6-2-3 Organization of the ANP

Established in 1916, the ANP has a long history as a port management body. Therefore, one of its strong points is that it has accumulated technical know-how on port construction, management and operation. On the other hand, its weak point is that its organization has not corresponded with recent trends like containerization. In the 1920's when the ANP started to provide port services, it was considered rational for the ANP to directly provide cargo handling service, tugboat service,etc., repair vessels in its own dock, or dredge the approach channel by direct management. However, nowadays private companies provide various services, therefore, it is not always necessary for the public sector (the ANP) to monopolize all port services.

The ANP had 3,362 employees as of March 1992. Maritime Operation Division in charge of tugboat service, dredging, etc. has 575 employees, Port Operation Division in charge of on-shore cargo handling, operation of warehouses, etc. has 808 employees and Construction & Maintenance Division in charge of construction and maintenance of port facilities has 598 employees. These seems to be an excess of employees taking into consideration the present service level.

Table 6-2-3-1 shows working hours of tugboats in 1991. The average number of working hours is 548 per year (except for 2 vessels under repair); especially notable is the average working hours of the second class, only 328, which is decidedly too little.

As mentioned above, to provide all port services by direct management is not always efficient, and personnel cost and depreciation cost might weigh heavy on management of the ANP.

It is desirable that a private sector provides some port services to provide better, more efficient or cheaper services.

Table 6-2-3-1 Working Situation of Tugboats in 1991

Name	Class	Year Built	Capacity (H.P.)	Working Hours	Remark
Gaucho	Special	1985	4000	792.76	
Lavalleja	First	1961	1680	1181.68	
Artigas	First	1931	1950	0	Under Repair
Ing.P.Ferres	First	1959	1100	0	Under Repair
Guenoa	Second	1982	700	509.1	
Gral.Leandro Gomez	Second	1976	550	353.77	
Sanducero	Second	1978	550	261.26	
Grito de Asencio	Second	1931	360	189.99	
Total				3288.56	

Source: ANP

6-2-4 Storage Facilities

Table 6-2-4-1 shows situation of use of warehouses and open storage yards in January 1992. Compared in/out volume with available area, we may say that use ratio of storage facilities is not high, though we can not say exactly because we do not know the staying period of cargo. Since 137 employees are allocated to the storage facilities except container yard, efficiency seems to be lacking. Furthermore, the warehouses were superannuate and some of them are not in good condition.

Table 6-2-4-1 In/Out Volume of Storage Facilities in January 1992

	Year of Construction	Available Area (m²)	Number of Staff	In Volume (Ton)	Out Volume (Ton)
Deposito 1	1932	6,426	6	9	9
Deposito 2	1932	7,182	4	60	183
Deposito 3	1912(1961)	3,175	6	142	230
Deposito 4	1912(1961)	2,872	10	1,123	1,284
Deposito 5	1912(1961)	3,175	11	722	311
Deposito 8	1913-1915	5,334	8	6	85
Deposito 9	1913-1915	5,334	9	181	280
Deposito 20		4,251	11	702	1,098
Deposito 22			4	116	57
Deposito 24			21	1,260	427
Deposito 25			5	77	34
Mercado de Frutos		24,624	8	43	208
Rambla 1		7,500	12	557	265
Rambla B Wharf		6,000	15	537	422
Rambla 2		5,500	7	699	135
Total			137	6,235	5,028

Note: ( ) indicates a remodeling year.

Source: ANP

6-2-5 Storage of Empty Containers

There are many empty containers stacked 2 or 3-high at various parts of the premises of the port. These empty containers disturb orderly use of the premises. In particular, it obstructs vision, which is a big problem for traffic safety.

6-3 Recommendations on the Present Management and Operation

6-3-1 Unification and Privatization of Cargo Handling

The biggest reason for the present low productivity of cargo handling is that cargo handling is divided into stevedoring (ANSE) and on-shore cargo handling (ANP) and there is a lack of coordination between them. Regarding this point, a new port law was established in April 1992; a new direction pointing towards the unification and privatization of cargo handling under control of the ANSE has been determined. With the introduction of privatized cargo handling, we can expect improvement of cargo handling efficiency because of following reasons; (1) Instead of monopoly by the ANSE and the ANP, competition of private companies is introduced. (2) Since private sectors have more freedom than public sectors, they can lead their organizations in an efficient and economically viable direction.

It is desirable that Government or a port management body should retain the minimum and necessary control of their works when private companies enter into the cargo handling business; one way is through the introduction of a permission system on tariffs. Second is the introduction of a license system for companies wishing to establish a cargo handling business. In this way, we can expect to avoid a surplus supply of cargo handling compared with the demand.

6-3-2 Efficient Use of Warehouse

Since there is a lot of cargo handled through direct delivery without storage in warehouses in Montevideo Port and potential demand for use of warehouses seems high, effective measures should be taken against warehouses with low utilization rates, taking users' opinions into consideration.

To put it concretely, it is recommended that the ANP rent warehouses (including renting some spaces of them based on square) to private companies, instead of operating them directly. This can make users of warehouses store cargo under their own plan and management. Furthermore, the ANP can not only simplify its organization (because direct management becomes unnecessary) but also utilize warehouses effectively. However, superannuated warehouses difficult to use should be demolished thereby creating space for other purposes.

In particular, the introduction of this renting method to the refrigerating warehouses should be aggressively examined.

Using ratio of the existing refrigerating warehouse of the ANP is not high as shown in 3-4-3 Terminal Performance. On the other hand, some foreign fishing vessels use refrigerating warehouses to store transshipment cargo. However, most of this transshipment cargo is not stored in the refrigerating warehouse of the ANP but in private refrigerating warehouses near the port. The ANP should introduce a means to raise the using ratio to utilize its locational advantage. As refrigerating warehouses, which handle specific cargo, are different from general warehouses, a high level of services at a reasonable charge are necessary.

To provide these services, it is recommended to introduce a renting method to private companies, which have the special know-how and provide quality services that can compete with other refrigerating warehouses located near the port.

6-3-3 Efficient Use of Cargo Handling Equipment

(1) Superannuate cranes or forklifts with low utilization rates should be demolished. Quay cranes should be moved to other wharves as necessary. Since to equip quay cranes on every berth is not always necessary, utilization of mobile cranes is also useful.

(2) Reinforcement of Maintenance

It is necessary not only to inspect handling equipment regularly but also to stock those spare parts which are used often. By doing this, troubles while cargo handling and a long period maintenance should be avoided.

6-3-4 Simplification of Business of the ANP

(1) General

Though privatization of port services is now going on in the field of cargo handling based on a new law, it is desirable to examine privatization of port service or entrusting business to private sector more in other fields in order to operate and manage the port efficiently.

Advantages of privatization of business or introduction of entrusting business to a private sector are (1) improvement of efficiency of port operation, (2) reduction of financial burden of public sector, (3) reduction of costs by introduction of competition principle, etc..

When introducing the above, various problems may arise such as influence upon financial situation of the ANP, treatment of staff or disposal of facilities, but these can be resolved in the long term.

Specifically, following items should be examined:

(2) Privatization of Tugboat and Line Handling Service

These services are not always necessary to be provided by a port management body. As shown in Table 6-3-4-1, which shows the business scope of port management body of 14 countries, they are privatized in half of them.

(3) Simplification of Maintenance Division

It is expected to simplify the maintenance division by improving the maintenance way; in stead of present direct management of repair, small repair or daily maintenance should be done by themselves but big repair should be entrusted to external organization. Especially, to repair vessels in the dock owned by the ANP is not efficient, therefore abolishing this practice might be considered.

(4) Entrusting dredging of channels and ports to private sector in stead of direct management

Examining this matter, we also need to pay attention to the fact that DNH (National Directorate for Hydrography, Ministry of Transport and Public Works) currently dredges other ports except Montevideo Port by using its own dredgers.

6-3-5 Reinforcement of Marketing Function of the ANP

Since Montevideo Port has advantage of deep water compared with other neighboring ports, growth of cargo volume, especially transit cargo can be expected.

To promote use of port it is essential to establish a more useful and attractive port in terms of both facilities and management and operation for users such as shipping lines, shipping agents, forwarders, shippers, consignees, etc.. For that purpose, it is necessary to have a real time, broad, systematic grasp of the users' needs and to reflect their needs in the practical development and management of the port.

The port should be marketed aggressively, providing users with pertinent information. These functions will become more important after implementation of expansion of the container terminal and construction of a grain terminal and a

Table 6-3-4-1 Business Scope of Port Management Body

Country	Japan	U.S.A.		England		Nether-lands	Germany	China	Phili-ppines	Thai-land	Guate-mala	Dominica	Chile	Malaysia	Singa-pore	Hong Kong	Taiwan
Port	Yoko-hama	Los Angels	Seatle	London	Southa-ptom	Rotter-dam	Hamburg	Dalian	Manila	Bangkok	Santo Tohmas	Haiti	Valpa-raiso	Klang	Singa-pore	Hong Kong	Kaoshung
Ownership of facilities (Wharf)	●	●	○	○	●	○	○	○	○	●	○	○	○	○	○	○	○
Berth Assignment	●	●	○	○	●	○	○	○	○	○	○	○	○	●	○	●	●
Collection of Charge	●	○	○	○	●	○	●	○	○	○	○	○	○	●	○	●	●
Port Statistics	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Navigation Control of Vessels					○	○	○								○	○	○
Customs																	
Quarantine																	
Immigration Control																	○
Traffic Safety in Port				○				○		○		○			○		○
Police/Fire Fighting		○	○	○				○		○		○			○		○
Permission of Use of Transit She	●		○	○	●			○		○		○		●	○	●	●
Operation of Container Yard				○	●			○		●	○		○		○		
Operation of CFS				?	●			○		○	○		○		○		
Stevedoring				○	●			○			○		○	○	○		○
On-shore Cargo Handling				○	●			○		○	○		○	○	○		●
Cargo Handling by Berge								○					○		○		○
Operation of Warehouses			○	○	●			○		○	○	○	○	○	○		○
Traffic Transportation				○													
Railway Transportation				○				○									
Tugboat Service				○				○		○	○			○	○		○
Line Handling Service				○				○		○	○			○	○		○
Water/Oil Supply										○	○	○	○		○		
Pilot Service						○		○			○	○		○	○	○	
Tallying								○		○	○	○		○	○		○

Note: ● indicates a case in which facilities are leased to other sectors, businesses are not provided by port management bodies.

Source: OCDI

foreign fishing terminal.

The existing commercial division of the ANP should be reinforced as a marketing division that promotes these works.

Establishing the marketing division, externally, it can collect information on port users' requirements, advertise the advantages of the port and attract customers. Internally, the division can function as an advisory organization to other divisions by providing information collected on users' requirements. Such a cross relation of divisions could revitalize the ANP as a whole.

6-3-6 Securing of Storage Space of Empty Containers

Storage space of empty containers must be secured to avoid transporting a lot of empty containers into the conventional wharves in view point of efficient cargo handling and traffic safety in the conventional wharves.

6-3-7 Restructuring the Tariff System

(1) Restructuring wharfage charge

Present tariff system of wharfage charge of Montevideo Port is based on length of vessel rather than size of vessel, therefore, large vessels enjoy relatively low wharfage fees. Since increasing berth depth to accommodate large vessels requires a lot of money, the tariff system of wharfage charge should be based on size of vessel such as GRT or NRT. In Montevideo Port large vessels such as container or bulk cargo vessels are increasing, therefore, the ANP should restructure the tariff system based on size of vessel.

(2) Restructuring charge levied on cargo

Charge levied on cargo should be changed from a system based on classification of NADE/NADI Code to a system based on type of cargo. Furthermore, as for import cargo, it also should be designed based on freight volume of cargo rather than value (CIF value).

This will make the tariff system simple and correspond with provided services.

(3) Simplification of container charge

Present tariff system of container is complicated because two kinds of charges are levied on containers; one is a charge levied on cargo and the other is the handling of container charge. It would be desirable to introduce a unified and simplified tariff for container based on a box (TEU), combining present charges levied on cargo and handling of container charge.

6-4 Management and Operation Plan for the New Grain Terminal

6-4-1 Implementation Body

Several factors are considered in selecting a construction and management/operation body for the new grain terminal. The body should satisfy the following conditions:

1) Be an organization that can provide services based on aggressive sales, efficient operation and reasonable charges, since the grain terminal handles foreign transit grain cargo and attracting users is a condition for success.

2) Possess adequate finances to construct the terminal

3) Possess terminal operation know-how

There are three alternatives for the creation of a construction and management/operation body:

Case I: Integrated construction and management/operation by the ANP

Case II: Integrated construction and management/operation by the private sector

Case III: The ANP constructs a mooring facility as a basic port facility, the private sector constructs and manages/operates handling equipment and silos.

These cases are evaluated below.

(1) Case I

In this case, the ANP can manage the grain terminal in an integrated way including other existing berths. Also, a soft loan can be expected.

However, it is inferior to the private sector both in terms of aggressive sales to obtain customers and in terms of efficient terminal operation.

(2) Case II

The terminal handles a number of foreign grain cargo. Therefore, it is requested that the implementation body have a continuous sales effort to obtain customers and operate it efficiently. Regarding this point, Case II, in which the implementation body is from the private sector, is desirable. Since it is requested that the implementation body possess knowledge of operations, a neighboring foreign company which has experience in the operation of a grain terminal or a joint venture of the foreign company and an Uruguayan company can be considered.

However, as this terminal will form another link in the port facilities of the ANP, it may be difficult to coordinate port management effectively. Therefore, the ANP should control planning and management of the terminal.

(3) Case III

In this case we assume that reclamation and a mooring facility as a basic port facility will be built by the ANP, while cargo handling equipment and storage facilities will be built and managed by the private sector. As it is necessary to use these mooring and storage facilities and handling equipment in an integrated way in the case of the grain terminal, unified management and operation by the private sector including berth assignment is desirable.

Therefore, it is considered that the ANP builds a mooring facility (including reclamation) by its financing and leases it to the private sector based on a long term lease such as 10 years and the private sector manages and operates it. In this case, investment body is both the ANP and the private sector, thus the financial burden is shared.

(4) B.O.T. system

The B.O.T. (Build-Operate-Transfer) system is considered as a variation of case II or III. This system was developed in Turkey and introduced in conjunction with the construction of a power station in 1985.

The principles of the B.O.T. system are summarized as follows: A private company receives a contract for the construction of a project, raises funds for the construction and manages and operates the project by himself for a given period of say 20-30 years. The private sector covers the construction cost by benefits received from management and operation of the project during the period. Namely, the private sector not only builds the facility but also manages and operates it after completion as an investor; this is the predominant feature of this system. At the end of the term, ownership of the whole facilities would transfer to the client without charge. A private sector receiving a contract is required to have a high degree of special knowledge concerning operation of facilities, and to establish a joint venture that would incorporate specialized companies.

Merits of the B.O.T. system are as follows:

1) A client does not need to raise the construction fund nor does he need to take an investment risk.

2) Technical transfer of know-how concerning management and operation from the private sector to a client can be expected.

3) It is expected that planning and management of the project by the private sector as an investor will make the probability of success higher.

On the other hand, this system is contingent upon a private sector being able to cover the construction cost from the operating revenue of the facility during the fixed period of time based on the contract. Therefore, it is necessary that the project is profitable to adopt the B.O.T.system.

In the case of the power station project in Turkey, there was an agreement that a fixed volume of electricity was purchased at a fixed price. (Of course, it is difficult to evaluate whether an agreement such as this ensures that the project cost will be covered.) However, in the case of this grain terminal project, it seems difficult to forecast how much cargo volume can be handled, or how much revenue can be obtained. The most important issue in this project is whether an investor can or cannot forecast enough cargo volume to cover the cost.

Therefore, when adopting the B.O.T. system, it would be advisable to make the investment environment as comfortable as possible and to make efforts to reduce the investment risk. (e.g., (1) The Government or the ANP guarantees a part of repayment of the project cost. (2) The Government or the ANP shares a part of the cost of infrastructure such as dredging.)

(5) Conclusion

Table 6-4-1-1 shows a summary of the above analysis.

Table 6-4-1-1 Evaluation of Implementation Bodies

	Case I	Case II	Case III
Public interest	○	△	○
Knowhow	△	○	○
Efficient operaton	△	○	○
Aggressive sales	△	○	○
Raising funds	○	○	○
Integrated use	○	○	△

Judging from the above analysis, Case II or Case III, in which the private sector is the main implementation body, is suitable.

However, the ANP should take following means to secure public interest.

1) The ANP reclaims the site and lends it (land) to the private sector (The ANP holds the ownership of the site).

In this scenario the ANP could participate in the project by investing the land itself.

2) The ANP controls planning and management of the terminal.

6-4-2 Organization

The organization of the grain terminal is shown in Table 6-4-2-1, which has *the following two divisions:*

Administration: 1) *General affairs about terminal operation, personnel affairs,* accounting, receipt of charge, etc.

2) *Obtainment of customers, contact/coordination with customers*

Operation: Berth assignment, loading/unloading of grain, storage in silo

Outline of operation division is as follows:

The Grain Superintendent directs which vessels are to be unloaded/loaded and is also responsible for grain stocks. He is assisted by two Shift Superintendents. They oversee the hour to hour operations including the loading and unloading systems, operational personnel, maintenance personnel.

Operators of equipment operate and maintain loading/unloading facilities and silo.

Programmer's duties are the minute by minute operations including the binning of grain being unloaded, the blending and weighing of grain for loading, etc..

Clerk's duties are to keep records of all inbound grain and outbound grain. The records must verify the weight, grade, and the destination of the grain.

An inspector monitors the sample being received for changes in quality, such as sourness or heated grain. In all phases of receiving grain, extreme care is taken to make sure that inferior grain is not mixed with higher quality grain.

Two tallymen are required. One is to confirm the quantity from/to vessels. The other is to confirm the quantity from/to silo.

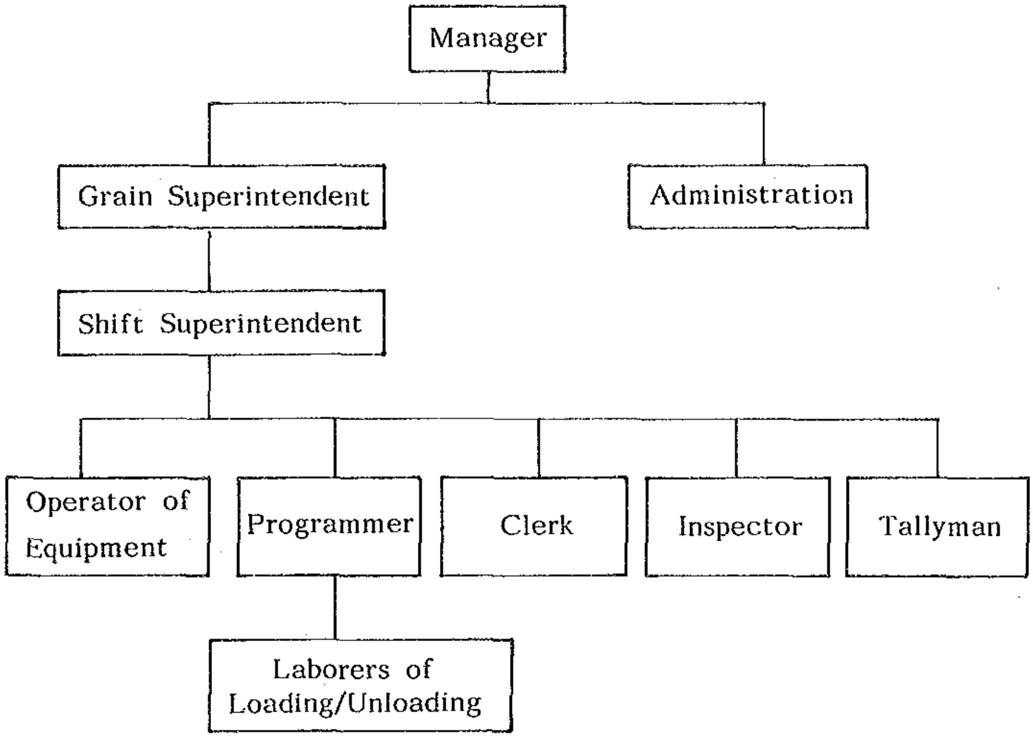


Figure 6-4-2-1 Organization Chart of the Grain Terminal

6-4-3 Operational Hours

(1) Operational division

Since cargo handling of grain in transshipment should be able to compete with other neighboring ports, the terminal should be operated 24 hours per day, seven days per week except holidays.

One shift should consist of 12 hours (2 shifts per day) taking into consideration that the cargo handling is mechanized and vessels are not always berthing.

(2) Administration and division

Eight hours per day, five days per week except holidays

6-4-4 Personnel Distribution

Required personnel for the grain terminal is shown in Table 5-4-4-1.

Table 6-4-4-1 Required Personnel for the Grain Terminal

Division	Number	Remark
Manager	1	
Administration Division	5	5 x 1shift
Operating Division		
Grain Superintendent	1	
Shift Superintendent	2	1 x 2shift
Operator of Equipment	12	6 x 2shift
Programmer	2	1 x 2shift
Clerk	2	1 x 2shift
Inspector	2	1 x 2shift
Tallyman	4	2 x 2shift
Laborers of Loading/Unloading	32	Loading: 6 x 2shift Unloading: 10 x 2shift
Total	63	

6-4-5 Berth Assignment

Efficient utilization of the facilities by planned berth assignment and silo use according to schedule is needed because there is only one loading berth and one unloading berth and limitations in the storage capacity of silos.

Therefore, a planned berth assignment, based on prompt grasping of users' requests of use of berth and silo, is strongly required.

6-5 Management and Operation Plan for the Foreign Fishing Terminal

(1) Basic character of the terminal

At present there are no priority berths for foreign fishing vessels except for Bit 137-141 Florida, and they use berths which are not occupied. But this situation is inconvenient; sometimes they have to move from berth to berth when cargo vessels berth, therefore, this terminal was planned as an exclusive terminal for foreign fishing vessels under 1000GRT class.

This terminal is basically used as a resting area for crew of foreign fishing vessels, supply of water or other necessary goods and repair of vessels. Transshipment of fishing products are expected to be handled in the foreport or other berths. Foreign fishing vessels over 1000GRT are expected to use existing berths.

(2) Implementation body of the terminal

Since this terminal was planned to alleviate the problem of berth shortage and inconvenience to foreign fishing vessels as mentioned above, basically same management and operation of existing berths should be followed. Therefore, the ANP should build and manage the terminal.

(3) Organization and personnel distribution

Though a new terminal is built, duties of the terminal are same as existing berths and foreign fishing vessels will not increase rapidly. Therefore, this terminal can be managed and operated by utilizing existing organization and personnel. New organization or personnel are not required.

7 ECONOMIC ANALYSIS

The purpose of the economic analysis is to appraise the economic feasibility of the Short-term Development Plan for the Montevideo port in the target year (1998) from the viewpoint of the national economy. The facilities to be constructed in the short-term development plan are a grain terminal and a foreign fishing vessel terminal.

Therefore, the purpose of this chapter is to investigate the economic benefits as well as the economic costs that will arise from this project and to evaluate whether the net benefits of the project exceed those that could be obtained from other investment opportunities ("The Opportunity Cost of Capital") in Uruguay.

7-1 Methodology of Economic Analysis

An economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the feasibility of this project. The flow chart of the economic analysis procedure is shown in Figure 7-1-1.

In estimating costs and benefits of the project, they should be fixed *quantitatively as much as possible. Then, "Economic Pricing" is applied after the* removal of "Transfer Items" such as tax, interest charges and subsidies. "Economic Pricing" here means the appraisal of cost and benefits in terms of international prices ("Border Prices").

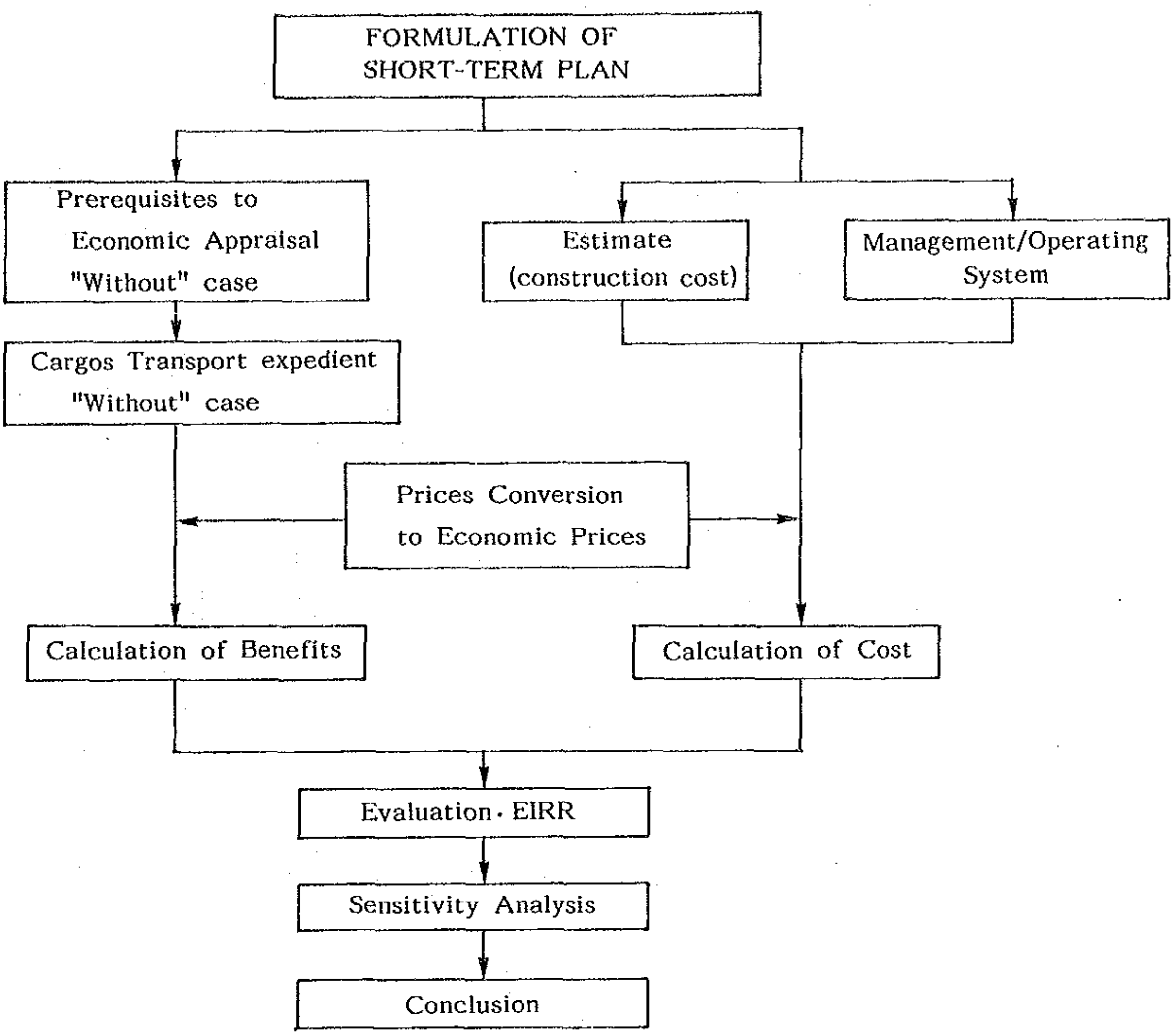


Figure 7-1-1 Flow Chart of the Economic Analysis Procedure

7-2 Prerequisites of the Economic Analysis

7-2-1 Base Year

The "Base Year" here means the starting year of the economic analysis. Taking into consideration the construction schedule in chapter 5 Construction of this part, 1994 is set as the "Base Year" for this Study.

7-2-2 Project Life

Taking into consideration the depreciation period of the main facilities mentioned in the chapter of Financial Analysis and construction period of four years, the period of calculation ("Project Life") in the economic analysis is assumed to be thirty years from the beginning of construction (i.e., from 1995 to 2024).

7-2-3 Foreign Exchange Rate

The exchange rate adopted for this analysis is US$1.00=N$2,667.00, that is, the same rate as used in the cost estimation.

7-2-4 "*Without*" Case

A cost-benefit analysis is conducted on the difference between the "With" case where investment is made and the "Without" case where no investment is made. In other words, incremental benefits and costs arising from the proposed investment are compared, and it is examined whether the benefits generated by the project exceed "the Opportunity Cost of Capital" in Uruguay.

Therefore, considering the "Without" case is one of the key elements of the economic analysis. In arguing the merit of the "Without" case, one must consider the true purpose of the project. Expressed in broad terms the true purpose is the "National development of Uruguay". Secondary aims include "Providing supplementary facilities of grain cargoes to the Alpha Zone" and "Providing improvement of service to foreign fishing vessels in the Montevideo port" and "Generation of foreign currency". Then, in this study, the following conditions are adopted as the "Without" case after various possibilities are discussed:

- Grain terminal is not constructed at the Montevideo port;

- A part of grain cargoes from Argentina is handled at the Alpha Zone and some facilities are increased for Alpha Zone;

- Foreign fishing vessels terminal is not constructed at the Montevideo port;
- Foreign fishing vessels visit Montevideo port the same as at present;

7-2-5 Cargo Volume Handled and Foreign Fishing Vessels Calling at the Montevideo Port

(1) "With" Case

The grain cargo volume handled and foreign fishing vessels calling at the Montevideo port in the target year under the "with" case were forecast in Chapter 1 of Part II.

The grain cargo volume is assumed to almost reach the handling capacity of crane and the number of foreign fishing vessels calling will not increase after 1998. Therefore, the grain cargo volume and foreign fishing vessels calling used for the economic analysis are assumed as follows:

	1998	After 1999
Grain cargo:	2,000,000tons	2,000,000tons
Foreign fishing vessels:	500 vessels	500 vessels

The volume exceeding the handling capacity is to be accommodated by the future development plan.

(2) "Without" Case

1) Grain Cargo

In the "With" case, grain cargo of 2,000,000 tons is to be handled at the port of Montevideo in 1998 (of which 201,000 tons are local grain cargoes, that is, import/export cargo, and 1,799,000 tons are transshipment grain cargoes). In the "Without" case, all local cargo forecast for 1998 must be handled at the port of Montevideo. However, transshipment grain cargo is not handled at the port of Montevideo.

These transshipment cargoes are assumed to be handled at Alpha Zone.

Table 7-2-5-1 shows the cargo volume handled at the Port of Montevideo after 1998 in both the "With" and "Without" case.

Table 7-2-5-1 Forecast Grain Cargo Volume in both the "With" and "Without" Case at the Port of Montevideo

	With	Without
Grain Cargo ('000) Local	After 1998 201	 Handled in Montevide
Transshipment	1,799	Handled in Alpha Zone

2) Foreign Fishing Vessels

In "With" case, 500 Foreign Fishing Vessels will call at the Port of Montevideo in 1998 (of which 374 vessels are under 1,000 GRT, and 126 vessels are over 1,000 GRT). In "Without" case, a foreign fishing vessels terminal is not constructed, therefore, foreign fishing vessels will be changing berths the same as at present, and services of ANP for foreign fishing vessels will make very slow progress. However, it is considered very unlikely that foreign fishing vessels entering the port of Montevideo at present would move to neighboring foreign ports rapidly given the deterioration of service, unless neighboring countries (Brazil and Argentina) change their policy for foreign fishing vessels. Therefore, in the "Without" case, number of foreign fishing vessels entering the port of Montevideo will maintain the status quo of 384.

Table 7-2-5-2 shows the number of foreign fishing vessels calling at the Port of Montevideo in 1998 in both the "With" and "Without" case.

Table 7-2-5-2 Number of Foreign Fishing Vessels calling in both the "With" and "Without" Case at the Port of Montevideo

	"With"	"Without"
Foreign Fishing Vessel	500	Same as Present (384)

7-3 Economic Prices

7-3-1 Methodology

The purpose of the economic analysis is to examine the value of a project, that is, to see if it represents an efficient allocation of resources in the national economy. The value of goods quoted at a market price do not always represent the true value of national resources actually consumed from the viewpoint of the national economy. The local currency portion of goods and materials at a market price often includes sales tax, subsidies, customs duties, etc. The labour cost at market prices is often influenced by a minimum wage system. Therefore, "Economic Pricing" should be conducted for the economic analysis.

There are several ways of conversion from market price to "Economic Price". In this study, the benefits and costs are divided into five items: traded goods, non-traded goods, skilled labour, unskilled labour and transfer items. Then, they are revised to "Border Prices" in an effort to determine a more rational valuation (L-M Method or OECD Method). In general, these "Border Prices" are intended to represent the international market value or the world prices. The market prices are changed to "Border Prices" by various conversion factors such as "Standard Conversion Factor", "Conversion Factor for Consumption" and so forth.

7-3-2 Exclusion of Transfer Items

Import duties, other taxes and subsidies are merely transfer items which do not actually reflect consumption of national resources. Therefore, these transfer items should be excluded in the calculation of the costs and benefits of the project for the economic analysis.

7-3-3 Method of Applying Conversion Factors

As mentioned above, all costs and benefits are generally divided into traded goods, non-traded goods, skilled labour, unskilled labour and transfer items.

Traded goods are expressed at CIF (cost, insurance & freight) for imports and FOB (free on board) for exports. As for non-traded goods, theoretically speaking, they should be classified and sorted by category and respective sub-categories into traded goods, non-traded goods, skilled labour, unskilled labour and transfer items, which are the items required for the production of non-traded goods. However, because of the absence of an I/O (input-output) table of inter-industrial relations in Uruguay, it is impossible to take these steps in this study. Hence, the local currency portion after deducting labour costs and transfer items is considered as non-traded goods, the economic price of which is calculated by multiplying the "Standard Conversion Factor" (SCF). The economic price of skilled labour is obtained by multiplying its market price by the "Conversion Factor for Skilled Labour" while that of unskilled labour is calculated by multiplying the market price by the "Conversion Factor for Unskilled Labour".

In this study, ANP provided the following conversion factors to the study team. ANP obtained these data from M.T.O.P.

(1) Standard Conversion Factor (SCF) is 0.703.

(2) Conversion Factor for Skilled Labour is 0.703.

(3) Conversion Factor for Unskilled Labour is 0.484.

7-4 Benefits

7-4-1 Benefit Items

Considering the "With" and "Without" situations mentioned earlier, the following items are identified as the benefits of the Short-term Development Plan for the Port of Montevideo:

Grain Terminal

a) Savings in river transportation cost including handling cost and additional construction cost of topoff vessels fleet at the Alpha Zone;
b) Savings in the staying cost (by shortening of cargo handling time) of vessels for Uruguayan grain cargoes;

Fishing Terminal

c) Savings in the changing cost of foreign fishing vessels at the Port of Montevideo;
d) Savings in the staying cost of foreign fishing vessels at the Port of Montevideo;
e) Increase in the output of port service industries (such as supplying gas oil, water and repairing vessels);

Common

f) Promotion of national development in Uruguay;

g) Increase in employment opportunities/incomes;

Of the above, items a), b), c), d) and e) are considered as benefits suitable for the cost-benefit analysis of this project. Other benefits are also considered qualitatively in this study.

7-4-2 Savings in River Transportation Cost Including Handling Cost

In the "Without" case, a grain terminal is not constructed at Port of Montevideo. All grain cargoes which would be handled at the port of Montevideo are handled at Alpha Zone. The total transportation cost of grain from up-river ports to the mouth of Laplata River is 14.05 US dollars when a panamax size ship is topped off with grain at Alpha Zone according to chapter of "Consideration of New Grain Transportation System". This cost consists of ship cost, port charge, channel charge and handling charge etc. On the other hand, when the new transportation system is introduced, in which grain is fully loaded to panamax size ship at the Port of Montevideo, the total transportation cost is calculated at 11.18 US dollars per ton under the condition that the value of FIRR is 8%. 8% is the minimum value necessary to ensure repayment of a loan in a 30 years project life. On this occasion, initial and maintenance dredging cost of channel and common basin are taken off because one terminal only (for example, the grain terminal) should not bear all these costs as all ships will use this channel. Cost difference of 2.87 dollars between "Without" and "With" case is a benefit. Handling volume is 1,799,000 tons, so total benefit is 5,163,000 US dollars.

7-4-3 Construction Cost of Top-off Vessel Fleet

In the "Without" case, grain terminal is not constructed at the port of Montevideo. Therefore, grain cargoes are handled at Alpha Zone. However, the handling capacity of transshipment facilities such as top off vessels at Alpha zone has reached its capacity limit of 1,700,000 tons. Therefore, it is necessary to increase the top-off vessel fleet in order to handle these excess cargoes.

Handling volume of top-off vessel fleet is half of the volume transshipped at the Alpha Zone, namely, 889,500 tons. Top-off vessel fleet works 10 months per year, and it sails one time per month with 27,500 tons of grain. Accordingly, these vessels have to carry 88,950 tons of grain per month. Required number of top-off vessels is calculated by the volume carried in one month divided by the volume of one sailing. Therefore, three top-off vessels (60,000 DWT) are required. 10 year old ships will be used for saving construction cost of topp-off vessels. Generally, the depreciation time of a vessel is 15 years. But this time, in 10 years time it will be replaced with another 10 year old ship. Cost for procurement of these vessels is one of the benefits.

These costs are as follows;

	Unit Costs	Total Benefit
Three Top-off Vessels	U$15,000,000-	U$45,000,000-

7-4-4 Savings in the Staying Cost of Vessels for Uruguayan Grain

In the "Without" case, grain terminal is not constructed at the port of Montevideo. Accordingly, ANP have to handle Uruguayan grain using existing handling equipment at existing berth. There is thus a difference in loading time between "With" and "Without" case. The loading time of "With" case is shorter than that of "Without" case. ANP saves loading time of grain by the construction of the grain terminal. This is one of the benefits. However, volume of import grain cargoes is not considered because these cargoes are assumed to be handled at existing wharves (12,000 tons) for which are small amount. Table 7-4-4-1 shows condition of "With" and "Without" case.

Table 7-4-4-1 Condition of "With" and "Without" case

	With	Without
Handling Efficiency	0.9	–
Working Time	20hour/day	12hour/day
Shiploader Capacity	1,800ton/hour	210ton/hour
Ship Size	55,000DWT	25,000DWT
Loading Capacity	32,400ton/day	2,520ton/day
Full Load (day)	1.7days	9.9days
Total days	5.84days	75days
Ship Cost	US$11,000	US$8,000
Total Cost	US$64,000	US$600,000

7-4-5 Savings in the Changing Cost of Berth for Foreign Fishing Vessels

In the "Without" case, foreign fishing vessels change berths same as the present. Number of berth changes is shown in Table 7-4-5-1.

Table 7-4-5-1 Number of Berth Changes of Foreign Fishing Vessels

Changing Time	Frequency Jan. to May	Number of Vessels	Changing Total	Frequency Jun. to Dec	Number of Vessels	Changing Total
0	86.4%	144		49.5%	107	
1	12.5%	21	21	25.2%	55	55
2	1.1%	2	4	11.7%	25	51
3				5.8%	13	38
4				2.9%	6	25
5				2.9%	6	31
6				1.9%	4	25
Total	100.0%	167	25	99.9%	217	225

Total Number of Changes = 249

Number of berth changes made by Foreign fishing vessels is 249 in all. It takes two hours on average to change berths according to interviews with shipping agents and captains of fishing vessels. Cost of changing berths includes tugboat charge (U$ 250/hour) and pilot charge (U$ 150/person); in addition, a foreign fishing boat has to pay 50% extra for the tugboat charge when she does not use her own engine. Therefore, cost of changing berths once is U$ 900 (U$250X2hourX1.5+U$150). And, cost of changing for 249 times is U$ 222,300 (249timesXU$900). This cost becomes U$ 156,000 when converted to economic price.

In the "With" case, foreign fishing vessels do not change berths as a foreign fishing vessel's terminal will be constructed, so this is one of the benefits.

This benefit returns to foreign countries because these fishing vessels are, of course, foreign. However, it is said that various economic activities are based on the principle of competition in a free market economy, so the port authority (ANP) will be able to share in this benefit with the main beneficiary (foreign fishing vessels company) by raising the port charge since the level of service will improve with increased investment. Therefore, it is assumed that 50% of this benefit will return to Uruguay.

The amount of this benefit is U$79,000.

7-4-6 Savings in the Staying Cost of Foreign Fishing Vessels

In "Without" case, foreign fishing vessels must stay beyond their designated departure time as a result of changing berths. It takes two hours for changing berths, and foreign fishing vessels need 30 minutes' preparation time before and after moving, so they waste three hours in total. Total staying times resulting from berth changing is 747 hours because there are 249 occasions of berth changing.

Fishing vessels ranging from 301 to 400 GRT represent the majority of vessels entering the port of Montevideo in 1991, therefore, 350 GRT is assumed as the average size of fishing vessel for calculation of ship cost. Fishing vessel cost of 350 GRT, *according to interviews with a Japanese fishing company* and operators of fishing vessels mooring at the port of Montevideo, is U$ 4,500 a day. It is considered that 741 hours is equivalent to 93 days, under the condition that working hours of fishing vessels mooring in the port are eight hours. Therefore, cost of increase in mooring days is U$ 419,000. This benefit also returns to foreign countries, the same as savings in the berth changing cost. The benefit which returns to Uruguay is U$ 210,000.

7-4-7 Increase in the Production of Port Service Industries

384 foreign fishing vessels will call, as at present, on the port of Montevideo if the foreign fishing terminal is not constructed in the "Without" case. In the "With" case, 500 foreign fishing vessels call on port of Montevideo. Difference between "With" and "Without" case is 116 vessels. These excess foreign fishing vessels will also require fuel oil, water, daily necessities and maintenance repairing. The revenue generated from these activities is one of the benefits.

The type and number of excess foreign fishing vessels enterring the port in the "With" case is shown in the following table based on the data in 1991.

Type of Ship	Crews	Number of ship	Entering Time a year
Tuna	23	9	2
Squid	28	21	1
Trawler(Asian)	43	29	2
Trawler(European)	43	57	2

(1) Supply of gas oil

CIF cost of gas oil is U$ 211 per kiloliter, and fishing vessels purchasing cost of oil is U$ 246 per kiloliter.

Difference in the two costs is one of the benefits for Uruguay. This benefit, after deducting tax and converting to economic price, is U$ 19. Gas oil volume purchased by other types of fishing vessels is shown in the following table. Squid fishing vessels do not require gas oil at the port of Montevideo.

Type of Ship	Average volume per 1 Time	Number of Ship	Economic Price	Benefit
Tuna	250 kl	9	U$19-	U$42,750-
Trawler	300 kl	86	U$19-	U$490,200-
Total		95		U$532,950-

Benefit of supplying gas oil is U$532,950.

(2) Supply of water

ANP buys water from OSE at U$0.8 per ton. ANP supples water to fishing vessels at U$1.5 per ton. In this case, difference cost is not benefit. Difference cost is overhead of ANP. Therefore, US$0.8 is benefit which increase by supply water. After conversion to economic price, a profit of U$0.44 is generated. Benefit of water supplying is shown in the following table.

Type of Ship	Average Volume per 1 Time	Number of Ship	Economic Price	Benefit
Tuna	80 tons	9	U$0.44-	U$317-
Squid	98 tons	21	U$0.44-	U$906-
Trawler	150 tons	86	U$0.44-	U$5,676-
Total				U$6,899-

(3) Supply of daily necessities

Generally, a crew requires US$ 5 per day for daily necessities. Economic price is US$2.7, calculated in the same method as above. Foreign fishing vessels call two time per year at the port of Montevideo except squid fishing vessels, accordingly they require six months worth of daily necessities. Squid fishing vessels also take six months of daily necessities because squid fishing vessels call at port twice, once at Montevideo and once in their own country. Cost of one time supplying is U$486 per person. These benefits are shown in the following table.

Type of Ship	crew	Cost of supply Per Person	Benefit
Tuna	23	U$486-	U$11,178-
Squid	28	U$486-	U$13,608-
Trawler	43	U$486-	U$20,898-
Total			U$45,684-

(4) Ship repair

Foreign fishing vessels require small repairs each time they enter the port; the average cost is U$ 3,500. This cost consists of personnel expenses (56%), material and machinery (24%) and profit for the repairing company (20%). Machinery cost is very small because small repair means mainly painting and possibly a little welding and cutting. For the purpose of calculation, machinery cost is included as part of material cost. And material cost does not include tax. Economic price is calculated at U$1,664 based on above mentioned conversion.

Generally, during a periodical inspection, fishing vessel must go to the dock yard, and such is the case at Montevideo. Currently, foreign fishing vessels receive periodical inspection on the dock in the port of Montevideo which happens to have some dock yards. This situation will remain unchanged even if the foreign fishing vessels terminal is not constructed. Therefore, these costs are not considered.

Repairing times are assumed as follows; 57 trawlers are European ship and 29 are Asian. European flag ships require periodical inspection every two years. European flag ships call at the port of Montevideo twice per year, and they require repair work (of a simple nature) three times every two years. Accordingly, 28.5 ships take repair 1.5 times per year. Total repair time of European flag ship is 42.75 times per year.

38 Asian flag trawlers and tuna fishing call on the port of Montevideo. These vessels call on the port of Montevideo two times per year each. Therefore, 19 fishing vessels call on the port two times per year. These fishing vessels require one periodical inspection per year. Therefore, they are serviced with small repairs 19 times. 21 Korean flag ships call once per year, so repairing times are 21. They undergo periodical inspection in their own country.

Total repairing times is 82.75. Benefit is U$ 138,000.

Total benefit of port service industries is U$ 723,000.

7-4-8 Other Benefit

As mentioned in 7-4-1, there are other important benefits arising from this project even though they are not calculated as benefits in the cost-benefit analysis in this chapter.

(1) Promotion of national development in Uruguay

The effect of the grain terminal will have a positive effected on the river transportation system, while the foreign fishing vessels terminal will help stimulate port related industries and tertiary industry for shift of fishing vessel's crew; therefore, the efficiency of the new terminal will have a strong impact on the outcome of these projects. Without the new terminal, it would be difficult to carry out the promotion of national development and the diversification of Uruguayan industry, the key objectives.

(2) Increase in employment opportunities/incomes

The construction of new facilities at the port of Montevideo will increase employment opportunities for both construction and port workers.

According to our cost estimates, total compensation paid to local employees during construction at market prices will be US$ 15,153,000 for the Grain Terminal and US$ 363,000 for the Foreign Fishing Terminal.

According to chapter 8 of this part, the grain terminal section will employ over 50 people and annual personnel costs at market prices will be US$807,000. Foreign Fishing Vessels Terminal will be US$ 46,500.

This boost to the region's employment level can be considered as one of the benefits of the project.

7-5 Costs

The cost items of the project are: construction costs, personnel costs, maintenance and repair costs, operation costs and replacement investment costs. "Residual Value" is also considered as a cost in the final year of the project.

7-5-1 Construction Cost

In the economic analysis, construction cost has to be divided into the foreign currency portion and the local currency; local currency portion can be further divided into skilled labour, unskilled labour, and others. Since the foreign currency portion is shown in CIF prices, there is no need for conversion into economic prices. The labour costs should be converted into economic prices by using the respective conversion factors. The economic prices of construction costs are shown in Table 7-5-1-1 for the Grain Terminal and Table 7-5-1-2 for the Foreign Fishing Vessels Terminal.

7-5-2 Personnel Costs

The personnel costs for the new facilities at the Port of Montevideo are shown in the next chapter. The costs are converted into economic prices by multiplying the corresponding conversion factor. Total personnel costs at economic prices are calculated as followed;

Grain Terminal	US$ 476,000	per annum
Fishing Terminal	US$ 27,000	per annum

Table 7-5-1-1 Economic Price of Construction Cost of Grain Terminal

Item	Market Price (US$ '000)	Foreign Currency	Local Currency (US$ '000)				Overall Conversion Factor	Economic Price (US$ '000)	1994	1995	1996	1997
			Non-tradable Goods	Skilled Labour	Unskilled Labour	Transfer Item						
		1.00	0.7025	0.7025	0.4840	0.00						
Civil Work												
Dredging												
Transfer Station	1,738	0.00%	91.25%	1.87%	2.08%	4.80%	66.42%	1,154	577		346	231
Foreport	1,053	0.00%	91.25%	1.87%	2.08%	4.80%	66.42%	699			280	420
Approach Chanel,Clay	2,907	0.00%	91.25%	1.87%	2.08%	4.80%	66.42%	1,931				1,931
Approach Chanel,Mud	13,161	0.00%	91.25%	1.87%	2.08%	4.80%	66.42%	8,742				8,742
Reclamation												
Silo Area	2,239	75.49%	20.11%	2.30%	1.04%	1.06%	91.74%	2,054		616	1,438	
Access Road Area	2,006	75.53%	20.08%	2.30%	1.04%	1.06%	91.75%	1,840		1,840		
Armor Stone	1,741	0.00%	92.42%	1.43%	1.29%	4.86%	66.55%	1,158			1,158	
Mooring Facilities												
Bresting Dolphin	3,328	49.43%	44.58%	2.18%	1.46%	2.35%	82.99%	2,762	2,486	276		
Mooring Dolphin A	924	7.25%	81.77%	4.00%	2.68%	4.30%	68.80%	636	636			
Unloading Pier	4,730	70.91%	25.64%	1.25%	0.84%	1.35%	90.21%	4,267	2,987	1,280		
Approach Jetty	323	34.40%	57.84%	2.83%	1.90%	3.04%	77.93%	251		251		
Mooring Dolphin B	832	49.40%	44.61%	2.18%	1.46%	2.35%	82.98%	690		690		
Pavement												
Silo Area	186	0.00%	93.88%	0.76%	0.42%	4.94%	66.69%	124				124
Access Road Area	138	0.00%	93.88%	0.76%	0.42%	4.94%	66.69%	92				92
Sub Total	35,305							26,401				
Mechanical Work												
Load/Unloading Equip.	20,194	86.43%	5.76%	4.37%	3.13%	0.31%	95.06%	19,197			15,357	3,839
Silo	25,584	40.78%	10.26%	31.59%	16.83%	0.53%	78.33%	20,041			8,016	12,024
Sub Toal	45,778							39,237				
Engineering Services	3,974	11.05%	0.00%	88.95%	0.00%	0.00%	73.54%	2,922	292	205	1,169	1,257
Physical Contingency	2,272	31.65%	60.26%	2.95%	1.98%	3.17%	77.01%	1,750	595	332	157	665
Total	87,329							70,311	7,572	5,492	27,922	29,324

Table 7-5-1-2 Economic Price of Construction Cost of Foreign Fishing Vessels Terminal

Item	Market Price (US$ '000)	Foreign Currency 1.00	Local Currency (US$ '000) Non-tradable Goods 0.7025	Skilled Labour 0.7025	Unskilled Labour 0.4840	Transfer Item 0.00	Overall Conversion Factor	Economic Price (US$ '000)	1994	1995	1996	1997
Mooring Facilities	5,589	38.31%	54.39%	2.66%	1.78%	2.86%	79.25%	4,429			2,436	1,993
Sub Total	5,589											
Engineering Services	279	38.35%	0.00%	61.65%	0.00%	0.00%	81.66%	228			125	103
Physical Contingency	559	38.28%	54.41%	2.66%	1.78%	2.86%	79.24%	443			244	199
Total	6,427							5,100			2,805	2,295

7-5-3 Maintenance and Repair Costs

Maintenance costs are also shown in the next chapter. The costs are assumed to be 1% of the construction cost for mooring facilities and 2% for handling facilities at economic prices.

Annual maintenance and repair costs at economic prices are US$ 2,420,000 for the Grain Terminal and US$ 79,000 for the Fishing Terminal.

7-5-4 Operation Costs

In the next chapter, the operation costs are estimated to be 50% of total personnel costs and electricity bill.

Annual operation costs at economic prices are US$ 422,000 for the Grain Terminal and US$ 8,000 for the Foreign Fishing Vessels Terminal.

7-5-5 Replacement Investment Costs

The next chapter presents the replacement investment schedule. Economic prices of these costs are calculated by multiplying the respective overall conversion factors.

7-5-6 Residual Values

Residual values are minus costs in the final year of this project. Economic prices of these costs are calculated by multiplying the respective overall conversion factors.

7-6 Evaluation

Table 7-6-1 shows the calculated results of the cost-benefit analysis of Grain Terminal project.

Table 7-6-2 shows the calculated results of the cost-benefit analysis of Foreign Fishing Vessels Terminal project.

Table 7-6-1 Cost-Benefit Analysis of Grain Terminal

Year	Cost ('000 US$)					Benefit ('000 US$)				Benefit – Cost	Net Present Value (NPV)		
	Construc–tion	Managemen & Operation	Replacemen Investment	Residual Value	Total	Staying Cost	Handling Charge	Construct–ion Cost	Total		Benefit	Cost	Benefit – Cost
1994	7,572				7,572				0	(7,572)	0	7,572	(7,572)
1995	5,492				5,492				0	(5,492)	0	4,934	(4,934)
1996	27,922				27,922				0	(27,922)	0	22,541	(22,541)
1997	29,324				29,324				0	(29,324)	0	21,270	(21,270)
1998		3,278			3,278	536	5,163	45,000	50,699	47,421	33,040	2,136	30,904
1999		3,278			3,278	536	5,163		5,699	2,421	3,337	1,919	1,418
2000		3,278			3,278	536	5,163		5,699	2,421	2,998	1,724	1,274
2001		3,278			3,278	536	5,163		5,699	2,421	2,694	1,549	1,145
2002		3,278			3,278	536	5,163		5,699	2,421	2,420	1,392	1,028
2003		3,278			3,278	536	5,163		5,699	2,421	2,175	1,251	924
2004		3,278			3,278	536	5,163		5,699	2,421	1,954	1,124	830
2005		3,278			3,278	536	5,163		5,699	2,421	1,755	1,010	746
2006		3,278			3,278	536	5,163		5,699	2,421	1,577	907	670
2007		3,278			3,278	536	5,163		5,699	2,421	1,417	815	602
2008		3,278			3,278	536	5,163	45,000	50,699	47,421	11,327	732	10,595
2009		3,278			3,278	536	5,163		5,699	2,421	1,144	658	486
2010		3,278			3,278	536	5,163		5,699	2,421	1,028	591	437
2011		3,278			3,278	536	5,163		5,699	2,421	924	531	392
2012		3,278			3,278	536	5,163		5,699	2,421	830	477	353
2013		3,278			3,278	536	5,163		5,699	2,421	746	429	317
2014		3,278			3,278	536	5,163		5,699	2,421	670	385	285
2015		3,278			3,278	536	5,163		5,699	2,421	602	346	256
2016		3,278			3,278	536	5,163		5,699	2,421	541	311	230
2017		3,278	19,197		22,474	536	5,163		5,699	(16,775)	486	1,916	(1,430)
2018		3,278			3,278	536	5,163	45,000	50,699	47,421	3,883	251	3,632
2019		3,278			3,278	536	5,163		5,699	2,421	392	226	167
2020		3,278			3,278	536	5,163		5,699	2,421	352	203	150
2021		3,278			3,278	536	5,163		5,699	2,421	317	182	135
2022		3,278			3,278	536	5,163		5,699	2,421	284	164	121
2023		3,278		(30,134)	(26,856)	536	5,163	(18,000)	(12,301)	14,555	(552)	(1,205)	653
Total	70,311	85,218	19,197	(30,134)	144,591	13,932	134,241	117,000	265,173	120,582	76,341	76,341	(0)

( ): Minus indication

EIRR = 11.3 %

Table 7-6-2 Cost-Benefit Analysis of Foreign Fishing Vessels Terminal

Year	Cost ('000 US$)					Benefit ('000 US$)				Benefit – Cost	Net Present Value (NPV)		
	Construc–tion	Managemen & Operation	Replacemen Investment	Residual Value	Total	Staying Cost	Changing Cost	Increasing Production	Total		Benefit	Cost	Benefit – Cost
1996	2,805				2,805				0	(2,805)	0	2,805	(2,805)
1997	2,295				2,295				0	(2,295)	0	1,979	(1,979)
1998		114			114	210	79	723	1,012	898	753	85	668
1999		114			114	210	79	723	1,012	898	649	73	576
2000		114			114	210	79	723	1,012	898	560	63	497
2001		114			114	210	79	723	1,012	898	483	54	429
2002		114			114	210	79	723	1,012	898	417	47	370
2003		114			114	210	79	723	1,012	898	359	40	319
2004		114			114	210	79	723	1,012	898	310	35	275
2005		114			114	210	79	723	1,012	898	267	30	237
2006		114			114	210	79	723	1,012	898	230	26	204
2007		114			114	210	79	723	1,012	898	199	22	176
2008		114			114	210	79	723	1,012	898	171	19	152
2009		114			114	210	79	723	1,012	898	148	17	131
2010		114			114	210	79	723	1,012	898	128	14	113
2011		114			114	210	79	723	1,012	898	110	12	98
2012		114			114	210	79	723	1,012	898	95	11	84
2013		114			114	210	79	723	1,012	898	82	9	73
2014		114			114	210	79	723	1,012	898	71	8	63
2015		114			114	210	79	723	1,012	898	61	7	54
2016		114			114	210	79	723	1,012	898	52	6	47
2017		114			114	210	79	723	1,012	898	45	5	40
2018		114			114	210	79	723	1,012	898	39	4	35
2019		114			114	210	79	723	1,012	898	34	4	30
2020		114			114	210	79	723	1,012	898	29	3	26
2021		114			114	210	79	723	1,012	898	25	3	22
2022		114			114	210	79	723	1,012	898	22	2	19
2023		114			114	210	79	723	1,012	898	19	2	17
2024		114			114	210	79	723	1,012	898	16	2	14
2025		114		(340)	(226)	210	79	723	1,012	1,238	14	(3)	17
Total	5,100	3,195	0	(340)	7,954	5,886	2,205	20,250	28,342	20,387	5,387	5,387	(0)

( ): Minus indication

EIRR = 15.9 %

7-6-1 Calculation of EIRR

The economic internal rate of return (EIRR) based upon a cost-benefit analysis is used to be appraise the economic feasibility of the project.

The EIRR is a discount ratio that makes the costs and benefits of a project during the project life equal. It is calculated using the following formula:

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

where, n: Period of cost-benefit analysis
Bi: Benefit in i-th year
Ci: Cost in i-th year
r: Discount Rate (EIRR)

The EIRR of the Short-term Development Plan of the Port of Montevideo is calculated as follows;

Grain Terminal	11.3%;
Foreign Fishing Vessels Terminal	15.9%;

7-6-2 Conclusion

There are various views concerning the appropriate EIRR level used to determine whether a project is feasible. The leading view is that the project is feasible if the EIRR exceeds the "Opportunity Cost of Capital" (OCC).

The OCC in Uruguay is not known. The value of the OCC adopted by International Bank for Reconstruction and Development (IBRD) is 12%, for the United States Agency for International Development (USAID), 8%, and for the Asian Development Bank (ADB), 10%. Meanwhile, the rate varies from 8% to 12%, according to the degree of development in each country. It is generally considered that an EIRR of more than 10% is economically feasible for infrastructure or social service projects.

(1) Grain Terminal

From above mentioned premise, *the calculated EIRR of 11.3% of this* project is considered feasible. However, sensitivity analysis results are around 9%, especially in the case where costs increase by 10% and the benefits decrease by 10%; the EIRR is then 7%. This reveals the precarious nature of the project.

(2) Foreign Fishing Vessels Terminal

From above mentioned premise, this project with the calculated EIRR of 15.9% is considered feasible.

7-6-3 Sensitivity analysis

To see if the project is still feasible when some factors vary, alternate cases are examined as follows.

Case A:The costs increase by 10%.
Case B:The benefits Decrease by 10%.
Case C:The costs increase by 10% and the benefits decrease by 10%

The results of the sensitivity tests are shown in Table 7-6-3-1.

Table 7-6-3-1 Sensitivity Analysis for EIRR

Case	Grain Terminal EIRR (%)	Foreign Fishing Terminal EIRR (%)
Base Case	11.3	15.9
Case A	9.2	14.3
Case B	9.0	14.2
Case C	7.0	12.7

8 FINANCIAL ANALYSIS

8-1 Purpose of the Financial Analysis

The purpose of the financial analysis is to appraise the financial feasibility of the short-term development plan. The analysis focuses on the viability of the grain terminal and the foreign fishing terminal proposed in the short-term plan.

8-2 *Methodology of the Financial Analysis*

The viability of the project is analyzed using the Discount Cash Flow Method and appraised by the FIRR (financial internal rate of return). The FIRR is a discount rate that makes the costs and the revenues during the project life equal, and it is calculated using the following formula;

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

n : project life
Bi: revenues in the i-th year
Ci: costs in the i-th year
r : discount rate

Costs and benefits which are taken into account for the calculation of the FIRR are summarized as follows:

Cost	Benefit
1) Total investment cost including initial capital and reinvestment for renewal	1) Port operating revenue
2) Operating cash expenses	2) Residual value of the fixed assets at the end of the project life

Costs and benefits exempt from calculation of the FIRR are summarized as follows:

Cost	Benefit
1) Depreciation cost	1) Fund management income
2) Repayment of the principal loan	
3) Interest on loans	

When the calculated FIRR exceeds the interest rate of the funds for the investments of the project, the project is regarded as financially feasible.

An FIRR is conducted for both the grain terminal and the foreign fishing terminal.

Furthermore, the financial soundness of the implementation body of the grain terminal, which is the main project of the short-term plan, is appraised based on its projected financial statements (Income and Expenditure Account, Cash Flow Statement and Balance Sheet). The appraisal is made from the viewpoints of profitability, loan repayment capacity and operational efficiency, using the following ratios:

(1) Profitability

Rate of Return on Net Fixed Assets:

$$\frac{\text{Net Operating Income}}{\text{Total Fixed Assets}} \times 100(\%)$$

This indicator shows the profitability of the investments, which are presented as net total fixed assets. It is preferable to keep the rate above the average interest rate of the funds for the investments.

(2) Loan Repayment Capacity

Debt Service Coverage Ratio:

$$\frac{\text{Net Operating Income + Depreciation Cost}}{\text{Repayment and Interest of Long-term Loans}}$$

This indicator shows whether the operating income can cover the repayment and interest of long-term loans. It must be more than 1 and it is preferable that it be over 1.75.

(3) Operational Efficiency

Operating Ratio:

$$\frac{\text{Operating Expenditure}}{\text{Operating Revenue}} \times 100(\%)$$

Working Ratio:

$$\frac{\text{Operating Expenditure - Depreciation Cost}}{\text{Operating Revenue}} \times 100(\%)$$

The operating ratio shows the operational efficiency of the organization as an enterprise, and the working ratio shows the efficiency of the routine operations of the port.

When the calculated operating ratios are less than 70-75%, and the working ratios are less than 50-60%, the operations are efficient.

8-3 General Prerequisites of the Financial Analysis

8-3-1 Common General Prerequisites of the Grain and the Fishing Terminal

(1) Project life

Taking account of the conditions of the long-term loans and the service lives of the port facilities, the project life for the financial analysis is determined to be 30 years, including 4 years for the construction of the facilities.

(2) Base year

For the estimation, costs, expenditures and revenues analyzed quantitatively here, 1992 prices are predominantly used. Neither price inflation nor increases in nominal wages are considered during the project life.

(3) Reinvestment

The facilities and equipment will be renewed based on their service lives which are shown as follows;

1) mooring facilities, dredging and pavement: 50 years
2) silo: 30 years
3) grain handling facilities: 20 years

The funds for reinvestment will be financed by internal resources of the implementation body.

(4) Value added tax

Value added tax (IVA) is included in expenditure.

(5) Fund raising plan

The project costs are assumed to be raised by loans as follows:

Loan period: 20 years
Grace period: 5 years
Interest rate: 8%

8-3-2 General Prerequisites of the Grain Terminal

(1) Cargo handling volume

The cargo handling volume is estimated based on the demand forecast of the lower limit as follows.

Transit cargo volume	1,799,000t/year
Export cargo volume	201,000t/year
Total	2,000,000t/year

(2) Revenues and tariff rates

1) Revenues

The following charges are the sources of revenue generated from the operation of the terminal.

- Use of port charge
- Wharfage charge
- Cargo handling/Storage charge

2) Tariff rates

Use of port charge, wharfage charge: present rates of the ANP
Cargo handling/Storage charge: $7.5/t (This is a rate less than that of Alpha Zone in the total cost.)

The revenue/year during the project life (except construction period) is shown in Table 8-3-2-1.

Table 8-3-2-1 Revenue/year during the Project Life

(Unit $)

Kinds of Charge	Revenue/y	Remarks
Use of Port Charge	42,816	
Panamax Vessel	28,416	$1.20 x 32000GT/100GT x 37vessels x 2days
Shattle Vessel	14,400	$1.20 x 10000GT/100GT x 120vessels x 1day
Wharfage Charge	34,420	
Panamax Vessel	17,020	$1 x 230m x 37vessels x 2days
Shattle Vessel	17,400	$1 x 145m x 120vessels x 1day
Handling/Storage Charge	15,000,000	$7.5 x 2,000,000t
Total	15,077,236	

(3) Costs of initial investments

The initial investments of the grain terminal are estimated in chapter 5-4. These are summarized in Table 8-3-2-2.

Table 8-3-2-2 Investment Costs of Grain Terminal

(Unit 1000US$)

	1994	1995	1996	1997	Total
Dredging	869		942	17,048	18,859
Reclamation		2,677	1,567		4,244
Slope Protection			1,741		1,741
Mooring Facilities	7,230	2,907			10,137
Pavement				324	324
Loading/Unloading Equipment			16,155	4,039	20,194
Silo			10,234	15,350	25,584
Sub-Total	8,099	5,584	30,639	36,761	81,083
Engineerig Services	405	279	1,574	1,716	3,974
Physical Contingency	767	424	213	869	2,273
Tax	1,501	1,332	2,319	2,336	7,488
Grand Total	10,772	7,619	34,745	41,682	94,818

(4) Maintenance, repair costs

The annual maintenance and repair costs for the grain terminal are calculated as follows;

1) mooring facilities, pavement and silo: 1% of the original construction cost
2) grain handling facilities: 2% of the original construction cost
3) dredging: $2,856,000 (See chapter 5-4)

(5) Personnel and other administration costs

The annual personnel costs are estimated based on the required number of workers proposed in chapter 6-4-2 and existing pay scales.

The total administration costs (which consist of maintenance, repair costs, personnel costs, electricity bill and other administration costs) are shown in Table 8-3-2-3.

Table 8-3-2-3 Administration Costs of the Grain Terminal

(Unit $)

Kinds of Costs	Amount	Remarks
Maintenance, Repair Costs	3,725,400	
Mooring Facilities, etc.	433,500	Original Construction Cost x 1%
Handling Facilities	435,900	Original Construction Cost x 2%
Dredging	2,856,000	
Personnel Costs	807,240	
Manager	55,800	1person x $3000/m x 12 x 1.55
Superintendent	33,480	1person x $1800/m x 12 x 1.55
Shift Superintendent	44,640	2persons x $1200/m x 12 x 1.55
Operator	167,400	12persons x $750/m x 12 x 1.55
Programmer	29,760	2persons x $800/m x 12 x 1.55
Clerk	27,900	2persons x $750/m x 12 x 1.55
Inspector	29,760	2persons x $800/m x 12 x 1.55
Tallyman	55,800	4persons x $750/m x 12 x 1.55
Laborer	297,600	32persons x $500/m x 12 x 1.55
Administration Clerk	65,100	5persons x $700/m x 12 x 1.55
Electricity Bill	366,000	$0.061/KW x 6,000,000KW
Other Administration Costs	403,620	Personnel Costs x 50%
Total	5,302,260	

(6) Depreciation costs

The annual depreciation costs of the port facilities and equipment are calculated by the straight line method based on their service lives.

(7) Fund management

The amount of cash on hand is assumed to be in banks with a 5% interest rate per annum.

8-3-3 General Prerequisites of the Foreign Fishing Terminal

(1) Number of Vessels

The number of vessels which use the terminal is 374 proposed in chapter 3-3-1, as shown in Table 8-3-3-1.

Table 8-3-3-1 Number of Vessels which Use the Fishing Terminal

Size (GRT)	Number of Vessels
100～300	33
301～400	147
401～500	78
501～1000	116
Total	374

(2) Revenues and tariff rates

1) Revenues

The following charges are the sources of revenue generated from the operation of the terminal.

- Use of port charge
- Wharfage charge
- Transshipment charge
- Water supply charge

2) Tariff rates

The revenues are calculated based on the present tariff rates of the ANP. However, regarding wharfage charge, tariff increase cases are also examined.

The revenue/year during the project life (except construction period) based on the present tariff rates is shown in Table 8-3-3-2.

Table 8-3-3-2 Revenue from the Foreign Fishing Terminal

1 Use of Port Charge

Category	Size (GRT)	Number of Vessels	Average GRT	Staying Period(day)	Tariff Rate	Revenue/ Year(US$)
1st Category Vessels (Stern Mooring)	100～300	2	200	2	$0.63/100GRT	5
	301～400	12	350	2	$0.63/100GRT	53
	401～500	6	450	2	$0.63/100GRT	34
	501～1000	8	750	2	$0.9/100GRT	108
	Total	28				200
2nd Category Vessels (Stern Mooring)	100～300	31	200	4	$0.9/100GRT	223
	301～400	135	350	4	$0.9/100GRT	1,701
	401～500	72	450	4	$0.9/100GRT	1,166
	501～1000	108	750	4	$0.9/100GRT	2,916
	Total	346				6,007
Alongside Mooring	100～1000	60	400	2	$0.9/100GRT	432
Grand Total						6,639

(Note) The tariff rate for vessels under 500GRT in the 1st category is assumed $0.63 taking into consideration the substitutive tariff (30% discount).

2 Wharfage Revenue

Category	Size (GRT)	Number of Vessels	Average Length (m)	Staying Period(day)	Tariff Rate	Revenue/ Year(US$)
1st Category Vessels (Stern Mooring)	100～300	2	40	180	$0.7/m x 50%	5,040
	301～400	12	50	180	$0.7/m x 50%	37,800
	401～500	6	55	180	$0.7/m x 50%	20,790
	501～1000	8	70	180	$1/m x 50%	50,400
	Total	28				114,030
2nd Category Vessels (Stern Mooring)	100～300	31	40	6	$1/m x 50%	3,720
	301～400	135	50	6	$1/m x 50%	20,250
	401～500	72	55	6	$1/m x 50%	11,880
	501～1000	108	70	6	$1/m x 50%	22,680
	Total	346				58,530
Alongside Mooring	100～1000	60	50	3	$1/m	9,000
Grand Total						181,560

(Note) The tariff rate for vessels under 500GRT in the 1st category is assumed $0.7 taking into consideration the substitutive tariff (30% discount).

3 Revenue from Transshipment

	Number of Vessels	Volume/ Vessel(t)	Tariff Rate	Revenue/ Year(US$)
In Water Area	138	270	$2.3/t	85,698
At Berth	48	232	$2.0/t	22,272
Total	186			107,970

4 Revenue from Fresh Water Supply

Type of Vessel	Number of Vessels	Volume/ Vessel(t)	Tariff Rate	Revenue/ Year(US$)
Tuna	30	80	$0.7/t	1,680
Squid	67	98	$0.7/t	4,596
Trawl	277	150	$0.7/t	29,085
Total	374			35,361

Note: Tariff Rate = 1.5/t - Purchase Cost 0.8/t =0.7/t

5 Grand Total $331,530

(3) Costs of initial investments

The initial investments of the foreign fishing terminal are estimated in chapter 5-4. These are summarized in Table 8-3-3-3.

Table 8-3-3-3 Investment Costs of the Fishing Terminal

(Unit 1000US$)

	1996	1997	Total
Mooring Facilities	3,074	2,515	5,589
Engineerig Services	153	126	279
Physical Contingency	308	251	559
Tax	625	512	1,137
Grand Total	4,160	3,404	7,564

(4) Maintenance, repair costs

The annual maintenance and repair costs for the foreign fishing terminal are calculated as follows;

1) mooring facilities: 0.5% of the original construction cost
2) dredging: $97,700 (See chapter 5-4.)

(5) Personnel and other administration costs

Five existing employees of the ANP are assumed to be engaged in the terminal. The annual personnel costs are estimated based on this required number and existing pay scales.

The total administration costs (which consist of maintenance, repair costs, personnel costs and other administration costs) are shown in Table 8-3-3-4.

Table 8-3-3-4 Administration Costs of the Fishing Terminal

(Unit $)

Kinds of Costs	Amount	Remarks
Maintenance, repair costs	135,500	
Mooring Facilities	37,800	0.5% of the original construction cost
Dredging	97,700	
Personnel Costs	46,500	5persons x $500/m x 12 x 1.55
Other Administration Costs	13,950	Personnel Costs x 30%
Total	195,950	

8-4 Appraisal of the Project

8-4-1 Grain Terminal

(1) Scenarios

The capital and maintenance dredging cost to increase water depth of the channel and necessary water area to -12 meters is included in the initial investments and annual operating expense, though the cost to increase water depth to -11 meters is assumed to be shared by the expansion project of the container terminal. This dredging cost (from -11 to -12 metre) occupies a large share of the total project costs.

Since not only vessels using the grain terminal but also other large vessels entering the port will get benefits equally from the dredging, it is not proper that only the grain terminal shares the total dredging cost, especially annual dredging cost.

Therefore, to examine the impact on the FIRR, the following conditions are established;

1) Case A: The grain terminal shares the total maintenance dredging cost.
2) Case B: The grain terminal shares two-thirds of it.
3) Case C: The grain terminal shares half of it.

In every case, it is assumed that the grain terminal shares the capital dredging cost.

(2) Results

The results are shown in Table 8-4-1-1 and the FIRR calculation of Case A is shown in Table 8-4-1-2. The FIRR exceeds the interest rate of the funds of 8.0%, which is the floor limit, in every case.

Table 8-4-1-1 FIRR of the Grain Terminal

	FIRR
Case A	8.5%
Case B	9.5%
Case C	9.9%

Table 8-4-1-2 FIRR of Case A

FIRR= 8.52%

YEAR	REVENUE	COST			REVENUE-COST	PRESENT VALUE IN 1994		
		INVESTMENT	EXPENSE	TOTAL		REVENUE	COST	DIFFERENCE
1994		10,772		10,772	-10,772	0	10,772	-10,772
1995		7,619		7,619	-7,619	0	7,021	-7,021
1996		34,745		34,745	-34,745	0	29,505	-29,505
1997		41,682		41,682	-41,682	0	32,618	-32,618
1998	15,077		5,303	5,303	9,774	10,873	3,824	7,048
1999	15,077		5,303	5,303	9,774	10,019	3,524	6,495
2000	15,077		5,303	5,303	9,774	9,233	3,248	5,986
2001	15,077		5,303	5,303	9,774	8,508	2,993	5,516
2002	15,077		5,303	5,303	9,774	7,841	2,758	5,083
2003	15,077		5,303	5,303	9,774	7,225	2,541	4,684
2004	15,077		5,303	5,303	9,774	6,658	2,342	4,316
2005	15,077		5,303	5,303	9,774	6,136	2,158	3,978
2006	15,077		5,303	5,303	9,774	5,654	1,989	3,666
2007	15,077		5,303	5,303	9,774	5,211	1,833	3,378
2008	15,077		5,303	5,303	9,774	4,802	1,689	3,113
2009	15,077		5,303	5,303	9,774	4,425	1,556	2,868
2010	15,077		5,303	5,303	9,774	4,078	1,434	2,643
2011	15,077		5,303	5,303	9,774	3,758	1,322	2,436
2012	15,077		5,303	5,303	9,774	3,463	1,218	2,245
2013	15,077		5,303	5,303	9,774	3,191	1,122	2,069
2014	15,077		5,303	5,303	9,774	2,940	1,034	1,906
2015	15,077		5,303	5,303	9,774	2,710	953	1,757
2016	15,077		5,303	5,303	9,774	2,497	878	1,619
2017	15,077	21,794	5,303	27,097	-12,020	2,301	4,136	-1,835
2018	15,077		5,303	5,303	9,774	2,120	746	1,375
2019	15,077		5,303	5,303	9,774	1,954	687	1,267
2020	15,077		5,303	5,303	9,774	1,801	633	1,167
2021	15,077		5,303	5,303	9,774	1,659	584	1,076
2022	15,077		5,303	5,303	9,774	1,529	538	991
2023	15,077	-44,481	5,303	-39,178	54,255	1,409	-3,662	5,071
TOTAL	392,002	72,131	137,878	210,009	181,993	121,995	121,995	0

(3) Sensitivity analysis

Sensitivity analysis is conducted for the following three cases to examine the impact of unexpected future changes:

Case I: The project cost increases by 10%.

Case II: The revenue decreases by 10%.

Case III: The project cost increases by 10% and the revenue decreases by 10%.

Table 8-4-1-3 shows the calculation results of each case. If the FIRR exceeds the interest rate of fund, we can judge the case to be financially feasible.

Table 8-4-1-3 FIRR Sensitivity Analysis

	Base Case	Case I	Case II	Case III
Case A (Sharing the total dredging cost)	8.5%	6.9%	7.1%	5.5%
Case B (Sharing two third of the dredging cost)	9.5%	7.9%	8.1%	6.6%
Case C (Sharing half of the dredging cost)	9.9%	8.4%	8.6%	7.1%
Interest Rate of Fund	8.0%			

Regarding Case A, in which the grain terminal shares the total maintenance dredging cost, every sensitivity analysis is not feasible, though the original case is feasible.

On the other hand, regarding Case C, in which the terminal shares half of the cost, not only the original case but also Case I and Case II are feasible.

Regarding Case B, Case I and Case II are almost feasible.

(4) Financial Soundness of the Implementation Body of the Grain Terminal

Case A is appraised from the viewpoint of financial soundness of the implementation body.

We consider the following two cases concerning the share of loan (The conditions of the loan are stated in chapter 8-3-1-(5).).

Case I: All funds are financed by loan.

Case II: 20% of the funds are financed by internal resources such as investments provided by members of the implementation body.

The projected financial statements and financial indicators: working ratio, operating ratio, rate of return on net fixed assets and debt service coverage ratio are shown in Table 8-4-1-4 and 8-4-1-5.

1) Profitability

The rates of return on net fixed assets of the both cases keep the preferable levels because they exceed the interest rate of the funds (8%) during the project life.

2) Operational Efficiency

Both the operating ratios and the working ratios of the both cases maintain favorable levels.

3) Loan Repayment Capacity

Concerning Case I, the debt service coverage ratios are less than 1 from 2002 to 2010. This means that the operating income cannot cover the repayment and interest of long-term loans during that period. On the other hand, concerning Case II, the ratios are less than 1 only from 2003 to 2005. Furthermore, Case I requires a short-term loan during the whole project life, however, Case II requires it only up to 1998, in addition, in Case II, the accumulated deficit disappears in 2004 and after that retained earnings increase.

Therefore, it is recommended that the implementation body provides some amount of internal resources.

8-4-2 Foreign Fishing Terminal

(1) Scenarios

To examine the impact on the FIRR, the following conditions are established;

1) Tariff increase of 400% from 1998 (when the fishing terminal opens)
2) Tariff increase of 300% from 1998
3) Tariff increase of 200% from 1998
4) Tariff increase 0%

Table 8-4-1-4 Project Financial Statements and Financial Indicators of Case I

(Unit 1,000 US$)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
INCOME AND EXPENDITURE ACCOUNT															
Operating Revenue					15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077
Operating Expenditure					8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077
Maintenance & Repair Costs					3726	3726	3726	3726	3726	3726	3726	3726	3726	3726	3726
Personnel Costs					807	807	807	807	807	807	807	807	807	807	807
Electricity Bill					366	366	366	366	366	366	366	366	366	366	366
Other Administration Expenditure					404	404	404	404	404	404	404	404	404	404	404
Depreciation					2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774
Net Operating Income					7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Non-operating Revenue					0	0	0	0	0	0	0	0	0	0	0
Interest Income					0	0	0	0	0	0	0	0	0	0	0
Non-operating expenditure		862	1,540	4,443	8,133	8,002	7,860	7,707	7,542	7,363	7,170	6,962	6,738	6,501	6,251
Interest on Long-term Loans		862	1,471	4,251	7,585	7,585	7,585	7,528	7,430	7,147	6,641	6,135	5,629	5,124	4,618
Interest on Short-term Loans			69	192	548	416	275	179	112	216	529	827	1,108	1,377	1,633
Net Income Before Taxation		-862	-1,540	-4,443	-1,133	-1,002	-860	-707	-541	-363	-170	38	262	499	749
Taxation												11	79	150	225
Net Income After Taxation		-862	-1,540	-4,443	-1,133	-1,002	-860	-707	-541	-363	-170	27	184	349	524
Retained Earnings		-862	-2,402	-6,845	-7,978	-8,980	-9,840	-10,547	-11,088	-11,451	-11,621	-11,594	-11,411	-11,061	-10,537
CASH FLOW STATEMENT															
Cash Beginning	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Inflow	10,772	7,619	34,745	41,682	9,774	9,774	9,774	9,774	9,774	9,774	9,774	9,774	9,774	9,774	9,774
Net Operating Income					7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Depreciation					2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774
Long-term Loans	10,772	7,619	34,745	41,682											
Interest Income					0	0	0	0	0	0	0	0	0	0	0
Cash Outflow	10,772	8,481	36,285	46,125	8,133	8,002	8,578	8,933	11,084	13,684	13,491	13,294	13,138	12,972	12,797
Investment	10,772	7,619	34,745	41,682											
Payment for Long-term Loans							718	1,226	3,542	6,321	6,321	6,321	6,321	6,321	6,321
Interest on Long-term Loans		862	1,471	4,251	7,585	7,585	7,585	7,528	7,430	7,147	6,641	6,135	5,629	5,124	4,618
Taxation												11	79	150	225
Interest on Short-term Loans			69	192	548	416	275	179	112	216	529	827	1,108	1,377	1,633
Cash Inflow-Outflow	0	-862	-1,540	-4,443	1,641	1,772	1,196	841	-1,310	-3,910	-3,717	-3,520	-3,364	-3,198	-3,023
Cash Ending	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash excess	0	-862	-1,540	-4,443	1,641	1,772	1,196	841	-1,310	-3,910	-3,717	-3,520	-3,364	-3,198	-3,023
Short-term Loans		862	1,540	4,443	-1,641	-1,772	-1,196	-841	1,310	3,910	3,717	3,520	3,364	3,198	3,023
BALANCE SHEET															
Current Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash & Deposit	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fixed Assets	10,772	18,391	53,136	94,818	92,044	89,270	86,496	83,722	80,948	78,174	75,400	72,626	69,852	67,078	64,304
Cost	10,772	18,391	53,136	94,818	94,818	94,818	94,818	94,818	94,818	94,818	94,818	94,818	94,818	94,818	94,818
Accumulated Depreciation					2,774	5,548	8,322	11,096	13,870	16,644	19,418	22,192	24,966	27,740	30,514
Net Fixed Assets	10,772	18,391	53,136	94,818	92,044	89,270	86,496	83,722	80,948	78,174	75,400	72,626	69,852	67,078	64,304
Current Liabilities	0	862	2,402	6,845	5,204	3,432	2,236	1,395	2,705	6,615	10,332	13,852	17,216	20,414	23,437
Short-term Loans		862	2,402	6,845	5,204	3,432	2,236	1,395	2,705	6,615	10,332	13,852	17,216	20,414	23,437
Fixed Liabilities	10,772	18,391	53,136	94,818	94,818	94,818	94,100	92,874	89,331	83,010	76,689	70,368	64,047	57,725	51,404
Long-term Loans	10,772	18,391	53,136	94,818	94,818	94,818	94,100	92,874	89,331	83,010	76,689	70,368	64,047	57,725	51,404
Capital	0	-862	-2,402	-6,845	-7,978	-8,980	-9,840	-10,547	-11,088	-11,451	-11,621	-11,594	-11,411	-11,061	-10,537
Net Income After Taxation		-862	-1,540	-4,443	-1,133	-1,002	-860	-707	-541	-363	-170	27	184	349	524
Retained Earnings		-862	-2,402	-6,845	-7,978	-8,980	-9,840	-10,547	-11,088	-11,451	-11,621	-11,594	-11,411	-11,061	-10,537
FINANCIAL INDICATORS															
Working Ratio (%)					35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%
Operating Ratio (%)					54%	54%	54%	54%	54%	54%	54%	54%	54%	54%	54%
Rate of Return on Net Fixed Assets					8%	8%	8%	8%	9%	9%	9%	10%	10%	10%	11%
Debt Service Coverage Ratio					1.29	1.28	1.18	1.12	0.89	0.73	0.75	0.78	0.82	0.85	0.89

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
INCOME AND EXPENDITURE ACCOUNT															
Operating Revenue	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077
Operating Expenditure	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077
Maintenance & Repair Costs	3726	3726	3726	3726	3726	3726	3726	3726	3726	3726	3726	3726	3726	3726	3726
Personnel Costs	807	807	807	807	807	807	807	807	807	807	807	807	807	807	807
Electricity Bill	366	366	366	366	366	366	366	366	366	366	366	366	366	366	366
Other Administration Expenditure	404	404	404	404	404	404	404	404	404	404	404	404	404	404	404
Depreciation	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774
Net Operating Income	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Non-operating Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	354
Interest Income	0	0	0	0	0	0	0	0	0	0	0	0	0	0	354
Non-operating expenditure	5,987	5,709	5,414	5,104	4,776	4,429	4,063	3,677	3,269	2,838	2,383	1,902	1,395	859	859
Interest on Long-term Loans	4,112	3,607	3,101	2,595	2,090	1,584	1,078	630	222						
Interest on Short-term Loans	1,875	2,102	2,313	2,508	2,686	2,845	2,985	3,047	3,047	2,838	2,383	1,902	1,395	859	859
Net Income Before Taxation	1,013	1,291	1,586	1,896	2,224	2,571	2,937	3,323	3,731	4,162	4,617	5,098	5,605	6,141	6,494
Taxation	304	387	476	569	667	771	881	997	1,119	1,249	1,385	1,529	1,681	1,842	1,948
Net Income After Taxation	709	904	1,110	1,327	1,557	1,800	2,056	2,326	2,612	2,913	3,232	3,568	3,923	4,298	4,546
Retained Earnings	-9,828	-8,924	-7,814	-6,487	-4,930	-3,130	-1,075	1,252	3,863	6,777	10,009	13,577	17,500	21,799	26,345
CASH FLOW STATEMENT															
Cash Beginning	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,073
Cash Inflow	9,774	9,774	9,774	9,774	9,774	9,774	9,774	9,774	31,568	9,774	9,774	9,774	9,774	9,774	10,128
Net Operating Income	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Depreciation	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774
Long-term Loans									21,794						
Interest Income	0	0	0	0	0	0	0	0	0	0	0	0	0	0	354
Cash Outflow	12,612	12,417	12,211	11,994	11,764	11,522	10,547	9,769	28,961	4,087	3,769	3,432	3,077	2,702	2,808
Investment									21,794						
Payment for Long-term Loans	6,321	6,321	6,321	6,321	6,321	6,321	5,603	5,095	2,779						
Interest on Long-term Loans	4,112	3,607	3,101	2,595	2,090	1,584	1,078	630	222						
Taxation	304	387	478	569	667	771	881	997	1,119	1,249	1,385	1,529	1,681	1,842	1,948
Interest on Short-term Loans	1,875	2,102	2,313	2,508	2,686	2,845	2,985	3,047	3,047	2,838	2,383	1,902	1,395	859	859
Cash Inflow-Outflow	-2,838	-2,643	-2,437	-2,220	-1,990	-1,748	-773	5	2,607	5,687	6,006	6,342	6,697	7,072	7,320
Cash Ending	0	0	0	0	0	0	0	0	0	0	0	0	0	7,073	14,393
Cash excess	-2,838	-2,643	-2,438	-2,220	-1,990	-1,747	-774	5	2,607	5,688	6,006	6,342	6,697	7,073	14,393
Short-term Loans	2,838	2,643	2,438	2,220	1,990	1,747	774	-5	-2,607	-5,688	-6,006	-6,342	-6,697		
BALANCE SHEET															
Current Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	7,073	14,393
Cash & Deposit	0	0	0	0	0	0	0	0	0	0	0	0	0	7,073	14,393
Fixed Assets	61,530	58,756	55,982	53,208	50,434	47,660	44,886	42,112	61,132	58,358	55,584	52,810	50,036	47,262	44,488
Cost	94,818	94,818	94,818	94,818	94,818	94,818	94,818	94,818	116,612	116,612	116,612	116,612	116,612	116,612	116,612
Accumulated Depreciation	33,288	36,062	38,836	41,610	44,384	47,158	49,932	52,706	55,480	58,254	61,028	63,802	66,576	69,350	72,124
Net Fixed Assets	61,530	58,756	55,982	53,208	50,434	47,660	44,886	42,112	61,132	58,358	55,584	52,810	50,036	47,262	44,488
Current Liabilities	26,275	28,918	31,356	33,576	35,566	37,313	38,087	38,082	35,475	29,787	23,781	17,439	10,742	10,742	10,742
Short-term Loans	26,275	28,918	31,356	33,576	35,566	37,313	38,087	38,082	35,475	29,787	23,781	17,439	10,742	10,742	10,742
Fixed Liabilities	45,083	38,762	32,441	26,119	19,798	13,477	7,874	2,779	0	0	0	0	0	0	0
Long-term Loans	45,083	38,762	32,441	26,119	19,798	13,477	7,874	2,779	0	0	0	0	0	0	0
Capital	-9,828	-8,924	-7,814	-6,487	-4,930	-3,130	-1,075	1,252	25,657	28,571	31,803	35,371	39,294	43,593	48,139
Net Income After Taxation	709	904	1,110	1,327	1,557	1,800	2,056	2,326	2,612	2,913	3,232	3,568	3,923	4,298	4,546
Retained Earnings	-9,828	-8,924	-7,814	-6,487	-4,930	-3,130	-1,075	1,252	3,863	6,777	10,009	13,577	17,500	21,799	26,345
									21794	21794	21794	21794	21794	21794	21794
FINANCIAL INDICATORS															
Working Ratio (%)	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%
Operating Ratio (%)	54%	54%	54%	54%	54%	54%	54%	54%	54%	54%	54%	54%	54%	54%	54%
Rate of Return on Net Fixed Assets	11%	12%	13%	13%	14%	15%	16%	17%	11%	12%	13%	13%	14%	15%	16%
Debt Service Coverage Ratio	0.94	0.98	1.04	1.10	1.16	1.24	1.46	1.71	3.28						

Table 8-4-1-5 Project Financial Statements and Financial Indicators of Case II

(Unit 1,000 US$)

INCOME AND EXPENDITURE ACCOUNT	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Operating Revenue					15,077	15,077	15,077	15,077	15,077	15,077
Operating Expenditure					8,077	8,077	8,077	8,077	8,077	8,077
Maintenance & Repair Costs					3726	3726	3726	3726	3726	3726
Personnel Costs					807	807	807	807	807	807
Electricity Bill					366	366	366	366	366	366
Other Administration Expenditure					404	404	404	404	404	404
Depreciation					2,774	2,774	2,774	2,774	2,774	2,774
Net Operating Income					7,000	7,000	7,000	7,000	7,000	7,000
Non-operating Revenue					0	0	47	191	322	367
Interest Income					0	0	47	191	322	367
Non-operating expenditure		689	1,232	3,554	6,506	6,257	6,068	6,022	5,944	5,717
Interest on Long-term Loans		689	1,177	3,401	6,068	6,068	6,068	6,022	5,944	5,717
Interest on Short-term Loans			55	154	438	189	0	0	0	0
Net Income Before Taxation		-689	-1,232	-3,554	494	743	979	1,169	1,378	1,650
Taxation					148	223	294	351	413	495
Net Income After Taxation		-689	-1,232	-3,554	345	520	685	818	964	1,155
Retained Earnings		-689	-1,922	-5,476	-5,131	-4,610	-3,925	-3,107	-2,143	-988
CASH FLOW STATEMENT										
Cash Beginning	0	0	0	0	0	0	938	3,822	6,433	7,338
Cash Inflow	10,772	7,619	34,745	41,682	9,774	9,774	9,821	9,965	10,096	10,141
Net Operating Income					7,000	7,000	7,000	7,000	7,000	7,000
Depreciation					2,774	2,774	2,774	2,774	2,774	2,774
Long-term Loans	8,618	6,095	27,796	33,345						
Interest Income					0	0	47	191	322	367
Internal Resources	2,154	1,524	6,949	8,337						
Cash Outflow	10,772	8,308	35,977	45,236	6,655	6,480	6,936	7,354	9,191	11,269
Investment	10,772	7,619	34,745	41,682						
Payment for Long-term Loans							575	981	2,834	5,057
Interest on Long-term Loans		689	1,177	3,401	6,068	6,068	6,068	6,022	5,944	5,717
Taxation					148	223	294	351	413	495
Interest on Short-term Loans			55	154	438	189	0	0	0	0
Cash Inflow-Outflow	0	-689	-1,232	-3,554	3,119	3,294	2,884	2,611	905	-1,128
Cash Ending	0	0	0	0	0	938	3,822	6,433	7,338	6,210
Cash excess	0	-689	-1,233	-3,554	3,119	3,295	3,822	6,433	7,338	6,210
Short-term Loans		689	1,233	3,554	-3,119	-2,357				
BALANCE SHEET										
Current Assets	0	0	0	0	0	938	3,822	6,433	7,338	6,210
Cash & Deposit	0	0	0	0	0	938	3,322	6,433	7,338	6,210
Fixed Assets	10,772	18,391	53,136	94,818	92,044	89,270	86,496	83,722	80,948	78,174
Cost	10,772	18,391	53,136	94,818	94,818	94,818	94,818	94,818	94,818	94,818
Accumulated Depreciation					2,774	5,548	8,322	11,096	13,870	16,644
Net Fixed Assets	10,772	18,391	53,136	94,818	92,044	89,270	86,496	83,722	80,948	78,174
Current Liabilities	0	689	1,922	5,476	2,357	0	0	0	0	0
Short-term Loans		689	1,922	5,476	2,357	0	0	0	0	0
Fixed Liabilities	8,618	14,713	42,509	75,854	75,854	75,854	75,279	74,299	71,465	66,408
Long-term Loans	8,618	14,713	42,509	75,854	75,854	75,854	75,279	74,299	71,465	66,408
Capital	2,154	2,989	8,705	13,488	13,833	14,354	15,039	15,857	16,821	17,976
Net Income After Taxation		-689	-1,232	-3,554	345	520	685	818	964	1,155
Retained Earnings		-689	-1,922	-5,476	-5,131	-4,610	-3,925	-3,107	-2,143	-988
Capital Fund	2,154	3,678	10,627	18,964	18,964	18,964	18,964	18,964	18,964	18,964
FINANCIAL INDICATORS										
Working Ratio (%)					35%	35%	35%	35%	35%	35%
Operating Ratio (%)					54%	54%	54%	54%	54%	54%
Rate of Return on Net Fixed Assets					8%	8%	8%	8%	9%	9%
Debt Service Coverage Ratio					1.61	1.61	1.47	1.40	1.11	0.91

INCOME AND EXPENDITURE ACCOUNT	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Operating Revenue	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077
Operating Expenditure	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077
Maintenance & Repair Costs	3726	3726	3726	3726	3726	3726	3726	3726	3726	3726
Personnel Costs	807	807	807	807	807	807	807	807	807	807
Electricity Bill	366	366	366	366	366	366	366	366	366	366
Other Administration Expenditure	404	404	404	404	404	404	404	404	404	404
Depreciation	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774
Net Operating Income	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Non-operating Revenue	310	266	235	216	211	220	243	282	336	406
Interest Income	310	266	235	216	211	220	243	282	336	406
Non-operating expenditure	5,313	4,908	4,504	4,099	3,694	3,290	2,885	2,481	2,076	1,672
Interest on Long-term Loans	5,313	4,908	4,504	4,099	3,694	3,290	2,885	2,481	2,076	1,672
Interest on Short-term Loans	0	0	0	0	0	0	0	0	0	0
Net Income Before Taxation	1,998	2,358	2,731	3,117	3,517	3,930	4,358	4,801	5,259	5,734
Taxation	599	707	819	935	1,055	1,179	1,307	1,440	1,578	1,720
Net Income After Taxation	1,398	1,651	1,912	2,182	2,462	2,751	3,051	3,361	3,682	4,014
Retained Earnings	410	2,061	3,973	6,155	8,617	11,368	14,418	17,779	21,461	25,474
CASH FLOW STATEMENT										
Cash Beginning	6,210	5,325	4,693	4,322	4,221	4,399	4,868	5,635	6,713	8,112
Cash Inflow	10,084	10,040	10,009	9,990	9,985	9,994	10,017	10,058	10,110	10,180
Net Operating Income	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Depreciation	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774
Long-term Loans										
Interest Income	310	266	235	216	211	220	243	282	336	406
Internal Resources										
Cash Outflow	10,969	10,673	10,380	10,091	9,806	9,526	9,250	8,978	8,711	8,449
Investment										
Payment for Long-term Loans	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057	5,057
Interest on Long-term Loans	5,313	4,908	4,504	4,099	3,694	3,290	2,885	2,481	2,076	1,672
Taxation	599	707	819	935	1,055	1,179	1,307	1,440	1,578	1,720
Interest on Short-term Loans	0	0	0	0	0	0	0	0	0	0
Cash Inflow-Outflow	-884	-632	-371	-101	179	468	768	1,078	1,399	1,731
Cash Ending	5,325	4,693	4,322	4,221	4,399	4,868	5,635	6,713	8,112	9,842
Cash excess	5,325	4,693	4,322	4,221	4,399	4,868	5,635	6,713	8,112	9,842
Short-term Loans										
BALANCE SHEET										
Current Assets	5,325	4,693	4,322	4,221	4,399	4,868	5,635	6,713	8,112	9,842
Cash & Deposit	5,325	4,693	4,322	4,221	4,399	4,868	5,635	6,713	8,112	9,842
Fixed Assets	75,400	72,626	69,852	67,078	64,304	61,530	58,756	55,982	53,208	50,434
Cost	94,818	94,818	94,818	94,818	94,818	94,818	94,818	94,818	94,818	94,818
Accumulated Depreciation	19,418	22,192	24,966	27,740	30,514	33,288	36,062	38,836	41,610	44,384
Net Fixed Assets	75,400	72,626	69,852	67,078	64,304	61,530	58,756	55,982	53,208	50,434
Current Liabilities	0	0	0	0	0	0	0	0	0	0
Short-term Loans	0	0	0	0	0	0	0	0	0	0
Fixed Liabilities	61,351	56,294	51,237	46,180	41,123	36,066	31,009	25,952	20,895	15,838
Long-term Loans	61,351	56,294	51,237	46,180	41,123	36,066	31,009	25,952	20,895	15,838
Capital	19,374	21,025	22,937	25,119	27,581	30,332	33,382	36,743	40,425	44,438
Net Income After Taxation	1,398	1,651	1,912	2,182	2,462	2,751	3,051	3,361	3,682	4,014
Retained Earnings	410	2,061	3,973	6,155	8,617	11,388	14,418	17,779	21,461	25,474
Capital Fund	18,984	18,964	18,964	18,964	18,964	18,964	18,964	18,964	18,964	18,964
FINANCIAL INDICATORS										
Working Ratio (%)	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%
Operating Ratio (%)	54%	54%	54%	54%	54%	54%	54%	54%	54%	54%
Rate of Return on Net Fixed Assets	9%	10%	10%	10%	11%	11%	12%	13%	13%	14%
Debt Service Coverage Ratio	0.84	0.98	1.02	1.07	1.12	1.17	1.23	1.30	1.37	1.45

INCOME AND EXPENDITURE ACCOUNT	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Operating Revenue	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077	15,077
Operating Expenditure	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077	8,077
Maintenance & Repair Costs	3726	3726	3726	3726	3726	3726	3726	3726	3726	3726
Personnel Costs	807	807	807	807	807	807	807	807	807	807
Electricity Bill	366	366	366	366	366	366	366	366	366	366
Other Administration Expenditure	404	404	404	404	404	404	404	404	404	404
Depreciation	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774
Net Operating Income	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Non-operating Revenue	492	596	746	934	1,233	1,660	2,102	2,559	3,033	3,523
Interest Income	492	596	746	934	1,233	1,660	2,102	2,559	3,033	3,523
Non-operating expenditure	1,267	863	504	178	0	0	0	0	0	0
Interest on Long-term Loans	1,267	863	504	178						
Interest on Short-term Loans	0	0	0	0	0	0	0	0	0	0
Net Income Before Taxation	6,225	6,733	7,242	7,757	8,233	8,660	9,102	9,559	10,033	10,523
Taxation	1,868	2,020	2,173	2,327	2,470	2,598	2,731	2,868	3,010	3,157
Net Income After Taxation	4,358	4,713	5,070	5,430	5,763	6,062	6,372	6,692	7,023	7,366
Retained Earnings	29,832	34,545	39,615	45,044	50,808	56,870	63,242	69,933	76,956	84,322
CASH FLOW STATEMENT										
Cash Beginning	9,842	11,917	14,922	18,689	24,670	33,207	42,044	51,189	60,655	70,452
Cash Inflow	10,286	10,370	10,520	32,502	11,007	11,434	11,876	12,333	12,807	13,297
Net Operating Income	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
Depreciation	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774	2,774
Long-term Loans										
Interest Income	492	596	746	934	1,233	1,660	2,102	2,559	3,033	3,523
Internal Resources				21,794						
Cash Outflow	8,192	7,365	6,753	26,522	2,470	2,598	2,731	2,868	3,010	3,157
Investment				21,794						
Payment for Long-term Loans	5,057	4,482	4,076	2,223						
Interest on Long-term Loans	1,267	863	504	178						
Taxation	1,868	2,020	2,173	2,327	2,470	2,598	2,731	2,868	3,010	3,157
Interest on Short-term Loans	0	0	0	0	0	0	0	0	0	0
Cash Inflow-Outflow	2,075	3,005	3,767	5,981	8,537	8,836	9,146	9,466	9,797	10,140
Cash Ending	11,917	14,922	18,689	24,670	33,207	42,044	51,189	60,655	70,452	80,591
Cash excess	11,917	14,922	18,689	24,670	33,207	42,044	51,189	60,655	70,452	80,591
Short-term Loans										
BALANCE SHEET										
Current Assets	11,917	14,922	18,689	24,670	33,207	42,044	51,189	50,655	70,452	80,591
Cash & Deposit	11,917	14,922	18,689	24,670	33,207	42,044	51,189	60,655	70,452	80,591
Fixed Assets	47,660	44,886	42,112	61,132	58,358	55,584	52,810	50,036	47,262	44,488
Cost	94,818	94,818	94,818	116,612	116,612	116,612	116,612	116,612	116,612	116,612
Accumulated Depreciation	47,158	49,932	52,706	55,480	58,254	61,028	63,802	66,576	69,350	72,124
Net Fixed Assets	47,660	44,886	42,112	61,132	58,358	55,584	52,810	50,036	47,262	44,488
Current Liabilities	0	0	0	0	0	0	0	0	0	0
Short-term Loans	0	0	0	0	0	0	0	0	0	0
Fixed Liabilities	10,781	6,299	2,223	0	0	0	0	0	0	0
Long-term Loans	10,781	6,299	2,223	0	0	0	0	0	0	0
Capital	48,796	53,509	58,579	85,802	91,566	97,628	104,000	110,691	117,714	125,080
Net Income After Taxation	4,358	4,713	5,070	5,430	5,763	6,062	6,372	6,692	7,023	7,366
Retained Earnings	29,832	34,545	39,615	45,044	50,808	56,870	63,242	69,933	76,956	84,322
Capital Fund	18,964	18,964	18,964	40,758	40,758	40,758	40,758	40,758	40,758	40,758
FINANCIAL INDICATORS										
Working Ratio (%)	35%	35%	35%	35%	35%	35%	35%	35%	35%	35%
Operating Ratio (%)	54%	54%	54%	54%	54%	54%	54%	54%	54%	54%
Rate of Return on Net Fixed Assets	15%	16%	17%	11%	12%	13%	13%	14%	15%	16%
Debt Service Coverage Ratio	1.55	1.83	2.13	4.07						

(2) Results

The results are shown in Table 8-4-2-1 and the FIRR calculation in case of tariff increase of 300% is shown in Table 8-4-2-2.

Table 8-4-2-1 Results of FIRR

	FIRR
Tariff Increase of 400%	10.4%
Tariff Increase of 300%	8.0%
Tariff Increase of 200%	5.5%
Tariff Increase 0%	-

Table 8-4-2-2 FIRR in Case of Tariff Increase of 300%

FIRR= 8.00% (Unit 1000US$)

YEAR	REVENUE	COST			REVENUE-COST	PRESENT VALUE IN 1996		
		INVESTMENT	EXPENSE	TOTAL		REVENUE	COST	DIFFERENCE
1996		4,160		4,160	-4,160	0	4,160	-4,160
1997		3,404		3,404	-3,404	0	3,152	-3,152
1998	876		196	196	680	751	168	583
1999	876		196	196	680	695	156	540
2000	876		196	196	680	644	144	500
2001	876		196	196	680	596	133	463
2002	876		196	196	680	552	123	428
2003	876		196	196	680	511	114	397
2004	876		196	196	680	473	106	367
2005	876		196	196	680	438	98	340
2006	876		196	196	680	406	91	315
2007	876		196	196	680	376	84	292
2008	876		196	196	680	348	78	270
2009	876		196	196	680	322	72	250
2010	876		196	196	680	298	67	231
2011	876		196	196	680	276	62	214
2012	876		196	196	680	256	57	198
2013	876		196	196	680	237	53	184
2014	876		196	196	680	219	49	170
2015	876		196	196	680	203	45	157
2016	876		196	196	680	188	42	146
2017	876		196	196	680	174	39	135
2018	876		196	196	680	161	36	125
2019	876		196	196	680	149	33	116
2020	876		196	196	680	138	31	107
2021	876		196	196	680	128	29	99
2022	876		196	196	680	118	26	92
2023	876		196	196	680	110	25	85
2024	876		196	196	680	101	23	79
2025	876	-3,328	196	-3,132	4,008	94	-336	430
TOTAL	24,528	4,236	5,488	9,724	14,804	8,960	8,960	0

(3) Sensitivity analysis

Sensitivity analysis is conducted for the following three cases to examine the impact of unexpected future changes in case of tariff increase of 300% and 400%:

Case I: The project cost increases by 10%.

Case II: The revenue decreases by 10%.

Case III: The project cost increases by 10% and the revenue decreases by 10%.

Table 8-4-2-3 shows the calculation results of each case.

Table 8-4-2-3 FIRR Sensitivity Analysis

	Base Case	Case I	Case II	Case III
Tariff Increase 300%	8.0%	6.8%	6.9%	5.8%
Tariff Increase 400%	10.4%	9.0%	9.1%	7.9%
Interest Rate of Fund	8.0%			

In case of tariff increase of 300%, only base case is feasible. On the other hand, in case of tariff increase of 400%, not only Base Case but also Case I and Case II are feasible; furthermore, Case III is also almost feasible.

8-5 Conclusion

8-5-1 Grain Terminal

Judging from the above analysis, this project can be regarded as barely financially feasible provided that the total dredging cost is shared.

However, since the grain terminal is a new project and handles transit cargo, it is difficult to forecast how much cargo volume can be handled and unexpected future changes might occur. On the other hand, the private sector is desirable as the implementation body of the project because this project requires aggressive sales, efficient operation and know-how as recommended in chapter 6-4-1.

Therefore, it is recommended that the Government or the ANP should make efforts to reduce the share of the maintenance dredging cost of the implementation body, which will promote the participation of the private sector.

8-5-2 Foreign Fishing Terminal

This project can be regarded as financially feasible if the present tariff of the wharfage charge is raised by 300% to 400%. Since after implementation of this project the foreign fishing vessels get benefits from this project equal to the increase revenue from raising the tariff of the wharfage charge, this raising of the tariff can be considered possible.

However, raising of the tariff from 300% to 400% is rather steep. On the other hand, present tariff structure of the wharfage based on length of vessel is remarkably profitable for large vessels, as described in chapter 6-2-2. This should be reconsidered taking the trend towards larger vessels into account. If the tariff structure of the wharfage charge is improved from the present one based on length of vessel to new one based on size of vessel such as GRT or NRT (e.g.,To adopt the same tariff of neighbouring Buenos Aires Port), we can expect significantly increased revenue from wharfage charges. Namely, this improvement of the tariff structure could generate enough revenue so that increasing the wharfage charge of the foreign fishing vessels would be unnecessary.

Therefore, this project can be regarded as financially feasible on condition that the ANP improves the tariff structure of wharfage charge based on size of vessel rather than raising tariff rate of wharfage charge of foreign fishing vessels.

APPENDIX

PART I

A-2-1 Calculation of the refraction of offshorewaves based on the energy equilibrium and the decrease of wave height due to the bottom mud

1) The calculation based on the energy equilibrium equation was conducted dividing in four regions as shown in Figure A-2-1-1, where each region is divided in meshes of the area $\Delta y \times \Delta x$. The number of meshes is 8 in x-direction and 17 in y-direction in the region No. 0,and 11 in x-direction and 28 in y-direction in the region No.3.

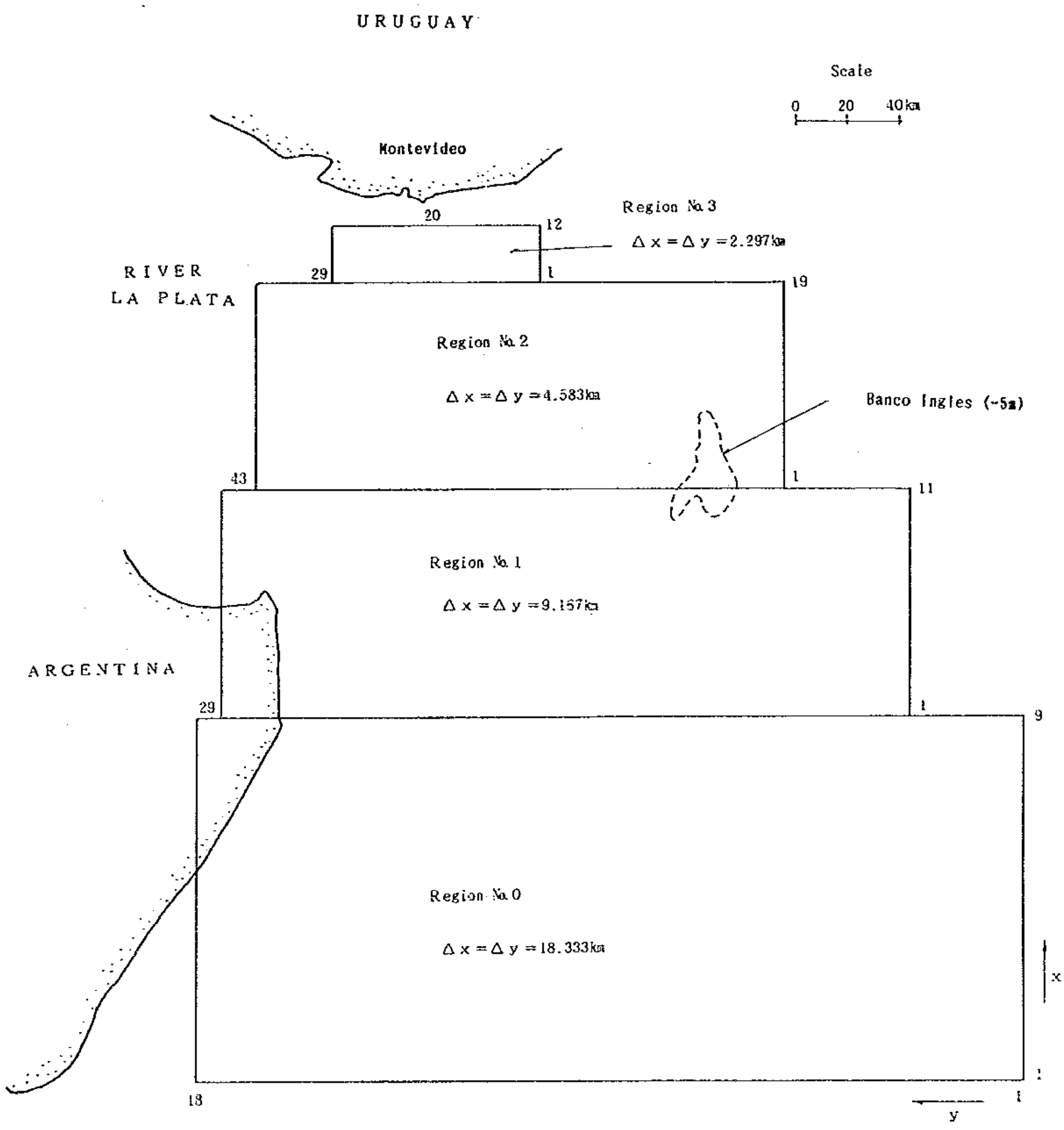


Figure A-2-1-1 Region of calculation of wave refraction based on the energy equilibrium

The condition of calculation is as follows:

Frequency spectrum: Bretshneider-Mitsuyasu type

Directional spreading function: Mitsuyasu type

Division number of frequency: 10

Division number of wave direction: 17 in the region of -90^{o} to 90^{o} from the central wave direction

The energy equilibrium equation is expressed as follows:

$$\frac{\delta (D\ Vx)}{\delta x} + \frac{\delta (D\ Vy)}{\delta y} + \frac{\delta (D\ V\theta)}{\delta \theta} = -EbD \qquad (A\text{-}2\text{-}1\text{-}1)$$

where $Vx = Cg \cos\theta$

$Vy = Cg \sin\theta$

$V\theta = (Cg/C)\left(\sin\theta\ \left(\frac{\delta C}{\delta x}\right) - \cos\theta\ \left(\frac{\delta C}{\delta y}\right)\right)$

D: Directional wave spectral density for a wave component which has a certain frequency and a certain direction

Eb: Coefficient of energy loss by wave breaking

C: Phase velocity of a component wave

Cg: Group velocity of a component wave

θ: Wave direction of a component wave

That is, the spectrum of a certain significant wave is divided in 170 of component spectrum, which are given in the line of $x = 1$ of the region No.0 in Figure A-2-1-1. Next, the change of each component spectrum due to refraction and wave breaking is calculated using Equation (A-2-1-1) for every meshes as wave progress toward Port Montevideo. The significant wave height in each mesh is calculated by summing all component spectra there.

Table A-2-1-1 shows a few results of the above calculation on the last line of Region No.3, from which the decrease of wave height seems to be 25 to 35 %.

Table A-2-1-1 Wave height and direction on the last line of Region No.3

(1) Offshore Wave: H1/3 = 3 m, T = 7 seconds, Direction = S (0 degree)

Mesh Number in y-direction	Wave Height H1/3 (m)	Wave Direction θ (degree)	Mesh Number in y-direction	Wave Height H1/3 (m)	Wave Direction θ (degree)
1	2.31	31.67	15	2.01	18.52
2	2.31	31.84	16	2.06	18.79
3	2.24	33.74	17	2.09	19.24
4	2.27	32.80	18	2.10	21.04
5	2.17	35.22	19	2.10	22.47
6	2.11	35.96	20	2.18	21.27
7	2.00	38.90	21	2.12	23.87
8	1.95	35.43	22	2.06	25.70
9	1.92	27.63	23	1.99	28.38
10	1.91	25.54	24	2.01	29.38
11	1.91	22.83	25	2.06	29.51
12	1.88	22.59	26	2.11	29.50
13	1.89	21.43	27	2.17	28.00
14	1.93	19.78	28	2.10	29.68

(2) Offshore Wave: H1/3 = 3 m, T1/3 = 7 seconds, Direction = SE (45 degree)

Mesh Number in y-direction	Wave Height H1/3 (m)	Wave Direction θ (degree)	Mesh Number in y-direction	Wave Height H1/3 (m)	Wave Direction θ (degree)
1	2.46	44.46	15	2.06	30.26
2	2.46	44.53	16	2.12	29.15
3	2.42	45.76	17	2.16	28.64
4	2.44	44.17	18	2.18	29.80
5	2.38	46.13	19	2.19	30.90
6	2.33	46.64	20	2.30	28.91
7	2.26	48.18	21	2.28	31.11
8	2.22	46.46	22	2.26	32.56
9	2.18	39.68	23	2.20	35.42
10	2.13	37.79	24	2.21	36.68
11	2.08	35.68	25	2.26	36.95
12	2.02	35.21	26	2.32	36.80
13	2.00	34.13	27	2.39	35.37
14	2.01	32.36	28	2.35	36.74

(3) Offshore Wave: H1/3 = 4 m, T1/3 = 12 seconds, Direction = S (0 degree)

Mesh Number in y-direction	Wave Height H1/3 (m)	Wave Direction θ (degree)	Mesh Number in y-direction	Wave Height H1/3 (m)	Wave Direction θ (degree)
1	3.31	38.88	15	2.86	19.13
2	3.31	38.82	16	2.95	18.94
3	3.23	40.62	17	3.03	18.87
4	3.29	39.24	18	3.08	20.69
5	3.17	40.81	19	3.10	22.07
6	3.09	41.04	20	3.24	20.09
7	3.04	42.76	21	3.16	23.32
8	3.03	39.53	22	3.05	25.41
9	2.88	30.02	23	2.92	28.82
10	2.80	28.85	24	2.97	30.27
11	2.79	24.68	25	3.08	30.25
12	2.73	24.76	26	3.19	29.89
13	2.73	22.98	27	3.34	27.53
14	2.78	20.66	28	3.19	29.61

2) The decrease of wave height due to the bottom mud has not sufficiently been made clear in the field, although some experimental and theoretical studies have been done. Among those studies, the following report has been quoted in order to consider this problem.

Robert A. Dalrymple and Philip L. F. Liu:
Waves over soft Muds: A Two-Layer Fluid Model.
Journal Physical Oceanography, November 1978, p1121 to p1131

The results of calculation due to the boundary layer approximation of the above report are shown in Table A-2-1-2, where the density of sea water and bottom mud was taken as 1028 kg/m^3 and 1800 kg/m^3 and the dynamic viscosity of those as 2.6 X 10^{-6} m^2/s and 0.1 m^2/s, respectively in the same way as the above report.

Table A-2-1-2 Calculated Coefficient Ki of Wave Height Decrease due to bottom mud

Wave Period (second)	Wave Height (m)	Water Depth (m)	Thickness of Bottom Mud (m)	Ki (m-1)
10	3	8	2.0	8.4183 X 10^{-6}
10	3	8	1.0	8.4176 X 10^{-6}
10	3	8	0.5	8.4161 X 10^{-6}
10	3	8	0.3	8.4142 X 10^{-6}
10	2	8	1.0	8.4176 X 10^{-6}
10	1	8	1.0	8.4176 X 10^{-6}
10	2	6	1.0	13.2239 X 10^{-6}
13	2	8	1.0	7.8049 X 10^{-6}
7	2	8	1.0	9.1064 X 10^{-6}
7	2	6	2.0	14.8221 X 10^{-6}
7	2	6	0.5	14.9026 X 10^{-6}

In the above calculation, the values of density and dynamic viscosity are not those of Montevideo and also other studies showed that the above boundary layer approximation often results in smaller value of Ki than the value of experimental data. Therefore, if the double times of the above value is also considered for Ki, Ki would become 1×10^{-5} to 2×10^{-5}.

The wave height H attenuated after the wave height Ho progresses the distance x is expressed as follows:

$$H = Ho \exp(-kix) \qquad (2\text{-}3\text{-}2\text{-}2)$$

Because there is the distance of about 40km where the water depth is of 5 to 8 m in the front of Port Montevideo,

$$H = Ho \exp(-1 \times 10^{-5} \times 40000) \quad \text{or} \quad Ho \exp(-2 \times 10^{-5} \times 40000)$$
$$= 0.67\ Ho \quad \text{or} \quad 0.45\ Ho$$

After all, the decrease rate of wave height due to bottom mud would be considered to be about 30 to 60 %.

In order to confirm the above-mentioned decrease of offshore waves, it is recommended for the following investigation to be carried out:

(1) To make to each ocean vessel entering the Port Montevideo a question of the wave height and period at the time when it passed though the south side of Banco De Ingles and the entrance of the navigation channel to the Port Montevideo

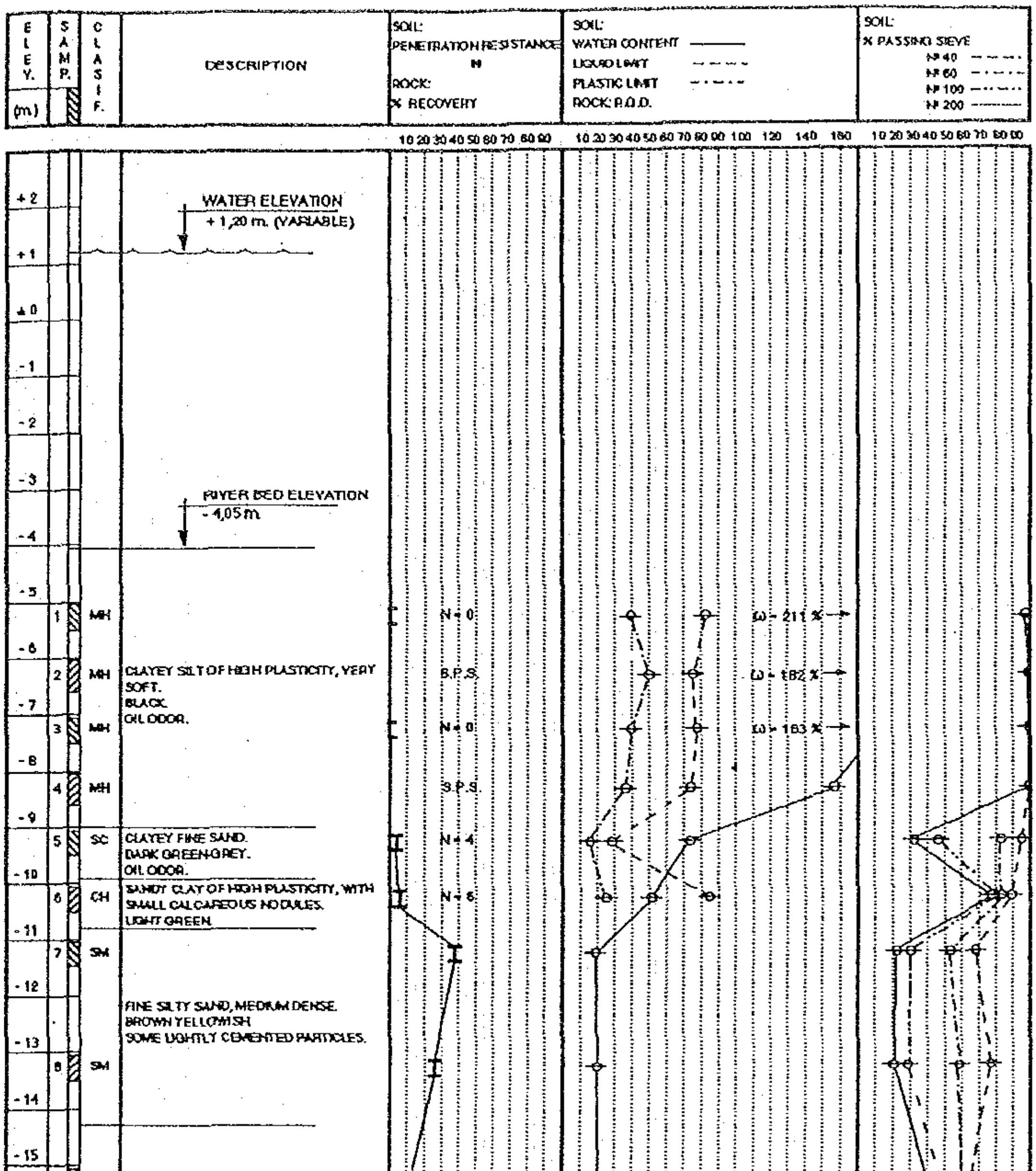
(2) At the same time, to observe the height and period at the entrance of the Port Montevideo

(3) To compare the values of the above (1) and (2)

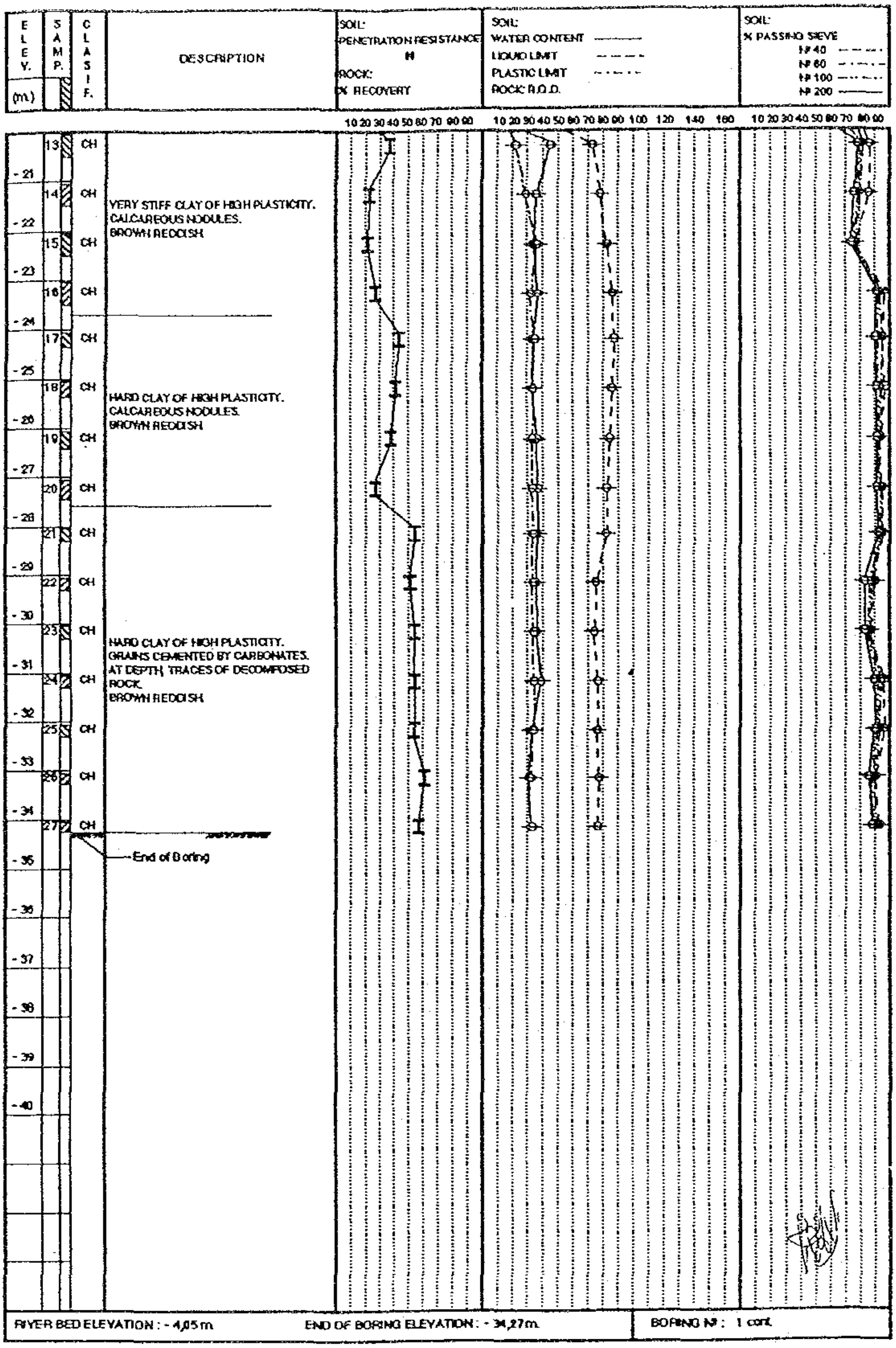
Thought such investegation is based on eye-measurement, the confirmation about the decay of offshore waves would be obtained up to a certain point.

A-2-2 Detailed Soil Profiles of Boring

Detailed soil profiles of boring points No.1 to 5 and the results of laboratory tests are presented in this section.



GEOPROYECTOS SOCIEDAD CIVIL	CLIENT : NIPPON TETRAPOD CO. LTD.
	PROJECT : DEVELOPMENT OF NEW PORT TERMINALS.
	LOCATION : MONTEVIDEO PORT, MONTEVIDEO



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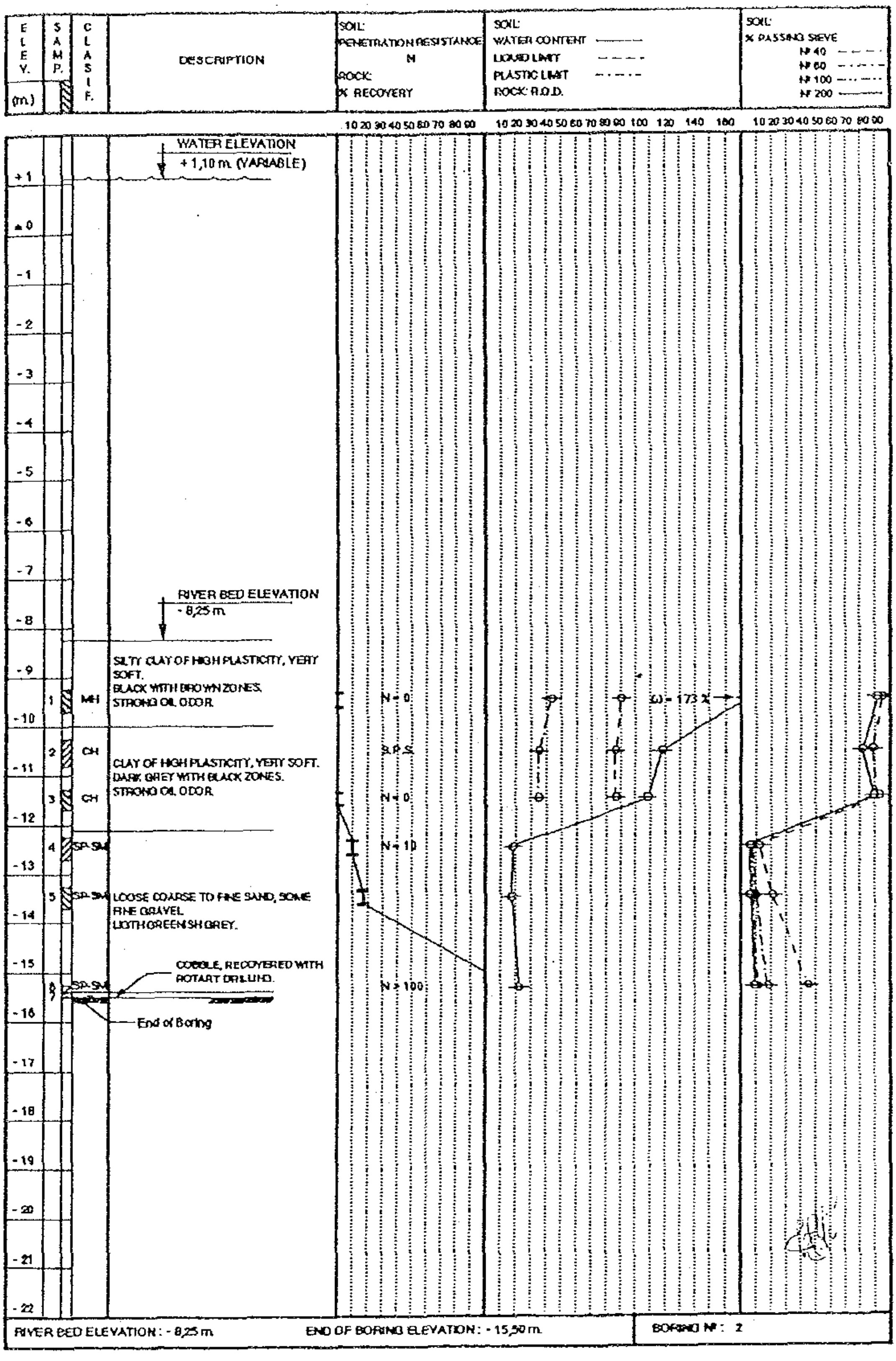

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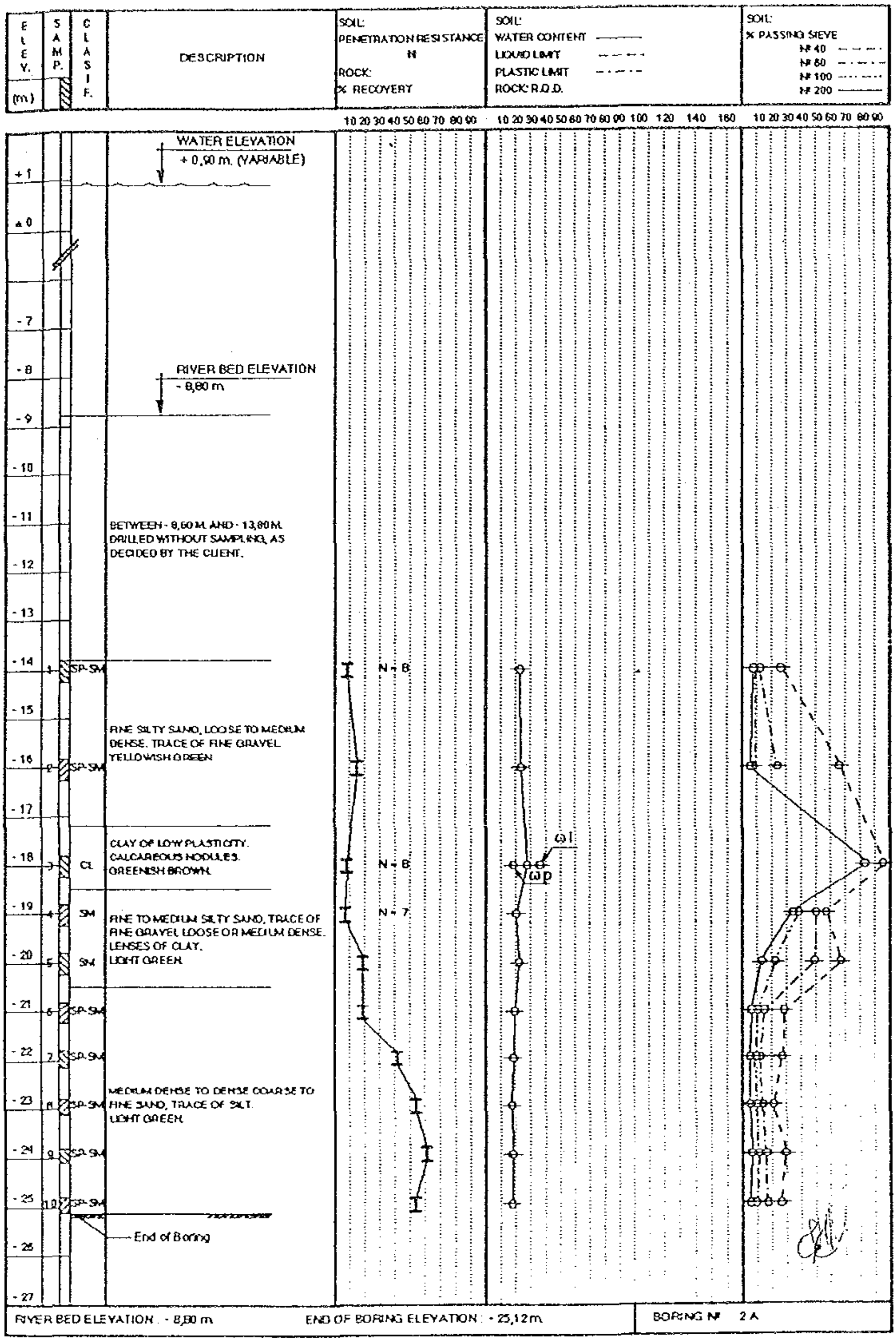
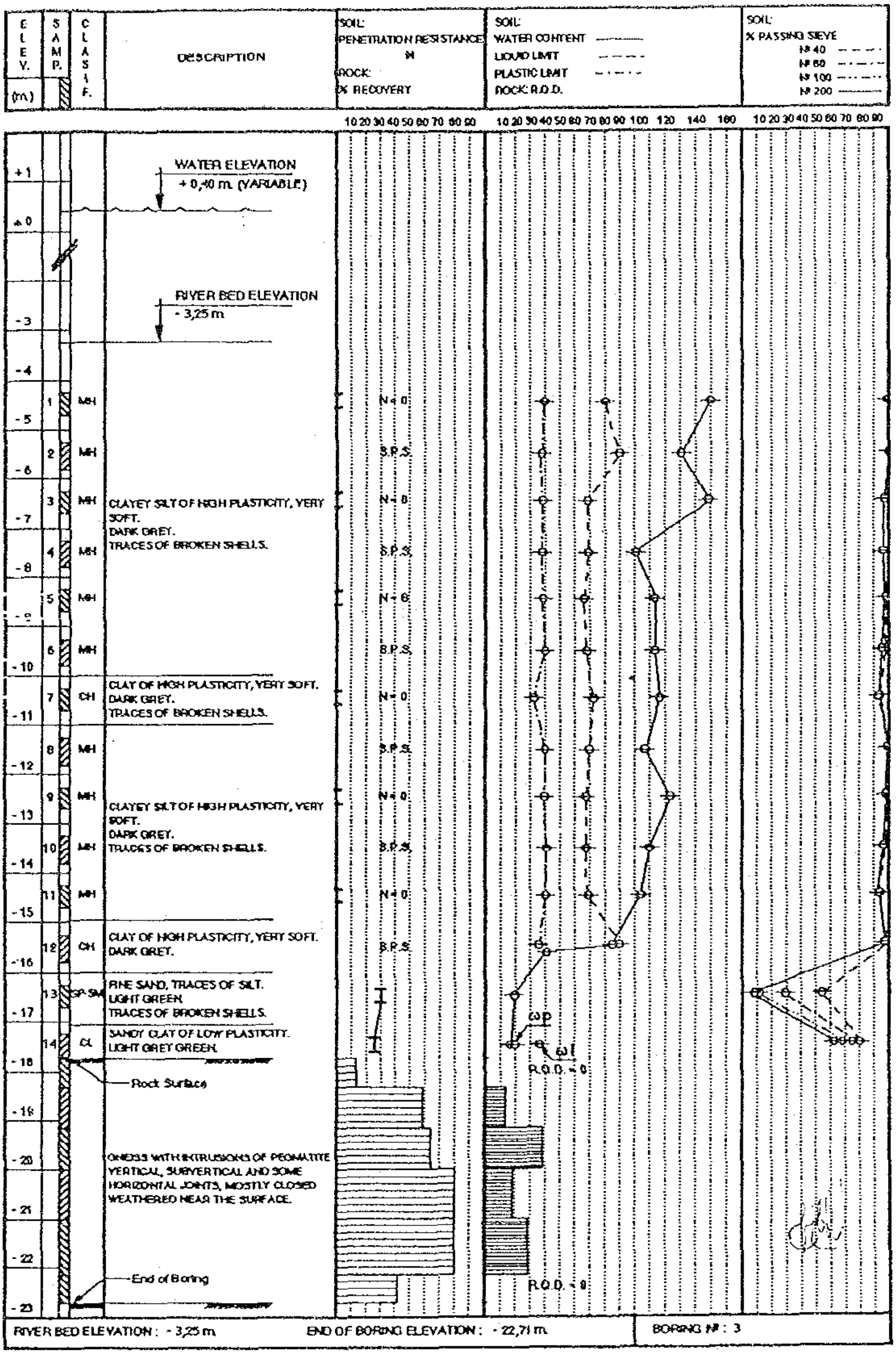
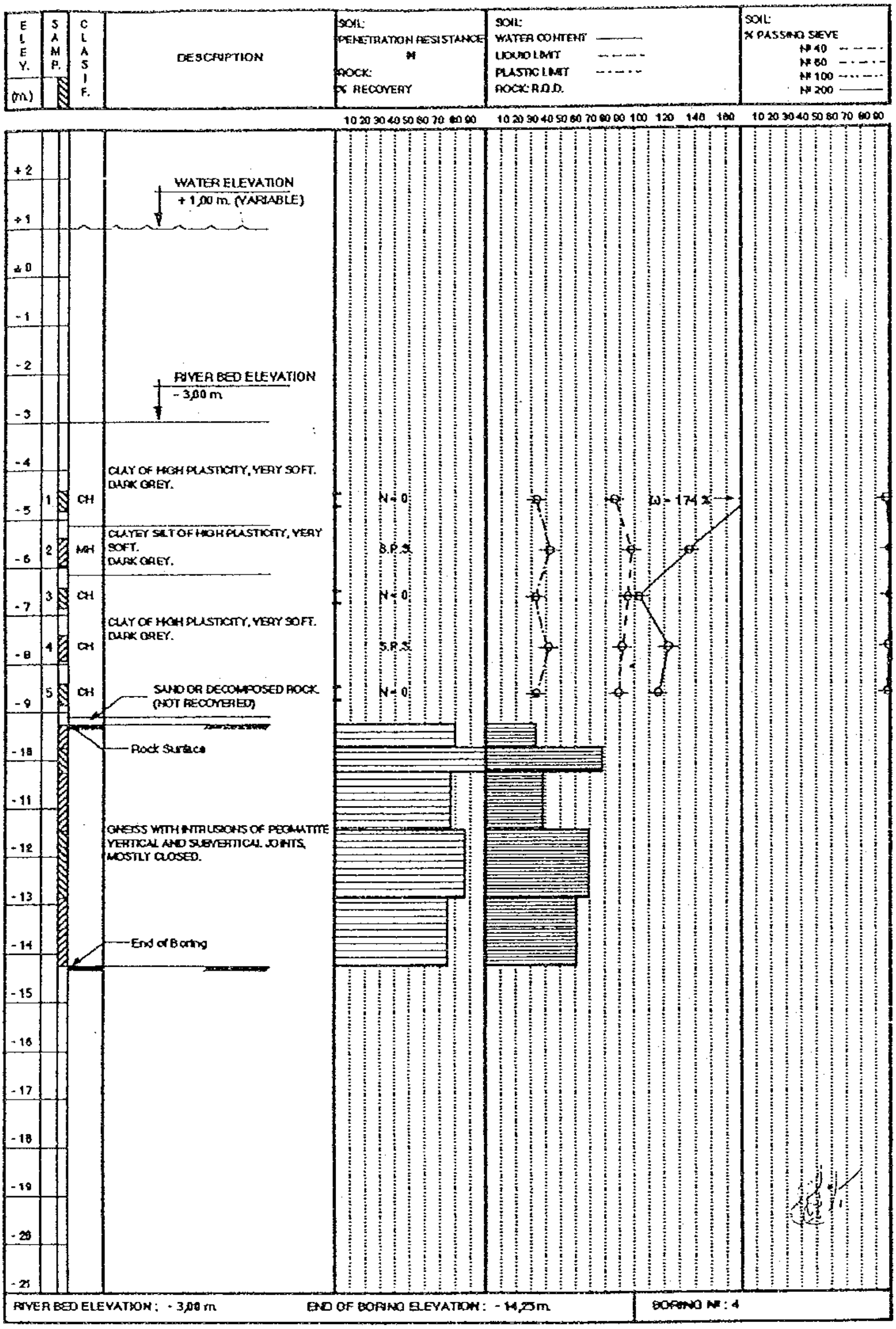
PROJECT :	DEVELOPMENT OF NEW PORT TERMINALS.
LOCATION :	MONTEVIDEO PORT. MONTEVIDEO



GEOPROYECTOS SOCIEDAD CIVIL		
	CLIENT	NIPPON TETRAPOD CO. LTD
	PROJECT	DEVELOPMENT OF NEW PORT TERMINALS
	LOCATION	MONTEVIDEO PORT MONTEVIDEO



G E O P R O Y E C T O S SOCIEDAD CIVIL	CLIENT: NIPPON TETRAPOD CO. LTD. PROJECT: DEVELOPMENT OF NEW PORT TERMINALS. LOCATION: MONTEVIDEO PORT, MONTEVIDEO



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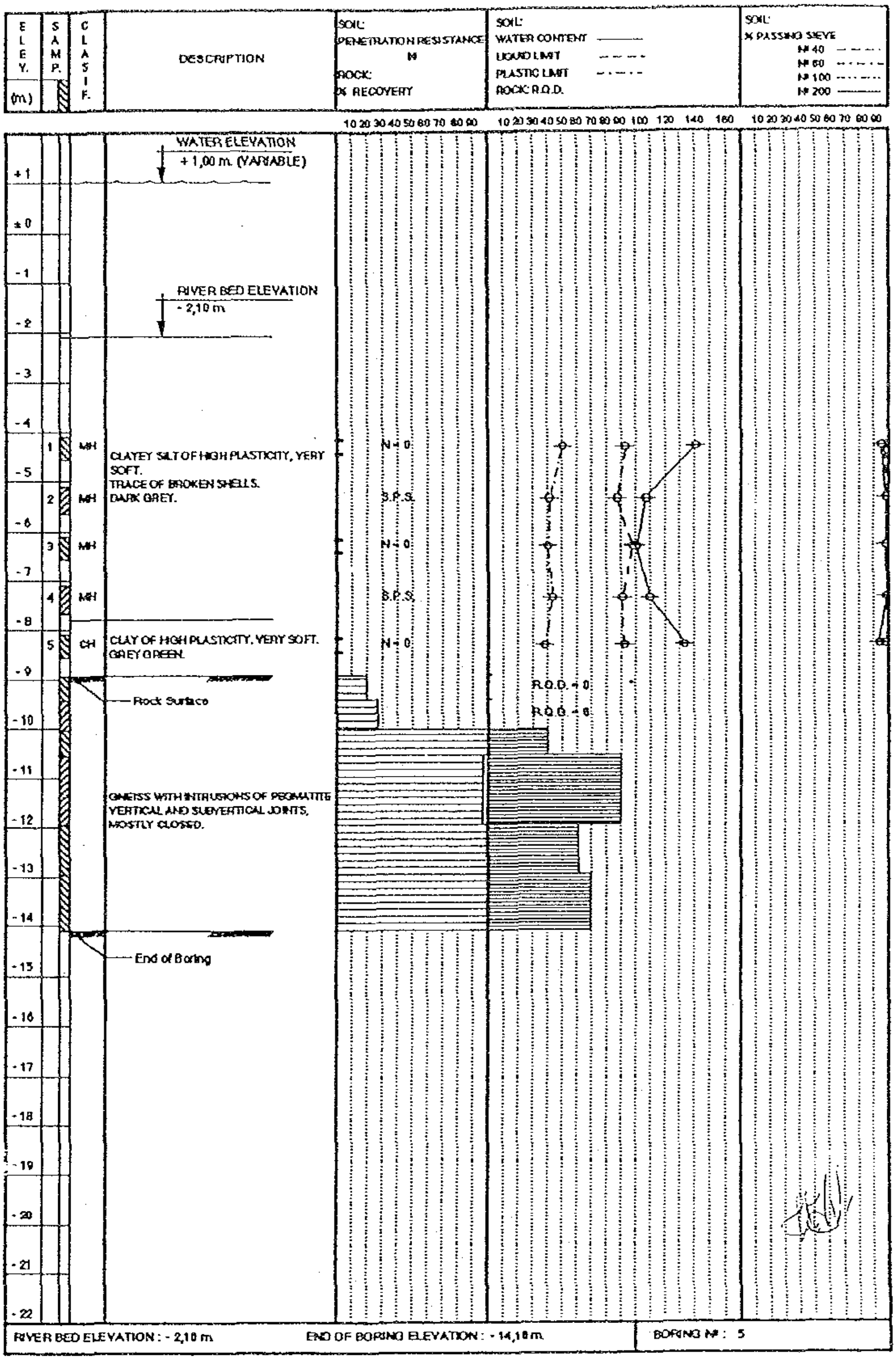
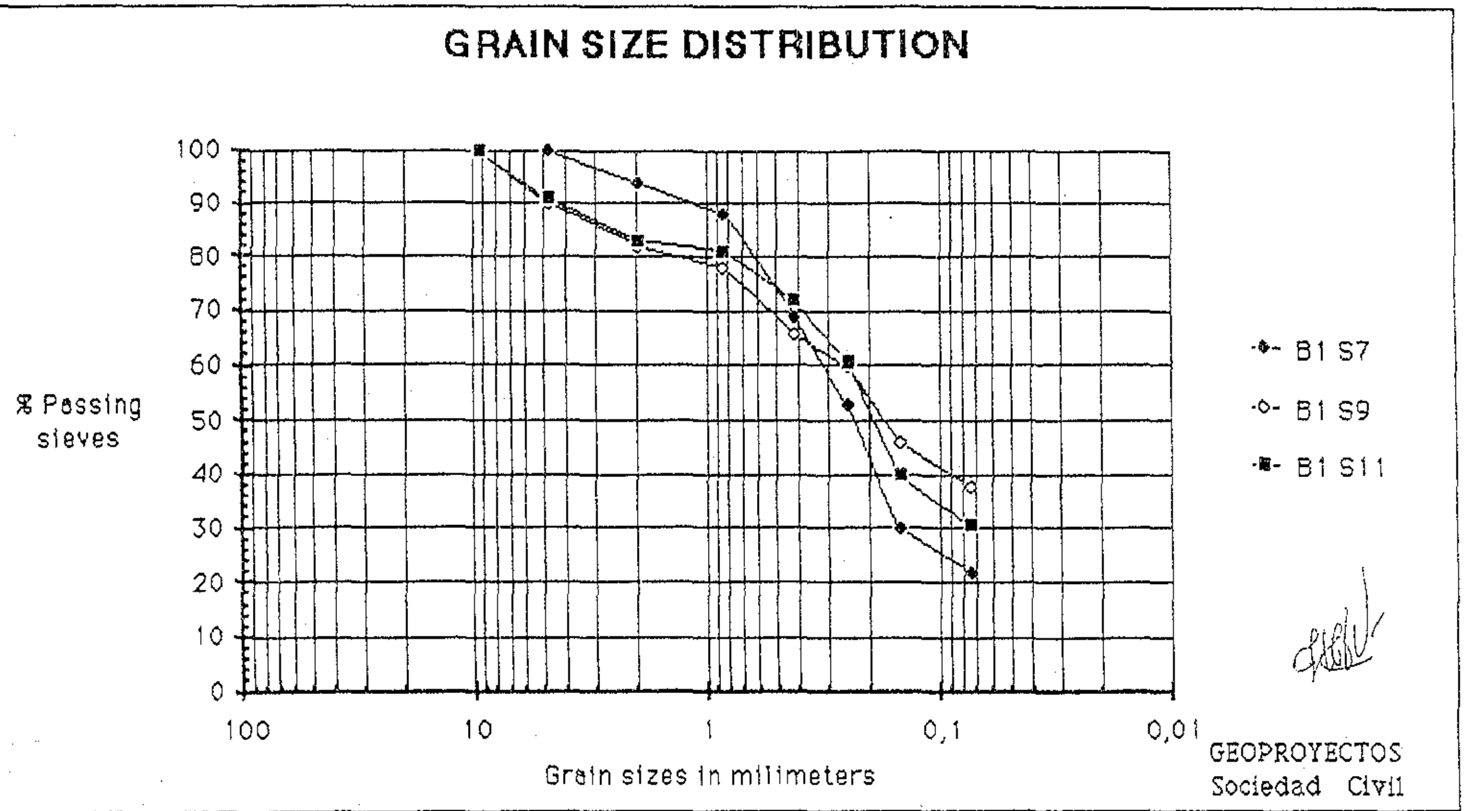
	PROJECT : DEVELOPMENT OF NEW PORT TERMINALS.
	LOCATION : MONTEVIDEO PORT. MONTEVIDEO



GEOPROYECTOS SOCIEDAD CIVIL	CLIENT : NIPPON TETRAPOD CO. LTD.
	PROJECT : DEVELOPMENT OF NEW PORT TERMINALS
	LOCATION : MONTEVIDEO PORT, MONTEVIDEO



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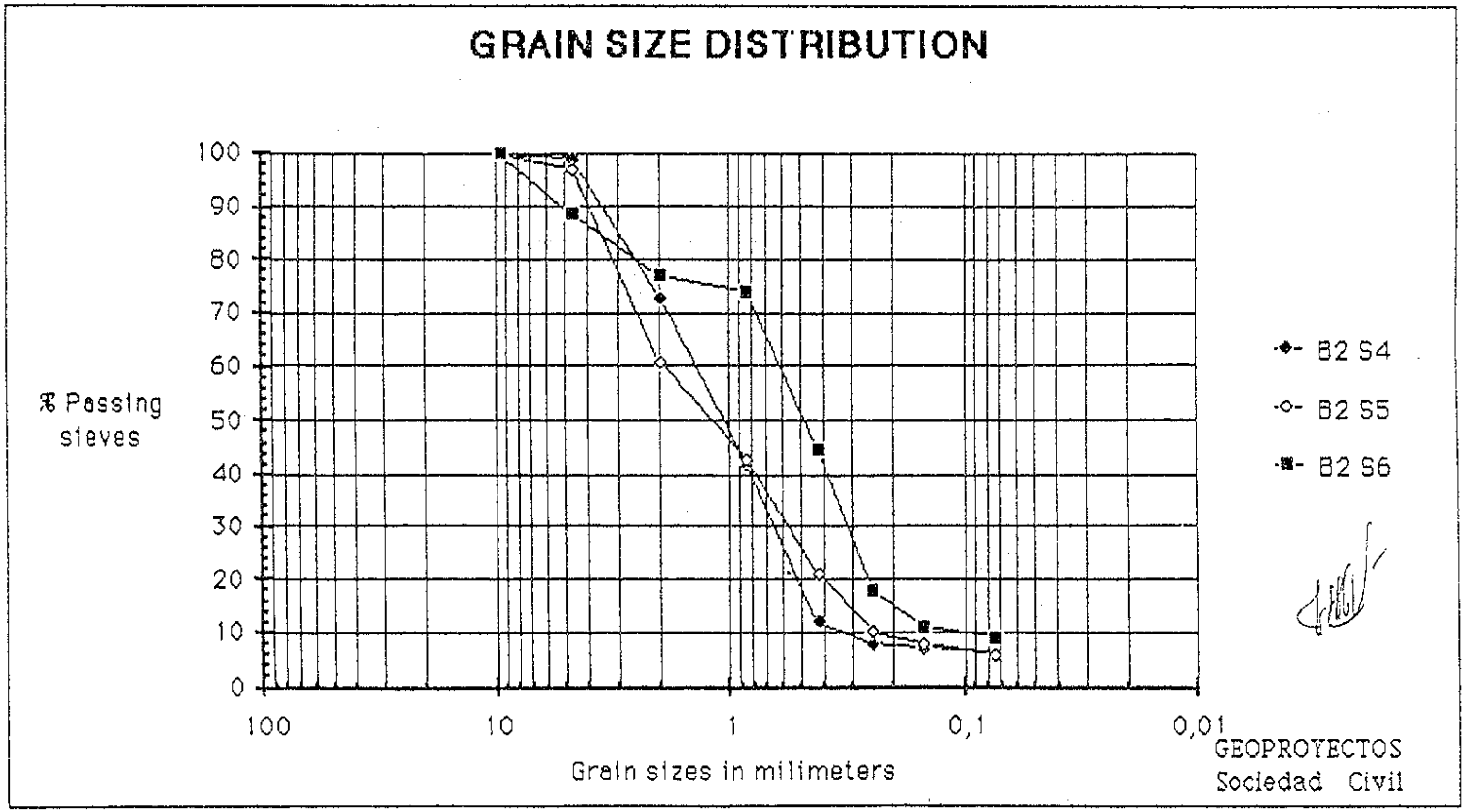
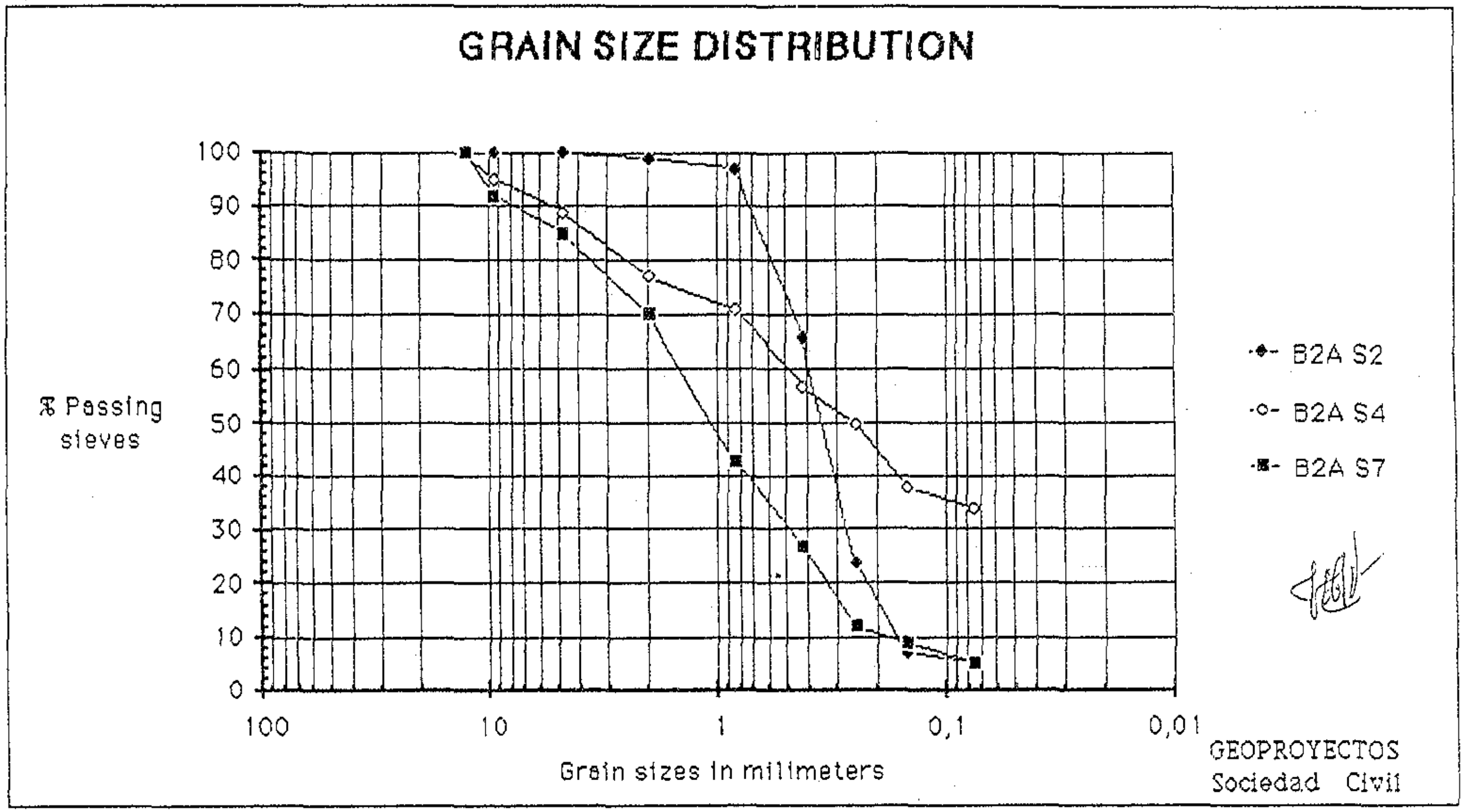

GRAIN SIZE DISTRIBUTION
% Passing sieves
100
90
80
70
60
50
40
30
20
10
0
100
10
1
0,1
0,01
Grain sizes in milimeters
B2 S4
B2 S5
B2 S6
GEOPROYECTOS
Sociedad Civil


GRAIN SIZE DISTRIBUTION
% Passing sieves
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80
70
60
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40
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20
10
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100
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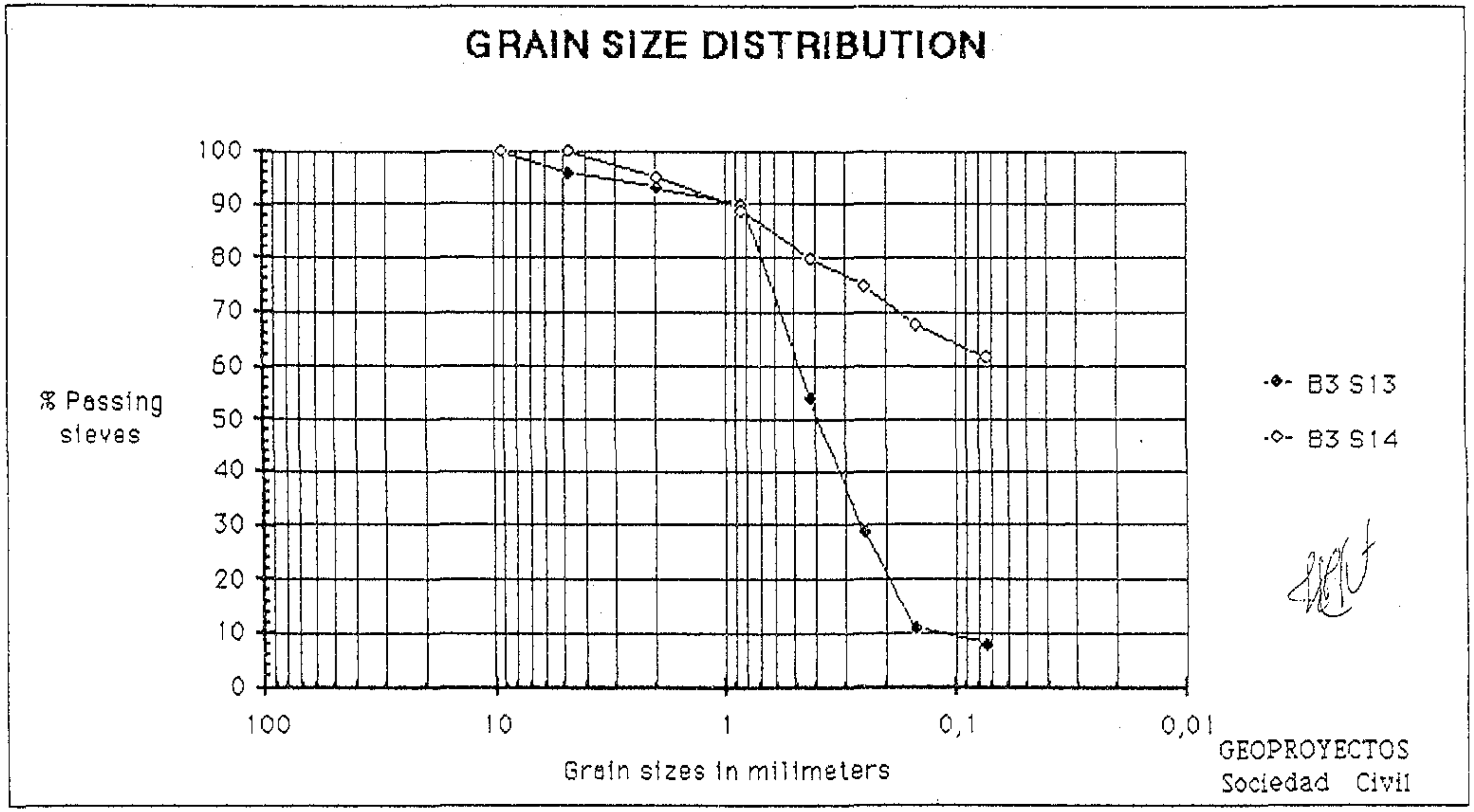
0,1
0,01
Grain sizes in milimeters
B2A S2
B2A S4
B2A S7
GEOPROYECTOS
Sociedad Civil


GRAIN SIZE DISTRIBUTION
% Passing sieves
100
90
80
70
60
50
40
30
20
10
0
100
10
1
0,1
0,01
Grain sizes in milimeters
B3 S13
B3 S14
GEOPROYECTOS
Sociedad Civil

Laboratory tests

Sample	Elevation(m)	q_u	ω	γ_h	γ_d	G
Boring nº 1						
B1S2	- 6,30	--	--	--	--	2,65
B1S4	- 8,30	0,01	157,3	1384	538	2,69
B1S20	- 27,30	--	--	--	--	2,67
Boring nº 2						
B2S2	- 10,40	--	--	--	--	2,62
Boring nº 3						
B3S2 a	- 5,60	0,02	129,7	1455	633	
B3S2 b	- 5,60	0,02	142,1	1406	581	
B3S4 a	- 7,60	0,07	102,6	1442	712	2,73
B3S4 b	- 7,60	0,07	105,2	1438	701	2,73
B3S4 c	- 7,60	0,07	111,7	1416	669	
B3S6 a	- 9,60	0,13	109,5	1533	732	2,76
B3S6 b	- 9,60	0,08	103,8	1579	775	
B3S6 c	- 9,60	0,08	107,8	1485	714	
B3S8 a	- 11,60	0,11	98,8	1470	739	2,77
B3S8 b	- 11,60	0,12	99,1	1472	739	2,74
B3S10 a	- 13,60	0,13	103,6	1439	707	
B3S10 b	- 13,60	0,09	99,2	1481	743	
B3S12 a	- 15,60	0,08	87,6	1510	805	2,75
B3S12 b	- 15,60	0,18	83,0	1527	834	2,82
B3S13	- 16,60	--	--	--	--	2,66

Sample	Elevation(m)	q_u	ω	γ_h	γ_d	G
Boring nº 4						
B4S2 a	- 5,70	0,02	128,3	1425	624	2,77
B4S2 b	- 5,70	0,02	128,2	1423	624	
B4S4 a	- 7,70	0,05	113,2	1480	694	2,82
B4S4 b	- 7,70	0,06	112,4	1478	696	2,88
Boring nº 5						
B5S2	- 5,40	--	--	--	--	2,65
B5S4 a	- 7,40	0,07	110,3	1491	709	2,67
B5S4 ~~a~~ b	- 7,40	0,06	117,6	1472	676	

q_u : Unconfined compressive strenght, $Kg./cm^2$.
ω : Natural water content, %
γ_h : Wet unit weight, $Kg./m^3$.
γ_d : Dry uni weight, $Kg./m^3$.
G : Especific gravity.

A-4 Other Date Related to Grain Transportation

Table A-4-3-1 Grain Storage Capacity in Argentina ('90)

Unit:tons

Province	Farm/Stor.	Offi./Stor.	Client/Stor.	Total/Storage
Buenos Aires	4,282,677	1,438,591	11,746,458	17,393,726
Cordoba	630,397	209,271	3,952,157	4,791,825
Santa Fe	778,938	722,962	6,323,603	7,825,503
Entre Rios	146,167	41,715	875,572	1,063,454
La Pampa	282,702	23,613	1,119,735	1,426,050
Others	184,853	109,938	1,224,359	1,593,150
Total	6,305,734	2,546,090	25,241,884	34,093,708

SOURCES: ANUARIO-90 BANCO VELOX

Table A-4-3-2 Export Volume of Grain Cargoes in Argentina ('85-'90)

Unit: 10^3tons

Products	1985	1986	1987	1988	1989	1989 (1- 6)	1990 (1- 6)
Wheat	9,583	4,020	4,192	3,677	4,323	2,065	4,421
Maize	7,069	7,411	3,987	4,216	1,903	927	1,896
Sorghum	3,275	1,960	1,004	1,476	385	138	657
Others	378	153	156	517	368	208	215
Soybeans	2,963	2,568	1,394	2,087	448	332	1,339
Others for oil	491	653	166	207	218	150	317
Total	23,795	16,747	10,899	12,180	7,645	3,820	8,845

SOURCES:DGEI(S.I.C.) en base a INDEC.-Direccion Nacional de Estadistica de Comercia

Table A-4-3-3 Export Volume of Wheat by Country ('85-'90)

Unit: 10^3 tons

	'85	'86	'87	'88	'89	'89 (1 - 6)	'90 (1 - 6)
CHINA REP.	843	405	800	185	1,127	1,048	727
BRAZIL	845	690	1,079	908	1,036	560	807
IRAN	548	507	500	654	628	174	1,200
U.S.S.R.	4,632	9	541	591	624	592	482
PERU	638	589	413	515	474	361	250
VENEZUELA	0	0	192	148	111	111	0
COLOMBIA	0	90	85	67	99	99	11
TURKEY	0	0	0	0	73	0	410
CUBA	425	66	119	116	50	0	123
INDONESIA	179	164	234	268	1	0	276
OTHERS	1,472	1,500	229	225	100	119	135
TOTAL	9,582	4,020	4,192	3,677	4,323	3,064	4,421

SOURCES: DGEI(S.I.C.) en base a INDEC.-Direccion Nacional de Estadistica de Comercia

Table A-4-3-4 Export Volume of Soybeans by Country ('85-'90)

Unit: 10^3 tons

	'85	'86	'87	'88	'89	'89 (1 - 6)	'90 (1 - 6)
BENELUX	845	615	437	1,089	269	169	435
ITALY	314	307	95	365	53	53	285
GERMANY-WEST	278	360	105	131	34	34	128
GREECE	41	56	14	46	29	19	29
INDONESIA	13	0	0	54	6	0	0
SPAIN	134	211	14	15	0	0	164
NORWAY	58	85	16	28	0	0	27
PORTGAL	217	245	24	217	0	0	76
YUGOSLAVIA	0	54	0	74	0	0	0
MALASIA	39	33	0	60	0	0	64
OTHERS	1,024	620	689	8	57	57	131
TOTAL	2,963	2,586	1,394	2,087	448	332	1,339

SOURCES: DGEI(S.I.C.) en base a INDEC.-Direccion Nacional de Estadistica de Comercia

Table A-4-3-5 Export Volume of Maize by Country ('85-'90)

Unit: 10^3 tons

	'85	'86	'87	'88	'89	'89 (1 - 6)	'90 (1 - 6)
IRAN	802	953	838	497	621	235	462
CUBA	342	303	383	579	574	297	286
GERMANY-WEST	164	117	94	139	125	101	56
BRAZIL	0	927	140	32	111	36	156
BELGIUM	267	252	262	166	90	44	23
ANGOLA	84	8	19	48	68	38	28
ITALY	507	324	231	187	66	8	33
PERU	138	102	0	256	45	25	91
BRITAIN	0	0	0	58	25	25	59
U.S.S.R.	2,040	365	1,200	778	21	21	0
SPAIN	1,004	40	34	186	4	4	53
SINGAPORE	10	12	19	127	2	2	57
JAPAN	469	1,295	268	138	1	1	9
EGYPT	369	359	40	241	0	0	15
PORTUGAL	7	174	25	32	0	0	57
SAUDI ARABIA	15	100	33	41	0	0	76
MALASIA	11	109	115	291	0	0	213
GERMANY-EAST	89	55	0	55	0	0	0
OTHERS	751	1,901	286	365	150	90	222
TOTAL	7,069	7,396	3,987	4,216	1,903	927	1,896

SOURCES: DGEI(S.I.C.) en base a INDEC.-Direccion Nacional de Estadistica de Comercia

Table A-4-3-6 Export Volume of Sorghum by Country ('85-'90)

Unit: 10^3 tons

	'85	'86	'87	'88	'89	'89 (1 - 6)	'90 (1 - 6)
JAPAN	1,367	1,503	784	1,028	190	99	440
CUBA	0	0	37	55	73	0	0
IRAN	0	0	32	32	56	8	0
U.S.S.R.	1,417	0	58	112	53	20	215
TAIWAN	60	176	79	34	0	0	0
MEXICO	396	252	0	43	0	0	0
OTHERS	35	29	14	131	13	11	2
TOTAL	3,275	1,960	1,004	1,435	385	138	657

SOURCES: DGEI(S.I.C.) en base a INDEC.-Direccion Nacional de Estadistica de Comercia

APPENDIX

PART II

Ratio of Containerization

(1) Trend of containerization at the study port

The percentage of containerization is the ratio of the volume of container cargoes to the volume of containerizable cargoes. The volume of containerizable cargo was estimated by an assessment of the physical characteristics of the major cargo categories and their suitability for containerization from the ANP statistics in 1990. The main categories of goods suitable for containerization include most "meat and related products", "others", some of "agricultural products" (52 % as export, 87 % as import), and "manufacturing"(32 %).

(2) Setting of logistic curves representing trend of progress of containerization

It is known from surveys at many ports with advanced containerization that the percentage of containerization approximately changes according to a logistic curve.

The equation for logistic curves representing the progress of containerization is;

$$P = \frac{Pm}{1 + C(t-to)}$$

Where P : Percentage of containerization in t year

Pm: Theoretical limit of percentage of containerization

C : Constant to determine shape of curve

t : Year

to : Time lag shown by unit of year(constant)

Theoretical limit of percentage of containerization (Pm) is 85 % in export cargo and 60 % in import cargo. The study team assumed that wood and stone are not container cargo in export and steel is not container cargo in import.

Value of constant C is 0.8260 in export and 0.4989 in import. Value of constant to is 9.2 year in export and 3.7 year in import.

A-3-1 Diffraction of Waves

1) The frequency spectrum of Bretshneider-Mitsuyasu is as follows:

$$S(f) = 0.257H^2_{1/3}T_{1/3}(T_{1/3}f)^{-5}\exp[-1.03(T_{1/3}f)^{-4}]$$

2) The directional wave spectrum is expressed as $S(f;\theta)=S(F)G(f;\theta)$ where $G(f;\theta)$ is the directional spreading function. The directional spreading function of Mitsuyasu is as follows:

$$G(f;\theta)=Go\cos^{2S}\left(\frac{\theta}{2}\right)$$

where,

$$Go=\left[\int_{\theta_{min}}^{\theta_{max}}\cos^{2s}\left(\frac{\theta}{2}\right)d\theta\right]^{-1}$$

$$S=\begin{cases} S_{max}\ (f/fp)^5 & \text{for } f \leqq fp \\ S_{min}\ (f/fp)^{-2.5} & \text{for } f \geqq fp \end{cases}$$

fp: frequency at the spectral peak

$$S_{max}=\begin{cases} 10 & \text{for wind waves} \\ 25 & \text{for swell with short decay distance} \\ 75 & \text{for swell with long decay distance} \end{cases}$$

3) The diagrams of distribution of diffraction coefficient are shown in Figure A-3-1 for the wave direction SE, S and SW.

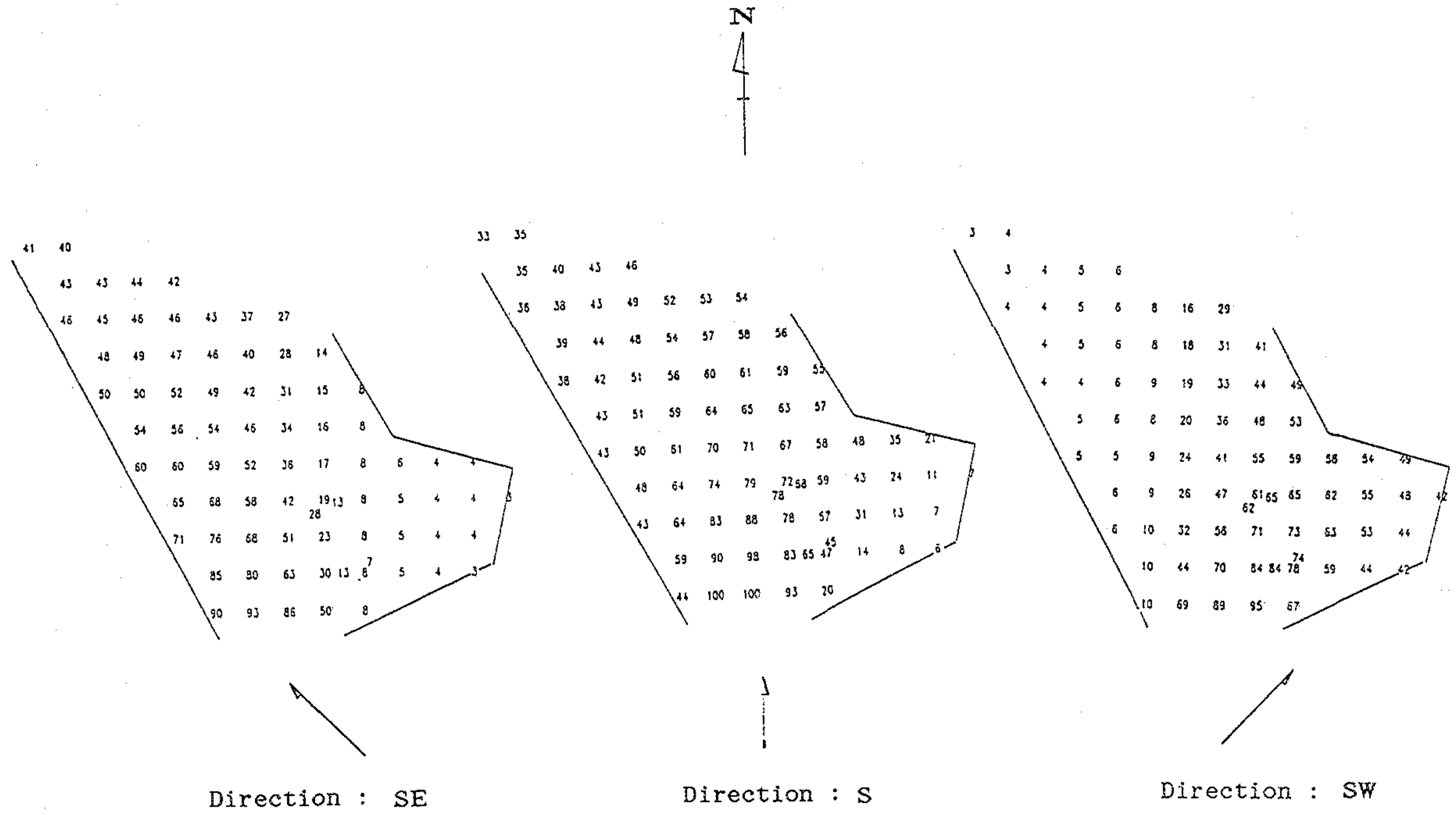


Figure A-3-1 Distribution of Diffraction Coefficient in Montevideo Port (Unit: %)

A-3-2 Calculation of Flying Distance

Concerning the flying distance of small particles, one equation has been proposed. The equation described below is used for calculating the distance. The result calculated by this formula is considered to show a referential value.

Flying distance of dust (l) is calculated using following formula:

$l = 18 \times \mu \times Vw \times h/(d^2(rp-r)) \times R$ ---------------------(1)

where: rp = specific gravity of flying particle (kg/m^2)

r = specific gravity of air ($1.25\ kg/m^3$)

μ = viscosity coefficient of air ($1.8 \times 10^{-6}\ kg\ S/m^2$)

Vw = wind velocity (m/s)

h = generation height of dust

d = diameter of flying particle

R = coeficient of correction (1.0)

As r is very small compared to rp, it is possible to consider as follows:

$rp - r = rp$

Therefore, formula (1) is as follows:

$l = 3.24 \times 10^{-5}\ Vw/(d^2 x rp)$

Here, the specific gravity and diameter of flying particle are determined as follows, using data of wheat.

$rp = 1.46 \times 10^3\ Kg/m^3$

$d = 12 \sim 33\ \mu$

Accordingly, l is calculated as follows:

$l = 0.204 \sim 1.541 \times 10^2 \times Vw \times h$

Therefore, when Vw and h are equal to 5m/s and 5m, respectively, l is calculated at 0.5 ~ 3.8 Km.

The result of calculation described above shows one possibility of flying distance of small grain particles. According to this result, area influenced by dust of grain is relatively large.

A-5-4 Estimation Basis of Unit Price of Dredging

Dredging costs have been estimated based on the unit price given in the following equation:

$$\text{Unit Price (US\$/m}^3) = \frac{\text{Expense For Work Per Day (US\$)}}{\text{Work Volume Per Day (m}^3)}$$

Then, the expense for work per day includes expenses for both operation per day and additional non-operation day. As the rate of non-operation, 0.15 non-operation days per one operation day is adopted in this estimation considering the site conditions such as natural condition, labor condition, etc. Large portion of this expense comprises the rent of construction equipment, that is the rent of dredger in this case, and a trailing suction dredger with 3,000 m^3 of hopper similar to that owned by ANP is adopted as a dredger from the consideration of work efficiency and condition of sediment to be dredged. Also, this trailing suction dredger is assumed to be delivered from Brazil, on the assumption that this project will be implemented by international bid.

Here will be calculated as below the expense of dredging work per day (Ed) for the case of dredging mud at the Foreport for example:

Ed = 1 day X Operation + 0.15 X Non-operation
= 1 X 26,479.10 + 0.15 X 6,704.00
= 27,484.00 (US$)

Breakdown is as follows:

(1) Operation

Unit: US$

1) Equipment rent fixed:	1	day			=	6,230.00
2) Equipment rent for: operation hours	24	hrs	X	686.00	=	16,464.00
3) Chief crew:	60	persons	X	11.25	=	675.00
4) Crew:	90	persons	X	8.32	=	748.00
5) Fuel:	4,544	liter	X	0.40	=	1,817.00
6) Others:	30	%	X	1,817.00	=	545.10
Total						26,479.10

(2) Non-operation

Unit: US$

1) Equipment rent fixed:	1 day			=	6,230.00
2) Equipment rent for: operation hours	9 hrs	X	686.00	=	0.00
3) Chief crew:	20 persons	X	11.25	=	225.00
4) Crew:	30 persons	X	8.32	=	249.00
5) Fuel:	0 liter	X	0.40	=	0.00
6) Others:	30 %	X	0.00	=	0.00
Total					6,704.00

In the above breakdown, it is assumed that dredging work will be carried out in three shifts a day with 8 hours work, and the equipment rent adopted herewith has been obtained from the rent calculated based on the international purchase price of a trailing suction dredger, that is approximately 9 million US$.

On the other hand, the dredging volume per day (Qd) of mud at the Foreport is calculated as follows:

$$Qd = 2,160 \ m^3/trip \ X \ 24 \ hrs/ \ 3 \ hrs/trip$$
$$= 17,280 \ m^3$$

The value of 2,160 m^3 in the above calculation is the useful capacity of hopper and obtained as follows:

Based on a 0.80 of sponginess coefficient and a 90 % of efficiency factor in the hopper filling, the useful hopper capacity is 3,000 m^3 X 0.80 X 0.90 = 2,160 m^3.

From the results of the above calculation, the unit price of direct cost for the case of dredging mud at the Foreport is obtained as below:

$$\text{Unit Price (US\$/m}^3) = \frac{\text{Ed (US\$)}}{\text{Qd (m}^3)}$$

$$= \frac{27,484.00}{17,280}$$

$$= 1.59 \ (\text{US\$/m}^3)$$

By adding the indirect cost including overhead, transportation cost, etc to the above obtained value of 1.59 (US$/m^3), the unit price required for the dredging work is obtained as 1.86 (US$/m^3).

For the other cases such as dredging clay or mud at the Approach Channel or dredging mud at the Transfer Station, the unit prices are also obtained in the same way by changing each value of Qd and fuel, and the results are as shown below.

Clay at the Approach Channel (case 1):	1.83 US$/m^3
Mud at the Approach Channel (case 2):	1.28 US$/m^3
Mud at the Transfer Station (case 3):	1.86 US$/m^3

The unit prices for the above three cases are obtained by using the following values of fuel and Qd indicated in Table A-5-1.

Table A-5-1 Fuel and Qd

Case	Fuel (liter)	Qd (m^3)	Calculation
Case 1	3,968	17,280	2,160 m^3/trip x 24 hrs/ 3 hrs/trip
Case 2	4,352	24,685	2,160 m^3/trip x 24 hrs/ 2.1 hrs/trip
Case 3	4,544	17,280	2,160 m^3/trip x 24 hrs/ 3 hrs/trip

A-9 Consideration of Grain Terminal Located at Site 3

From the view point that the structural change of transportation system and development of the Montevideo Port in future are difficult to be forecast accurately, the ANP requested further study on Site 3 where the space for the transportation system by both sea and land is easily reserved. So, here will be prepared some basic information on the grain terminal at Site 3.

A-9-1 Preliminary Design

A-9-1-1 Design Conditions

The design conditions described below are the same as those of Site 4 except the soil condition.

As the soil condition, the profile B7 in Figure 2-4-2-1 of Part I is applied to the entire area of the mooring facilities of grain terminal of this site, although it is sure that this area is not uniform in soil condition. The profile B7 is also shown in Figure A-9-1-1, where only Standard Penetration Test was conducted until - 17 m below the sea level with no soil sampling and laboratory test. Therefore, in designing the structures, it has been assumed that the kind of soil is sandy clay and that the N-value in deeper part than - 17 m is the same as that at -17 m.

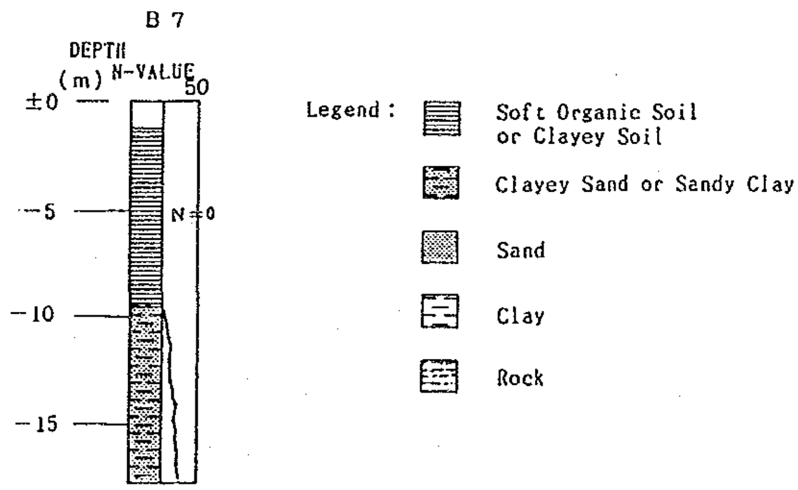


Figure A-9-1-1 Soil Profile at B7

A-9-1-2 Design

The plan view of mooring facilities is shown in Figure A-9-1-2. The designed structures are shown in Figure A-9-1-3 to A-9-1-7. Comparing with those of Site 4, the foundation piles at Site 3 become longer than Site 4, in addition to enlarging the diameter of foundation piles of the approach jetty. And as for the grain handling and storage facilities, the length of receiving conveyor becomes short from 400 m to 100 m due to the change of layout plan. The others are the same as Site 4.

A-9-1-3 Comments

The same as Site 4.

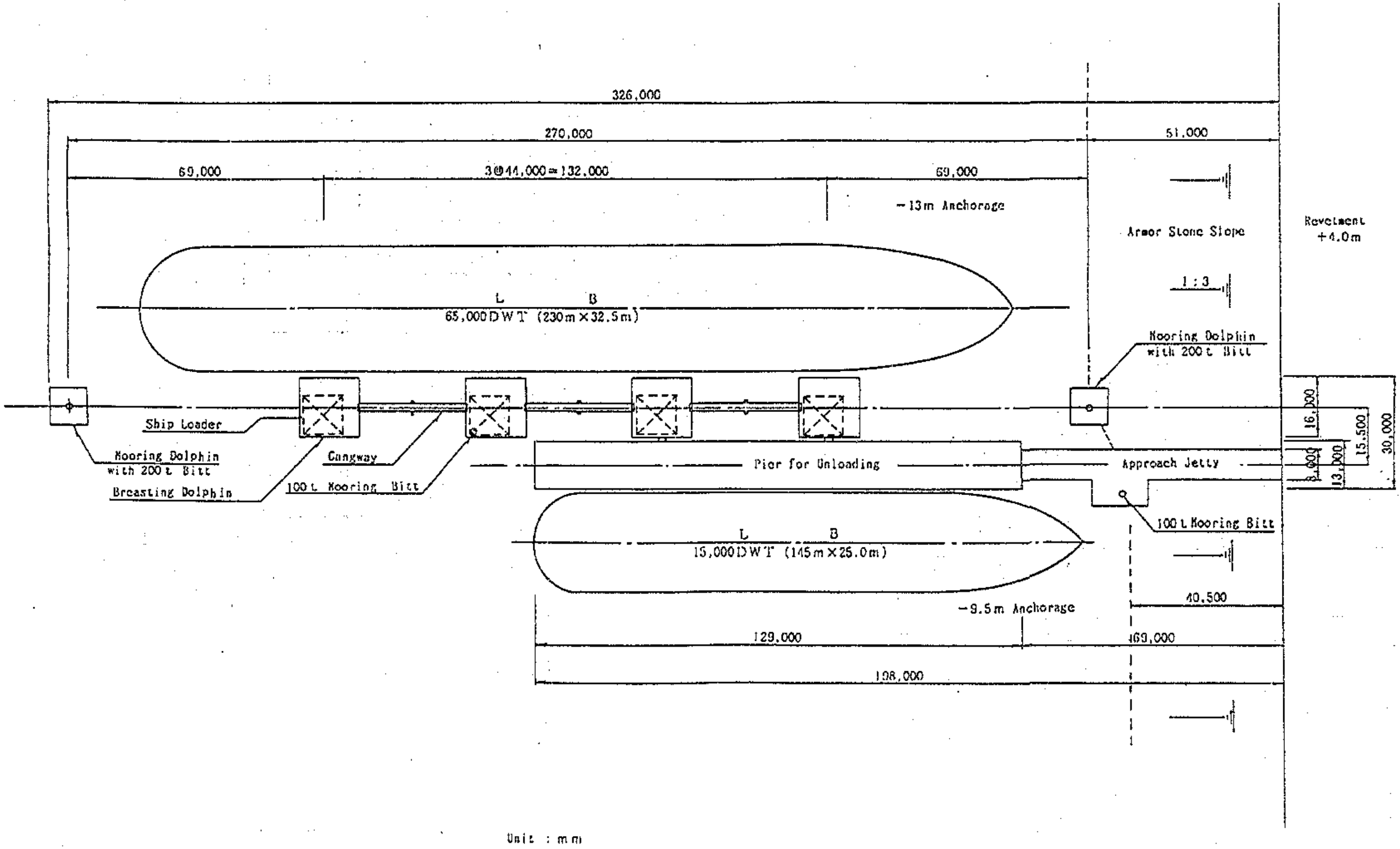


Figure A-9-1-2 Plan View of Mooring Facilities at Grain Terminal

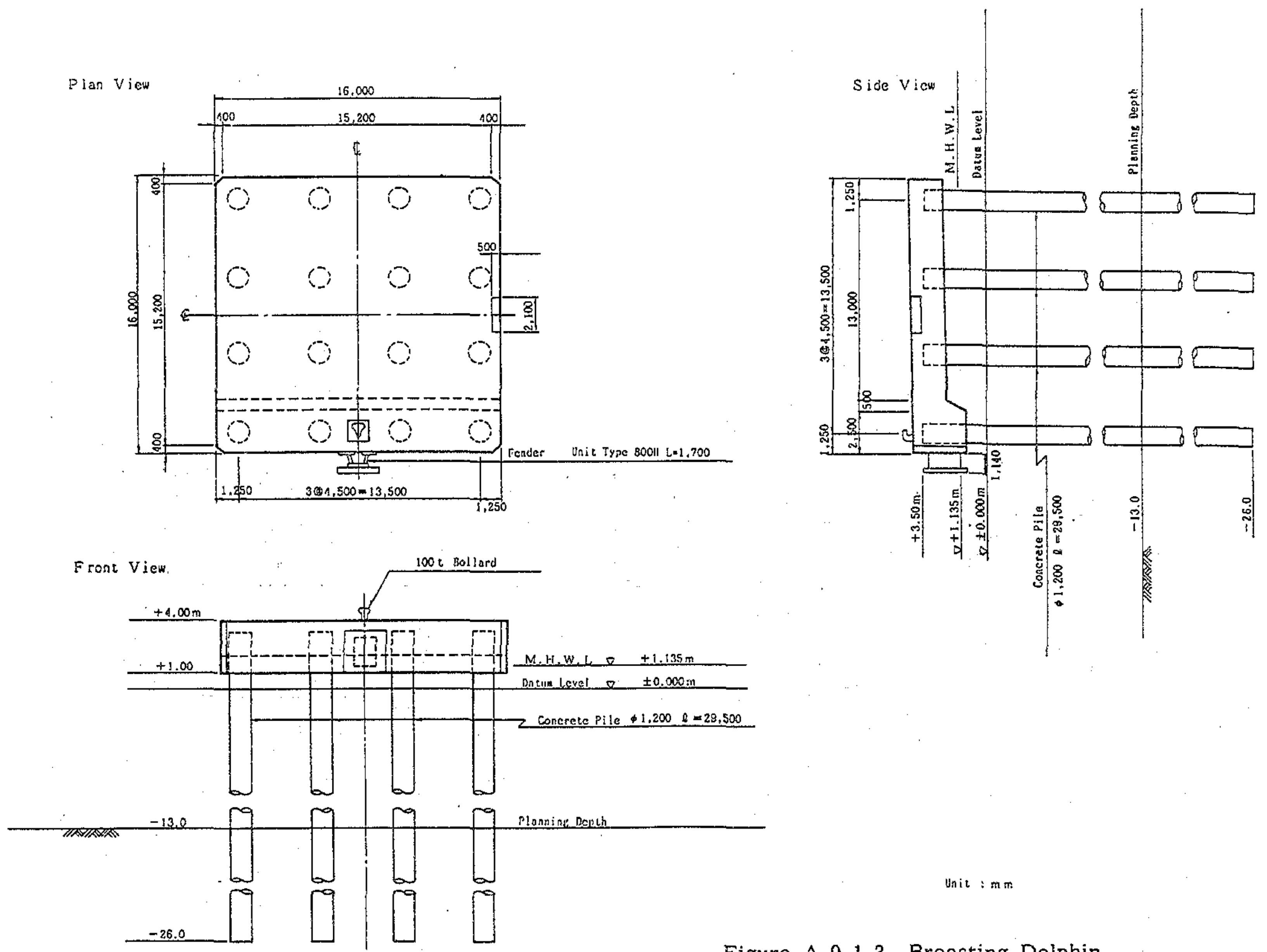
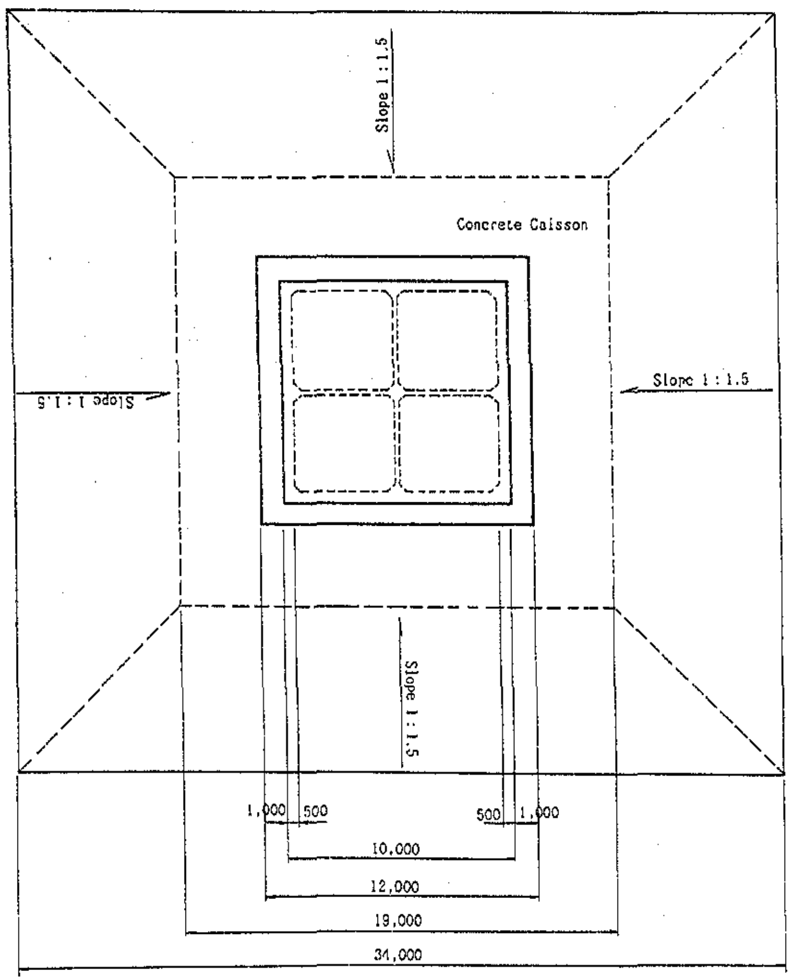
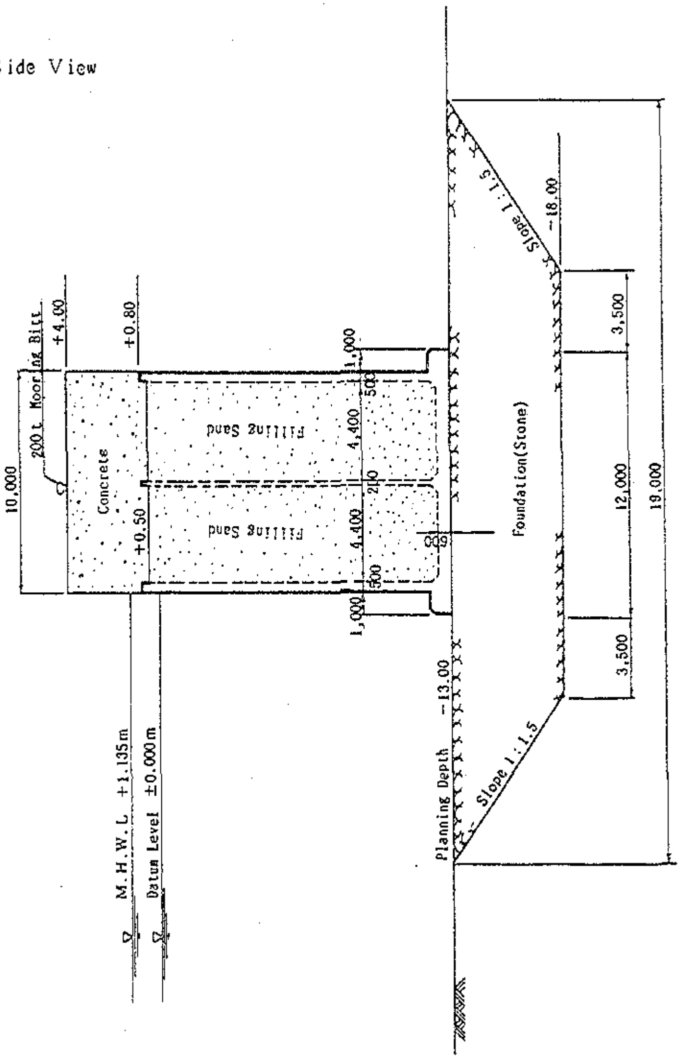


Figure A-9-1-3 Breasting Dolphin

Plan View

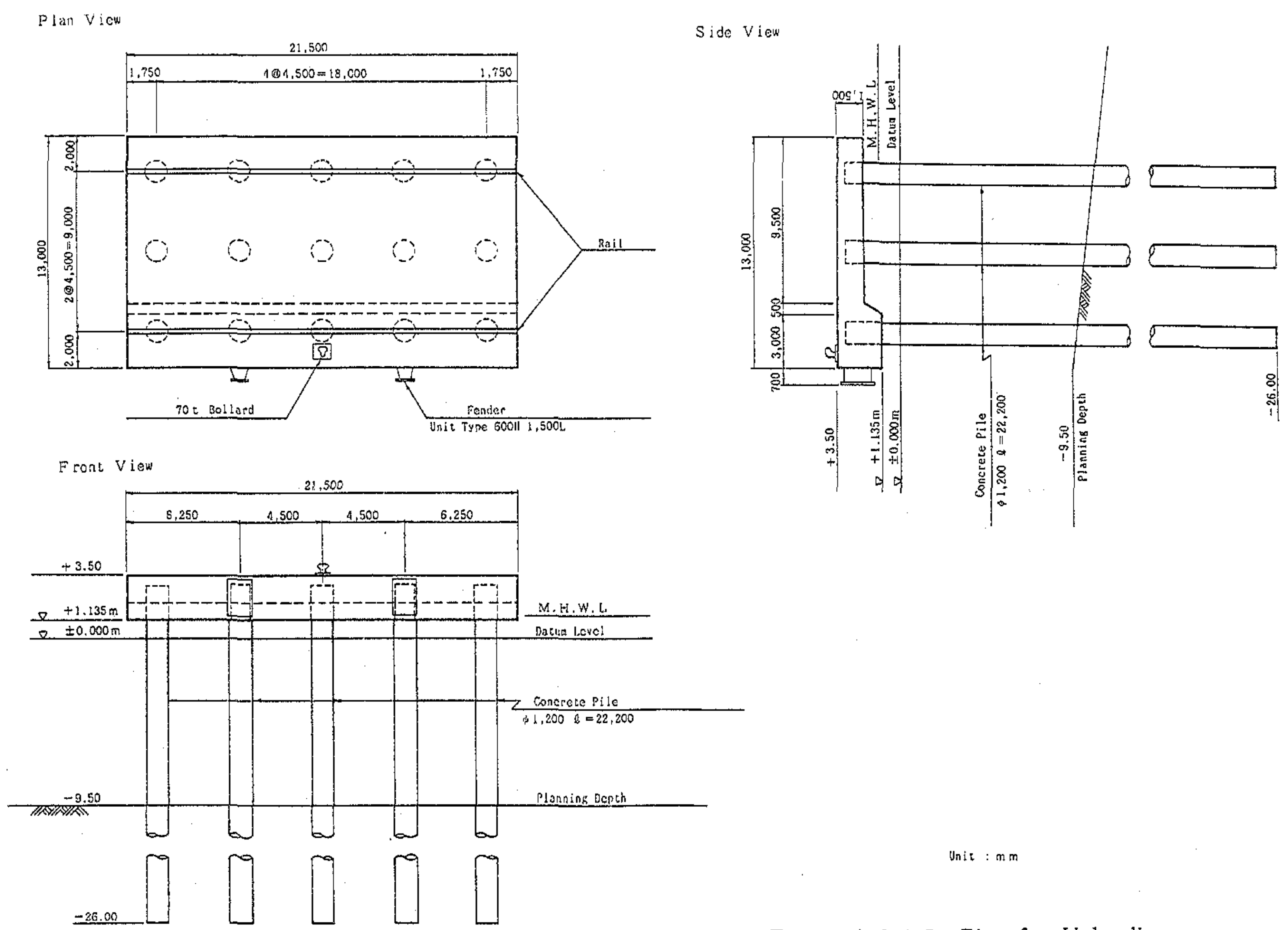


Side View



Unit: mm

Figure A-9-1-4 Mooring Dolphin



Unit : mm

Figure A-9-1-5 Pier for Unloading

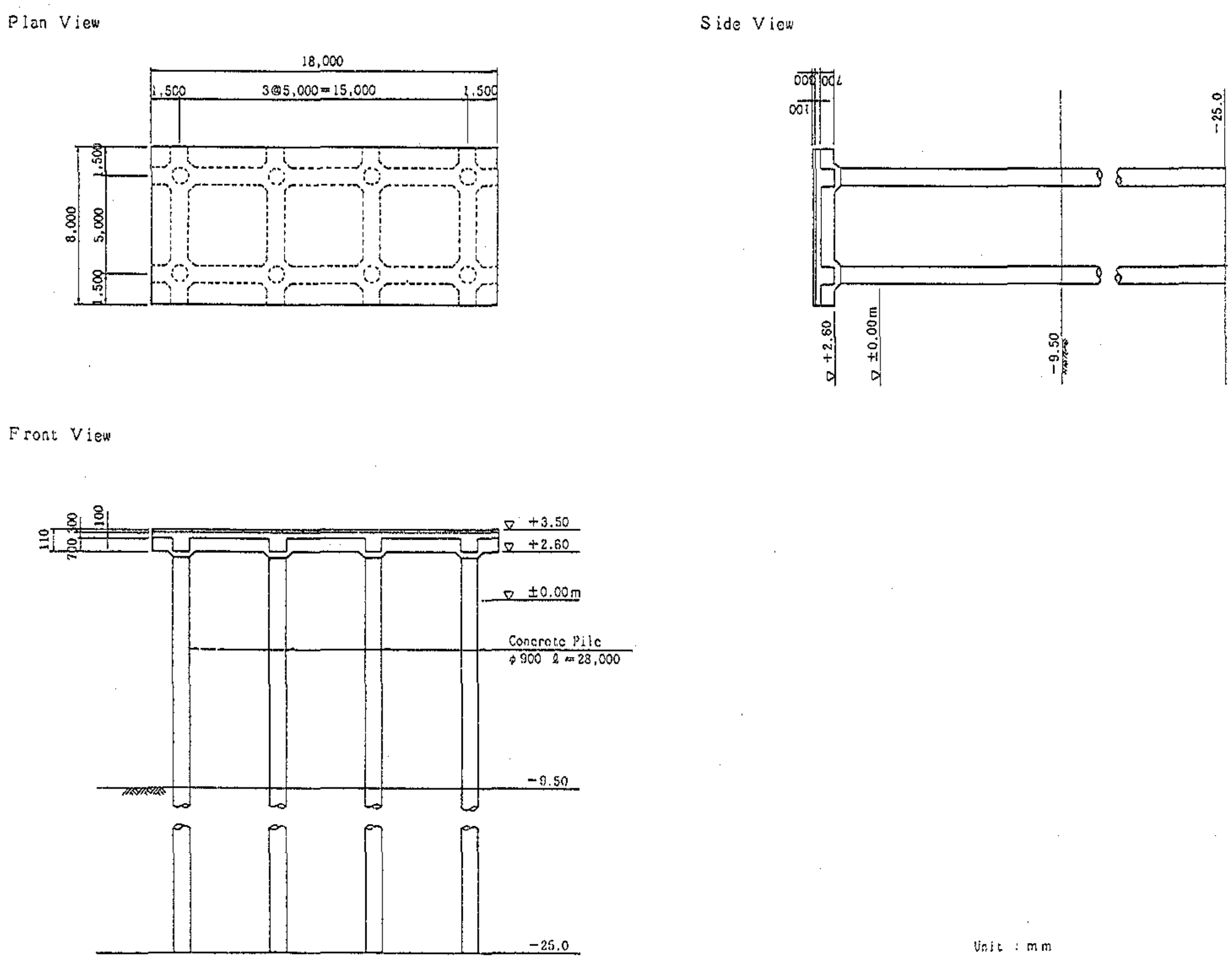


Figure A-9-1-6 Approach Jetty

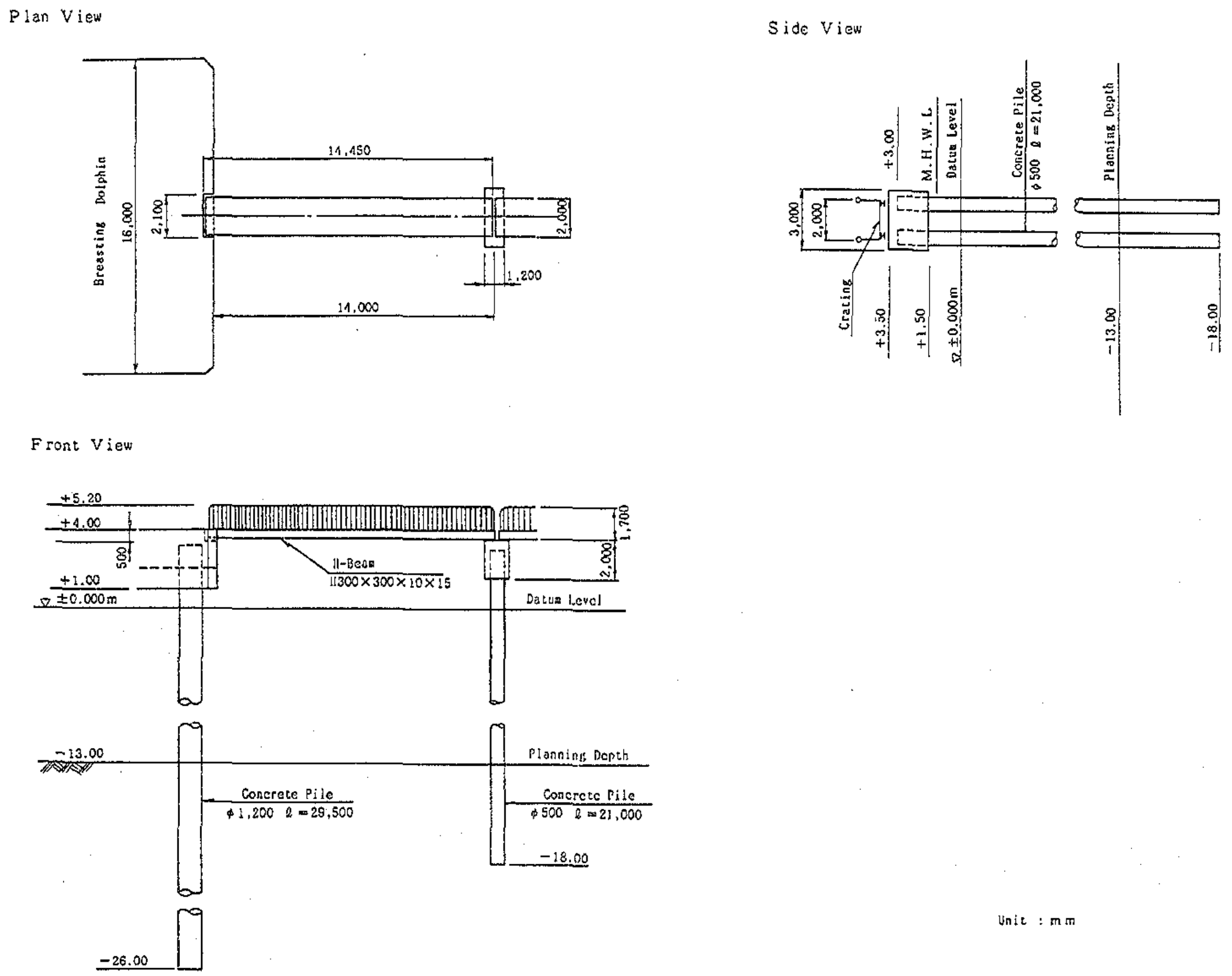


Figure A-9-1-7 Gangway

A-9-2 Construction and Cost Estimation

A-9-2-1 Construction Quantities

(1) Facilities

The construction quantities of facilities of the grain terminal at Site 3 are presented in Table A-9-2-1.

(2) Materials

The main materials needed for the construction are listed in Table A-9-2-2. Water, fuel and electricity are not included in this table. As shown in the table, a great amount of materials are needed for the construction. Therefore, the supply method of the materials should be examined in more detail before construction.

Table A-9-2-1 Grain Terminal Facilities and Construction Quantities

Facility		Unit	Quantity	Remarks
1. Dredging	(1) Transfer Station	m^3	5,753,500	-13m/-9.5m Depth
	(2) Foreport	m^3	443,700	-12m Depth
	(3) Ancap Channel	m^3	940,500	-12m Depth
	(4) Approach Channel	m^3	11,833,000	-12m Depth, 160m Width
2. Reclamation	(1) Silo Area	m^3	629,800	23,500 m^2
	(2) Access Road	m^3	243,000	13,500 m^2
3. Slope Protection	(1) Access Road	m	1,830	Armor Stone Slope
4. Mooring Facilities	(1) Breasting Dolphin	unit	4	Concrete Pile
	(2) Mooring Dolphin A	unit	2	Concrete Caisson
	(3) Unloading Pier	m	129	Concrete Pile
	(4) Approach Jetty	m	53	Concrete Pile
	(5) Mooring Dolphin B	unit	1	Concrete Pile
5. Pavement	(1) Silo Area	m^2	3,738	Asphalt Pavement
	(2) Access Road	m^2	10,800	Asphalt Pavement
6. Breakwater		m	1,400	Crown Height +4.0m Crown Width 3m
7. Grain Handling Facilities	(1) Unloader	unit	2	700 ton/hr
	(2) Ship Loader	unit	4	900 ton/hr
8. Grain Storage Facilities	(1) Silo	unit	1	93,000 ton
	(2) Wharf Conveyor for Unloading	line	2	700 ton/hr X 200m
	(3) Receiving Conveyor	line	2	700 ton/hr X 400m
	(4) Delivery Conveyor	line	2	900 ton/hr X 400m
	(5) Wharf Conveyor for Loading	line	2	900 ton/hr X 100m

Table A-9-2-2 Main Construction Materials

Facility	Main Materials					
	Steel (t)	Concrete (m^3)	Stone (m^3)	Filling (m^3)	Asphalt (m^3)	Others
1. Dredging	---	---	---	---	---	
2. Reclamation	---	---	---	606,600	---	Fence (620 m)
3. Slope Protection	---	---	39,960	---	---	
4. Mooring Facilities	980	13,400	7,200	1,990	---	Rubber Fenderr (16 sets) Bitt & Bollard (12 sets) Beacon (2sets), Rail (220m)
5. Pavement	---	---	3,250	---	1,450	
6. Breakwater	---	---	392,000	---	---	
7. Grain Handling Facilities	832	---	---	---	---	
8. Grain Storage Facilities	9,185	---	---	---	---	
Total	10,997	13,400	442,410	608,590	1,450	

A-9-2-2 Construction Procedure

(1) Basic Concept

Basic concept of construction of grain terminal at Site 3 is much the same as that of Site 4. Entire volume of work is a little larger than Site 4, but the volume of dredging and filling only increases. Therefore, equipment and labourers for the construction works will be locally procurable except for large sized construction crafts such as sand carrier with grab bucket, floating crane for cast-in-place pile, etc.

(2) Construction of Each Facility

Construction procedures of main facilities are much the same as those of Site 4, but the foot protection of cast-in-place concrete pile is unnecessary because bedrock like Site 4 dose not exist at the foundation area for the piling work, and rock drilling are also unnecessary. The steel casing for cast-in-place concrete piles is only required.

A-9-2-3 Construction Schedule

Construction schedule of the grain terminal at Site 3 is presented in Table A-9-2-3.

Table A-9-2-3 Construction Schedule of the Grain Terminal Facilities

Facility		Unit	Quantity	Construction Year				
Item	Sub Item			1993	1994	1995	1996	1997
1. Dredging	(1) Transfer Station	m^3	5,753,500		—		—	—
	(2) Foreport	m^3	443,700				—	—
	(3) Ancap Channel	m^3	940,500				—	—
	(4) Approach Channel	m^3	11,833,000					—
2. Reclamation	(1) Silo Area	m^3	629,800			—	—	
	(2) Access Road	m^3	243,000			—		
3. Slope Protection	(1) Access Road	m	1,830				—	
4. Mooring Facilities	(1) Breasting Dolphin	unit	4		—	—		
	(2) Mooring Dolphin A	unit	2		—			
	(3) Unloading Pier	m	129		—	—		
	(4) Approach Jetty	m	53			—		
	(5) Mooring Dolphin B	unit	1			—		
5. Pavement	(1) Silo Area	m^2	3,738					—
	(2) Access Road	m^2	10,800					—
6. Breakwater		m	1,400		—	—		
7. Grain Handling Facilities	(1) Unloader	unit	2				—	
	(2) Ship Loader	unit	4				—	—
8. Grain Storage Facilities	(1) Silo	unit	1				—	—
	(2) Conveyor Facilities	line	2				—	—

A-9-2-4 Cost Estimation

This section presents the construction cost of grain terminal at Site 3.

Estimate conditions and procedure described in the section 5 - 4 of Part II are also applied to this section.

The summary of estimated construction costs is presented in Table A-9-2-4. And Table A-9-2-5 shows the annual investment and Table A-9-2-6 shows the annual maintenance dredging cost.

Table A-9-2-4 Construction Cost of the Grain Terminal

Facility		Unit	Quantity	Construction Cost ('000 US$)		
				Total	Foreign Portion	Local Portion
1. Dredging	(1) Transfer Station	m^3	5,753,500	10,697	0	10,697
	(2) Foreport	m^3	443,700	825	0	825
	(3) Ancap Channel	m^3	940,500	1,749	0	1,749
	(4) Approach Channel	m^3	11,833,000	16,092	0	16,092
	Sub-Total	LS	1	29,363	0	29,363
2. Reclamation	(1) Silo Area	m^3	629,800	4,897	3,326	1,571
	(2) Access Road		243,000	1,457	1,278	180
	Sub-Total	LS	1	6,354	4,603	1,751
3. Slope Protection	(1) Access Road	m	1,830	3,346	0	3,346
4. Mooring Facilities	(1) Breasting Dolphin	unit	4	2,792	1,064	1,728
	(2) Mooring Dolphin A	unit	2	915	66	849
	(3) Unloading Pier	m	129	4,013	1,541	2,472
	(4) Approach Jetty	m	53	556	168	388
	(5) Mooring Dolphin B	unit	1	698	266	432
	Sub-Total	LS	1	8,974	3,106	5,868
5. Pavement	(1) Silo Area	m^2	3,738	724	0	724
	(2) Access Road	m^2	10,800	186	0	186
	Sub-Total	LS	1	538	0	538
6. Breakwater		m	1,400	15,348	1,281	14,067
7. Grain Handling Facilities		unit	1	17,194	14,453	2,741
8. Grain Storage Facilities		unit	1	25,584	10,434	15,149
Total		LS	1	106,887	33,878	73,009
8. Engineering Services		LS	1	5,415	2,659	2,756
9. Physical Contingency		LS	1	3,654	605	3,049
10. Tax		LS	1	12,015	0	12,015
Grand Total		LS	1	127,971	37,142	90,829

Table A-9-2-5 Annual Investment at the Grain Terminal

Unit: '000 US$

Facility		Unit	Quantity	1994			1995			1996			1997			Total		
				F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total	F/C	L/C	Total
1. Dredging	(1) Transfer Station	m^3	5,753,500	0	5,349	5,349	0	0	0	0	3,209	3,209	0	2,139	2,139	0	10,697	10,697
	(2) Foreport	m^3	443,700	0	0	0	0	0	0	0	330	330	0	495	495	0	825	825
	(3) Ancap Channel	m^3	940,500	0	0	0	0	0	0	0	1,049	1,049	0	699	699	0	1,749	1,749
	(4) Approach Channel	m^3	11,833,000	0	0	0	0	0	0	0	0	0	0	16,092	16,092	0	16,092	16,092
	Sub-Total	LS	1	0	5,349	5,349	0	0	0	0	4,588	4,588	0	19,426	19,426	0	29,363	29,363
2. Reclamation	(1) Silo Area	m^3	629,800	0	0	0	998	471	1,469	2,328	1,100	3,428	0	0	0	3,326	1,571	4,897
	(2) Access Road		243,000	0	0	0	1,278	180	1,457	0	0	0	0	0	0	1,278	180	1,457
	Sub-Total	LS	1	0	0	0	2,275	651	2,926	2,328	1,100	3,428	0	0	0	4,603	1,751	6,354
3. Slope Protection	(1) Access Road	m	1,830	0	0	0	0	0	0	0	3,346	3,346	0	0	0	0	3,346	3,346
4. Mooring Facilities	(1) Breasting Dolphin	unit	4	958	1,555	2,513	106	173	279	0	0	0	0	0	0	1,064	1,728	2,792
	(2) Mooring Dolphin A	unit	2	66	849	915	0	0	0	0	0	0	0	0	0	66	849	915
	(3) Unloading Pier	m	129	1,079	1,730	2,809	462	741	1,204	0	0	0	0	0	0	1,541	2,472	4,013
	(4) Approach Jetty	m	53	0	0	0	168	388	556	0	0	0	0	0	0	168	388	556
	(5) Mooring Dolphin B	unit	1	0	0	0	266	432	698	0	0	0	0	0	0	266	432	698
	Sub-Total	LS	1	2,103	4,134	6,237	1,003	1,734	2,737	0	0	0	0	0	0	3,106	5,868	8,974
5. Pavement	(1) Silo Area	m^2	3,738	0	0	0	0	0	0	0	0	0	0	186	186	0	186	186
	(2) Access Road	m^2	10,800	0	0	0	0	0	0	0	0	0	0	538	538	0	538	538
	Sub-Total	LS	1	0	0	0	0	0	0	0	0	0	0	724	724	0	724	724
6. Breakwater		m	1,400	512	5,627	6,139	769	8,440	9,209	0	0	0	0	0	0	1,281	14,067	15,348
7. Grain Handling Facilities		unit	1	0	0	0	0	0	0	11,562	2,193	13,755	2,891	548	3,439	14,453	2,741	17,194
8. Grain Storage Facilities		unit	1	0	0	0	0	0	0	4,174	6,060	10,234	6,260	9,090	15,350	10,434	15,149	25,584
Total		LS	1	2,615	15,109	17,724	4,047	10,826	14,873	18,064	17,287	35,351	9,151	29,788	38,939	33,878	73,009	106,887
9. Engineering Services		LS	1	131	756	887	202	541	743	1,478	452	1,930	848	1,007	1,855	2,659	2,756	5,415
10. Physical Contingency		LS	1	236	962	1,198	253	628	881	116	452	568	0	1,007	1,007	605	3,049	3,654
11. Tax		LS	1	0	2,810	2,810	0	3,317	3,317	0	3,398	3,398	0	2,490	2,490	0	12,015	12,015
Grand Total		LS	1	2,982	19,637	22,619	4,502	15,312	19,814	19,658	21,589	41,247	9,999	34,292	44,291	37,142	90,829	127,971

Table A-9-2-6 Annual Maintenance Dredging Cost

Dredging Area	Area (m^2)	Shoaling Height (m/year)	Dredging Volume (m^3)	Cost ('000 US$)	Remarks
Approach Channel	---	----	2,214,000	2,457	-11 to -12m
Port Mouth	132,800	0.80*0.3	31,872	51	-11 to -12m
Central Area	163,000	0.29*0.3	14,181	22	-11 to -12m
Transfer Station	512,650	0.7	358,855	570	-12/-13m
Total				3,100	

A-9-3 Economic Analysis for Site 3

In this chapter, the economic analysis is conducted to evaluate the economic feasibility of the Grain Terminal located at site 3.

A-9-3-1 Method

The various factors and conditions used in the economic analysis for the Grain Terminal located at site 3 are the same as mentioned in chapter 7 in part II except construction cost.

A-9-3-2 Construction Cost

Construction costs at economic Prices of the Grain Terminal located at site 3 are shown in Table A-9-3-1.

Table A-9-3-1 Construction costs at Economic Prices

Item	Market Price (US$ '000)	Economic Price (US$ '000)
Civil Work		
Dredging		
Transfer Station	10,697	7,105
Foreport	825	548
Ancap Channel	1,749	1,162
Approach Chanel	16,092	10,689
Reclamation		
Silo Area	4,897	4,367
Access Road Area	1,457	1,397
Slope Protection	3,346	2,227
Mooring Facilities		
Bresting Dolphin	2,792	2,211
Mooring Dolphin A	915	629
Unloading Pier	4,013	3,181
Approach Jetty	556	425
Mooring Dolphin B	698	553
Pavement		
Silo Area	186	124
Access Road Area	538	359
Break Water	15,348	10,616
Mechanical Work		
Load/Unloading Equip.	17,194	16,197
Silo	25,584	20,041
Engineering Services	5,415	4,595
Physical Contingency	3,654	2,628
Total	115,956	89,053

A-9-3-3 Result of Cost Benefit Analysis

Table A-9-3-2 shows the calculated results of the cost-benefit analysis of the Grain Terminal located at site 3.

EIRR of this project is calculated at 7.7%.

The sensitivity analysis for EIRR yealds 6.1% for case A, 6.0% for case B, and 4.4% for case C.

Case A:The costs increase by 10%.

Case B:The benefits decrease by 10%.

Case C:The costs increase by 10% and the benefits decrease by 10%.

Table A-9-3-2 Cost-Benefit Analysis

No	Year	Benefit – Cost	Net Present Value (NPV)		
			Benefit	Cost	Benefit – Cost
1	1994	(14,247)	0	14,247	(14,247)
2	1995	(12,504)	0	11,609	(11,609)
3	1996	(31,380)	0	27,050	(27,050)
4	1997	(30,922)	0	24,748	(24,748)
5	1998	47,470	37,673	2,399	35,274
6	1999	2,470	3,932	2,228	1,704
7	2000	2,470	3,650	2,068	1,582
8	2001	2,470	3,389	1,920	1,469
9	2002	2,470	3,147	1,783	1,364
10	2003	2,470	2,922	1,655	1,266
11	2004	2,470	2,713	1,537	1,176
12	2005	2,470	2,519	1,427	1,092
13	2006	2,470	2,338	1,325	1,014
14	2007	2,470	2,171	1,230	941
15	2008	47,470	17,932	1,142	16,790
16	2009	2,470	1,871	1,060	811
17	2010	2,470	1,738	984	753
18	2011	2,470	1,613	914	699
19	2012	2,470	1,498	849	649
20	2013	2,470	1,391	788	603
21	2014	2,470	1,291	731	560
22	2015	2,470	1,199	679	520
23	2016	2,470	1,113	631	482
24	2017	(13,726)	1,033	3,522	(2,489)
25	2018	47,470	8,535	544	7,992
26	2019	2,470	891	505	386
27	2020	2,470	827	469	358
28	2021	2,470	768	435	333
29	2022	2,470	713	404	309
30	2023	17,359	(1,429)	(3,445)	2,016
Total		108,866	105,437	105,437	0

EIRR=7.7%

A-9-4 Financial Analysis for the Grain Terminal Located at Site 3

In this chapter, the financial analysis is conducted to evaluate the financial feasibility of the grain terminal located at site 3.

A-9-4-1 Methodology

The viability of the project is analyzed using the Discount Cash Flow Method and appraised by the FIRR (financial internal rate of return), which is the same method used in chapter 8 Financial Analysis of part II.

A-9-4-2 Prerequisites

The various factors and conditions used in this analysis are the same as mentioned in chapter 8 except investment costs and maintenance and repair costs including maintenance dredging costs. These costs are estimated in A-9-2-4. The initial investment costs and annual administration costs of the grain terminal located at site 3 are shown in Table A-9-4-1 and A-9-4-2.

Table A-9-4-1 Investment Costs of Grain Terminal Located at Site 3

(Unit 1000US$)

	1994	1995	1996	1997	Total
Dredging	5,349		4,588	19,426	29,363
Reclamation		2,926	3,428		6,354
Slope Protection			3,346		3,346
Mooring Facilities	6,237	2,737			8,974
Pavement				724	724
Breakwater	6,139	9,209			15,348
Loading/Unloading Equipment			13,755	3,439	17,194
Silo			10,234	15,350	25,584
Sub-Total	17,725	14,872	35,351	38,939	106,887
Engineerig Services	887	743	1,930	1,855	5,415
Physical Contingency	1,198	881	568	1,007	3,654
Tax	2,810	3,317	3,398	2,490	12,015
Grand Total	22,620	19,813	41,247	44,291	127,971

Table A-9-4-2 Administration Costs of Grain Terminal Located at Site 3

(Unit $)

Kinds of Costs	Amount	Remarks
Maintenance, Repair Costs	4,097,410	
Mooring Facilities, etc.	597,450	Original Construction Cost x 1%
Handling Facilities	399,960	Original Construction Cost x 2%
Dredging	3,100,000	
Personnel Costs	807,240	
Manager	55,800	1person x $3000/m x 12 x 1.55
Superintendent	33,480	1person x $1800/m x 12 x 1.55
Shift Superintendent	44,640	2persons x $1200/m x 12 x 1.55
Operator	167,400	12persons x $750/m x 12 x 1.55
Programmer	29,760	2persons x $800/m x 12 x 1.55
Clerk	27,900	2persons x $750/m x 12 x 1.55
Inspector	29,760	2persons x $800/m x 12 x 1.55
Tallyman	55,800	4persons x $750/m x 12 x 1.55
Laborer	297,600	32persons x $500/m x 12 x 1.55
Administration Clerk	65,100	5persons x $700/m x 12 x 1.55
Electricity Bill	366,000	$0.061/KW x 6,000,000KW
Other Administration Costs	403,620	Personnel Costs x 50%
Total	5,674,270	

A-9-4-2 Appraisal

(1) Scenarios

To examine the impact on the FIRR, the following conditions are established;

1) Case A: The grain terminal shares the total maintenance dredging cost.
2) Case B: The grain terminal shares two-third of it.
3) Case C: The grain terminal shares half of it.

(2) Appraisal

The results are shown in Table A-9-4-3. The FIRR does not exceed the interest rate of the funds of 8% in every case.

Judging from the above analysis, the grain terminal project located at site 3 cannot be regarded as financially feasible.

Table A-9-4-3 FIRR of the Grain Terminal Located at Site 3

	FIRR
Case A	5.5%
Case B	6.4%
Case C	6.8%

FINAL REPORT

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FEBURUARY 1993

JAPAN INTERNATIONAL C