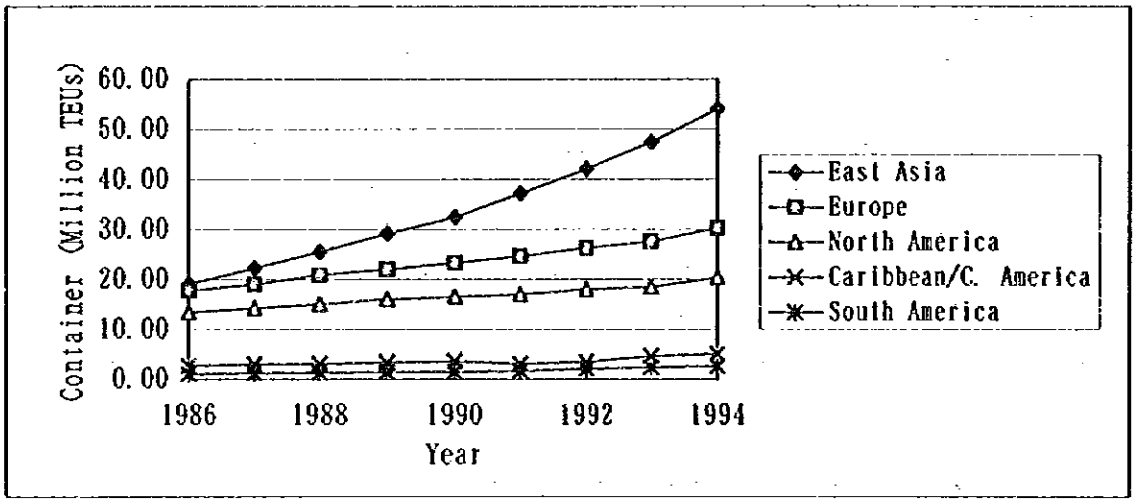


Source: Ocean Shipping Consultants Ltd.

Figure 4-1-1 Worldwide Container Throughput by Regions (1986-1994)

4.2 The Panama Canal and Alternative Study

4.2.1 Brief History of the Panama Canal

10. The history of Panama is the history of the Canal, and the history of the Canal itself tells the history of Panama. This is true in that the Canal continues to play a significant role in supporting the country as the most vital infrastructure of Panama.

11. The construction work of the Canal was virtually completed by the end of 1913, and the Canal received for the first time a French tugboat in early 1914. It had taken about thirty two years to complete the construction work of the Canal, beginning in 1881 when the earliest team of French engineers had ventured into the construction site of the Canal.

12. Prior to 1979, when the Panama Canal Treaties became effective, the Canal was managed and operated mostly under the control of the United States in accordance with the original bilateral canal treaty signed in 1903, which had been a cause of many conflicts between the United States and Panama. After two adjustments of the original treaty in 1936 and 1955, and after a bloody incident of riots in January 1964, the negotiations for a new treaty were began by U.S.

president Lyndon B. Johnson seeking a wholly different regime for the Canal. After long and extended negotiations, the new treaties were signed on 7 September 1977 under the Jimmy Carter administration.

13. The two treaties signed on the date and to become effective 1st October 1979 consist of the Panama Canal Treaty and the Treaty concerning the permanent neutrality and its operation, which contains a complex scheme to determine U.S. rights and obligations of the canal and also allows the use of military bases by the United States until 2000.

4.2.2 Outlines of the Canal Facilities

14. The Panama Canal is a 82 kilometer (51 mile) long lock-type canal connecting the Atlantic and Pacific Oceans through the Republic of Panama. The minimum width of navigable channel is approximately 150 meters (500 feet). While the navigable channel depth is dependent on the amount of water available in Canal reservoirs, the normal transit draft is maintained up to about 12 meters (40 feet) of tropical fresh water.

15. The Canal has three sets of locks, namely Gatun, Pedro Miguel, and Miraflores locks whose sizes are 305 meters long and 33.5 meters wide, limiting the size of ships to transit the Canal to 65,000 DWT fully laden. Vessels passing the Canal from the Atlantic Ocean side are raised at Gatun Locks up to the level of Gatun Lake, which is 26 meters higher than the level of the Atlantic Ocean, through a three step operation of the locks. After passing through Gatun Lake, vessels are lowered to sea level again in three steps (one step of 8 meters at Pedro Miguel, and other two steps of 18 meters at Miraflores). The three sets of the Canal locks are always paired so that the Canal traffic can flow simultaneously in both directions. The widest ship ever to transit the Canal was the battle ship New Jersey, which had a beam of 33 meters. Figure 4-2-1 shows a longitudinal profile of the Canal.

16. Besides the three sets of the Canal locks, the Commission owns and operates towing locomotives at the lock side and various types of vessels including dredgers, tugs, barges and launches to provide safe and smooth operation of the Canal.

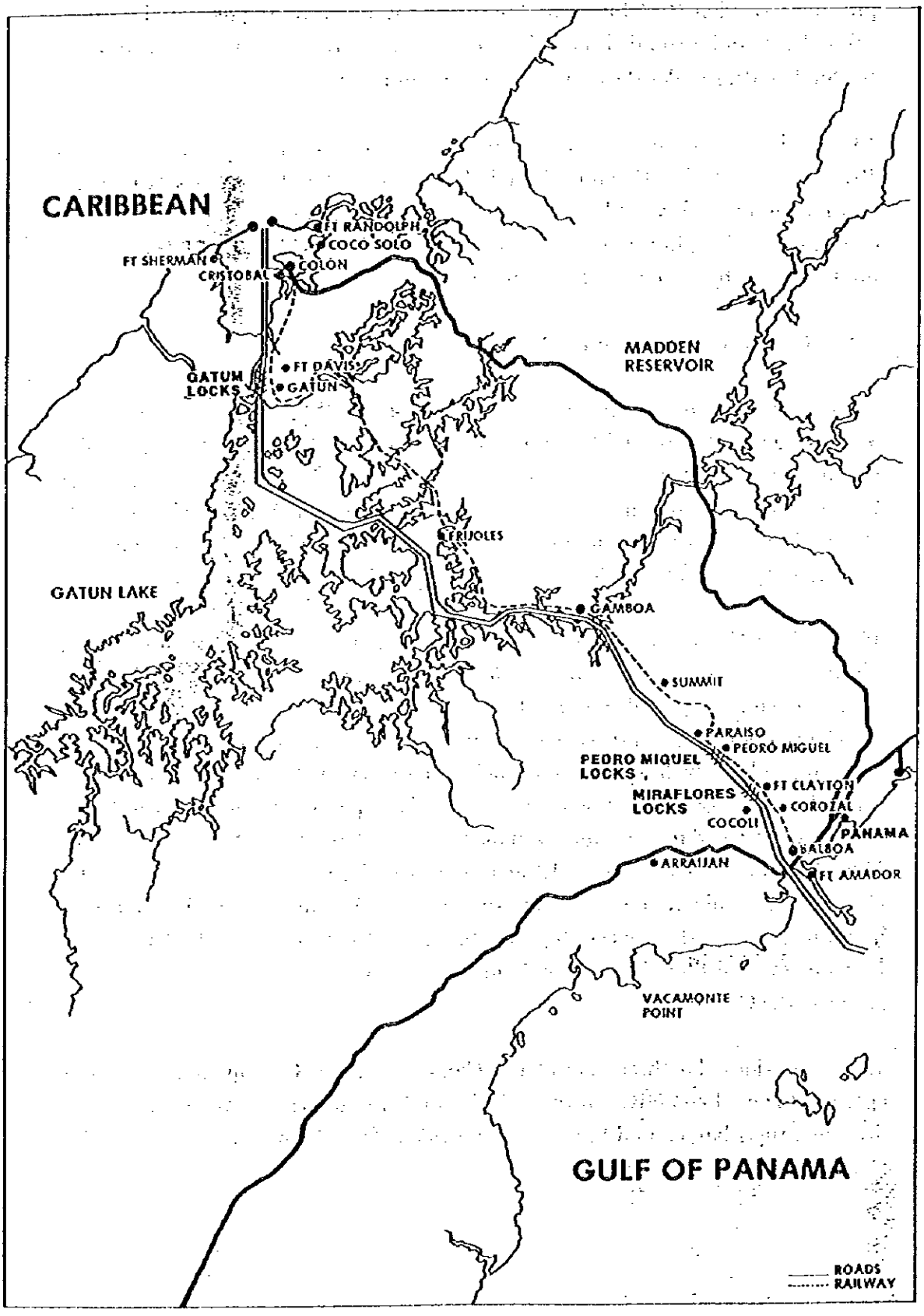


Figure 4-2-1 Longitudinal Profile of the Panama Canal

4.2.3 Toll Rates, Revenues and Traffic

17. The operating revenues of the Canal are mostly dependent on tolls revenue. During fiscal year 1994, 81% of the total transit revenues was derived from tolls revenue.

18. Current toll rates, which have been in effect since October 1, 1992, are:

a) $2.21 per net vessel ton of 100 cubic feet on;
merchant vessels, Army and Navy transports, hospital ships, supply ships and yachts, when carrying passengers or cargo,

b) $1.76 per net vessel ton of 100 cubic feet on;
such vessels in ballast, without passengers or cargo,

c) $1.23 per ton of displacement on;
other floating craft.

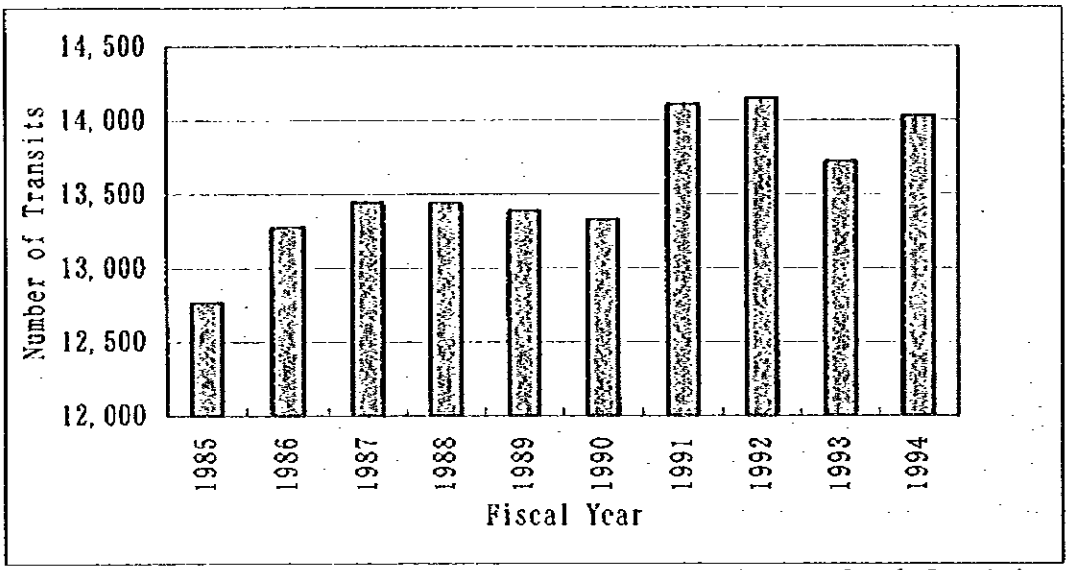
19. All tonnage applied to the above toll rates is determined in accordance with "Rules of Measurement of Vessels for the Panama Canal".

20. Table 4-2-1 summarizes annual records of vessel traffic, tolls revenue, and cargo traffic from fiscal year 1985 to FY 1994. The total revenues are variable depending on the volume and the toll rate of Canal traffic. In FY 1994, the total revenues amounted to $419 million. Figure 4-2-2 shows the number of transits through the Panama Canal. The number of transits increased dramatically in FY 1991 and reached 14,029 in FY 1994.

Table 4-2-1 Panama Canal Traffic (Fiscal Years 1985 to 1994)

Fiscal Year	Total Traffic			Traffic Assessed Tolls on Net Tonnage		Traffic Assessed Tolls on Displacement Tonnage	
	No. of Transits	Tolls (US$)	Long Tons of Cargo	No. of Transits	Net Tonnage	No. of Transits	Displacement Tonnage
1985	12,766	300,807,914	138,903,258	12,426	170,141,227	340	356,687
1986	13,278	322,734,202	140,125,818	12,899	183,517,249	379	421,102
1987	13,444	329,858,775	148,899,425	13,159	187,139,260	285	381,036
1988	13,441	339,319,326	156,780,203	13,139	192,275,497	302	264,537
1989	13,389	329,765,627	151,868,518	13,055	186,828,878	334	227,028
1990	13,325	355,557,957	157,322,924	13,015	182,495,977	310	384,786
1991	14,108	374,624,737	163,212,553	13,719	192,760,362	389	614,650
1992	14,148	368,662,504	159,615,224	13,822	189,890,079	326	554,746
1993	13,720	400,884,033	157,980,301	13,356	187,371,843	364	752,389
1994	14,029	419,218,757	170,836,012	13,676	195,224,596	353	602,090

Source: Panama Canal Commision



Source: Panama Canal Commision

Figure 4-2-2 Number of Transits through Panama Canal (1985-1994)

4.2.4 The Study of Alternatives to the Panama Canal

21. Article XII of the Panama Canal Treaty, entitled "A Sea-Level Canal or a Third Lane of Locks" says in the first paragraph:

> "1. The United States of America and the Republic of Panama recognize that a sea-level canal may be important for international navigation in the future. Consequently, during the duration of this Treaty, both

Parties commit themselves to study jointly the feasibility of a sea-level canal in the Republic of Panama, and in the event they determine that such a waterway is necessary, they shall negotiate terms, agreeable to both Parties, for its construction."

22. On the basis of the above article, the Government of Panama and the United States exchanged the notes on September 30, 1982 to establish a Preparatory Committee for the study of alternatives to the Panama Canal. The signatories of the exchange of notes agreed to invite the Government of Japan to join the Preparatory Committee as a full member. In accordance with the above exchange of notes and its annexes, the Preparatory Committee was constituted and commenced to prepare the terms of reference for studies, which were presented as a recommendation to the member Governments in June 1985. Upon receipt of the recommendation, the three member Governments exchanged notes and its annex on September 26, 1985 under which The Panama Canal Alternatives Study Commission was established and the Panama Canal Alternatives Study was commenced officially on the date under the responsibility of the Commission.

23. Along with the progress of the study, several alternatives had been elaborately examined and two different types of alternatives were selected to further detailed study. The two alternatives are:

a) High Rise Lock Canal Alternative (Alternative-A)
b) Sea Level Canal Alternative (Alternative-B)

24. Alternative-A is a plan which involves a new third set of locks to be constructed next to the existing Gatun Lock and Miraflores Lock. All the existing locks are assumed to be operational together with the new locks. Under this concept, two alternatives are being considered. One is with the design ship of 150,000 DWT and the other of 200,000 DWT.

25. Alternative-B calls for the construction of a sea level canal along the new route which is about 20 km to the west of the existing canal route. This alternative assumes the simultaneous operation of the existing canal with widened Clebra Cut. In this case, the scale of design ship is 250,000 DWT.

26. The final report of the study was submitted on the date of September 20, 1993. In the final report, the following conclusions are made:

- No enhancement is required before the end of the second decade of the 21st century as the present Panama Canal, with the Gaillard Cut widening project, is capable of accommodating demand at least to that time;

- The high rise lock alternative with a single lane portion in the Gaillard Cut, operating in conjunction with improvement to the present Panama Canal and capable of handling ships of a design of 150,000 DWT would be the most effective enhancement.

27. The alignment of the high rise lock canal around the port of Balboa on the Pacific side is shown in Figure 4-2-3. The basic principle in the design of the high rise route has been the maximum use of the existing canal route. In those places where a sharp deflection angle is required, making navigation difficult, the inside bank will be widened by the adoption of a curved design.

28. The location of the new high rise lock on the Pacific side has been located slightly westward from the existing lock because of the partial alteration of the canal alignment to enable the smoother navigation of vessels. As a result, the location of the new lock is a distance of some 1km from the existing lock. This separation is preferred on safety grounds as the canal side water level of the high rise lock is 85' which is much higher than the water level of Miraflores lake of 55'.

29. The Pacific Approach (the section between Point T and Point U) basically follows the existing approach although the alignment of the section has been slightly modified to make it straighter. Along this section, the southwestern bank will be pushed back to increase the width while the northeastern bank remains unchanged. Some of the existing facilities on the southwestern bank of the Canal, such as the Rodman Naval Base, will require modification to accommodate this widening of the Canal.

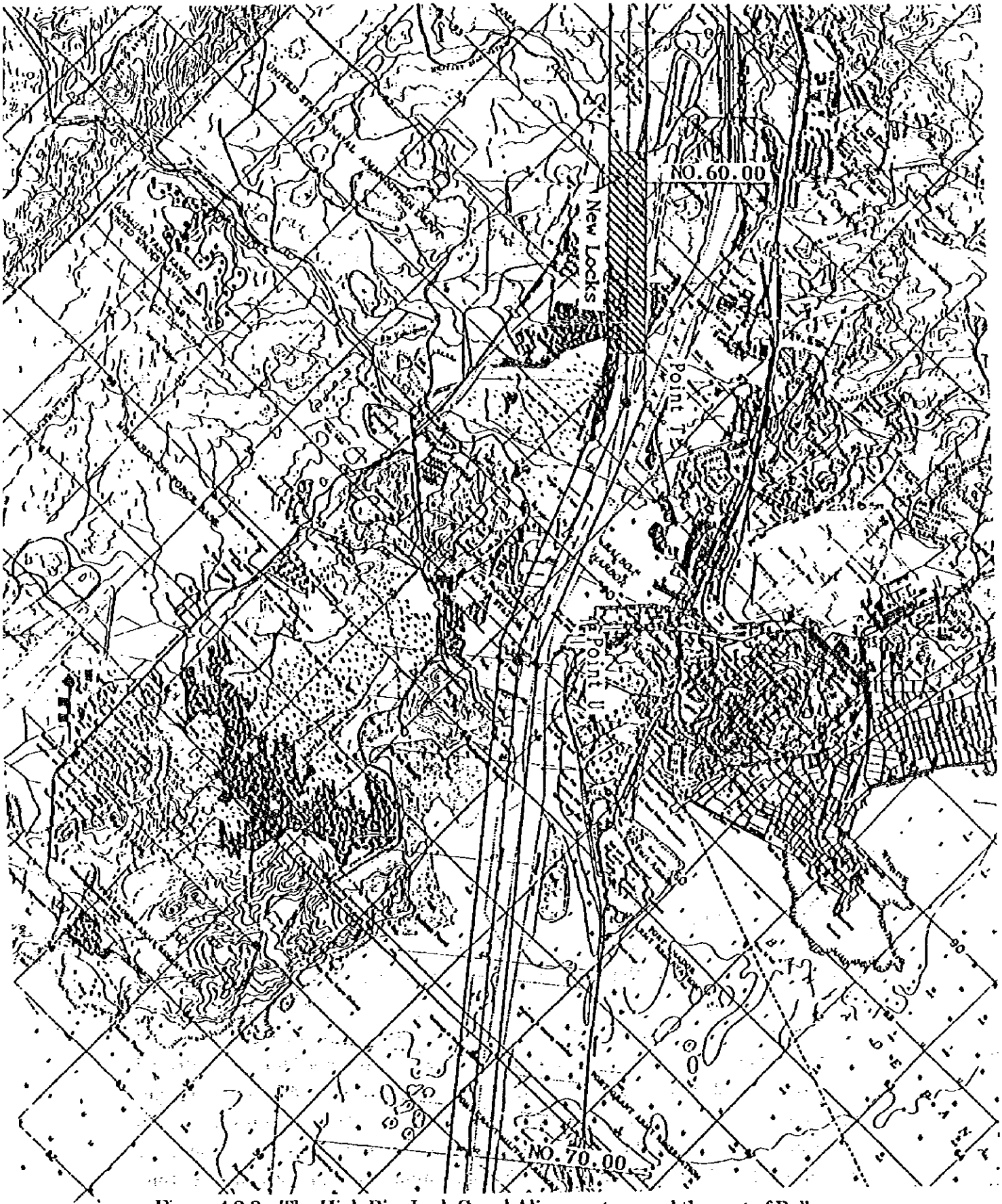


Figure 4-2-3 The High Rise Lock Canal Alignment around the port of Balboa (Source: Final Report of the Commission for the Study of Alternatives to the Panama Canal)

4.3 Major Proposals Related to the Port of Balboa

4.3.1 Centerport Concept (CPC)

(1) Outlines of CPC

30. While the development concept similar to CPC for a set of transport facilities to handle container cargoes crossing the isthmus of Panama had been discussed several times during the years, the comprehensive idea of this kind of concept was first presented to the Government of Panama in 1987 by a consortium of consultants (PRC Engineering-Ingenieria Caribe) hired by the Government of Panama under financing of IDB (Inter-american Development Bank). The official title of the report submitted was "Strategic Master Plan for the Development of Panama Centerport".

31. "The basic concept of Panama Centerport is to take advantage of the unique concentration of transportation services created by the Panama Canal to carry out container cargo transshipment operations. These operations offer the possibility of reducing costs and increasing the efficiency of container transport services by creating a center for distribution and concentration of traffic in an area which, being necessary passage of many trade routes, implies neither detours nor unproductive sailing time. Basically, transshipment operations would be carried out while ships await their transits, which would not constitute a waste of the vessel's time, but instead an alternative that will make maximum use of its capacity and operation costs." (extracts from executive summary of the report)

32. The above concept of CPC is derived from the understanding that the savings generated by the Panama Canal are based on the reduction in operation costs of vessels and the shorter sailing time in comparison with other available options. The concrete plan of the development scheme under the concept is to create a large scale transshipment center by connecting both ports of Balboa in the Pacific side and Cristobal in the Atlantic side with high standard railroad and highway road system so that the two ports could function jointly as one port.

33. Since the most important requirement of CPC is quick and reliable transshipment between ships and trains or trucks, the proposed terminals located near the ports should be furnished with sophisticated inter-modal facilities to meet the demand on the market of transshipment services. The total maximum ship time of CPC is set within 12 hours with the minimum number of container handling of 30 TEUs per hour and the maximum 2.5 hours of transport time

between the terminals.

34. The prospective market for transshipment services for worldwide containerized cargo traffic include;

a) transshipment services between main and feeder lines
b) transshipment services between main lines
c) collection and distribution services for domestic cargoes

35. Among the above, the largest demand of traffic is expected in transshipment services between main lines. The most important merit of CPC for the shipping companies or consignors is more effective and economical operation of transshipment of cargoes in the worldwide maritime transport. The Panamanian economy could also enjoy a wider range of positive effects through the dramatic increase of transshipment cargo if the project would be successfully completed and operated as planned.

(2) Issues and Prospect of CPC

36. When the report was once submitted to the Government of Panama in 1987, the Government had requested the consultants to elaborate the report in demand forecast and marketing policy of the project. Since then, many discussions have been made on the feasibility of the project among the agencies and parties both in public and private sectors concerned.

37. While the basic idea of the project was considered reasonable enough and acceptable, the scale of the project appeared too large in the amount of investment including rehabilitation of relevant facilities. It is fair to say that the majority of people concerned have a feeling that there are a lot of things to do before starting the project. Consequently, CPC has been suspended and any authorization by the Government has not yet been given. Several deficiencies and problems of CPC are pointed out below:

a) Both initial and total cost of the project are far beyond the reasonable range of investment by the interested parties. The investment for improving the Panama Railroad accounts for a substantial part.

b) There remain considerable uncertainty which does not always guarantee the success of the project.

c) Adjustment of the interests among shipping companies may be extremely difficult.

d) In order to avoid possible investment risk, the shipping companies may not be interested in joining the project at its initial stage. From the shipping companies' point of view, it is apparently reasonable to join the project at its later stage when the more profitable and less risky business can be expected.

e) While highly reliable operation is prior requirement for the container terminal and railroad system, they are considered neither reliable nor efficient. Therefore, it may be quite hard for the Government to manage and operate such a sophisticated system to combine the different modes of transport including railroad, road, and port.

38. On the basis of the above observation, it may be fair to say that CPC is not really feasible, if the project should follow the original scale and schedule.

4.3.2 Port Panama Concept (PPC)

(1) Outlines of PPC

39. In September 1995, Bechtel Enterprises, Inc. agreed to conduct a feasibility study for the Government of Panama to determine if a privatized integrated transshipment center, consisting of the ports of Cristobal and Balboa and the trans-isthmus railroad, would be commercially feasible and provide greater benefits to the country than developing separately the ports and railroad. The report was submitted to the Ministry of Commerce and Industry of the Republic of Panama in December 1995.

40. The Port Panama project represents the comprehensive development, rehabilitation, expansion, financing, and operations of the ports of Cristobal and Balboa, and the connecting trans-isthmus railroad. Participation in the development, ownership, and operation of Port Panama will be open to all carrier, but no single carrier or carrier group will be allowed to dominate management control.

41. According to the report, rather than separating development of ports, a combined development of Cristobal, Balboa, and the rail link would be more beneficial to all participants. Integrated facilities, management, and operations

will create economics of scale that will allow Panama to offer superior transshipment services to the international community at the lowest cost.

42. A "modular" approach will be taken to modernizing and expanding the facilities at Port Panama. Modules will be developed to respond to capacity commitments and future demands. The total container forecast for Port Panama consists of Panama's local and transshipment markets. The total volume in container moves according to the forecast of the report exceeds 700,000 TEUs in 2000 and 1.4 million TEUs in 2010.

43. The total project investment related to phased development is estimated to exceed US$ 620 million, which includes US$ 567 million of direct capital costs. Over US$ 210 million is expected to be invested in the initial phase of the project.

44. The approach to phased development in the short term will immediately introduce efficiency improvement such as new port equipment, and result in two gantry-serviced container berths at each port. The long term plan will significantly expand the capacities of the container facilities to meet the future growth of transshipment and origin/destination container traffic.

45. In the port of Balboa, existing facilities will be initially modified to accommodate the operation of four gantry cranes and to provide adequate container yards to support container transshipment activities. Later, the area to the north at Diablo will be developed by constructing modern container terminal. Initial costs are estimated to be US$ 94 million, with total investment anticipated to be US$ 340 million.

46. In trans-isthmus rail link, immediate improvement will consist of replacing ties and unstable ballast to provide a track with a safe operating speed of 25 kilometers per hour and allowing two trains per day in either direction, with up to 50 TEUs per train. Expected initial costs are US$ 7 million. Ultimately development would provide a modern double-stacked rail system with up to five trains per day in either direction, 100 TEUs per train. These improvement would require a total investment of US$ 29 million.

47. In the conclusion, the report says that the Port Panama project is technically, commercially, and financially feasible and will provide the most competitive and efficient transshipment center in Latin America.

4.4 Mini Land Bridge (MLB)

4.4.1 Concept of Mini Land Bridge

48. The name of Mini Land Bridge (MLB) was created for one of the inter-modal container transport systems designed for more efficient and reliable operation of container transport from the Far East to the east coast or the Gulf area of the United States via container terminals along the U.S. west coast. While most traditional transport routes of seaborne cargo from the Far East to the U.S. east coast are those passing the Panama Canal (All Water Service), MLB provides a new route by utilizing the transcontinental railroad network for such container cargo from the Far East. Under the new concept of MLB, therefore, the containers should be transshipped to the container train at the intermodal terminal in the ports along the U.S. west coast.

49. Due to the strong cost consciousness of consignors and constant severe competition between shipping companies, the container transport system is always requested to guarantee a regular, safe, reliable, speedy and economical handling of cargo. In this respect, MLB does not appear in a competitive position against All Water Service because of its sophisticated inter-modal operation with highly standardized transport equipment. The practical use of idling capacity of railroad network and intensive innovation of transshipment technology may, however, allow MLB to be another possible channel of container flow across the continent.

50. Another advantage of MLB against All Water Service via Panama Canal is that the size of container ship is free from the limitation of the physical capacity for the Canal. Since the so-called Panamax type of container vessel has the maximum size through the Canal, larger container vessel called Post-Panamax can serve efficiently on MLB routes.

4.4.2 Trend of Container Movement in North America

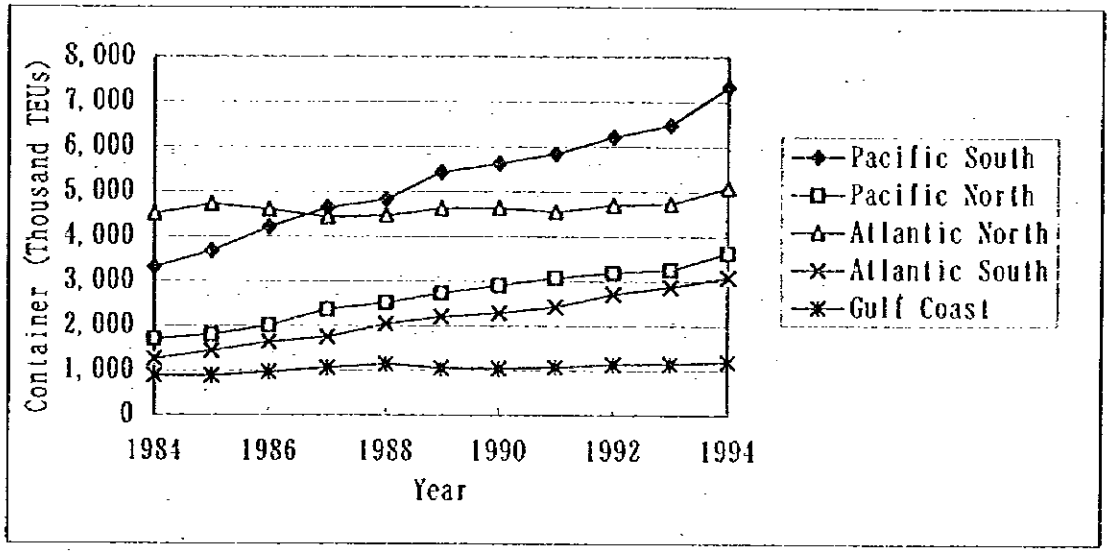
51. Table 4-4-1 and Figure 4-4-1 display the regional development of North American container port volumes. While total container throughput increased by 74 percent over 1984 to 1994, the two Pacific and the Atlantic South regions have gained share, but the Atlantic North and Gulf regions have lost share substantially.

Table 4-4-1 North American Container Throughput by Port Ranges (1984-1994)

Unit: Thousand TEUs

Year	Pacific South	Pacific North	Atlantic North	Atlantic South	Gulf Coast	Total	Total (Index)
1984	3,310.3	1,703.7	4,506.8	1,259.9	884.8	11,665.5	100%
1985	3,677.1	1,799.4	4,721.5	1,441.4	880.2	12,519.6	107%
1986	4,203.7	2,010.1	4,600.9	1,642.5	962.7	13,419.9	115%
1987	4,632.8	2,371.0	4,428.7	1,718.2	1,060.6	14,241.3	122%
1988	4,824.3	2,518.4	4,461.1	2,011.1	1,148.4	14,996.3	129%
1989	5,131.1	2,733.8	4,614.3	2,206.5	1,056.9	16,042.6	138%
1990	5,621.3	2,901.9	4,630.9	2,287.2	1,014.7	16,486.0	141%
1991	5,836.6	3,073.6	4,513.7	2,422.5	1,079.2	16,955.6	145%
1992	6,213.3	3,190.7	4,696.1	2,708.3	1,137.5	17,945.9	154%
1993	6,479.1	3,254.9	4,727.8	2,872.1	1,147.6	18,481.5	158%
1994	7,328.4	3,626.3	5,081.2	3,085.5	1,192.6	20,314.0	174%

Source: Ocean Shipping Consultants Ltd



Source: Ocean Shipping Consultants Ltd

Figure 4-4-1 North American Container Throughput by Port Ranges (1984-1994)

52. Over the ten year period to 1994, the growth in throughput at Atlantic North ports reached only 13 percent. The relative decline of the Atlantic North region reflects both lower economic growth and structural problems of MLB operations to/from ports on the west coast.

53. Recent trend of MLB traffic shows a drastic increase in the volume of containers. The main reasons for this trend can be illustrated by the timely innovation of intermodal transshipment technology and deregulation policy for the railroad operation and motor carrier business.

54. One of the most stimulating technological developments was the Double-Stack Train (DST) which was first introduced by American President Companies (APC) in 1984 to the railroad lines of Chicago & North Western Transportation Company and Union Pacific Railroad. In the beginning, APC started DST operation between Los Angeles and Chicago with a weekly service using 20 DST with its capacity of 200 FEU (40ft container equivalent unit). Since then, DST service under MLB operation has been increased at a dramatic pace.

55. Consequently, throughput at Pacific coast ports rose rapidly between 1984 through 1994 to nearly 11 million TEUs with increase of 118 percent. The growing national role of ports on the Pacific coast also served to minimize the effect of recession in California during the early 1990's.

56. The far-reaching changes in the relative development of container port ranges are dramatically reflected in the increase in DST capacity between the Pacific seaboard and locations on the eastern side of the continent. The scope for further expansion of intermodal trade is one of the most significant factors to forecast development of North American container cargo volumes in the next few years.

57. In 1986, DST capacity on routes to/from the Pacific seaboard amounted to 0.68 million TEUs/year. By 1991, capacity had increased by 75 percent to 1.19 million TEUs and, in 1995, it reached 3.29 million TEUs, 381 percent higher than that in 1986.

58. Over 1986 to 1991, the highest growth was on capacity serving the north-east, particularly to/from the Pacific North coast. Over 1991 to 1995 brought a new phase, with capacity serving the south-east and Gulf expanding most rapidly, with growth concentrated on routes to/from the Pacific South ports.

4.4.3 Future Prospect of MLB Traffic

59. As long as trade from the Far East is shipped across the Pacific, the role of intermodal transport seems certain to continue to strengthen. The dynamic development of west coast container volumes will therefore continue to be reinforced by demand generated far from regional markets. The individual ports that will benefit most are those which are able to develop the largest and most efficient intermodal terminals, with on-dock or near-dock rail facilities becoming a prime factor in port competitiveness. However, the introduction of larger vessels of 6,000 TEU and more routed by Suez may once again boost the roles of Atlantic

ports. With several services already operating to/from the Far East via Suez to/from the east coast ports are working hard to increase this "pendulum" traffic.

60. The following findings are pointed out by the leading shipping companies concerned as the advantages of container transport from the Far East to the east coast by MLB against all water service via the Panama Canal.

- Under all water service, all vessels are operated at full load. The marginal portion of cargo is shifted automatically to MLB and other ways.

- Net transport time required in all water service is at least 7 days longer than those of MLB.

- Since the difference of transport fare between all water service and MLB became very small, all water service becomes less attractive.

61. While the above findings might suggest that the future prospect of MLB operation is bright, there may be different views on the future of MLB. From the short or medium term point of view, the advantages of container transport by MLB may exist as pointed out above. It is, however, still uncertain from the long term point of view whether MLB could maintain adequate transport capacity with sufficiently reasonable cost to compete with the all water service through the Canal, mainly because;

- The existing railroad network available for MLB has been fully utilized almost to its maximum capacity.

- In order to meet the future demand of transport across the U.S. continent, substantial investment will be needed in upgrading the total railroad network capacity including huge number of trains, inter-modal facilities, and storage areas.

- In the case, the relevant port facilities should be improved accordingly.

62. Considering the above observations and recent strong trend of the Canal traffic with constant portion of container traffic of 13%, it may be fair to say that the movement of MLB may not greatly influence the future Canal traffic in long term.

4.5 Current Situation of Competing Ports at Pacific Side of Central and South America

4.5.1 Trend of Container Transportation in Central and South America

(1) Central America and Caribbean

63. The 1984-1994 development of container volumes through Central American and Caribbean ports is presented by main regions in Table 4-5-1 and Figure 4-5-1. The total container throughput increased by 117 percent from 1984 to 5.05 million TEUs in 1994. Growth was steady until 1991, when there was a 13 percent downturn. This fall was concentrated in the Caribbean ports, and was caused by the general economic downturn. Since then, however, there has been a strong and consecutive increase in traffic of port container.

64. The Caribbean is the most significant area of container port demand within these regions, accounting for 2.96 million TEUs in 1994. Although this throughput is an 85 percent increase over the 1984 level, it does represent a decline in share from 69 percent in 1984 to 59 percent in 1994, as container throughput at the less developed container ports in Central America has grown faster.

65. Strong growth in throughput at ports on Central America's Atlantic coast has boosted in share of regional container volumes from 28 percent (0.65 million TEUs) in 1984 to 37 percent (1.88 million TEUs) in 1994. Mexico, Costa Rica and Panama are the principal markets.

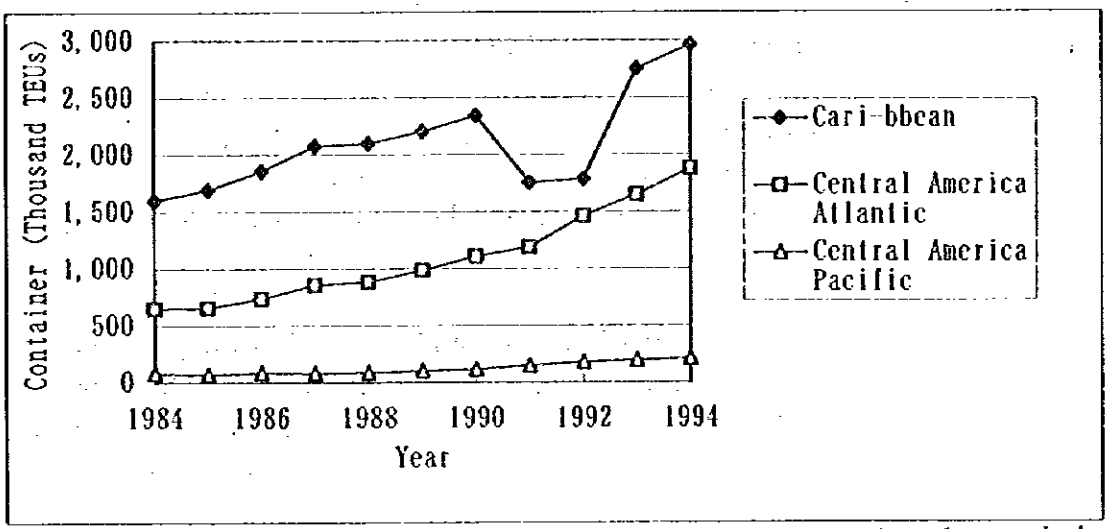
66. The very low level of containerization on Central America's Pacific coast is reflected in much lower throughput totaling 0.21 million TEUs in 1994, but an increase of 166 percent over 1984 to 1994. Although the container revolution has only just appeared there, new investments seem certain to generate considerable future growth in container traffic.

Table 4-5-1 Caribbean/Central America Container Port Volumes by Main Regions (1984-1994)

Unit: Thousand TEUs

Year	Cari-bbean	Central America Atlantic	Central America Pacific	Total	Total (Index)
1984	1,596.8	647.7	78.9	2,323.4	100%
1985	1,689.5	653.0	67.6	2,410.1	104%
1986	1,855.6	735.9	83.6	2,675.1	115%
1987	2,073.9	853.9	78.8	3,006.6	129%
1988	2,095.0	882.3	84.4	3,061.7	132%
1989	2,201.1	982.1	99.6	3,282.8	141%
1990	2,340.9	1,101.3	114.7	3,559.9	153%
1991	1,753.4	1,185.3	145.5	3,084.2	133%
1992	1,784.6	1,461.0	176.2	3,421.8	147%
1993	2,752.8	1,617.0	191.5	4,591.3	198%
1994	2,961.0	1,876.3	209.9	5,047.2	217%

Source: Ocean Shipping Consultants Ltd



Source: Ocean Shipping Consultants Ltd

Figure 4-5-1 Caribbean/Central America Container Port Volumes by Main Regions (1984-1994)

(2) South America

67. Containerisation was slow to get off the ground in the South America, and the development of container port volumes disappointed expectations during 1980's. This could be attributed principally to a lack of investment, both in container port facilities and in transport infrastructures, and to slow-moving

economic growth during much of the 1980's. In addition, the technical limitations of port's container handling capabilities were getting worse by dramatic inefficiencies in port operation, giving rise to very high handling costs and canceling much of the cost advantages to be gained by containerization.

68. Despite this slow start, container volumes at South American ports have expanded significantly over the last decade. Faster economic growth and the slow, but progressive, privatization and deregulation of economic activity have altered the overall prospects for the region. The development of container throughput by seaboards and countries is set out in Table 4-5-2. Over 1984-1994, total throughput increased by 188 percent to 2.54 million TEUs. Although traffic remained static in 1990, as a result of worsening economic conditions, growth has started again more recently, in line with the remarkable improvement in some of the major regional economies.

69. Regional development is dominated by the larger countries, namely Brazil, Argentina, and Chile, where there have been some major changes. Chile has experienced a ten year record of healthy GDP growth, trade surpluses, falling inflation and increased overseas investment. In Argentina also, economic growth was running high until 1995. Privatization policies are being pursued in both countries, and in Argentina at least, have advanced far enough to attract new capital investment. Uruguay, Ecuador and Peru are also embarked on port privatization.

70. The number and capacity of cellular container vessels arranged for north-south trades have mounted rapidly, and major regional owners have begun investing in new cellular buildings. The increase in the world fleet of cellular vessels is also creating a larger pool of second-hand container ships for resale into the South American trades.

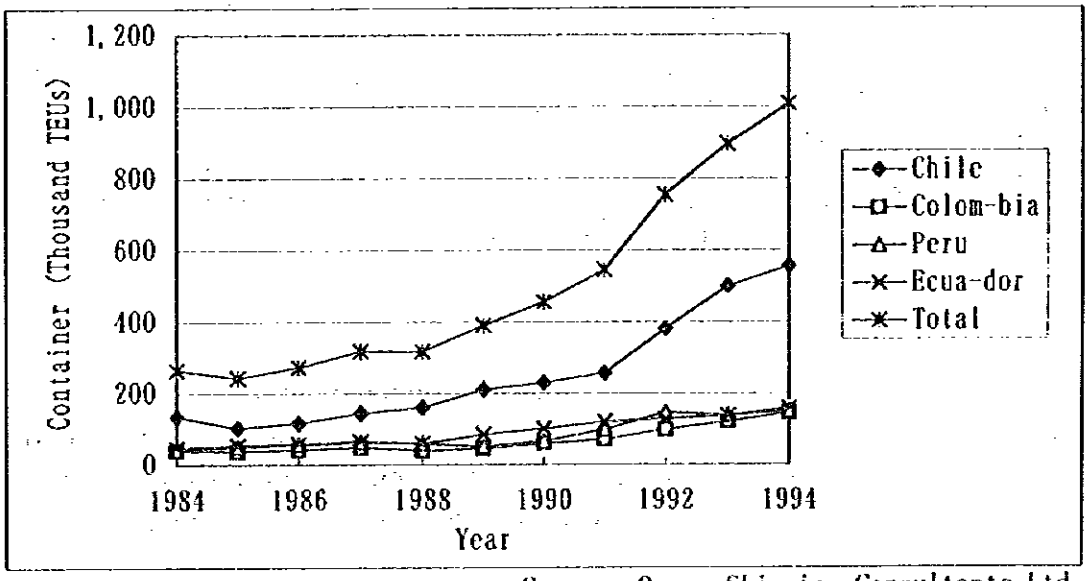
71. The overall market is weighted toward the Atlantic seaboard, which accounted for around 60 percent of regional throughput in 1994. However, the Atlantic and Pacific seaboards have presented similar growth patterns.

Table 4-5-2 South America Container Port Volumes by Nation and Seaboard (1984-1994)

Unit: Thousand TEUs

	Pacific					Atlantic				
Year	Chile	Colom-bia	Peru	Ecua-dor	Total	Brazil	Argen-tina	Uru-guay	Total	Total
1984	134.8	39.2	43.8	46.4	264.2	475.9	120.0	20.7	616.6	880.8
1985	102.4	37.0	50.6	53.4	243.4	563.4	121.3	23.4	708.1	951.5
1986	116.2	42.0	56.7	57.7	272.6	588.7	139.3	35.0	763.0	1035.6
1987	144.0	47.7	62.4	63.9	318.0	666.1	188.6	40.0	894.7	1212.7
1988	160.0	39.3	59.5	58.7	317.5	784.2	191.8	45.4	1021.4	1338.9
1989	210.7	44.8	50.0	84.4	389.9	713.9	218.3	50.6	1012.8	1402.7
1990	229.6	59.1	65.6	100.9	455.2	728.7	201.0	51.4	981.1	1436.3
1991	256.1	70.5	98.3	119.7	544.6	740.2	251.7	55.5	1050.4	1595.0
1992	380.7	98.5	146.4	128.8	754.4	818.4	350.0	75.6	1274.0	2028.4
1993	500.0	120.7	138.0	136.9	895.6	910.7	498.0	88.9	1497.6	2393.2
1994	555.6	145.0	150.0	157.0	1007.6	969.2	450.0	110.0	1529.2	2536.8

Source: Ocean Shipping Consultants Ltd



Source: Ocean Shipping Consultants Ltd

Figure 4-5-2 South America Pacific Container Port Volumes by Nation

4.5.2 Competing Ports at Pacific Coast of Central and South America

72. There are 13 major ports along the Pacific coast of the Central and South America. (5 ports in Central America Pacific and 8 ports in South America Pacific) The major ports are being compared together as competing ports against the port of Balboa in the following sections.

(1) Pacific Coast Ports in Central America

73. Table 4-5-3 presents the development of container throughput at the Pacific ports in the Central America. Main trend has been the huge expansion of demand at Mexican ports. The degree of containerization is more limited than on the Atlantic coast, but there is huge potential for development to match the expected growth of the Mexican economy.

Table 4-5-3 Central American Pacific Container Throughput by Ports 1984-94

Unit: Thousand TEUs

	Mexico			El Salvador	Panama	
Year	Lazaro Cardenas	Manzanillo	Salina Cruz	Acajutla	Balboa	Total
1984	N/A	N/A	14.2	11.0	53.7	78.9
1985	N/A	N/A	15.0	10.8	41.8	67.6
1986	N/A	N/A	22.7	11.2	42.7	76.6
1987	9.8	N/A	27.6	13.1	18.3	68.8
1988	22.7	N/A	18.0	13.7	10.0	61.4
1989	28.3	N/A	14.8	12.4	14.1	69.6
1990	26.2	32.8	13.4	13.1	10.7	96.2
1991	39.2	41.9	16.7	12.3	12.5	122.6
1992	41.7	50.4	12.4	14.8	16.6	138.9
1993	59.6	50.9	23.8	19.2	20.8	174.3
1994	79.0	63.8	10.6	24.5	44.8	222.7

Source: Ocean Shipping Consultants Ltd

74. Two ports, Lazaro Cardenas and Manzanillo, now have been working hard for container terminals and throughput has increased rapidly at both. Both have benefited from considerable investment including the installation of gantry cranes and stacking cranes, which is likely to boost volumes still further.

75. Lazaro Cardenas, Mexico's largest west coast port, came out as a significant container port in the late 1980's when its container terminal was built. Volumes increased from negligible levels to 0.08 million TEUs in 1994, with significant further expansion expected.

76. At the Mexican port of Manzanillo, container throughput has grown to 0.06 million TEUs in 1994. In 1995, the port gained a private operator, a partnership of the Seattle-based Stevedoring Services of America and the Mexican shipping company, Transportacion Maritima Mexicana. TMM has ambitions to make Manzanillo a regional hub for container traffic. Tariffs at the port have

been raised substantially.

77. The third container handling facility on Mexico's Pacific seaboard is Salina Cruz, which was not included in the initial privatization program and has seen decrease of volumes by 55 percent in 1994 to 0.01 million TEU, after almost doubling in 1993. Lack of development in favor of the two main ports could cause traffic to decline further.

78. Very limited container throughput levels are recorded for El Salvador, with containers handled by the conventional facilities at Acajutla.

(2) Pacific Coast Ports in South America

79. This region includes ports in Chile, Peru, Ecuador, and Colombia. As detailed in Table 4-5-4, regional container throughput increased by 261 percent over 1984-1994 to 0.95 million TEUs. Most of the growth has occurred in the 1990's: 9 percent growth over 1984-1990 compares with 21 percent growth over 1990-94.

Table 4-5-4 South American Pacific Container Throughput by Ports 1984-94

Unit: Thousand TEUs

	Chile					Colombia	Peru	Ecuador	
Year	Valparaiso	San Antonio	Iquique	Arica	Antofagasta	Buenaventura	Callao	Guayaquil	Total
1984	89.2	25.0	8.3	4.1	8.2	39.2	43.8	46.4	261.2
1985	61.4	14.5	8.2	8.1	10.2	37.0	50.6	53.4	243.4
1986	74.7	8.6	11.3	9.3	12.3	42.0	56.7	57.7	272.6
1987	97.0	9.8	19.9	7.5	9.8	47.7	62.4	63.9	318.0
1988	101.3	12.6	16.6	12.9	13.6	39.3	59.5	58.7	317.5
1989	131.9	13.7	19.4	19.9	12.3	44.8	50.0	84.4	379.4
1990	149.8	20.2	22.9	13.8	10.9	59.1	65.6	97.0	439.3
1991	145.1	25.8	26.5	15.0	6.9	70.5	98.3	113.5	501.6
1992	229.9	33.9	45.9	35.9	9.3	98.5	146.4	120.8	720.6
1993	250.2	95.6	61.1	40.4	19.0	120.7	138.0	126.6	851.9
1994	240.5	136.9	74.4	41.6	21.9	145.0	150.0	144.3	951.6

* Figures of Buenaventura and Callao in 1991 are estimated.
Source: Ocean Shipping Consultants Ltd

80. The Chilean market is by far the largest, contributing 54 percent of regional throughput to 0.52 million TEUs in 1994. Strong growth totaling 63 percent over 1984-1991 has become spectacular, with a near doubling of volumes over 1991-1993 followed by a further 10 percent rise of the previous year in 1994.

81. Compared to its high number of ports, Chile has a relatively small population (13 million) and consumption, and its remoteness makes it unsuitable as a major hub for transshipment purposes. However, Chilean ports have the potential to serve markets in Argentina, Brazil, Peru, Bolivia and Paraguay, not just their own hinterland if the necessary inland transport infrastructures could be established. Shipping companies from those countries have claimed they would use ports such as Valparaiso and San Antonio if good road/rail links were established. The Chilean government plans to invest $10 billion in infrastructure projects and is encouraging Chilean companies to invest in other Latin American companies to support more economic integration. These countries constitute Chile's main trading partners, and trade barriers within the continent are steadily being reduced through agreement such as NAFTA and Mercosur (the customs and economic zone set up in January 1995 by Brazil, Argentina, Uruguay and Paraguay). Chile is expected to join NAFTA and is considering membership of Mercosur also.

82. In the absence of an important trade, the level of demand for containerized shipping is relatively small. Therefore, calling vessels tend to be small and self-sustaining with regard to loading and discharging. The port authorities claim that container handling equipment has been kept down intentionally to a level consistent with the relatively low number of moves per port call. Until 1995, Valparaiso was the only port with a container gantry crane.

83. Nevertheless, there has been a significant improvement in cargo handling procedures. Private stevedoring companies have been in operation since the early 1980's and the resultant competition has reduced port costs and raised productivity dramatically.

84. At Valparaiso port, container throughput climbed steadily from 0.09 million TEUs to 0.25 million TEUs over 1984-1993, an increase of 180 percent. In 1994, there was a 3.9 percent drop in container volumes. Valparaiso has lost traffic to San Antonio.

85. At San Antonio, container traffic grew by 36 percent over 1984-92, then took off with a near threefold expansion in 1993 and a further 43 percent increase in 1994.

86. The next rank of container ports, including Iquique, Arica and Antofagasta, are all located in northern Chile and are used by landlocked Bolivia as well as Chile. Iquique is the most significant because of its free trade zone.

Container throughput is still fairly low, ranging down from 0.07 million TEUs at Iquique to 0.02 million TEUs at Antofagasta in 1994.

87. In the Colombian Pacific port of Buenaventura, there has been a more than threefold increase in container volumes over 1984-1993. Privatized along with the other Colombian ports in 1993, Buenaventura's container throughput reached 0.12 million TEUs in that year.

88. In Peru, there have been considerable advances in port operation since the abandonment of state monopoly in 1990, and port costs have been more than reduced by half. The stagnation of container volumes in the 1980's was followed by an estimated 129 percent increase at the main port of Callao over 1990-1994 to 0.15 million TEUs, managed without a container gantry crane.

89. The Ecuadorian government also has a privatization program for its ports. Services at Guayaquil, the only significant container port, were the first state enterprises to be offered to the private sector in 1994. Guayaquil has one ship-to-shore gantry crane. Container throughput at the port has risen steadily over the past decade to 0.14 million TEUs in 1994, over three times the level in 1984.

(3) Port Facilities in Competing Ports

90. Table 4-5-5 illustrates major facilities of the competing ports. The terminal areas in this table are mostly small within 10 ha. except for the ports of Guayaquil, Arica, and Acajuntla. The maximum water depth of berths is around 9-12 meters which makes it possible to accept medium container vessels. The total length of berths varies widely from nearly 250 meters to 1200 meters. While an area for container storage is prepared at most of the ports, their scale is relatively small according to the number of containers being handled. Container gantry cranes are equipped at only few ports of Lazaro Cardenas, Salina Cruz, Guayaquil, and Valparaiso.

91. Since the competing ports are all considered leading ports in the region, most of them have direct-call liner service to secure stable import and export channels for national sound economy and everyday life of the citizens.

92. For bunkering service, only two ports of Lazaro Cardenas and Balboa can provide all kinds of marine fuel. For ship repair service, there is only the port of Balboa which can provide ship repair service in large dry dock of Panamax vessels. Most of them do not have any dry dock.

Table 4-5-5 Port Facilities of competing Ports in Pacific Latin America

Port	Lazaro Cardenas	Manzanillo	Salina Cruz	Acajutla	Balboa	Buena-ventura	Guayaquil	Callao	Arica	Iquique	Anto-fagasta	Valparaiso	San Antonio
Country	Mexico	Mexico	Mexico	El Salvador	Panama	Colombia	Ecuador	Peru	Chile	Chile	Chile	Chile	Chile
Direct-call liner service (companies)	2		1	12	6	9	21	19	10	11	15	22	7
Terminal Facilities (ha)	3.5		7.4	10.5	N/A	3.5	23.5	5.6	19.3	9.2	1.5	5.1	6.1
No. of Berth*	1		1	2	3	10	3	22 **	6	3	7	2	2
Length of Berth* (m)	286		275	256	724	N/A	555	4000 **	1,050	870	1,230	N/A	383
Depth of Berth (m)	13.7		12	13.5	9-10	4.4-9.1	9.8	9-10.7	3.9-10.4	9.2	8.7-11.3	11	9.7
Container Storage (TEU)	N/A		2,750	2,247	1,300	5,000	6,750	3,700	1,600	N/A	3,000	1,350	1,800
No. of CFS	1		1	0	1	1	1	1	1	1	1	1	1
Area of CFS (ha)	0.68		0.4	0	N/A	19.3	5.9	0.82	1.3	0.08	N/A	3	0.8
No. of Container Gantry Cranes	3		1	0	0	0	1	0	0	0	0	1	0
Future Plans					Container Yard (1200TEU)								
Bunkering Service	All kinds of marine fuel	Available		Only Diesel	All kinds of marine fuel	Available		Available	N/A	Available by tank truck	Fuel oil, light diesel	Petroleum and diesel	Available in emergency
Dry Dock	N/A	Floating Dry Dock (3500t)		Minor Repair	3 docks (65000, 15000, 2000dwt)	N/A		Available	N/A	N/A	N/A	Available	N/A

* Berths used for only containers
** General cargos share same berths with container cargos
This table should be revised according to the survey of neighboring ports in August of 1996
Source: Containerisation International Handbook 1996

4.6 World Trend of Marketing Strategy

93. As ideal goal, the marketing strategy of the port of Singapore will be mentioned briefly in this section.

4.6.1 General

94. In 1994, Singapore maintained its position as the world's busiest port in terms of the shipping tonnage of ship arrivals. The number of ship arrivals went up by 9% to 101,107 with a shipping tonnage of 678.6 million gross tons, also up by 9% from 1993. Total seaborne cargo throughput handled in Singapore registered a 6% growth to 290.1 million tons, including 124.1 million tons of mineral oil-in-bulk handled at the oil terminal.

95. Port of Singapore Authority's terminals and Jurong Port handled 162.6 million tons, a 10% increase over 1993. Of this, general cargo recorded a 10% increase to reach 156.7 million tons. This was contributed mainly by a 12% increase in containerized cargo to 142.2 million tons, which more than offset the marginal fall of 2% in non-containerized cargo to 14.5 million tons. Bulk cargo grew by 6% to reach 5.9 million tons.

96. Looking for container operations, the Port of Singapore handled a total of 10.4 million TEUs in 1994, the first time it ever achieved a double-digit mark. The increase was a significant 15% over 9.05 million TEUs handled in 1993. This enabled Singapore to strengthen its position as the world's top container port, after Hong Kong.

4.6.2 New Container Terminal

97. A new container terminal at Pasir Panjang will be developed in four faces spanning 30 years to meet Singapore's demand for container handling facilities well into the 21st century. It will have 50 container berths totaling 17 kilometers, designed for concentrated automatic operations to optimize Singapore's limited supply of land and labor. 99% of the terminal will be built on reclaimed land.

98. Reclamation, decking, and soil improvement works for Phase I of the project are progressing on schedule. This phase will have 8 container berths, constructed and equipped at a total cost of over $2 billion. The first five berths are expected to be operated in 1998.

99. Phase II of the project will be built and equipped at a cost of approximately $5 billion. It will have 18 berths when completed in 2009. Reclamation works will commence in 1995. A five-story distribution center with over 138,000 square meters of storage space will be constructed.

100. This new megaport will operate with the latest automated container handling equipment to improve terminal productivity and to overcome the manpower constraints.

4.6.3 Bunkering Services

101. Singapore has been the world's top bunkering port since 1988. This position was maintained in 1994 with 17.6 million tons of bunkers lifted by vessels in Singapore.

102. To further ensure reliability and efficiency of bunker tankers in Singapore, the Standard for Bunker Tankers was implemented in January of 1994. This standard specifies the operational requirements for tankers operating in Singapore.

103. The Singapore Bunkering Procedure, specified as the Singapore Standard Code of Practice for Bunkering by barges and tankers in October 1993, has served the bunkering industry well in upgrading the level of bunkering services in the port.

4.6.4 Marine Services

104. A total of 101,107 vessels called at Singapore in 1994, representing a 9% increase over 1993's figure. Shipping tonnage also rose by 9% to 678.6 million gross tons with the arrival of more tankers and container vessels.

105. Although the number of piloted vessel movements went up 5% from 93,513 to 98,286, the port authority maintained its high level of service. About 96% of the piloted jobs were serviced within half an hour in 1994. This was made possible with a better arrangement of pilots, launches, and tugs through computerization.

106. In 1994, the port authority's ten ferries transported a total of 1.4 million passengers to Sentosa, Kusu, St. John's Islands. There are plans to privatize the ferry services to these islands. Even after privatization, the port authority will

ensure that the service level provided by the new operator is satisfactory.

107. The port authority operates a fleet of 21 tugs, of which 12 are the authority-owned and 9 chartered, to provide 24-hour assistance in berthing and unberthing vessels at the wharves, oil installation, and shipyards. A total of 88,580 tug jobs were performed in 1994, an increase of 4% from 1993. To meet the increasing demand for tug services, there are plans in 1995 to purchase three additional tugs. The port authority also has 6 waterboats and 5 garbage-collection craft to service vessels in the anchorages.

108. 24-hour gas-free inspection services, including the testing of toxic vapors and the inspection of hot works, were provided to tankers. A total of 4,999 gas-free inspections were made in 1994, a 21% increase from 1993.

109. The Inspectorate of Dangerous Goods continued to undertake all services relating to dangerous goods for classification, handling and storage. In 1994, a total of 311,955 containers including dangerous goods were handled, 12% more than in 1993.

110. Since February 1994, the port authority has been using the Differential Global Positioning System for hydrographic surveys and for positioning of buoys. This system gives more accurate readings and measurements.

4.6.5 Security Services

111. The port authority has its own Police Force comprising 374 policemen and security guards to enforce security in the port. All loaded vehicles are checked at the gate to ensure that they have the proper documents and carry the correct cargo.

112. The One-Stop Document Center conveniently allows port users to apply for port clearance certificates, licenses, passes, and permits, all under one roof and in one location. In 1994, some 27,000 passes were issued to port users. A video-imaging ID card system will be purchased in 1995 to combine the process of photo-taking, laminating, encoding, and decorating for the port authority pass.

113. The port authority has its own Fire Service with 7 fire engines. Its 120 fire-fighting personnel respond to fire calls and oil spill incidents, and provide regular fire prevention inspections in the port areas.

4.6.6 Warehousing & Distribution

114. To complete port operations, the port authority operates a number of distribution centers in the port. The total warehouse space managed by the authority is 14% of the total stock in Singapore, by that means making the authority the largest warehouse operator.

115. Alexandra Distripark comprises 5 ten-story buildings yielding 211,600 square meters of storage space. It houses about 300 companies engaged in warehousing, manufacturing and distribution activities.

116. Pasir Panjang Distripark, comprising 8 single-story warehouses and a three-story distribution center, provides about 195,900 square meters of warehousing space. About 170 trading and transportation companies are housed in this distripark.

4.6.7 Cruise Center

117. The $50 million Singapore Cruise Center comprises an international passenger terminal with 3 berths, a regional ferry terminal, and a domestic ferry terminal.

118. During 1994, 49 international cruise liners made 986 calls at Singapore with a total of 703,400 passengers. This was four-fold increase from 1993's figure of 164,600 passengers. The regional ferry terminal reached a growth of 23% with 2.8 million passengers. Domestic harbor cruises, however, declined by 11% to 326,300 passengers.

V NATURAL AND ENVIRONMENTAL CONDITIONS AROUND THE PORT OF BALBOA

5.1 Meteorological Conditions

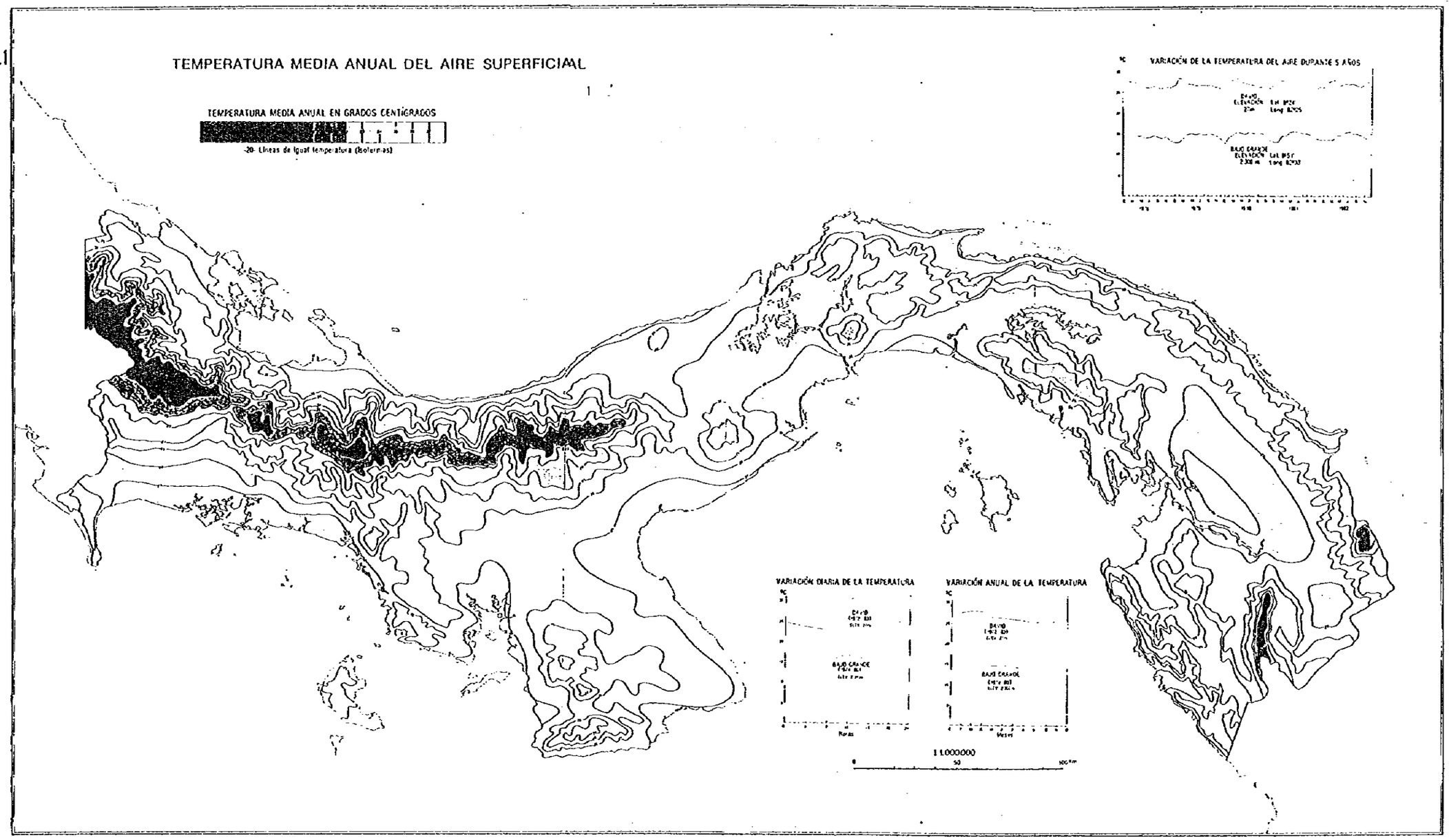
5.1.1 General Information

1. Two weather systems define the climate of Panama. One is the semi-permanent anticyclone of the Atlantic which produces east winds in the lower layers of the atmosphere. The other is the Intertropical Convergence Zone (ITCZ), a kind of meteorological interference associated with the anticyclone of the Eastern Pacific. The ITCZ moves following the displacement of the sun throughout the year. Consequently, the seasonal migration of the masses of tropical air from the Pacific and those of sub-tropical air from the Atlantic, in combination with the local physical geography of mountains, establishes the weather of each area.

2. In the Pacific Slope, there is an extent and unique rainy season, which begins at the end of April or at the beginning of May, and extends to mid or end of November. This period is characterized by the maximum coincident precipitation with the passage of the ITCZ to the North (June), and to the South (October). Between December and the end of March, the dry season is established in this region with almost total absence of rain. Eventually during this period rainstorms occur with abundant rain caused by the incursion of intense cold fronts, which arrive at this latitude, and are forced by strong advances of huge masses of polar air coming from the arctic regions. Annual temperatures and precipitation all over Panama are shown in Figure 5-1-1. and Figure 5-1-2 respectively.

5.1.2 Weather at Port of Balboa

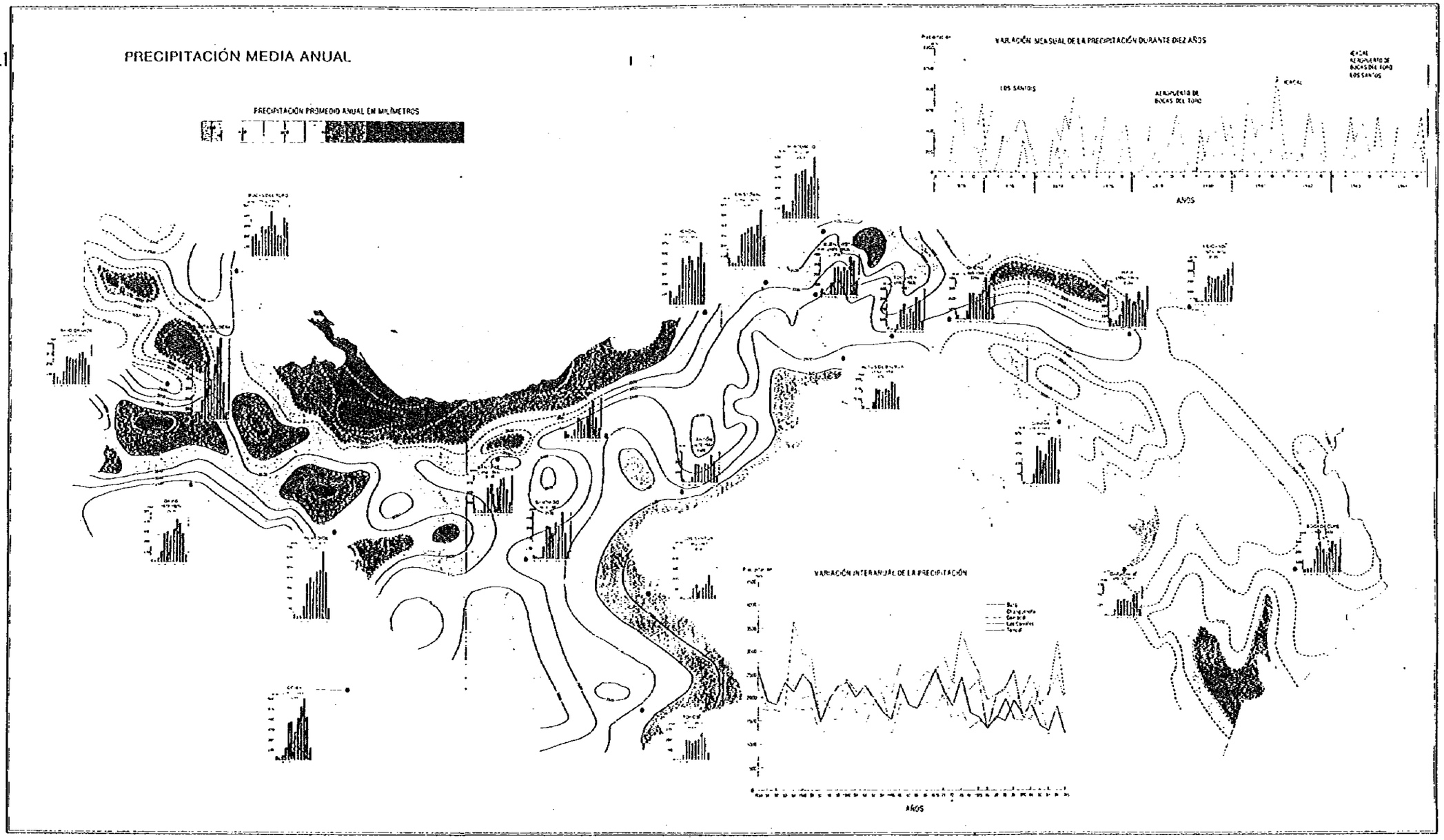
3. The weather around the Port of Balboa is accompanied with two seasons consisting of the rainy season from May to November and the dry season from December to April. The annual rainfall is about 1,700 mm, annual average temperature is 27℃, and the annual relative humidity is 83.3%. During the dry season, according to information of the meteorological division of the Panama Canal Commission, the prevailing winds are mostly from the northwest (58%) with an average speed of 8.0 miles per hour (MPH) and the next prevailing one is from the north (36%) with an average speed of 11.0 MPH.



Source: ATLAS NACCIONAL de la REPUBLICA de PANAMA

Figure 5-1-1 Mean Annual Surface Temperatures In Panama

11.1



Source: ATLAS NACCIONAL de la REPUBLICA de PANAMA
INSTITUTO GEOGRAFICO NACCIONAL

Figure 5-1-2 Mean Annual Rainfall

During the rainy season, the prevailing winds continue mostly from the northwest (50%) with an average speed of 6.0 MPH and the next prevailing one is again from the north (15%) with an average speed of 5.0 MPH. The winds from the south and the southeast are 12% with an average speed of 7.0 MPH and 5.5% with an average speed of 5.0 MPH respectively. The annual, seasonal and monthly wind roses at Balboa are shown in Figure 5-1-3.

5.2 Oceanographic Conditions

5.2.1 Tides

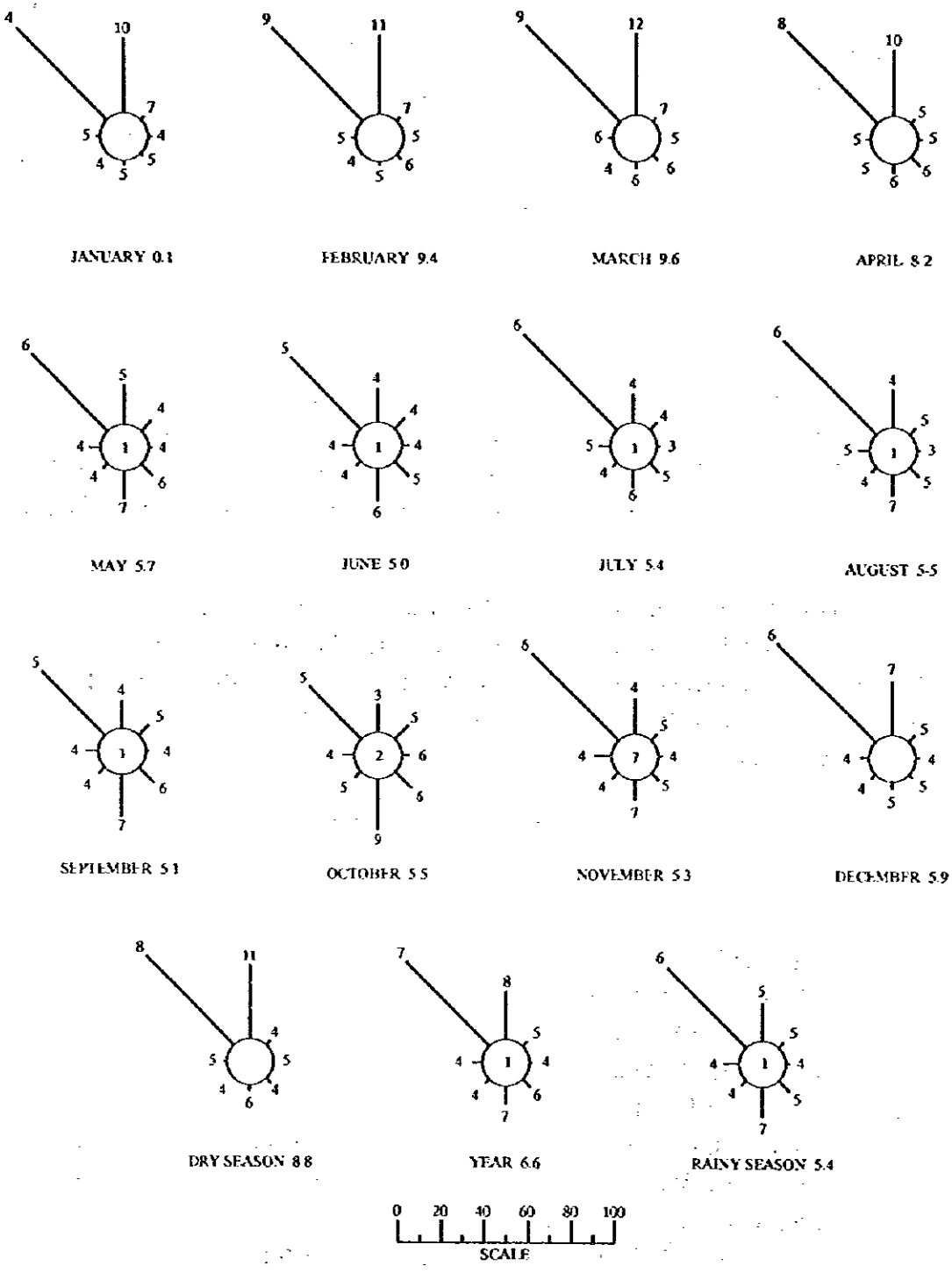
4. The tides are very different between the both coasts of Panama. At the Pacific Coast, the tides are semi-diurnal, varying much (approximately 5 m) and well predicted. At the Caribbean, they are diurnal, varying less (approximately 1 m), irregular and largely influenced by meteorological conditions.

5. The Port of Balboa is affected by the tide of the sea with an average tidal range of 3.84 m. The average maximum tidal change reaches to 5.85 m. The highest and lowest tides ever recorded from 1909 to 1991 at the Port of Balboa are 5.918 m (19.417 feet) and -1.123 m (-3.683 feet) with respect to the Mean Low Water Springs (MLWS) respectively.

Main tides with respect to MLWS are as follows:-

Tides	(meters)	(feet)
- Highest Water	+ 5.918	+ 19.417
- Mean Monthly Highest High Water	+ 5.345	+ 17.537
- Mean High Water	+ 4.462	+ 14.639
- Lowest High Water	+ 2.998	+ 9.837
- Mean Sea Level	+ 2.629	+ 8.625
- Highest Low Water	+ 1.995	+ 6.547
- Mean Low Water	+ 0.626	+ 2.005
- Mean Low Water Spring	+/- 0	+/- 0
- Mean Monthly Lowest Low Water	- 0.466	- 1.527
- Lowest Water	- 1.123	- 3.683

(All the means are 19 year means from 1973 to 1991. The extremes are 83 year extremes from 1909 to 1991.)



Length of lines from circumference of circles represents the percentage of hours with wind from the indicated direction. The percentage scale is shown above. The figures around the circles show the average velocity from that direction in miles per hour. The figure following each month is the average number of miles per hour regardless of direction.

Source : The Panama Canal, Meteorology and Hydrology Branch

Figure 5-1-3 Wind Roses at Balboa Height

6. Figure 5-2-1 shows the tide comparison between the Port of Balboa and the Port of Cristobal. The tide of the Port of Balboa varies about 5.8 m (between Mean Monthly Lowest Low Water and Mean Highest High Water), which is more than 10 times of that of Cristobal (about 0.5 m). The quays of the Port of Balboa, therefore, requires to be deeper by about 5.5 m than those of Cristobal when they are designed to accommodate a same size vessel. Container cranes to be installed at the Port of Balboa are also required to cover a larger vertical range.

5.2.2 Currents

7. The marine currents at the Pacific have a prevailing course to the east, while at the Caribbean the currents have a prevailing course to the west. The relatively large tidal changes on the Pacific coast provoke several currents affecting the Port of Balboa.

8. According to "The Panama Canal Pilot" by Captain George A. Markham, there are tidal currents crossing the entrance channel setting to the west with an average velocity of a slightly over 0.3 knots. However, during the peak of the rainy season, in November, the current sets more southerly, and this is accentuated when the tide is flooding. The maximum velocity can be expected when the tide is ebbing. The currents are stronger during the dry season than they are in the rainy season.

9. The currents observed at the Balboa Harbor are generally described as follows:

a) The evacuated water mass drained from the Miraflores Locks and from the Cardenas River provokes the currents around the Balboa Harbor.

b) The flood of the Curundu River accompanied by that of the Maria Salas River is able to provoke certain currents around Pier No. 18. However, any tidal changes do not practically provoke troublesome currents to Piers No. 16, 17 and 18.

c) At Pier No. 6, which is more exposed to the tidal currents, the ships are suffering from troublesome situations; they are pushed toward the pier during ebb tides and pulled away from the pier during rising tides.

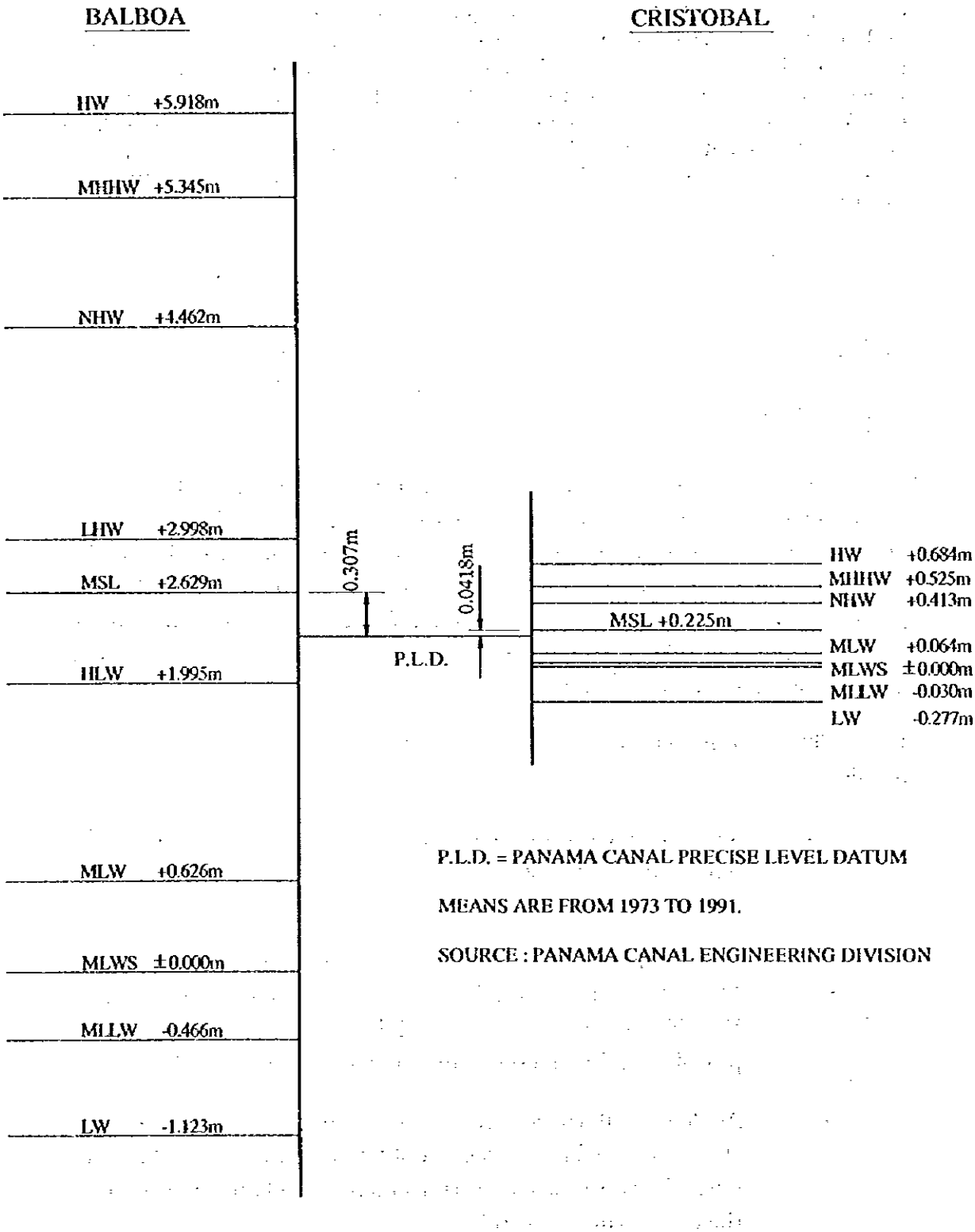


Figure 5-2-1 Tides at Balboa and Cristobal

10. It should be noted that berthing of a vessel coming from the Caribbean side of the canal to Pier No. 7 during the ebb tide requires very careful ship maneuver because the stopping and turning must be done in the current coming from the stern without a turning basin.

5.2.3 Sedimentation

11. APN has periodically conducted the bathymetric survey at the Balboa Harbor and observed around 24 cm annual sedimentation. This sedimentation is caused by the following:

a) Sediments evacuated together with the water mass drained from the Miraflores Locks

b) Sediments evacuated from the Cardenas River, the Curundu River, the Maria Salas River and other rivers debauching to the Canal

c) Sediments generated by the maintenance dredging and moved by the tidal currents, particularly from the entrance channel of the canal

c) Sediments from the sea coast.

12. Among the above sediments from the various origins, those from the Curundu River are likely to be serious for the Port of Balboa since it debauches directly to the Balboa Harbor and urbanization is proceeding in its catchment area.

13. APN periodically conducted a bathymetric survey of the port basin. According to the survey results conducted in February 1995, the port basin was generally maintained deep for a full-loaded panamax ship (-12.95 m MLWS). From the comparison between the bathymetry of 1995 and that of 1996, the seabed is observed to rise 30 to 60 cm.

5.3 Sea Water Quality

14. Seasonal changes in the oceanography and water quality were observed by Commission for the study of the Alternatives to the Panama Canal to be as follows:

- The condition of the water mass in the Bay of Panama during the rainy season indicates an uniform distribution of the properties in the water column. This includes the absence of thermal stratification and the presence of a mixed layer with relatively warm water from the surface to the bottom. This mixed layer has a relatively low salinity, low concentration of nutrients, and chlorophyll "a". All of these parameters were uniformly distributed in the water column. The concentration of dissolved oxygen in bottom layers was generally near 5 ppm.
- This study identifies and describes the development of the seasonal upwelling in the Gulf of Panama, during the dry season of 1993. This phenomenon was followed by a significant decrease in the water temperature and a pronounced increase of the salinity in the entire water column. Simultaneously with these changes, there is significant increase in the concentration of total phosphorus (twice as much as found during the rainy season) and the concentration of nitrates (about three times more than observed during the rainy season). This same pattern was observed with chlorophyll "a".
- In contrast to these changes, the concentration of dissolved oxygen decreased below thermocline. At the end of the dry season, the annual cycle started again.
- The study of the water quality showed slight level of pollution.
- From analysis of samples collected in the area, no volatile organic were found. The BOD concentrations were low and in general, the counts of total and fecal coliforms are below what the water quality standards indicate for recreational waters. This inventory has indicated that the marine area near the Fort Amador Causeway, an important recreational area, has a fairly good water quality.

15. APN performed water quality survey in the Port of Balboa and its vicinity on the 16th and 17th of November in 1992. DO, pH, salinity, conductivity and temperature were measured using an instant measuring equipment. The survey area and stations are shown in Figure 5-3-1. Part of the results around the Port of Balboa are shown in Table 5-3-1. The area has a good water quality except for Station 32, the inner part of Balboa Port.

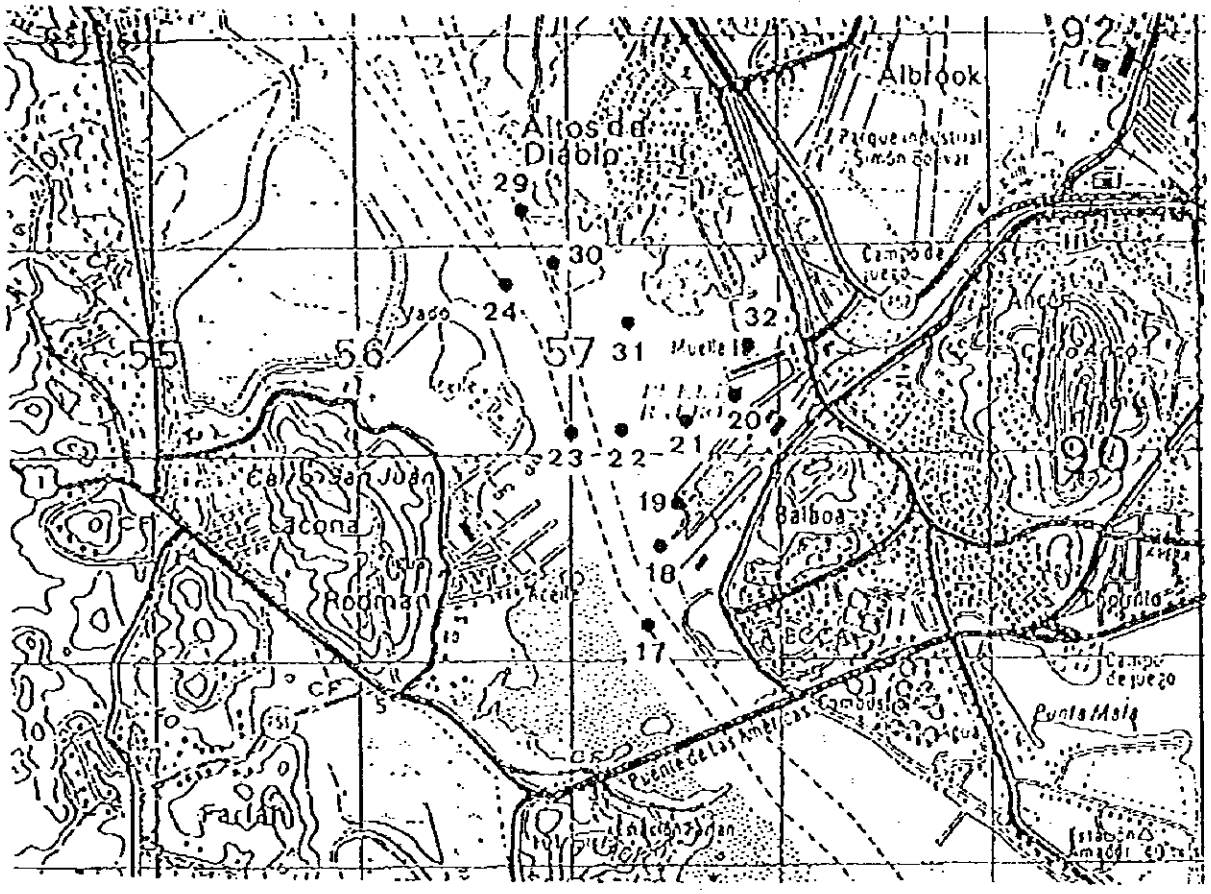


Figure 5-3-1 Survey Area and Stations around Balboa Port by APN in 1992.

5.4 Topographic Conditions

16. The Port of Balboa is located on the east bank of the Panama Canal about 9 km from the canal entrance, at the west of the Panama City. Sosa Hill immediately stands at the south of the port. On the east of the port, a flat plane of Albrook airstrip, an international airport until Tokmen Airport was open, lies expanding northeastwards to Curundu. On the north, lies a swampy area, partly occupied by small workshop operators and partly reclaimed by other concessionaires. Over this swampy area, a residential area of Diablo exists further extending to the north. See Figure 5-4-1.

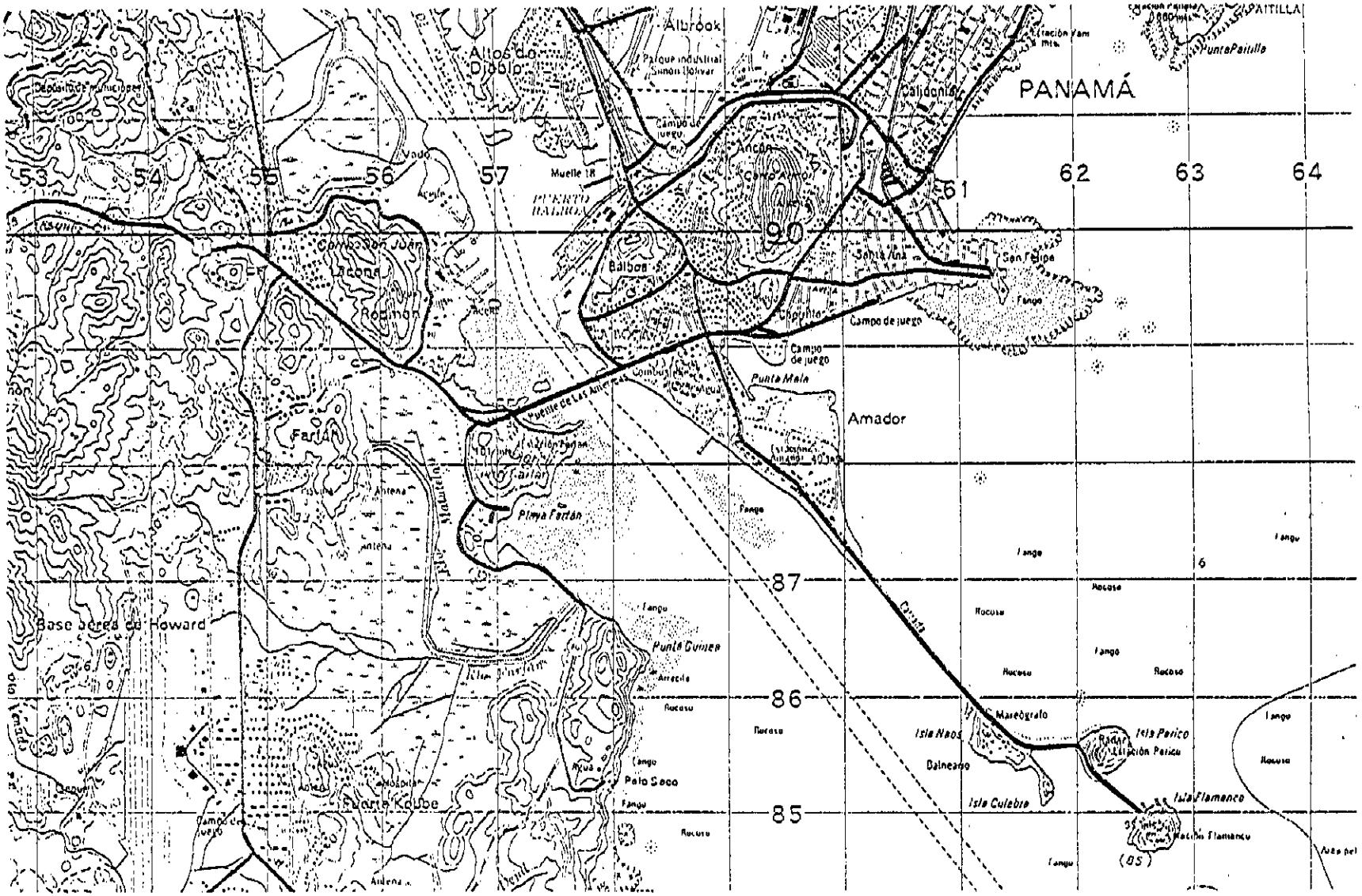
Table 5-3-1 Water Quality Survey by APN in 1992.

Station	Depth	pH	DO	Station	Depth	pH	DO
17	1m	8.0	5.4	23	1m	8.1	5.3
	8m	8.0	5.1		8m	8.1	5.1
18	1m	8.0	5.4	24	1m	8.0	5.7
	8m	8.1	5.1		8m	8.1	5.0
19	1m	8.0	5.2	29	1m	8.0	5.4
	8m	8.1	4.0		8m	8.1	4.3
20	1m	8.0	5.6	30	1m	8.1	5.9
	8m	8.1	4.8		8m	8.1	4.8
21	1m	8.0	5.3	31	1m	7.8	5.1
	8m	8.1	4.9		8m	8.1	5.1
22	1m	8.0	5.5	32	1m	7.8	4.1
	8m	8.1	5.3		8m	7.7	3.6

Source: APN

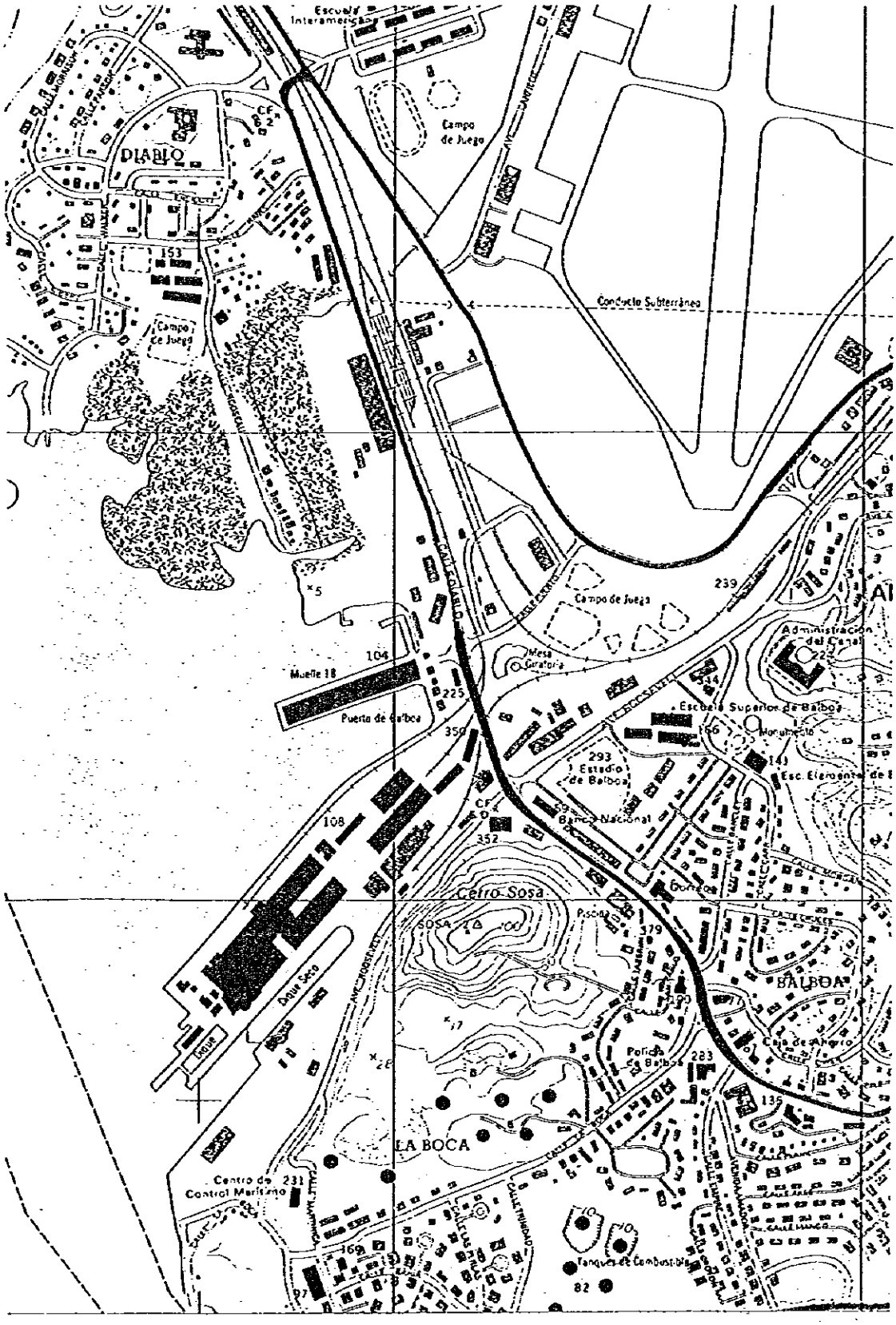
17. Before the canal was constructed, the site of the Port of Balboa was a swampy marsh predominated by tides. The Albrook airstrip was made by reclaiming the marsh between the Curundu River and Marca Salas River by use of dredged materials from the canal. Between the port area and the airstrip at present, several sport grounds and railway facilities exist on the reclaimed area.

18. On the south, Sosa Hill stands behind Dry-Dock No. 1. On the hill top, telecommunication facilities are installed and operated by PCC. On the south and west feet of the Sosa Hill, there are tank yards for bunkering which is operated by private companies. On the north of the port, the swampy area extends from Pier No. 19 on the canal bank. The area covering this swampy area and the adjoining residential area is the most prospective site for the short-term development of the Port of Balboa. See Figure 5-4-2.



Source: Panama 1:50,000
INSTITUTO GEOGRAFICO NACCIONAL

Figure 5-4-1 Topographic Map of Panama City



Source: CIUDAD DE PANAMA 1:12,500
INSTITUTO GEOGRAFICO NACCIONAL

Figure 5-4-2 Topography in the Vicinity of Port of Balboa

19. A swampy flat low land of Farfan, the area as the most prospective site for the long-term development, is located at the opposite side of Amador across the Panama Canal. The access to Farfan from Panama city at present is the Bridge of America crossing the canal. At Farfan, the low land extends about 3 km from north to south and about 1.2 km in average from east to west and it is surrounded by hills in all the directions but the east, where the low land opens to the canal. See Figure 5-4-1.

20. The flat low land of Farfan was originally a tidal swamp with the Farfan River flowing into the Rio Grande River, along which the canal was excavated. The Farfan swamp was reclaimed with excavated materials from the canal and has been used for a disposal area for the maintenance dredging. The reclaimed soils are silty clay with granular materials, very firm. A part of the Farfan swamp is being used as a radio transmission station by US military. The Howard Air Base is located on the west of this low land. See Figure 5-4-1.

5.5 Bathymetric Conditions

21. Before the canal was excavated, a river, called Rio Grande, was running almost along the canal alignment. Rio Curundu, Rio Maria Salas and other rivers used to run into Rio Curundu. As the seashore was shallow, an ocean going steam ship could dock only at a small islet offshore, called Isla Naos (Ship Island), which is connected to the main land now with the Amador causeway. Only small boats could dock a jetty of Panama City, now called "The Old Jetty" at Punt Mala. As implied from this history, the entrance channel and port basin of the Port of Balboa are likely to become shallow without maintenance dredging.

22. According to the survey maps of both PCC and APN, the sea bed in front of all the piers is sloped and shallower than the sea bed of the port basin. This is due to the shape of old ships; cross section of a ship hull used to be rather round before. As the ship hull shape is rather rectangular now, this shallow sloped seabed in front of the piers prevents a full-loaded panamax size ship from docking to any pier of Port of Balboa.

23. At present, the main part of the port basin is maintained 12.95 m below MLWS while it is -12.20 m , -11.42 m, -12.20 m and -11.59 m in front of Pier No. 6, No. 7, No. 14, No. 17 and No. 19 respectively. On the west bank of the canal, the sea bed is maintained 12.19 m (40 ft), 10.67 m (35 ft) and 8.53 m (28 ft) for Pier No. 1, No. 2 and No. 3 respectively.

24. During very low tides, the seabed appears in front of the Farfan beach, where a long-term port development is envisaged. The dry seabed at the very low tide extends almost to the channel of the canal and is mainly composed of disposals of excavated materials. There are in-situ rock exposed to the seabed at least at two locations near Farfan Beach.

5.6 Geotechnical Conditions

5.6.1 Geographic Information

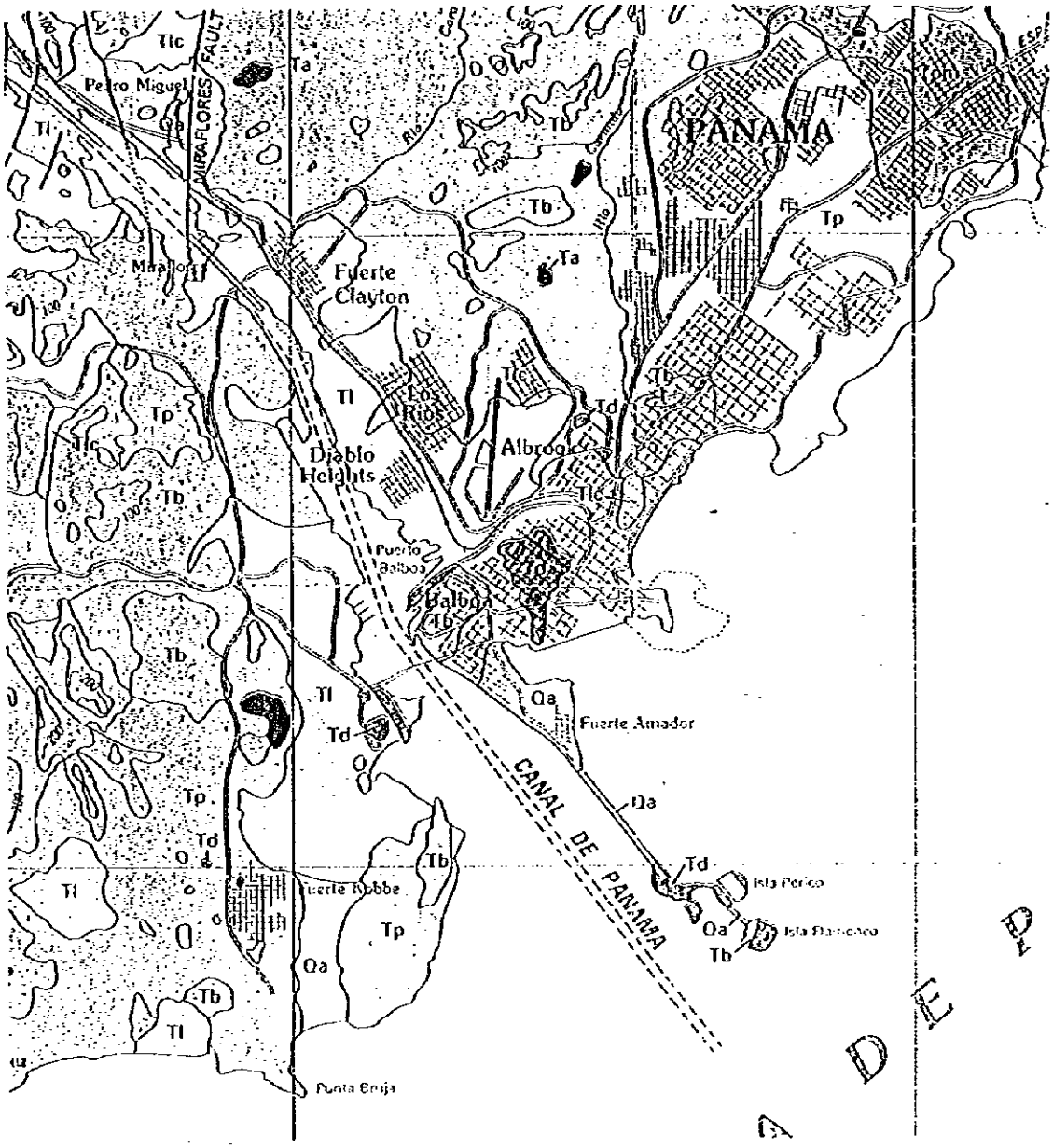
25. The Port of Balboa is located at a geologically unique site. The surrounding area is composed of the "La Boca Formation" which was produced in early Miocene and composed mainly of sedimentary rock, like mudstone, siltstone, sandstone, tuff and limestone. In Miocene era, intrusions of dacite and dacite porphyry formed the rock along the dry-dock area of the Port of Balboa. (The same intrusion formed the rock of Ancon Hill.) In the middle or late Miocene, intrusions of basalt formed the rock of Sosa Hill, which is right behind Pier No. 6 and Pier No. 7. Therefore, to some extent, the foundations of Piers No. 6 and No. 7 are rested on the basalt rock. Meanwhile, the foundations of Piers No. 14 to No. 18 are rested on "La Boca Formation" i.e. on the sedimentary rock mainly composed of shale. See Figure 5-6-1.

26. Farfan, the prospective site for the long-term development of the Port of Balboa, is composed mainly of La Boca Formation. However, a tiny hill on the beach of Farfan is formed of basalt rock like Sosa Hill. In addition, during very low tides, in-situ rock appears offshore the Farfan Beach which seems continuous with the rock of Farfan Hill.

5.6.2 Geotechnical Information of the Port of Balboa

27. The note in the general information shown on the drawing prepared for "Study and Design of Rehabilitation of Piers of Port of Balboa" describes that the stratification of the surface and sub-soils is generally characterized as follows:-

a) The surface soil is the formation of the sediments of the marsh origin in Holocene era, consisting of mud, clay and organic substances.



Legend:

Tl: La Boca Formation, early Miocene. Mudstone, siltstone, sandstone, tuff and lime stone.

Tp: Panama Formation, early to late Oligocene. Conglomerate, principally basaltic and graywacke sandstone.

Tb: Intrusive and extrusive basalt, middle and late Miocene.

Td: Intrusive dacite and dacite porphyry, Miocene.

Source: Geological Map of Panama Canal and Vicinity (compiled by R.H. and J.L. Stewart with collaboration with W.P. Woodring)

Figure 5-6-1 Geological Map in the vicinity of Port of Balboa

b) Below the surface, normally encountered is mud called "Lama", also called "lodo marino (marine mud)", which the Panama Canal Commission names "Pacific Muck (mud of the Pacific)". This strata is also formed in Holocene.

c) Below "Lama" encountered is the formation called "La Boca", which consists of shale, sandstone of the marine origin containing fine granular, calcareous, carbonation and fossils.

d) At Pier No. 6, intrusions of the basalt flows into the formation of "La Boca" are observed. These intrusions took place during Miocene. This basalt consists of segments of weathered and sound rock in a comparative form. This basalt is more durable than the formation of "La Boca."

28. A typical formation of the subsoil at the Port of Balboa is illustrated in Figure 5-6-2 and the subsoil conditions at Pier No. 16 is presented as an example in Figure 5-6-3. It should be noted that all the foundations of the piers of the Port of Balboa are supported on "La Boca" except Pier No. 6 and Pier No. 7. Some pile foundations of Pier No. 6 are rested on the basalt rock and the concrete abutments of Pier No. 7 were directly constructed on the basalt rock.

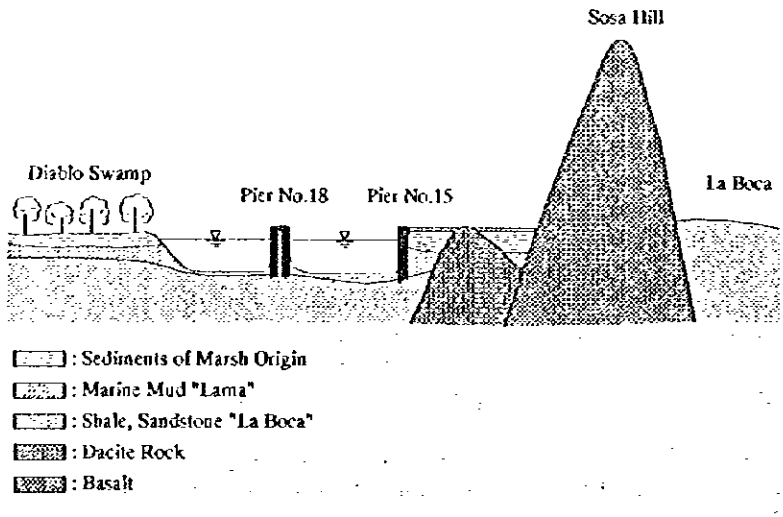


Figure 5-6-2 Illustration of Sub-Soil Formation at Port of Balboa

Borehole No.P-16-2

ELEVATION	DEPTH	SYMBOL	DESCRIPTION OF MATERIAL	SAMPLE NO.	TYPE OF SAMPLE	STANDARD PENETRATION TEST N	P	qu	RECOVERY %	NATURAL W. CONTENT %	OBSERVATIONS
	0.00		ELEVATION +7.35m								0.00
			Sandy silt landfill with gravel and coral fragments with few clay. Very hard. Low plasticity. Low to high water content according to the depth. Clear chocolate color with yellow seams.								
+3.15	4.20										
	4.50		Silty sand (SM). Soft. Low plasticity. High natural water content. Gray. (SM)	1	A	1	15				
						2	15	0.37	62.2	47.0	TF BTC
+1.45	5.90					1	15				
	6.00		Silty sand with coral and shells (SM). Very hard. High plasticity. Medium natural water content. Obscure gray. (SM)	2	A	16	15				
						28	15	6.17	100.0	23.4	
						40	15				
	7.50			3	A	10	15				
						29	15	5.85	83.8	19.4	
-1.45	8.80					28	15				
	9.00		Organic clay called "Lama" (OH) with sand. Semi-firm. High plasticity. High natural water content. Obscure gray. (OH)	4	A	4	15				
-2.25	9.60					5	15	1.00	33.3	87.9	
	10.00					3	15				10.00
	10.50		Poorly graded sand (SP) with few fine. Soft. Not plastic. High natural water content. Gray. (SP)	5	A	1	15				
-3.65	11.00					1	15	0.25	33.3	37.8	
				6	A	4	15				
	12.00					4	15	1.00	100.0	71.5	
						4	15				
			Organic clay called "Lama" (OH). Semi-firm to firm according to the depth. Medium to high plasticity. High natural water content. Obscure gray. (OH)	7	A	4	15				
	13.50					3	15	0.84	88.8	73.6	TF BTC
						4	15				
	15.00			8	A	4	15				
						5	15	1.16	100.0	76.6	
						5	15				
-9.15	16.50			9	A	12	15				
	16.60					50	15	6.21	100.0	47.2	
						10	15				
			Silty clay (CH). Hard. High plasticity. Medium to low natural water content according to the depth. Yellowish chocolate color with gray seams. (CH)	10	A	18	15	+10.0	100.0	17.2	18.00
	18.90					71	15				
											BTC
	19.50			11	A	75	5	+10.0	100.0	13.6	
-13.15	20.00										20.00
	20.50										
	21.00		Shale. Silty clayey sedimentary rock. Weathered and decomposed rock. Soft to moderately soft rock. Medium plasticity. Medium natural water content. Grayish purple	12	A	33	15	+10.0	100.0	25.6	
						75	13				
											BTC
	22.55			13	A	75	5	+10.0	100.0	21.8	22.55

Source : "Study and Design of Improvement of Piers of Port of Balboa" APN

Figure 5-6-3 Sub-Soil Log at Pier No.16 of Port of Balboa

5.7 Earthquake

29. Four tectonic plates affect the seismological conditions of Panama. They are Coco Plate, Nazca Plate, Microplate of Panama, and South American Plate. Along the convergence of these tectonic plates, epicenters are distributed. Particularly at the southwest of the province of Chiriqui and at the southeast of the province of Darien, where the three tectonic plates of the above convergence meet, the seismic activities are intense. Figure 5-7-1 shows the epicenters ever recorded in Panama.

30. As the Port of Balboa is distant from the convergence of these tectonic plates and located at the central part of the Microplate of Panama, it has not recorded any seismic incidents. However, a horizontal force equivalent to 10% of the gravity is to be considered as a seismic force.

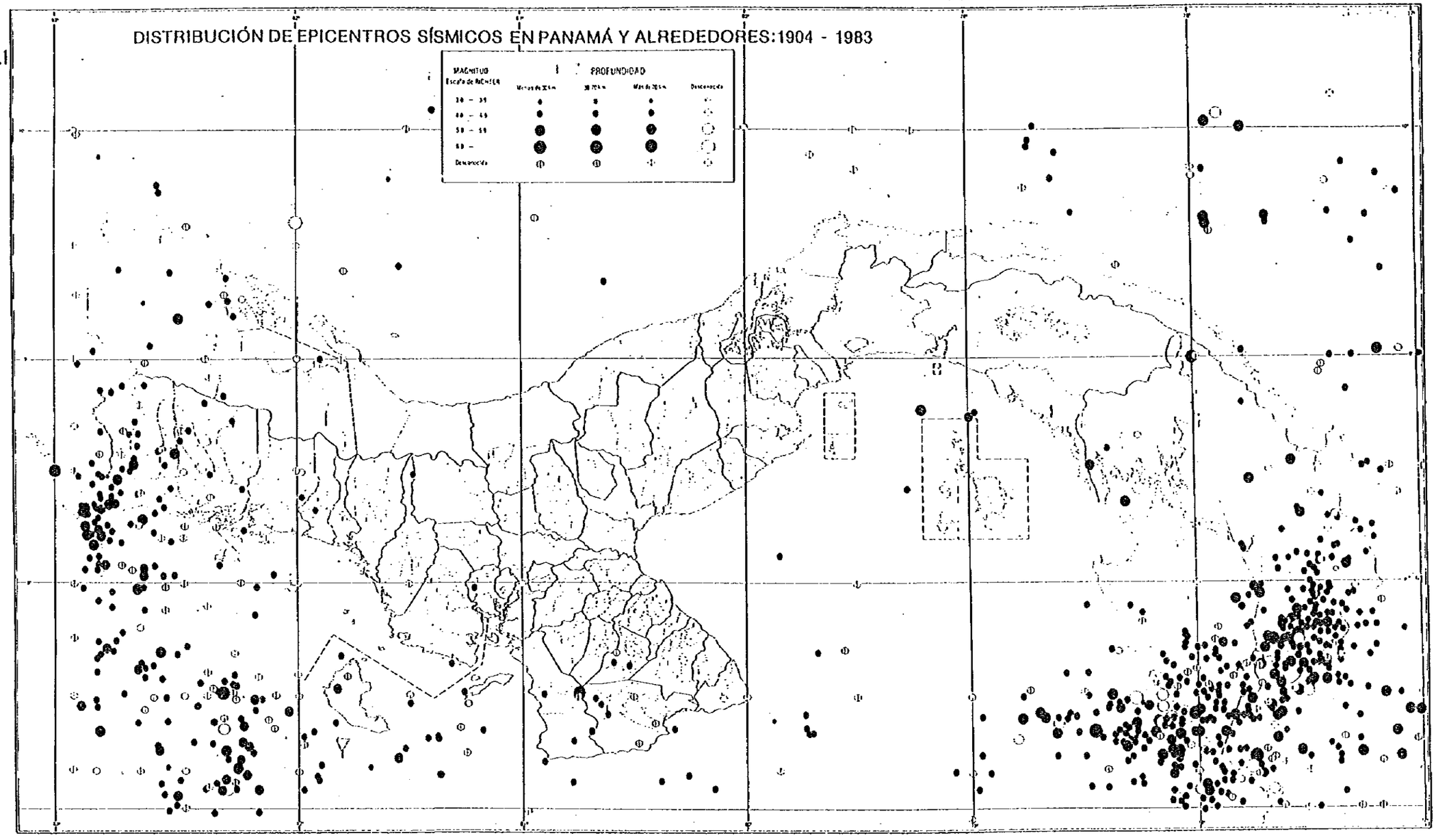
5.8 Present Vehicular Traffic

31. As not much cargoes are unloaded or loaded at the Port of Balboa at present, the traffic congestion around the port is not observed.

32. Inside the port, for the same reason the traffic congestion is not observed. However, at Pier No. 15 and No. 16, containers are stacked on the apron and have the passage narrow, the traffic movement is jeopardized. In addition, movement of the reach-stackers through the public road from the main gate to the newly built container storage near Pier No. 7 caused slight inconvenience to the general public.

33. Container movement between the Port of Balboa and the Port of Cristobal will take more time in future since heavy traffic congestion is observed on the road to Route 3 at the commuting hours.

5.1



Source: ATLAS NACCIONAL de la REPUBLICA de PANAMA
INSTITUTO GEOGRAFICO NACCIONAL

Figure 5-7-1 Epicenters in Panama

5.9 Distribution of Mangrove and its Conditions

5.9.1 Protected Areas

34. Of its seven million hectares, through laws and decrees, Panama placed over 1.2 million hectares under special protection status, classifying them into natural parks or wildlife reservations. In Panama, the responsible entity is the National Renewable Resources Institute (INRENARE). Along Panama Canal and in its environs are protected areas and parks (Figure 5-9-1), such as Lago Gatun (Recreational area), Soberania (National park), Barro Colorado (Nature reserve), Summit (Municipal park), Parque Metropolitano (Natural park) and Islas Taboga y Uraba (Wildlife refuge). Of these areas and parks, Parque Metropolitano 4 km to the northeast of Balboa Port, belongs to the watershed of the Curundu River. According to the engineer of the park, almost the same species of flora and fauna as those in the park can be found around Balboa Port, because of the same watershed (Table 5-9-1).

Source: Panama Now, Focus Publications, 1992.

Figure 5-9-1 Protected Areas and Parks along Panama Canal and in its Environs.

Table 5-9-1 Species of Fauna in Parque Metropolitano

	Numbers	Species protected by law*
Mammals	42	Tamandua mexicana, Cyclopes didactylus, Dasypus novemcinctus, Cabassous centralis, Saguinus geoffroyi, Aotus lemurinus, Alouatta palliata, Procyon lotor, Nasua narica, Lontra longicaudis, Herpailurus yaguarondi, Leopardus pardalis, Odocoileus virginianus, Hydrochaeris hydrochaeris, Agouti paca, Dasyprocta punctata
Birds	219	Crypturellus, Ortalis cinereiceps, Columba cayennensis, Amazona ochrocephala
Reptiles	23	Caiman crocodilus, Iguana iguana, Boa constrictor
Amphibious	15	-

*In danger of extinction specie, according to Resolution No DIR-002-80 of the 24 of January in 1980.

Source: Lista General de Fauna del Parque Natural Metropolitano, Fernando A. Arosemena, 1995.

5.9.2 Mangroves

35. Mangroves distributing around the Pacific entrance to the Panama Canal were surveyed by Commission for the study of the Alternatives to the Panama Canal to be as follows:

- There are five areas of mangrove forests in this section, notably Rio Farfan, Rodman, Cocoli, Altos de Diablo, and Clayton. The country-side surrounding these mangroves is generally hilly and built over, although there are several scattered stands of natural trees.

- This estuary extends to around 10 km upstream, approaching the locks and dam of Miraflores, near Clayton. This course is reasonably direct and much is along the Canal waterway. The biggest stand of mangroves were found near Cocoli(~25 ha), and is part of the old French Canal.

- Seven mangrove species, and the white form of Pelliciera, were observed in this system. Ranges of distribution in this system are relatively uniform, although Rhizophora recemosa is found more downstream compared with the riverine estuaries of the Perequeto and Caimito. Again, Laguncularia racemosa and Avicennia germinans extend virtually throughout the estuary. Pelliciera

rhizophorae "red" is relatively wide ranging, especially compared with the white form.

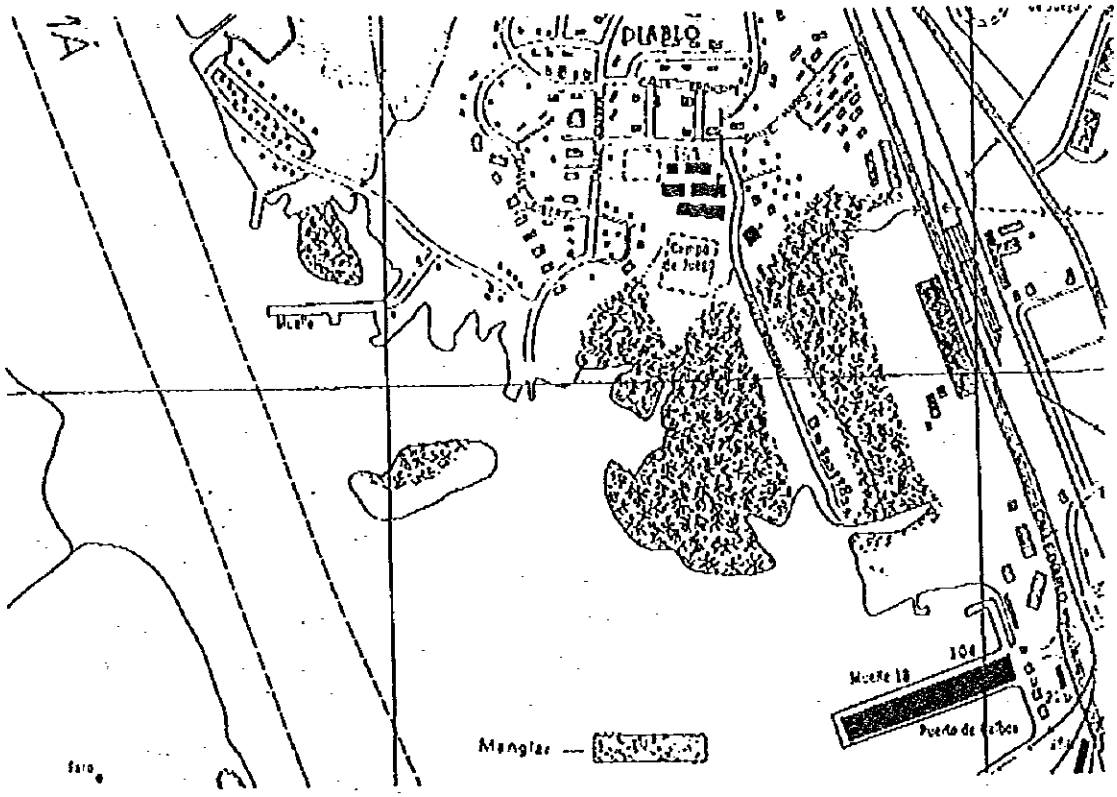
- The mouth of the Canal and the surrounding rocky headland shores were notably dominated by scrubby Laguncularia trees (3-8 m tall). This includes the offshore Culebra site, near Naos Island.

5.9.3 Around Balboa Port

36. There are no protected areas around Balboa Port.

37. Mangrove forests exist in Diablo Distract to the north of Balboa Port. Figure 5-9-2 shows the distribution of mangroves. After part of the mangroves, however, was cut down, a small yard, workshops and a small harbor were constructed. The Curundu river water including non-treated contaminated water from the urban area of Panama city is flowing through the mangroves into Balboa Port. Crocodiles and migratory birds are confirmed in the mangroves. In the past, mangroves were distributed from the mouth to the further upstream. At this present, the mangroves remain only in Diablo due to urban development along the river bank. According to INRENARE engineers, these mangroves are not thought to be much important comparing with the mangroves existing in protected areas in Panama. However, as the importance of this mangrove has not yet been confirmed, flora and fauna with mangrove itself will be investigated this December.

38. Ancon hill is an important place for migratory birds. They are from or to Alaska, Canada, Columbia, Caribbean region, Orinoco River etc.



Source: PANAMA 1:12,500, Instituto Geografico Nacional.
Figure 5-9-2 The Distribution of Mangroves in Diablo District.

5.10 Local Residence and Cultural Asset

39. Neither archeological sites nor cultural assets exist in and around Balboa Port. However, as historical buildings, are listed Ancon station and other old public buildings.

40. Residences in Diablo, having already been restored by PCC, which are under the control of the Ministry of Housing, are rented to private citizens. The area with a few hundred residents, has a small supermarket and a clinic without a school and a hospital. All the residences there are old and wooden houses, and are planned to be removed in the near future.

41. Environment in Diablo and its surrounding residential areas is in good condition without air pollution, noise and vibration. However, with the future increase of traffic these problems may occur.

5.11 Rules and Regulations on Environmental Preservation in Panama

42. Panama is located in a tropical zone, and has flourishing rain forests with many species of wildlife and coral sea with abundant marine creatures.

43. The Government of Panama has paid a great amount of attention to environmental preservation. The constitution expresses the spirit for keeping this valuable environmental condition in its Chapter 7.

44. Till quite recently, however, Panama did not have any unified or organized system of rules and regulations on the environmental issue, and no governmental organization has full responsibility in environmental protection. Each governmental organization had its own regulations according to its own administrative needs and contradictions between the policies of each organization sometimes occurred.

45. With the recent and global increase of concern about the environmental issues, the Government is now preparing to establish an effective system of rules and regulations for environmental preservation.

46. Early In 1994, the forest legislation of the Republic of Panama was established. It is a comprehensive and fundamental law on the conservation, treatment and utilization concerning the environmental resources, part of which was reformed at the end of 1994. The draft of Executive Decree, which is to be regulated by said law, is at the final step waiting only for the sign by the president as of May,1996. This Decree is the general guideline of Environmental Impact Studies (EISs). The existing rules and regulations on environmental protection are shown in Table 5-11-1.

47. According to said law and regulation, EISs are obliged to be submitted to the National Institute for the Renewable Natural Resources (INRENARE) for every work project and/or human activity that deteriorates or affects the physical or natural environment. After coordinating with the other related state entities, INRENARE will grant an Environmental Permit in 45 work days, starting on the date when the EIS was presented to INRENARE, if the Study is approved.

48. Several projects such as mine, tourism, city, road and (private) port development were already obliged to submitted EISs , substantially based on said regulation. The method of international organization such as UN is applied correspondingly to these EISs. In the case of the port development, APN plays a

more important role to INRENARE. With the good coordination, the Environmental Permit is expected to be granted by INRENARE in much less than 45 work days after the submission of the EIS.

Table 5-11-1 Existing Rules and Regulations on Environmental Issues

LAW No.	DATE	CONTENTS
Decree No. 159	09-19-1941	By which Decree No. 75. July 27, 1937 is reformed and also regulates the transit through the National territory.
Law No. 66	11-10-1947	By which Sanitary Code is aproved.
Law No. 17	07-09-1959	By which fishing and the exploitation of fish products is regulated.
Law No. 21	07-09-1959	By which norms are dictated about the pollution of the sea and navigational waters.
Law No. 37	09-21-1962	By which the Agricultural Code is approved.
Decree No. 23	08-22-1963	By which the Mineral Resources Code is approved.
Decree No. 35	09-22-1966	To regulate the use of the waters.
Decree No. 39	09-29-1966	By which the Forestry Law is issued.
Decree No. 23	01-30-1967	By which urgent measures are taken to protect and preserve wild life and Resolution No. Dir-002-80 from Ministry of Agricultural Development is
Decree No. 44	02-16-1967	By which is regulated the clearance and the burning in the rural zones .
Law No. 66	11-10-1967	By which the Labor Code is adopted (the Labor Code also has some norms on Environmental issues, specifically on matters of hygiene and
Article VI	1977	THE PANAMA CANAL TREATY This Article intitled "Protection of the Environment" creates the Joint Commission of the Natural Environment.
Law No. 14	10-28-1977	The Convention on the Int'l. Commerce of endangered specimen of wild fauna and flora.
Decree No. 29	08-03-1983	By which is created the National Commission on the Environment (CONAMA)
Decree No. 43	11-29-1983	By which Decree No. 29 is modified.
Law No. 21	12-16-1986	By which is created the National Institute for Natural Renewable Resources (INRENARE)
Law No. 24	11-23-1992	By which incentives are established and the activities of reforestation in the Republic of
Decree No. 89	06-08-1993	By which Law No. 24. November 23, 1992 is regulated.
Law No. 1	02-03-1994	By which the forest legislation of the Republic of Panama is established, and other dispositions are dictated.
Resolution No. JD-08-94	03-25-1994	By which measures are promulgated for the usage and protection of mangrove swamps.
Law No. 30	12-30-1994	By which the article 7 of Law No. 1. February 3, 1994 is reformed .
Law No. 24	06-07-1995	By which the legislation of wild life in the Republic of Panama is established and other dispositions are dictated.
Decree (Draft)	1996	By which Law No. 30. December 30, 1994 is regulated.