2-3-3 Hinterland and Traffic Demand

The hinterland delineation is determined by the complex interaction of many different factors such as the capacity of port facilities, charges for using port facilities, congestion in the port area, commercial practices and tradition, transportation facilities linked with the port, cost of transportation to the port, etc. In the said feasibility study for Bahia Blanca development, the cargo traffic was estimated for each port by simulation with attention paid to the existing hinterland area of each port.

In the following, an analysis of the transportation method that can minimize the total cost incurred by the entire grain transportation system (sum total of costs for grain transportation from producing areas to loading on grain carriers) is made, in order to determine what sort of transportation system will be most desirable for the national economy from a long-range point of view. Since commercial transactions and grain transportation service are carried out mainly by private sector enterprises, it cannot be argued that such a system that minimizes the total transportation cost will be realized in the future. Nevertheless, the minimization of total transportation cost will serve as an important objective function in formulating a development plan for various infrastructural facilities supporting the grain export, such as roads, railways, ports and channels.

(1) Procedure of analysis

The following steps are taken to how much of exportable surplus of each zone is to be transported to which port in order to obtain the highest overall economic efficiency.

Step 1 A roadnetwork and a railway network are input in the computer memory, to which the centroid of each zone (point of traffic demand generation) is connected. Railways and roads are connected at points where the grain transhipment is possible.

Step 2 Transportation cost per km of railway and road, road-railway transhipping cost, various port charges and costs, carrier transportation cost, etc. are input.

Step 3 Obtain the cheapest route from each zone to each port.

Step 4 Obtain the optimum transportation plan by the linear programming method. For this purpose, the following calculation is worked out.

to minimize $\sum_n \sum_m C_{mn} X_{mn}$

under conditions $\sum_k X_{ik} = G_i$

$\sum_k X_{kj} \leqq A_i$

$X_{ij} \geqq 0$

where, G_i : Exportable surplus of zone i

A_j : Capacity of port J

C_{ij} : Transportation cost from zone i to port j

X_{ij} : Grain traffic from zone i to port j

(2) Preconditions for analysis

1) Grain export port

Four ports of Zone Beta, Port Island off Sta. Teresita, Quequen and Bahia Blanca are assumed. Zone Beta can be considered a topping-off terminal or a floating elevator terminal. Shipment to Zone Beta is made from four ports of Buenos Aires, Villa Constitucion, Rosario and Santa Fe. If topping-off operation is planned, about 30% of grains shipped from river ports are assumed to be transhipped in Zone Beta.

2) Truck/railway transportation cost

Economic cost of truck/railway transportation is expressed by the following formulas in the feasibility study for Bahia Blanca development.

truck $Y = 5.980 + 0.032D$
railway $Y = 2.437 + 0.011D$

where, D: Transport distance
Y: Transportation cost for D km (economic cost in US$)

Transshipping cost from truck to railway and vice versa is set at US$1.5/ton.

3) Land transportation network

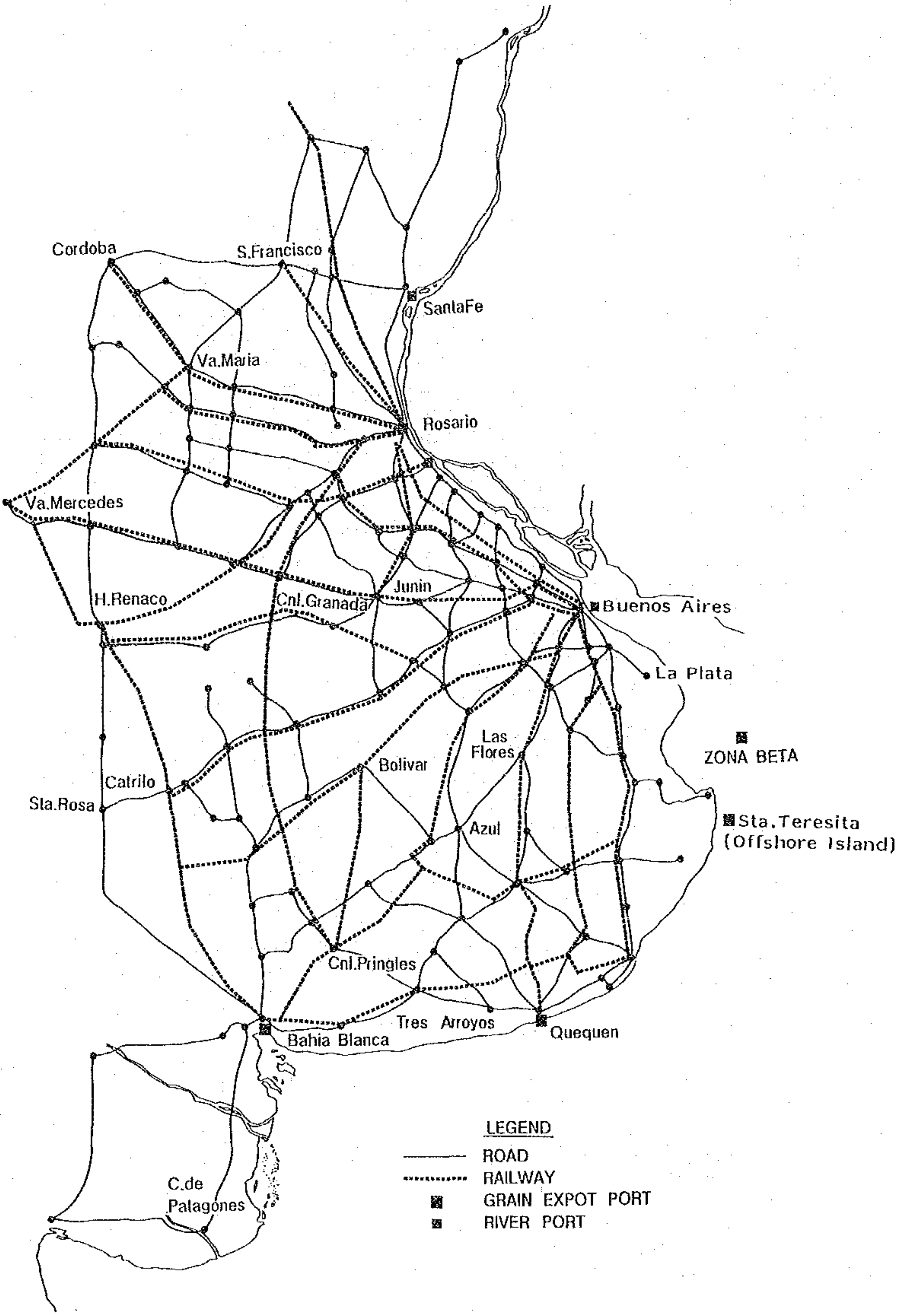
Truck and railway transportation network is assumed as shown in Figure IV-2-7.

4) Costs after unloading at port

The following items are considered as costs to be incurred after unloading grains at the port.

- Cargo handling cost (unloading/silo/loading)
- Pilotage/tug
- Demurrage
- Other port charges
- E. Mitre Channel due
- Topping-off cost

Figure IV-2-7 Transportation Network for Grain Export



5) Cargo handling cost

Economic loading/unloading cost is taken at half the tariff. It amounts to US$1.5/ton at Santa Fe, Villa Constitucion and Buenos Aires, and to US$3.0/ton at other ports. Silo storage cost is assumed to be US$0.05/ton/day, and the average storage period is taken at 10 days.

6) Carrier size

For account items varying by the carrier size, the weighted mean of dues and charges is adopted, based on the assumption that 60% are composed of 30,000 DWT-class carriers and 40% of 60,000 DWT-class ones.

7) Pilotage and tugboat service

The following costs are assumed to be the prevailing tariff.

(Unit: US$/ton)

	Pilotage	Tug
Santa Fe	0.40	0.47
Rosario	0.27	-
Villa Constitucion	0.27	0.23
Buenos Aires	0.13	0.38
Santa Teresita	0.03	0.23
Quequen	0.03	0.23
Bahia Blanca	0.14	0.40

8) Demurrage

Demurrage is set at US$3,000/day for 30,000 DWT-class carriers and US$5,000/day for 60,000 DWT-class ones, and the weighted mean of ¢9.3/ton/day is adopted.

9) Other port charges

An amount of ¢20/ton/day is assumed for all charges.

10) E. Mitre Channel due

Since the channel due is US$3,730 for 30,000 DWT-class carriers and US$8.924 for 60,000 DWT-class carriers, an amount of weighted average ¢13/ton is adopted.

11) Topping-off cost

An amount of US$15/ton is collected as the topping-off charge, but the cost of topping-off operation is estimated at US$6.8/ton. Since 30% of grains shipped from river ports are estimated to be transshipped in Zone Alpha or Zone Beta, the average topping-off cost is assumed to be US$2.04/ton for all grains transported from river ports along the Parana and La Plata.

12) Unit trains

In case the policy is to develop and promote the Atlantic ports (Bahia Blanca, Quequen, the port of the artificial island off Sta. Teresita) as main grain export ports, and to connect main inland producing areas and their export ports by unit train service, the transport cost is calculated at 20% less than the value given by the formula in 2).

(3) Results of analysis

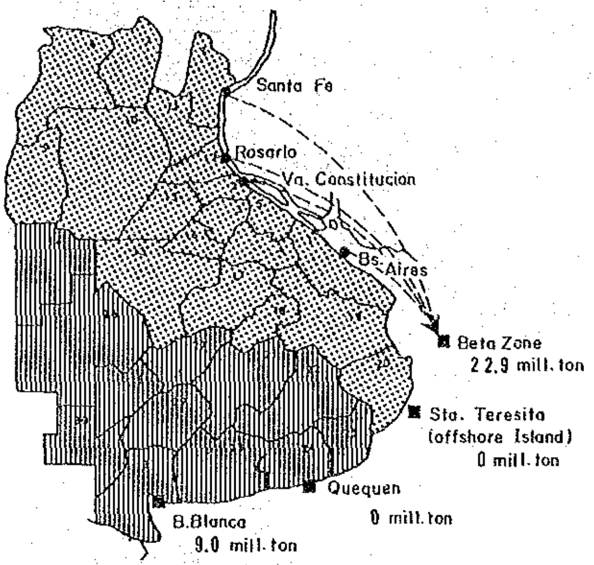
The following Cases 1 to 6 of Figures IV-2-8 and IV-2-9 show how the export quantity in the year 2000 given in the Table IV-2-11 in 2-3-2 can be distributed to these ports in the above mentioned conditions. The analysis gives the following suggestions as guidelines for improvement of infrastructure to support future grain export. (It should be taken into account that the analysis is very rough one, and that the conclusions drawn hereunder are only provisional ones. An accurate analysis requires to have in its mode also other factors like running cost and capacity of roads and railways, export season of each grain, types of ocean-going grain carriers, costs of construction and improvement of infrastructure, etc. in addition to further refinement of values assumed in the above (2)).

1) In the case the export is made only through the river ports and the port of Bahia Blanca, their hinterlands separates from each other along the line connecting Mar del Plata and Va. Mercedes, and the proportion of export quantity between the river ports and the port of Bahia Blanca will be 71:29. If we add to this the port of Quequen, the proportion between the river ports, Bahia Blanca, and Quequen will be 71:22:7.

2) The economic share of each of the above ports is not far off their actual share, and, in the actual supply of transport infrastructure, it is reasonable to export about 2/3 of the total export quantity through the river ports. If we do not plan a large investment or improvement in the transport system, it is indispensable to improve and enlarge the existing facilities supporting the export from the Parana and La Plata. From this viewpoint, it is advisable to promote projects for extention of elevators and silos on the river ports and of topping-off equipment (increase in the number of large barges, floating elevators, etc).

3) However, if it is difficult to increase the capacity of the river ports because of their waterdepth or that of water channels, then the Atlantic ports must take charge of future increase of export.

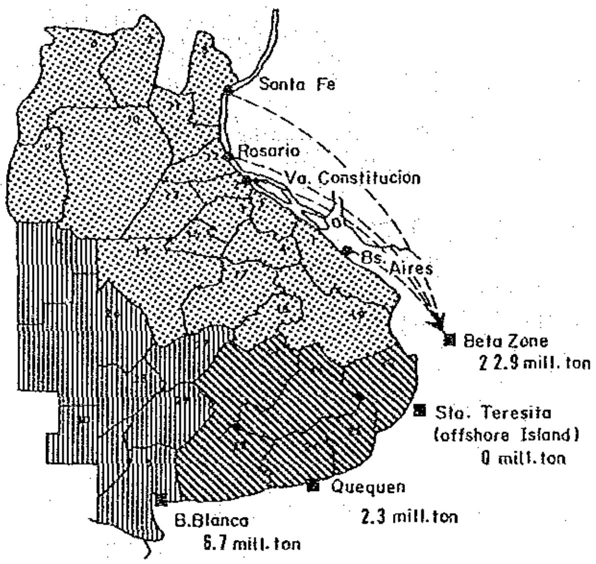
Figure IV-2-8 Grain Export Ports and Their Hinterlands (Without Unit Train Services)



Case 1: Export through the river ports and Bahia Blanca

(Assumptions and calculated total transport cost)

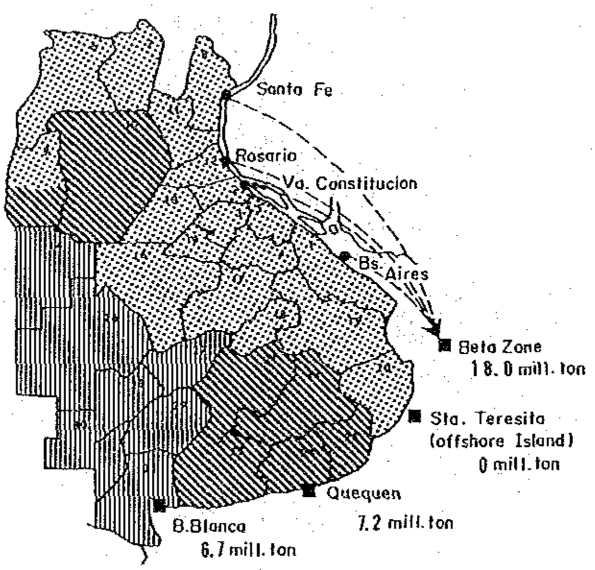
- Export made only through the river ports and the port of Bahia Blanca in their actual state.
- No limitations on the capacity of ports.
- Total transport cost: $665.2 millions.



Case 2: Export through the river ports, Bahia Blanca, and Quequen

(Assumption and calculated total transport cost)

- No limitations on the capacity of ports.
- Total transport cost: $659.0 millions.

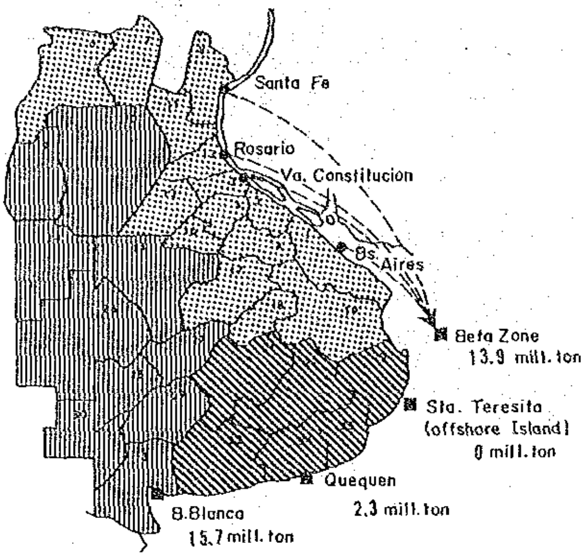


Case 3: Export through the river ports, Bahia Blanca, Quequen, limitation supposed to the capacity of the river ports

(Assumption and calculated total transport cost)

- Total capacity of river ports supposed to be 180.0 millions ton, but no limitations on the capacity to the port of Bahia Blanca and the port of Quequen.
- Total transport cost: $662.0 millions.

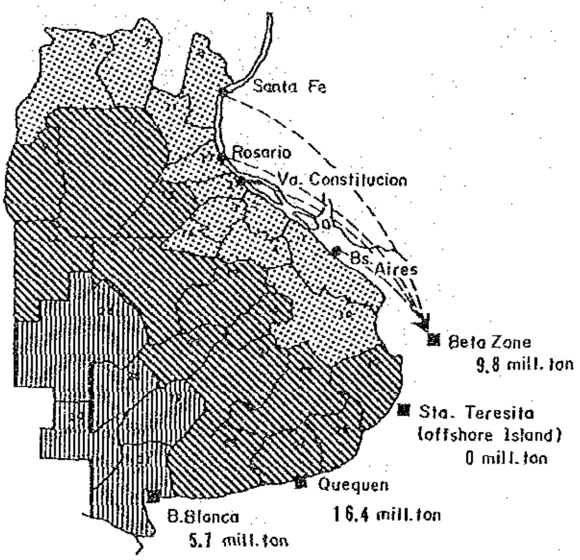
Figure IV-2-9 Grain Export Ports and Their Hinterlands (With Intensified Unit Train Services)



Case 4: Unit train service to the port of Bahia Blanca

(Assumptions and calculated total transport cost)

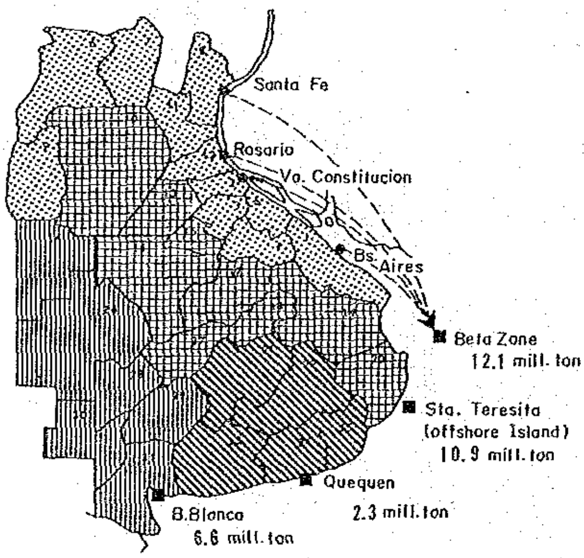
- .No port on the artificial island.
- .No limitations on the capacity of ports.
- .Total transport cost: $643.2 millions.



Case 5: Unit train service to the port of Quequen

(Assumptions and calculated total transport cost)

- .No port on the artificial island.
- .No limitations on the capacity of ports.
- .Total transport case: $640.8 millions.



Case 6: Unit train service to the port on the artificial island

(Assumptions and calculated total transport cost)

- .Railway constructed connecting directly Bragado - 25 de Mayo - Las Flores - Gral. Guido - Sta. Teresita.
- .No limitations on the capacity of ports.
- .Total transport cost: $648.2 millions.

When the total export capacity of the river ports is supposed to be 18 millions of ton, the surplus overflows to the port of Quequen (Case 3). This fact suggests that after the 2nd phase extention project of Bahia Blanca Port is realized, efforts for further development of ports should be directed rather to the port of Quenquen than to the port of Bahia Blanca. In that case, the export grains from the Zone 9 and the Zone 10 (Marcos Juarez, General Lopez, General Villegas) will be transported to the port of Quequen.

4) It should be noted that, in the above Case 3, the total transport cost is supposed to be $662,0 millions, not very far from the total cost in the Case 2 which is supposed to be $659.0 millions.

5) In the Cases 4 to 6, we supposed an intensified railway transport by the introduction of unit train system in order to know through which Atlantic port we should develop for export. The analysis shows clearly an increased need for the transport to the port of Quequen. It shows also that, in any case, the rationalization of the railway transport has a great influence on the hinterland of each port.

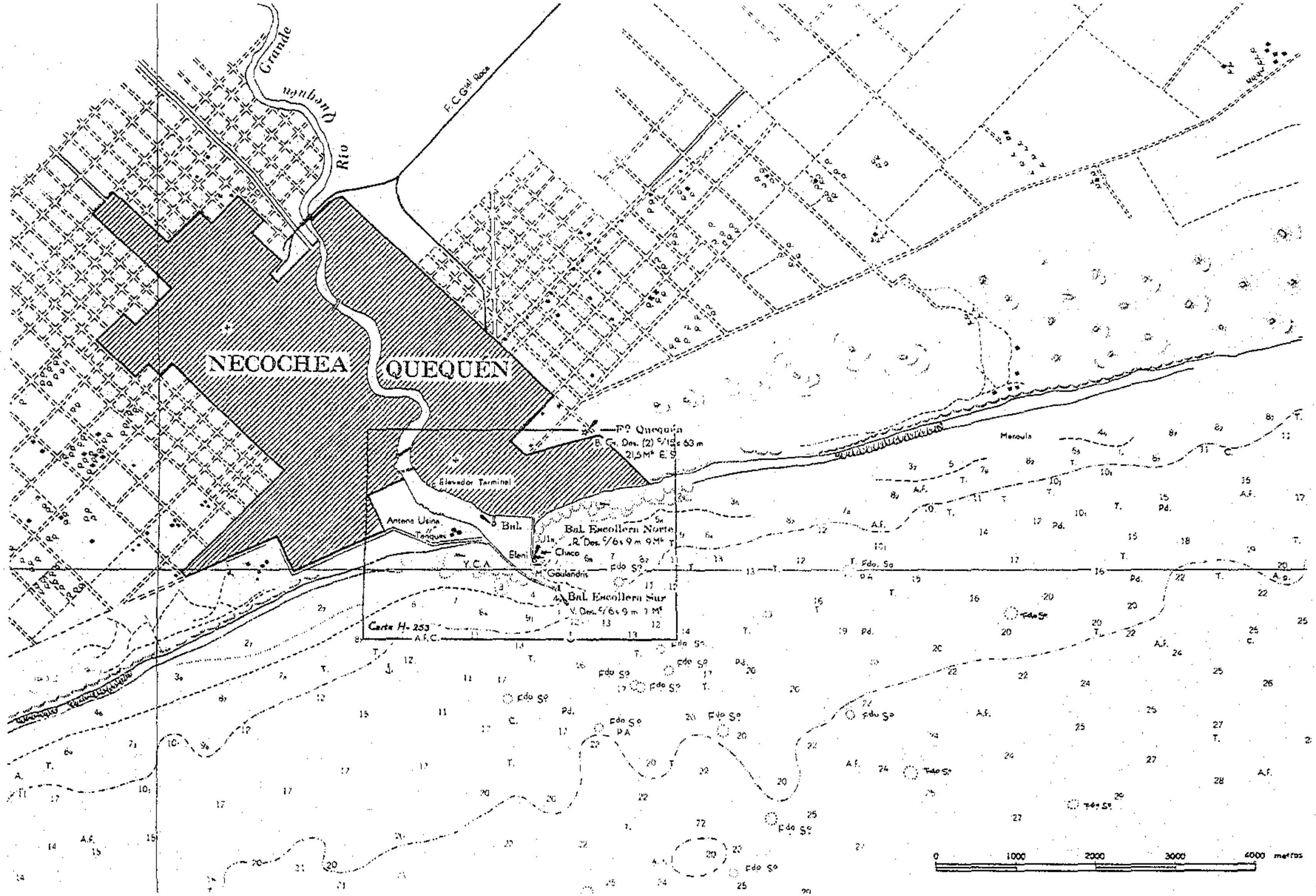
6) It is noted that dispite the substitution effect of the development of the port on the artificial island off Sta. Teresita, it affects hardly the hinterlands of the ports of Bahia Blanca and of Quequen.

2-3-4 Improvement of Quequen Port

Site conditions of ports and harbors change with the lapse of time. What the people called "natural, good harbors" in former days were all located in the innermost part of rivers and creeks or in deep-water bays surrounded with sheer cliffs. At present, ports built along rivers and creeks are confronted with the problem of access channel maintenance resulting from the mammothization of ships, and those constructed in bays surrounded with cliffs are unable to provide sufficient land necessary for the development of port-oriented industries.

Sandy coast facing the outer sea was once considered unsuitable for construction of ports because it is directly exposed to violent waves from the outer sea. However, the recent development of port and harbor construction technologies has turned such sandy coast to one of ideal sites for port construction. Waves propagating from the outer sea are now prevented by breakwaters, and mooring facilities in deep-water basins do not call for maintenance dredging of access channels. Unlike river ports, sea ports constructed on such sandy coast can provide sufficient land for development. These sea ports were once unable to cope with waves from the outer sea and shoaling of channels due to littoral drift. As littoral drift is caused mainly by waves generated in the outer sea, it is now controlled by suitable arrangement of breakwaters including detached ones. Port and harbor development based on these advanced technologies calls for a large initial capital input, but it can be economically justified by the low maintenance cost and a notable saving of transportation cost attainable by the use of large-size ships.

Figure IV-2-10 Quequen Port



From the viewpoints indicated in Sections 2-2-4, 5 and 2-3-1 which stated that the improvements of existing ports along Parana and La Plata rivers are handicapped because of shallow depth of river channels and expensive topping-off costs, and favorable conditions for port construction at the sandy coast, it can be said that Quequen Port (Figure IV-2-10), located in the approximate center of the sandy coast facing the Atlantic, has great development potential especially because its present size is very small. In the following, Quequen's development potential as a grain loading terminal is discussed.

(1) Development potential as grain loading terminal

(a) Geographical conditions

Located in the approximate center of the Atlantic coast of Buenos Aires Province and having the country's main grain producing area in its hinterland, Quequen Port is geographically conditioned favorably for overland grain transportation from producing area to shipping port. Its development is not likely to cause the risk of double investment because Bahia Blanca, already developed as a deep-water port, is located at the western end of Buenos Aires Province, more than 300 km apart from Quequen.

(b) Conditions for port construction

As it is possible to secure a water depth of 15 m in the offing only about 2 km from the coast, the following three methods can be conceived for the port construction.

1) Open an access channel from the offing to the coast by dredging, and construct breakwaters in prevention of channel shoaling and for maintenance of calmness within the port area.

2) Construct grain loading facilities in the offing which are severed from the outer sea by breakwaters and connected with the coast.

3) Build an artificial land in the offing and install shipping facilities on the land-side seawall, and link them with a bridge.

The bearing layer of structures is rigid enough to permit highly economic design and construction of structures. Another factor that ensures high economic efficiency of the construction work is the possibility of securing a water depth of 15 m or more in the offing only about 2 km from the coast.

The unused space on the left bank of the Quequen river facing the existing Quequen Port can be conceived as the development site. For intermediate and long range development, however, it is possible to use the coast on the east of the existing port.

(c) Port utilization conditions

The present Quequen Port is closed to incoming ships on about 120 days a year because of its narrow entrance and also because it is not protected sufficiently against waves from the outer sea. However, the wave frequency in the offing of Quequen, inferred approximately from the past data of wave observation in the offing of Mar del Plata, is 8.8% for waves with a height of more than 1.5 m, 2.3% for 2.0 m or more, and 0.8% for 2.5 m or more. This means that the port operating rate can be maintained at a high level by protecting the channel sufficiently against waves with breakwaters.

(d) Private sector investment intent

Although Quequen Port is now equipped only with poor infrastructural facilities, the private sector investment intent for the port is heightened these days in expectation of its future development to a modern, deep-sea port. For example, ACA and FACA have recently installed port elevators, and there are other private enterprises planning to site their new facilities in the port. It can be foreseen that such private sector investments, combined with the public sector for infrastructural improvement, will produce a very high overall investment effect.

(2) Investment effects

Development of Quequen Port is expected to produce the following effects.

1) Reduction of grain transportation cost

- In the short, reduction of transportation cost can be realized by solving the problem of waiting time in the offing of Bahia Blanca for transshipping operation and by reducing the uneconomical transshipment by topping-off operation in the estuary of La Plata.

- From an intermediate and long range point of view, it can be expected that transportation cost will be cut down when the 2-port loading becomes unnecessary by the development of overland transportation network including railways.

2) Economic security by the operation of 2 deep-water ports

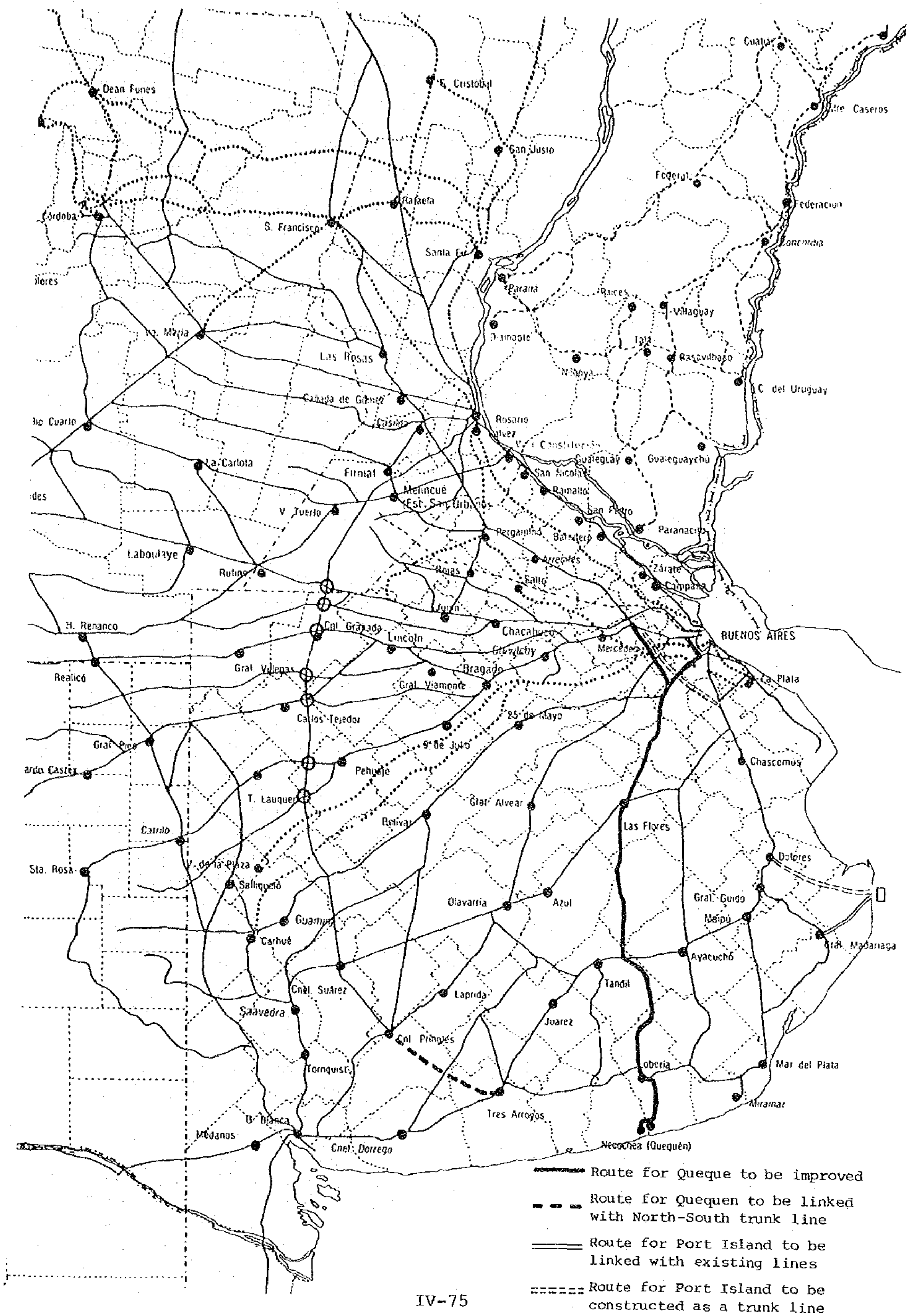
- When Quequen is developed to another deep-water port to be operated in Argentina besides Bahia Blanca, it will offer high economic security for grain transportation especially in case of an accident necessitating the channel closing.

3) Regional development effect in the Necochea area.

(3) Necessity of railway network development for closer linkage with hinterland area

The prime objective of developing Quequen to a deep-sea port is to discontinue the uneconomical 2-port loading by consolidating the railway transportation network and linking it with Quequen, because railways should essentially be most economical for middle- and long-distance grain transportation. Accodingly, the consolidation of the railway network to a level capable of bulky transportation of

Figure IV-2-11 Possible Railway Network Development



grains using unit trains should be carried out progressively in parallel with the development of Quequen Port.

Quequen Port already has railways laid in its area, but these are used mainly for shipment of grains from hinterland areas. For the purpose of centralized development of this port aimed at long-distance bulky transportation of grains, it is necessary to establish a shuttle transportation system using special trains by developing a new south-north route, not the existing trunk line leading to Bahia Blanca. Tracks, signals and some of the stations of the existing lines need to be improved to meet the grain traffic demand in the few years to come. When the traffic demand becomes larger, it will have to be met by double-tracking or construction of a new line. This new line will greatly facilitate the grain collection service as it will cross the existing trunk line leading to Buenos Aires (Figure IV-2-11).

Quequen should be provided with sidings for arriving and leaving trains with a capacity of 20 million tons, with unloading facilities to elevators installed between them. The trunk line and port railways improvement should be carried out by stages according to the increase in the cargo handling volume at the port to attain the highest investment effect.

As railways are essentially required to function as a system, the above trunk line development work should be carried out in parallel with the modernization of the whole operating system of the National Railways.

(4) Development steps

In the foregoing, the development potential of Quequen Port as a deep-water grain loading port has been studied. For the implementation of this project, further detailed studies should be made, including a technical, financial and economic assessment of the investment for a grain loading port as well as that of the possibility of using the port for a deep-sea container terminal, etc. If the project is justified as a result of these studies, then a master plan for the development of Quequen Port should be formulated from a long range viewpoint to make the best of the port's high development potential, and the construction work should be carried out step by step on the basis of the master plan.

2-3-5 Installation of Floating Elevators

(1) Reasons legitimizing the installation of floating elevators

River ports along the Parana account for about 70% the country's total grain export at present, and it is likely that they will hold a share of more than 50% in total grain export in the future. Ships with a tonnage of more than 60,000 tons account for 40% of all bulk carriers currently engaged in grain transportation service in the world, and this percentage has been on the increase. The 60,000-ton class is generally accepted as the most economical size of grain carriers, and grain transactions are generally carried on for a lot of this amount. However, it is nearly impossible to increase the depth of La Plata including the Ing. E. Mitre Channel and the Parana to permit the navigation of 60,000-ton class carriers with full load because of the huge amount of cost required for dredging work.

For these reasons, ships loaded to half the hold capacity at river ports along the Parana are required to proceed to Buenos Aires, Bahia Blanca or to Zone Alpha and Zone Beta for topping-off operation for completion, which involves huge amount of operation cost. In order to solve these problems caused by multi-port loading operations, it is necessary to develop deep-sea ports along Atlantic coast and to improve connecting inland transport systems. Even after the introduction of those deep-sea ports along the Atlantic coast, the sizable amount of grains is still to be handled at the existing ports along the Parana and La Plata rivers, as is shown in the Section 2-2-3 on the analyses of the hinterland of ports. The rationalization and economization of operations at existing ports along the Parana and La Plata rivers including topping-off operations are the important transport planning issues to be tackled. The installation of floating elevator is one of the plausible means of solving huge operation cost problems by relatively small amount of initial investment cost.

Whether the installation of floating elevators be an alternative to the expansion of Quequen port or a supplementary means to it must be analysed in more detailed technical, financial and economic considerations of long-range perspectives.

(2) Advantages of floating elevator

When a floating elevator is constructed, it will not only display the completion function by transshipping operation, which is currently performed by topping-off operation in Zone Alpha and Zone Beta, but will also have the same function as a deep-water port equipped with storage facilities. Specifically, it will have a storage silo of grains to be loaded onto ocean-going carriers as well as efficient cargo handling facilities. If the berth is open, therefore, ocean-going carriers can be loaded fully at this terminal and need not go up the Parana for loading.

The floating terminal will also realize grain transportation from river ports along the Parana by a special shuttle vessel with the largest allowable size and draft, as well as efficient unloading of transported grains using cargo handling equipment installed at the terminal. The operation of this shuttle vessel need not be synchronized with that of ocean-going carriers, so the problem of waiting time presently caused by the topping-off operation in Zone Alpha and Zone Beta can be solved. The shuttle vessel can also be used as an ocean-going carrier ores and coal in the off-season.

(3) Issues to be considered in installing floating elevator

1) Installation site

The terminal is required to have a water depth of 14 m or more at all times for free berthing of PANAMAX-class carriers, so that it will have to be constructed in a suitable place near the Atlantic coast. Accordingly, careful studies must be made before selecting its installation site because the annual number of its operating days will be influenced by the wind and waves from the outer sea.

2) Design of floating body

If the suitable installation site can be found only in a place exposed to unfavorable hydrographic conditions, then it will be necessary to select a floating body design most effective in mitigating the influences of such conditions. For example, the semi-submersible type may have to be considered as one of alternative designs, and the submerged type may have to be introduced instead of the floating body.

3) Mooring method

Special consideration must be paid in selecting the mooring method because it is very difficult to moor the terminal under unfavorable hydrographic conditions without causing any hindrance to free berthing of ocean-going carriers and shuttle vessels.

4) Terminal ownership and management

The existing port elevators are owned and operated by the JNG and private enterprises. However, the newly installed elevator(s) will have to be placed under the management of the JNG or a certain private operator because their limited size will not allow for the ownership division among many private enterprises. The operator of the terminal will therefore be charged with the task of encouraging many private enterprises to use this terminal and of operating efficiently.

2-3-6 A Long-term Development Possibility: Construction of Port Island

There are two deep-water areas along the Atlantic coast in Buenos Aires Province. One is found in the neighborhood of Quequen, and the other is near Santa Teresita outside La Plata's estuary (see Figures IV-2-12, IV-2-13). Submarine topography along other parts of the Atlantic coast from Mar del Plata to Punta Medanos is complex and rugged. The water area near Santa Teresita is considered to have the same deep-water port development potential as Quequen Port. This development potential is studied below in comparison with that of Quequen Port for the same purpose of constructing a modern deep-sea grain shipping terminal.

(1) Geographical conditions

The hinterland immediately behind this area is a marshy district not producing grains. Accordingly, the railway grain collection service covering an extensive area is an essential precondition for economic justification of a new port development project in this area. As the hinterland of this new port will partly overlap that of Quequen, the necessity of railway development for this port needs to be checked against the railway development required for Quequen. As no railways are laid in the neighborhood of Santa Teresita, a new line

Figure IV-2-12 Atlantic Coast in Buenos Aires Province

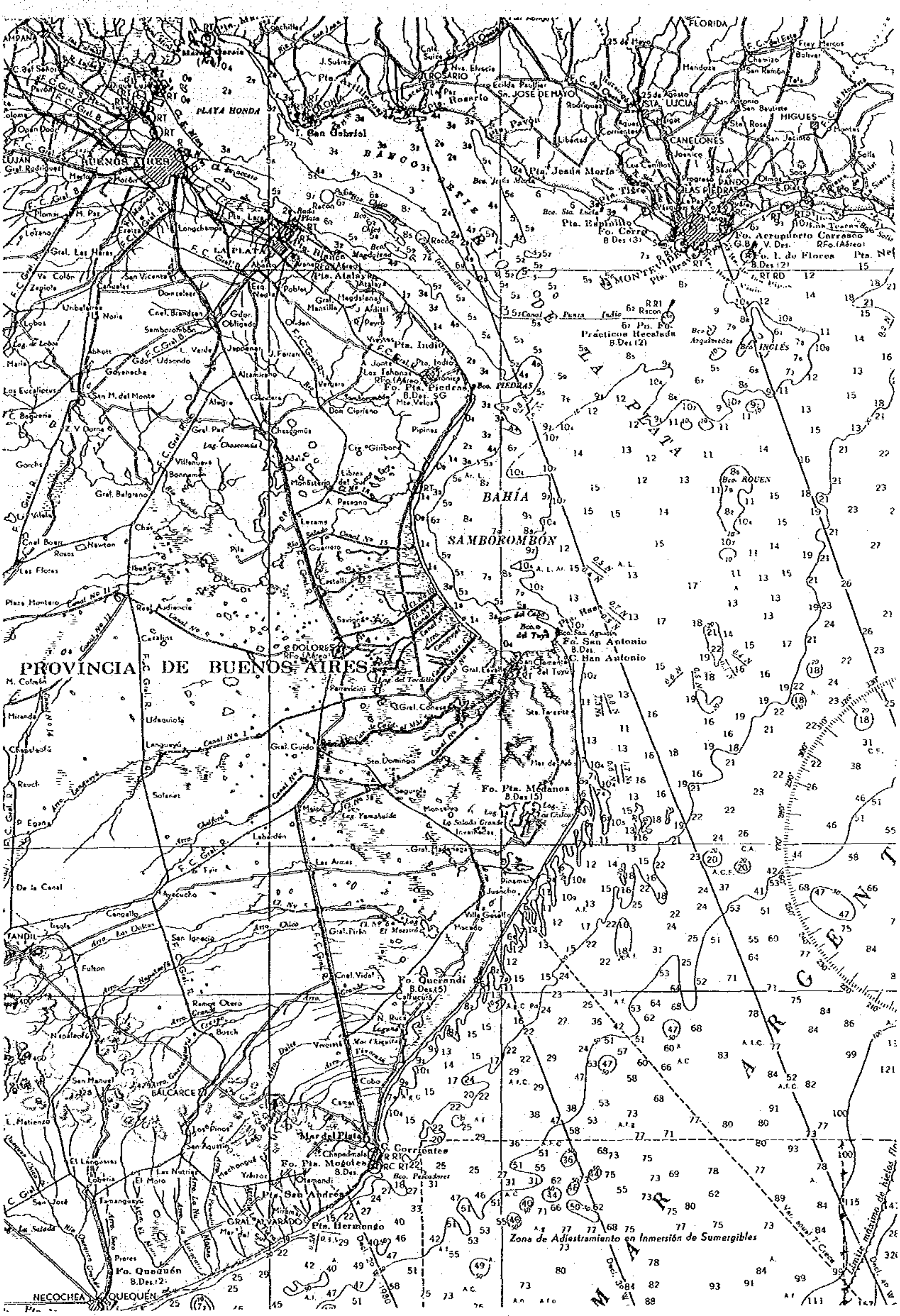
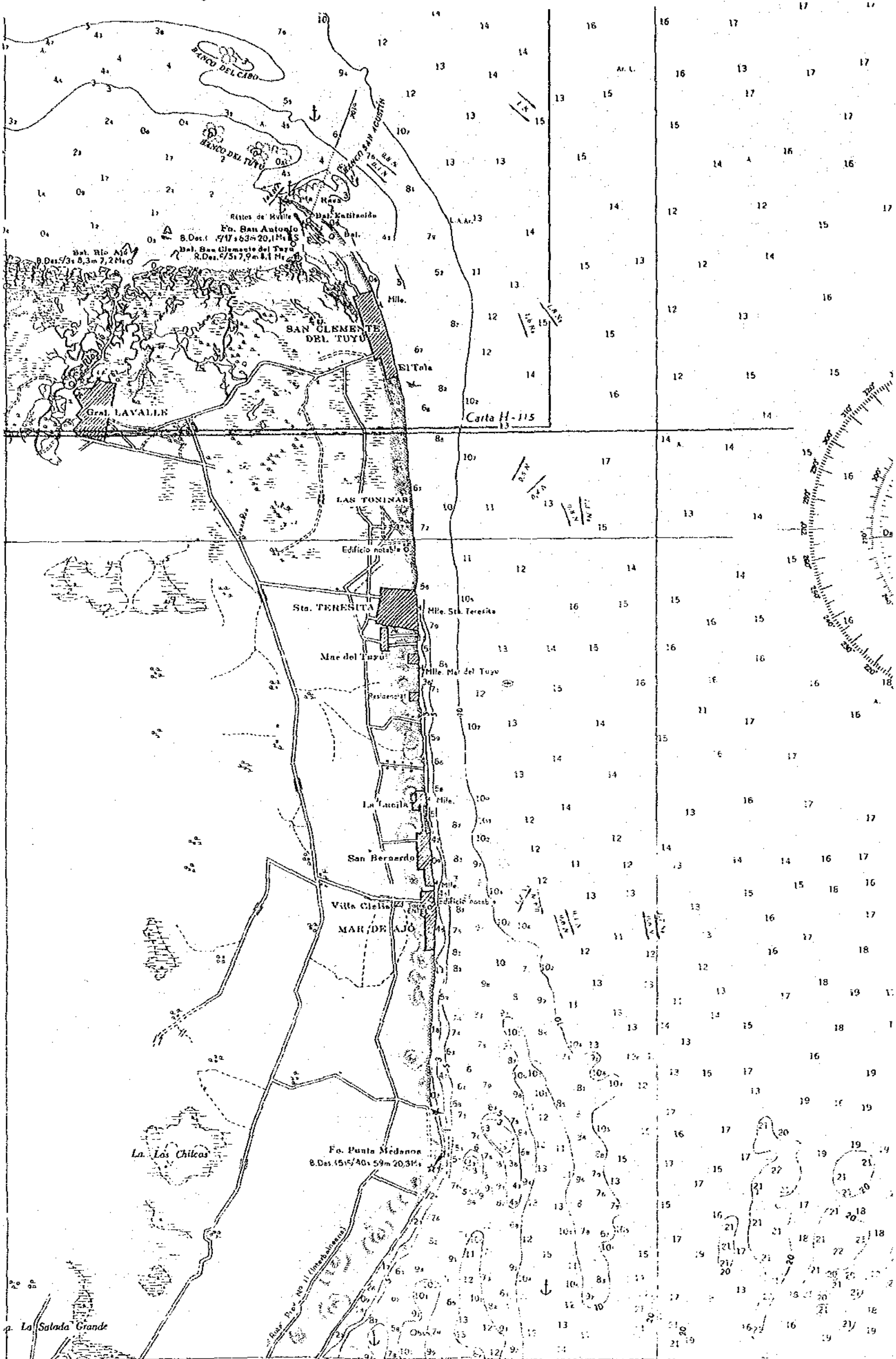


Figure IV-2-13 Atlantic Coast near Santa Teresita



with a length of about 40 km must be constructed to connect the new port with the existing railway network. Since this new line will connect to the trunk line leading to Buenos Aires, another new line needs to be built that takes a roundabout route bypassing Buenos Aires. On the other hand, Quequen already has railways laid in the port area, and mass grain transportation to Quequen can be realized by improving the existing railway network. Hence, the cost of railway transportation improvement for Quequen will be considerably lower than would be required for the said new port island development project.

(2) Conditions for port construction

The same three methods of construction as listed in 2-3-4-(1)-(b) can be conceived for this project. However, only method 3) i.e., construction of an artificial island in the offing, is actually applicable because the distance between the coast and an offshore area where a depth of 13 - 14 m can be secured near Santa Teresita is much longer than in the neighborhood of Quequen, although it is far shorter than in other coastal areas.

A detailed study is required to make a choice between the three alternative construction methods conceived for Quequen. But if the artificial island construction method is adopted, then the capital input required for Quequen Port development will be smaller because the island construction cost is virtually the same for the two projects but the length of the connecting bridge is shorter in the case of Quequen development. If any of the other construction methods is adopted, the gap in capital requirement between the two project will become wider. Another drawback of this new port project is that there is no suitable base port of construction craft near the project site, and this means that the unit construction cost will be higher than is required for Quequen Port development.

Judging from the conditions mentioned above, it can be said that Quequen Port has decisively higher development potential than the offing of Santa Teresita for construction of a grain terminal. Nevertheless, this port island construction project is quite attractive because the new port is geographically suitable as an outer port of Buenos Aires, the capital of the country. Buenos Aires plays an important role in Argentina's export/import of general merchandise, but it is functionally deteriorated and cannot catch up with the transportation revolution prompted by the mammothization and containerization of ocean-going ships. It is considered difficult to meet this revolution by the redevelopment of existing port facilities. It is therefore hoped that due recognition be paid to the fact that the realization of a new, economic foreign trade transportaiton system meeting the global trend of transportation revolution is one of essential prerequisites for Argentina's national development toward the 21st century, and that the feasibility of the port island project be studied on the basis of the above recognition by positioning it as a development project a multipurpose harbor of Buenos Aires designed for construction of may different terminals including a grain terminal and a container terminal.

2-4 Measures for Short-term Grain Transportation Improvement

As is stated in 2-3-1, what is urgently required at the moment to augment Argentina's grain export to the 40 million-ton level is to establish a long-range development policy for improving the national grain transportation system. The following short-term development measures will be effective if they are implemented under the long-range development policy framework by classifying their position in the entire grain transportation system.

2-4-1 Improvement of Grain Transportation from Producing Areas to Export Ports

(1) Railway Transportation

For the purpose of short-term improvement of inland grain transportation by railways, it is recommended that the railway transportation service be improved for the near future by solving the existing problems, while at the same time studies for charting a course of long-range improvement be conducted. This calls for rapid progress of improvement of river port utilization system currently undertaken in Argentina in parallel with the consolidation of sea ports. Since inland transportation of grains is middle- and long-distance bulk transportation, it is strongly hoped that railways will be utilized for its improvement. This is because railways can provide shuttle transportation service of large quantities of cargoes between the producing area and the port elevator terminal, and can thus ensure great economy of energy and labor. At present, the Government is pushing forward its policy to promote the railway transportation of grains, consignors do not place much confidence in railways because of a number of drawbacks of railway transportation service, and many of them are forced to use trucking service and bear a costly transportation.

The short-range improvement policy should be carried out on the basis of a long-term development project, with efforts to minimize corrections and retrogression. This in turn will serve to shape a course of short-range improvement of railway transportation service. Improvement of railway transportation service is certain to lead to efficient transportation of not only grains but also cargoes in general and passengers, and at the same time contributes to the reconstruction of the National Railways' finance which is casting a heavy burden on the national budget. The National Railways is required to map out a clear-cut plan to cope with the demand for grain transportation, and position it clearly in its short- and long-range improvement plans. This will call for an approach based on a new Government traffic policy because the National Railways is financially incapable of solving the problem.

Behind the prevailing problems in grain transportation by railways, there is a historical background of Argentina's grain export for which railways were used for transportation from producing areas to grain loading ports along the Parana and La Plata. These problems arose from the structural change in the transportation service resulting from the recent emergence of PANAMAX type ocean-going carriers and the growth of trucking service for inland transportation which is due to improvement in road conditions. The present declining tendency of railway transportation cannot be repressed if the railway transportation systems and facilities remain unchanged and old. The focal point in the short-term improvement of railways is to modernize and regenerate such systems and facilities.

The improvement measures enforced in the past by the National Railways include the following.

1) Abolition of low-demand sections no longer calling for railway transportation service.

2) Centralization of freight stations and yards, and consolidation of freight lines.

3) Introduction of through train system using unit trains in place of the former system of collecting cargoes at each freight station (December 1983).

4) Improvement of grain transportation facilities with financial assistance from the World Bank.

   - Improvement of freight yard at Bahia Blanca.
   - Improvement of freight car-to-elevator loading facilities.
   - Improvement of silos in producing areas.
   - Remodeling of freight cars (by FA).

5) Introduction of a new railway tariff to promote the railway utilization.

These measures can be evaluated as pointing the right direction, but need to be reexamined from a viewpoint of the entire railway transportation system and the entire grain transportation system.

The following 7 points can be cited as short-term improvement measures that can be conceived from the team's survey in Argentina.

1) Grasping the existing state of transportation facilities and systems

All parties concerned with railway transportation service are aware that railway facilities are generally deteriorated and various systems are no longer compatible with the actual state of things. It is therefore necessary to obtain a firm grasp of all facilities in both qualitative and quantitative aspects, and to check each system to see if it meets consignor demands satisfactorily and if it is operated smoothly within the National Railways.

In examining transportation facilities, special efforts should be made to clarify the existing state of tracks, locomotives and freight cars. As regards the systems, the actual flow of cargoes from the time of accepting consignor orders to the time of unloading at destination should be made clear, and the railway workers' efforts to comply with consignor demands and reflect them in such flow of cargoes should also be checked.

2) Grasping of grain traffic volume

Both total grain traffic by railways and line-wise grain traffic vary according to the production, consumption in the world market, seasonal changes in production and consumption, share in total grain transportation volume including that of trucks, and shipment from each port. It is therefore necessary to analyze the existing state of grain traffic, and forecast the share of inland transportation by route so as to be able to estimate the route-wise railway traffic of grains.

3) Disposal of unused facilities

Since all facilities are old and not given sufficient maintenance service, it is probable that their operating rate has been on a constant decline. It is therefore recommended that the National Railways refrain from keeping all existing facilities, and classify them and systematically dispose of unused facilities that incur too much maintenance cost. This disposal should include the abolition of routes and stations, scraping of locomotives and freight cars, and removal of unused tracks, thus making clear what facilities should be given careful maintenance service.

4) Effective utilization of operative facilities

Under the circumstances, no large equipment investment can be made for improvement of facilities or introduction of new cars. Accordingly, locomotives and freight cars should be assigned preferentially to routes with heavy traffic for the purpose of their effective utilization. Regarding tracks and locomotives which are used for both passenger and freight transportation, the National Railways should establish a plan for their most efficient utilization and conduct surveys for formulating a facilities operation plan.

5) Effective utilization of budget and personnel

Budgetary appropriation for power and maintenance costs is not sufficiently available, so that these costs should be defrayed mainly for high priority sectors for effective utilization of budget. It is also necessary to enforce measures for raising the productivity of personnel assigned to various sectors.

6) Effective utilization of new investment

There is possibility of new investment for railway transportation improvement, as seen in the financial assistance offered to the Government by the World Bank. The World Bank-financed project for improvement of transportation service to Bahia Blanca conforms to the aforementioned long-range development scheme. Effective utilization of such investment should be considered for the improvement of railways facilities. If such fund is used for creation of an information network for communicating data on consignor orders, freight car positions, etc., it will be possible to raise the operating efficiency of freight cars and offer better service to consignors.

7) Government incentive policy for railway service improvement

A new tariff has been introduced as a measure related to the division of share between the truck industry and the National Railways in the inland grain transportation market. However, this tariff is not strictly observed by truckers because they are private enterprises and the market is almost in a state of free competition. For this reason, the railway transportation promotion policy is not working as planned. The Government is therefore urged to clarify the roles to be played by railways in the comprehensive national traffic system, and carry out incentive measures including financial assistance such as subsidies and partial disbursement of construction cost from the Treasury.

(2) Truck transportation

The most notable of all Government measures for truck transportation of export grains is the compulsory submission of a trucking record and the data base creation based on such records. Adequate management, systematization and planning of grain transportation by trucks can be realized only when a firm grasp of all factors of trucking service is acquired. Specifically, the following factors will be brought to light by analyzing data collected from grain trucks.

1) Hinterland of each port.

2) Consignor choice of destination (port) and means of transport.

3) Competition between truck transportation and other modes of transportation in each zone.

4) Truck operating conditions (loading factors, turnover, etc.).

5) Grain shipping conditions by zone.

The most important thing to be done at the moment for effective utilization of this system is to develop a computerized information system capable of immediate and centralized processing of data collected at all ports. Assuming that 85% of about 24 million tons export grains are transported by trucks with an average loading capacity of 30 tons, the number of trucking records will amount to a total of about 680,000 documents. The existing port authorities or central government offices (e.g., JNG, Grain Transport Coordination Committee) do not have the capability for processing this huge volume of data. It is therefore necessary to build an online information system under which coded information can be input and transmitted by terminals at each port to the Grain Information Center (provisional name) in time with unloading of each truck. The capital input required for developing this system should more than pay for the benefit derivable from the information it produces.

A similar export grain information system covering ports and carriers is now in the making in parallel with the development of the said grain truck information system. When this system is completed in addition to the existing information system developed for grain transportation by railway, they Argentina's grain export rationalization scheme will be evaluated as firmly founded in the software aspect.

There are two ways of utilizing such integrated information. One is immediate (or short-term) utilization, in wich analyzed data will be fed back to ports, carriers and consignors for entrance management of carriers and guidance in the timing and destination of land transportation service. This will call for the development of a simulation model for short-term forecasting of all grain shipping ports in Argentina and a carrier assignment optimization model.

The other is long-range utilization,, in which highly accurate, unified data will be used for shaping optimum maintenance, development and investment plans for ports, railways and roads. The system will make it possible to obtain a firm grasp of all factors of grain transportation by trucks, and this in turn will open up the possibility of framing a more appropriate tariff policy based on the analysis of overloading and operating conditions of trucks as well as suitable plans for port facilities expansion and interurban bypass construction mentioned in 2-2-2-(2).

(3) River transportation

Barges hold a negligible share at present in total grain traffic from producing areas to shipping ports. However, when Argentina's agricultural development project is pushed forward beyond Pampa Humeda region in the future, barges will play an important role in the grian transportation from the NOA and NEA areas where the development is delayed owing to high transportation cost despite the high production potential of the two areas. Barge transportation from Barranqueras and other river ports along the Upper Parana to the shipping ports along the Lower Parana or to transshipping facilities (floating elevator, etc.) to be developed in La Plata's estuary should therefore be reviewed carefully because its development will meet the dual purpose of enhancing the country's regional development strategy and cutting down the cost of grain transportation.

Promotion of river transportation using barges presupposes a number of conditions such as the improvement of facilities at both shipping and receiving ports, additional installation of navigation aids to alleviate the restrictions on night-time navigation of barges, and reinforcement of barges and tug boats. If barges are to be used for grain transportation to the transshipping facilities at the mouth of La Plata river, it will be necessary to increase the number of river-sea barges because the existing barge convoys cannot be used for this purpose.

When all conditions mentioned above are taken into consideration, it is obvious that the following measures are indispensable for promoting grain transportation by barges from producing areas to shipping ports.

1) Improvement of grain receiving facilities and barge loading operation at Barranqueras.

2) Additional installation of buoys and beacons and enhanced utilization of communication facilities to alleviate the restrictions on night-time barge navigation.

3) Augmentation of barge-to-carrier loading capacity at Buenos Aires.

4) Reinforcement of bage-to-carrier transshipping facilities (floating elevator, etc.) at Escobar.

5) Reinforcement of barges and tug boats.

2-4-2 Development of Port Facilities and Elevators

As described in 2-2-3, the mooring basins in front of the existing berthing facilities of the ports in the Parana- La Plata river system do not call for maintenance dredging because they are deep enough as compared with the channels. As for external port facilities, however, it will be possible to raise Quequen's operating rate if the existing breakwaters are extended, as mentioned in 2-3-4-(1).

Regarding port elevators, the port-wise effective reception and loading capacities are as shown in Table IV-2-12. The reception capacity shown in this table is converted to tons/day based on daily operating hours of 12 hours.

Table IV-2-12 Effective Grain Reception and Loading Capacities by Port

(ton/day)

Port	Reception Capacity	Loading Capacity
Barranqueras	3,410	6,000
Santa Fe	5,700	10,000
Diamante	6,000	9,600
San Lorenzo	42,100	58,600
Rosario	71,400	67,000
V. Constitucion	8,160	8,400
San Nicolas	8,340	18,000
Ramallo	2,400	2,900
San Pedro	4,500	7,200
(Parana River)	(152,030)	(187,700)
C. del Urguay	6,000	7,800
(Uruguay River)	(6,000)	(7,800)
Buenos Aires	20,400	21,600
(La Plata River)	(20,400)	(21,600)
Bahia Blanca	8,400	21,000
Quequen	17,400	32,000
Mar del Plata	5,400	7,200
(Atlantic Ocean)	(31,200)	(60,200)
Total	209,630	277,300

Source: Comite Coordinacion del Transporte de Granos

Table IV-2-13 shows the port-wise grain handling volume prepared on the assumption that the target grain export of 40 million tons established by the Government for 1990 will maintain the same port-wise ratios as estimated in the Phase II Report of the Bahia Blance Development Project. In this table, the grain handling volume in peak month is assumed to increase by 12% of the annual level (or 44% of the monthly average level), and each port will be operated 25 days a month.

Table IV-2-13 Required Grain Handling Capacities by Port for 40 Million Tons Export Target

Port	Tons/Year	Tons/Month	Tons/Day
Rosario-San Lorenzo	15,520	1,862	74.5
San Nicolas	680	82	3.3
San Pedro	80	10	0.4
Santa Fe	160	19	0.8
V. Constitucion	1,600	192	7.7
(Parana River)	(18,440)	(2,165)	(86.7)
Buenos Aires	3,220	386	15.4
(La Plata River)	(3,220)	(386)	(15.4)
Bahia Blanca	15,920	1,910	76.4
Quequen	2,880	346	13.8
(Atlantic Ocean)	(18,800)	(2,256)	(90.2)
Total	40,060	4,807	192.3

Source: Study Team

The figure shown in the two tables indicate that all ports excluding Bahia Blanca have capacities large enough to cope with the target export volume of 40 million tons. The export volume is expected to increase by direct loading of the following grains.

- Linseed, peanut, barley, etc. which are generally not loaded on carriers from elevators.
- Grain lots of less than 3,000 tons which are not handled by the JNG's elevators.
- Grains directly loaded under a contract.

In actuality, however, many carriers wait for loading operation at river ports along the Parana and Buenos Aires and Bahia Blanca. Although this is ascribable to reasons other than the elevator capacity, it is advisable that the elevator operating system be improved so that all elevators will display full capacity. While private elevators are relatively new and operated at a high rate, the JNG's elevators include many aged ones operated below the nominal capacity.

The JNG's Elevator Unit VII at Rosario and the main Elevator Unit V at Bahia Blanca are either incomplete or inoperative owing to an accident. Early completion or repair of these units therefore hoped for.

2-4-3 Improvement of Topping-off Operations

As mentioned in 2-2-4, the topping-off through offshore transshipping has the following problems:

1) Feeder ships carrying grains from the Parana to transshipping point and ocean-going carriers can not be synchronized in time and quantity, which causes a great loss.

2) Handling efficiency is low because unloading is performed with grabs.

3) Marine and weather conditions affect greatly the operation and limit the number of days worked.

A probable solution of these problems would be to construct offshore topping-off floating elevators equipped with large capacity storage and weighing facilities, equivalent to the onshore elevator. Besides the topping-off operation, the floating elevator is also capable of a full loading of ocean-going grain carrier, which is more preferable: the carrier need not sail far upstream the Parana and can expect a substancial reduce of demurrage costs. However, there are still several points to be studied in this solution with floating terminal as its location, structure, capacity, general profitability, ownership and operational system etc, as is mentioned in 2-3-5.

2-4-4 Maintenance and Improvement of Waterways

DNCPyVN is in charge of maintenance and improvement of waterways, but, as we saw in 2-2-5 they are suffering from a lack of equipment and manpower due to a lack of budget.

Dredgers presently in possesion are:

Bucket dredgers	8 (8)
Grab dredgers	1 (1)
Drag suction dredgers	10 (6)
Cutter suction dredgers	5 (1)
Dustpan dredgers	4 (2)

The problem is that dredgers under 10 years of age , which are in parenthesis, are very few.

For the drag suction dredgers which are most suitable for maintenance dredge, the number is only 6, 5 of which were purchased in 1979 on bilateral credit from Spain, too small for the vast dredging quantity needed for the maintenance of waterways.

Our study on the river ports on the Parana and La Plata and the coastal ports on the Atlantic lead to the following suggestions.

(1) Parana river

No need to deepen more than 28 feet, Ing. E. Mitre Channel having currently this depth of draft limitation, but it is advisable to keep this depth of 28 feet as an admissible draft in the ports and waterways south of Santa Fe in order to make best use of Ing. E. Mitre Channel. The annual dredge quantity needed for the maintenance of the waterways would be 15,000,000 m^3 approximately.

(2) La Plata river

It is indispensable to dredge all the waterways of this river, Ing. E. Mitre Channel and Martin Garcia Channel leading to the Parana, Punta Indio Channel constituting its main waterway, North Channel and South Channel leading to Buenos Aires, the biggest exporting port of the country etc,. Up to 1984, every year saw an annual dredge of 40,000,000 m^3, but the quantity has reduced to 12,000,000 m^3 in 1985.

(3) Coastal ports

Actual problems for the port of Quequen are as follows:

1) Layout of the breakwater forces the ship to enter into the port perpendicularly to the wave, a difficult steering operation.

2) Three ships remain sunken near the breakwater. This narrows the waterway.

3) With the actual facilities, the port must be closed 30% of days because of bad weather.

4) Breakwater being built perpendicularly to the coastal current, the water depth tends to decrease near the entrance of the waterway. On the other hand, the waterway bottom is rocky at some points reducing its depth to 32 feet.

For all that, the port itself has a good water depth of 40 feet and a very short access channel, making a dredging work relatively easy apparently. Besides, the problems above are not so difficult to resolve: the authorities studies already an improvement of the breakwater. When the breakwater improved according to the study, the port would work as the second deep water port of the country next to Bahia Blanca port.

The port of Bahia Blanca also has its own problem: located 96 km inland from the Atlantic coast, the port has 2 bars on its access way, which forces ships to wait the full tide to enter into the port. However, a project is already settled to deepen the port to allow free access to vessels of up to 45 feet draft, then placing the port as the deepest in the country. It is desirable to realize the project as soon as possible.

2-4-5 Improvement of Navigation Control and Information Exchange and Processing System

As described in 2-2-6, all carriers navigating in the Parana-La Plata river system are placed under the control of Prefectura Naval Argentina (PNA) from the time they arrive at Recalada until they are loaded with grains and reach the outer sea. Security service for the safety of navigation and prevention of accidents is very important in this river system because of many restraints imposed on navigating ships such as changes in channel depth due to silting and extreme meandering of channels. The PNA resorts to VHF radiocommunication with navigating ships to obtain information necessary for the channel traffic control, such as the position of each ship and the water depth measured by each ship, and does not have a radar system for confirming the reported ship positions.

The present one-to-one information interchange system using VHF radiocommunication makes it impossible for the PNA to obtain the latest and adequate information necessary for safe navigation control in the entire river system and supply it to all ships and all related organizations. Unless a radar system is installed as a navigation control equipment, therefore, it cannot be hoped that the safety standard for navigation and the channel traffic information processing system will be improved.

Ships enter the channels basically in the order of arrival at Recalada, so that it is after each ship arrives at Recalada that relatively accurate information becomes available regarding the date of its entrance. As described in 2-2-2-(2), Comite Coordinacion del Transporte de Granos is making preparations for introducing a data collection system covering grain transportation by trucks. For rationalization of the entire grain transportation system, it is considered necessary to make a step forward from this data collection system and develop an inter-modal grain information system linking all related organizations for online realtime processing and transmission of information on grain transportation by ships, railways, trucks, barges and related organizations. From this viewpoint, the following measures are proposed for improvement of navigation control and information processing in the Parana-La Palata river system.

1) Installation of a radar system for the PNA's upgraded navigation safety control.

2) Development of a system designed for immediate processing of information and ships' behaviors and navigation that will be made available by the radar system, as well as for realtime transmission of such information to all related organization.

3) Development of an inter-modal grain information system linking all related organizations for online realtime processing and transmission of grain transportation information of ships and other modes of transportation.

2-5 Suggestions

2-5-1 Underlying Issues

Argentina is producing 40 million tons of grains a year, of which 25 million tons is exported abroad to earn the greater part of its foreign currency reserves. Its industrialization has yet to be promoted so that the Argentine industrial products will gain a competitive edge in the international markets.

In order to work off its accumulated deficits with the overseas countries and to finance its industrialization, Argentina has not short- or medium-term measure to choose but depending on the encouragement of grain exports in which it is competitive internationally. For this reason, the Argentine Government is contemplating to increase the grain production to 60 million tons and grain exports to 40 million tons by 1990. For this purpose, however, it is mandatory to build up transportation by rail and water, elevators at both the producing areas and ports, and various other associated facilities.

The grave matter standing in the way of grain transportation in Argentina is the fact that the port available for accommodation of the PANAMAX type ocean-going bulk carriers that dominate in the grain shipping world is limited to Bahia Blanca Port only. Furthermore, Bahia Blanca Port is down far away from the major grain producing areas in the north of Buenos Aires, Cordoba, and Santa Fe. Accordingly, 70% of the total of shipments from these granaries is dependent on the ports on the Parana-La Plata river system. The ports and channels on the Parana-La Plata river system from Barranqueras Port to Buenois Aires Port are always affected by sedimentation and silting, and dredging has always been carried out to maintain a navigable water depth. While dredging facilities can satisfactorily maintain the water depth under normal conditions, they are not enough when major river-bed evolutions are caused by flooding to silt up the channels. In the Parana-La Plata river system, the PANAMAX type grain carriers are allowed to be loaded not fully, but to the extent the keel clearance permits, and are forced to be topped off at cost partly at Bahia Blanca Port and partly at the topping-off stations at the estuary of La Plata River.

The vast expanse of granaries and the scattered distribution of loading ports along the Parana River make it difficult to justiry the economic viability of railway transportation of grains by unit train shuttle services. As a result, costly overland trucking is mainly used instead. As regards the railway facilities, tracks, signals and telecommunication facilities,locomotives, and freight cars are all left dilapidated for want of funds for maintenance and updating. Together with this, the basic shortage of locomotives and freight cars refuses to effectively respond to shippers' requests for reduction of transit time and fulfillment of appointed date of delivery, only to encouragage the shippers to desert rail transportation. The transportation by barges in the Parana-La Plata river system is carried out only on a negligibly small scale. The cost of transportation by water is lower than that by rail and truck, and it is suggested that truck services be replaced by rail and barge transportation in order to improve the international competitiveness of grain exports by overall retrenchment of transportation cost.

In Argentina, various measures have been taken for many years for the purpose of improving the grain transportation efficiency. To be worthy of special mention in this respect is the establishment of the Comite Coordination del Transporte de Granos (CCTG) formed by the representatives of organizations relating to grain transportation under the sponsorship of the Secretaria de Transporte. The CCTG has so far gone a long way toward improving the efficiency of grain transportation through well-coordinated activities of the membership organizations. While the CCTG's efforts have been rewarding on a short-term basis, it will be important for Argentina to contemplate the improvement of grain transportation efficiency from a long-term viewpoint because the importance of the position held by grains in Argentine export trade will continue unabated deep into the 21st century. If it is made clear what the transportation system should be from a long-range viewpoint, the short-term measures will be implemented in keeping with the long-range improvement plan to eliminate waste in investment.

2-5-2 Needs for Long-range Grain Transportation Development Policy

As discussed in 2-5-1, the PANAMAX type grain carriers cannot be fully loaded at one port on Parana and La Plata rivers because of draft limitations, but need to be topped up at Zone Alpha or Zone Beta or at Bahia Blanca Port. The basic measure to solve this problem of transportation by the Parana-La Plata river system will be to increase the number of ports deep enough to load the PANAMAX type grain carriers full draft. As regards the buildup of deep-water ports, the improvement of Bahia Blanca Port has already been under way. That Bahia Blanca Port alone is deep enough to accommodate PANAMAX type grain carriers is not sufficient. Similar deep-water ports must be developed as well. In view of this, the following two plans are considered to be most promising.

1) Quequen Port is 40 feet deep, and new facilities installed by private organizations such as ACA and FACA have already been in service. The only problem is that the main channel (about 2 km long) is as shallow as 32 feet in depth. By dredging the channel deep enough to accommodate the PANAMAX type carriers, Quequen Port will be turned into the second deep-water port following Bahia Blanca Port. Cargo handling facilities and intermodal transportation facilities should also be improved and reinforced to meet the port capacity.

   In order to develop the port as another deep-sea grain loading base, however, the following problems are to be taken into account:

   a) The distance from major grain producing areas of northern part of Buenos Aires Province and Santa Fe Province is fairly long.

   b) The hinterland of the Port more or less duplicate with that of Bahia Blanca Port.

   c) A considerable amount of further investment for improving railway transportation capacity is required.

d) As a container terminal, the distance from the Port to the Buenos Aires metropolitan region is fairly long.

2) Another plan is to install a floating elevator at a deep-water site at the mouth of La Plata river to accommodate the PANAMAX type carriers. The floating elevator is equipped with a large-capacity hold and a large-capacity cargo handling system. With this, ocean-going grain carriers can be fully loaded without going up to the Parana river. However, a careful consideration should be paid to weather and marine conditions since the expected mooring site for the floating elevator is off the mouth of La Plata river, it might be necessary to develop system to cope with these conditions. It is also advisable to consider whether it is necessary to introduce large-capacity shuttle carriers of a shallow draft that can play between the ports along the Parana River and the floating elevator by clearing the navigational limitations in the Parana River.

There exist a possibility which could offer some fundamental solution to the constraints of the country's port system that there is no deep-water port near Buenos Aires, but which may be difficult to realize in a short time because of Argentina's financial difficulties that will deny the plan with huge initial investments involved, is to install an artificial island equipped with a deep-water port off the mouth of La Plata river. This artificial island will be sited 7 to 8 km off the shore of Santa Teresita to have a water depth of about 14 m. The artificial island can accommodate the PANAMAX type ocean-going grain carriers without any need for costly and troublesome maintenance dredging of river ports and channels. In addition, it can accommodate barges from the Parana. The island will be connected with a rail-road bridge to the shore.

The technological advantage of this scheme is that the artificial island is little subjected to littoral drift incidental to surf zone, and also that the existing beaches will not be affected by the artificial island. This kind of artificial island can be equipped with not only a grain terminal, but also a container terminal capable of accommodating the 4th generation full-container ship with a capacity greater than 3,000 TEUs, oil terminal, and a deep-sea fishing base. On the other hand, the above possibility of constructing the port island has the following problems to be solved.

a) the distance from major grain producing areas such as the northern part of Buenos Aires Provinces and Santa Fe Province is fairly long,

b) a huge initial investment is required for such engineering works as the reclamation of island, the construction of rail-road bridge, etc.,

c) a sizabl amount of new investment for connecting the island with the existing railway network, and

d) an introduction of deep-sea marine engineering technology which could be new to Argentine engineers is necessary.

Considering the importance of grain exports to the Argentine economy, it will be urgent to set out the basic policies about which of two alternative plans and one possibility mentioned above be decided upon, or which combination of the plans be selected, what role the existing ports should play within the overall grain transportation system, and what short-term improvement measures, mentioned in the following section 2-5-3, be taken to be compatible with the selected long-term policies.

2-5-3 Areas for Short-term Improvement

Any short-term measures should be implemented in keeping with the long-term policies for the improvement of grain transportation system. With this in mind, the following short-term improvement measures should be promoted.

(1) Improvement of rail transportation

For the improvement of inland grain transportation by railway, the following measures are suggested to be implemented in a short-term perspective.

1) Inventory survey of track structures, roadbed, signaling and telecommunication facilities, locomotives, freight cars, depots, etc., and identification of equipment and facilities in need of reconstruction and repairs.

2) Quantitative survey of stations and routes for grain transportation.

3) Disposal of overage and obsolete facilities (particularly, locomotives and freight cars).

4) Prioritization of lines for allocation of locomotives and freight cars.

5) Prioritization of lines for maintenance budgeting.

6) Establishment of dynamic information exchange and processing system for locomotives and freight car dispatching to fulfill the shipping orders in the shortest possible time.

(2) Trucking

It is also a matter of urgency to reduce the demurrage of trucks by improving the turnaround facilities at ports. It is also required to make clear the role to be played by each transport mode and to improve the tariff system for smooth, efficient and reasonable intermodal transportation for the across-the-board reduction of inland transportation costs.

(3) Grain loading facilities at ports

While some of privately owned facilities at loading ports are new and efficient, most of facilities are decrepit. Particularly, JNG's facilities have already been superannuated to impede cargo handling work seriously, and should be replaced.

(4) Waterways

Following projects on tap should be implemented as soon as possible in order to augument the efficiency of handling cargoes (mainly grains) at ports and harbours.

1) Bahia Blanca Phase II project.

2) Implementation of detailed studies for dredging of access channel for Quequen Port and installation of floating elevators.

3) Installation of radar system for navigation control.

In addition, some measures should be taken to secure the safety of navigation at channels and rivers, particularly at night, in the light of the efficient cargo transportation.

(5) Information system

At present, the COTG is in the process of developing a database concerning the production, distribution, storage and transportation of grains. While the database is important for the formulation of a long-range strategy for the rationalization of grain transportation, it is equally important to develop a central real-time information processing system that will streamline daily transportation operations, help use the facilities available to the maximum extent, and will also assist in doing logical decision-making for the reduction of the overall transportation cost. It is therefore strongly recommended to develop a computer-assisted system for the planning and management of grain transportation.

3. CONTAINERIZATION IN ARGENTINA

3-1 Existing State of Containerization

3-1-1 Container Handling Volume

As described in 1-5-1-(1), the number of marine containers handled at Argentine ports totaled about 130 thousand TEUs (incl. empty ones) in 1984. Seen by port, Buenos Aires registered by far the largest number of about 119 thousand TEUs, accounting for 91.7% of total container volume handled in that year (see Table IV-1-2 in 1-5). In the three-year period from 1982 to 1984, the container handling volume in Argentina showed a steady upward trend, with about 104 thousand TEUs recorded in 1982, about 129 thousand TEUs in 1983, and about 130 thousand TEUs in 1984. Changes in base cargo volume in the said three-year period, excluding grains, sand and gravels, iron ores, petroleum, etc. (i.e. commodities shown under Items 10/1 (wheat) - 12 (oil seeds), 25/1 (sand) - 27/3 (liquid fuels), and 73 (iron and steel) in Commodity Classification Table IV-1-1 are excluded), are as shown in Table IV-3-1.

Table IV-3-1 Changes in Container Base Cargo Volume

	Base Cargoes (1,000 tons)	Number of loaded containers (1,000 TEUs)
1982	7,115	74 (55 : 45)*
1983	5,968	87 (56 : 44)
1984	5,556	88 (58 : 42)

* Ratio of incoming containers to outgoing ones.
Source: Calculated from the data in Table IV-1-1.

As seen in the table the base cargo volume either dwindled or leveled off in the three-year period, but the number of loaded containers kept increasing, showing a growing tendency toward containerization.

It can also be seen in Table IV-3-1 that the ratio of incoming loaded containers to outgoing ones is generally balanced, although incoming containers show an upward trend. Share of empty containers in the total number of containers handled (TEU) is about 30%.

The General Port Administration (AGP) estimates that the container handling volume will be increased to 230,000 TEUs in the year 2000. This is 1.8 times the 1984 level of 130,000 TEUs based on an annual growth rate of 3.6%. Considering that the total container traffic in the world showed an average annual growth rate of 9.5% in the recent five-year period from 1979 to 1983, it can be said that the AGP's estimate is rather conservative and does not reflect the rapid progress of containerization in the world.

3-1-2 Container Terminal at Buenos Aires Port

As described above, Buenos Aires accounts for about 90% of the total container traffic in Argentina. Buenos Aires Port has a container terminal equipped with the only gantry crane in the country. The terminal is located in front of Dock D in the new port area, facing JNG's grain elevator Unit I which also uses Dock D (see Figure IV-3-1). The following are the main data of this container terminal.

Berth length	495 m
Yard width	Approx. 100 m
Maximum allowable draft*	29 ft (29 ft in access channel)
Gantry crane	1 unit

* See the maximum allowable draft shown in Table IV-2-7.

The container yard extension work (8,000 m^2) is now planned, and additional installation of one unit of gantry crane is also being examined.

The maximum allowable draft at this container terminal is regulated by that of Canal Principal (Punta Indio), just as the case with the grain terminal mentioned in 2-2-3-(1).

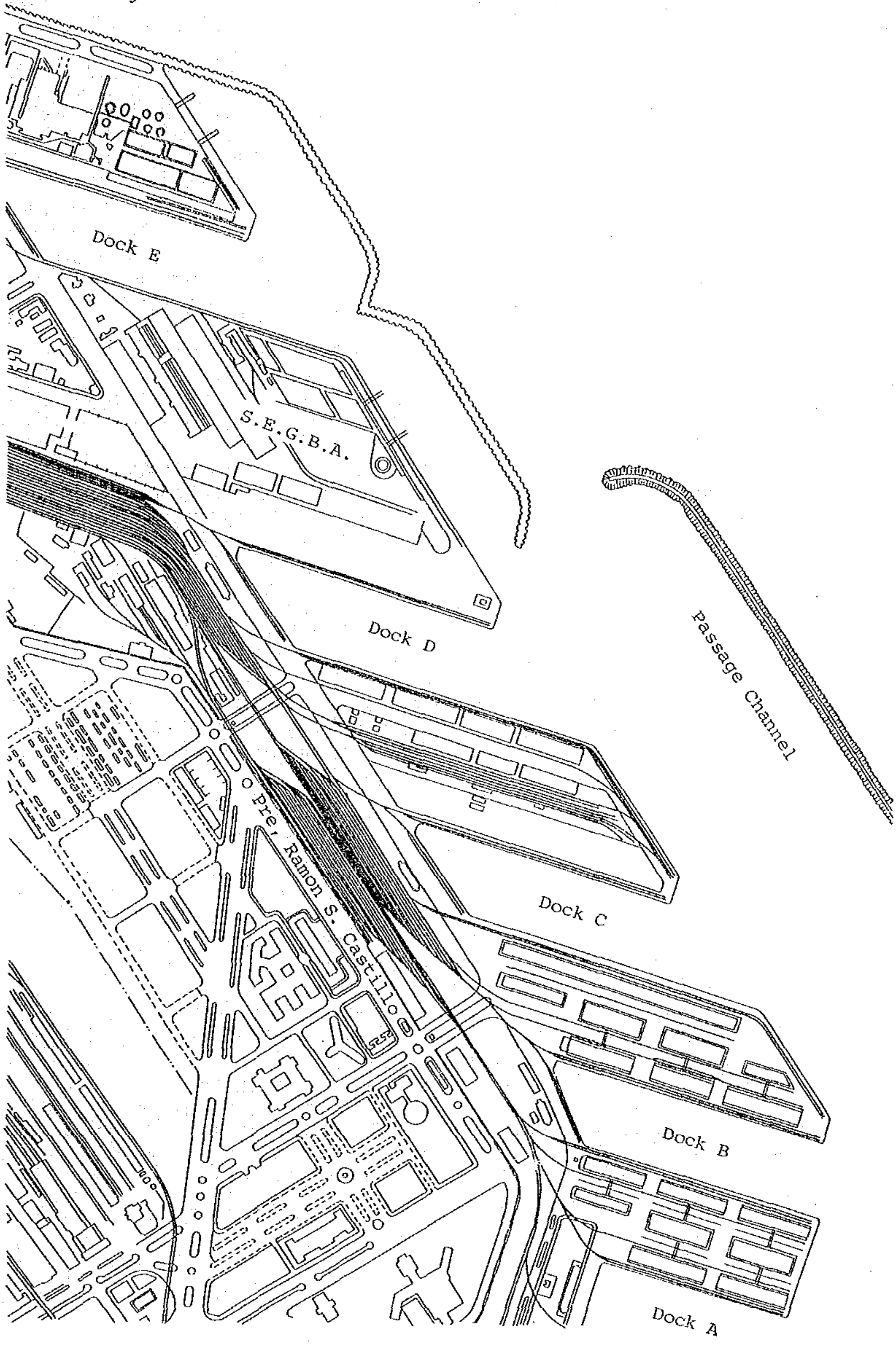
The terminal is placed under the direct management of the AGP, but the gantry crane is owned and operated by a private stevedoring company. For each container cargo handling operation, the stevedoring company applies for the AGP's permission to use the yard, and uses the designated place in the yard. Since the yard has a width of only about 100 m, there is no container stock place behind the apron. Furthermore, if the apron is excluded, it is nearly impossible to secure the space for marshalling yard. This is causing a hindrance to smooth loading work because the stevedoring company is required to carry the containers from a storage place far from the terminal immediately before each loading operation.

3-1-3 Incoming Container Ships

Full container ships have recently been put on the USA and European lines, but most of them are small ones with a hold capacity of about 800 TEUs because of the small allowable draft at the terminal.

Container cargoes handled at the terminal include those carried by full container ship, semi-container ships and conventional cargo ships.

Figure IV-3-1 Container Terminal at Buenos Aires Port



3-2 Trend of Containerization in the World

3-2-1 Changes in Container Handling Volume

Since the advent of the first container ship in the mid-1960s, containerization progressed at a rapid pace in the world's marine transportation service. The world container port traffic kept increasing consistently, not influenced by the first oil crisis of 1973 or the subsequent second oil crisis of 1979. The world total of container port traffic reached about 46 million TEUs in 1983. This is 2.7 times the level in 1975, and indicates an average annual growth rate of 12.9%. The annual growth rate averaged as high as 9.5% even in the recent five-year period form 1979 to 1983 (see Table IV-3-2).

Advanced countries in the world are on the move of developing of an international, intermodal and door-to-door container service system that will benefit the shippers with time and cost savings. Containerization of sundry goods will gain more and more momentum in the future.

As shown in Table IV-3-3, the majority of regular freight liners in the world have already been containerized, and the market of conventional cargo carriers will be reduced for any regular liner service. Containerization is an overwhelming trend in the shipping world, and Argentina should prepare itself immediately to keep pace with this trend to pave the way for its economic growth.

3-2-2 Transition of the Type of Container Ships

The basic design and philosophy of full-container ships have changed with the progress of containerization started since the mid-1960s and in keeping with the changes in the world economies. Here, the container carriers are classified into the following four types for chronological analysis.

(1) 1st generation container carrier (1966-1970)

The age of international container service began in 1966 when Sea-Land Service, Inc. assigned four freighter-converted container carriers to the North Atlantic route between the Atlantic coast of North America and Europe.

In its early stages, the container service was mainly led by small container carriers of 700 to 1,200 TEUs partly because the shipping industry tried to make a moderate start for the purpose of avoiding investment risks and partly because the demand for container cargo transportation was relatively small. The speed of the container carriers, however, was set at 21 to 23 knots to be faster than the conventional high-speed cargo carriers, to impress the shippers with the merits of containerization - a quicker and cheaper way of transportation.

Table IV-3-2 World Container Port Traffic by Country

(1,000 TEU's)

Region	Country	Ranking	1975	1976	1977	1978	1979	1980	1981	1982	1983	Average increase rate per year % 1975-1983	1979-1983
Far East & Asia	Japan	2	1,868	2,380	2,709	2,918	2,897	3,320	3,737	3,754	4,106	10.3	9.1
	Taiwan	4	471	656	747	1,043	1,341	1,644	1,788	1,902	2,429	27.8	16.0
	Hong Kong	6	802	1,029	1,259	1,226	1,304	1,465	1,560	1,660	1,837	10.9	9.0
	Singapore	9	221	312	374	539	699	917	1,065	1,116	1,274	24.5	16.2
	South Korea	15	189	264	498	554	626	688	803	862	978	22.8	11.8
	Philippines	18	95	134	169	210	354	426	553	685	722	28.3	19.5
	Thailand	26	14	59	73	120	164	181	242	259	305	47.0	16.8
	Malaysia	27	66	83	100	123	152	172	205	234	291	20.4	17.6
Central & South America	Puerto Rico	16	877	875	786	1,113	803	852	842	935	911	0.5	3.2
	Brazil	22	44	56	46	78	35	43	223	265	364	30.2	17.7
Middle East	Soudi Arabia	12	-	-	274	499	710	818	914	1,049	1,187	-	13.7
	United Arab Emirates	20	-	-	91	190	259	340	440	411	501	-	17.9
	Israel	24	134	169	199	237	268	279	293	304	336	12.2	5.8
	Kuwait	28	-	-	59	91	122	171	223	284	250	-	19.6
Africa	South Africa	19	63	114	146	323	457	570	734	661	652	33.9	9.3
North America	USA	1	5,270	5,723	5,477	6,173	7,243	8,618	8,363	8,730	9,477	7.6	6.9
	Canada	17	438	491	626	629	749	789	836	767	839	8.5	2.9
Europe	UK	3	1,393	1,535	1,774	1,986	2,300	2,236	2,283	2,575	2,768	9.0	4.7
	Netherlands	5	1,139	1,298	1,404	1,696	1,872	2,082	2,240	2,302	2,423	9.9	6.7
	German Fedral Republic	7	736	878	979	1,177	1,332	1,493	1,725	1,690	1,758	11.5	7.2
	Italy	8	318	445	604	824	1,021	1,074	1,272	1,241	1,368	20.0	7.6
	Belgium	10	492	524	597	636	871	915	1,034	1,028	1,214	11.9	8.7
	France	13	393	543	628	715	928	1,071	1,280	1,215	1,165	14.5	5.8
	Spain	14	267	333	593	559	689	766	864	1,075	960	17.3	8.6
	Sweden	21	205	234	256	275	346	315	346	422	417	9.3	4.8
	Denmark	23	209	201	215	241	304	318	332	353	346	6.5	3.2
Australia & South Pacific	Australia	11	745	755	852	854	1,162	1,245	1,254	1,267	1,205	6.2	0.9
	New Zealand	25	71	88	168	222	252	347	291	328	329	21.1	6.9
World Total			17,410	20,263	22,992	27,039	31,986	36,510	40,851	42,845	45,957	12.9	9.5

Source: Containerization International Yearbook (Years 1975 - 1983), edited by Jane R.C. Boyes.

Table IV-3-3 Tonnage and Number of Units of Containers Carried by Full-Container Ships (1984)

Route	No.	GT	DWT	TEU
Far East/North America West Coast	169	4,132,910	4,512,623	253,319
Far East/North America East Coast	89	2,781,764	3,071,548	181,863
Far East/Europe	89	2,258,123	3,113,480	184,204
Far East/Mediterranean	56	1,617,379	1,631,682	94,456
North America East/Coast/Europe	85	1,889,246	2,101,546	123,115
North America Gulf/Europe	21	357,079	404,330	21,041
North America East Coast/Mediterranean	53	1,138,950	1,229,253	74,671
North America Gulf/Mediterranean	24	414,769	480,986	27,639
North America West Coast/Europe Mediterranean	21	493,224	506,712	26,498
Far East/Australia, New Zealand	57	820,850	923,268	47,065
North America/Australia, New Zealand	23	386,238	472,992	24,932
Europe Mediterranean/Australia, New Zealand	43	992,712	1,109,155	56,983
Australia, New Zealand/Middle East	29	712,875	775,856	37,862
Australia, New Zealand/India	3	42,652	44,698	1,864
Middle East/South America	2	16,265	48,268	1,000
Middle East/Africa	13	129,455	183,632	7,892
Middle East/India	16	184,249	216,765	11,199
North America/Middle East	34	739,942	987,867	53,948
North America/Middle East	173	3,167,628	4,264,740	231,622
Far East/Middle East	85	2,030,092	2,243,395	119,956
Far East/South America	13	304,794	334,360	16,117
North America/South America	33	509,908	540,961	24,542
Europe Mediterranean/South America	62	1,235,815	1,365,657	70,310
South America/West Africa	1	7,955	7,200	414
Far East/Africa	12	187,934	214,338	10,405
North America/Africa	3	57,493	45,125	2,604
Europe Mediterranean/South Africa	22	623,416	667,427	32,543
Europe Mediterranean/West Africa	33	409,784	514,469	24,271
Europe Mediterranean/East Africa	27	605,741	671,584	33,612
Far East/India	11	150,482	166,943	8,682
Europe Mediterranean/India	11	139,069	178,500	8,812

Source: Research Division, Nippon Yusen Kaisha Co.

Notes :
1. Ships of capacity more than 150 TEU and more than 3,000 Gross Ton, and of LO/LO or RO/RO type are indicated.
2. The above table indicates that many container routes are originated from/destined to Middle East. However, this is the result of what many container lines are passing through Middle East and other longer lines stopping over Middle East ports are also included in the Middle East lines.

(2) 2nd generation container carrier (1971-1973)

While intermodal transportation via container called for vast sums of investments, a reduced transit time, increased cargo safety, and various other features of containerization met with the needs of shippers. As a result, shipliners fell into line with shippers to promote containerization. In the 1971-1973 period, the container shipping found its footing as a mode of transportation after going through with its experimental stages, and all the major routes connecting North America, Europe, Japan and Australia had been containerizated. To establish long-distance containerized cargo routes between the Far East and Europe, and between the Far East and the east coast of North America in order to meet the increasing demand for maritime transportation due to the vigorous economic growth in the world, the shipping industry launched high-tonnage high-speed container carriers ranging in capacity from 1,800 to 3,000 TEUs and in speed from 25 to 33 knots. The largest of the container carriers was set to be the PANAMAX size because the Suez Canal was held closed at that time and also because the shipowners held in view the application of carriers to other routes.

(3) 3rd generation container carrier (1974-1981)

The first Oil Crisis triggered in 1973 brought about oil price hikes and diminished world trade. Alarmed by the situation, every industry made every effort to reduce energy consumption to maintain cost competitiveness. The shipping industry was no exception, and medium-speed high-efficiency container carriers with a capacity of 1,300 to 1,600 TEUs and running at a speed of 20 to 22 knots took a leading position. Emphasis was placed on the stowage efficiency rather than on speed; namely, a broad and deep-draft hull was employed for an increased stowage factor, and the main engine was changed from the hitherto turbine to the diesel one for an improved energy efficiency. In addition, automatic navigation system was introduced to reduce labor cost. The hull breadth remained restricted to the PANAMAX size of 106 feet.

Highlighting this period is the advancement of the oil-rich countries in the Middle East and the newly industrializing countries in East and Southeast Asia which made marked economic progress into the container shipping by their own national lines by constructing container terminals of their own. As the container shipping routes had diversified, so had the types of container carriers. Namely, RO/RO ships, semi-container ships and bulk/container carriers, etc. together with full-container carriers participated in container shipping to meet specific conditions of routes and ports and harbors.

As the containerization of the routes connecting among developed countries almost have completed, the containerization of the north-south routes connecting between developed countries and developing countries was brought into focus. Unlike the routes between developed countries, the north-south routes carried containerized cargo one way only, and was not so lucrative. The existing shipping companies were forced to operate their cargo liners with no regard to payability in order to survive fierce competition and defend their market shares to the last.

(4) 4th generation container carrier (1982-present)

With the popularization of container transportation and with the growth of container transportation technology, any newly-established shipping company has become able to enter upon regular liner services only if he has enough fund for investment. This in turn has led to a fierce competition between the members of the Shipping Conference and the outsiders. The buildup of public container terminals and associated infrastructural facilities has betrayed the original forecast that the outsiders would be given little chance of entering into a capital-intensive container transportation business.

Since 1982, the large-sized container carriers have been thought better of for the economy of scale to survive an elimination game through cost reduction. Namely, the container carrier has been increased in size to the extent allowed by the PANAMAX size, and has been fitted with an energy-efficient low-speed main engine. Its service speed has been reduced to 18 to 20 knots.

3-2-3 Merits and Demerits of Containerization

Container transportation on a commercial basis started in the latter half of the 1950s when a U.S. rail company developed a new transportation system called the piggy-back system to go hand in hand with the upstarting trucking services that were beginning to nibble away the share of rail transportation. The piggy-back system is an intermodal transportation system in which the economy of a long range high-speed low-cost mass transit service by rail is combined with the door-to-door delivery convenience of short-range trucking to offer an integrated and rationalized transportation service to the shippers.

The scheme proved to be a great success. The number of freight cars in the USA was 160,000 in 1955, but shot up to 1,160,000 in 1966. This explosive growth of the piggy-back system came from its virtues including: (1) economy (inexpensiveness), (2) mobility, (3) safety, (4) ease of cargo handling, and (5) reduced cargo handling time at cargo terminals.

As the containers were found efficient in overland transportation, the shipping industry was quick to introduce containers for marine transportation. In 1966, Sea-Land Service, Inc. initiated ocean container shipping on the North Atlantic route between the Atlantic coast of the USA and northern Europe. In less than a decade, the major regular liner routes in the world have been containerized. This rapid progress of containerization of ocean transportation may be explained by the following merits.

1) Rationalization of cargo handling

Unitization of cargo has made it possible to develop efficient cargo handling facilities, which in turn have improved the labor productivity to save labor cost tremendously.

2) Improvement of turnaround efficiency

Loading and unloading of vessels can be carried out in a short time even in bad weather, reducing the turnaround for increased operating efficiency of the container carrier.

3) High-speed mass transportation

The rationalized cargo handling and improved operating efficiency have made even a high-priced large-sized high-speed container carrier viable, doing much for high-speed mass transportation of cargo and for the expansion of international trade.

4) Well-coordinated intermodal transportation

Transshipping of cargo between container carrier, rail, truck, barge and airline has become easy, and has broadened the range of choice of transportation means and routes to best meet every shipper's needs.

5) Reduction of packaging cost

The containerization has revolutionalized packaging, and has reduced the packaging cost and labor cost pronouncedly.

6) Protection of cargo from damage and theft

A sturdy container protects cargo from damage and theft, minimizes break-bulk operations, and has reduced freight insurance premiums.

7) Stabilization of inventory

The smooth cargo handling reduces the lead time for cargo transportation and distribution, making it easy to control inventories for reduction of interest on commodities.

8) Ease of handling special cargoes

Special containers have been developed for door-to-door transportation of special cargoes such as frozen goods and liquids without deterioration of their quality.

Upon international standardization of containers, the containerization with these advantages spread rapidly from the USA to European countries and Japan as it was found effective particularly in developed countries where there is a heavy demand for transportation and the labor cost is high.

While the containerization has merits as stated above, it has drawbacks as well. For example, the containerization is a capital-intensive project because it requires heavy investments in the construction of carriers, terminals and cargo handling equipment for exclusive use for containers.

The containerization also calls for a well-developed information network that always keeps track of container vans for the purpose of dispatching and routing them quickly and efficiently.

For this reason, it was generally believed in the early stages of containerization that the container shipping would not pay off on routes where a small quantity of diverse cargoes must be handled. This view deterred the containerization of routes to the developing countries.

The progress of containerization on the routes connecting the developed countries made the cargo transportation more and more efficient, only to widen the gap in international competitiveness of products between the developed and developing countries. Alarmed by the situation, the developing countries began to accelerate containerization.

The shipping industry all over the world is now well prepared to handle sundry goods by carrying containers aboard the conventional cargo carriers or by making use of semi-container carriers.

Containerization which started with a specific route for a specific type of cargo has now evolved into an increasingly coordinated transportation system covering not only developed but also developing countries for transportation of a wide variety of goods. As the merits of containerization have been more and more amplified the containerization.

3-2-4 Container Terminal

(1) Basic data

At present, major container terminals in the world have a water depth of about 13 - 14 m or 39 - 42 ft for berthing the PANAMAX type container ships, and some have a larger water depth in anticipation of the advent of the Super PANAMAX class ships (see Table IV-3-4).

Some major container terminals have a berth length of more than 1 km to realize efficient operation by making use of the scale merit (see Table IV-3-5).

Most of these terminals have a container yard width of 300 - 500 m, and some have even larger container yard widths. Smooth and fast container handling at the terminal calls for a considerably large width of the container yard.

(2) Management system

The following two are the common management systems adopted today at most of container terminals in the world.

1) Leased management system

In this system, the infrastructural facilities of container terminal are built mainly by the port administration body, and leased to a private sector enterprise such as a stevedoring company or a shipping company under a long-term contract.

Table IV-3-4 Maximum Water Depths at Leading Container Terminals

Region	Port	Maximum Water Depth at the Terminal (ft)	Remarks
Europe	Marseille	42	Fos, Deck 2
	Barcelona	42	
	Algeciras	36	
	Hamburg	42	HHLA, Burchardkai
	Rotterdam	45	ECT, Delta
	Antwerp	54	Seaport (Multipurpose)
Far East	Kobe	39	Rokko
	Yokohama	39	Honmoku, D
	Busan	38	
	Inchon	42	
	Hong Kong	37	
	Kaoshiung	42	
Asia	Singapore	38	
	Kelang	40	
North America	New York	37	Sea Land
	Baltimore	35	Dundalk Marine
	Seattle	46	Terminal 18
	Oakland	38	Sea Land
	Long Beach	38	OTS
	Los Angeles	41	

Source: Study Team

Table IV-3-5 Total Berth Lengths at Leading Container Terminals

Terminal	Port	Berth Length (m)
Fos. Dock 2	Marseille	980
Muelle Principal de España	Barcelona	1,088
HHLA Burchardkai	Hamburg	2,375
Eurokai	Hamburg	890
ECT home	Rotterdam	2,880
ECT Delta	Rotterdam	1,250
Prinses Bealrix Haven NE	Rotterdam	2,300
Hessenatie Neptunus	Antwerp	1,070
Gylsen	Antwerp	1,500
Ohi 3, 4, 5	Tokyo	850

Source: Study Team

The container terminal is managed by such stevedoring or shipping company.

2) Direct management system

In this system, the container terminal is placed under the direct management of the port administration body.

Most of major container terminals in the world are run by the leased management system, but there are some which are run by the direct management system. If in the case that the direct management system is adopted, it is usually operated as follows:

1) Only the apron with a width of 50 - 80 m is managed directly by the port management body.

2) The container yard behind the apron used as marshalling/stock yard is managed by a private sector enterprise under a long-term lease agreement with the port management body.

3-3 Problems in Existing Container Terminal of Buenos Aires Port

Judging from the existing state of containerization in Argentina and the trend of containerization in the world discussed in Sections in 3-1 and 3-2, respectively, the problems currently confronting the existing container terminal at Buenos Aires Port can be summarized as follows.

1) Owing to the small water depth at the berth, large-type full container ships cannot be accommodated. For this reason, containers are transported by large-capacity but shallow draft full-container carriers, small-capacity container carriers, semi-container carriers, multi-purpose cargo boats, and conventional cargo carriers.

2) Container yard has a width of only 100 m. If the apron is excluded, the space for marshalling yard is very narrow, and there is no stock yard behind the apron. This is causing a serious hindrance to the quick, efficient container loading/unloading operation.

3) Although the container terminal is placed under the direct management of the AGP (port administration body), no container yard is secured immediately behind it that can be used exclusively for cargo handling service of a private sector enterprise. Coupled with the physical factor mentioned in 2) above, this is causing a difficulty in terminal management, making it impossible to realize efficient, speedy container loading/unloading service.

4) There is but one wharf container crane insufficient in outreach and height. The greater part of 130,000 TEUs of containers handled in 1984 may have been handled by ship's cargo gear or other wharf facilities. Assuming that the existing are operated 300 days a year and 12 hours a day at an efficiency of 20 TEUs per hour, the

annual container handling capacity is 72,000 TEUs (300 x 12 x 20), which is far short of 230,000 TEUs estimated by AGP for the year 2000.

5) It takes too long to complete the formalities for customs clearance, etc.

3-4 Suggestions for Accelerated Containerization in Argentina

It is probable that containerization in Argentina will proceed at a high pace in the future in parallel with the worldwide progress of containerization. The AGP's forecast that the total container traffic at Argentine ports will increase to 230,000 TEUs by 2000 is to be construed as a conservative estimate.

The following is the growth of container cargo volume cited from various studies by AGP in its "Estudio Evaluacion Trafico de Contenedores".

(1,000 TEUs)

Study	1985	1990	2000	2010
AGP	140	172	226	278 (Bs As Port only)
Puerto Escobar	-	196	428	-
Eurokai	337	-	-	-
Copuap	397	-	692	-

Source: AGP, Estudio Evaluacion Trafico de Contenedores.

According to "Estudio Evaluacion Trafico de Contenedores", the imports and exports of containerizable products were about 3,744,000 tons in 1982, and the containerized imports and exports were about 95,000 TEUs. Assuming that the ratio of empty containers is 11%, and the weight is 12 tons/TEU, the containerized ratio is calculated at about 27% (95,000 TEUs x 0.89 x 12 tons/TEU ÷ 3,744,000 tons). As regards Hamburg Port appearing in AGP's report, the containerized ratio in 1983 was 63% (= 2,015/3,214), almost on the same level as 64.51% estimated by AGP for the year 2000.

As things stand now in Argentina, the containerized ratio is kept quite low, which may be attributable to the following.

1) Underdeveloped container terminals defy the access of container carriers.

2) Surcharges for container transportation are disincentive to shippers.

Elimination of these impediments will give a spur to container transportation. Increases in imports and exports due to growth of population and GNP and in containerization of import and export cargoes will soon bring AGP's estimated container demand being too conservative.

The container handling capacity of the existing terminal is coming close to its limit even at the present traffic level of 130,000 TEUs. Considering the problems pointed out in 3-3, it is necessary to enforce drastic measures to cope successfully with the expected increase in container handling volume in the future. Regarding the small yard size and the capacity shortage of gantry crane cited in 2) and 4) of 3-3, it will be possible to find a solution by the restructure of existing facilities of Buenos Aires Port. However, the shortage of water depth pointed out in 3-3, 1) cannot be solved by the restructure of port facilities because it is a restraint imposed by the access channel.

Since the restructure of existing facilities will serve only for uneconomical container traffic by small type ships and will consequently produce a limited investment effect, it is recommended that studies be made regarding the possibility of developing a new container terminal from a long range point of view at a suitable port on the Atlantic coast which has a sufficiently large water depth and is close to Buenos Aires. In exploring the feasibility of this plan, it will be necessary to study the possibility of providing efficient railway transportation service linking the new container terminal with Buenos Aires and other major cities in the country.

As for the problem of terminal management system mentioned in 3-3 3), it is considered that efficient terminal management and operation can be realized by a capable private sector enterprise under the leased management system described in 3-2-4-(2). Even if the port management body undertakes the terminal management, the scope of such direct management should be limited to the apron, and a container yard for exclusive use of a private sector enterprise should be secured immediately behind it. This is an essential prerequisite for speedy, efficient container handling service in the future.

As regards the time required for various formalities including the customs clearance procedure, it will be possible to cut it down by reexamining all relevant regulations and by introducing a computerized procedural system.

A container terminal with a 230,000 TEUs a year capacity estimated by AGP for the year 2000 is about the size of Berths 3, 4 and 5 of Ohi Wharf at Tokyo Port. The principal particulars of Ohi Wharf's Berths 3, 4 and 5 are given below by way of reference for the modernization of the container terminal at Buenos Aires Port (See also Figure IV-3-2).

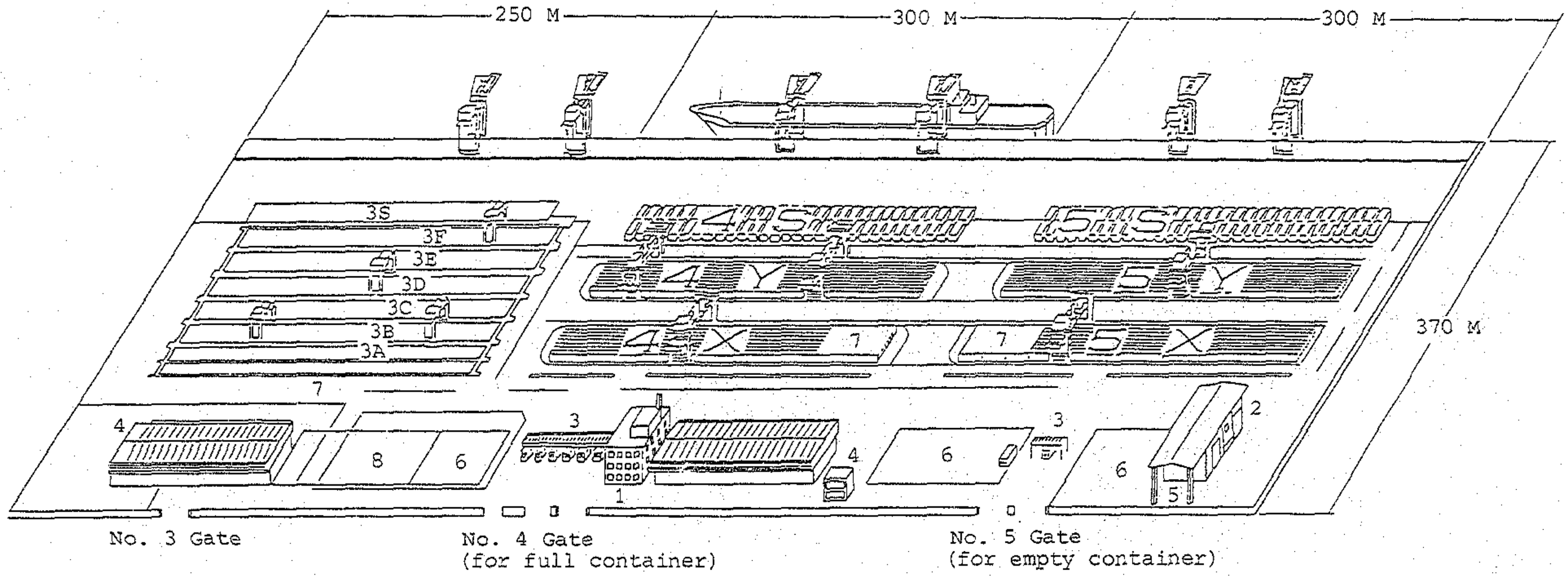
1) No. of containers handled	:	250,000 to 300,000 TEUs/year
2) Area	:	314,500 m^2
3) Berth length	:	Berth No. 3: 250 m
		Berth No. 4: 300 m
		Berth No. 5: 300 m
4) Berth width	:	370 m
5) Draft	:	36 ft
6) Gantry crane	:	30.5t (Max. 45.5t) 6 units

7)	Transfer crane (Rail type)	:	30.5t (Max. 40.5t)	5 units
8)	Transfer crane (rubber type)	:	30.5t (Max. 39.5t)	4 units
9)	Straddle carrier	:	30.5t	8 units
10)	Tractor	:		21 units
11)	Chassis	:		67 units
12)	Forklift	:	15.0t	2 units
13)	Containers storage capacity	:	Dry container:	11,400 TEU
			Refer container:	470 TEU
14)	Other facilities	:	Maintenance facilities	1,799 m^2
		:	Administration offices	5,382 m^2

Bringing about a technical innovation in physical distribution, containerization has served as a prime mover for the introduction and development of new production and transportation systems throughout the world. The conventional stowage aboard a ship, which necessitated the skillful operation and thereby a large number of skilled labors has now been replaced by a simple operation of stacking containers, and the regular cargo liner services have become more punctual and efficient because of high-efficiency and uniform-quality cargo handling services at terminals. the simplification and standardization of seaborne cargo transportation by containerization have modernized the shipping industry by leaps and bounds, bringing about dramatic changes in the relative bargaining position of shippers, shipping companies and freight forwarders.

Containerization has not always been a boon to all. Nevertheless, the rapid pace of containerization in the world's shipping circles remains unabated, reflecting the strong needs of the times for containerization. Irrespective of the ups and downs of the world economy, the role played by container transportation in world trade will become increasingly important in future. If Argentina is to improve its economy and its world trade position, to promote its industrialization, and to build a better life, it should exhibit the vision and the courage to push forward containerization with a vigorous national commitment.

Figure IV-3-2 Ohi No. 3,4,5, Container Yard



1.	Main Office	5.	Cleaning Area
2	Maintenance Shop	6.	Repairing Area
3.	Gate	7.	Reefer Container Stocking Area
4.	Substation	8.	Area of Botanical and Ecological Inspection

4. CARGO TERMINAL IN BUENOS AIRES

Cargo terminals installed by private cargo transporters for smooth operation of their business are called private cargo stations. On the other hand, terminals aimed at improving the efficiency of general inter-urban cargo transportation and urban traffic service, which are used by all transporters for a fee, are called general cargo terminals. These are sometimes called public terminals because they are open to all users, but this does not mean that they are all placed under the management of the central or local government.

As of 1986, Argentina has no general cargo terminals intended mainly for trucking service of cargoes. In Buenos Aires, however, moves were made a number of times toward constructing such terminals. In 1982, for example, CONARSUD S.A.[1] conducted a feasibility study for a general cargo terminal construction project, which was commissioned by the DNTT (National Directrate of Land Transport) of the Ministry of Public Works and Services (MOSP). In this chapter, the existing state of cargo movement in Buenos Aires and the background/contents of the said general cargo terminal construction project will be reviewed, and the problems entailed in the project will be pointed out and measures for their solution will be proposed on the basis of the Japanese experience in the construction and operation of cargo terminals.

4-1 Outline of Cargo Traffic

4-1-1 Inbound/Outbound Cargo Traffic of Capital Region

In the Buenos Aires Capital Region, a comprehensive traffic and transportation survey was conducted at the outset of the 1960s. However, the data of urban cargo traffic is extremely limited at present because no similar surveyes have been made since that time. In the 1982 feasibility survey conducted by CONARSUD for the said Buenos Aires general cargo terminal construction project, the inbound/outbound cargo traffic of the Capital Region was estimated as follows on the basis of limited data.

The Capital Region, which is made up of the City of Buenos Aires and 24 departments of the Buenos Aires Province, covers an area of 43.6 km^2 and has a population of about 11,600,000 (1986 estimate) which accounts for 38% of the country's total population. In 1980, it is estimated that inbound cargo traffic to this region amounted to a total of 76.1 million tons and outbound traffic from it registered a total of 36.7 million tons. This means that total cargo traffic increases at an annual rate of 3.1% between 1968 and 1980 because the 1968 statistics shows a total of 55.3 million tons for inbound traffic and 22.5 million tons for outbound traffic. This growth rate is much higher than the average population growth rate of 1.7% recorded in Buenos Aires in the 1970s. It is probable, however, that the present cargo traffic shows

1) CONARSUD S.A., Estado de Localizacion y Factibilidad de Una o Varias Terminales de Cargas en la Region Metropolitana de Buenos Aires, Noviembre 1982.

little change from the levels in 1980 because the Argentine economy's stagnation in the first half of the 1980s must have slowed down the growth of cargo traffic.

The 1980 inbound/outbound cargo traffic, broken down by means of transportation, is shown below. It can be seen that trucking held a share of more than 2/3 of total traffic of both inbound and outbound cargoes, and air-borne cargo traffic is negligible.

Means of transportation	Inbound (%)	Outbound (%)
Truck	68	67
Railway	6	1
River/marine transportation	26	32
Total	100	100

Inbound cargoes to the Capital Region are composed mainly of import cargoes landed at the port, export cargoes bound for the port, industrial raw materials and semi-manufactured goods for factories, vegetables, fruits and livestock products for consumer markets, petroleum products of power plants, factories and gas stations, comment for contractors and wholesalers, sugar for warehouses and factories, and general consumer goods. Cargoes outgoing from the region are comprised mostly of export goods to be shipped from the port and industrial products manufactured at factories in the region and to be shipped to inland areas.

4-1-2 Number of Automobiles

In 1983, Argentina had a total of 5,001,317 registered automobiles, of which 40%, or 2,000,911 cars, were used in the Capital Region (see Table IV-4-1). 80% of all automobiles registered in the Capital Region are passenger cars, 18.5% are trucks, and 1.5% are buses, and about half of all these automobiles are found in Buenos Aires City.

Table IV-4-1 Number of Automobiles in Capital Region (1983)

	Passenger cars	Trucks	Buses	Total
Buenos Aires City	839,289	151,320	18,645	1,009,254
Greater Buenos Aires[1)]	762,788	216,701	12,168	991,657
Total	1,602,077	368,021	30,813	2,000,911

Source: M.C.B.A.
Note : 1) 19 departments of Buenos Aires Province.

Table IV-4-2 shows annual changes in the number of automobiles in Buenos Aires City. As seen in the table, passengers increased at an annual rate of 5.7% and trucks at an annual rate of 4.7% from 1977 to 1983.

Table IV-4-2 Changes in Annual Number of Automobiles in Buenos Aires City

Year	Passenger cars	Trucks	Buses	Total
1976[1)]	575,000	111,790	13,210	680,000
1977	601,693	114,768	13,989	730,451
1978	685,743	124,788	15,339	825,870
1979	666,535	121,475	15,167	803,177
1980	707,633	130,195	16,076	853,934
1981	756,645	139,962	17,234	913,841
1982	818,710	149,005	18,428	986,143
1983	839,289	151,320	18,645	1,009,254

Source: M.C.B.A.
Note : 1) Estimates

4-1-3 Cargo Transporters

Industrial products account for a dominant portion of cargoes shipped from the Capital Region to local areas. Cargoes bound from factories in the region to local areas are shipped mostly in large lots of 3 - 5 tons or more, and transporters of these cargoes provide the door-to-door delivery service, carrying them from the factory or warehouse to the destination in local area.

In case of a small-lot cargo too small to make a truckload, the consignor is required to carry it to the transporter's office at his own expense because no cargo collection service is offered to such cargoes (called fractional cargo = carga fraccionada). Transporters of small-lot cargoes assort them in a warehouse or at their own truck terminal, and dispatch them when they are gathered to make a truckload. The aforementioned general cargo terminal project is intended mainly to improve the transport service of such small-lot cargoes.

The 1982 survey of CONARSUD disclosed that there were 1,059 fractional cargo transporters in the Capital Region, of which 40.6% were located in the Parque Patricios district (barrio de Parque Patricios) in Buenos Aires City. Most of them are private enterprises operating with 1 - 2 trucks, as seen in the following table.

Number of trucks owned	Component ratio (%)
1	31.4
2 - 6	37.6
7 - 16	17.5
17 or more	13.5

The truck industry, operated with a total of about 1.4 million trucks across the country, is an important industrial sector holding a share of 5.3% in Argentina's gross national product. However, transporters are small in operational scale. It is said that 85% of them are subsistence-level enterprises with an operational holding of 1 - 2 trucks, about 10% are medium-scale enterprises with an operational holding of 20 - 30 trucks, and less than 5% are large enterprises holding 50 or more trucks.

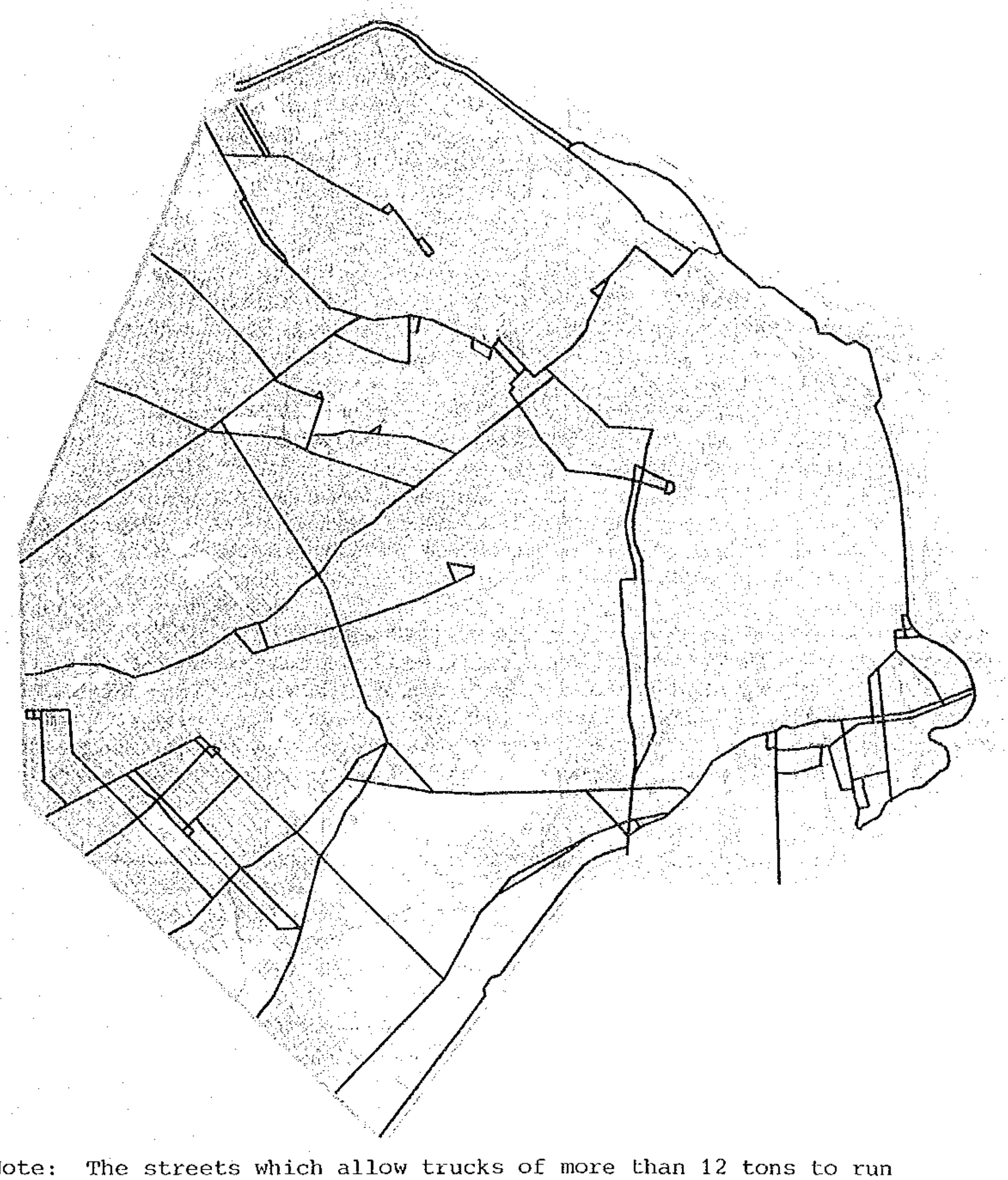
CONARSUD's questionnaire survey on the aforementioned small-lot cargo transporters in the Capital Region revealed that the operational holding per company averaged 7.4 trucks, weekly number of trips is 4.39, and monthly cargo handling volume is 401.2 tons. The facilities they own are generally limited to those meeting the minimum required operational demand. 47% of them have loading/unloading platforms, but those having cargo handling equipment account for only 14% of all transporters.

4-1-4 Restrictions on Truck Passage on Streets

If large trucks are allowed to run freely on streets in city areas, they are prone to cause various problems such as traffic congestion, noise pollution and deterioration of road conditions. Truck terminals constructed on the periphery of cities avert these problems by performing the transshipping function between large trucks for interurban cargo transportation and small ones for intra-urban cargo collection service.

Most of streets in Buenos Aires are two-lane roads with a roadway width of 5.5 - 7.0 m, but are actually one-lane roads because one of the two lanes is used as kerb parking lane. Since the traffic on such narrow streets is certain to be impaired extremely if trucks are allowed to run, the municipal authorities of Buenos Aires imposes restrictions on the passage of trucks in the city area. Figure IV-4-1 shows the restrictions imposed under the Ordinance No. 34856 and the Municipal Bulletin No. 15997 of 1979, which prohibit trucks of more 12 tons to run on any streets other than shown in the figure. The restrictions are applied 24 hours a day, not in certain time zones of the day. Some of the transporters covered by the said questionnaire survey voiced the view that it was difficult for them to abide by such restrictions owing to the absence of sufficient transshipping facilities.

Figure IV-4-1 Restrictions on Heavy Truck Passage on Buenos Aires Street Network



Note: The streets which allow trucks of more than 12 tons to run are indicated in thick lines.

4-2 Background of General Cargo Terminal Development Project

The scheme for developing a general cargo terminal in Buenos Aires City is a long-standing one that has been brought close to a successful issue a number of times in the past, but each time it was postponed owing to political, economic or social reasons.

In 1929, the Argentine trucking companies organized a union and negotiated with the Government for establishment and enforcement of the Government measures for rationalizing cargo transportation service. This union is the predecessor of the Argentine Confederation for Land Transportation of Cargoes (CATAC) established in 1954, which has grown to a huge organization having more than 200,000 member transporters. The first proposal for developing a truck terminal was made in 1961 by a group of private transporters belonging to the CATAC. The scheme developed by these transporters received positive support from the municipal authorities of Buenos Aires, but was baffled by a political change in the country. In 1964, another terminal development plan was studied within the Secretariat of Transportation of the MOSP, but was not taken up for discussion as a government project.

The first scheme mentioned above was developed as a pilot project for verifying the advantages of truck terminals. For this purpose, a land area of 15 ha facing Perito Moreno Street (Avda. Perito Moreno) near Cruz Street was planned to be used, but it was occupied by a squatter before the municipal authorities completed the formalities for granting the use of it.

In December 1967, a group of relatively large-scale member companies of the CATAC left it and organized the Argentine Federation of Truck Transporters of Cargoes (FADEEAC). From this time on, the FADEEAC played a central role in promoting the private cargo terminal development project, making efforts for elaborating the scheme for practical execution and negotiating with the Government for its early materialization.

In 1978, the municipal authorities of Buenos Aires determined to use the said land on Perito Moreno Street for the truck terminal and began removing the squatter. The land the municipal authorities planned to sell to the terminal developer covered an area of 78 ha (including the said 15 ha area) in Almirante Brown Park.

In the mean time, moves gained impetus for terminal development among private sector enterprises. In 1979, about 110 member enterprises of the FADEEAC gathered for establishment of the joint stock company Buenos Aires Cargo Transshipment Station (ETCARBA). After the ETCARBA made a start in 1980, it took the place of the FADEEAC in carrying out negotiations with the municipal authorities and the Federal Government for terminal development. The ETCARBA studied the feasibility of implementing the terminal development project in the said land area, and proposed the following land use plan to the municipal authorities.

1.	Green zones	39,074 m^2
2.	Central office building	22,532
3.	Repair shop	13,210
4.	Garage	11,856
5.	Truck standby space	10,762
6.	Truck parking space	4,000
7.	Inter-warehouse roads	49,820
8.	Warehouse-front parking space	201,157
9.	Principal roads	70,082
10.	Passenger car parking space	55,768
11.	Operating module (incl. platforms)	149,940
	Total	641,792 m^2

Negotiations for realizing the terminal were held a number of times between the municipal authorities and the ETCARBA, but the two parties failed to reach an accord principally in regard to the transfer price of the land. Furthermore, the project site was not as suitable as it was in the 1960s owing to the changes in traffic and land use conditions resulting from the urbanization that had gone far beyond it by this time, although many transporters were located near Almirante Brown Park. In the 1980s, the truck industry faced a depression that followed the decline of Argentina's economy, and the project had to be dropped.

As described above, CONARSUD, a consultant firm, conducted a feasibility study for the cargo terminal development project in 1982 under commission from the DNTT of the MOSP. On the basis of this study, CONARSUD selected land adjoining La Matanza Central Market as the most suitable site of the terminal, and proposed the construction of 266 modules to accommodate about 300 transporters. CONARSUD also proposed that the first phase construction work be completed in 1984 - 1985 period for terminal opening in 1986. However, the project has not shown any notable progress up to the present time (June 1986) partly because the growth of the truck industry slowed down in the first half of the 1980s as a result of continued stagnation of Argentina's economy. In the following section, the contents of the said feasibility study are briefly introduced.

4-3 Outline of CONARSUD's Feasibility Study

4-3-1 Objective and Functions of General Cargo Terminal

In 1982, CONARSUD conducted a feasibility study for the Buenos Aires truck terminal development project at the request of the DNTT. In this project, the terminal was planned as a nodal point of intra-urban collection service and inter-urban long-distance transportation service where small-lot cargoes bound from the Capital Region for local areas are to be sorted, stored and transshiped for truck transportation. The terminal was expected to bring about the following advantages to the former trucking system.

1) Raise the loading factor of small truck used for intra-urban cargo collection service.

2) Increase the number of inter-urban trips of large trucks.

3) Cut down the transportation cost by virtue of scale effects such as the introduction of cargo handling equipment and joint use of personnel and various service facilities.

4) Makes it possible to adjust two different modes of transportation, i.e., railway transportation and road transportation, by laying a railway siding in the terminal.

5) Transport market information can be collected and used for rationalization of trucking service through the operation of the terminal.

6) Strict enforcement of all existing transport-related laws and regulations which can be realized with ease by centralized management of trucking service.

7) Terminal operation produces various external economies, including the allevation of urban traffic environmental problems such as traffic congestion, noise pollution and exhaust gas emission, higher land utilization resulting from the transfer of existing private terminals and efficient use of their former land sites, and industrial development in the areas surrounding the terminal.

The project was formulated with the following as the focal points of development.

1) Development of a truck terminal with ready access to railways.

2) Project implementation under the Concession Scheme on of Public Works.

3) Voluntary location of transporters in the terminal based on their own discretion.

4) Flexible terminal design and operation to cope with all kinds of development.

4-3-2 Demand for Using Cargo Terminal

CONARSUD conducted a questionnaire survey on 235 companies (22%) sampled from all 1,059 fractional cargo transporters in the Capital Region to study the possibility of their using the terminal. The following were the major survey items covered in this survey.

1) Whether the respondent company deals only in small-lot cargoes.

2) Whether the respondent company is using a private cargo station or is operated individually.

3) Whether the facilities in use are owned by the respondent company or leased.

4) Where the land used for the respondent company's warehouse (depot) conforms to zoning for land use classification under the urban plan code.

5) Operational scale of the respondent company in terms of the number of trucks owned.

6) Existing state of the facilities and equipment currently used.

7) Respondent's concern for the cargo terminal

The number of companies likely to move to the new terminal, as estimated on the basis of analysis of survey data along the above major criteria, accounted for 38%, or 331, of all transporters currently using a private cargo station, and 12%, or 380, of all transporters individually operated, thus totaling 711 companies. In its report, CONARSUD stated that this estimate represented a rather conservative number.

The terminal development period is divided into two phases. In the first phase development period to be completed for opening of the terminal in 1986, it is planned that 300 of the above-mentioned potential tenants will be accommodated in the terminal. The second phase development, to be focused on the terminal expansion and improvement, is planned to be completed 10 years later, or in 1996. During this period, it is recommended that the project effects be evaluated on the basis of the tenant's financial conditions, and that studies be made on new facilities and services to be introduced for 411 new tenants to be additionally accommodated in the terminal. This phased development plan based on constant monitoring of project effectiveness can be evaluated as highly appropriate because the project is the first general cargo terminal development project to be undertaken in Argentina and also because it has the nature a pilot project.

Operational characteristics of tenant companies (operational scale, average distance covered, number of trips, number of trucks, tonnage of cargoes transported, etc.), as estimated from the results of the said questionnaire survey, are shown in Table IV-4-3. Information shown in this table was used as the basic data in the design of various terminal facilities.

Table IV-4-3 Characteristics of Expected Tenant Companies of the Cargo Terminal

Company Size	Number of Companies	Vehicles per Company	Total Vehicles	Weekly Trips per Company	Total Trips	Monthly Cargo per Company (tons)	Total Cargo (tons)	Cargo * Universe	Share of Terminal (%)
(1) Companies currently using terminals									
1 Vehicle	74	1.00	74	1.91	141	190.71	14,113	33.183	42.5
Small	52	2.73	142	2.96	154	276.34	14.370	33.718	42.6
Medium	8	7.42	59	5.42	43	365.68	2.925	6.948	42.1
Large	6	25.33	152	6.33	38	782.75	4,696	12,524	37.5
Sub-total	140	3.05	427	2.69	376	257.89	36,104	86.368	41.8
(2) Companies operating individually									
Small	75	4.86	364	3.86	289	226.41	16.981	40.301	42.1
Medium	51	11.60	592	8.36	426	450.52	22.976	54.513	42.1
Large	34	30.90	1.051	9.25	315	834.18	28.362	67.569	42.0
Sub-total	160	12.50	2.007	6.44	1.030	427.00	68.319	162.383	42.1
Total	300	8.11	2.434	4.69	1.406	348.10	104.425	246.751	42.30

Source : Questionnaire survey done by CONARSUD S.A.
Note : * Total small-lot cargoes generated in the Metropolitan Region.

4-3-3 Site Location

As alternative sites of the terminal, 15 places where a land lot of a minimum of 4 ha can be secured were selected within the area lying within a distance of 30 km from the center of Buenos Aires City where the terminal construction did not run counter to the land use planning. Optimum site was determined by evaluating all 15 alternative sites by the weighted mean method along three judgement criteria, i.e., accessibility to each site from trucks, railways, ports and harbors, airports, etc., influences on urban environment, and land price (incl. preparation cost) (See Figure IV-4-2).

Analysis of site conditions along the said criteria was made for two plans, one for constructing a single general cargo terminal in the Capital Region and the other for developing two terminals. As a result, La Matanza adjoining the Buenos Aires Central Market received the highest score among all alternative sites considered for the single terminal plan, and the combination of La Matanza and Ingeniero Brian placed first for the two-terminal plan. (The following description deals only with the single terminal plan because it was given preference over the two-terminal plan when it was found to produce greater economic benefits than the two-terminal plan).

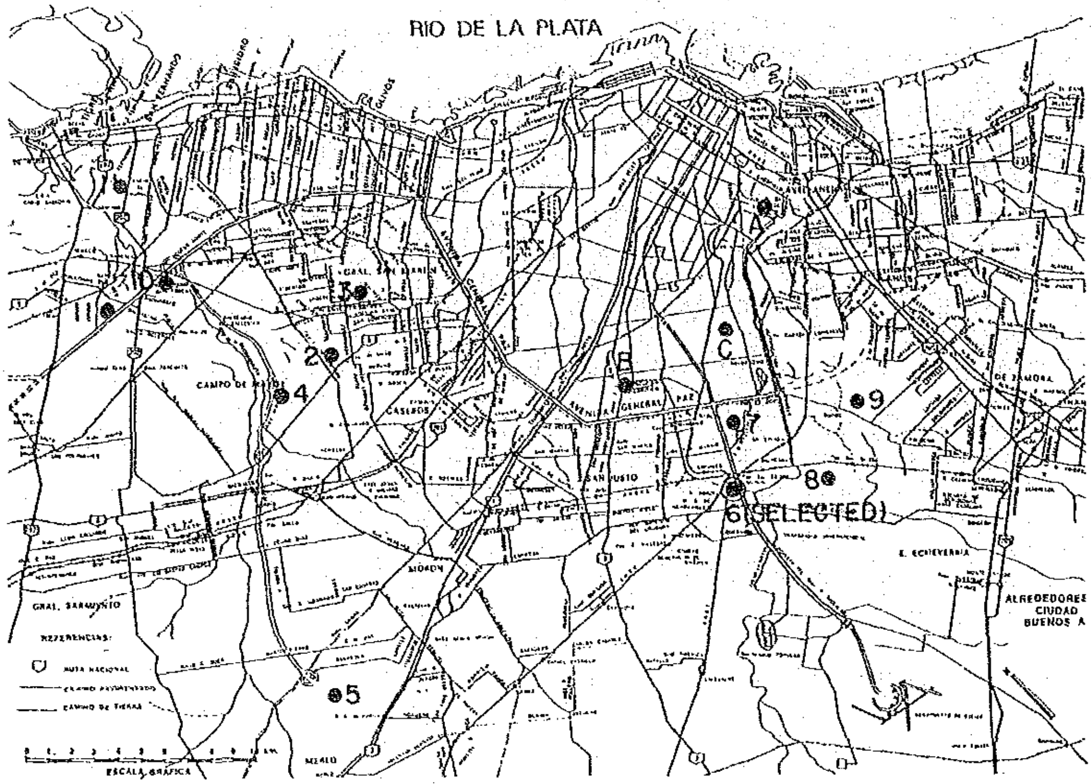
La Matanza is a triangular land lot covering an area of about 64 ha and surrounded by the Autopista's General Ricchieri route, National Highway No. 4, and the National Railways' Belgrano line (F.C.G.B.). It is a vacant lot owned by the Buenos Aires Central Market, except that its 9-ha portion is now used by the Buenos Aires Police School.

4-3-4 Facilities Plan and Basic Design

The terminal will be operated mainly for receiving and dispatching cargoes. Cargoes carried into the terminal by small- and middle-size trucks will be unloaded on the plantform on the same level with the truck bed, sorted and stored in the depot by item, destination and date of dispatch using handcarts, forklift trucks and cranes, and transhipped to large trucks and dispatched when they reach a certain amount (truckload). The terminal will be equipped with the following facilities for this purpose as well as for other services.

1) Facilities for truck driver	Restaurants, rest rooms, toilet compartments.
2) Facilities for vehicles	Parking space for trucks and passengercars, internal circulation roads, service stations (tire repairshop, parts store, fuel station).
3) Facilities for cargo storage and handling	Short-term cargo deposits, warehouses, cargo handling equipment, cargo handling personnel, container yard.

Figure IV-4-2 Candidate and Selected Sites for Buenos Aires Cargo Terminal



1. PDO. SAN FERNANDO	6. PDO. LA MATANAZA (SELECTED)	11. PDO. DETIGRE
2. PDO. SAN MARTIN	7. PDO. LA MATANZA	12. PARTIDO DE BERAZATEGUI (OUTSIDE THE MAP)
3. PDO. SAN MARTIN	8. PDO. LAMOS DE ZAMORA	A. ESTACION ING. BRIAN
4. PDO. 3 DE FEBRERO	9. PDO. LAMOS DE ZAMORA	B. FRIGORIFICO NACIONAL DR. LISANDRO DE LA TORRE
5. PDOS. MORON-MERLO	10. PDO. DE TIGRE	C. PARQUE ALTE. BROWN (ETCARBA)

Source: CONARSUD S.A., 1982

4) Facilities for transporters	Cargo operation modules, office room, communication facilities (telex, radio, telephone, etc.), technical guidance in transportation cost, freight, truck operation.
5) Facilities for transport operators	Cargo operation modules, office room, trucking and railway tranportation service.
6) Facilities for consignors	Transporters' service, trucking and railways transportation service, guidance in completing formalities, dispatch service, customs clearance, etc.

The terminal will not have all these facilities when it is opened. It is proposed that the minimum required facilities be provided at the outset of operation for additional installation of new facilities to be introduced on a case-by-case according to user demands. For example, the facilities to be provided when the terminal is opened after the first development phase do not include a railway siding, container cargo facilities, warehouses for long-term storage, facilities for transport operators, and facilities for consignors.

The cargo operation yards, which are the core of terminal facilities, will be leased to transporters by modules. Each module consists of a platform (7 x 34 m) and a shed (7 x 28 m) built over it. Inside the shed are provided cargo deposit, passageways, and an office room (7.5 m²). On both sides of the shed is a cargo loading/unloading space (7 x 3 m) where trucks will be parked with the bed end aligned with the platform. Some of these trucks will be small- and middle-size trucks for intra-urban cargo collection service, and some others will be large-size trucks for inter-urban cargo transportation.

Each row of 30 modules will be constructed as a single building, so that each cargo operation building, including platforms, will have an area of 21 x 34 m. When the terminal is opened in 1986, 7 such buildings embrancing a total of 210 modules will be available, and the number of these buildings will be increased thereafter according to user demands. In the aforementioned CONARSUD's report, the required number of modules is estimated at 188 on the assumption that all modules will be operated 8 hours a day and 4 hours will be required loading cargoes on large-size trucks. (In the second phase development to be completed in 1966, two additional buildings will be constructed for daily 16-hour operation of a total of 266 modules). The cargo operation management building will be constructed in the second phase development period. In the initial 10 years of terminal operation, therefore, it is planned that some of the modules will be used as a cargo operation management center.

Access to railways will be realized in 1996. CONARSUD forecasts that 5% of all cargoes passing through the terminal in 1996 will be carried by railway. This means that about 6 freight cars/day and depots for 3 modules will be required. Figure IV-4-3 shows a plan of the terminal upon completion of the second phase development work in 1996. Access to the terminal is possible only from the Provincial Road No. 4 at the outset. When the second phase development work is completed, however, the terminal will be connected to the entrance to the Autopista's General Ricchiari route and to the G branch line of the National Railways' General Belgrano line.

4-3-5 Construction Cost

Table IV-4-4 shows the cost estimation for the terminal development. Total capital input required for the project, calculated with 1981 as base year, amounts to US$13.2 million, but this does not include the land price.

The first phase development work (1984 - 1985) for commissioning the terminal in 1986 calls for investment of US$8.2 million which accounts for 62.3% of the said total capital input.

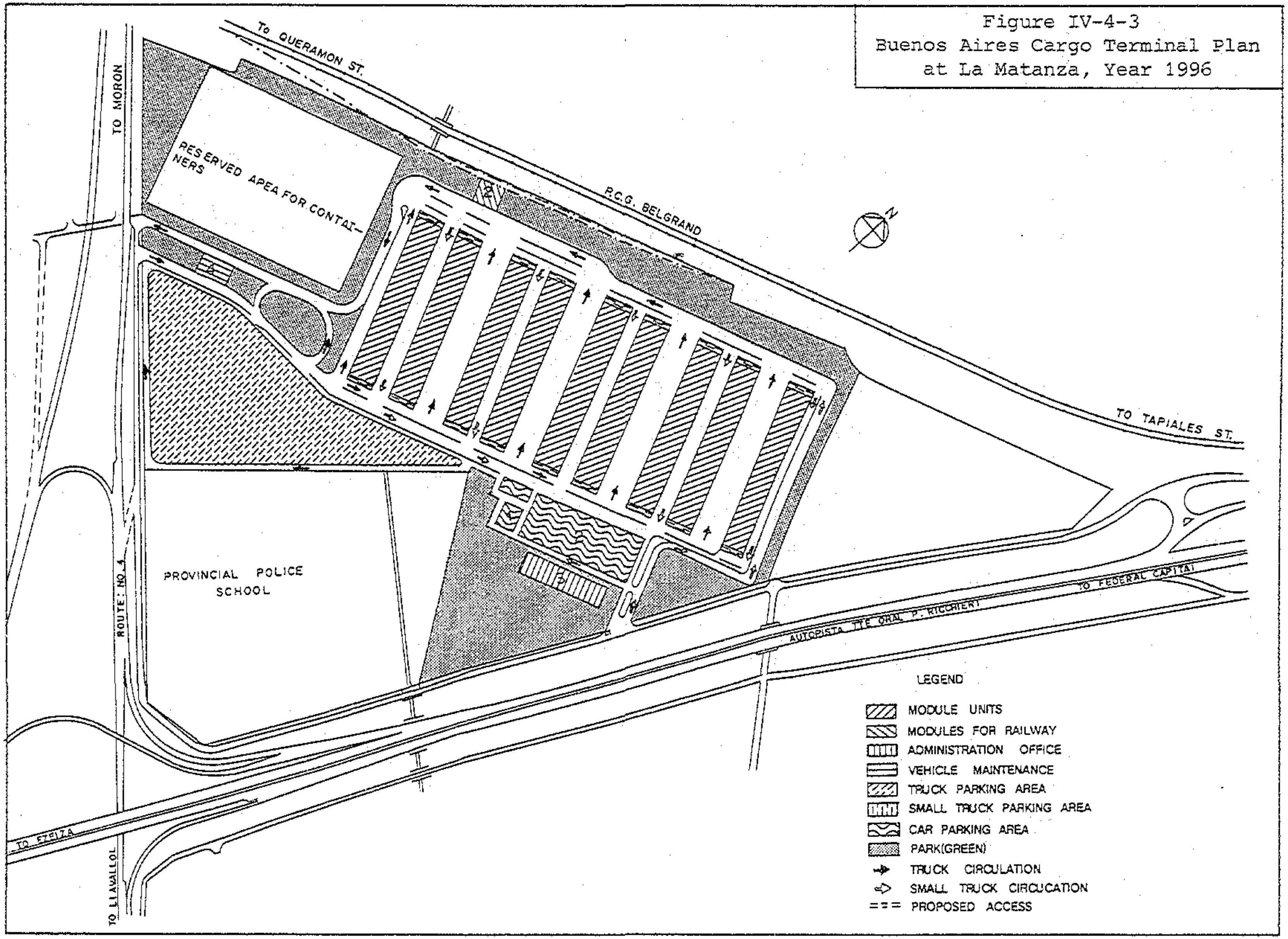
Table IV-4-4 Construction Cost of Cargo Terminal at La Matanza

(US$ at Dec. 1981 Price)

Item	Quantity	Unit Cost	Total Cost
1 Module Unit	9 buildings	583142	5248278
2 Administration Office	4693 sq.m	252	1186636
3 Truck Parking	47688 sq.m	25	1192200
4 Restaurant and Bar	192 sq.m	252	48384
5 Vehicle Workshop	1203 sq.m	53	63759
6 Pipe Installation	400 m	583	233200
7 General Illumination	-	3 %	316173
8 Telephone	-	1 %	105391
9 General Pavement	101312 sq.m	23	2330176
10 Sanitary Installation	-	4 %	421564
11 Water Supply	-	5%	526955
12 Gas Supply	-	3%	316173
13 Greenery	83000 sq.m	0.3	24900
14 Perimeter Fencing	26000 m	11	28600
15 Access Gate	2	1072	2144
16 Modules for Railway	-	-	369994
17 Car Parking	12320 sq.m	23	283360
18 Cargo Taxi Parking	600 sq.m	23	13800
19 Light Truck Parking	1050 sq.m	23	24150
20 Pavement of Access	18600 sq.m	23	427800
21 Demorition & Reconstruction of Existing Facilities	200 sq.m	278	55600
Total			13219237

Source: CONARSUD S.A.

Figure IV-4-3
Buenos Aires Cargo Terminal Plan
at La Matanza, Year 1996



4-3-6 Economic Evaluation

CONARSUD estimated the benefits (cost reduction) that can be brought about by the terminal by cost comparison for the future cargo traffic between the existing system and the improved system utilizing the terminal. This estimation was made for the following two kinds of benefits.

(1) Direct benefit (I)

The following are cited as the most salient direct benefit from terminal operation.

(A) Reduction in travelling cost of inter-urban trips for cargo collection and inter-urban trips for cargo transportation.

(B) Reduction in cargo handling cost by rationalized cargo handling in the terminal.

In the calculation of the benefit (A), the Origin-Destination (OD) volume of small-lot cargoes likely to pass through the terminal is estimated by dividing the Capital Region into 10 zones, and the difference in truck running cost is obtained by comparing the case where the said OD volume is assigned to the existing system and the case where it is assigned to the improved system utilizing the terminal. The benefit (B) is calculated by obtaining the difference between the existing system and the improved system in terms of cargo handling cost, cargo operation management cost, facilities rentals, and facilities maintenance cost.

Table IV-4-5 shows the direct benefit estimated for each year from the terminal opening year of 1986 to 2005. Table IV-4-6 shows the results of economic evaluation based on a comparison between this direct benefit and the terminal construction cost mentioned in 4-3-5 (Note that the construction cost is calculated by accounting price in the economic evaluation). On the basis of this economic evaluation in which the project was given high scores along all indicators, it is concluded that the project is economically feasible.

Table IV-4-5 Direct Benefit of Cargo Terminal Project (I)

(US$1,000, at 1981 value)

Year	Benefit	Year	Benefit
1986	3,429	1996	10,111
1987	3,652	1997	10,249
1988	3,803	1998	10,458
1989	4,351	1999	10,670
1990	4,745	2000	10,884
1991	5,266	2001	11,100
1992	5,884	2002	11,318
1993	6,674	2003	11,538
1994	7,584	2004	11,761
1995	8,648	2005	11,986

Source: CONARSUD S.A.

Table IV-4-6 Results of Economic Evaluation

Indicator	Discount rate (%)	Value
Benefit-cost ratio	10	2.5
Net present value	10	US$37.2 million
Internal rate of return	-	25%

Source: CONARSUD S.A.

(2) Direct Benefit (II)

Operation of the terminal is expected to raise the loading factor of trucks used for cargo collection service and decrease the number of inter-urban trips of large trucks and improve their operating rate. This benefit, derivable in the 20-year period after the terminal opening, is estimated at values shown in Table IV-4-7 and will amount to a total of US$191.0 million at a benefit-cost ratio of 7.7. Accordingly, this benefit alone suffices for economic justification of the project.

Table IV-4-7 Direct Benefits Generated by Cargo Terminal (II)

(US$ at Dec. 1981 Price)

Item			(1) Without Terminal	(2) With Terminal	(3)=(1)-(2) Benefit
Cargo Collection					
	Light Truck	Running Cost	161826	119432	42385
		Time Cost	198339	146790	51549
	Medium Truck	Running Cost	79834	71378	8456
		Time Cost	78466	64299	14167
Toward Interior					
	Heavy Truck	Running Cost	80630	106853	-26222
		Time Cost	545740	515353	30388
Terminal Cost			222980	152730	70251
Total			1367817	1176834	190974

Source: CONARSUD S.A.

Note : Each cost is a total for 20 years with the discount rate of 10%.

4-3-7 Financial Evaluation

Financial evaluation was made for the terminal management body as well as for the tenant transporters.

The terminal company's income will comprise 1) charges for services to trucks and drivers, 2) charges for services to tenant transporters, and 3) others.

Charges for services to trucks and drivers, comprising the fees for using the parking space, cooking facilities, showers and changing rooms, are estimated at US$1.92/day per truck, which is about 10% of daily wages of inter-urban truck drivers.

The main source of income of the terminal company is the rent of modules (platform, depot, office room and passageways) leased to transporters, which is set at a monthly rate of US$4.8/$m^2$ in anticipation of productivity improvement. Tenant transporters will also be charged for using forklift trucks, cranes, racks, etc. at an amount considered reasonable for the 10-year depreciation of such facilities. 50% of module maintenance cost and 75% of installation cost of telephones, electricity and gas supply systems, etc. will also be charged to them.

Other income sources include the rent of the space for restaurants, bars, cafeterias, car-washing yards, repair shops, parts stores, gas stations, etc. These facilities will be built and run by their operations in the space leased by the terminal building under a lease contract.

It is planned that an admission of 48 cents will be collected from each small truck for cargo collection service. This fee is equivalent to 12% of the hourly rental of a small truck. It is believed that the introduction of this admission is planned not as an income source of the terminal company, but for easy control of incoming trucks.

Table IV-4-8 shows the cash flow up to 2005 prepared by forecasting the terminal's revenues and expenditures on the basis of the above assumptions. As seen in the table, average annual gross profit amounts to US$4.6 million. Average annual net profit after deducting the depreciation expense (depreciation period - 20 years) and a 33% income tax amounts to US$2.9 million, so that the financial internal rate of return turns out to be 20%.

Table IV-4-9 is a comparison of operational cost between average transporters using conventional cargo stations and those using the terminal. As seen in the table, the operational cost is lower by about 20% for the latter than for the former, so that the terminal utilization is evaluated as highly advantageous to transporters.

4-3-8 Conclusion

Concession for public works is granted to private sector enterprises in three different cases, i.e., 1) concession for a charge, 2) concession without charge, and 3) concession with government

Table IV-4-8 Pro-Forma Cash Flow of the Buenos Aires Cargo Terminal

(US$ 1000 at Dec. 1981)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
INVESTMENT																						
Civil Work	4123	4153	0	0	0	0	0	0	0	0	2424	2552	0	0	0	0	0	0	0	0	0	0
Equipment	0	1434	269	0	0	1006	1006	1044	1006	1029	1008	3605	1242	0	0	209	232	247	206	206	209	416
Total	4123	5587	269	0	0	1006	1006	1044	1006	1029	3432	6156	1242	0	0	209	232	247	206	206	209	416
MAINTENANCE COST	0	0	228	229	229	229	302	375	447	520	592	596	862	935	935	935	935	935	935	935	935	935
PERSONNEL COST	0	0	996	1253	1506	1763	2020	2277	2530	2787	3044	3298	3554	3554	3554	3554	3554	3554	3554	3554	3554	3554
OPERATING COST	0	0	886	973	1059	1146	1243	1337	1455	1525	1624	1713	1820	1827	1827	1827	1827	1827	1827	1827	1827	1827
TOTAL	0	0	2110	2455	2795	3139	3565	3988	4433	4832	5256	5676	6256	6316	6316	6316	6316	6316	6316	6316	6316	6316
INTEREST ON LAND COST	0	0	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660
TOTAL EXPENDITURE	4123	5587	3038	3115	3455	4805	5231	5692	6099	6521	9348	12492	8138	6976	6976	7185	7208	7225	7183	7183	7185	7393
INCOME																						
Parking	0	0	62	65	69	76	84	92	101	111	123	135	150	151	153	154	156	157	159	160	162	164
Service for Company																						
Rent	0	0	2581	2820	3080	3364	3674	4013	4383	4788	5229	5712	6239	6239	6239	6239	6239	6239	6239	6239	6239	6239
Worker	0	0	771	1011	1250	1490	1730	1970	2210	2449	2689	2929	3169	3169	3169	3169	3169	3169	3169	3169	3169	3169
Generl service	0	0	778	844	909	974	1083	1190	1315	1404	1511	1617	1796	1838	1838	1838	1838	1838	1838	1838	1838	1838
Rent of Gnrl. Service Space	0	0	43	43	43	43	43	43	43	43	43	43	216	216	216	216	216	216	216	216	216	216
Entrance Fee	0	0	709	743	778	812	846	1842	914	948	982	1016	1051	1061	1072	1082	1093	1104	1115	1126	1138	1149
TOTAL INCOME	0	0	4945	5524	6129	6759	7460	9150	8966	9743	10577	11453	12619	12673	12685	12698	12710	12722	12735	12748	12761	12774
GROSS PROFIT	-4123	-5587	1907	2409	2674	1954	2229	3458	2868	3223	1230	-1040	4481	5697	5709	5512	5502	5499	5552	5565	5575	5381

Source: CONARSUD S.A.

Table IV-4-9 Terminal Costs of a Typical Transportation Company

(1) Using the terminal (US$ at Dec. 1981 price)

Cost Item	Remarks	Monthly Cost
Salary payment to		
Workers of the company	1.2 x $ 281	337
Workers of the terminal	1.2 x $ 309	371
Administration personnel	1.17 x $ 421	492
Sub-total		1200
General Cost		
Payment to the terminal		160
Company's general cost		48
Sub-total		208
Parking Cost	25% of owned trucks (2 trucks x 30 days x $ 1293)	115
Office Rent	One office of 20 sq.m in the administration building	96
Module Rent		731
Total		2350

(2) Present Situation

Cost Item	Remarks	Monthly Cost
Salary Payment to		
Workers	3.2 x $ 281	877
Administration Personnel	1.47 x $ 421	620
Administration Cost		619
Rent of Site and Facilities	approx.$2596/sq.m	794
Total		2910

Source: CONARSUD S.A.
Note: Assuming the following characteristics of a typical company.
Fleet: 7.76 trucks Cargo Handling: 3.2 workers
Trips: 4.69 per week Administration: 1.47 employees
Cargoes: 335 tons toward interior

assistance, as stipulated in Law No. 17520. The enterprise to be granted a concession is determined by tender, with all tenderers required to present the type of service to be offered, a tariff, desired period of concession, or desire for government guarantee. In this case, the tariff is required to be lower than the economic value of the service to be offered.

In its report, CONARSUD states that the terminal development project at La Matanza is feasible both economically and financially and has a great social significance in that it will contribute toward the inprovement of problems in urban traffic, land use and urban environment, but advances a skeptical view regarding the possibility of finding an enterprise that would invest in this type of undertaking. CONARSUD goes on to say that considering the high inflationary trend at the time of survey and the huge amount of Argentina's foreign debts, it would be difficult to find an investor because an intermediate or long range period must be assumed for capital recovery from the project, adding that the government guarantee for the investment risk is required to promote the project, as was the case with the Autopista and Bus Terminal Development Projects.