agency for Project Implementation:

Bureau of Marine Resources in Ministry of Resources and Development

3) Management and Operation Entity:

Peleliu State Government

Chapter 2

Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the project

2-1-1 Basic Concept

The pier facility of Peleliu State is a multipurpose facility not only used for fishing activities but also serving port functions like embarkation and disembarkation of passengers and unloading of daily commodities, construction materials, fuel and others.

Therefore, it will be necessary to consider not only fishing port functions but also commercial port functions in planning the facilities to be included in the project besides also taking into consideration of Peleliu State's environmental aspects.

In this project, the following items will be formulated as the basic concepts of the project for developing a fishery base including port activities.

(1) Ensuring the safe navigation of fishing boats and other calling boats
(2) Eliminating the restriction of the dock use depended on tide level.
(3) Improvement of efficiency of cargo handling works at the dock
(4) Environmental Consideration
(5) Avoiding the increasing of personal expense by new staffing

When the necessity of components and design of scale are studied, surveys of records and interviews to relevant person for researching the status of fishery activity, fishery cooperative's activity and cargo / passenger handling have been executed to decide the suitable contents representing the present circumstance.

Therefore, scale designing does not include future increasing demand, but it is based on present number of fishing boats, operating rate and fishery activity.

2-1-2 Justifiability of Construction of Facilities and Procurement of Equipment

(1) Feasibility for Construction of Facility and Procurement of Equipment

As already described, pier and access channel of North Dock have difficulties for safety and utilization. It is studied that the project to improve fishery facilities has reasonable urgency and feasibility because it will solve the said difficulties.

Equipments for the dispensary and fishermen's assembly house are decided that their contributions to develop for Peleliu State are not essential comparing with other port facilities.

Therefore, it is judged that their necessity, feasibility and urgency are not enough to materialize the project.

2-1-3 Examination of the Contents of the Request

(1) Contents of the Request

The project contents requested by the Government of Palau are summarized in followings.

Table 2.1.3(1)-1 Contents of the Request

No	Name of Facilities	Description	Quantity / Scale
F1	Pier extension and dredging of anchorage		
F1-1	New pier	Extension + corner part	45m+5m=50 m
F1-2	Dredging of anchorage in front of new pier		1,270 m^3
F1-3	Dredging of existing anchorage	water depth -1.5m + allowance 0.5m =2.0m	30m x 50m x 0.5m = 750m^3
F1-4	Dredging of water channel	former R2, R4, R5 area extension, 1,080m center	14,000m^3
F2	Ramp-way for landing	A ramp-way for landing of cargo carrier will be built.	Front edge + 1.0m, width x length =6m x 8m
F3	Slipway	A slipway for repair of boats will be built.	Water depth at front edge -1.5m, width x length = 4.5m x (0.3m x 10m)
F4	Navigation Aids	Equipped with a solar panel will be built at the intersection between the artificial and natural channels	A navigation aid and a navigation pole
F5	Fishermen's assembly house	The structure of the facility is a 60 m^2- meeting room with a 40m^2- semi outdoor work space.	A flat house with an area of 100m^2
F6	Embankment of Eastern Ward of North Dock	The revetment was requested verbally to be built along the Eastern shore line.	Not specified
E1	Dynamap Monitor	Indirect Brood Pressure Monitors	1
E2	Portable X-Ray Machine		1
E3	Table Top Sonogram	Ultrasonic Diagnostic	1
E4	Table Top Electrolyte Machine		1
E5	Basic CBC Analyzer	Automatic Blood Cell Counter	1
E6	IV Drop Machine	Infusion Pump	2
E7	Suction Machine		1
E8	Electric O_2 Concentrator		1
E9	Tympanogram	Audiometer	1
E10	Pulmonary Function Test	Spilometer	1
E11	Nebulizers		4
E12	Hospital beds with arm Table		5
E13	Portable Dental Unit		1

No	Name of Equipment	Description	Quantity
E14	Portable Heat Monitor with Defibrillator capability		1
E15	Complete Emergency Kit		1
E16	Digital Tonometer		1
E17	Digital Otoscope	able to send pictures	1
E18	Digital Ophthalmoscope	able to send pictures	1
E19	Gulcometers		10
E20	Blood Pressure Cuff		10
E21	Stethoscope		5
E22	Back-up Power Supply		1

1) Pier extension and dredging of anchorage

The existing narrow pier will be expanded and improved for landing and refilling activity by fishing boats, landing of materials and commodities required for lives in Peleliu, arrival and departure of passenger boats used by the local residents for their movement and the arrival and departure of small-newly commissioned boat for tourists.

(a) New pier: extension 45m + corner part 5m = 50m
(b) Dredging of anchorage in front of new pier: 1,270m3
(c) Dredging of existing anchorage: (water depth -1.5m + allowance 0.5m =2.0m), Scale 30m x 50m x 0.5m = 750m3
(d) Dredging of water channel: (former R2, R4, R5 area extension, 1,080m center) about 14,000m3

2) Ramp-way for landing

A ramp-way for landing of cargo carrier will be built.
Front edge + 1.0m, width x length =6m x 8m

3) Slipway

A slipway for repair of boats will be built.
Water depth at front edge -1.5m, width x length = 4.5m x (0.3m x 10m)

4) Navigation Aids

A navigation aid equipped with a solar panel will be built at the intersection between the artificial and natural channels so that the entrance of the channel can be recognized even at night and at high tide.

5) Fishermen's assembly house

A flat house with an area of 100m^2 will be built as a facility big enough for fishermen to assemble and to hold various kinds of workshops targeted for island residents. The structure of the facility is a 60 m^2- meeting room with a 40m^2- semi outdoor work space.

6) Embankment of Eastern Ward of North Dock

The revetment was requested verbally at the Project Site to be built along the Eastern shore line to prevent the coastal erosion.

7) Provision of materials and equipments for dispensary

Medical materials and equipments centering on items for emergency will be provided to enable to address a sudden illness and injury by local residents or tourists as well as to give an appropriate first-aid treatment in case of a serious patient who needs to be taken to Koror. The details of the equipments are shown in the equipment list below. These contents were revised by Ministry of Health and Dr. Togomae who is in charge of the dispensary in Peleliu State.

(2) Examination of the Contents of the Request

Examination of the justifiability of the requested project contents is described as in followings.

As the result of field study, most prioritized contents of the project shall be extension of the pier (including construction of ramp-way) and dredging of access channel.

1) Ramp-way for landing

(a) Present Conditions

ODESANGEL_DIL, major RoRo vessel begun its service on November 26 of 2004, conduct loading and unloading the cargo at existing natural ramp-way located in 140m Eastern coast from North Dock

Photo 2.1.3(2)-1 Existing Ramp-way

Photo 2.1.3(2)-2 Unloading Scene

Vessel has to berth at right angle to the shore line during her cargo handling operation at the site. Wind, current and wave from West will force the vessel drift to East during her works. During the works, captain has to control the vessel with sensitive maneuver which operates and controls twin engines, power and steerage of rudders to maintain the direction of vessel to be at right angle to the coast.

It has used15 minutes to unload 2 vehicles when on-board investigation was conducted on August 22, 2005. During the unloading works, keel of the vessel has been touched to seabed and made the shrill noise.

(b) Planning Elements

Berthing Direction should be East-West direction according to the suggestion by Captain of ODESANGEL_DIL, because Eastern current, Western wind and wave are strong to make berthing the vessel difficult with North-South direction.

Ramp equipped at bow of ODESANGEL_DIL is 3.5m in width and 3.5m in length.

Also her width is 5.5m and length is 20.4m.

(c) Description of Facility

Ramp-way of 4m length and 6m width will be constructed with East-West direction in the Western side of North Dock.

Conceptual cross-section of ramp-way is shown in Figure 2.1.3(3)-3(P.2-). Structure of Ramp-way is the gravity type of upright style with concrete blocks and partly in-situ concrete. Also to reduce the sway during cargo handling work, vessel fixes with bollard and fender installed in front of ramp-way and beside the berth located in extended pier of North Dock.

2) Pier Extension

For the necessary designing scale of pier extension in the basic design study, the mean value and actual data of base line survey at the site were utilized as numerical evidences for confirming the logical feasibility and necessity. The baseline survey was conducted from August 12 to 31, 2005 in the vicinity of North Dock.

Avoiding the excessive planning and designing, the elements of study for number of the operation rate of fishing boat and RoRo cargo vessel don't include increasing future demand.

(a) Present Conditions

Planned configuration of existing pier of North Dock is rectangular of 32m for East-West direction and 25m North-South direction. There are 3 berths in North side of the pier and 1 birth in West side.

Cargo handling volume and numbers of passenger in North Dock has been increased since "The Project of Fishing Village Development in Peleliu in 1998" was completed. Existing pier is congested because of its narrowness.

Table 2.1.3(2)-1 Passengers, Cargoes and Income in North Dock, (RoRo cargo vessel, 1999 to 2004)

Year	Passengers (person)	Cargoes (numbers)	Income (US$)
1999	4,066	4,652	
2001	6,305	6,516	35,386
2004	6,343	6,076	57,459

(Source : Peleliu State Office)

Table 2.1.3(2)-2 Lodging Visitors to Palau and Peleliu State

	Year 2000	Year 2004
Whole of Palau	57,732	89,161
Peleliu State	1,665	3,768

(Source : Palau Visitors Authority)

Berthing pattern as daily average during field investigation in Peleliu in the vicinity of North Dock is shown in Figure 2.1.3(2)-1.

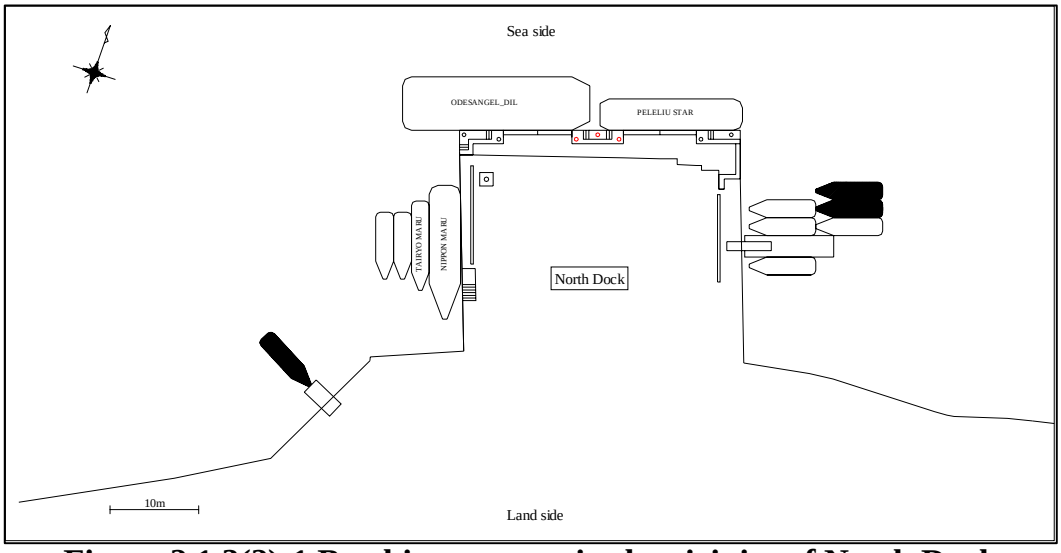


Figure 2.1.3(2)-1 Berthing pattern in the vicinity of North Dock

Table2.1.3(2)-3 Mooring Boats in North Dock(Peleliu State Boats＋Pleasure Boats)

Hour	8	9	10	11	12	13	14	15	16	17	Total	Ave-rage	Maxi-mum	Mini-mum
Front Berth and West Berth	5.8	5.3	6.0	7.2	7.4	7.4	6.7	6.3	5.7	5.5	-	6.3	7.4	5.3
East Revetment	5.5	5.2	5.0	5.1	5.1	5.2	5.0	4.8	4.6	4.7	-	5.0	5.5	4.6
Total of Permanent Berthing Boats	11.3	10.5	11.0	12.3	12.5	12.6	11.7	11.1	10.3	10.2	-	11.3	12.6	10.2
Total of Visiting Boats berthed	1.3	0.5	1.0	2.3	2.5	2.6	1.7	1.1	0.3	0.2	13.5	1.3	2.6	0.2

(Survey Period: from August 12, 2005 to August 31, 2005)

Referring to Table 2.1.3(2)-3, average number of boats moored in North Dock permanently is regarded as ten boats. Also entrance and clearance to North Dock is counted 14 boats as average per day. Minimum number of temporary mooring in North Dock was one boat and maximum number was three boats. However, congested status of North Dock is shown by “photo-6” in opening page of the report. There will be more than 25 boats in North Dock in the ceremonial occasion. There is no port control office in North Dock. Therefore there is no port manager who will conduct flexible berthing control depends on the berthing demand.

Large vessels which call to North Dock are ODESANGEL_DIL, PELELIU STAR and NIPPON MARU. NIPPONMARU has been moored at the West berth in North Dick because of long absence of her captain. Also, TAIRYO MARU, on-board powered small transporting boat of fish catch, can not navigate because of her engine trouble. It is almost impossible to utilize West berth for the visiting boats since she is always there.

Aging of the structures of West berth, East and West revetments in North Dock have been proceeding. 7 bitts are workable, however they have been corroded.

Photo 2.1.3(2)-3 Existing West Birth

Photo 2.1.3(2)-4 Existing East Revetment

Moreover, weathering of the concrete at West berth and East revetment in North Dock has been proceeding. Concrete under the signboard of Peleliu State has been damaged and material of base course has been sucked out.

Photo 2.1.3(2)-5 Existing West Steps

Photo 2.1.3(2)-6 Existing West Birth

Gabion, steel mesh of revetment structure, at the seaside of fishery complex located in West of North Dock has been broken and its inner stones have been exposing.

Photo 2.1.3(2)-7 Gabions in West Coast of North Dock

Apron is not paved and coral sand of the base course material is exposed. There are bumps and pot holes here and there in North Dock and they become the obstacle

for the smooth cargo handling. Also, foundation of North Dock has been excavated by wheels because large pot holes have been existed.

Existing apron status after rain is described below.

Photo 2.1.3(2)-8 Existing Apron (North) **Photo 2.1.3(2)-9 Existing Apron (East)**

There is a light fixed pole in the corner of west and north berth in North Dock. This pole with light will be removed because the pole will be obstacle for the traffic of new ramp-way.

Photo 2.1.3(2)-10 Existing Light (Workable in August, 2005)

(b) Planning Elements

a) Mitigation concept of berthing congestion based on average number of berthing boats

(i) Under the present circumstance, western side of existing pier will be reclaimed and extended the pier for mitigation of the congestion of North Dock. Three berths will be always secured for the boats coming from other states to mitigate the congestion of berthing boats.

(ii) For the mitigation of congestion in existing pier, it is recommended that NIPPON MARU and TAIRYOU MARU which are not currently operating condition and moored in the pier will be moved to South Dock.

(iii) As already described, the ramp-way will be constructed at the western reclaimed area of North Dock for the cargo loading of ODESANGEL_DIL and its direction will be from East to West considering the predominant wind direction.

(iv) Now, PELELIU STAR will be moored at Western side of North berth in North Dock. And it is recommended that 4 boats will be moored 2 by 2 by parallel berthing at both side of Peleliu State's floating jetty after dredging vicinities basin of the jetty.

(v) Finally, extended area of the pier needs to include one berth where 2 boats can be moored by parallel berthing anytime. Western berth located in extended pier will be used for the above mentioned purpose.

According to these arrangements, 2 berths in North side of the pier and 1 berth of West side of the pier will be utilized for the berthing of temporary calling fishing boats and pleasure boats. Berthing pattern as daily average after extension of Pier and idea of zoning after berth extension is shown in Figure 2.1.3(2)-2.

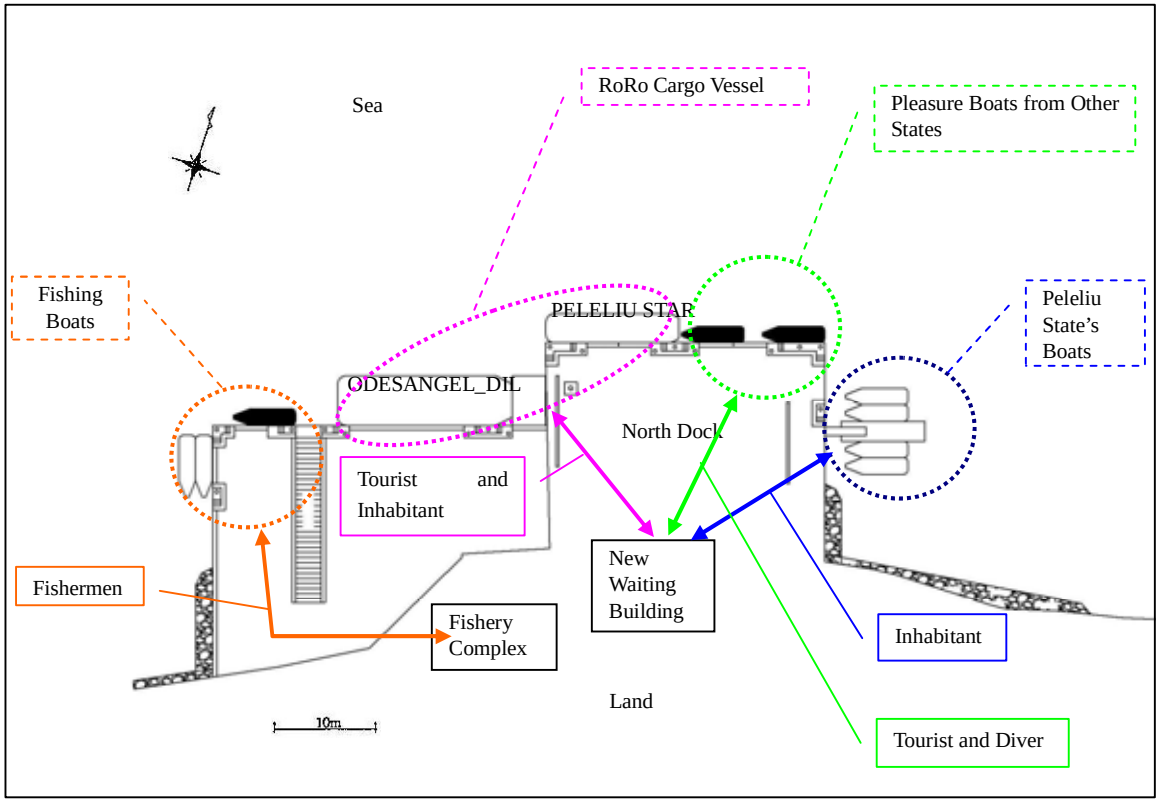


Figure 2.1.3(2)-2 Zoning of Extended Pier in North Dock

b) Mitigation concept of berthing congestion against maximum number of berthing boats

If boats are moored by parallel berthing, the designed scale of the pier would even meet the maximum number of calling boats observed in the base-line survey conducted from August 12 to 31, 2005. Mooring concepts of maximum number of boat at present and after implementation are described in Figure 2.1.3(2)-3 and -4.

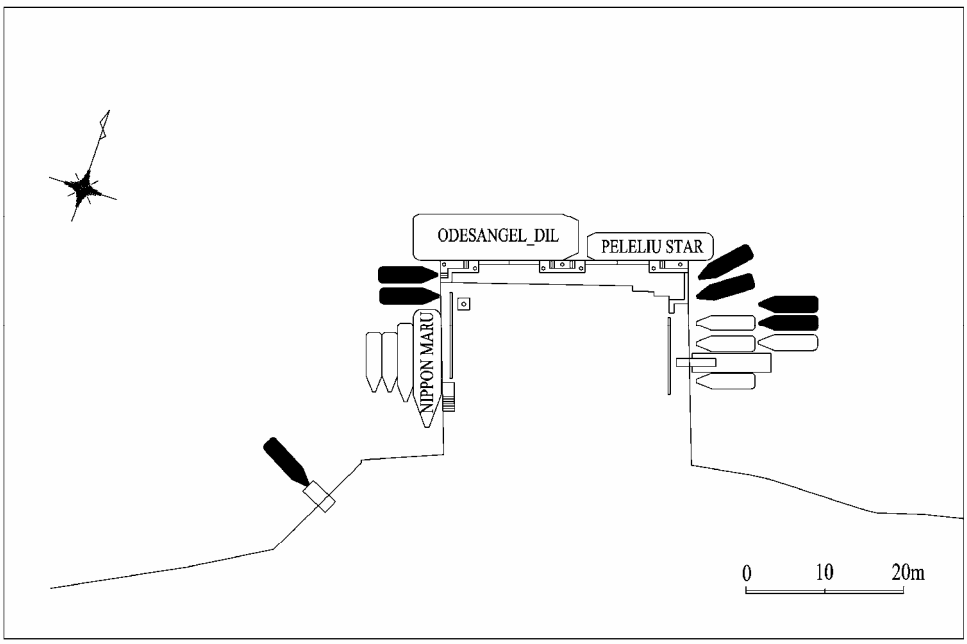


Figure 2.1.3(2)-3 Berthing Pattern for maximum Number of Boats (Present condition)

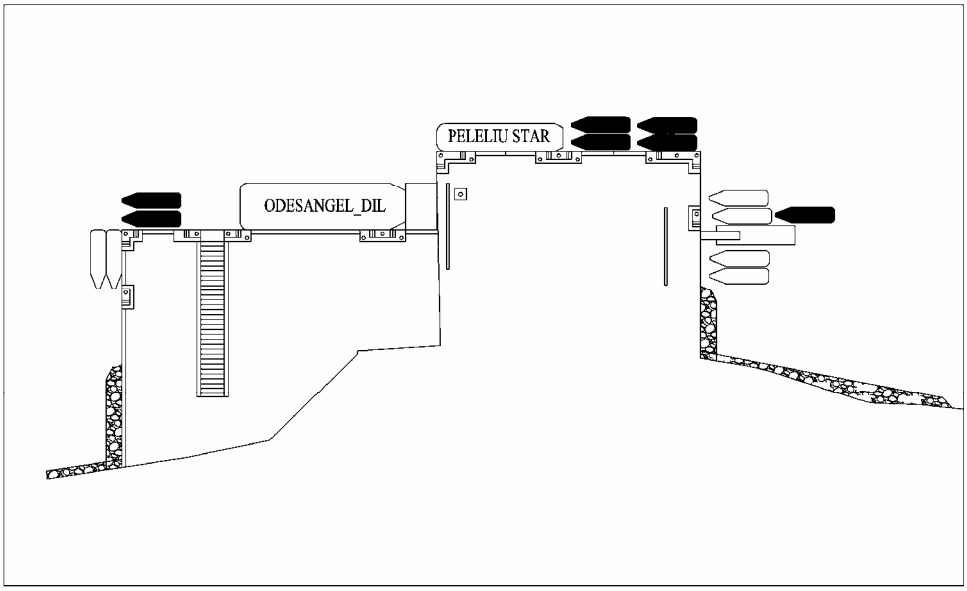


Figure 2.1.3(2)-4 Berthing Pattern for maximum Number of Boats (After Extension of Pier)

c) Temporary utilization of the berth for RoRo cargo vessel

The berth for RoRo cargo vessel includes step structure to secure the passenger's access between vessel and berth in the low tide. While RoRo cargo vessel navigates to Koror State, it is fiscally possible to moor the fishing boats and other boats utilizing the bollards and the steps located at the berth.

However, as already described in "(a) present circumstance", there is no port control office in North Dock. That is, port manager who directs suitable berth as occasion may demand on the change of boat calling status does not exist. Therefore,

under the circumstance, flexible and permanent utilization of the berth when RoRo cargo vessel is out of berth will be quite difficult.

d) Navigation Schedule

ODESANGEL_DIL and PELELIU STAR run between Peleliu and Koror operated by Peleliu State Government utilizing North Dock as the mother port. Navigation schedules of both vessels are shown in Figure 2.1.3(2)-6. Both vessels are berthing at North Dock every day.

Date / Vessel	Sun	Mon	Tue	Wed	Thu	Fri	Sat
ODESANGEL_DIL	Peleliu *** Koror ◄——► Peleliu ***		Peleliu **********	Peleliu **********	Peleliu **********	Peleliu *** Koror ◄——► Peleliu ***	
PELELIU STAR	Peleliu **********	Peleliu **********	Koror **◄——►**	Koror **◄——►**	Peleliu **********	Peleliu **********	Peleliu **********

Figure 2.1.3(2)-5 Navigation Schedule of ODESANGEL_DIL and PELELIU STAR

It is highly appreciated that Peleliu State has two vessels operated between Peleliu and Koror State of which route is life line for logistics and these two vessel operation reduces the risk of interruption of continuous logistic.Currently, 2 captains and 1 set of crew have operated ODESANGEL_DIL and PELELIU STAR. And there is no particular port manager who will execute the flexible berthing in North Dock. If ODESANGEL_DIL and PELELIU STAR share to moor in a berth, navigation schedule of both vessels shall be too busy and the extra crews are necessary to be employed. Moreover, a port manager shall be employed to avoid 2 vessels berth at the same time in North Dock.It is suggested in the study that settlement of congestion in North Dock will be mitigated without additional economical load such as additional wages. Planning elements of boats to meet the designing and concepts are described below.

a) Numbers of parallel berthing will be limited to 2 boats.

b) ODESENGEL_DIL and PELELIU STAR have been moored in North Dock every day. Therefore, ODESANGEL_DIL will be moored at the right berth located in new pier and PELELIU STAR will be moored at the left berth of existing pier.

c) Details of designing vessels for extension of the pier are shown in Table 2.1.3(2)-4.

Table 2.1.3(2)-4 Designing Vessels of Extension of the Pier

Spec.	ODESANGEL_DIL	Pleasure Boat
Length	20.4 m	10.0 m
Breadth	5.5 m	2.0 m
Draft	1.4 m	Less than 1.0 m
Max Depth	2.4 m	1.0 m
Photo		

(c) Description of Facility

a) Extension of Western Side of the Pier

Existing pier of North Dock will be extended 37m (except 4m as length of Ramp-way) to Western direction. 31m of concrete seawall with a berth will be constructed from the North-West corner of extended pier to existing coastal revetment.

Existing coastal revetment made by gabion will be replaced by concrete masonry revetment.

b) Modification of Eastern Side of the Pier

New concrete seawall with a berth will be constructed 4m off to Eastern side of existing pier. Existing structure will be demolished and pave by concrete as the apron.

East revetment will be reinforced by the gravity type of vertical structure with concrete blocks and partly in-situ concrete. One berth will be constructed to fix the existing floating jetty which is now utilized by State Boats.

c) Miscellaneous Facilities

(i) Bitt and bollard will be installed on the new seawall and berth.

(ii) Concrete curb stopping the vehicle will be installed on the new seawall and berth.

(iii) Apron will be paved by concrete.

(iv) 2 of new lights will be installed and 1 of existing light will be replaced along the new seawall and berth.

3) Dredging in Anchorage (DL-2.0m), Access Channel (DL-2.0m) and Basin in front of Ramp-way (DL-3.0m)

(a) Present Conditions

As the result of comparison of the sounding maps between 1999 and 2005, depositing sand in the vicinity of navigation poles No.10, 16, 20, 22 and 24 and North-Eastern cape of Peleliu State was found significantly.

According to on-board investigation of ODESANGEL_DIL, she took only 2 hours from Koror to the entrance of access channel of North Dock, however, she needed 50 minutes from the entrance of the channel to North Dock.

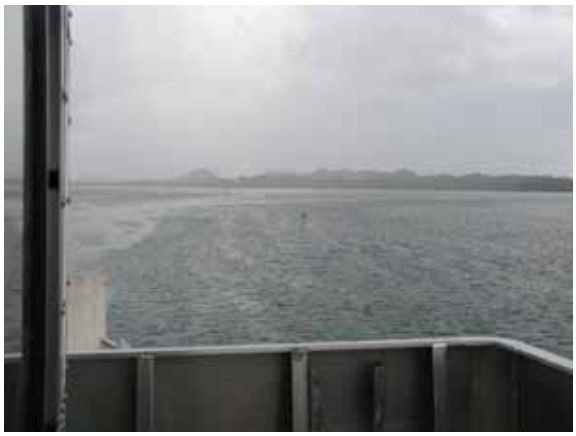


Photo 2.1.3(2)-11 Navigation Pole No.16 **Photo 2.1.3(2)-12 Navigation Pole No.20**

There are more than 10 scratched marks on seabed made by the keels and bottoms of ODESANGEL_DIL and PELELIU STAR according to the diving investigation on August 28.

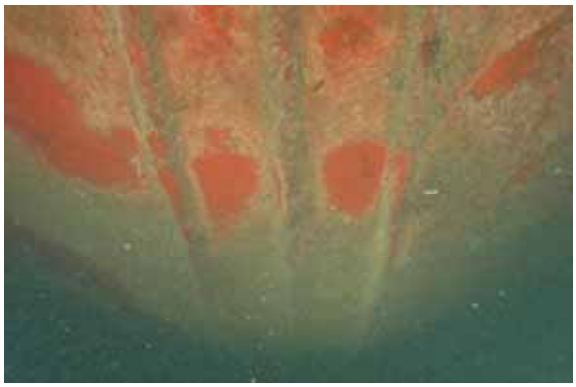


Photo2.1.3(2)-13Bottom of ODESANGEL **Photo 2.1.3(2)-14 Bottom of P.Star**

Propellers and rudders of ODESANGEL_DIL are sticked out from vessel bottom and steel protectors of propellers and rudders are scratched by touching the seabed.

Photo2.1.3(2)-15 Twin Propellers **Photo 2.1.3(2)-16 Protector of Propeller**

(b) Planning Elements

Maximum Depth of ODESANGEL_DIL: -1.4m

Additional Depth of Steel Protector for Propellers and Rudders of ODESANGEL_DIL: -1.0m

(c) Description of Facility (Design Depth and Width of Access Channel)

a) Access Channel

Designing depth of access channel will be DL-2.0m without extra dredging. Figures, tables and study results will be described below. Also detailed reference will be attached in appendix 6-4-2.

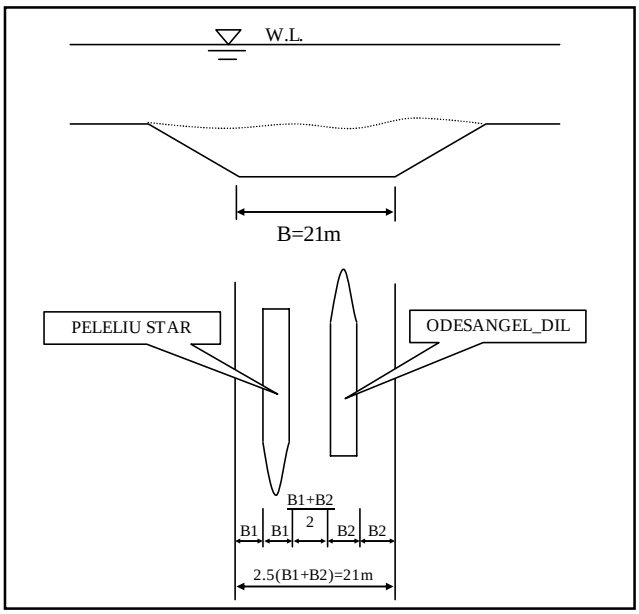


Figure 2.1.3(2)-6 Examination of Width of the Access Channel

Regarding the study of width for the above mentioned access channel, detailed study results will be attached in appendix 6-4-3.

Mitigating normal line and corner cut will be provided at the two of bending corner in the vicinity of navigation aid No.16R and No.20.

Table 2.1.3(2)-5 Navigable Days of ODESANGEL_DIL in 2005

Depth	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep/	Oct.	Nov.	Dec.	Navigable Days	Navigable Ratio	Un-navigable Days	Un-navigable Ratio
-1.2 m	0	0	0	5	1	2	5	5	11	11	4	0	44	12%	321	88%
-1.5 m	20	15	17	18	18	15	16	17	19	20	22	21	218	605	147	40%
-2.0 m	29	28	31	27	29	24	24	24	24	26	27	30	323	88%	42	12%
-2.5 m	31	28	31	20	30	24	25	25	29	28	30	31	341	93%	24	7%
-3.0 m	31	28	31	30	31	29	29	31	30	31	30	31	362	99%	3	1%

If depth of the access channel become DL-2.0m, navigable days will be increased significantly. It will be more than 50% comparing to the depth of DL-1.5m, and it will be 27days per month, that is, she can navigate most of days regardless the condition of tidal change. If depth of the access channel is shallower than DL-1.5m, continuous un-navigable days will be 8 days in June, 6 days in July and 6days in August by the tidal calendar of 2005. This status will be big obstacle for the smooth logistics. It is recommended that depth of the access channel will be deeper than DL-2.0m because the access channel is the only life line of logistics to north Dock. If depth of the access channel is deeper than DL-1.5m, continuous un-navigable days will be a few days,

fore example, 3 days each in June and July by the tidal calendar of 2005.

Most economical depth of the access channel will be studied in Table 2.1.3(2)-6. Approximate dredged volume is compared by width of the access channel in the table with categorized in the depth.

Table 2.1.3(2)-6 Dredged Volume and Design Depth

Depth	Width	Dredged Volume (m^3) (DL-1.5m)	Dredged Volume Categorized by Design Depth (m^3)*	Dredging Volume of Sand Trap with 600m in length (m^3)	Total Dredging Volume (m^3)
−1.5m	15m	14,000			14,000
−2.0m	21m	14,000	17,500		31,500
−2.0m	21m	14,000	17,500	6,300	37,800
−2.5m	21m	14,000	40,000		54,000
−3.0m	21m	14,000	67,500		81,500

(Note：Length of the Access Channel is supposed to be 5,000m from the navigation aid No2R to North Dock.)

Prospected site for temporary construction yard as the dumping site is located 50 m from South East of North Dock. Area of the site is approximately 19,000m^2, however, the dumping area will be limited because half of the area is covered by trees.

Photo 2.1.3(2)-17 Prospected Site of Temporary Yard

As studied above, depth of the access channel will be increased from DL-1.5m to -2.0m. This design is practical to meet the condition of dredging volume and dumping area and secures the enough navigable days.

b) Sand Traps

Significant sand deposited area mentioned in Table2.1.3 (2)-7 will be dredged up to DL-2.5 as sand trap to alleviate the future sand depositing. Therefore dredging to DL-2.5 m (sand trap) in some parts of the access channel, its total length 600m approximately, will be recommend to mitigate the urgency of maintenance dredging in the future.

Table2.1.3(2)-7 Location and Length of Sand Trap

Location of Sand Traps (Landmarks for location)	Length of Sand Traps	Width of sand Traps
Navigation Aid No.10R	80m	21m
Navigation Aid No.16R	180m	21m
Navigation Aid No.18R	110m	21m
Navigation Aid No.20R	80m	21m
Navigation Aid No.24R to North Dock	40m	21m
Navigation Aid No.24R to North Dock	80m	21m
Navigation Aid No.24R to North Dock	40m	21m

c) Width of the Channel

Width of the access channel will be 21m.

(d) Design Depth for Other Area

a) Basin in front of Ramp-way (D.L. -3m)

Designing depth of the basin in front of ramp-way will be DL-3.0m to maintain the safe berthing even in nearly lowest low water level. Dredging area will be 23m in length and 6m in width which is conformed to berthing area of ODESANGEL_DIL. Therefore, depth in front of the berth for ODESANGEL_DIL will be DL-3.0m which can be maintain enough clearance between bottom of ODESANGEL_DIL and seabed even tide level becomes DL±0.0m.

The berth neighboring to ramp-way will be reinforced by the gravity type of vertical structure.

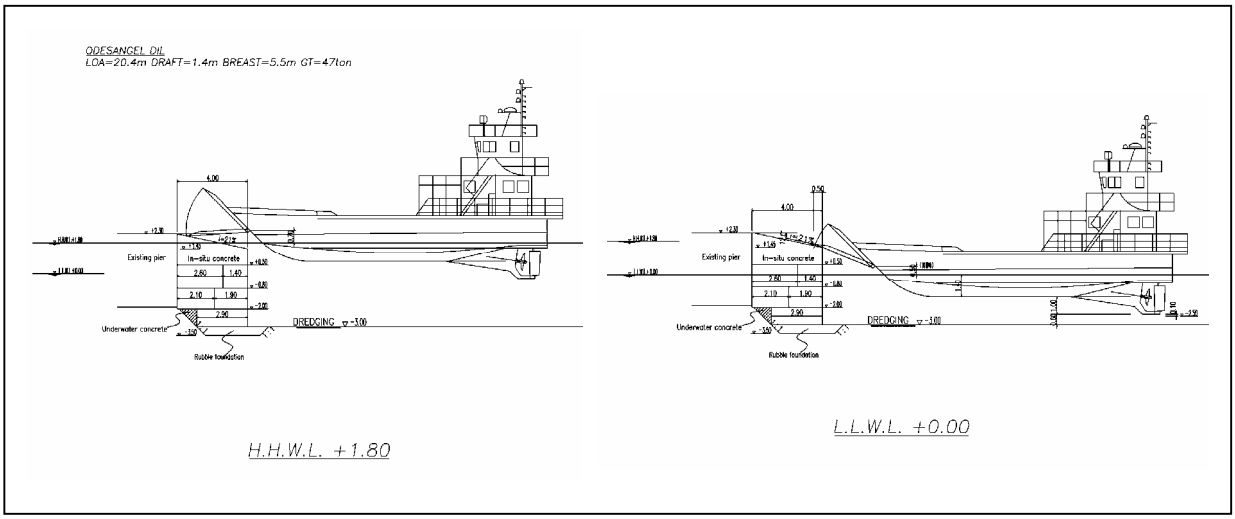


Figure 2.1.3(2)-7 Examination of Depth of the Basin in front of Ramp-way

b) Basin

Design depth of the anchorage will be DL-2.0m. In this depth, navigable days by waiting for the tide to turn will be 323 days according to the tide table in 2005.

Dredging areas for the basin will be octagon anchorage included turning basin

of 22.5m in radius including water in front of Western berth, water in front of Eastern revetment and water in front of existing Northern berth.

After dredging, periodical bathymetric survey and certain maintenance works shall be required. Similar scale of sand deposition at present in the access channel and basin will be generated in 6 to 12 years if maintenance dredging does not executed and future natural and oceanographic condition is the same as last 6 years.

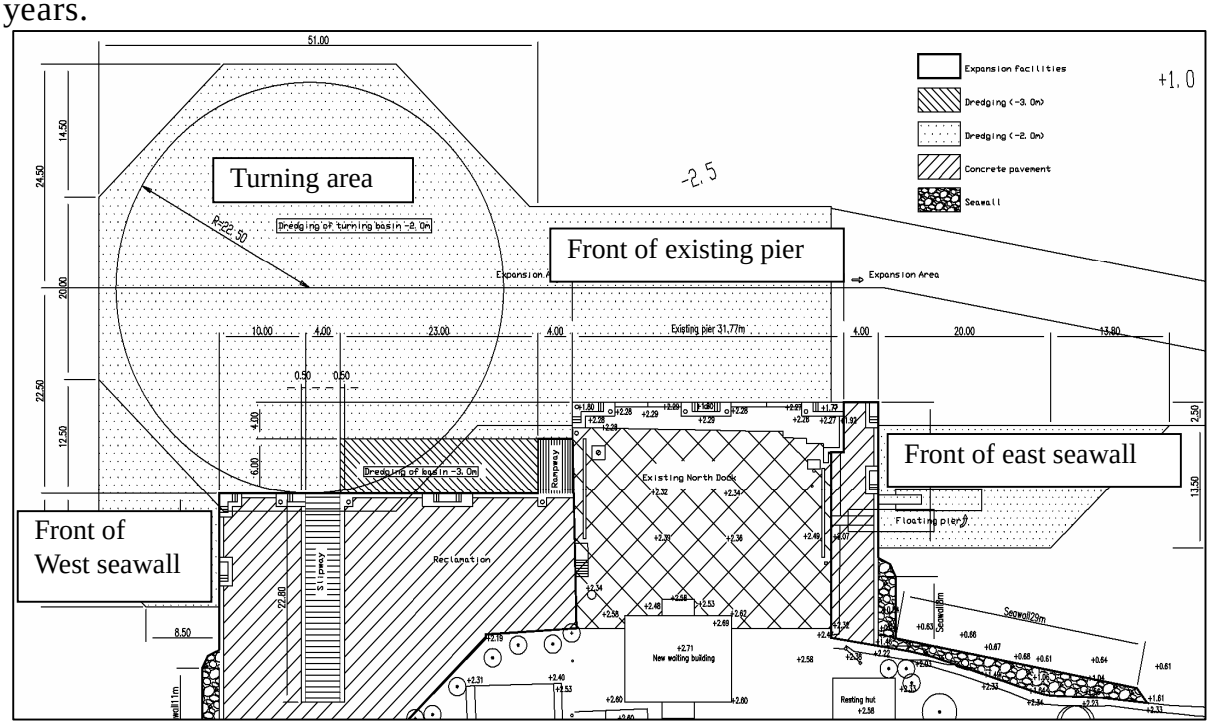


Figure 2.1.3(2)-8 Areas of the Basin in Anchorage (DL-2.0m)

4) Navigation Aid

(a) Present Conditions

Navigation aid in the entrance of the access channel is a navigation buoy which is still working. The working condition was confirmed at night investigation on August 17th and 22nd, 2005. Light of it was weak and difficult to identify at night or raining time. There are red and green small lights on the navigation poles No.16 located the turning corner of the access channel. Also, these lights were slightly twinkling when the night investigation was carried out on August 22, 2005.

Photo 2.1.3(2)-18 Navigation aid Buoy in Rainy Night **Photo 2.1.3(2)-19Navi.Pole No.16 in Rainy Night**

(b) Planning Elements

Planning depth of fixing the new navigation aid will be DL-2.0m.

There is the small group of corals out of the channel behind navigation pole No.16. The new navigation aid will be installed between No.16 and No.18 to reduce the affection of the installing works.

Also navigation pole with small light will be installed out side of access channel between navigation aids of No2 and 4 to design the bending point of the channel.

Photo 2.1.3(2)-20 Corals behind the Pole No.16 outside of the Access Channel

(c) Description of Facility

a) New Navigation aid installing between Navigation Pole No.16 and No.18

The navigation aid will equip solar panel, battery and red flush light. Height of light will be more than DL+1.77m as nearly highest high water level plus 1.2m as design wave height.

Also the navigation pole will be equipped with small light. Maintenance works of the navigation aids (for example, clean up of solar panel, change the LED and bulb and change of battery) shall be conducted by Palau side.

b) Maintenance of Existing Navigation aid in the Entrance of Access Channel

To recover the original capability of the navigation aid, Japan side advised contacting to following manufacture of the navigation aid to purchase the consumption articles or to order maintenance works.

Automatic Power Inc., Navigation Aids, Tel:+1-714-540-6815, +1-800-234+6845, Fax:+1-714-557-4954, 1240 Logan Avenue SUITE H. Costa Mesa CALIF 92626

or

Service Department, Automatic Power Inc., Tel:+1-713-228-5208,

Fax:+1-713-228-3717, 213 Hutcheson Street, Houston, Texas 77003,

Web Site:http://www.automaticpower.com/, E-mail:sales@automaticpower.com

5) Embankment of Eastern Ward of North Dock

(a) Present Conditions

The revetment with length from 100m to 300m was requested to be built along the Eastern shore line to prevent the coastal erosion. According to the field investigation and analysis in Japan, following facts were surveyed and examined.

a) There is no house along East ward coast of North Dock.
b) Average distance from road edge to East ward coast is 11m.
c) There are remaining structures of temporary jetty and sunken barge along the coast.
d) It is difficult to find the remarkable changes of contour line or shore line as the comparison of topographic map between 1999 and 2005.
e) Angle of fore shore in 2005 is supposed to be steeper in 2003 by the comparison of photographs.
f) The serious erosion can be found at their roots of two big trees. They are standing along the coast less than 34m Eastern ward of existing pier of North Dock.

Photo 2.1.3(2)-21 Eroded Tree at 33m from Pier

Photo2.1.3(2)-22 Eroded Tree at 20m from Pier

(b) Planning Elements

Foot of the new seawall in the East side of existing pier has possibility to be eroded. Because solid and upright structure like concrete seawall will construct touching to the natural coast which shown the erosion already.

Boats berthing to existing floating jetty or going vessels in access channel should be protected from the damages by the fallen trees.

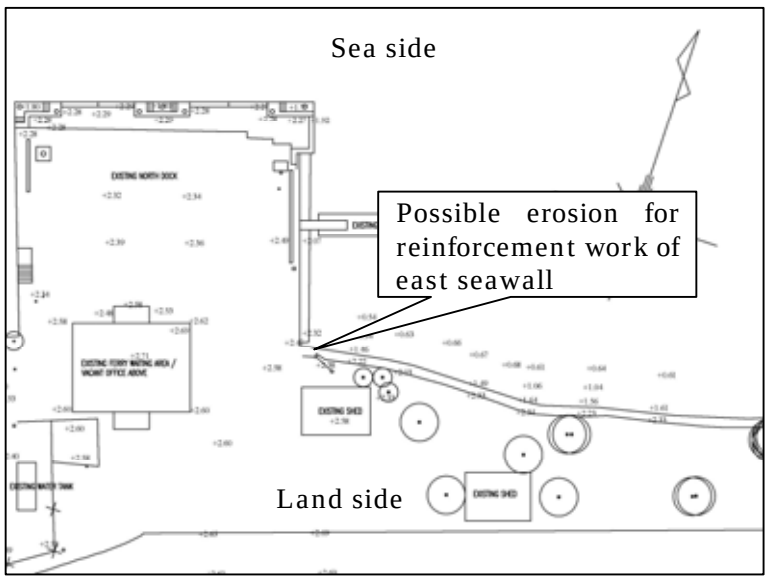


Figure 2.1.3(2)-9 Possible of Erosion by the Construction of New Seawall

(c) Description of Facility

Length of revetment will be 34m from East side of existing pier. Structure will be sloping revetment with concrete masonry.

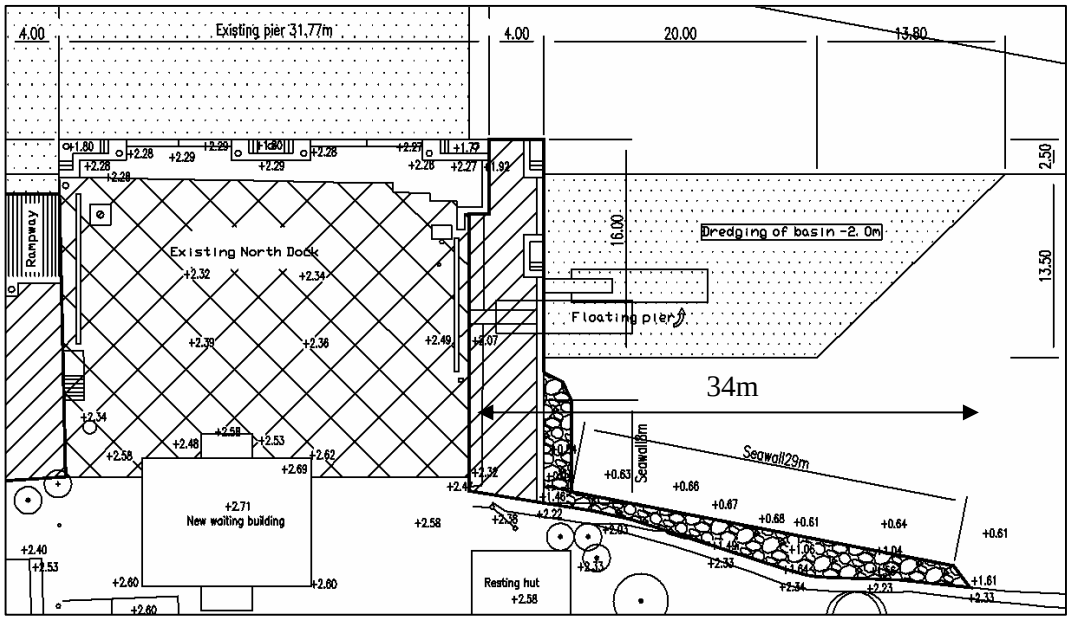


Figure 2.1.3(2)-10 Layout Plan of Eastern Revetment

Photo2.1.3(2)-23 Example of Sloping Revetment with Concrete Masonry

6) Slipway

(a) Present Conditions

There are existing slipway located at East and West side of North Dock utilizing natural slope in private lands. It is necessary to use vehicle and boat trailer to load and unload the boats in the existing slipway. There are 11 trailers in Peleliu State. 10 trailers are privately owned and 1 trailer is belonging to Peleliu State.

Mainly, trailers are carrying the pleasure boats at present.

Photo 2.1.3(2)-24 Boat Trailer of Peleliu State

(b) Planning Elements

Grand elevation will be DL+2.3m. Toe elevation of slipway will be DL-1.5m.

Angle will be 1:6 according to Japan's Fishery Harbor Standard. Horizontal length of the slipway will be 22.8m. There will be no boat sliding timbers and winches in the slipway.

(c) Description of Facility

Slipway with concrete structure will be constructed at the extended pier in North Dock. Structure will be concrete slab. Width of the slipway will be 4m.

Study results of width and length of slipway are described in appendix 6-4-4. Boat slider, winch, forklift and etc. shall not be procured. Entering to the water or hauling of the boat from water shall be done by boat trailer with vehicle. Toe and end of slope in slipway may have depositing sand in the future. Maintenance dredging there by Palau side shall be required, if necessary.

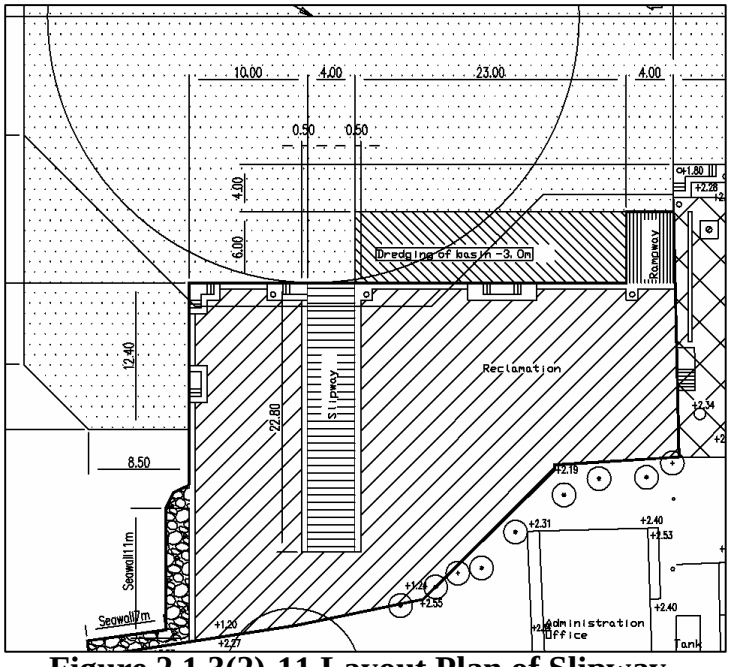


Figure 2.1.3(2)-11 Layout Plan of Slipway

Constructions of the items from 1) to 6) were decided to be materialized.

7) Fisherman's assembly house

(a) Existing conditions

Currently, the Peleliu fisherman's association is holding the regular meeting. The numbers of attendants are about 20. Usual agenda of the meetings are repair and maintenance of fishing boats and fishing gears, aquaculture of marine resources and so on. Since there is no assembly house for these meetings, they are forced to hold the meeting at a member's house or out side if the weather allows.

(b) Validity of the building

According to the interview with the member of the association, to accommodate the new assembly house is their growing need.

However, only 5m away from the association building, the new multi use building was built in 2003 and the second floor (office portion) has been vacant for 2years. Thus, this report recommends this empty space to be used as the fisherman's meeting space rather than building a new structure.

(c) Studies for usage of new waiting building

The second floor of the new waiting building is suitable for the new assembly area because it has all the functions as assembly area needed.

For example,

a) Meeting Space, b) Stage Space, c) Storage space for equipment, d) Toilet and
e) Administrative office

As meeting space and stage space require only 35 m^2. And only 3-5 m2 is required for equipment storage area. Since the new multi use building has 120m^2, witch is more than enough. Even the New Waiting Building does not offer the toilet in it, there are available toilets at the fisherman's associate complex and other public toilets are also available across the road. These have enough capacity even for the temporally increased users.

In conclusion, the empty space at the new multi use building can be used as the new assembly area. It is easy to maintain this space since the meeting is held only once a month and no wet area in it. This multi use building is donated by Taiwan government to the Peleliu state government, and still controlled by the state government, therefore the discussion of both the Peleliu state and the fisherman's association is required to use this space.

8) Provision of materials and equipment for dispensary

(a) Present Conditions

Dr. Ishmael Togomae, Physician from Solomon Island, is permanently stationed at the Southern Community Health Center in Peleliu State.

There is no assistant doctor or nurse as permanent staff at the health center.

The nurse has been dispatched once a month and doctor also be dispatched upon request.

According to the report issued by Dr. Togomae, he is handling and curing the 4 to 12 patients per day.

Major medical and general equipments in the health center are listed below.

a) Microscope x 1, b) Spinner x 1, c) Refrigerator x 1, d) Computers x 2, e) Copier x1, f) Printers x 2, g) Generator x 1(Under repairing), h) Facsimile machine x 1,

i) Oxygen Cylinder x 1, j) Portable Oxygen Cylinders x 2, k) Oxygen Concentrator x 1
l) Electric Fans x 6, m) Wall mounted auriscope x 1, n) Bed x 4, o) Chairs,
p) Laryngoscope x 1 with blades, q) Pulse Oximeter x 1, r) Gulcometers x 1,
s)Vehicle x 1 and t) Scooter x1

Photo2.1.3(2)-25 Health Center in Peleliu State

Photo2.1.3(2)-26 Treatment Room in the Center

(b) Recommendation of Practical Measure

Most of requested items exist in Belau National Hospital or the Health Center.

Also emergency boat has been procured to Peleliu State by the funds from Embassy of Japan Grant Assistance for Grassroots Project.

Namely, there have been fundamental infrastructure and equipment in Peleliu State already. In the consideration of above mentioned facts for the Health Center, to provide more equipments will not be important to modify or improve the medical situation in Peleliu State.

Japan side would like to suggest following 2 advises to improve the medical situation practically.

a) Some of doctors or nurses will be stationed in Peleliu State before requesting more equipment.
b) Action plan or implementation plan and exercise will be examined and decided between Ministry of Health and Peleliu State Government to utilize emergency boat for the transportation of the patients in the near future.

2-1-4 Result of Examination

As the results of examination of the justifiability among the requested project contents, the facilities which summarized in Table 2.1.4-1 are decided as the contents of the project.

Table 2.1.4-1 Contents of the Project

No	Name of Facilities	Description	Quantity / Scale
F1	Pier extension and dredging of anchorage	Pier extension with 0.2m thickness of concrete pavement, 2 of lights, curb concrete, bitts, bollards and mooring rings	
F1-1	New pier	Extension + corner part (Ramp-way)	37m + 4m (length of Ramp-way)=41 m
F1-2	Dredging of anchorage in front of new pier	Water depth DL-3.0m as the berthing area of ODESANGEL_DIL	More than 20,000 m^3
F1-3	Dredging of existing anchorage	Water depth DL-2.0m	
F1-4	Dredging of water channel	former R2, R4, R16, R18, R20, R22, R24 and existing natural ramp-way area, DL-2.0m, Partially DL-2.5m at the Sand Trap	
F2	Ramp-way for landing	A ramp-way which is concrete structure for ODESANGEL_DIL will be built.	Water depth of front edge DL+1.45m, 6m in width and 4m in length, angle of slope 1:4.7 (12 degree)
F3	Slipway	A slipway made by concrete slab for approach of boat and trailer to the sea will be built.	Water depth at front edge DL-1.5m, 4m in width and 22.8m in length, angle of slope 1:6 (9.5 degree)
F4	Navigation aid and Navigation Pole	Equipped with a solar panel will be built at the intersection between existing navigation Pole No.16R and 18R. Simple Navigation Pole will be built between existing navigation Pole No.2R and No.4R.	A navigation aid and a navigation pole
F5	Embankment of Eastward of North Dock	Revetment made by rubble stone concrete	29m in length (34m from existing East revetment of the Pier)

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

Designing of the facilities of the project will be executed in accordance with Japan's standard listed below.

* "Design Guidance of the Facilities in Fishing Port and Fishing Ground" editorial supervised by Fishery Agency, the Government of Japan
* "Technical Standard / Manual of the Facilities in Port and Harbor" editorial supervised by Ministry of Transport (Ministry of Land, Infrastructure and Transport in present), the Government of Japan

This grant aid cooperation aims for solving the problems such as utilization limitation by tide and time for the vessels and boats berthing North Dock, congestion of berth and inefficient cargo handling work, lack of water depth in access channel and inadequacy of safety navigation for vessels and boats in and out from the port. And in order to construct berth (extension length=41m, reclamation, Ramp-way for cargo loading etc.) dredging access channel and basin (volume= approx. 26,000m^3), navigation aid (two poles) based on the request from the Government of Palau, field study and the results of discussion the followings are planned.

(1) Design criteria for civil structures like berths

1) The structure of berths will be gravity-type with concrete blocks considering soil conditions, construction and economic efficiencies. Steel sheet piling type and others are excluded because limestone exists at shallow part of foundation.
2) The renovation of berths in south east pier will be gravity-type with concrete blocks same as the above.
3) The ramp-way will be constructed for the efficiency of cargo handling work of large size cargos by setting lengthy direction of berths facing to west side so as to moor ships at east west direction considering the handling efficiency of large size liner vessel which may be affected by site wind and current directions.
4) The slipway will be concrete structure which is safer to be hauled by boat trailer towed with vehicle for fishing boats.
5) The counter measure revetment for erosion in berths of east coast will be slope-type rubble stone revetment type for reducing reflected waves.
6) Rubber fender, bollard, lighting pole will be accommodated to improve port functions and protect damages of structures and vessels body.

(2) The design policy of the basin and access channel

1) In order to keep necessary water depth(more than 2.4m) for large size liner vessel which is the design objective the water depth in front of berths is to be 3.0m and deepen the access channel from 1.5m to 2.0m.The dredging will be carried out by dredger with back-hoe judging from hard soil conditions at basin and access channel.
2) The width of access channel will be 21m so that two liner vessels currently navigated can be passable safely at the same time (inter traffic).

(3) Navigation aid and other supporting facilities

1) Navigation aids to show the location of the vessel will be fixed by concrete slab and pole with lighting system and the power source will be solar panel and battery for easy maintenance.
2) In order to improve port function and prevent the damages to berths and vessels

body the renovation of mooring facilities like rubber fender, the increase of number of lighting poles and the pavement of apron.

(4) Layout Plan

General layout plan is shown in Figure 2.2.3-1.

(5) Procurement

Common material and equipment will be procured in Palau.

(6) Predominant Wind Direction

Predominant wind direction is from NE to E in winter and spring in Koror. On the other hand, it is changed from SW to W in summer and autumn in Koror. These wind directions will be concerned for design of the mooring facilities.

(7) Waves

North Dock is surrounded by large size coral reefs with longitude of 2 to 4km from wave attacks. Because of above, wave situation of North Dock is considered rather mild. Design wave of North Dock had been fixed by typhoon "MIKE" attacked Palau in November, 1990. Design wave in front of North Dock is fixed described below by wave deformation calculation of above offshore design wave.

Wave height (H1/3) 1.2m
Wave period (T1/3) 13.0s

(8) Tide

Observation of tide levels of North Dock was carried out. during the field surveys. Table 2.2.2(8)-1 shows the comparison of harmonic constants between this field survey and previous survey results (in 1998). There are not so much difference on tide condition, therefore the tide levels for design of the structures of North Dock is fixed same as previous project as below.

High Water Level (HWL)	+ 1.32 m
Mean Sea Level (MSL)	+ 0.90 m
Low Water Level (LWL)	+ 0.48 m

Table 2.2.1(8)-1 Comparison of Harmonic Constants

	This project		Previous Project (1998)	
Component Tides	Amplitude (cm)	Lag Angle (degree)	Amplitude (cm)	Lag Angle (degree)
M_2	35.7	212.3	41.7	237.9
S_2	16.6	251.6	15.5	259.5
K_2	4.5	251.6	4.2	259.5
N_2	7.5	201.2	4.5	208.1
M_4	9.2	3.5	11.4	48.7
K_1	16.0	235.1	20.4	251.2
O_1	12.5	211.6	8.9	239.7
P_1	5.3	235.1	6.8	251.2
Q_1	2.5	209.6	3.4	171.5
MS_4	7.1	52.6	8.4	59.1

2-2-2 Basic Plan (Construction Plan/Equipment Plan)

(1) Ramp-way for landing

1) Structure: Gravity type with Concrete Blocks
2) Vessel for Design Criteria: ODESANGEL_DIL

3) Dimension: 4m in length and 6m in width
4) Miscellaneous: ODESANGEL_DIL should be moored at East-West direction due to concerning the predominant wind.
5) Scale: 4 m in length and 6 m in width and slope top of ramp-way will be smoothing to the existing pier. And elevation of toe of ramp-way will be DL+1.45m according to the study results described in appendix 6-4-1.
6) Surfacing of slope

Tide difference is large at the site. Angle of the ramp-way will be 21%, 11.8 degree, according to appendix 6-4-1 which is described the study result of the layout and relation between tide difference and ramp on the RoRo cargo vessel.

To secure the safety and convenience at the time of loading / unloading for the self driving vehicle, it is recommended that mitigating slope will be arranged at the top of ramp-way and surfacing of ramp-way will be anti-slip finishing.

(2) Pier Extension

1) Structure: Gravity type with Concrete Blocks
2) Vessel for Design Criteria: ODESANGEL_DIL and Pleasure Boat
3) Scale: 37m extension to Western side except ramp-way length, 4m extension to Eastern side and concrete masonry sloping revetment to replace existing gabions

Maximum tide level was D.L.+1.82m according to be base line survey at the site. Incident wave height at North Dock is rather small as 1.2m in design wave condition. Therefore crown height of ramp way is planed as D.L.+2.30m being the same as existing crown height of Pier.

4) Miscellaneous:

Bitt and bollard will be installed on the new seawall and berth.

Concrete curb stopping the vehicle will be installed on the new seawall and berth. Apron will be paved by concrete.

2 of new lights will be installed and 1 of existing light will be replaced along the new seawall and berth.

(3) Dredging in Anchorage (DL-2.0m), Access Channel (DL-2.0m) and Basin in front of Ramp-way (DL-3.0m)

1) Design Depth:

Dredging in Anchorage until DL-2.0m

Access Channel until DL-2.0m, Some parts of access channel will be dredged DL-2.5m as the trap to prevent sand depositing

Basin in front of Ramp-way (DL-3.0m)

2) Vessel for Design Criteria : ODESANGEL_DIL
3) Scale: Dredging volume will be more than 20,000 m^3.

Dredging areas for the basin will be octagon anchorage included turning basin of 22.5m in radius, water in front of Western berth, water in front of Eastern revetment and water in front of existing Northern berth.

Radius of turning basin is decided as 22.5 m according to the dredging area of "The Project for Development of Fishing Community in Peleliu State in 1998" and conditions of design are described below.

(a) ODESANGEL_DIL which is the maximum sized vessel berthing in North Dock during base line survey is flexible for turning because she has twin

propellers, twin engines and twin rudders.

According to the results of on-board investigation and interview to the captain, dredging area in turning basin is designed as 22.5m in radius which is same to the previous North Dock project as described above.

(b) Shallow area with mangroves located in Northern of North Dock has been reserved as the preserved area by Bureau of Arts and Culture and Peleliu State Government. To avoid the dredging works of this area, said scale of dredging for turning basin is designed.

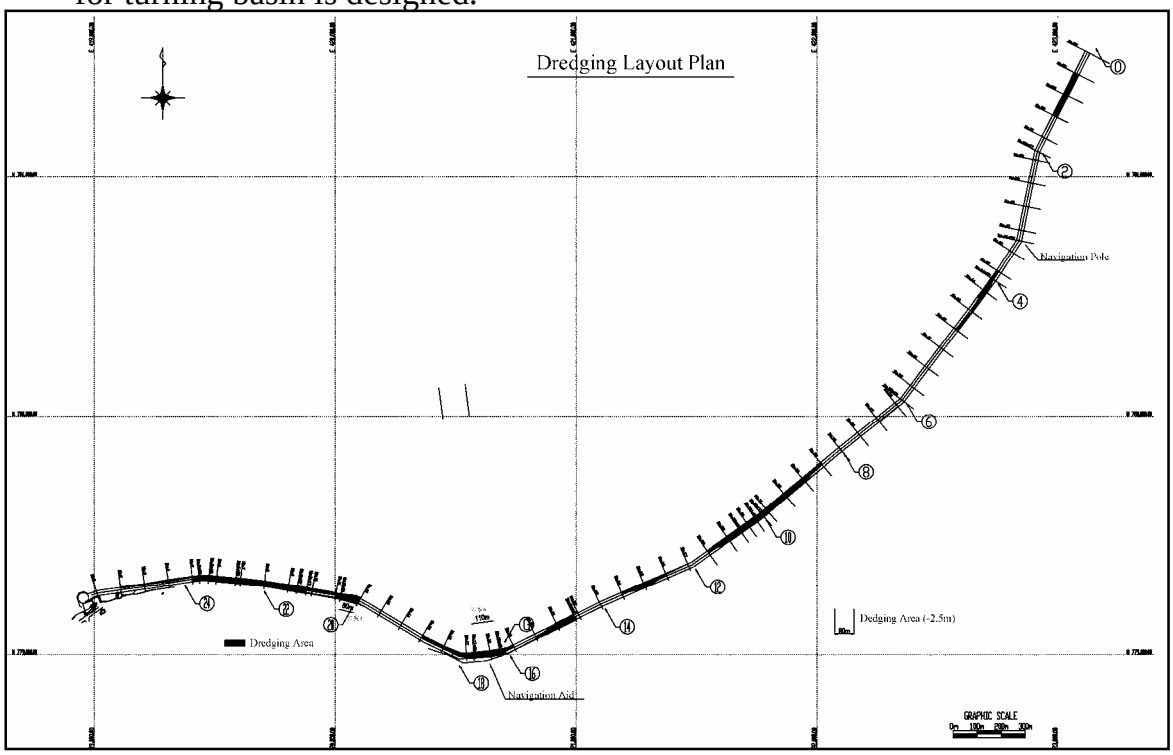


Figure 2.2.2(3)-1 Dredging Layout Plan

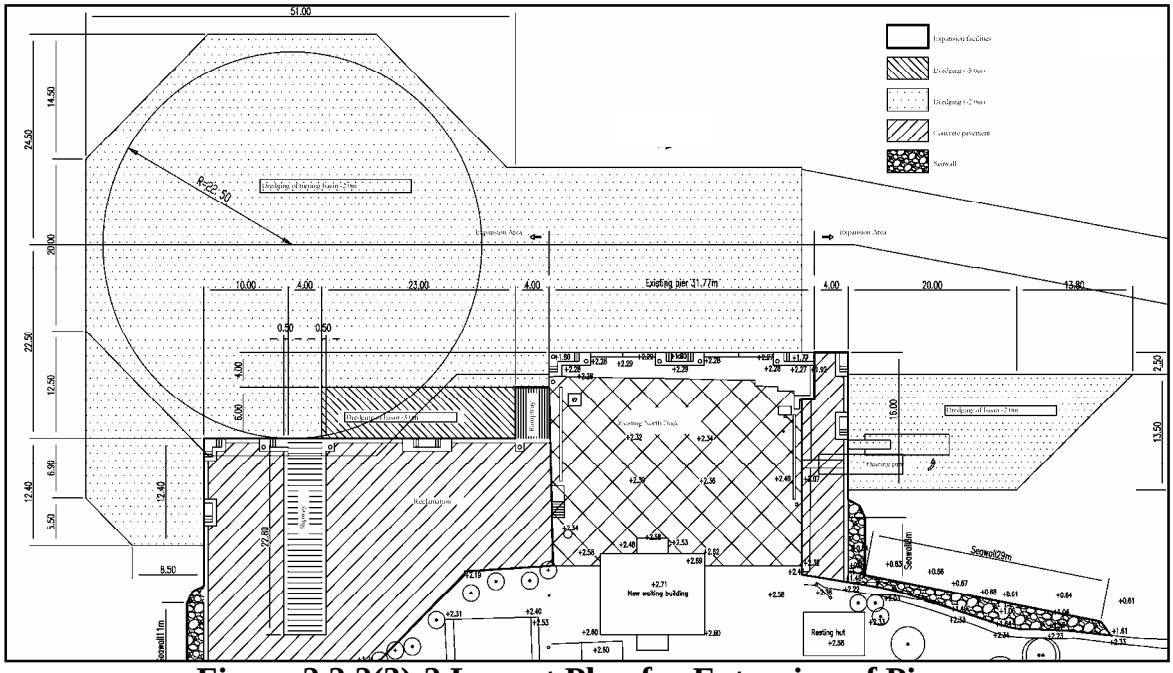


Figure 2.2.2(3)-2 Layout Plan for Extension of Pier

(4) Navigation Aids

1) Navigation aid

(a) Number of Procurement: One Navigation aid

(b) Location of Installation: One Navigation aid along the access channel between navigation pole No.16R and 18R

(c) Light Color: Red

(d) Flashing Interval: 5 second

(e) Power Source: Solar Panel and Battery

(f) Light Height: more than DL+2.97m

(g) Structure: Fix by concrete slab and pole with lighting system

2) Navigation pole

(a) Number of Procurement: One Navigation Pole

(b) Location of Installation: One Navigation Pole along the access channel between navigation pole No.2 and No.4

(c) Light Color: Red

(d) Power Source: Solar Panel and Battery

(e) Structure: Fix by concrete slab and pole with lightning system

(5) Embankment of Eastern Ward of North Dock

1) Structure: concrete masonry sloping revetment

2) Scale: Length of revetment will be 34m from East side of existing pier.

(6) Slipway

1) Design concept

Boats are hauled up by vehicle and boat trailer. Boat sliding timber and mooring ring are not planned.

2) Structure: concrete slab

3) Scale: Vessel or Trailer for Design Criteria: 2m boat width, 2.5m boat trailer width

4m width, 22.8m horizontal length

Angle of slope 1:6

Grand elevation will be DL+2.3m.

Toe elevation of slipway will be DL-1.5m.

2-2-3 Basic Design Drawing

List of Basic Design Drawings is shown below.

Figure 2.2.3-1 General Layout Plan of the Pier
Figure 2.2.3-2 Dredging Plan of Access Channel (1/7)
Figure 2.2.3-3 Dredging Plan of Access Channel (2/7)
Figure 2.2.3-4 Dredging Plan of Access Channel (3/7)
Figure 2.2.3-5 Dredging Plan of Access Channel (4/7)
Figure 2.2.3-6 Dredging Plan of Access Channel (5/7)
Figure 2.2.3-7 Dredging Plan of Access Channel (6/7)
Figure 2.2.3-8 Dredging Plan of Access Channel (7/7)
Figure 2.2.3-9 Dredging Area of Access Channel
Figure 2.2.3-10 Cross Section of Pier
Figure 2.2.3-11 Cross Section of Revetment
Figure 2.2.3-12 Setting Position of Concrete Block 1st Layer (Elevation Level of Foundation)
Figure 2.2.3-13 Setting Position of Concrete Block 2nd Layer
Figure 2.2.3-14 Setting Position of Concrete Block 3rd Layer
Figure 2.2.3-15 Setting Position of Concrete Block 4th Layer
Figure 2.2.3-16 Setting Position of Concrete Block Top Layer (Existing Grand Elevation Level)
Figure 2.2.3-17 Setting Position of Concrete Block (Elevation Plan of Eastern Side)
Figure 2.2.3-18 Setting Position of Concrete Block (Elevation Plan of Western Side)
Figure 2.2.3-19 Plan and Cross-section of Slipway (North – South Direction)
Figure 2.2.3-20 Plan and Cross-section of Slipway (East – West Direction)
Figure 2.2.3-21 Structure Drawings of Slipway
Figure 2.2.3-22 Cross-section of Rampway
Figure 2.2.3-23 Layout of Concrete Pavement (Apron)
Figure 2.2.3-24 Details of Navigation Aids

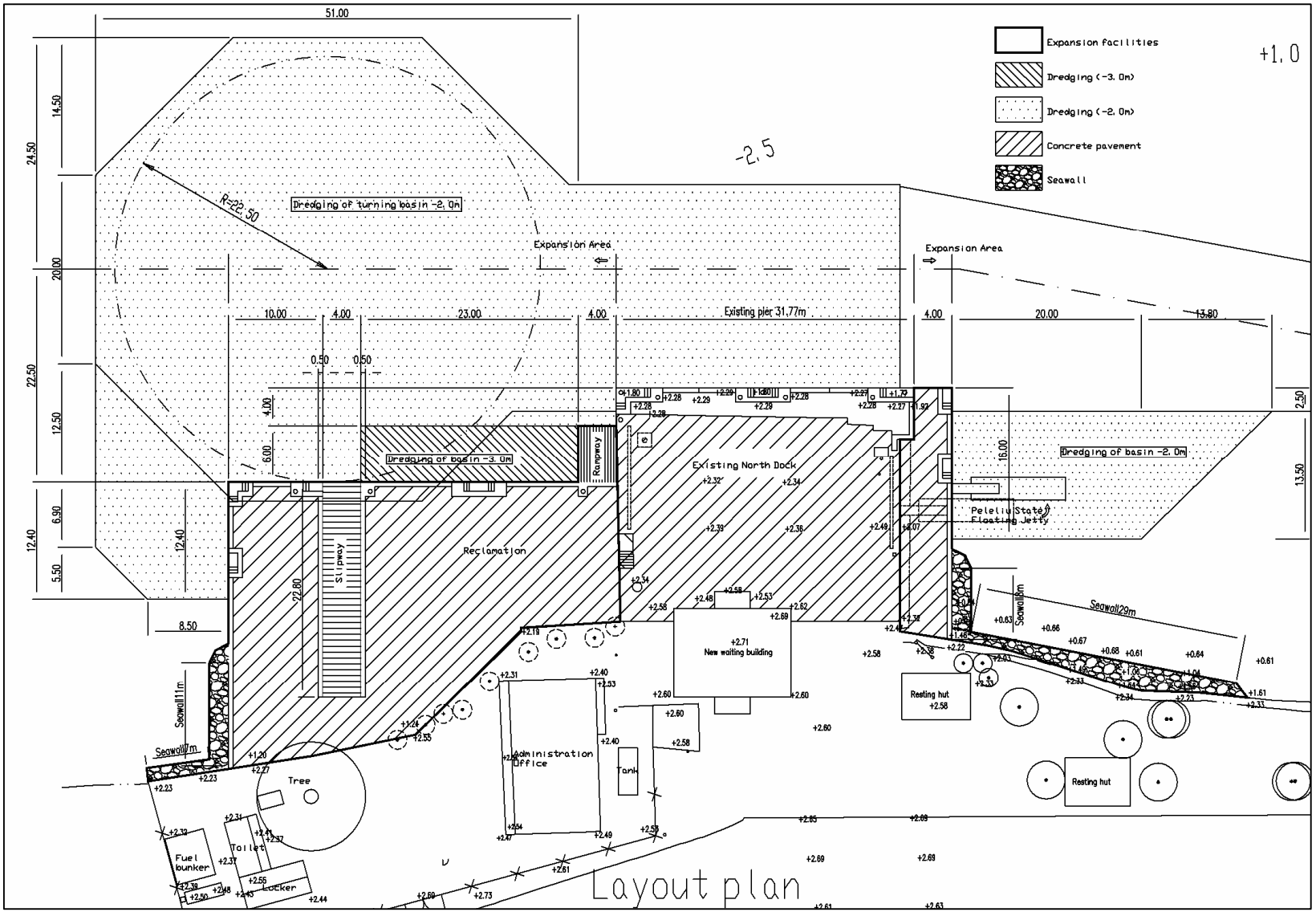


Figure 2.2.3-1 General Layout Plan of the Pier

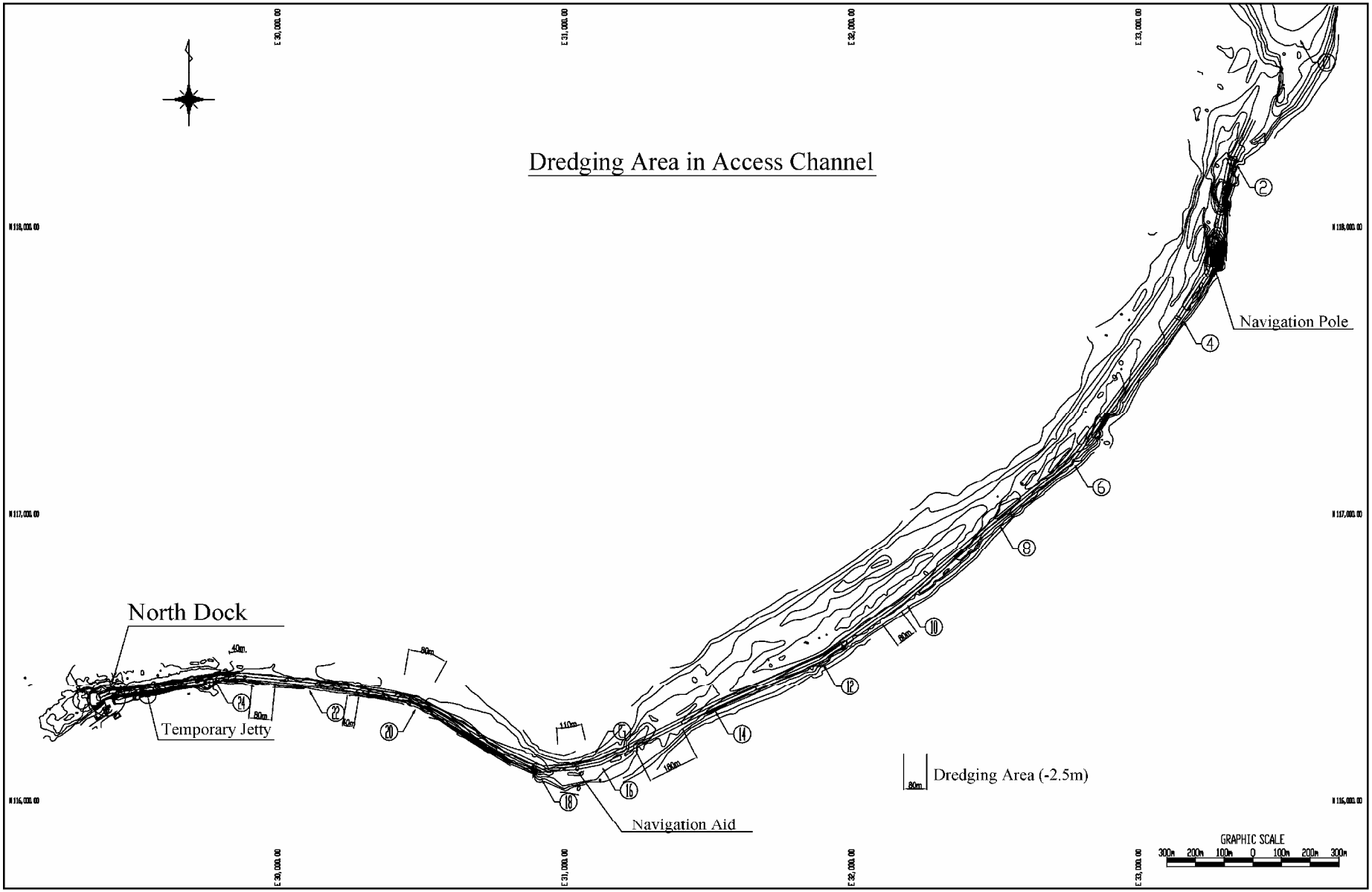


Figure 2.2.3-2 Dredging Plan of Access Channel (1/7)

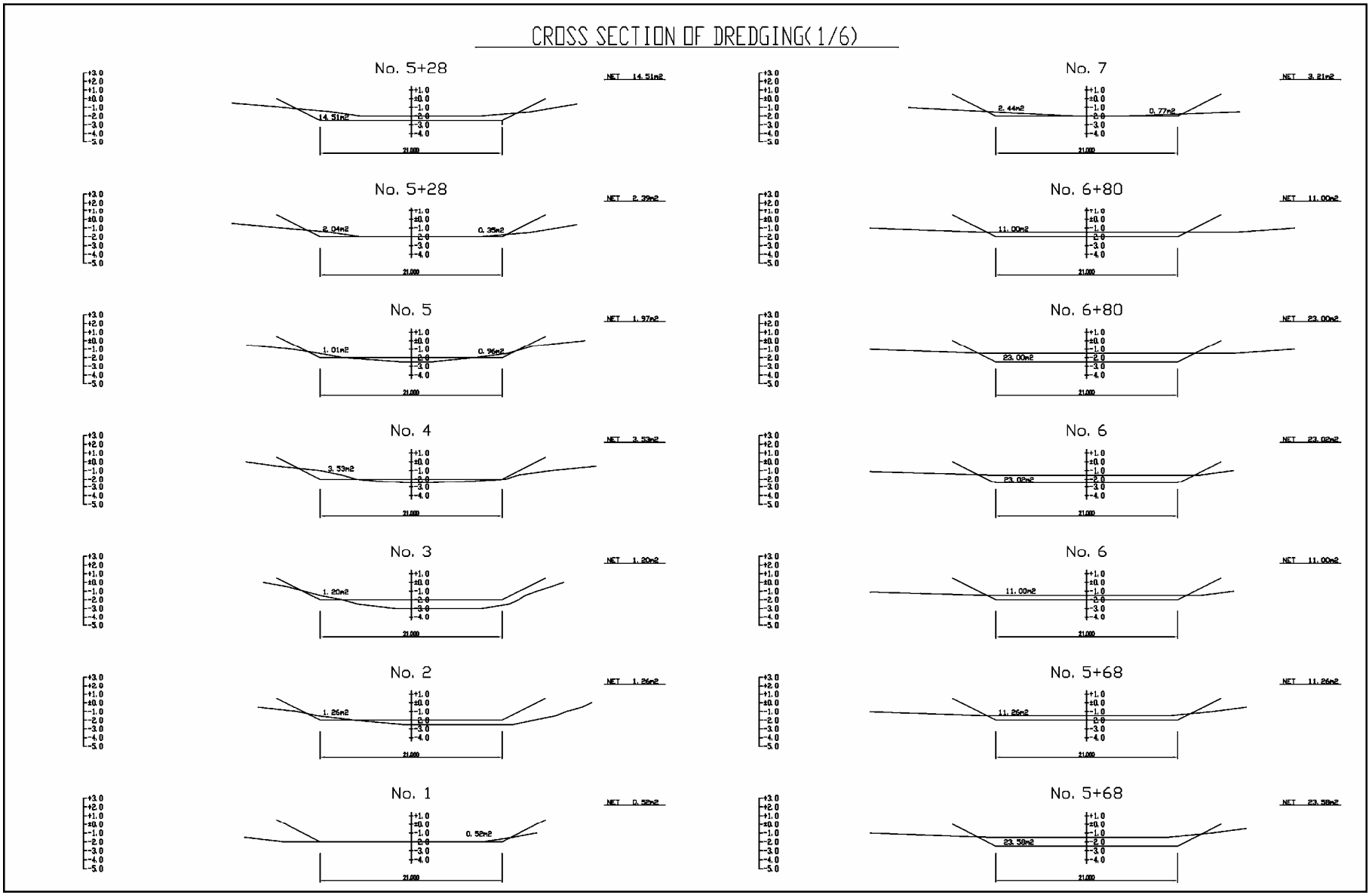


Figure 2.2.3-3 Dredging Plan of Access Channel (2/7)

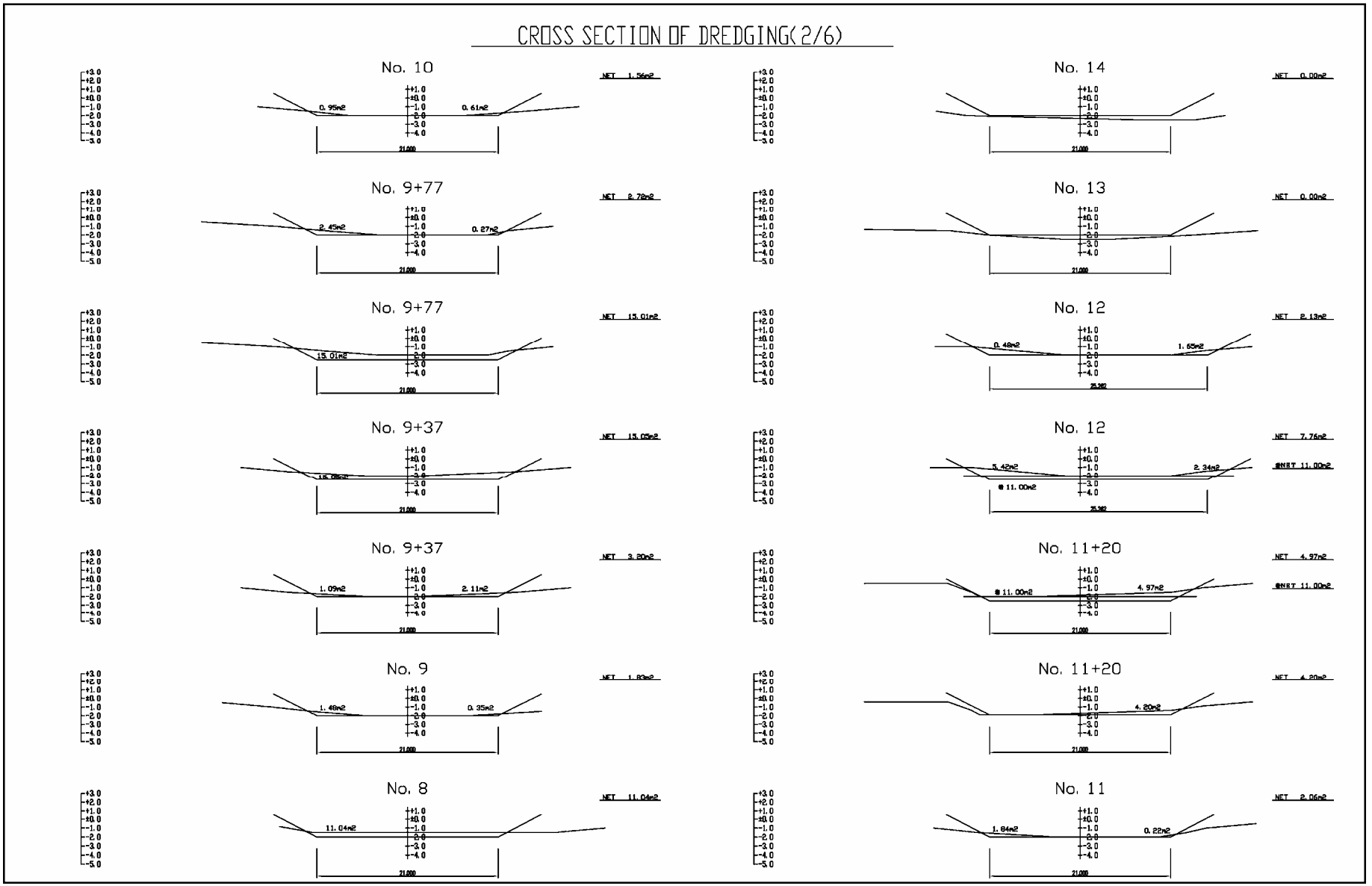


Figure 2.2.3-4 Dredging Plan of Access Channel (3/7)

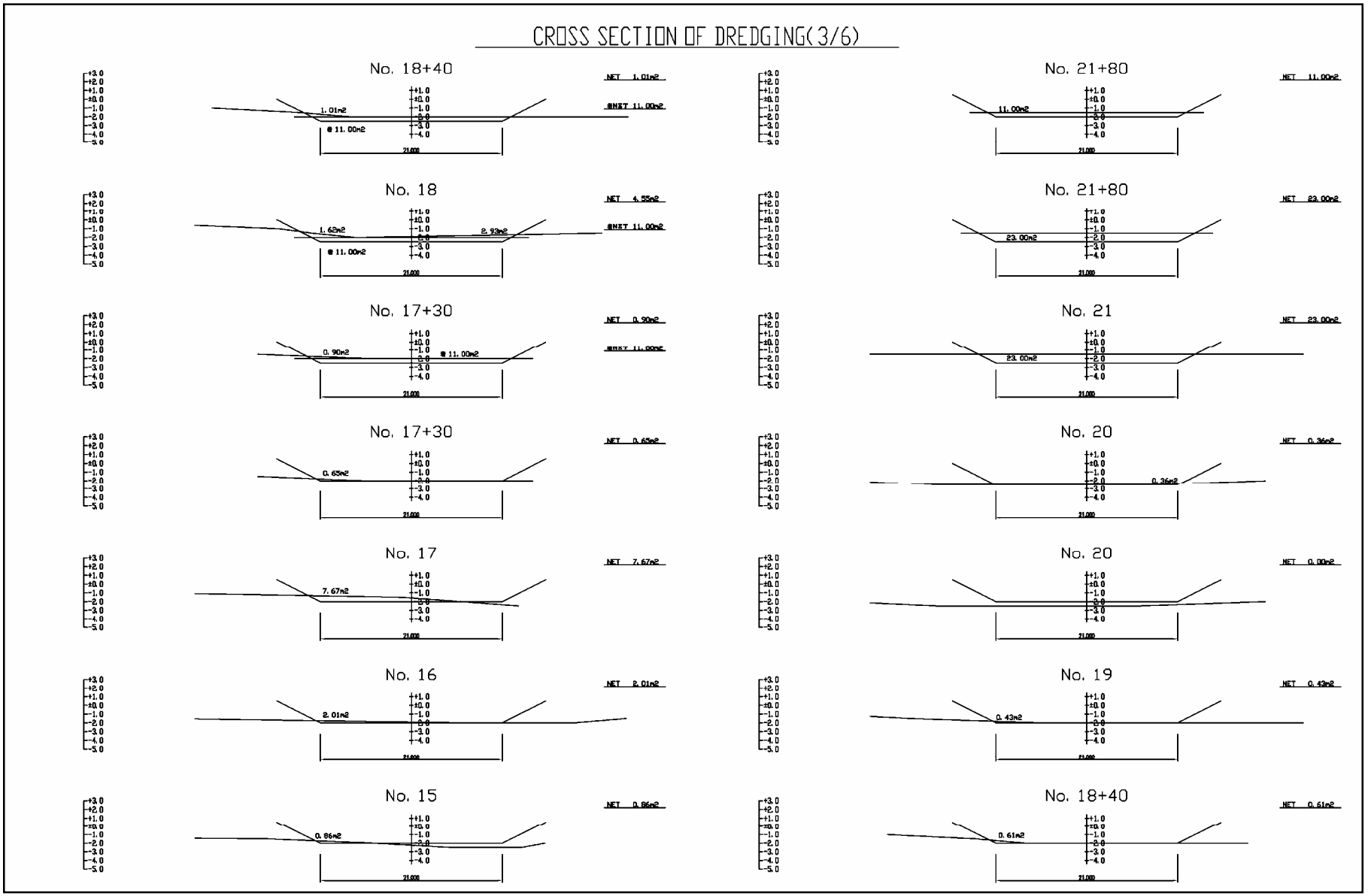


Figure 2.2.3-5 Dredging Plan of Access Channel (4/7)

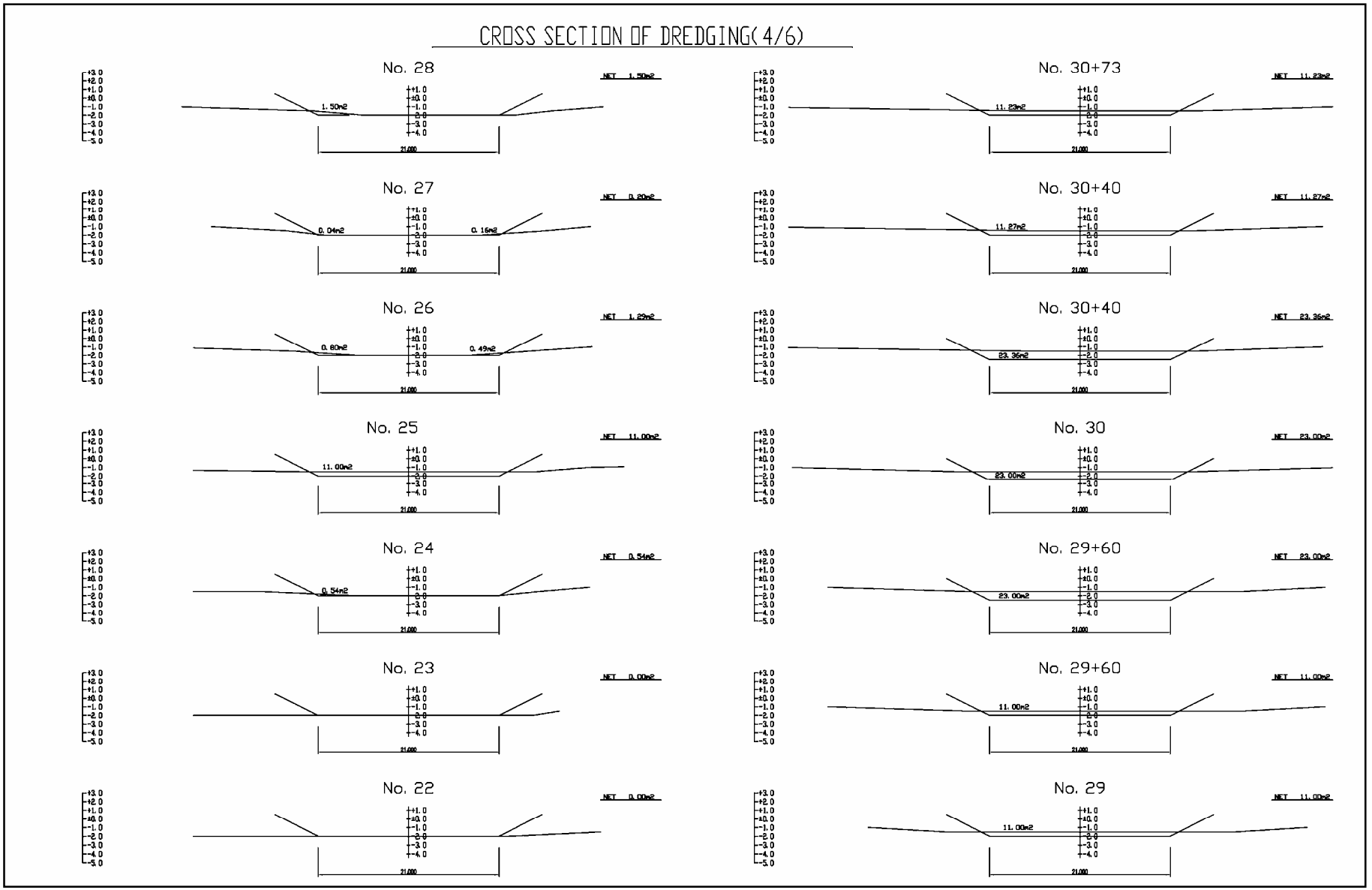


Figure 2.2.3-6 Dredging Plan of Access Channel (5/7)

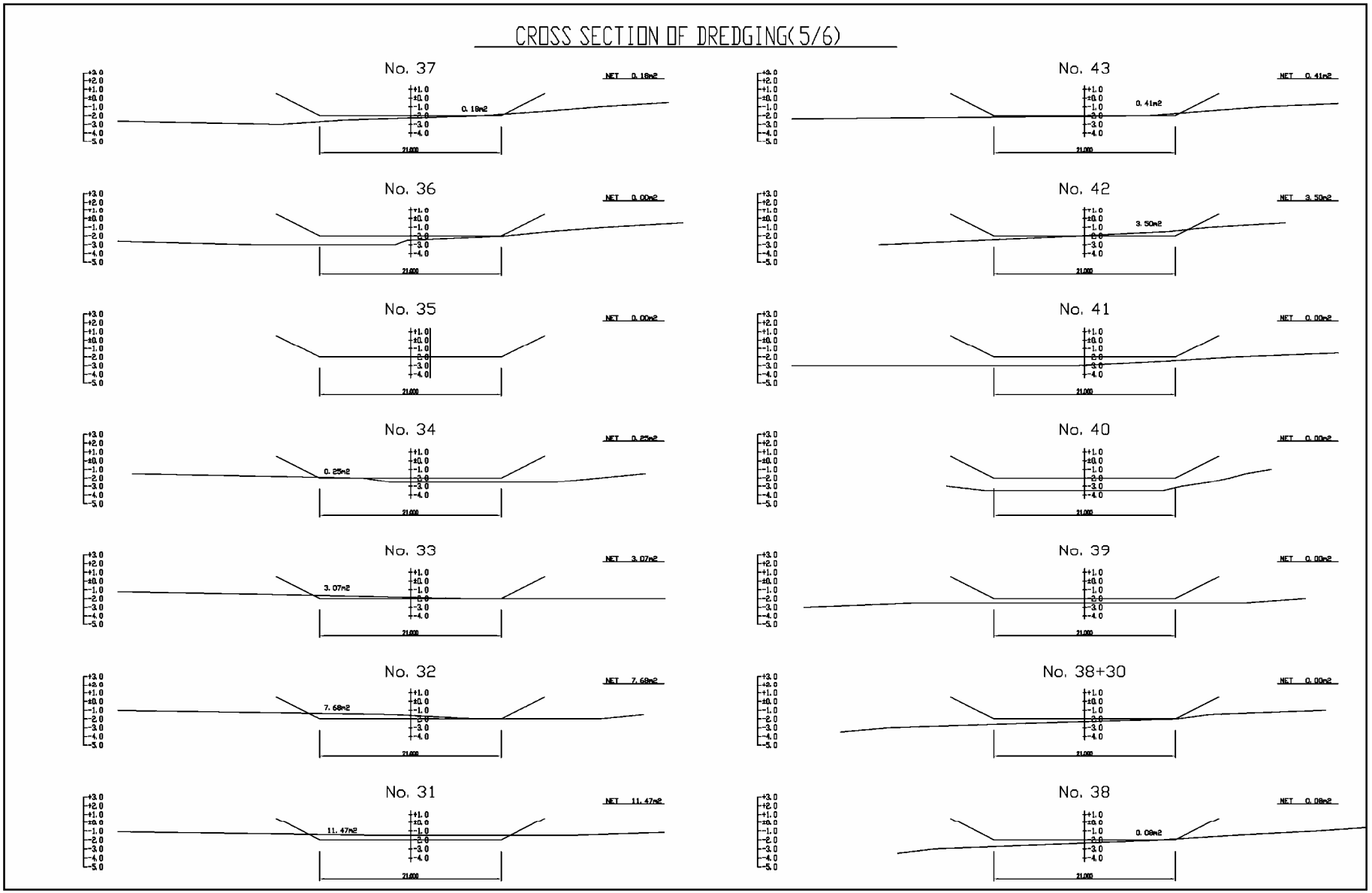


Figure 2.2.3-7 Dredging Plan of Access Channel (6/7)

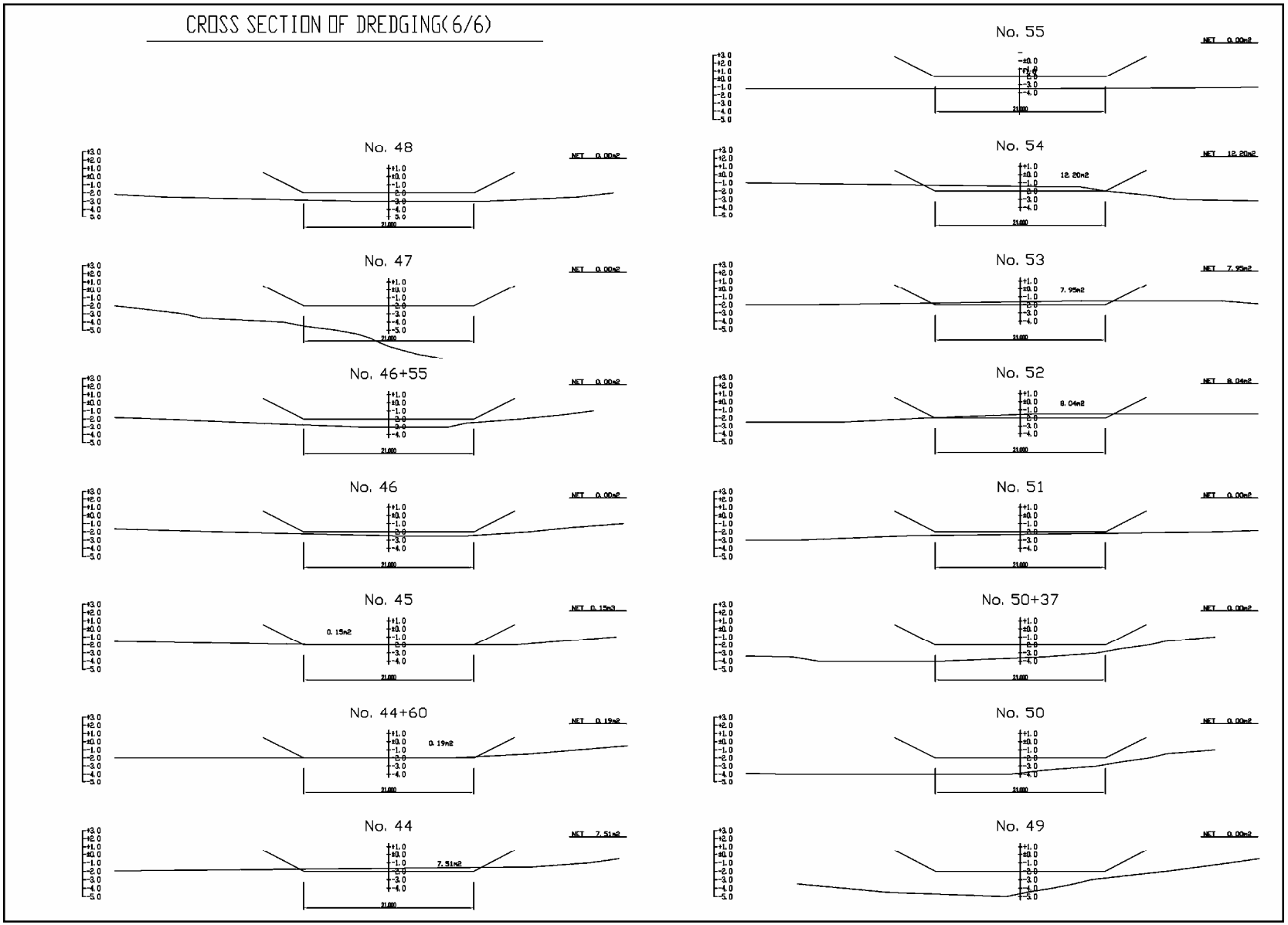


Figure 2.2.3-8 Dredging Plan of Access Channel (7/7)

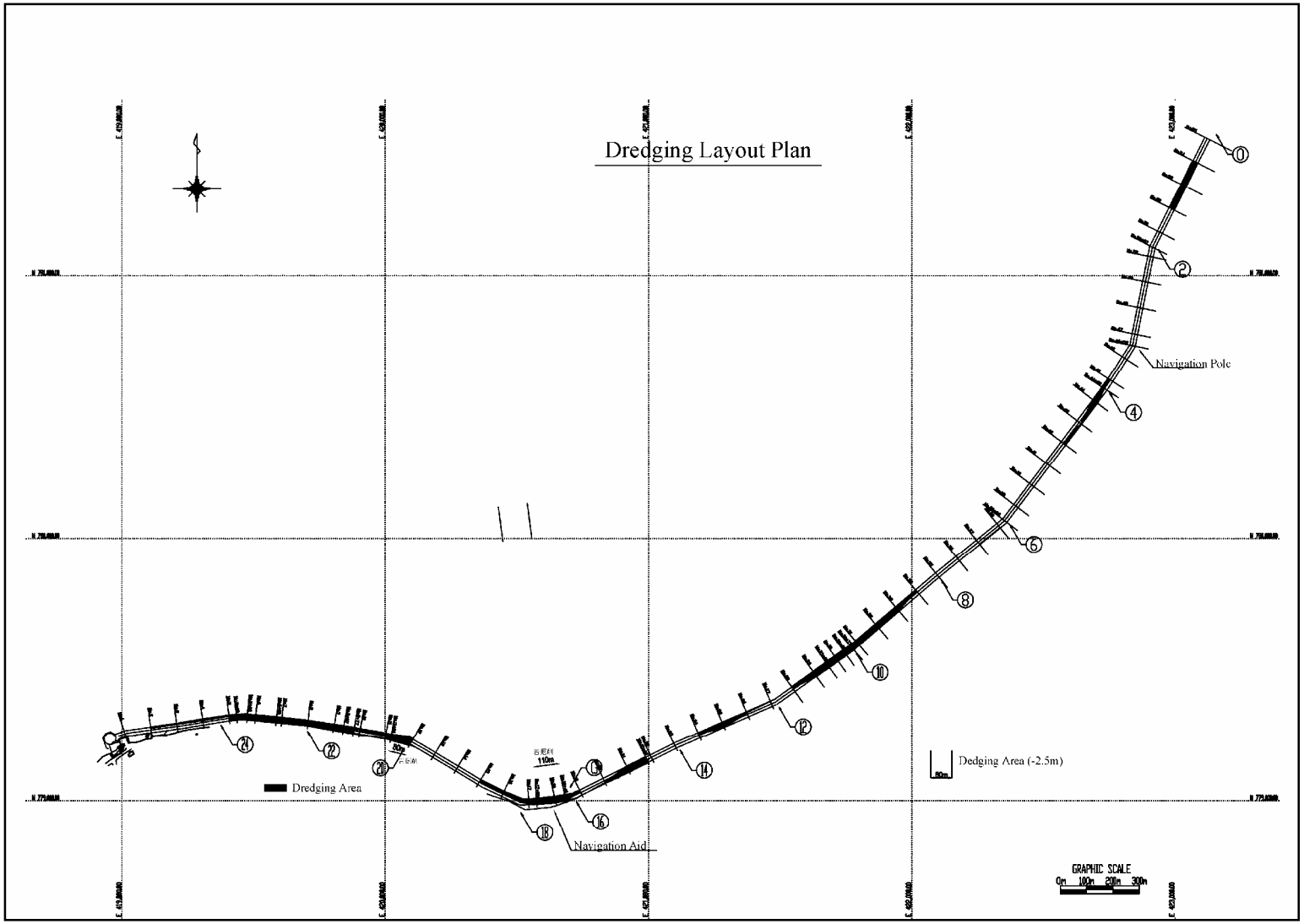


Figure 2.2.3-9 Dredging Area of Access Channel

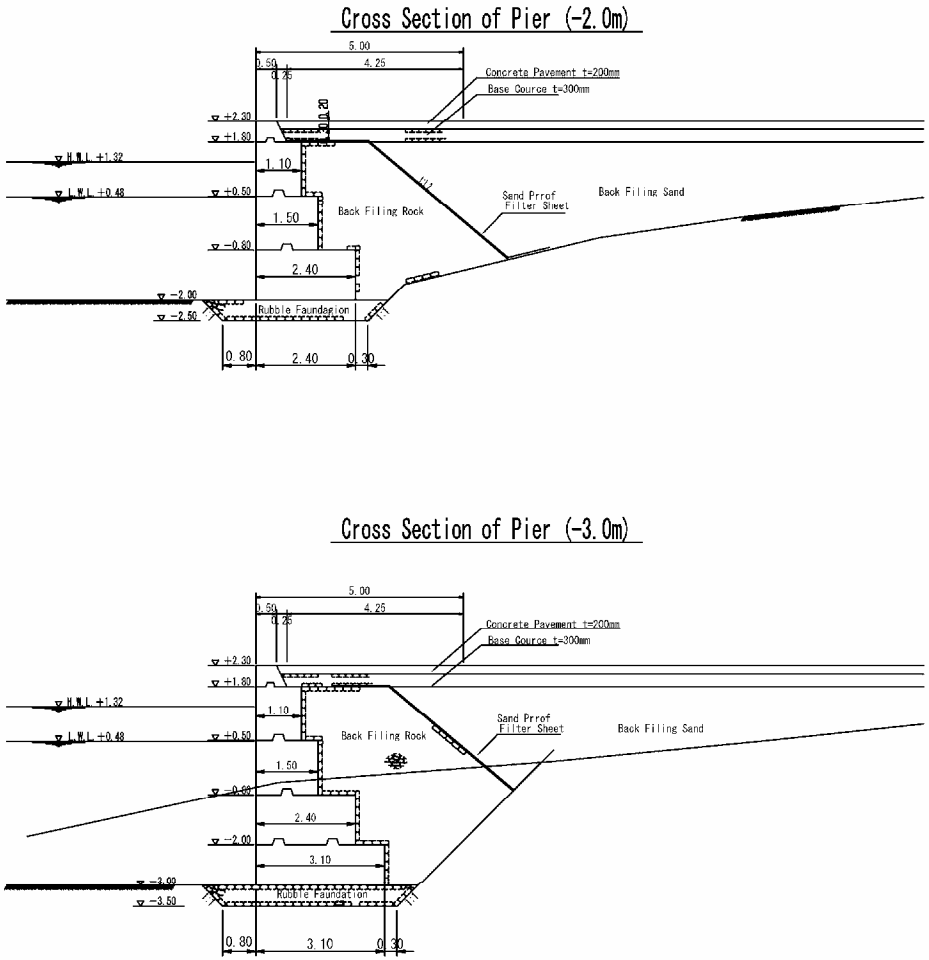


Figure 2.2.3-10 Cross Section of Pier

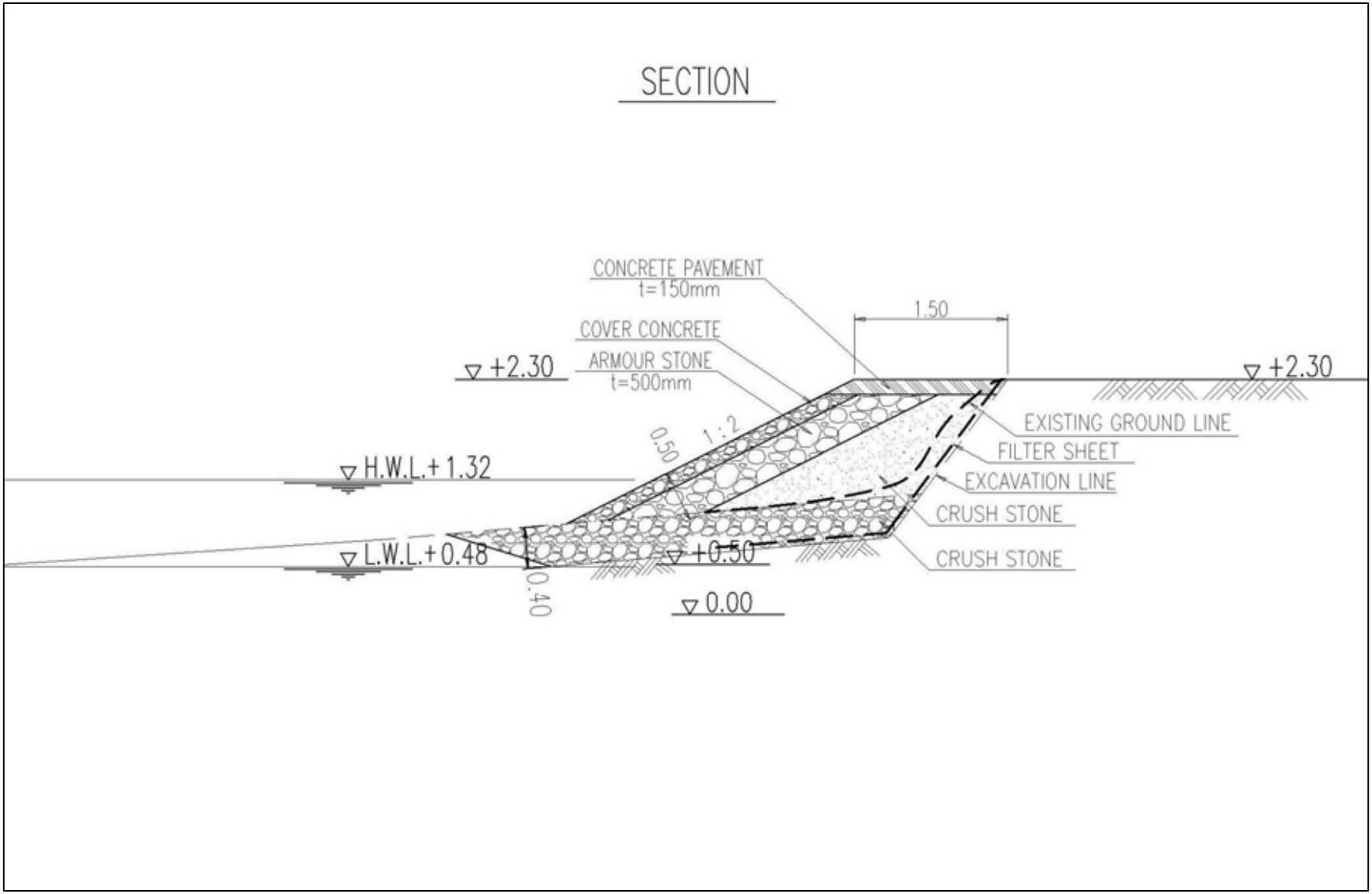


Figure 2.2.3-11 Cross Section of Revetment

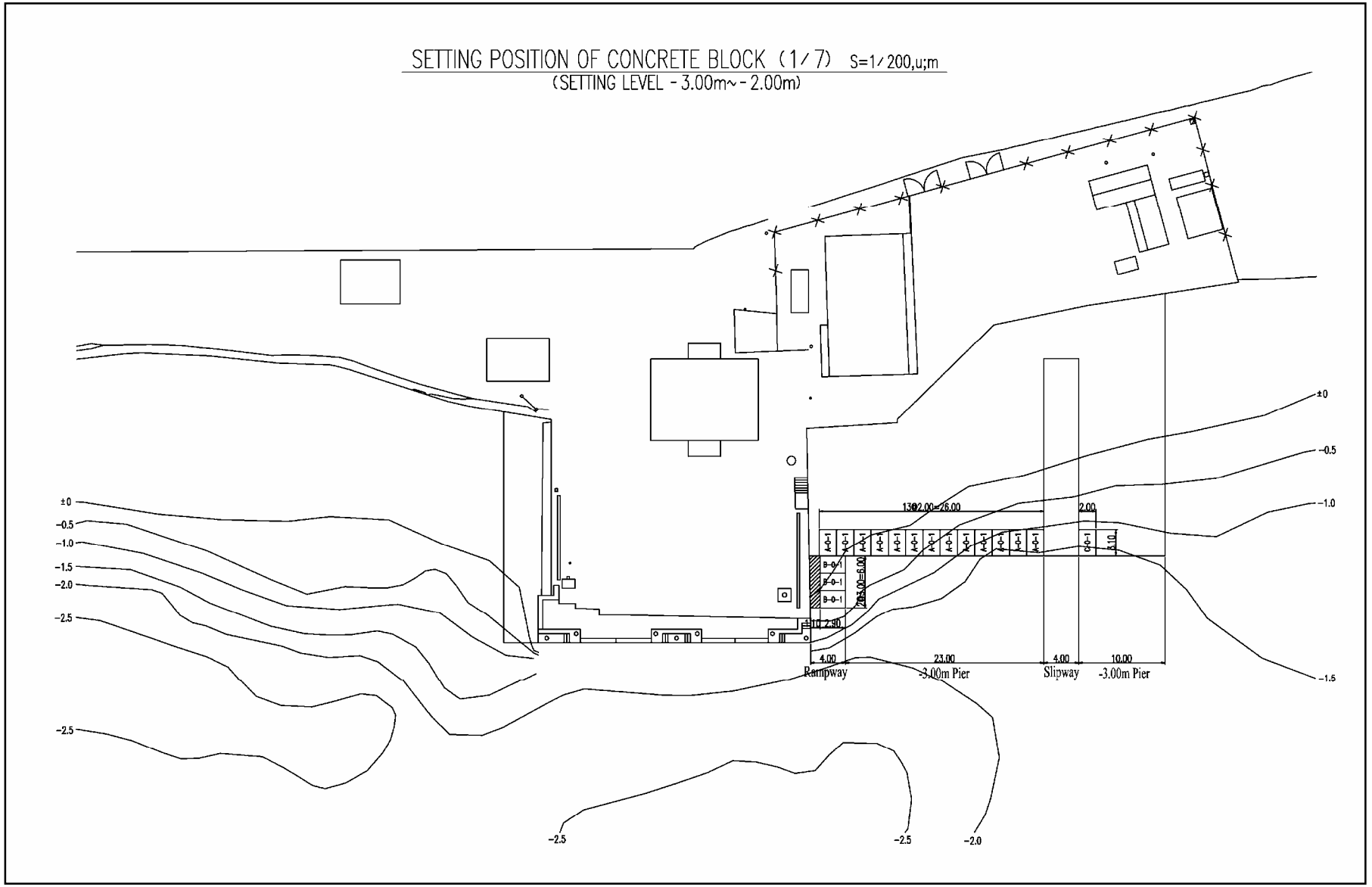


Figure 2.2.3-12 Setting Position of Concrete Block 1st Layer (Elevation Level of Foundation)

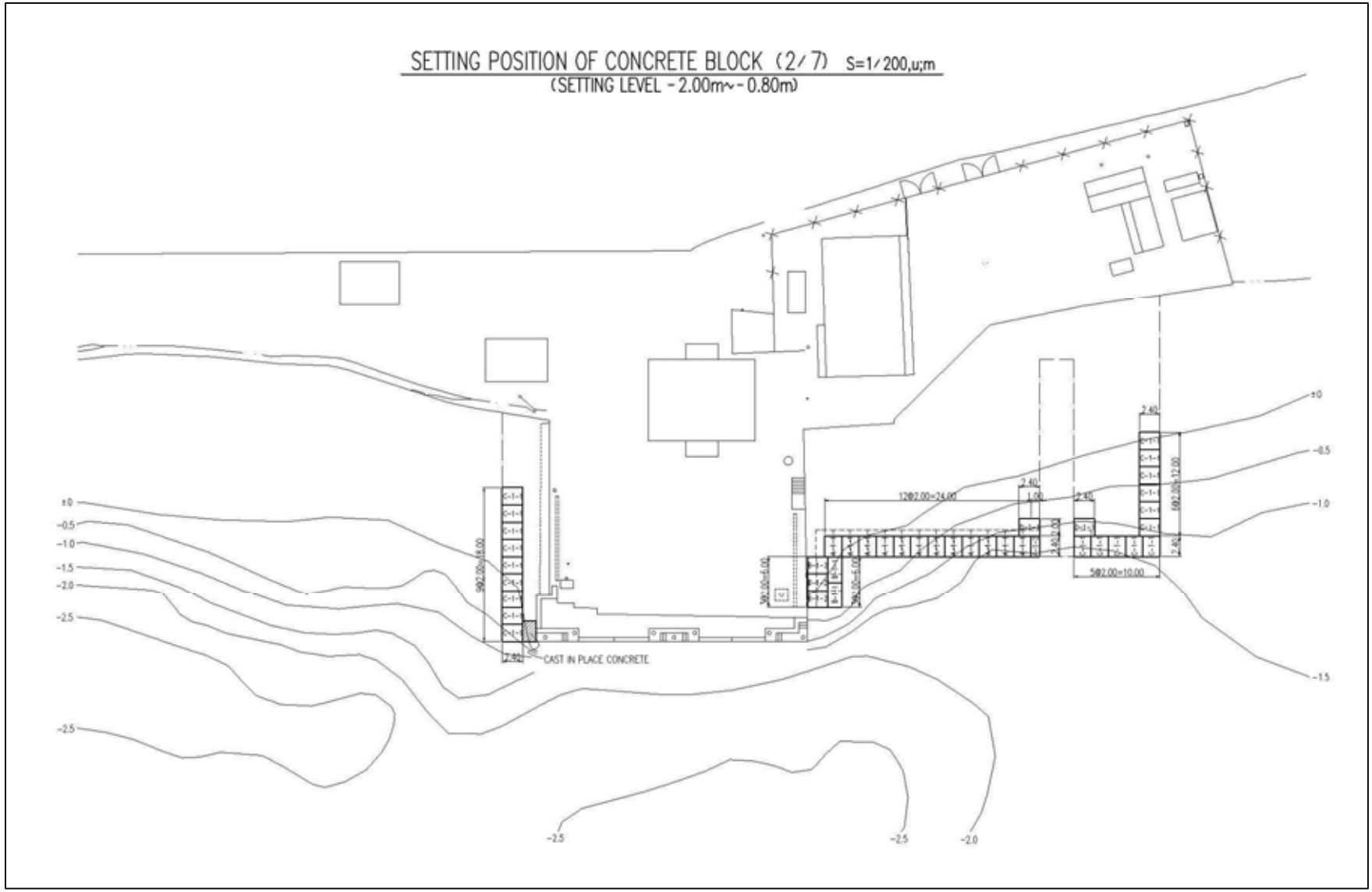


Figure 2.2.3-13 Setting Position of Concrete Block 2nd Layer

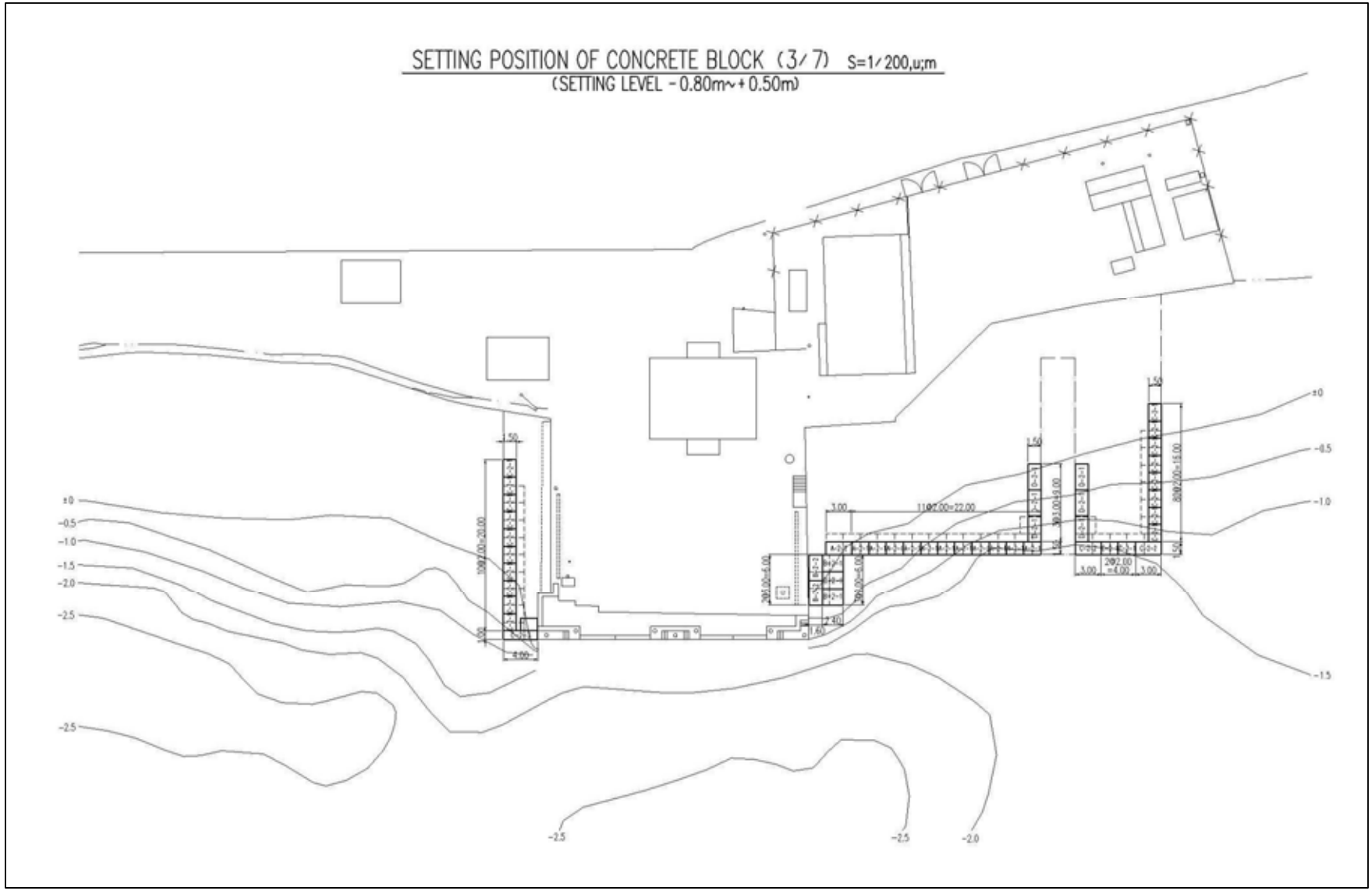


Figure 2.2.3-14 Setting Position of Concrete Block 3rd Layer

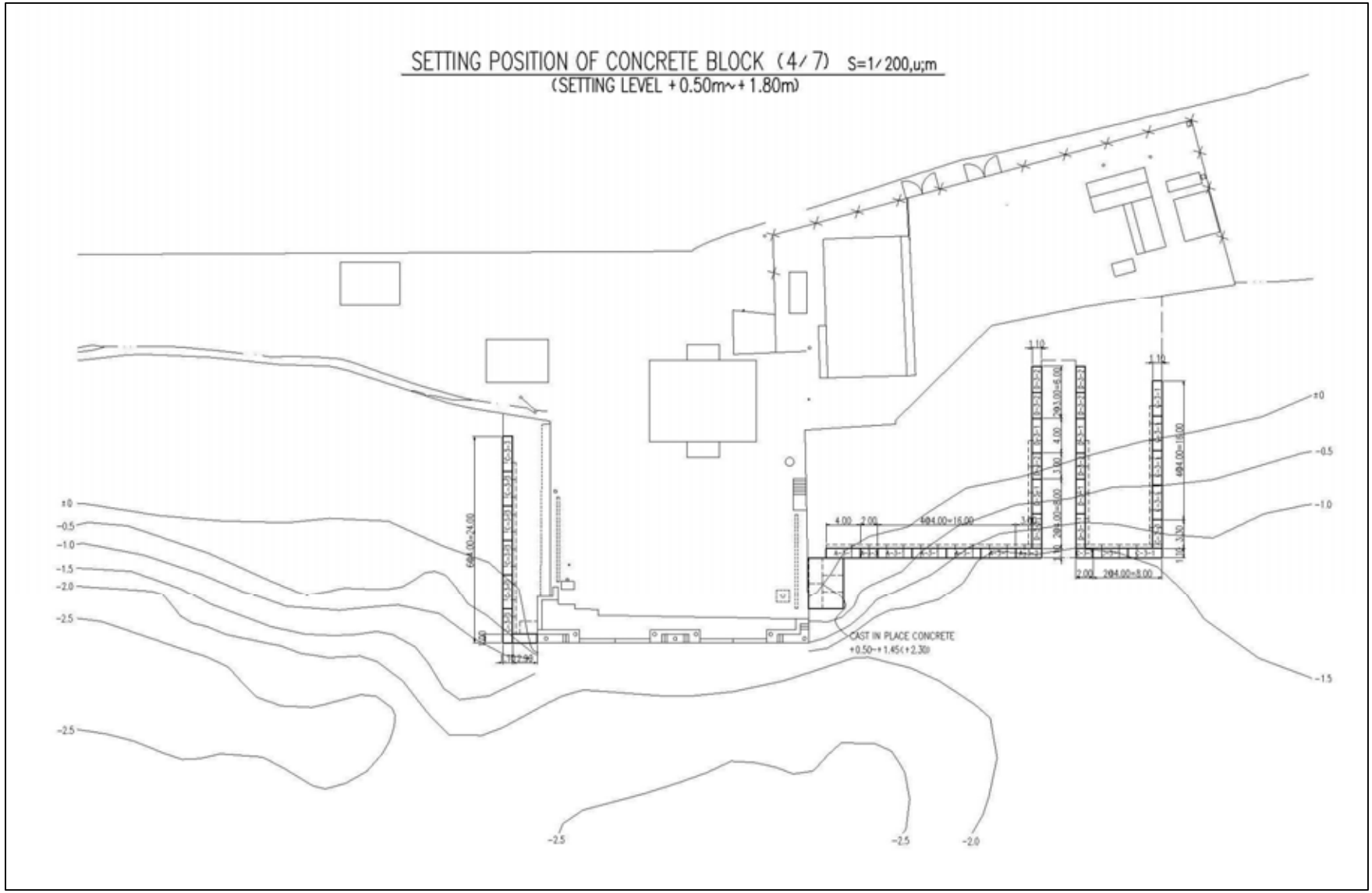


Figure 2.2.3-15 Setting Position of Concrete Block 4th Layer

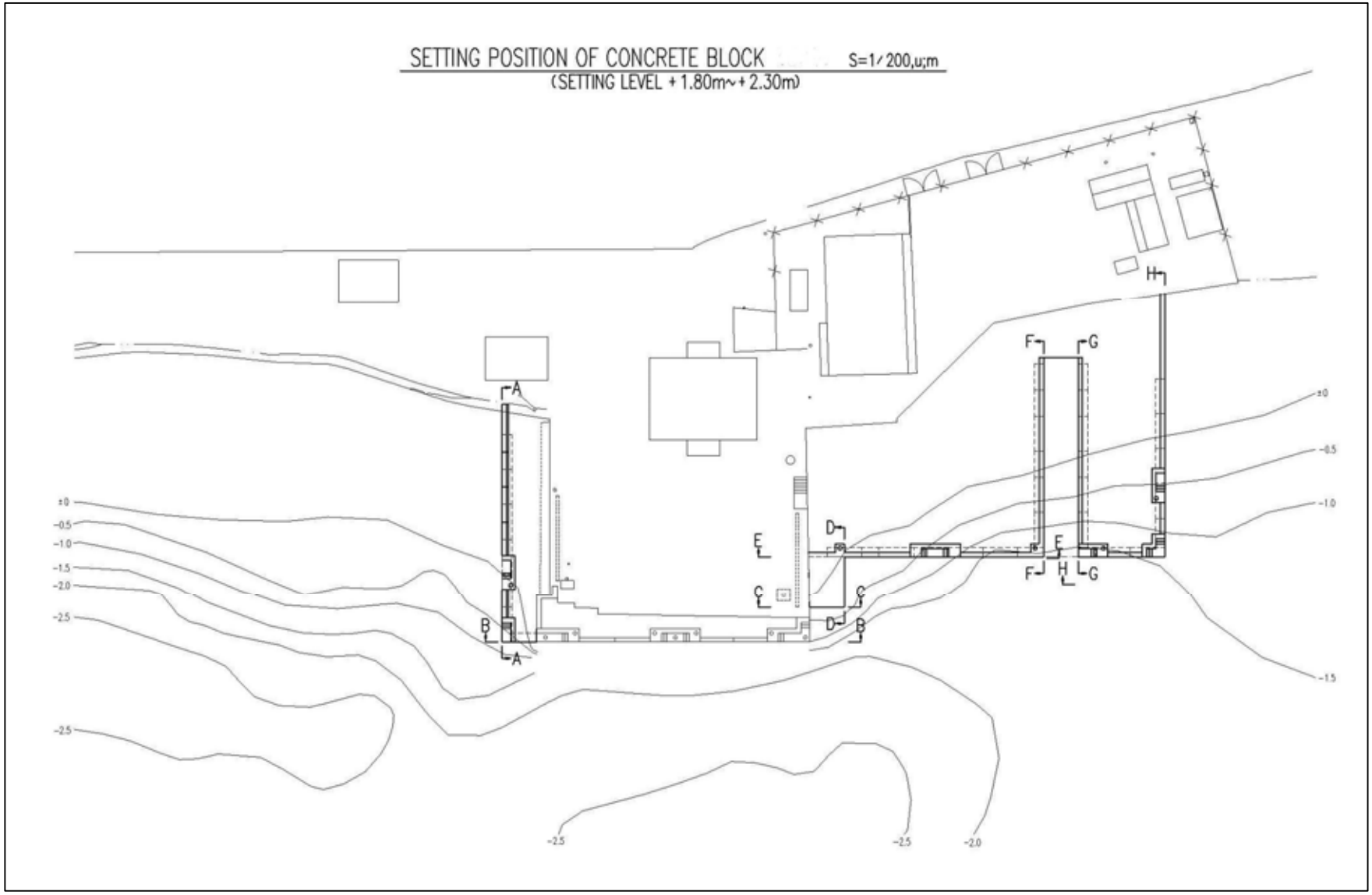


Figure 2.2.3-16 Setting Position of Concrete Block Top Layer (Existing Grand Elevation Level)

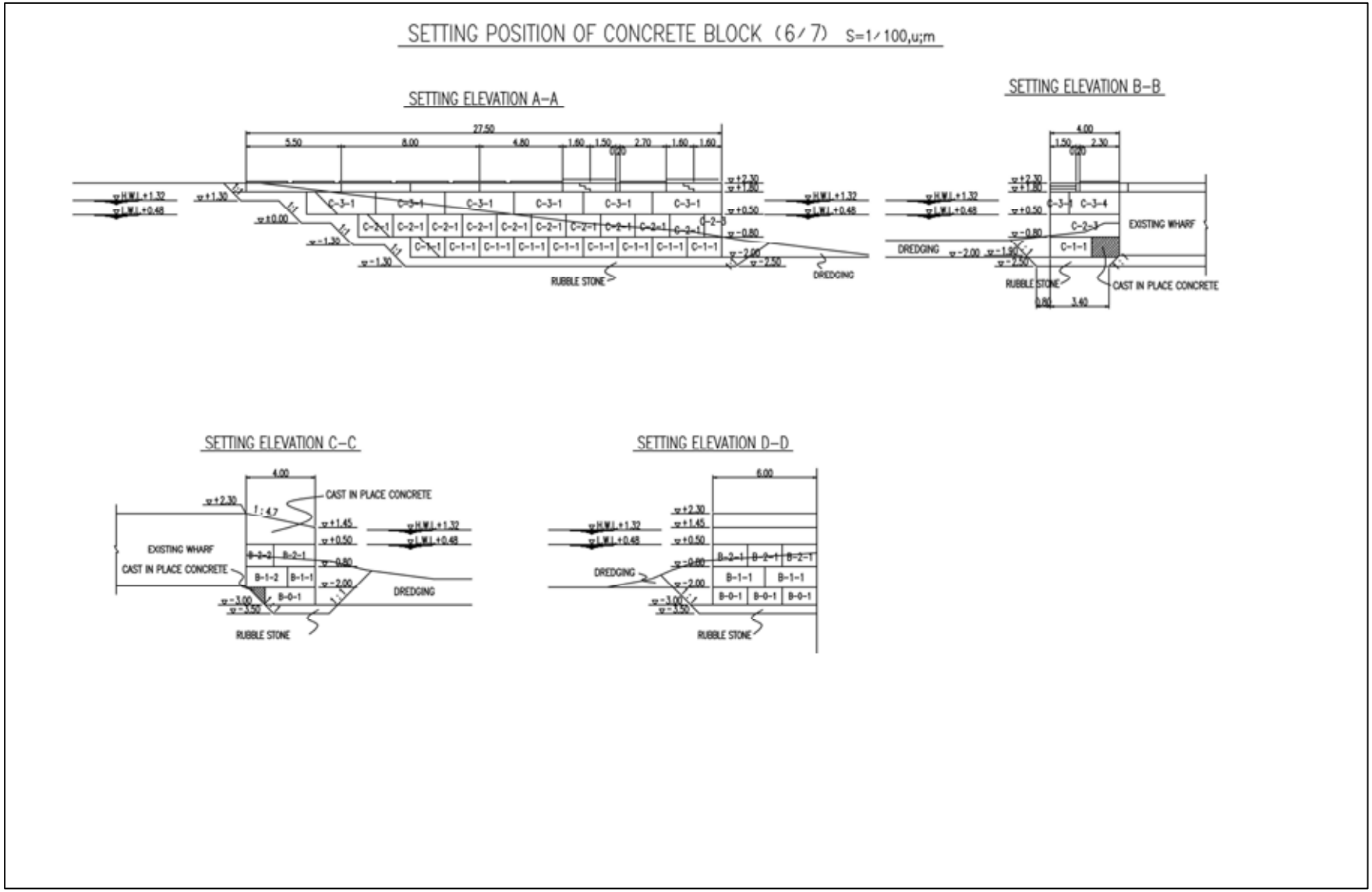


Figure 2.2.3-17 Setting Position of Concrete Block (Elevation Plan of Eastern Side)

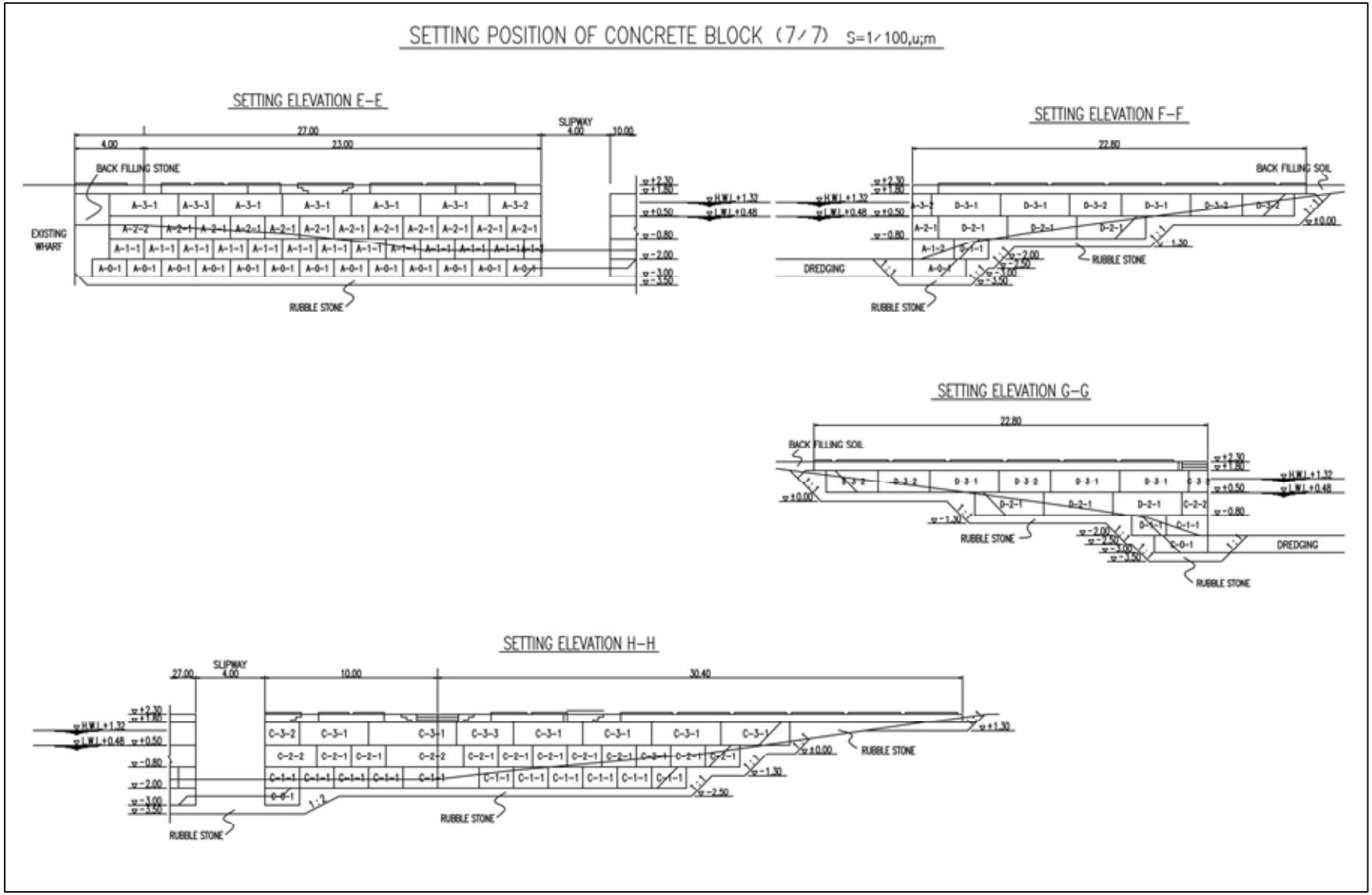


Figure 2.2.3-18 Setting Position of Concrete Block (Elevation Plan of Western Side)

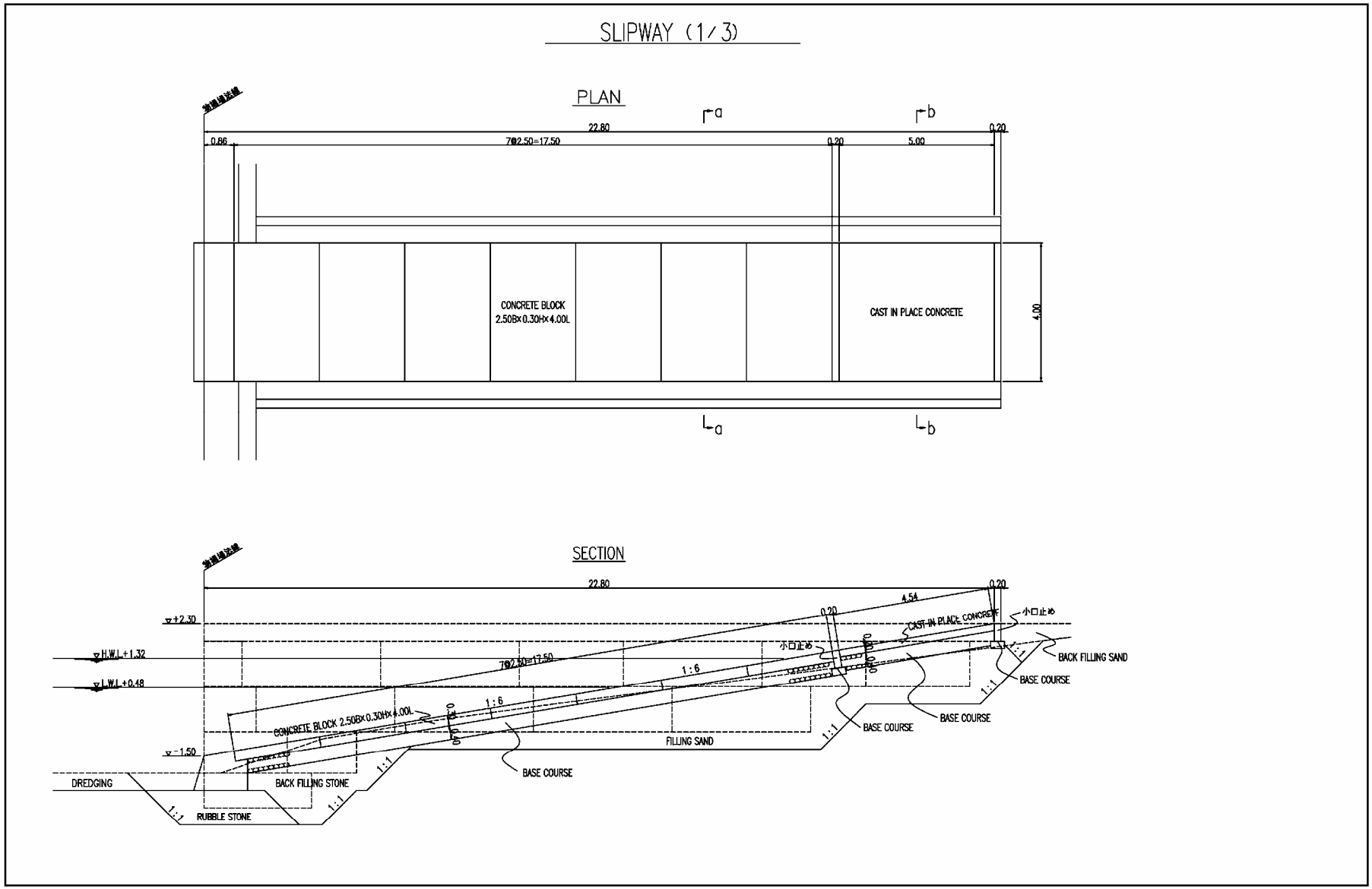


Figure 2.2.3-19 Plan and Cross-section of Slipway (North – South Direction)

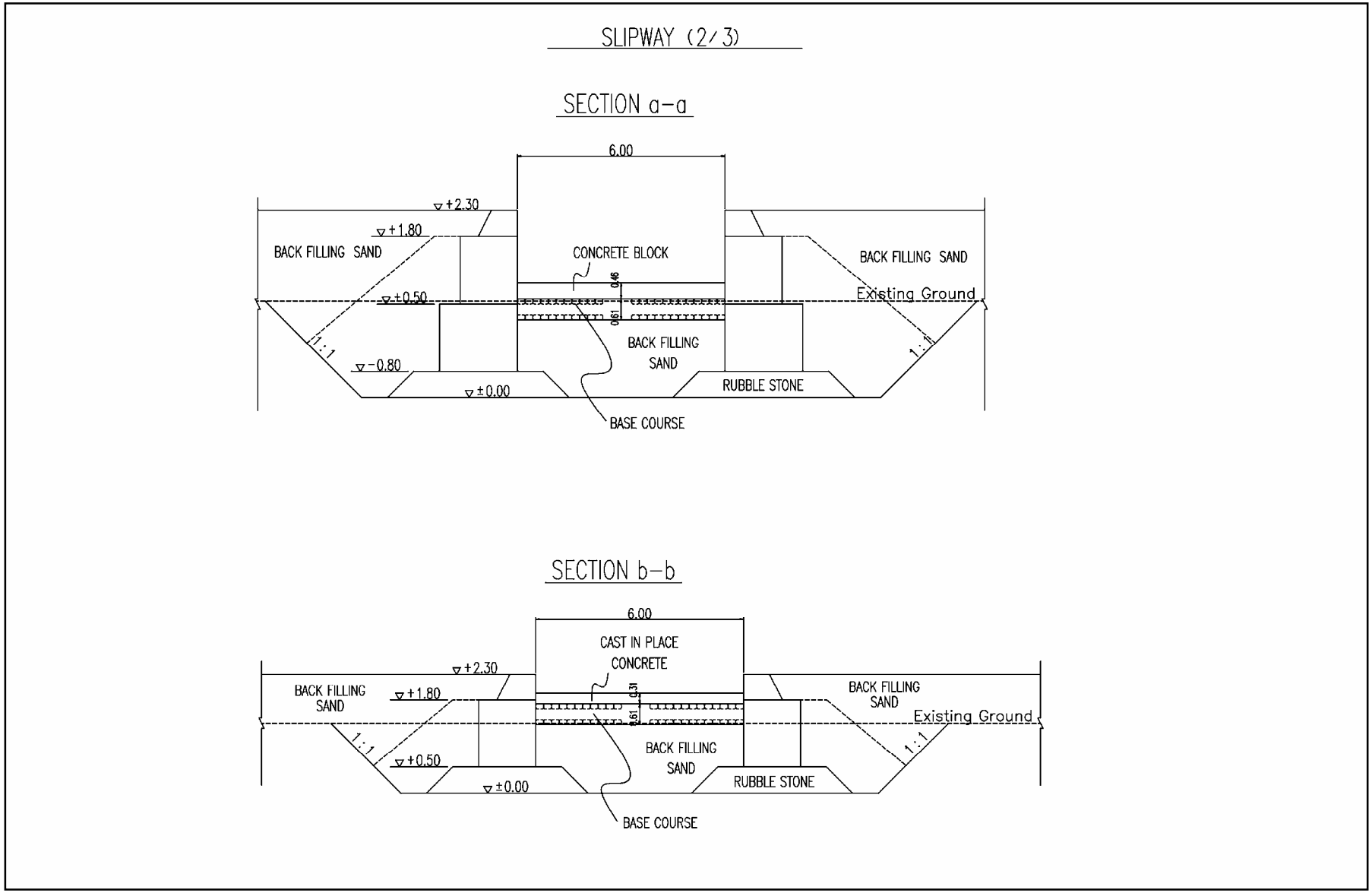


Figure 2.2.3-20 Plan and Cross-section of Slipway (East – West Direction)

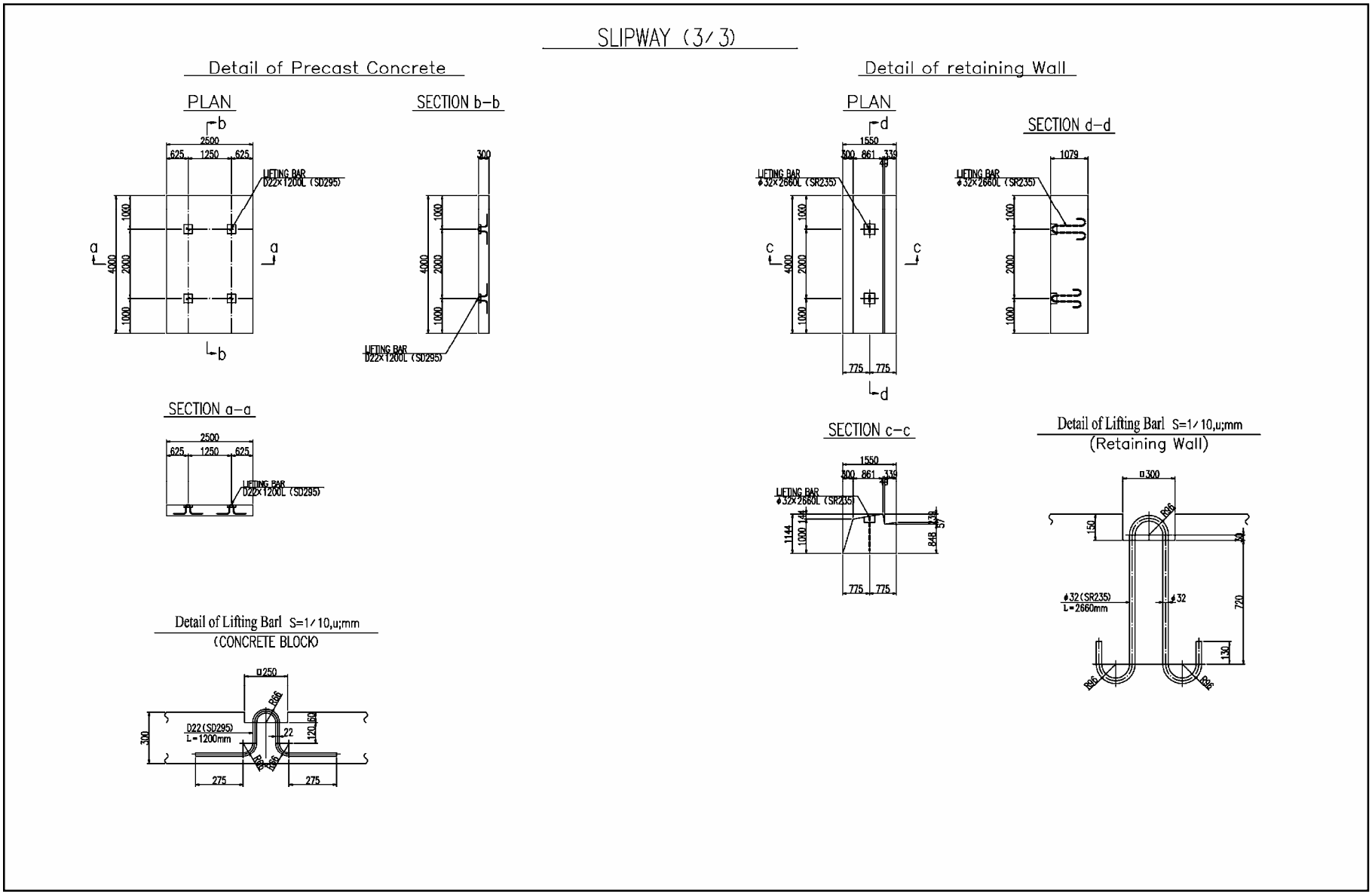
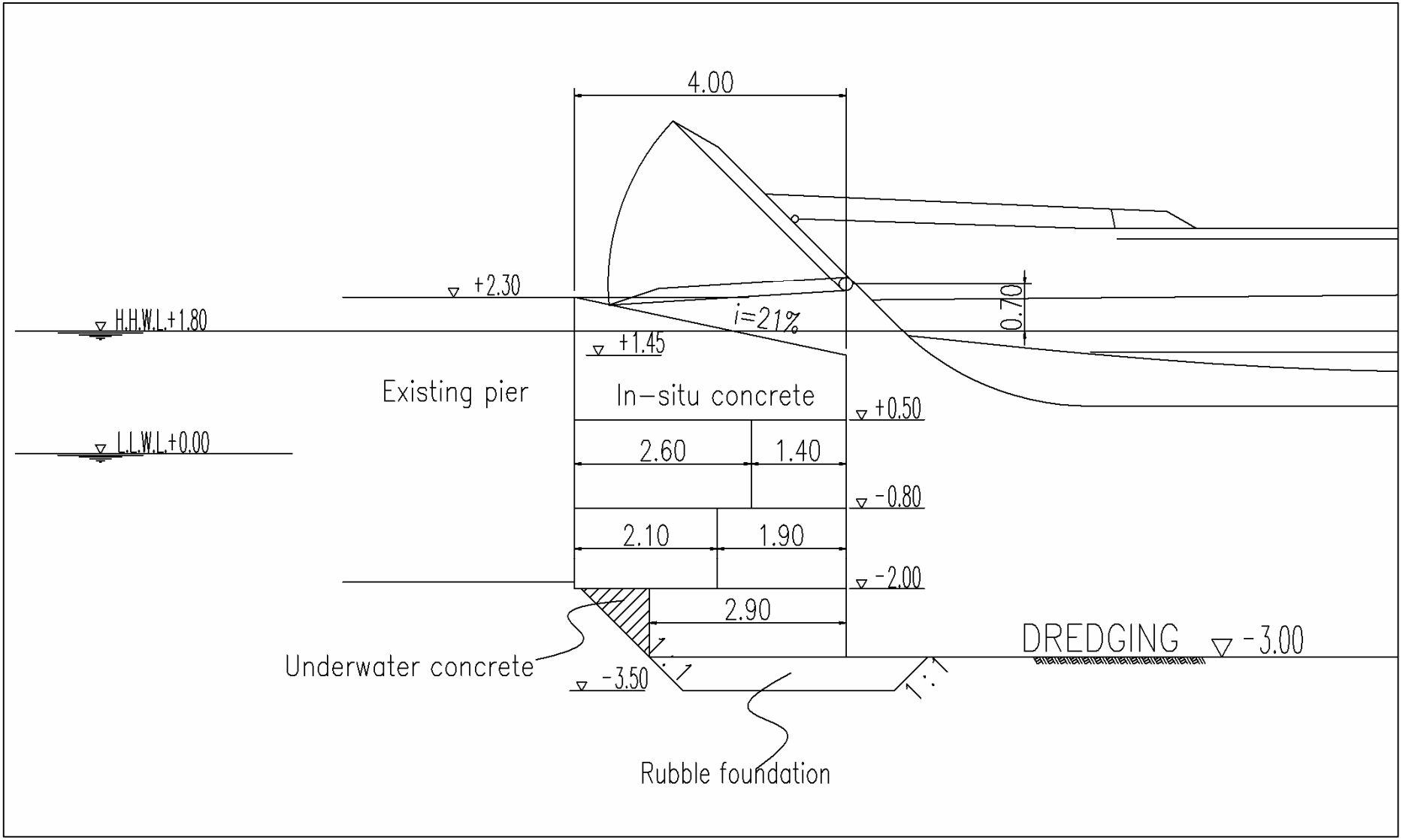


Figure 2.2.3-21 Structure Drawings of Slipway



igure 2.2.3-22 Cross-section of Rampway

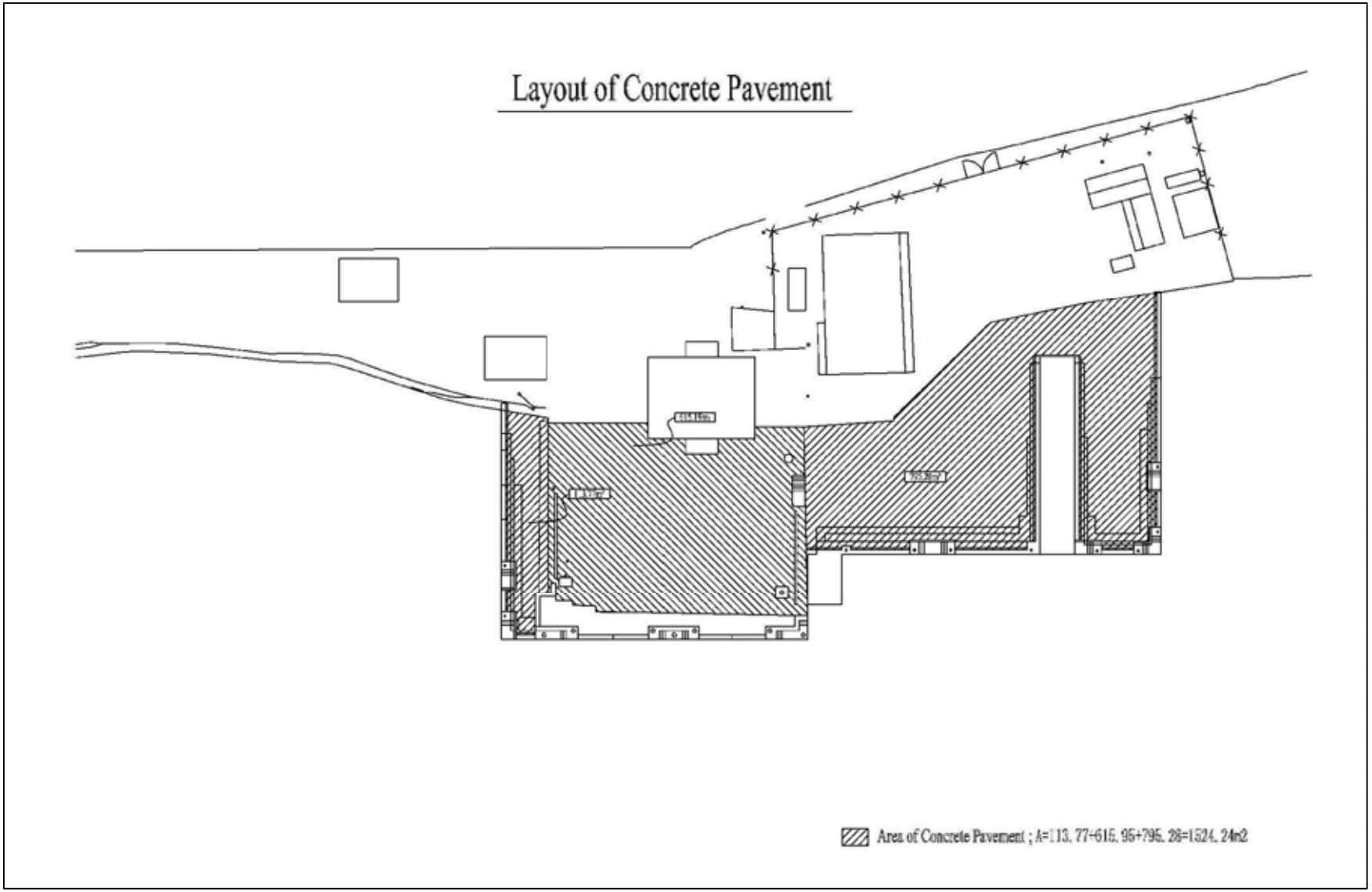
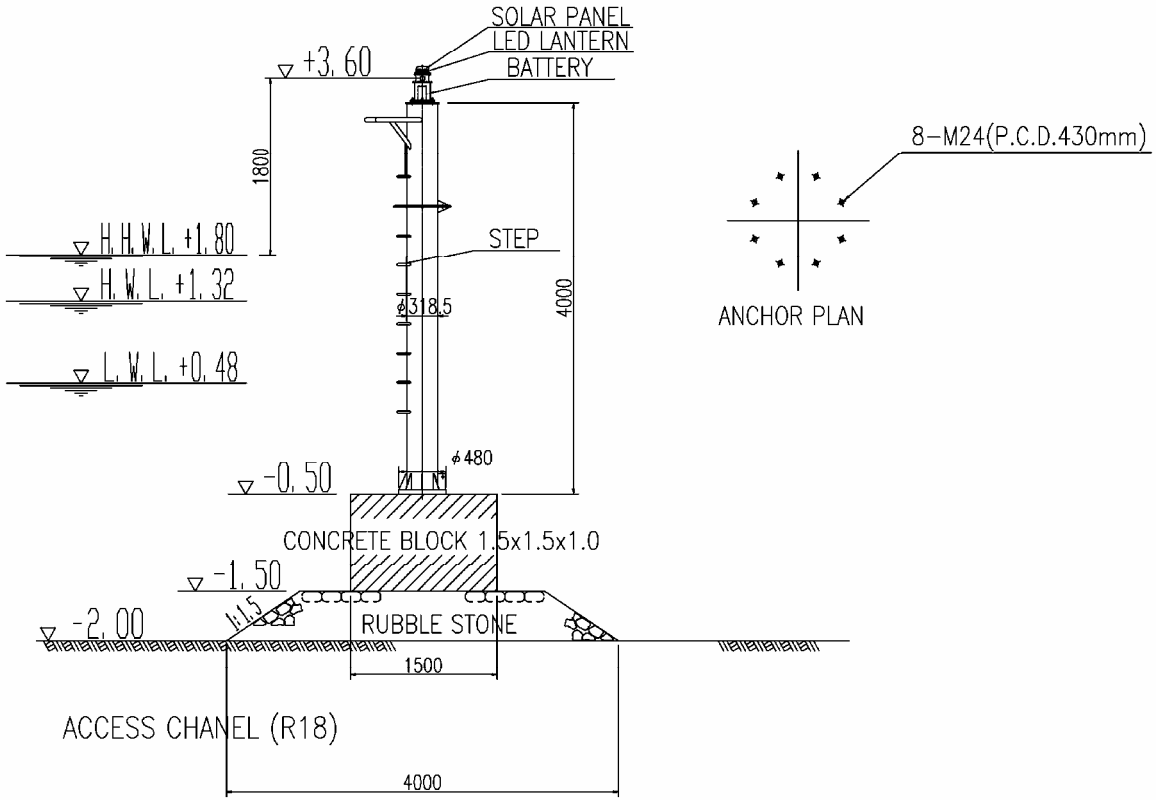
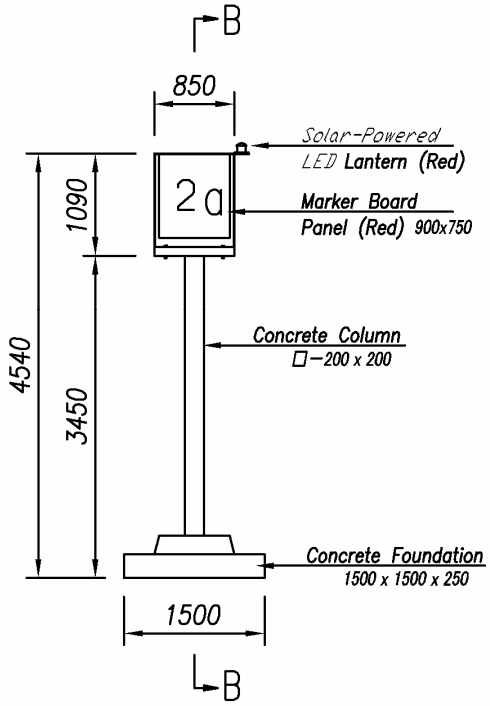


Figure 2.2.3-23 Layout of Concrete Pavement (Apron)



Navigation Aids



Navigation Pole

Figure 2.2.3-24 Details of Navigation Aids