PN 66649

PRELIMINARY REPORT
MAKAR WHARF
FEASIBILITY STUDY

APRIL 1991

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April 17, 1991

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Subject: **PRELIMINARY REPORT**

Project: **Delivery Order No. LBII-02**
Makar Wharf FS and EA
Philippine Assistance Program Support
Contract No. 492-0452-C-00-0099-00

Dear Mr. Sundermann:

Pursuant to Section 4.01 of Appendix A1 of the subject Delivery Order Contract, we are pleased to submit herewith for your review and comment three (3) copies of the Preliminary Report for the Makar Wharf Feasibility Study. In accordance with our previous discussions, we are concurrently distributing copies of this report as follows:

	Name	Agency	No. of Copies
1.	Mr. Tomas Quintos	Philippine Ports Authority	3
2.	Mr. Salvador Reyna	PPA, Gen. Santos City	2
3.	Ms. Gloria Mercado	CEMO, Gen. Santos City	2
4.	Mr. Rogelio Singson	CODA, Central Bank	3
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8.	Ms. Beta Balagot	DENR/EMB	2
9.	Mr. Michael Kingery	USAID/MDP	1
10.	Mr. Pat Johnson	CCSC	2

By copy of this letter, we request that the above-named agencies review this report and forward comments, if any, to the following office not later than April 30, 1991:

Mr. Rogelio Singson
Chairman, Committee on Official
Development Assistance (CODA)
14th Floor, Multi-storey Building
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Thank you for your cooperation on this matter. Should you have any questions or require further information, please feel free to contact this office.

Very truly yours,
LOUIS BERGER INTERNATIONAL, INC.

WILLIAM J. PARENTE
PAPS Project Manager

PETER JOLOWICZ
Team Leader - Makar Wharf

Encl. Makar Wharf Preliminary Report (3 copies)

cc: Pat Quinn, Group Vice President, Louis Berger, Wash.-DC
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All subconsultants

PRELIMINARY REPORT

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CHAPTER 1

INTRODUCTION

The Coordinating Council of the Philippine Assistance Program selected a series of Special Development Projects for Poverty Alleviation. The General Santos Agro-Industrial Development Project contains one of these series, consisting of (a) the establishment of an Agro-Port Processing Center; (b) the improvement of the Makar Port facilities; (c) the upgrading of the facilities at Buayan Airport, the airport of General Santos City; and (d) the improvement of the area's telephone facilities. The present study and report, as well as the corresponding Environmental Assessment, is concerned with the improvement of the Makar Port facilities.

The United States Agency for International Development (USAID) is one of the many contributors to the Philippine Assistance Program (PAP) and has agreed to finance the Makar Port studies. To that effect it has entered into a consultancy contract with Louis Berger International, Inc. (LBII) who in turn has associated with several subcontractors: Ernst & Young; Lockwood Greene Engineers, Inc.: Globetrotter Engineering Corporation; Trans-Asia (Philippines), Inc.; and Consultant Management Services, Inc.

1.1 OBJECTIVE

In accordance with the Terms of Reference, the present feasibility study has the purpose to identify and select a technically feasible, economically justified, socially sound, and cost-effective staged implementation plan for improving and upgrading the port facilities serving General Santos City in order that these facilities will adequately serve the needs of the South Cotabato Province up to the year 2010.

1.2 BACKGROUND AND PREVIOUS STUDIES

The Makar port started in 1954 with the construction of a 21-meter long T-shaped pier head, connected to the road by a causeway. In 1958 the pier head was extended on both sides, each extension being 48 meters long. A small upland area was created by partially filling in the area behind the pier. A small passenger and cargo shed was built on this area.

Between 1967 and 1970 the pier was extended further in both directions, including a short narrow angled extension at the southwestern end. The area behind the pier was filled and

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several buildings were erected in this new upland area. With these improvements the berthing structure became a 241.5-meter long and 9-meter wide marginal wharf with a mostly unpaved upland area and several private buildings belonging to shipping lines.

In 1972 Sir William Halcrow and Partners prepared the first relevant feasibility study for Makar Port for the United Nations Development Programme and the World Bank. It determined that the wharf structure was not sufficiently strong for modern traffic and basically recommended the following improvements:

a. strengthening of the existing structure by redriving and extending all piles, strengthening pile caps, and placing a reinforced concrete overlay over the entire wharf:

b. replacing all wooden fender piles with rubber fenders, placed on a new fascia beam;

c. extending the wharf in two steps by 300 meters and creating additional upland area by backfilling behind the new wharf extension.

The Philippine Ports Authority (PPA) had not been created yet and the improvements were built between 1976 and 1978 for the Department of Public Works and Highways. A set of as-built drawings, prepared by Sir William Halcrow & Partners, is available at the PPA office at the Makar Port site.

A few minor improvements were introduced after 1978 to bring the port into the form it now has, as described in Chapter 5 of this report.

1.3 RECENT STUDIES FOR THE PORT

As part of the Philippine Assistance Program, USAID commissioned the Mindanao Area Development Study from UPLB Foundation, Inc. Los Baños, Laguna. This study contains pre-feasibility studies for the four projects indicated in the first paragraph of this chapter. The pre-feasibility study for Makar Port analyzes the following project components:

a. a new finger pier, 40.88 meters long and 9 meters wide, at the South end of the wharf, extending the existing angled pier;

b. reclamation of 30,000 square meters at an unspecified location, to facilitate the handling of containers;

c. a movable bulk loading conveyor for grain handling, at 100 tons per hour;

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d. a 5000-square-meter container freight station;

e. a 150-meter long and 18-meter wide wharf extension at the northeastern end; and

f. reclamation of approximately 4.3 hectares of land behind the proposed new wharf extension.

The UPLB study also mentions a new Ro-Ro ramp to facilitate the loading and unloading of cargo by means of rolling equipment to and from specialized Ro-Ro (Roll-on/roll-off) ships. This ramp, together with the finger pier indicated under a., is presently under construction, funds having been allocated in the 1990 budget of the PPA General Santos Port Management Office.

The UPLB report, dated 7 January 1991, does not mention that at that time the present study was under negotiation. Also since September 1990 STV/Lyon Associates, a U.S. consulting firm, is preparing a feasibility study for corn bulk handling facilities, including storage silos, under a contract with USAID. Furthermore, Wilbur Smith Associates, Charleston, South Carolina, U.S.A., is conducting a feasibility study for the improvement of Buayan Airport. Finally, Japanese investors were interested in the Agro-Processing Center and commissioned a feasibility study by Singconsult, whose report is dated November 1990.

1.4 SCOPE OF THE PRESENT STUDY

The Terms of Reference for the present study were developed within the scope of the Mindanao Development Project, to remove a number of constraints related to the existing port. This may involve improvements or extensions of physical facilities and it may be achieved through changes in procedures or organizational structures, or a combination thereof. The Consultant investigated a number of possible schemes and selected the alternative that promised the best solution. This investigation included a brief analysis of what advantages and disadvantages a new port at a different site would present. Where necessary, the analysis included economic and financial comparisons. The selected alternative was then submitted to a complete economic and financial analysis.

All parts of the study, such as preliminary designs and cost estimates, were taken to a degree of precision sufficient for the proper conduct of the analyses at the level of feasibility studies. In cases where certain factors could not be determined to the desired level of precision, sensitivity analyses were conducted to ascertain that the recommended courses of action would not be affected by a certain range in the values of these factors.

The results of this study will allow the decision makers to determine the course of action to be taken within the next few years. Although a phased implementation plan covers the period of

20 years, it is obvious that developments in the economic performance of the area cannot be predicted for such a long period, hence decisions to be taken in, say, five years must be based on an updating or at least a review of the conclusions and recommendations of this report.

CHAPTER 2

ECONOMIC ACTIVITIES

Makar Wharf competes with three other major public ports on the island of Mindanao: Davao, Cagayan de Oro and Polloc. Within an area extending approximately 80-90 km from the wharf in the direction of the other ports, Makar offers lower total transport costs (land plus sea) to major national markets such as Manila and Cebu City. This defines the economic hinterland of Makar Wharf, an area comprising the entire Province of South Cotabato and some small contiguous areas of the neighboring provinces of Sultan Kudarat, North Cotabato and Davao del Sur. In the following discussion, the port hinterland will be considered synonymous with South Cotabato, since it corresponds to over 80 percent of the total hinterland area and is a defined political unit for statistical data collection. (In Chapter 7, the traffic projections for some products are adjusted upward slightly to account for potential flows from outside South Cotabato). Within its hinterland, Makar also faces competition from private wharfs, owned and operated by firms which are involved in local agribusiness activities. Currently, Dole Philippines, General Milling and Caltex are operating private wharfs within 20 km to the south-southwest of Makar Wharf, and other firms have waterfront lots which could be used for construction of private wharfs. Most of these firms are large national or multinational enterprises, and several of them have interests in other sectors of the economy which are financially more important than their agribusiness ventures.

The well-protected, deep water Sarangani Bay and the virtual absence of typhoons make Makar and the private wharfs in General Santos City excellent locations for shipping. Complementing this marine transport potential is one of the most important agricultural areas in Mindanao, along with an expanding agro-industrial sector and a variety of educational and other services.

2.1 AGRICULTURE AND OTHER PRIMARY SECTOR ACTIVITIES

South Cotabato has a surface area of 791,078 ha, about 7 percent of the total surface area of the Philippines; 47 percent of the area of the province is classified as suitable for cropland and grassland grazing areas. Most of the remaining 53 percent of land area is unsuitable for these activities, as their slopes exceed 30 percent. The cultivated area of 323,000 ha is equal to 86 percent of the 375,208 ha classified as suitable for cultivation; the remaining 52,000 ha of arable lands are in pasture, non-agricultural uses (such as farm buildings and housing) or, in some areas, abandoned due to guerrilla activity and other conflicts. Some 96,000 ha is in pasture, 25 percent more than the 76,641 ha classified as suitable for that activity, indicating that pasture is also found on agricultural and marginal lands.

The vast majority of the remaining 53 percent of the land area in the province is mountainous. This area should be reserved for forestry and tree crops which furnish a protective cover of vegetation, in order to avoid excessive runoff of rainwater and consequent erosion. Predatory logging and slash and burn agriculture, however, have denuded a large percentage of the mountainous areas. Soil loss and flooding have become a major problem, with floods causing damage to property, agricultural activities and infrastructure such as bridges. Several large logging companies operate in the province. Some of these mountainous areas are also occupied by tribal peoples who plant corn and other temporary crops on the steep slopes, exposing the soil to erosion and runoff. The areas planted under these conditions are typically quite small, and yields are very low. Most of this mountain production is consumed on-farm rather than marketed, due to the small quantities involved and the relatively greater isolation of these regions. Reforestation efforts have been insufficient to reverse the trend toward denudation of mountainous lands and consequent soil loss and flooding.

Unless terracing is used, South Cotabato offers little margin for expanding cultivation of crops such as corn and rice. The agricultural and grazing lands do, however, offer exceptional conditions for raising a wide variety of crops. The soils are predominately sandy loams and clay loams of basaltic and alluvial origin. They are only slightly acidic (in some areas, slightly alkaline), requiring little or no lime for most crops. The province lies outside the typhoon belt, mean temperatures in the agricultural areas are in the 20s and low 30s Celsius throughout the year, and mean rainfall varies from about 1000 mm in the environs of General Santos City to some 2500 mm further north. Many farmers are thus able to obtain 2.5 croppings in a calendar year for corn and other crops which have maturation periods of approximately 120 days. Soil and climatic conditions are equally favorable for vegetables, legumes, tropical fruits and a wide variety of fruit crops.

The lack of additional land suitable for agriculture implies that production can only be increased by raising the productivity of crop and livestock production. In some cases, the extension of irrigation facilities will elevate yields per crop and permit farmers to obtain more crops in a given year. Irrigation infrastructure is very capital intensive, however, and much of the easily available surface water is already being used for rice production.

Data on area planted, production and yields are given in Table 2-1. Aside from the inherent difficulties in estimating agricultural production and yields, some special problems are found in the data on area harvested. For rice, corn and some other crops, the "area harvested" is larger than the physical area each occupies. This occurs since the area is counted each time a crop is harvested, and, as noted, some areas are harvested two or more times during the calendar year. Further, there are also cases of intercropping (two or more crops grown in the same field, such as corn planted in coconut groves). Again, the areas listed in the table must be interpreted with caution.

Given these caveats, the data provide a useful picture of agricultural activities in South Cotabato. Corn, rice, coconuts, pineapples and bananas are the most important crops. The production of

Table 2-1
ESTIMATED AREA HARVESTED, PRODUCTION AND YIELDS
SOUTH COTABATO, 1989

CROP	AREA HARVESTED (ha.)	PRODUCTION (t)	YIELDS (t/ha)
Palay	52,700	187,465	3.56
Corn	491,250	1,022,110	2.08
Coconut	115,351	953,227	8.26
Pineapple	15,756	471,480	29.92
Banana	2,020	61,874	30.63
Mango	1,978	10,968	5.55
Cassava	786	9,337	11.88
Camote	226	1,939	8.58
Coffee	3,713	6,349	1.71
Tomato	127	818	6.44
Cabbage	56	455	8.12
Calamansi	32	403	12.58
Onion	30	223	7.43
Cacao	120	108	0.90
Peanut	51	39	0.76
Mongo	70	64	0.91
Rubber	48	52	1.07
Tobacco	23	10	0.43
Cotton	7,644 *	7,512 *	0.98 *

Source: Bureau of Agricultural Statistics
* Data from Philippine Cotton Corporation for 1988-89 crop year.
Note: Area harvested may be a multiple of physical area occupied, due to multiple croppings on the same area within the calendar year.

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three of these crops is significant in national terms. In 1989, South Cotabato produced 23 percent of the Philippines corn, 40 percent of its pineapple, and 8 percent of its coconut. In some years, the province has also produced a significant part of Philippine cotton, but this is of lesser importance since the country's total production accounts for under 10 percent of the consumption of its textile industry.

The wide variety of crops listed in Table 2-1 reflects the favorable growing conditions for grains, root crops, fruits and vegetables in South Cotabato. The province's share in the total Philippine production is not large for these commodities, but is in line with its 2.65 percent of the country's total land area. South Cotabato produces 4 percent of the Philippine's coffee, 3 percent of its mangoes, 2 percent of its rice and bananas, and 1 percent or less of the other products in the table. This low degree of supply from an area of rich lands and abundant rainfall reflects the relative isolation of the province from national and international markets for the majority of its agribusiness endeavors. The local markets are not large enough to support commercial production of large amounts of fruits, vegetables and root crops. To place them in national or foreign markets in a state acceptable to consumers requires either air transport or, if sent by sea, canning or refrigerated containers. The only commercial airport in the province at present is Buayan in General Santos City; it cannot accommodate larger, more economical jet cargo planes. Refrigerated container operations are currently available only on a very small and inefficient scale on Makar Wharf: ships with draughts of over eight meters cannot be fully loaded, container handling is performed with some difficulty, and there are no electrical connections for refrigerated containers, forcing shippers to rely on more expensive auxiliary units for refrigeration of their containers.

Despite these obstacles, there has been growth of a number of specialty crops in South Cotabato where private investors have provided agribusiness expertise and investment in all phases of the production (generally, through contracts with independent farmers), processing and marketing chain. At least three of these companies operate their own wharfs on Sarangani Bay, although some of them also use Makar Wharf. The Dole Philippines pineapple operation is the most obvious example of an integrated agribusiness endeavor (see Section 2.1.2).

Specialty crops offer the potential of higher earnings for farmers and greater value added throughout the processing, packaging and marketing stages. Their feasibility and rate of growth, however, depend on the degree of successful integration of production with all other phases of the agribusiness chain.

Livestock and poultry are also found on almost all farms in South Cotabato and even in a large proportion of urban lots. Inventory figures are given in Table 2-2. Carabao are used as draught animals, especially for weeding and pulling farm carts. Many farmers also use carabao for plowing, although there is a tendency toward hiring tractors equipped with disks for that operation.

These figures are again in line with the province's 2.65 percent of Philippine land area. South Cotabato livestock and poultry production is about 2 percent of the Philippine total for all the

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Table 2-2
LIVESTOCK AND POULTRY INVENTORY
SOUTH COTABATO, 1990*

(unit: no. of head)

TYPE OF ANIMAL	BACKYARD	COMMERCIAL	TOTAL
Carabao	49,360	-	49,360
Cattle	33,300	14,470	47,770
Hogs	98,050	68,930	166,980
Goats	43,070	2,730	45,800
Chickens	1,270,170	162,540	1,432,710
Ducks	242,560	17,060	259,620

Source: Bureau of Agricultural Statistics
* Preliminary estimates

animals and chickens listed in the table; for ducks, it reaches 4 percent. The scale of these activities is atomistic, as occurs with crop production. The "backyard" operations in Table 2-2 -- as opposed to commercial enterprises -- are defined as those with less than 21 adult carabao, cattle, hogs or goats; for chickens, less than 500 layers (young animals are weighted as half an adult animal). By this standard, all carabao are backyard operations, along with 70 percent of cattle, 59 percent of hogs, 98 percent of goats, 89 percent of chickens and 93 percent of ducks. Both meat and poultry production is quite small, as seen in Table 2-3. The data on meat obtained from chickens may be understated: although the backyard operations are characterized by much longer laying cycles and longevity of chickens than in commercial operations, the data have an implicit rate of slaughter of only 13 percent per annum, which is very low by any standard. The figures would still be modest, however, if they were increased by an order of magnitude.

The small scale of livestock and poultry operations reflects the land tenure situation, where the majority of farmers (whether owners or tenants) have from 1 to 3 ha of land, and a farm of 7 ha is considered large. A typical farm has a principal crop or two, such as corn or rice, providing cash income along with food for the farm family and animals. Such crops are usually complemented by a carabao to till the soil, along with a limited number of other animals and poultry to provide food for the farm family and an additional source of cash income. Land is intensively used, along with virtually all farm products. Road sides and fence rows are used for grazing of carabao, cattle and goats, coconut trees provide wood, charcoal, firewood, and material for roofing. Residuals of other crops provide livestock feed, fuel and organic fertilizer. Little if anything is wasted.

Fishing is also a major activity in General Santos City. The 1989 catch yielded 90,954 t, of which 85.4 percent is from commercial fisheries, 14.2 percent from municipal fisheries and 0.4 percent from inland fishing. For 1986, the Business Resource Center at the Notre Dame College of Dadiangas estimated that there were 5,000 fishing craft operating in Sarangani Bay and the surrounding seas, along with 46,622 subsistence fishermen and a small but growing number of inland fisheries and prawn farms. Part of the catch of the smaller enterprises is consumed in General Santos City and smaller urban centers in South Cotabato; much of the commercial fishery catch is canned; fresh tuna is sent by airplane to more distant markets (including Japan), being moved by truck to the larger airport facilities in Davao for transfer to large jet aircraft.

Forestry products are of limited importance in South Cotabato, since decades of predatory logging and slash and burn agriculture have eliminated most timber stands. For 1980, the Philippine Statistical Yearbook registers only 7770 ha of land covered with forest growth in South Cotabato. A bill currently under discussion in the Philippine legislature is designed to ban all logging except that undertaken by a limited number of cooperatives whose logging activities are effectively integrated with reforestation. Enforcement is of course a major problem. Both local reports and the national media feature descriptions of illegal logging, while squatters and tribal peoples continue to practice slash and burn agriculture.

Table 2-3
LIVESTOCK AND POULTRY SLAUGHTERED
AND MEAT PRODUCTION
SOUTH COTABATO, 1990*

TYPE OF ANIMAL	NUMBER SLAUGHTERED	TONS OF MEAT
Carabao	4,220	780.7
Cattle	5,660	1,132.0
Hog	72,620	4,066.7
Goat	2,620	34.6
Chicken	186,510	208.2
Duck	n.a.	n.a.

Source: Bureau of Agricultural Statistics
* Prelim aary estimates

Small-scale production of forestry products, nonetheless, furnishes material for firewood, housing, furniture and handicrafts. The materials come from ageing coconut palms in agricultural areas, from small stands of bamboo on farmlands and in the few remaining bamboo coves in more isolated mountain areas, and from remnants of rattan stands in mountain areas.

2.2 AGRO-INDUSTRIAL ACTIVITIES

The population in South Cotabato is estimated at slightly over one million at present. It has grown rapidly due to both natural increase (31 births and 11 deaths per thousand, or 2 percent annual growth), and substantial in-migration from the Visayas and other provinces. Although over half of the provincial population is classified as rural, there is a significant and growing urban sector with a variety of industrial activities and commercial and public services. General Santos City has an estimated 1991 population of 278,000 people, and the provincial capital, Koronadal (Marbel), has about 100,000. There are a number of smaller towns which have a variety of agribusiness and service activities. There were 332 industrial firms registered with the Department of Trade and Industry in General Santos City in 1988, with total investments of P 163 million and 5076 persons employed. These ranged from cottage industries to important agro-processing firms, and contributed to the province's highly favorable balance between outbound and inbound shipping.

Table 2-4 shows General Santos City's ten leading export products. Pineapples, tuna and bananas account for 97 percent of the value of exports, followed in order by mahogany, cotton seeds, scrap copper and asparagus. Imports of animals for breeding stock, fertilizers, insecticides and other chemicals comprise about 27 percent of the 10 leading imports (Table 2-5). The value of the 10 leading exports was three times that of the ten leading imports.

The overall traffic is somewhat more diversified. Table 2-6 lists 27 categories of shipping in interisland and foreign trade, measured in tons. Outbound interisland cargo is 2.3 times greater than inbound; inbound tonnage from foreign ports is slightly larger than the corresponding outbound tonnage (by some 3900 t), but total foreign tonnage is only nine percent of total tonnage passing through the port and, as seen above, exports are of more highly valued products than are imports. Nonetheless, the predominance of primary sector products in total movements through Makar Wharf is again evident in Table 2-6.

A comprehensive definition of agribusiness includes all the phases of production and marketing, from the supply of inputs to farmer-producers through the successive stages of production, transport, storage and processing and, finally, wholesaling and retailing (for detailed definitions, see Allen and Dy's reports on the Philippine agribusiness sector in the references). Markets for individual agricultural products in South Cotabato present a wide variation in their degree of vertical integration.

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Table 2-4
TEN LEADING EXPORT PRODUCTS BY WEIGHT AND VALUE,
GENERAL SANTOS CITY, 1989

COMMODITIES	GROSS WEIGHT (MT)	F.O.B. VALUE ($)
Canned pineapples	129,891	45,521,150
Fresh/dried pineapples	70,044	10,607,334
Fresh bananas	39,695	7,416,417
Canned tuna	8,392	16,967,832
Philippine mahogany lumber	6,775	1,567,659
Cotton seeds	4,399	664,121
Frozen tuna	2,280	3,408,435
Scrap copper	183	331,487
Guano	100	9,000
Fresh asparagus	5	11,132
T O T A L	261,764	86,504,567

Source: Department of Trade and Industry, General Santos City; cited in the "1989 Socio-Economic Profile, General Santos City," p.92.

Table 2-5
TEN LEADING IMPORT PRODUCTS BY WEIGHT AND VALUE,
GENERAL SANTOS CITY, 1989

COMMODITIES	GROSS WEIGHT (MT)	F.O.B VALUE ($)
Urea	31,526,124	4,762,233
Kraft liner, in rolls & sheets	21,068,026	6,845,536
Tin sheets and steel plates	16,596,820	8,983,283
Articles temporarily exported/imported	5,643,735	3,993,748
Ammonium sulphate and perosulphate (including alums)	3,577,000	348,893
Gifts, donations and articles for relief, education and scientific purposes	2,010,000	201,000
Bovine animals, live purebred for breeding and scientific purposes	1,942,300	2,037,428
Other chemical products and preparations (potassium chloride)	1,504,350	175,500
Insecticides/Fungicides	112,322	355,891
Parts, n.e.s of machines	90,550	990,530
T O T A L	84,071,227	28,694,042

Source: Department of Trade and Industry, General Santos City; cited in the "1989 Socio-Economic Profile, General Santos City," p.90.

Table 2-6
INTERISLAND AND FOREIGN TRADE CARGO HANDLED
AT MAKAR WHARF, 1989 (t)

COMMODITIES	DOMESTIC		FOREIGN	
	IN	OUT	IN	OUT
1. Corn	-	163,898	-	-
2. General Cargo	152,017	123,312	28	23
3. Copra	-	43,120	-	2,790
4. Palay & Rice	500	21,137	-	5,000
5. Canned pineapples	-	11,170	-	7,169
6. Live Animals	10	24,794	4,730	-
7. Bottled Cargo	34,183	23	-	-
8. Fertilizer	14,843	-	31,444	-
9. Cement	6,084	-	-	-
10. Empty Bottles	-	27,189	-	-
11. Other Consumer Goods	8,387	-	-	-
12. Animal feeds	7,187	91,012	668	-
13. Other Cereals	3,180	2,186	-	-
14. Sugar	7,657	-	-	-
15. Palm oil	-	7,540	-	-
16. Cotton oil	-	1,728	-	-
17. Banana	-	4,118	-	3,157
18. Scrap Cartons	-	3,244	-	-
19. Canned fish products	-	10,369	-	-
20. Plywood & Veneer	1,760	-	-	-
21. Scrap iron/tins	-	2,760	-	-
22. Palm Kernel	-	2,478	-	-
23. Lumber	12	769	-	1,323
24. Cotton seeds	-	301	-	7,911
25. Fish	-	-	920	-
26. Kraftliner Board	-	-	1,902	-
27. Fresh Pineapples	-	-	-	8,387
	235,819	541,148	39,692	35,759

Source: Philippine Ports Authority.
Note : Column totals may differ slightly from sums due to rounding.

Corn has one of the least integrated markets of any crop in the Philippines. The crop is produced by individual farmers (landowners, sharecropper, tenants) under a wide range of natural conditions and technologies. Low-yielding white corn, a traditional product used primarily for human consumption, is produced along with hybrid yellow corn. Yellow corn offers higher yields, but is also more demanding in its requirements of fertilizers and other purchased inputs, and its yields vary more widely with respect to rainfall. The farmer may finance his own operation, seek a loan from the Land Bank through a local cooperative, or request a loan from a local trader. The trader is usually the only source of loans for tenant farmers with no collateral. Their interest rates are normally high; rates may reach as much as 10 percent a month, since the trader must cover the risk of everything from crop failure to non-payment and, in some areas, risks of banditry and guerrilla warfare, plus the very high financial cost which have recently prevailed in Philippine money markets, due to the restrictive monetary policy of the Central Bank. Some traders may also exert market power, especially in the least accessible areas. There is a tendency for each trader to have his own network, that is, to sell to a trader or group in a larger city who deals in larger volume. Although traders may exchange information, they do not normally operate in overt collusion to separate their markets into exclusive geographical areas, nor conspire to leave a farmer with access to only one trader. Some degree of competition is present for loans to farmers and purchases of corn at the local level. If the farmer secures a loan from a trader, however, he is obliged to sell his crop to that trader. The trader usually does not furnish other inputs, such as seed and fertilizer, nor specify the production technology to be used. But there are instances when the trader is also the owner of a local general store, and the farmer may even be indebted to the trader for food and other supplies which the trader will discount from the payment for the next crop.

Corn may be consumed directly on the farm, milled locally and returned to the farm as animal feed, or sold to a local or regional trader. If a local trader purchases the crop, he may have it shelled, milled for animal feeds locally, or sell it to a regional trader or an agribusiness firm. The trader or firm may in turn resell it or process it for animal feed, oil, human food products, or some combination of these uses. The market is thus characterized by a large number of options, levels of intermediation, technologies and producers, and a low level of integration.

Much shelling and drying of corn is done on the farm level. As occurs with other crops, drying may be done by simply spreading the grain on the ground in the sun (basketball courts and paved roadways are often used for this purpose). Rains can result in moldy corn, however. Many farm-level shelling operations are not equipped with blowers, so that corn often enters the marketing chain with high percentages of dirt and moisture, a combination which fosters biological activity and rapid deterioration. There are also over 70 licensed corn shelling operations in South Cotabato, but these are concentrated in General Santos City and other urban areas and are not immediately available to more isolated farmers. There is a general lack of more sophisticated drying facilities for corn, along with more appropriate farm-level drying devices.

One subsector of corn production, however, is highly integrated: the production of hybrid corn seed. Two major multinational firms, Pioneer and Cargill, are active in South Cotabato. Pioneer has the larger market share, and is associated with two major Philippine agribusiness firms, Ayala Development Corporation and San Miguel Corporation. Both Pioneer and Cargill have their own experimental stations in South Cotabato and are striving to produce varieties which are both disease resistant and adapted to the specific conditions of soils and climate in Southern Mindanao. Actual hybrid seed production is done by contract farming. The agribusiness firm furnishes to a selected group of farmers specified amounts of the original varieties to be "crossed" to form the hybrid. These farmers must follow strict guidelines on all aspects of planting and cultivation. It is necessary to control such factors as spacing of plants, number of rows in each variety and removal of tassels in order to obtain quality hybrid seed. The company or its agents purchases the resulting hybrid seed corn at a predetermined price from its contract farmers and is responsible for other phases of marketing of the certified seed, including transport, shelling, drying, storage, fumigation, bagging and sale to wholesalers or retailers, who in turn sell the seed to farmers. The companies are also active in providing information to wholesalers, retailers, farmers and others regarding practices necessary to obtain good yields with hybrid seeds.

Despite the availability of hybrid seeds in South Cotabato for over a decade, only about a third of farmers use them. There are several reasons for this. Hybrid seeds are expensive, and have to be purchased every year, while seed from traditional varieties (generally of white corn) is obtained simply by using a small amount of grain saved from the last harvest. Hybrids also require high levels of fertilizer use for good yields, and irregular rainfall may reduce yields proportionately more for hybrids than traditional varieties. In at least some cases, white corn (used in the Visayas and other regions for human consumption) may bring a higher price than yellow corn. The average yield per cropping is only about 2 t/ha in South Cotabato (Table 2-1); the median yield (half of farmers obtain more, half less) for hybrid corn is only 3 t/ha; the highest farm yield was 6.8 t/ha; and 25 percent of farmers obtained yields of at least 5.4 t/ha. By way of comparison, a good yield in the prime agricultural lands in Iowa would be 9 t/h, and many farmers in the American corn belt have yields in the range of 6.5 to 7.5 t/ha. Farmers in the American corn belt, however, are limited to one crop per year.

The South Cotabato corn sector thus presents a very wide range of degrees of vertical integration; average yields are quite low, but many farmers are obtaining yields which are quite respectable in international terms.

Soybeans, although commonly used in rotation with corn in the American and Brazilian corn belts, have been limited to small scale experiences in South Cotabato. The Consultant believes this is due to the difficulty of harvesting soybeans by hand, and the lack of large contiguous planting areas which would be necessary to make mechanical harvesting economic.

Rice has a less complex marketing structure since it is normally used for human consumption after a rather simple milling process. Nevertheless, several levels of traders may be involved

before the product is available to the consumer on the retail level. There are over 20 threshers in South Cotabato, plus a substantial number of rice mills.

The International Rice Research Institute in Los Banos has contributed to the production of improved varieties, some of them capable of producing from 8 to 10 t/ha on irrigated fields under the strict management conditions of agricultural experiment stations. Yields on farms have been much lower, averaging only 3.6 t/ha of palay in South Cotabato, where most rice is irrigated (Table 2-1). Little attention has been devoted to improving varieties and yields on upland fields, resulting in a pattern of planting rice on irrigated lands and corn on upland areas. This is an option for the future, however, as the current line of research is thought to be nearing the limits of its possibilities, while available water sources impose constraints on the area which can be easily and economically irrigated.

Vertical integration in livestock raising is also quite low in South Cotabato. There is little market-oriented dairy production, and farm level meat production occurs on a very small scale, as noted earlier. Currently, many animals are shipped out live from Makar Wharf to Manila, other cities or even foreign markets. However, major agribusiness firms such as Purefoods and San Miguel are active in the area and may choose to expand their operations in the future. Broiler production is one potential growth subsector for vertically integrated production, since it is the easiest subsector to integrate and the one where there is most to be gained from integration. The integrating firm can reduce its costs and guarantee a more uniform, better quality product if it can buy a more uniform product from farmers. This involves either contract farming or intermediaries who are responsible for market coordination, along with the provision of a uniform and productive stock of chicks at specified times, more uniform feeding and facilities, and purchase of the broilers by the processor at a predetermined weight and age.

Agribusiness firms are active in the coconut subsector; however, there is little integration backward to the farm level. There are also cotton gins in the province, but no further processing facilities, and coffee is not processed locally.

The Dole pineapple operation is an example of a large scale and highly integrated agribusiness endeavor. Contract farming allows such firms to ensure timely harvests of large quantities of reasonably uniform fruits, which are then purchased at a predetermined price and transported, processed, canned and marketed by the firm. Such vertical integration offers advantages to the farmers, since the firm must guarantee them a relatively high rate of return in order to ensure that they will dedicate their lands to a specific crop and adhere to a demanding set of specifications on production technology. Under the Philippine agrarian reform program which places strict limits on landholding by firms, such contracts will probably be the only option at the level of crop production.

Other crops offer similar potential for the growth of contract farming and vertical integration, including a wide variety of fruits (guyabano, mango, passion fruit, papaya, durian, guava, calamansi, oranges), black pepper, cut flowers, decorative foliage, and vegetables. The tree crops, however, have a cycle of several years before a high volume of production can be

assured, and current high financial costs discourage long term investments. Cut flowers have to be refrigerated very quickly and transported to their markets quickly and at carefully controlled temperatures; this often requires air freight. Successful agribusiness ventures in any of these specialty crops requires a wide variety of supplies and equipment which South Cotabato cannot provide locally. They also are likely to require top flight communications and transport facilities. Although none of these problems is insurmountable, but their combined effect delays the establishment and expansion of agribusiness ventures.

The fishing industry also varies in its degree of sophistication and vertical integration. Many individual fishermen have their own small craft and take their catch directly to the fish market in Dadiangas (the central part of General Santos City). Larger fishing craft take their catches of tuna to one of the canning factories (Purefoods, Santa Monica Canning Corporation); and there is even a market for fresh tuna, inspected at the fishport, taken by truck to the Davao airport and flown to Japan. The most highly integrated fishing operation is prawn production. A joint venture of Dole and the Alcantara group has about 30 contract growers and 1000 ha of prawn farms.

Fishing has created a series of local industries and services, ranging from building and repairing small ships to providing ice for refrigeration of the catches. Paradoxically, however, there are imports of dried fish into General Santos City. Dried fish is consumed by the local population, but fish are not dried locally.

2.3 SOCIAL, ECONOMIC AND POLITICAL ENVIRONMENT

The population of South Cotabato is slightly over one million at present, with nearly one third in General Santos City and an additional 100,000 in the provincial capital of Marbel. The population under 14 years of age comprises nearly 45 percent of the total, leading to a high dependency ratio and a corresponding high demand for schools and social services. Although estimates of the rural population from earlier censuses and surveys indicated that 65 percent of the population was rural, the current figure is probably much nearer to 50 percent and declining rapidly. The distinction between urban and rural, however, is not always clear, as small urban settlements may be classified as rural by the census, while, at the opposite extreme, many residents of General Santos City and Marbel continue to derive their living from agriculture and to have a basically rural lifestyle.

The Business Resource Center estimates the unemployment rate in South Cotabato at 15 percent, with an additional 14 percent underemployed. The city office of Planning and Development lists unemployment in General Santos City at 10 percent of the labor force. The literacy rate is relatively high, about 83 percent. In General Santos, the completion rate of Grade VI (which includes attrition along the way) stood at 79 percent in 1989. The attrition rates are presumably greater in rural areas. Although attrition rates are not particularly high, they are concentrated in the public schools rather than the private establishments, and are influenced by poverty.

Poorly nourished children frequently have difficulty in learning and are more likely to be forced to leave school to help sustain their families. The presence of malnutrition is indicated by an estimated 50 percent of school age children who are moderately to severely underweight. The National Statistics Office's 1988 survey of family incomes and expenditures placed 52 percent of Southern Mindanao families below the poverty line, a percentage slightly worse than the national average of approximately 50 percent.

In addition to its primary and secondary schools, South Cotabato has a branch campus of Mindanao State University, several private colleges and a variety of technical courses are available.

The province has reasonably adequate health care facilities, with 16 hospitals (7 of them public), a TB pavilion, two schistosomiasis control units, and a rural health center in each municipality. The number of qualified doctors, nurses and technicians, however, is quite small in relation to the population (one nurse and one doctor per each 7,500 persons, approximately). Water supplies are untreated, and gastrointestinal diseases rank with tuberculosis among the most frequent causes of death.

Industrial activities not related to agribusiness ventures are rather limited in General Santos City and other urban centers of South Cotabato. The construction industry is growing, but from a very small base. Most housing continues to be made of materials such as bamboo and coconut leaves. Manufacturing is hampered by the distance from major markets, an unreliable power supply, and the lack of an established industrial base which is needed to allow firms to obtain locally and inexpensively the wide variety of inputs, services and skilled labor necessary to produce goods efficiently. Secondary sector activities are small in scale; metalworking is confined mainly to cutting and welding operations; some small industrial operations are more aligned with service and repair activities than more formal manufacturing operations. Services, both governmental and private, are extensive and economically important. Tourism exists, but is rather limited in extent. None of these activities appear capable of becoming the driving force of the local economy during the next two decades, so that the agribusiness sector (including farmer-producers) will continue to fill that role.

The chief political factors affecting the local economy are agricultural and trade policies, and the peace and order situation. One of the policies with greatest potential impact (both positive and negative) is the agrarian reform program. The 1989 program goals published in the Philippine Statistical Yearbook include the redistribution of approximately a million acres in Southern Mindanao, with over 300,000 beneficiaries. By giving land to the tiller, the program is designed to reap the benefits of similar programs in South Korea, Japan and Taiwan shortly after World War II. Those countries effectively redistributed much of the available wealth through this mechanism without any adverse conflicts in the rural areas, contributing to a politically stable and highly productive agricultural sector. There is, however, the danger that delays, partial implementation and bureaucratic tangles will accentuate conflicts and discourage investments in agribusiness initiatives while the principals wait to see what will effectively

emerge from the program (e. g., an agribusiness concern will not invest in its own lands for fear of losing its money, and cannot contract potential beneficiaries because they are not yet the new property owners). The most favorable scenario for the Philippine agrarian reform program features Southern Mindanao following the path of the other Asian countries described; the least favorable, stagnation resulting from the threat of agrarian reform without its effective implementation.

Another important factor is the nature of government intervention in markets. Currently, the National Food Authority administers a price support program and may enter the market for corn and rice if the farm gate price falls below the minimum level. It may hold these products for a time and later redistribute them to needy areas or sell them on the market at times of seasonal shortages. The Authority at present is confronted with irate farmer organizations in Southern Mindanao. Although the support prices are P 6/kg of palay and P 5/kg for corn, farm gate prices have dropped to P 3.8/kg for palay and P 2.80/kg for corn. The Authority alleged in mid-March that it had no budgetary provision for purchasing either commodity and apparently still has stock accumulated in anticipation of major market disruptions due to the Gulf War. A short time later it announced the possibility of a loan from the Social Security System, and, at about the same time the Government announced its intention of exporting corn for the first time, with Indonesia as a prospective buyer; exports could quickly reduce stocks and reestablish remunerative prices at the farm gate.

Agricultural policy is the major issue preventing progress in the Uruguay round of the General Agreement on Tariffs and Trade (GATT), with major policy differences among countries and, often, among different segments of population and interest groups within a given country. Philippine agricultural policy may be influenced both by international agreements and internal debates. Some indication of the uncertainties and debates which surround future trends in agricultural policy include: the National Food Authority's inability to purchase rice and corn at the minimum price; President Aquino's recent speech emphasizing the need to promote Philippine agriculture and self-sufficiency of food production; regulations which deny private agribusiness firms direct access to foreign markets, which depress agricultural prices and growth; a paper by a World Bank technician, widely cited in the Manila press, which urges the Philippines to abandon the goal of self-sufficiency in rice production and to import wheat instead.

Along with present and potential conflicts over land tenure, Mindanao has been one of the areas where guerilla groups have been active. The Business Resource Center believes that hundreds of farmers have been dispossessed by such activity, and cites cases where barangay traders have been forced to move to municipal centers after physical attacks. Many farmers which produced hybrid corn abandoned their lands, while others reverted to production of white corn to reduce the threat of losing their investments. The Center also cites at least 500 fishermen killed or missing over the 1983-1987 period due to attacks of armed brigands operating in the high seas on calm days with motorboats equipped with outriggers. The armed forces, however, claim that guerrilla activity has been considerably reduced, and South Cotabato appears to suffer less from these conflicts than other provinces.

The incentives which ultimately spur or discourage investment by farmers and agribusiness firms depend to a considerable degree on the resolution of these conflicts and on the provision of a supportive climate for investments on the part of government. This includes the elimination of excessive regulation and bureaucracy of agribusiness initiatives, coupled with measures which tend to encourage the emergence of efficient rural financial markets.

2.4 PHILIPPINE ASSISTANCE PROGRAM (PAP)

The Philippine Assistance Program aims to promote equitable and sustainable economic growth in the Philippines. The principal goal is to alleviate poverty in the countryside through production-oriented activities outside the National Capital Region. The program supports the Philippines' medium-term development plan for the period 1987-1992.

The PAP grew out of the interest of a bipartisan group of U.S. legislators who established an initial aid fund of $ 200 million to promote economic development in support of the restored democracy in the Philippines. They urged President Reagan to lead an effort to create a "mini-Marshall Plan".

This initiative was presented to Japanese Prime Minister Noboru Takashita and the Group of Seven (highly industrialized nations) in 1988; it evolved into a formal multilateral program launched in Tokyo on July 3, 1989 with a pledging conference attended by 19 donor countries and a number of multilateral institutions. Pledges take the form of loans, grants and "soft" loans. They reached P 98 billion ($3.5 billion) last year and P 92.4 billion ($3.3 billion) in the recently concluded Hong Kong round, and are expected to continue at similar levels over a period of five years. In addition to this official assistance, the program seeks to mobilize private investments through the dual incentives of improved infrastructure and measures designed to produce a more favorable climate for private investors.

To be included in the PAP, projects should be located in one of the 16 "economic development zones", one of which is General Santos City and its hinterland. Such zones and projects should present high potential for growth of the productive capacity of the economy, and should also:

- channel resources into rural areas in such a way as to promote a broadly-based agro-industrial economy
- give priority to products which have potential for high value-added processing and marketing operations, preferably with immediate export potential using indigenous resources
- have spillover effects which attract private investments and generate additional employment

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- improve the socio-economic status and self-esteem of the rural Filipino.

A major task in the PAP is that of identifying productive investment projects and undertaking the necessary studies required to effectively carry them out. Both the identification of cost-effective programs and detailed pre-implementation studies are essential if the Philippine Assistance Program is to be successfully implemented. The General Santos City projects analyzed in the present report cover a hinterland corresponding to a substantial portion of southern Mindanao. More specifically, the hinterland includes the Province of South Cotabato and also some of the contiguous areas of the southern part of Davao del Sur and some of the barangays of Sultan Kudarat and North Cotabato which may enjoy better access to the port of General Santos City than to alternative ports. These projects are all potential parts of the Mindanao Development Program.

2.5 MINDANAO DEVELOPMENT PROGRAM

The Mindanao Development Project is a demonstration project in the hinterland of General Santos City, currently being developed by the Government of the Philippines and the U.S. Agency for International Development (USAID). These entities have identified deficiencies in transport, communications and agro-industrial facilities which must be overcome to encourage faster expansion of private agricultural, fishery and agro-industrial activities. These deficiencies imply high marketing costs and result in low prices for farm and fishery produce and high costs for purchased inputs. Faced with such conditions, many agro-processing activities are currently uneconomic. This depresses farmers' incomes, reduces the use of purchased inputs and limits the number of crops which can be commercially produced in the region, despite its exceptional soil and climatic conditions.

The Mindanao project is designed to concentrate USAID's limited funding and project management resources on an area where they will have a significant impact, quickly removing the constraints on marketing farm and fishery products and thus encouraging private sector investment.

The initial subprojects which have been identified for further study and potential funding include:

- Makar Wharf Improvement and, or, Expansion, including improved grain shipping facilities
- Tambler Agro-Industrial Project
- Tambler Fish Port
- Buayan Airport Improvements

- Road Improvements
- Mindanao Telecommunications Improvement
- Grain Shipping Facilities for Other Mindanao Ports

The first four are located in the immediate environs of General Santos City, while the road improvements are concentrated in its rural hinterland. Improved rural roads are important in decreasing average cost of transportation of inputs and products and in permitting transport at all times -- a requirement for commercial production of highly perishable goods and a key factor in promoting production of less perishable crops such as corn and rice.

The telecommunications improvements cannot be targeted exclusively for the project area; rather, General Santos City is one of the beneficiaries of a larger, integrated effort to improve telecommunications in Mindanao. Lastly, improvements in grain shipping facilities are under consideration for other ports, including Cagayan de Oro and Davao City. Their chief impact on the Makar Wharf project is derived from the competition for cargo, with relative transport costs and quality of service acting to define the ports' respective hinterlands.

2.6 AGRO-INDUSTRIAL PORT COMPLEX AT TAMBLER

Barangay Tambler is located along the Banwalan Creek SSW of the center of General Santos City. The proposed 32-ha project site is located on Sarangani Bay about 9 km by road to the south of Makar Wharf. The proposed complex includes components such as a corn oil producing plant, a feed mill, a slaughterhouse and meat processing plant (abattoir/cold storage), and processing facilities for agricultural and extractive products. The latter include cashew nuts, coconut shells for granulated charcoal, fruits and vegetables (mangos, bananas, papayas, guyabanos, asparagus, potatoes, sweet corn). The facilities would provide for juice extraction, canning, drying and making chips. Some of these products would be destined to other islands or countries and could be shipped out of Makar Wharf. Others would have a negative effect on certain types of traffic through Makar Wharf: the most obvious one is the corn oil production facility which competes directly for corn which might otherwise pass through the proposed bulk handling facility. In still other cases, competition may be quite complex. The abattoir/cold storage facility could produce frozen meats. These could be containerized and shipped out through Makar Wharf, reducing the exports of live animals through Makar Wharf. The Wharf might also compete with the airport for the shipment of more select types of frozen fish.

2.7 FISH PORT AT TAMBLER

The proposed fishing port complex is located within the Agro-Port Complex at Tambler. It consists of three separate fish landings, a "hall" for auctions and marketing, cold storage, an ice plant, ice storage and support facilities.

The landings are subdivided in:

- a wet fish landing quay to handle up to 20 boats of 3-15 gross tons each
- a tuna landing area for large boats handling mainly tuna -- a landing jetty for up to 15 boats of a maximum of 40 gross tons each
- a purse seiner landing wharf for up to 5 boats of 300-2,000 gross tons each.

The fishing port offers an alternative work location for the fishing and gleaning families presently located at Makar Wharf who may have to be relocated if the wharf is extended in the near future. It is unclear at this point if the fish processed in the facilities behind the landings might be frozen and shipped out in containers from Makar Wharf, or flown out from the Buayan Airport.

2.8 IMPROVED AIRPORT FACILITIES AT BUAYAN

The only airport in the province of South Cotabato is located in Buayan, in General Santos City (there is at least one unpaved landing strip elsewhere in the province). Currently, Buayan is capable of handling only prop aircraft, such as the Fokker series. Passenger service is available to Cebu and Manila during weekdays, via connection with jet service in Cebu or, alternatively, in Davao City. The delays and inconvenient hours associated with such indirect service may discourage some businesses from locating in the province. It is likely, however, that the economic problems from limitations on air cargo are more severe than those from the passenger service. The existing runways cannot accommodate larger, more economical carriers, such as the Boeing 737 or Airbus 300, without major new construction. A consulting firm is currently engaged in a feasibility study of the options for extending runway(s) at Buayan or constructing a major new airport at another site. A number of variations on these two basic options are involved, and the predicted net economic benefits are to be compared with the status quo. As mentioned earlier, fresh tuna is now being sent by truck to the Davao City Airport, and other potential cargo may require either air transportation or efficient container operations at Makar Wharf if it is to be produced and marketed economically from South Cotabato.

CHAPTER 3

PHYSICAL CONDITIONS

3.1 CLIMATE

The data used in this Report come mainly from the weather station maintained by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) at General Santos.

3.1.1 Wind

Winds in the General Santos area blow mainly from the South or from the North. For example, the prevailing winds are North winds of approximately three meters per second from November to April and South winds of generally the same strength from May to October, as indicated in Table 3-1 which also shows normal values of other climatological data. Extreme values are indicated in Table 3-2. The highest wind speed recorded during the period from 1966 to 1986 was 20 meters per second. This occurred in September, during the monsoons which blow from June to November, with the strongest winds occurring during August and September.

At the Makar Wharf there are daily variations: the wind blows from the North during the morning, changing to South winds during the afternoon. Since the South wind blows over the entire length of Sarangani Bay, with a very large fetch, it soon obtains relatively high velocities, while the North winds are relatively mild because of the sheltering effect of the mountains surrounding the Bay.

The predominance of South and North Winds and the lack of winds from any other direction, is shown graphically in Figure 3-1 where the wind roses for every month of 1989 and for the whole year are presented. They indicate the percentage of time when winds from a certain direction exceed certain velocities.

The maximum wind velocity of 20 meters per second (72 kilometer per hour, 45 miles per hour) recorded in General Santos, is an indication of the fact that Mindanao lies south of the typhoon belt. Winds of this velocity are classified as storms, the second lowest class of tropical cyclones.

Tropical cyclones are classified into three types. Tropical cyclones with maximum wind speed of 45 kph up to 63 kph are classified as depressions. Those with 64 kph to 119 kph winds are classified as storms. Tropical cyclones with maximum wind speed of 120 kph or stronger are called typhoons.

Table 3-1
CLIMATOLOGICAL NORMALS

STATION : GENERAL SANTOS
COORDINATES : 06 07 N 125 11 E

MONTH	RAINFALL (mm)	RAINY DAYS	TEMPERATURE (deg C)					DEW PT.	RH (%)	MEAN SEA LEVEL PRESSURE (millibars)	PREVAILING WIND		CLOUD (octa)	DAYS	
			MAXIMUM	MINIMUM	MEAN	DRY BULB	WET BULB				DIRECTION	SPEED (mps)		TSTM	LGHT
JAN	64.1	9	32.6	21.5	27.0	26.7	23.5	22	76	1010.4	N	3	5	1	4
FEB	73.2	8	32.9	21.6	27.2	26.9	23.6	22	76	1010.3	N	3	6	2	5
MAR	39.5	7	33.6	21.8	27.7	27.5	24.0	23	75	1010.5	N	3	5	2	5
APR	50.5	8	33.7	22.4	28.0	27.8	24.6	23	77	1009.8	N	3	5	4	9
MAY	87.5	12	32.7	22.7	27.7	27.4	24.7	24	80	1009.7	N	3	6	6	13
JUN	112.5	14	31.4	22.3	26.8	26.8	24.4	24	82	1010.2	S	3	6	4	11
JUL	104.3	13	31.0	22.0	26.5	26.4	24.2	23	83	1010.0	S	2	6	4	8
AUG	87.2	13	31.0	21.9	26.4	26.5	24.2	23	83	1010.3	S	3	6	4	9
SEP	80.6	12	31.4	21.9	26.6	26.6	24.2	23	82	1010.2	S	3	6	4	9
OCT	94.4	12	31.8	22.0	26.9	26.8	24.3	23	81	1010.1	S	3	6	4	10
NOV	87.0	12	32.4	21.9	27.1	26.9	24.3	23	81	1009.7	N	3	6	4	10
DEC	74.1	11	32.5	21.7	27.1	26.8	24.0	23	79	1009.7	N	3	6	3	7
ANNUAL	954.9	131	32.3	22.0	27.1	26.9	24.2	23	80	1010.1	N	3	6	42	100

Source: PAGASA

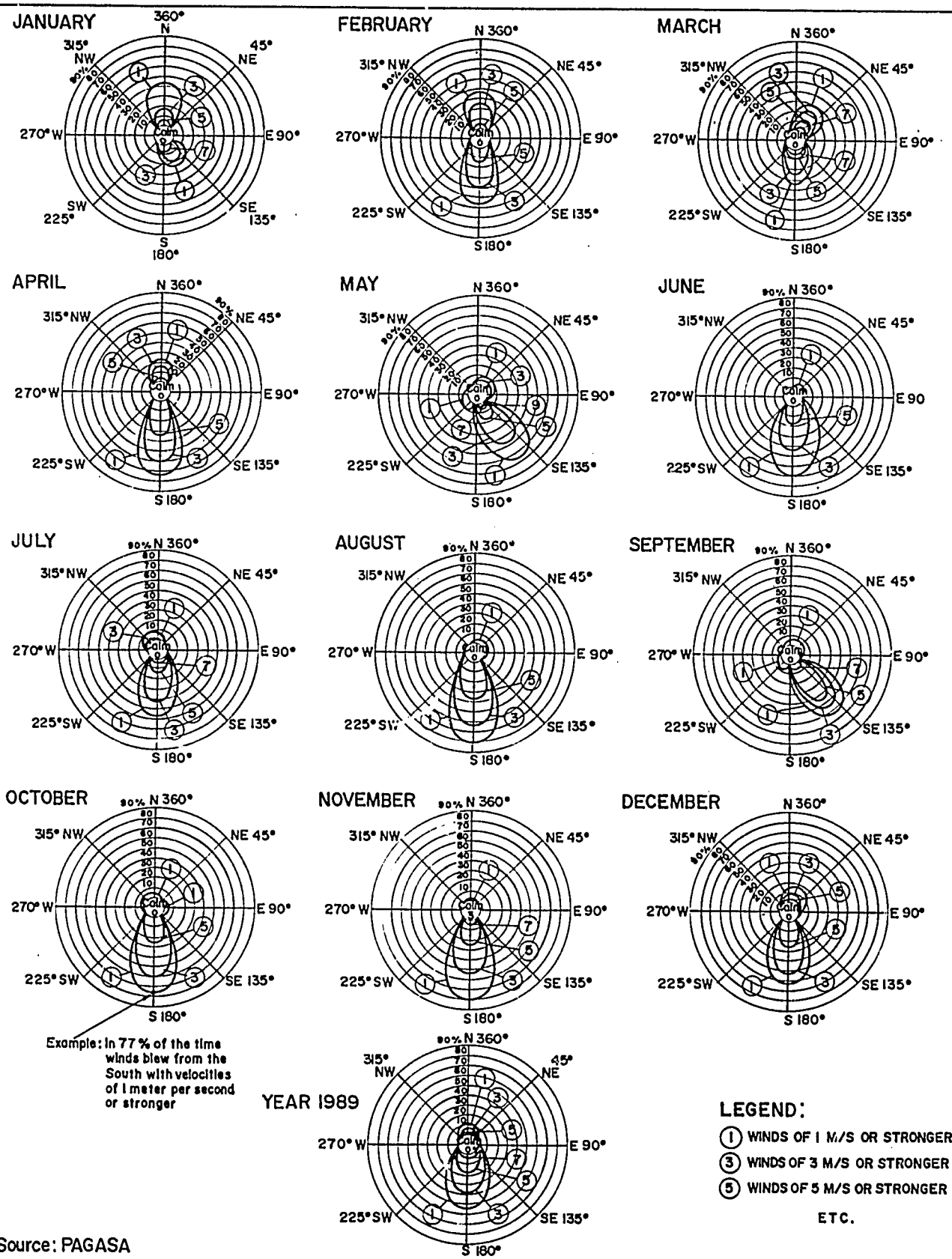
Legend: TSTM - Thunderstorm
LGHT - Lightning

Table 3-2
CLIMATOLOGICAL EXTREMES

GENERAL SANTOS CITY
AS OF 1986

MONTH	TEMPERATURE (deg. C)				GREATEST DAILY RAINFALL (mm)		HIGHEST WIND (mps)		SEA LEVEL PRESSURE (millibars)			
	HIGH	DATE	LOW	DATE	AMOUNT	DATE	SPD/DIR	DATE	HIGH	DATE	LOW	DATE
JAN	36.4	25'64	17.1	24'65	105.9	17'66	20 / S	9'82	1017.0	16'59	1001.7	2'50
FEB	37.8	21'83	17.2	4'58	79.0	4'82	16 / NNE	3'75	1016.8	16'53	1000.0	9'85
MAR	38.0	19'83	16.9	9'63	55.6	15'49	18 / SW	22'83	1017.7	30'58	1001.8	18'86
APR	38.0	20'83	18.3	11'51 11'63	600.0	13'89	19 / S	19'71	1016.8	1'66	1000.5	11'85
MAY	38.0	12'83	18.7	14'51	86.1	21'55	14 / S	29'72	1017.3	9'57	1001.8	2'86 11'86
JUN	36.8	4'79	17.9	10'61	366.0	30'89	17 / S	24'72	1016.0	2'66	1001.4	11'86
JUL	36.1	7'73	17.2	9'85	309.0	9'83	17 / SSE	24'72	1017.3	2'65	1002.7	16'77
AUG	36.1	2'73	17.5	16'85	126.0	28'59	17 / S	30'72	1015.8	23'65	1002.0	12'86
SEP	36.8	5'79	18.0	5'85	189.5	8'77	18 / SSE	14'72	1016.0	15'63	1002.9	24'70
OCT	37.0	16'80	18.2	8'61	101.0	18'70	17 / S	12'72	1016.0	8'59	1001.0	12'70
NOV	37.0	14'83	18.3	28'51	102.1	9'62	15 / SE	7'70	1018.2	16'65	1001.6	20'76
DEC	36.7	29'82	18.0	30'50	62.2	14'64	14 / SSW	8'72	1017.1	2'66	1000.9	8'84
OVERALL	38.0	3/19/83 4/20/83 5/12/83	16.9	3/9/83	600.0	4/13/89	20 / S	1/9/82	1018.2	11/16/65	1000.0	2/9/85
PERIOD OF RECORDS	1949-1986				1949-1989		1966-1986		1949-1986			

Source: PAGASA



Source: PAGASA

PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0099-00	MAKAR WHARF FEASIBILITY STUDY	FIGURE 3-1
LOUIS BERGER INTERNATIONAL, INC. •LOCKWOOD GREENE INT'L. •TRANS-ASIA (PHIL.), INC. •ERNST & YOUNG INT'L. •CONSULTANT MANAGEMENT SERVICES, INC. •GLOBETROTTERS ENG'G CORP.	WIND ROSES	

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The average annual number of tropical cyclones that pass the Philippine Area of Responsibility is 21. The mean number of tropical cyclones that cross the Philippines is nine per year. Figure 3-2 shows the mean percentage frequencies of tropical cyclone passage.

Records from PAGASA showed that from 1948 to 1989 (42 year period) only four tropical cyclones passed Region XI. However, for the same period, no tropical cyclone passed General Santos City directly. This is confirmed by the Figure 3-3 which shows the tracks of tropical cyclones at several probabilities for every month.

3.1.2 Temperature

The mean annual temperature in General Santos is 27.1°C. Temperature variations are relatively small: normal mean temperatures vary between a high of 28°C in April and a low of 26.4°C in July, as shown in Table 3-1. The highest temperature recorded was 38°C and the lowest 16.9°C, as shown in Table 3-2. Both occurred at the same time of year, in March.

3.1.3 Rainfall

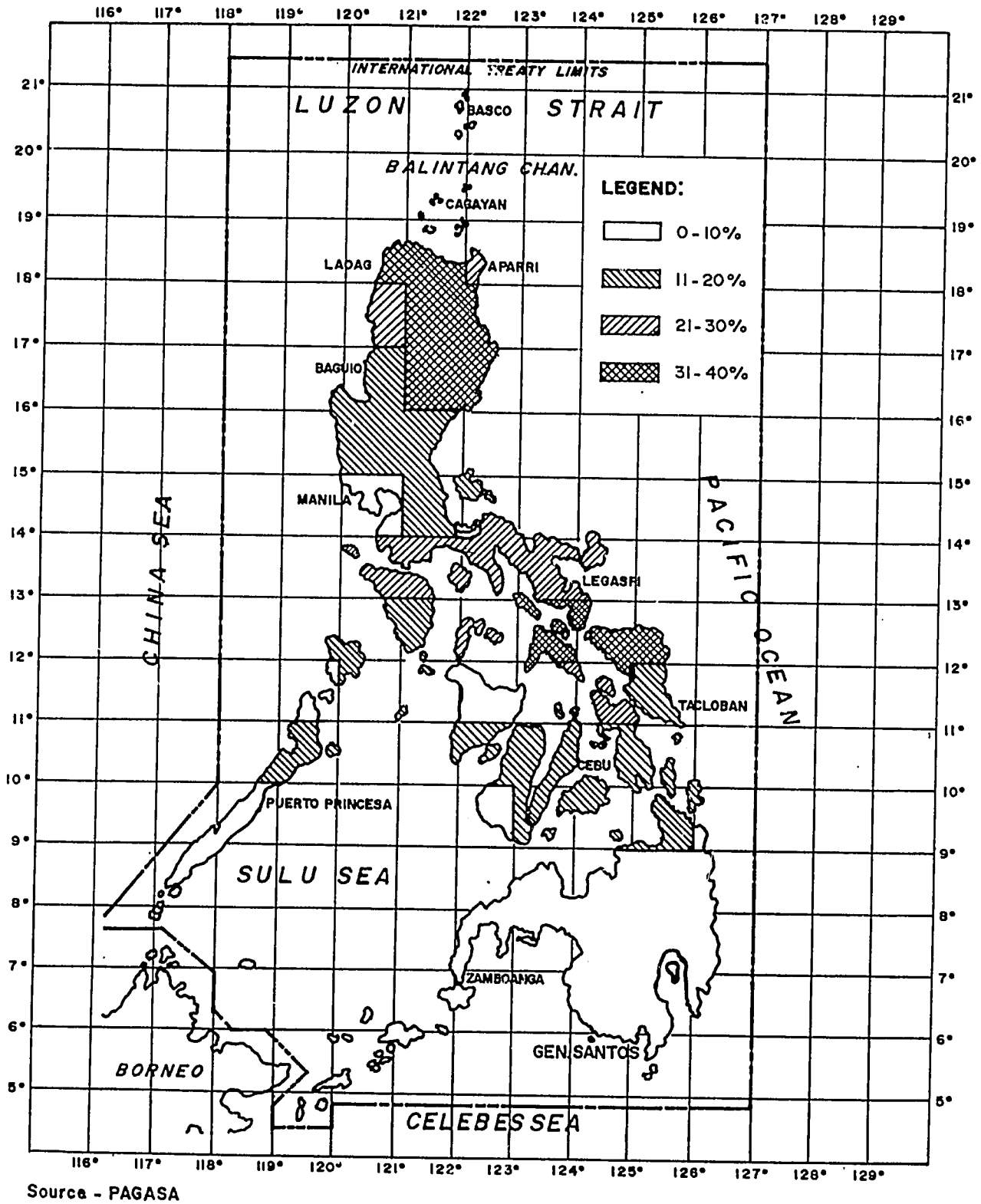
There is no dry season in the area of General Santos. Even in the month with the lowest normal value, 39.5 millimeters of rain fell on the area, while June is the month with the highest normal rainfall, with 112.5 millimeters. As shown in Table 3-1, this distribution also coincides with the number of rainy days: seven in March and 14 in June. An extraordinary downpour occurred in April 1989, when 600 millimeters of rain fell in one 24-hour period. The next highest rainfall occurred in June of the same year, with 366.8 millimeters in one day.

PAGASA used 22 years of records at General Santos to compute extreme values of precipitation and the average intensity, measured in millimeters per hour, for periods of 5 minutes to 24 hours, and for return periods of 2 to 100 years. These values are given in Table 3-3.

3.2 SEA CONDITIONS

3.2.1 Waves

The most site-specific investigation about the wave situation at Makar Wharf was made in 1972 by Sir William Halcrow & Partners for his feasibility study for the expansion of the wharf. Both hindcasting and wave measurements were used. Halcrow used the 1970 wind data. The important effective fetches were 101 nautical miles from the SSE direction and 50 nautical miles from the SSW direction for the entrance to Sarangani Bay. Tropical cyclone data for a typical storm over the Celebes Sea, South West of Sarangani Bay, resulted in waves with characteristic



Source - PAGASA

PHILIPPINE ASSISTANCE PROGRAM SUPPORT
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
CONTRACT NO.: 492-0452-C-00-0090-00

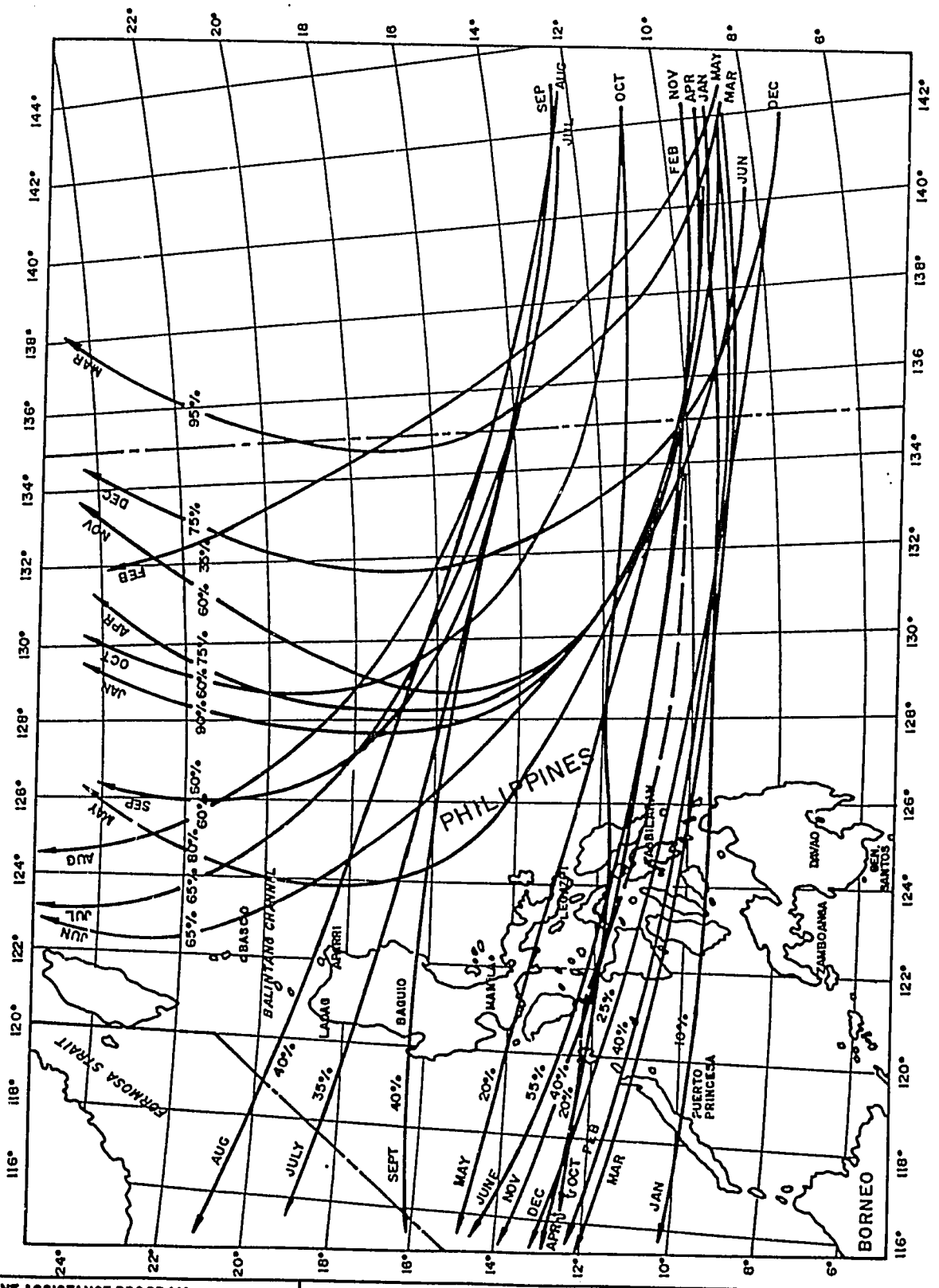
LOUIS BERGER INTERNATIONAL, INC.
• LOCKWOOD GREENE INT'L
• ERNST & YOUNG INT'L
• GLOBETROTTERS ENG'G CORP.
• TRANS-ASIA (PHIL.), INC.
• CONSULTANT MANAGEMENT SERVICES, INC.

MAKAR WHARF FEASIBILITY STUDY

FREQUENCY OF TROPICAL CYCLONES

FIGURE 3-2

Source - PAGASA



PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0099-00	MAKAR WHARF FEASIBILITY STUDY	
LOUIS BERGER INTERNATIONAL, INC. •LOCKWOOD GREENE INT'L. •TRANS-ASIA (PHIL.), INC. •ERNST & YOUNG INT'L. •CONSULTANT MANAGEMENT SERVICES, INC. •GLOBETROTTERS ENG'G CORP.	MEAN MONTHLY TRACKS OF TROP. CYCLONES AFFECTING THE PHIL.	FIGURE 3-3

Table 3-3

RAINFALL INTENSITY-DURATION-FREQUENCY DATA

FOR

GENERAL SANTOS

BASED ON 22 YEARS OF RECORD

Computed Extreme Values (in mm) of Precipitation

Return Period (yrs)	5 mins	10 mins	15 mins	20 mins	30 mins	45 mins	60 mins	80 mins	100 mins	120 mins	150 mins	3 hrs	6 hrs	12 hrs	24 hrs
2	5.9	9.1	11.7	13.8	17.2	20.6	23.0	27.1	30.5	33.1	36.5	39.5	51.0	61.9	69.9
5	8.9	13.5	17.5	20.7	25.9	31.0	34.5	40.6	45.9	50.1	55.5	60.2	78.7	95.9	109.0
10	10.8	16.5	21.3	25.3	31.6	37.9	42.2	49.5	56.1	61.3	68.1	74.0	97.0	118.5	134.9
15	11.9	18.2	23.5	27.8	34.8	41.8	46.5	54.6	61.8	67.7	75.2	81.7	107.3	131.2	149.5
20	12.7	19.3	25.0	29.6	37.1	44.6	49.5	58.1	65.9	72.1	80.2	87.1	114.6	140.1	159.7
25	13.3	20.2	26.1	31.0	38.9	46.7	51.8	60.8	69.0	75.5	84.0	91.3	120.1	147.0	167.6
50	15.1	23.0	29.7	35.3	44.2	53.1	59.0	69.2	78.5	86.1	95.8	104.2	137.3	168.1	191.9
100	16.9	25.8	33.3	39.5	49.6	59.6	66.1	77.5	88.0	96.5	107.5	117.0	154.4	189.1	216.0

Equivalent Average Intensity (in mm/hr) of Computed Extreme Values

Return Period (yrs)	5 mins	10 mins	15 mins	20 mins	30 mins	45 mins	60 mins	80 mins	100 mins	120 mins	150 mins	3 hrs	6 hrs	12 hrs	24 hrs
2	70.8	54.6	46.8	41.4	34.4	27.5	23.0	20.3	18.3	16.6	14.6	13.2	8.5	5.2	2.9
5	106.8	81.0	70.0	62.1	51.8	41.3	34.5	30.5	27.5	25.1	22.2	20.1	13.1	8.0	4.5
10	129.6	99.0	85.2	75.9	63.2	50.5	42.2	37.1	33.7	30.6	27.2	24.7	16.2	9.9	5.6
15	142.8	109.2	94.0	83.4	69.6	55.7	46.5	41.0	37.1	33.9	30.1	27.2	17.9	10.9	6.2
20	152.4	115.8	100.0	88.8	74.2	59.5	49.5	43.6	39.5	36.0	32.1	29.0	19.1	11.7	6.7
25	159.6	121.2	104.4	93.0	77.8	62.3	51.8	45.6	41.4	37.8	33.6	30.4	20.0	12.3	7.0
50	181.2	138.0	118.8	105.9	88.4	70.8	59.0	51.9	47.1	43.0	38.3	34.7	22.9	14.0	8.0
100	202.8	154.8	133.2	118.5	99.2	79.5	66.1	58.1	52.8	48.3	43.0	39.0	25.7	15.8	9.0

Source: Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

values of 10.4 meters height and a period of 12.5 seconds. At the entrance to Sarangani Bay, these values would be reduced to 3.7 meters height and 7.4 seconds period. The analysis of the diffraction patterns around Calumpang Point resulted in wave heights of 0.6 meters at the South West end of the wharf and 1.5 meters at the present North East end of the wharf, with a probability of 0.00017, indicating conditions that may occur during the passage of a tropical cyclone.

The probability values for other significant wave heights were computed, which resulted in the graphs for wave heights and periods reproduced in Figure 3-4. The graph is applicable at the North East area of the existing wharf. The results of the wave measurements are also plotted on the graph.

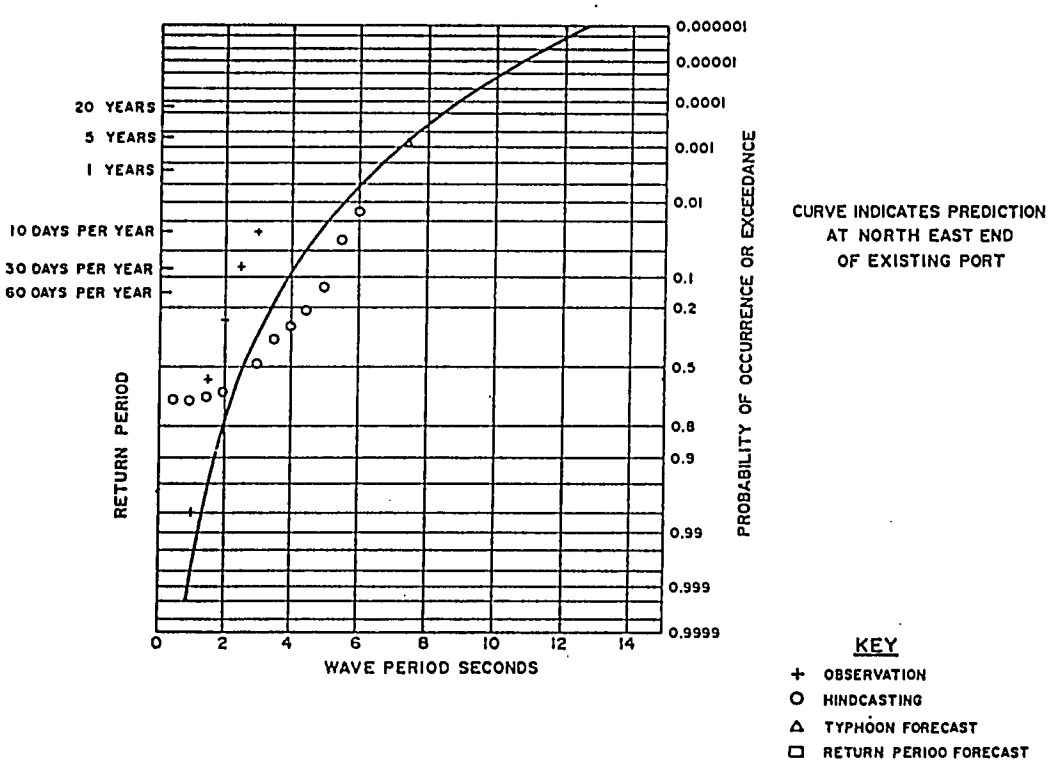
The results of the theoretical computations by Halcrow were borne out by the experience of the years since the wharf was extended into the area for which the analyses had been made. All consulted sources, including the port management and the Chief Pilot, confirm that it is a very rare occurrence, if indeed it ever happened, that a ship had to be moved away from the wharf because of high wind or dangerous waves, even at the North East end of the wharf which is more exposed to wind and waves than the South West end which receives more protection from Calumpang Point.

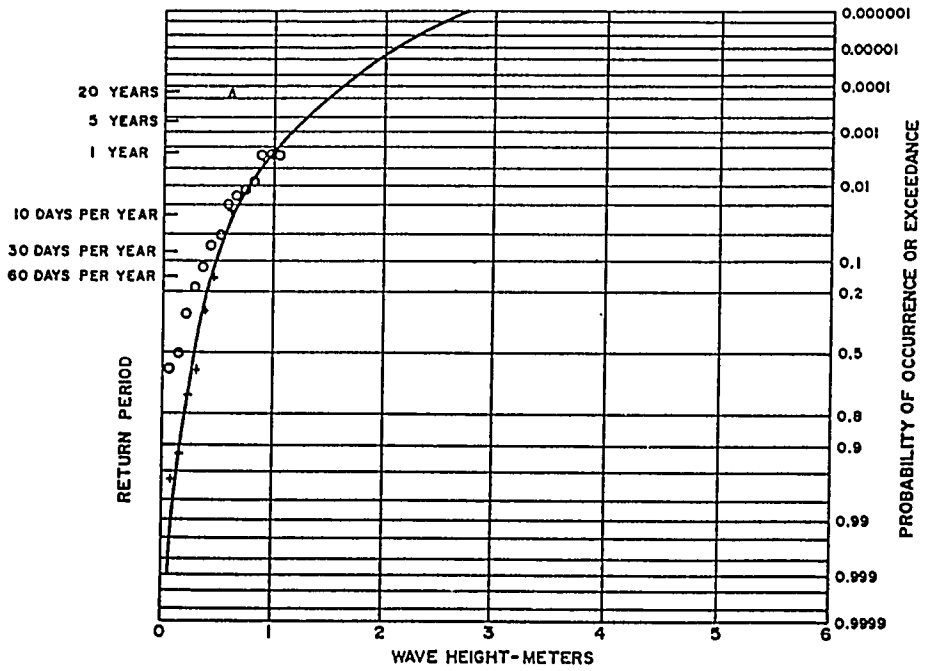
3.2.2 Tides

The 1991 Predicted Tide and Current Tables of the National Mapping and Resource Information Authority, Department of Environment and Natural Resources, do not show tides directly for Makar Wharf. The nearest Primary Tide Station is Davao. However, tide data for Sarangani Bay are referenced to the predicted tide data at Legazpi Port, on Luzon. Tides are semidiurnal, Mean Higher High Water is 1.55 meters above Mean Lower Low Water (MLLW), as indicated on the hydrographic charts. The extreme low water is indicated on the chart as 0.73 meters below MLLW. The tidal differences, in accordance with the Tide Tables, are only a few minutes in time and a few centimeters in height from the reference times and heights at Legazpi Port.

3.2.3 Currents

All consulted sources agree that currents in the vicinity of Makar Wharf do not pose any problem for maneuvering of ships or for vessels berthed at the wharf. Consequently no major current observations or studies were undertaken for this Report. Any currents that occur close to the wharf are caused by the tidal flow inside the Bay and by the ocean current outside the Bay. The general direction of the currents outside the Bay are caused by the global East to West equatorial currents which, together with the wind patterns in the vicinity of the Philippines, generate during most of the year clockwise coastal currents around the southern part of Mindanao. The currents in Sarangani Bay are generally counter-clockwise, including those caused by the tidal flow. This is confirmed by the results of intensive current measurements





Source: SIR WILLIAM HALCROW & PARTNERS-1971·General Santos Report·

PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0099-00	MAKAR WHARF FEASIBILITY STUDY	FIGURE 3-4
LOUIS BERGER INTERNATIONAL, INC. •LOCKWOOD GREENE INT'L. •TRANS-ASIA (PHIL.), INC. •ERNST & YOUNG INT'L. •CONSULTANT MANAGEMENT SERVICES, INC. •GLOBETROTTERS ENG'G CORP.	WAVE PREDICTIONS	

conducted by Dames & Moore close to the site of the proposed agro-industrial complex at Tambler. This location is too far away to allow conclusion as to the detailed conditions at Makar Wharf. However, all sources agree in the basic fact that currents around Makar Wharf are generally from the northeast and are of little concern for the ships approaching or berthing at the wharf.

3.2.4 Tsunamis

Tsunamis are high-energy sea waves generated by earthquakes. When they reach the coast under certain condition they may get as high as 10 m. The time interval between successive waves is from 20 to 30 minutes. Tsunamis travel at approximately 700 to 800 kph, depending on the water depth.

A report published by the Philippine Institute of Volcanology and Seismology (PHILVOLCS) mentions that the coastal areas of Southern Mindanao facing the Celebes Sea are prone to tsunamis because tsunamigenic earthquakes often originate under the bottom of Celebes Sea. The areas with recorded tsunami hits are shown in Figure 3-5.

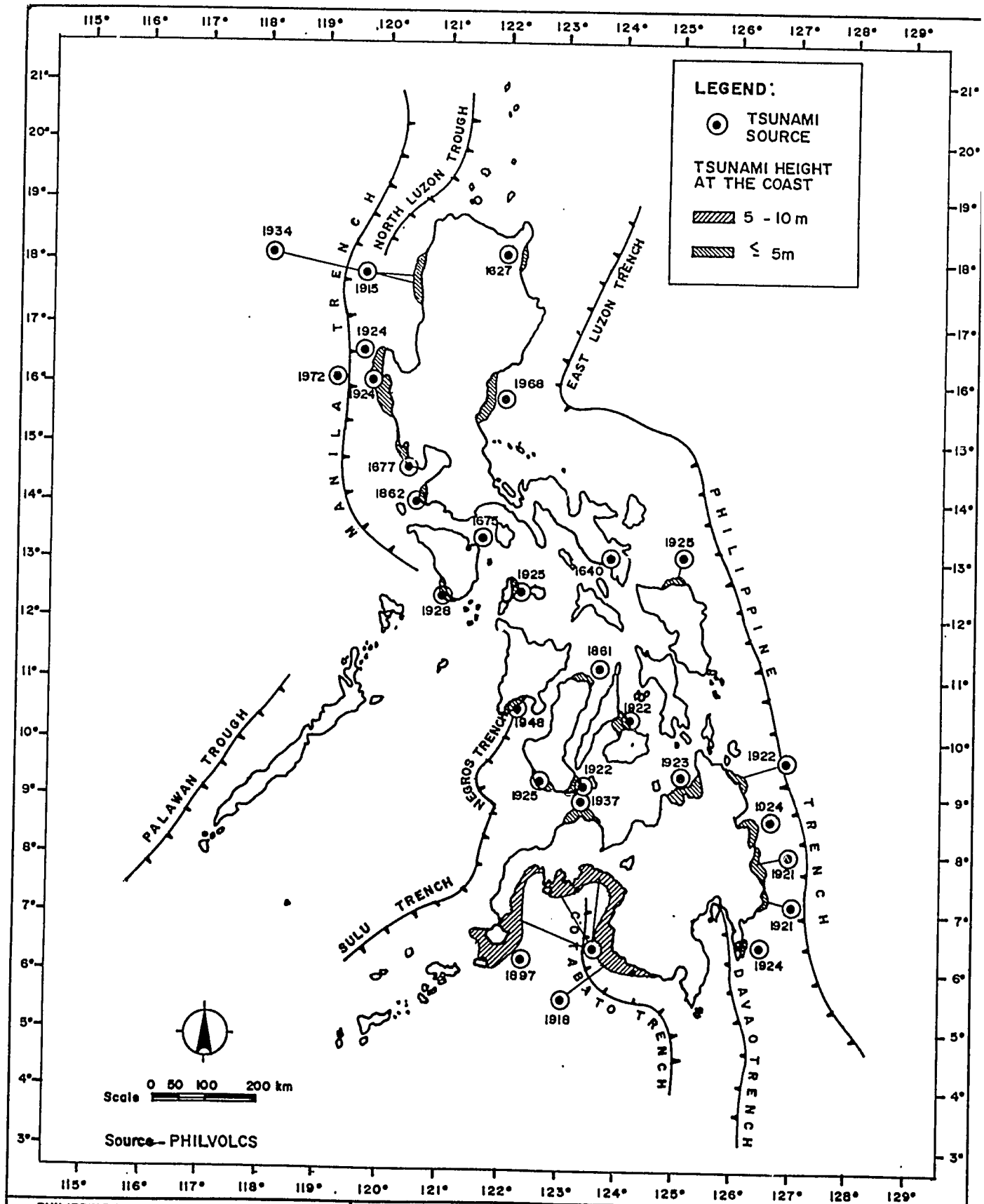
On August 1976 the Moro Gulf earthquake produced a tsunami that devastated the Southwest coast of Mindanao and left more than 3,000 people dead and at least 1,000 missing. More than 8,000 people were injured and 12,000 families were rendered homeless by waves as high as five meters.

Figure 3-5 shows that Sarangani Bay has not experienced any tsunamis. The Consultant has not heard any account of a tsunami at General Santos, nor has he seen any evidence of tsunami damage.

3.2.5 Storm Surges

The geographical location of the city virtually shelters it from the average 21 weather disturbances that annually visit the country. As per calculation made by the Halcrow report only one storm in every 16 years can be expected in the city. This calculation was based on records of the Royal Observatory of Hongkong for a period between 1953-1984.

The climatological data show that during the most severe depression the difference in barometric pressure is of such a magnitude that it could produce an increase in water level of only about 0.10 meters. Such a small amount would get lost in the wave disturbance caused at the wharf by the storm, hence the Consultant's sources indicated that storm surges at the port are of no concern.



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MAKAR WHARF FEASIBILITY STUDY

DISTRIBUTION OF TSUNAMI HIT AREAS IN THE PHILIPPINES

FIGURE 3-5

3.3 SEISMIC CONDITIONS

The Philippine Archipelago lies between two major tectonic plates of the world, the Pacific Plate and the Eurasian Plate. These plate interactions and movements along other active faults are responsible for the high seismicity of the Philippine Archipelago.

Earthquakes with magnitude seven or more had affected the Philippines in the recent past, and the chance of these destructive earthquakes occurring again in the future is very strong.

At least five earthquakes per day occur in the Philippines. The most seismically active part is its eastern section including eastern Mindanao, Samar and Leyte with an average of 16 perceptible earthquakes per year. In General Santos City, the annual average number of perceptible earthquakes is six. Figure 3-6 shows the annual average number of perceptible shocks of the different parts of the Philippines.

In August 1976, an earthquake of magnitude 7.9 hit the Moro Gulf, Southern Mindanao, and caused severe damage and casualties. The highest recorded earthquake magnitude is 8.3 which occurred in July 1954 in Sorsogon. Figure 3-7 shows the distribution of epicenters of strong and major earthquakes in the Philippines.

Figure 3-8 shows the identified earthquake generators in the Philippine Archipelago. General Santos is situated about 20 km from the Mindanao Fault. An earthquake produced by this fault would affect the port of Makar.

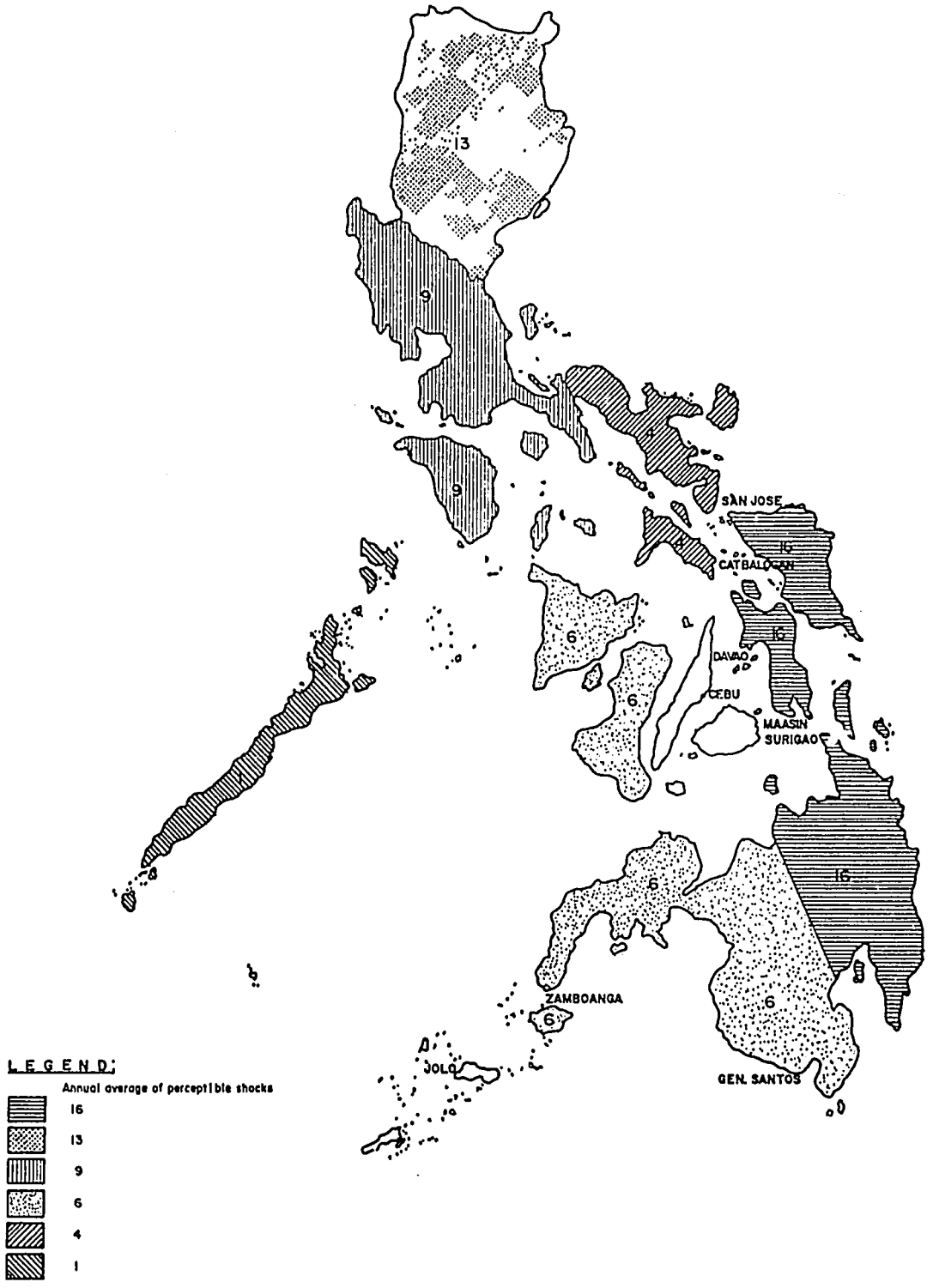
Design of any structure of Makar Wharf must take into account earthquake forces. The National Building Code requires that every building or structure be designed and constructed to resist stresses produced by lateral forces such as earthquake and wind. Chapter 2, Section 2.1 of the National Structural Code of the Philippines (NSCP) provides the guidelines for the analysis of earthquake forces.

3.4 GEOTECHNICAL INFORMATION

3.4.1 Geology

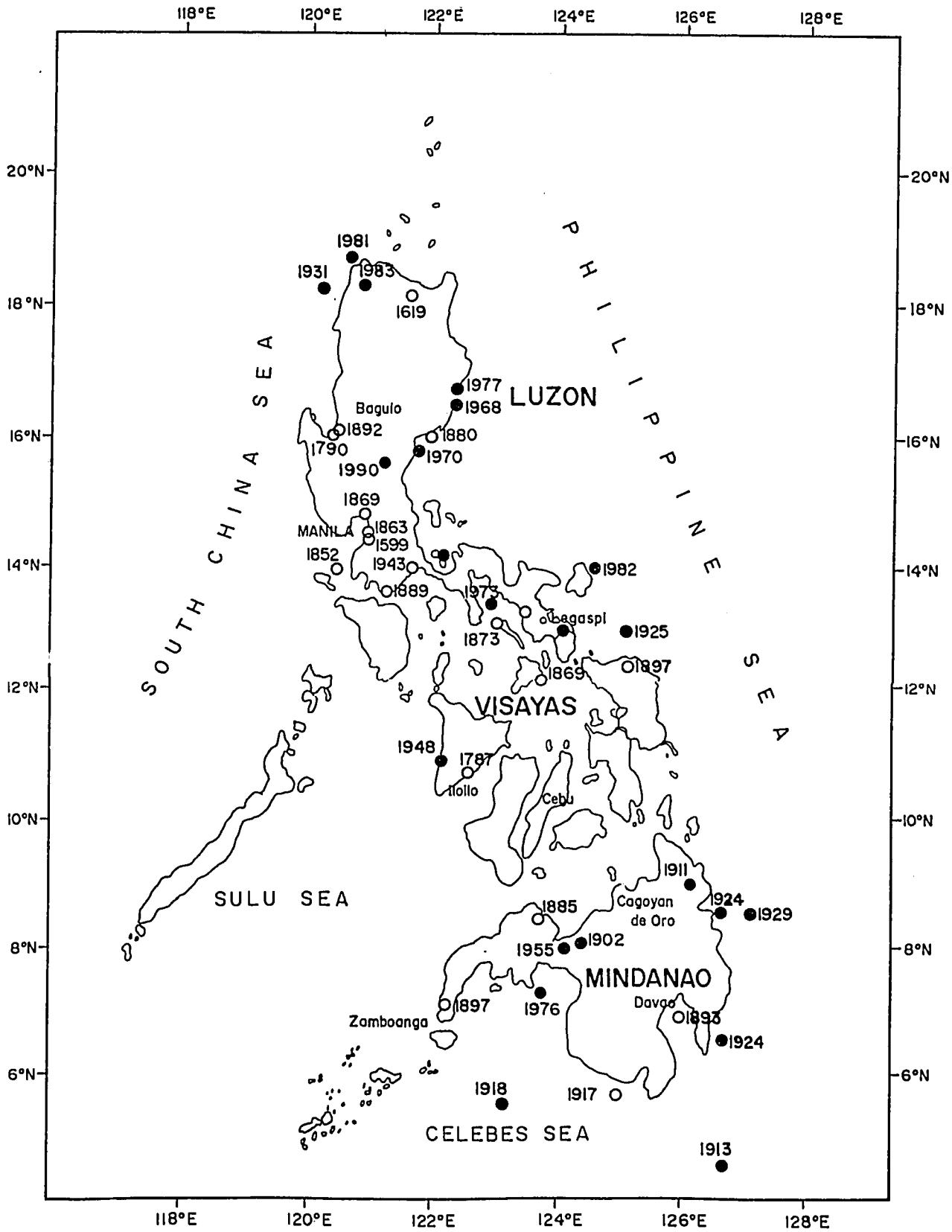
The following geological description refers principally to the watershed of the Makar River. It is extracted from a more detailed description prepared especially for the Environmental Assessment part of this Study.

Surface soils at the Makar Wharf are mainly composed of mixed unconsolidated sedimentary materials (recent alluvium) from sandstones, coralline limestones and volcanic fragments. These



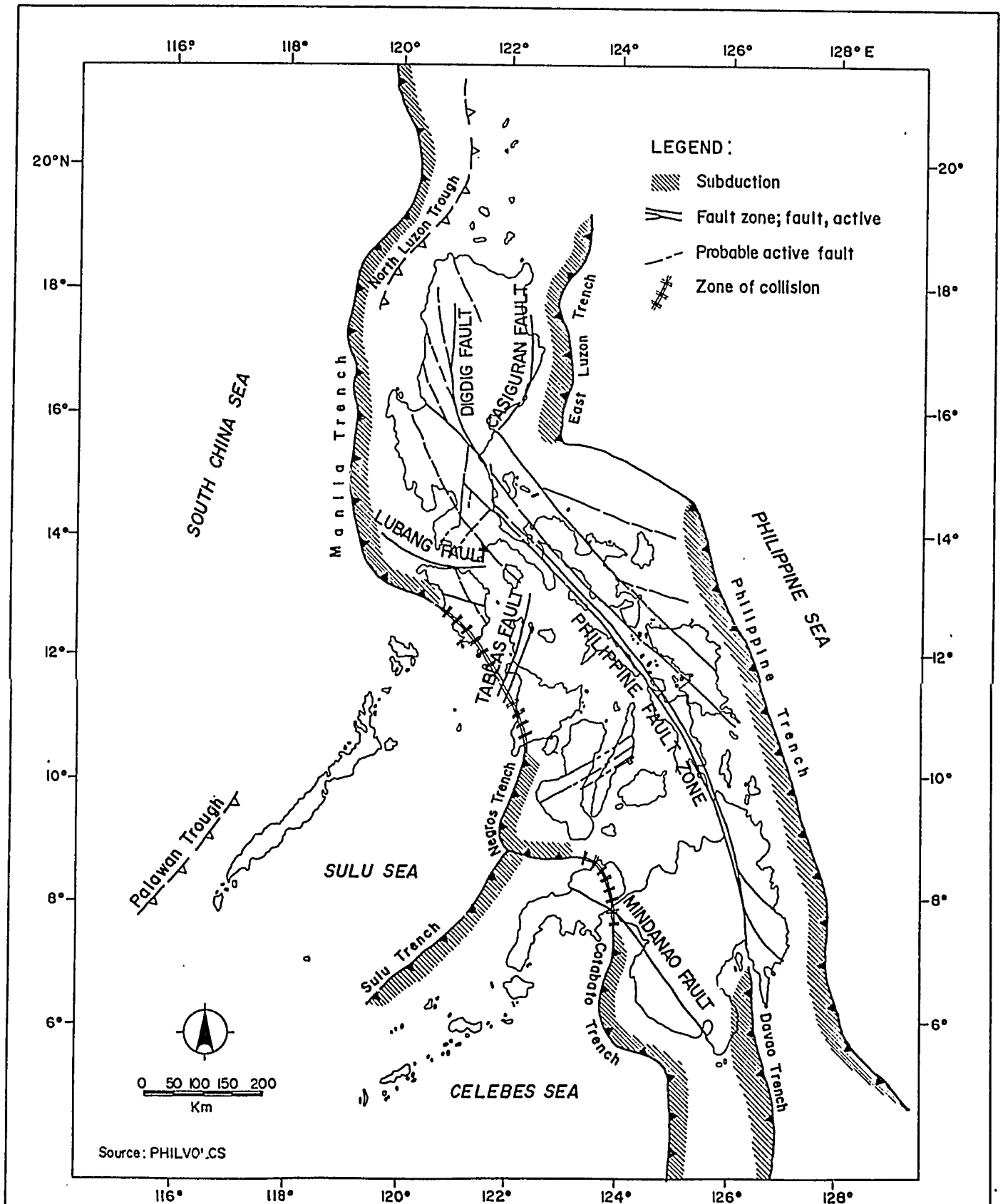
Source: PHILVOLCS

PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0099-00	MAKAR WHARF FEASIBILITY STUDY	FIGURE 3-6
LOUIS BERGER INTERNATIONAL, INC. • LOCKWOOD GREENE INT'L. • ERNST & YOUNG INT'L. • GLOBETROTTERS ENG'G. CORP. • TRANS-ASIA (PHIL.), INC. • CONSULTANT MANAGEMENT SERVICES, INC.	ANNUAL AVERAGE NO. OF PERCEPTIBLE SHOCKS IN THE PHILIPPINES	



Source - PHILVOLCS

PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0098-00	MAKAR WHARF FEASIBILITY STUDY	FIGURE 3-7
LOUIS BERGER INTERNATIONAL, INC. • LOCKWOOD GREENE INT'L. • TRANS-ASIA (PHIL.), INC. • ERNST & YOUNG INT'L. • CONSULTANT MANAGEMENT SERVICES, INC. • GLOBETROTTERS ENG'G CORP.	EPICENTERS OF DESTRUCTIVE PHILIPPINE EARTHQUAKES	



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MAKAR WHARF FEASIBILITY STUDY

DISTRIBUTION OF EARTHQUAKE GENERATORS IN THE PHILIPPINES.

FIGURE 3-8

geological materials occupy an area of approximately 1840 hectares. In general, the upper layer which can extend to a depth of three meters consists mostly of coarse, non-plastic and non-sticky sandy loams and loamy sands. The underlying material immediately under the sandy layer consists of corraline limestones which are relatively impervious in some places. Under the coralline limestones are varying stratifications of loose clayey muds and volcanic materials.

The areas outside and upland from the Makar Wharf site are composed of two major geologic formations: the Banga Formation and the Pyroclastics. The Banga Formation occupies an area of 5312 hectares, immediately upland from the recent alluvium area and represents the elevated and dissected first level residual terraces of the Makar River watershed. The underlying materials are basically conglomerates intermixed with various sedimentaries, such as siltstone, tuffaceous sandstone, and shale. This interbedding of sedimentaries and conglomerates is likewise intercalated with coralline limestones which occupy the seaward front of the Banga Formation. The conglomerates are riverlaid rounded and sub-rounded volcanic pebbles similar in composition to the volcanic material obtained from the ejects of Mount Matutum. When completely weathered, this material provides the finer sediments (silts and clays) to the generally sandy material found nearer to shore.

The rest of the Makar River watershed consists of Pyroclastics which occupy around 10,800 hectares. They are mainly composed of thick deposits of volcanic ejecta consisting of various materials such as ash, volcanic sand, cinders, tuff and other volcanic debris.

The majority of the watershed (59 percent) is severely eroded, mainly in the steep areas of the hills and mountains away from the shore. This is due to very low organic matter or vegetation. Practically all water courses in the area are braided and show numerous sandbars due to the deposition of eroded material.

The total area of the Makar River watershed is approximately 17,900 hectares. River water seems to have been diverted for irrigation to such an extent that the river stopped flowing some three to five years ago. The river bed is now dry and occupied by fishermen and boat builders. This would mean that normal transport of sediments should have stopped. However, it is quite possible that occasional heavy rains would cause a certain amount of water to come down the river bed, bringing with it some sediment which would be deposited at the mouth of the river.

3.4.2 Previous Geotechnical Explorations

Five borings and ten dynamic cone penetration tests were performed by the Bureau of Public Works (BPW), (presently, the Department of Public Works and Highways), in 1971, in the area Southwest of the port, in the vicinity of the Makar River delta. In 1971, ten additional borings and seven probings were conducted at the request of Sir William Halcrow and Partners in connection with the Southwest extension of the quay and the rehabilitation of the wharves constructed between 1954 and 1970. These borings were located near the Makar River and North East of the port, along the coral reef. The boring depths ranged from 5.0 m to a

maximum of 28 m. The dynamic cone penetration tests were performed using a 2.50 sq. in. cone, driven with a 10 lb hammer with a 30 in. free-fall.

During the first phase of the northeasterly extension of the quay, 10 soil borings were completed in 1972, and an additional 11 borings were completed between December 23, 1975 and January 6, 1976, during the course of the second phase extension. The boreholes' location and logs were secured from the BPW drawing No. PGSS-21AO, dated December 15, 1978, as provided by the Philippine Ports Authority. The boring depths ranged from 8.47 m to 20.0 m; and although one boring was carried out to a depth of 30.50 m, bedrock was not reached in any of the borings. The sea bed elevation was estimated from contours developed from concurrent bathymetric surveys and the elevations were referenced to the MLLW datum.

From the boring logs, a general subsoil profile consisting of the following units can be defined:

- Surficial Soil

  A relatively thin layer of saturated surficial soil was encountered in the on-shore borings. This material consists of a dark gray medium to coarse sandy loam with highly weathered angular to subangular volcanic rock fragments (mostly basalt) and corals. This stratum ranged in thickness from 0.45 to 1.50 meters.

- Fine Silty Sand

  A light pinkish to dark grayish layer of saturated fine silty sand in a loose structureless matrix of coralline limestone and siltstone underlies the surficial soils to a depth range of 6.50 meters to 8.0 meters. The weathered deposits are distinguished from the unweathered deposits by their light grayish to pinkish color which is an indication of past partial dessication and oxidation. This desiccated upper portion of the deposit generally exhibits higher strengths than the underlying unweathered deposit.

- Medium to Coarse Sand

  Underneath the silty sand lies a medium to dense stratum of dark brown saturated coarse sand with pyroclastic stone fragments, primarily quartz and feldspar constituents. This deposit is interbedded with lenses of dense medium to fine silty sand with traces of clay. This layer extends to a depth of 15 to 18 meters.

- Clay

  This deposit was encountered at the bottom of the two deepest boreholes at an average depth of 16.5 meters of unknown thickness and consisted primarily of dark brown to black wet clay with high plasticity.

These clays, referred to as marine clays were deposited under highly flocculated conditions due to the environment high sodium cation concentration. Subsequent ground water fluctuations and leaching by infiltration gradually decreased the electrolyte sodium concentration thus resulting in a clay with high strength when undisturbed but readily reduced to a viscous fluid when disturbed. As it were, these clays are highly sensitive.

While a priori, there appears to be ample information on the subsoil engineering characteristics of the subject site, considerable care must be exercised when interpreting these data. The reasons for this are:

- The adopted soil description does not conform with the Unified Soil Classification System (USCS) and qualitative terms relative to colour and gradation have been omitted.

- The drilling procedures have not been specified, although it is likely that the more popular conventional method was employed. This technique uses mounted drilling equipment such as a rotary drilling rig with either continuous flight augers or various cutting bits on a boat or a barge specially modified for the purpose. Drilling is performed through a steel casing extending to the sea-bed in order that an open borehole can be maintained through saturated conditions.

  Nonetheless, operational errors and equipment condition remain no less determinent of the usefulness of the collected data, particularly, the split-spoon counts.

- The split-spoon data, useful though they may be with regard to confirming the site subsoil stratigraphy and relative consistencies, can result in gross design inefficiencies if correlated with other engineering parameters such as relative densities (Meyerhof, 1957), and lateral earth pressure coefficients (Skempton, 1986). This stems from the fact that not only were non-standard tubes used, but the previously mentioned uncertainties related to equipment condition and operational errors might have contributed to produce erroneous test results.

  Indeed, blow counts exceeding 110, for a mere 10-inch penetration have been recorded. This abusive effort results in a warped and worn driving shoe which in turn exaggerates the driving resistance.

- No undisturbed samples were recovered. This means that settlement-induced consolidation of the cohesive material encountered within the zone of influence of the foundation cannot be predicted.

Certain conclusions can be drawn from the pile driving records. Although the hammer specifications are not now known, the pile driving and static load tests records gathered during

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the Sir William Halcrow and Partners intervention tend to confirm the site stratigraphy. In addition, these data suggest that an adequate penetration resistance (up to 90.40 metric tons) can be mobilized within the sand stratum with minimum embedment, using a 450 mm reinforced concrete square pile. This yields pile lengths ranging from 19 to 25 meters depending on the sea bed elevation.

The original section of the quay, completed in 1954, as well as the subsequent extensions effected in 1958 on both sides of this original quay were designed for a live load of 200 lb/sq ft. Two further extensions completed in 1970 used design live loads of 300 lb/sq ft.

In 1974, notwithstanding the absence of underdeck distresses, underpinning of the existing quay was deemed essential in view of the German Code requirements and/or of the anticipated loadings resulting from the port improved standard. Moreover, the dredging operation which accompanied the betterment of the port, drastically reduced the frictional component of the piles bearing capacity. The existing deck had hence to be broken through and the piles extended and re-driven to within the sand stratum.

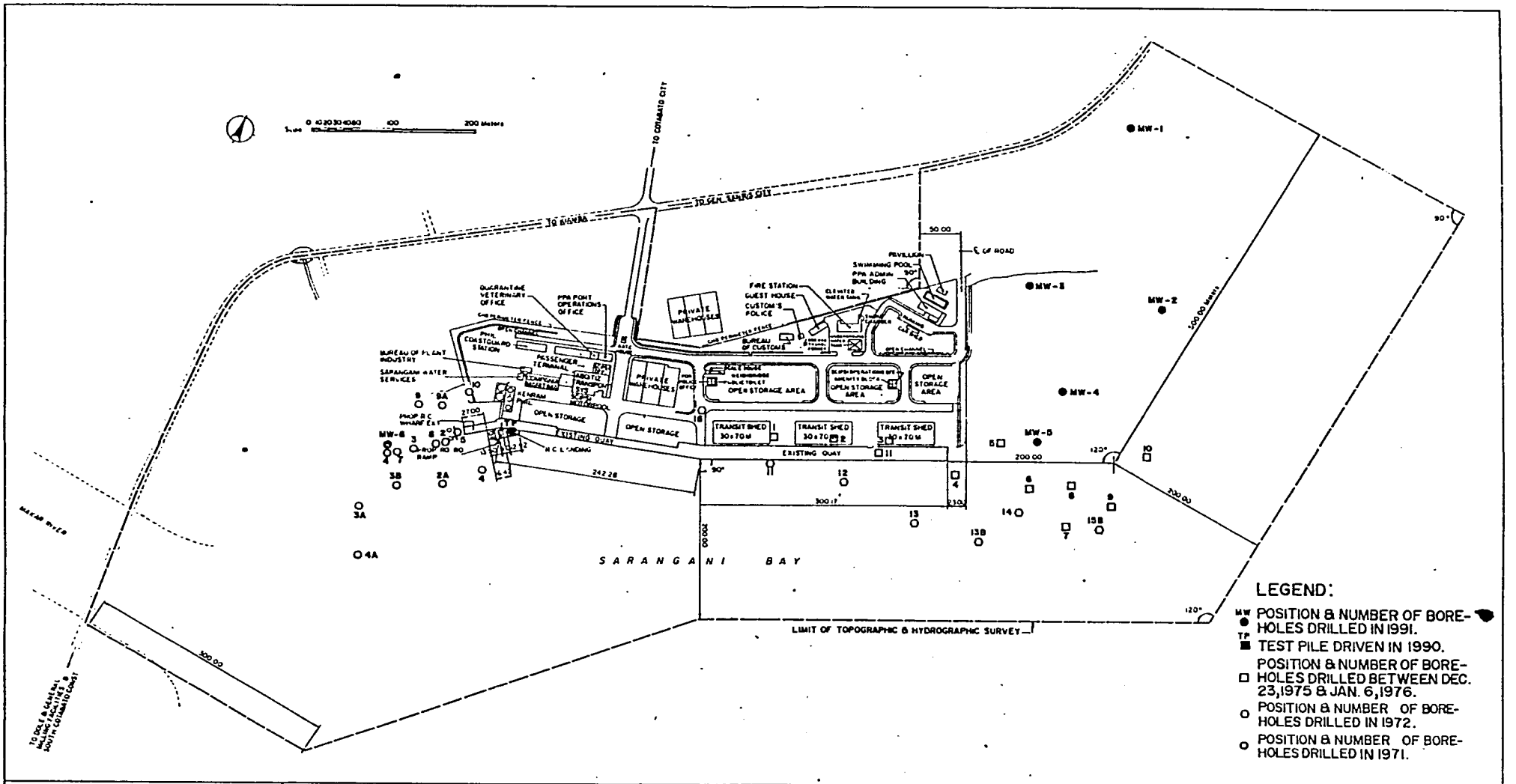
The present condition of the quays, attests to the fact that indeed satisfactory bearing capacity has been achieved with minimum penetration into the sand layer.

One test pile was driven on November 2, 1990, by V. T. Lao Construction at the site of the proposed Wharf Extension, Ro-Ro Ramp and Platform. This 450 mm sq. reinforced concrete pile was driven to a tip elevation of -22.76 meters. This corresponds to an embedment of 13.82 meters. The actual bearing capacity computed using the Engineering News Formula resulted in an allowable bearing capacity of 107.34 metric tons. This capacity level satisfies the specifications, thus further demonstrating that enough resistance can be mobilized within the sand layer.

In view of the lack of information on the laboratory results of the previous soils explorations and because these explorations did not cover all the areas that now are under consideration for the extension of the port, the Consultant commisioned a special subsurface investigation, consisting basically of six new borings. One of these borings is located in the area southwest of the ro-ro ramp and the others to the northeast of the present port area, as shown on the location map of Figure 3-9. The borings were completed in early April. The corresponding report by the subcontractor had not been delivered yet at the close of this Preliminary Report. The results will be analyzed and presented in the Final Report.

3.5 TOPOGRAPHIC INFORMATION

The topography of Southern Mindanao is characterized by mountainous areas interspersed with large plateaus and valleys. Mount Apo, with 2954 meters the highest mountain in the



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MAKAR WHARF FEASIBILITY STUDY

SOIL BORING LOCATION PLAN

FIGURE 3-9

Philippines, lies in Southern Mindanao, effectively dividing Davao del Norte from Davao del Sur. The Alip Mountain Range runs between Davao del Sur and South Cotabato, to the southern tip of Davao del Sur, with its highest peak reaching 900 meters. The Roxas Range extends West of General Santos City to Cotabato City in the North.

General Santos City has gently rolling plains, mountains and hills, with slopes ranging from 0 percent in the plains to 50 percent in the mountains. The urban settlement of Dadiangas and its surrounding barangays, including the area of the Makar Wharf, lie in a plain with slopes between 0 percent and three percent. This plain comprises 35 percent of the total area of General Santos City. Denuded and eroded hills dominate some of the outlying barangays in the North and West.

In the western section of the city and North of the City boundary, major rivers and numerous creeks form flood plains and river basins, fed from the mountains and hills in the West. Sarangani Bay lies to the South and East of the City; 28.5 kilometers of its shoreline fall under the jurisdiction of General Santos City.

Makar Wharf is settled on a relatively flat terrain, on Sarangani Bay, South-west of Dadiangas. To obtain the necessary data for the planning and preliminary design of port improvements, the Consultant commissioned a topographic survey. The survey was completed in late March. Its results will be presented and analyzed in the Final Report.

3.6 HYDROGRAPHIC INFORMATION

The first good information about the hydrography at the Makar Wharf was obtained through a hydrographic survey conducted for Sir William Halcrow in 1972. The Halcrow Report mentions previous hydrographic plans by the BPW (now the Department of Public Works and Highways, DPWH), without giving any details. These plans were not available for the present Study. The Halcrow Report contains a drawing "Survey of General Santos Port" that shows contour lines of the sea floor down to 30 meters, from the southern bank of the Makar River to a point approximately 250 meters North of the present North end of the wharf. This survey served at the time to determine the alignment of the 300-meter wharf extension of 1974. The data and contour lines from this survey are reproduced on Figure 3-11 which is presented in the form of an overlay for Figure 3-10 to show the changes that have taken place in the sea floor since 1972.

Hydrographic and navigation charts of Mindanao show that in most parts the sea bottom falls away sharply from the coast. As shown in Figure 5-5, Sarangani Bay is no exception. At Makar Wharf the 30-meter contour is very close to the face of the wharf and the sea bottom keeps dropping sharply. As a result, ships trying to berth cannot use anchors to help in the maneuver. Also, the alignment of any new wharf addition must be selected very carefully to avoid deep spots in the sea bottom that would render any new construction difficult and expensive. Due to

this sensitivity, the Consultant commissioned a detailed hydrographic survey. The survey was completed in late March. Its results will be presented and analyzed in the Final Report, together with Figures 3-10 and 3-11.

CHAPTER 4

THE ROAD NETWORK

4.1 THE EXISTING ROAD NETWORK

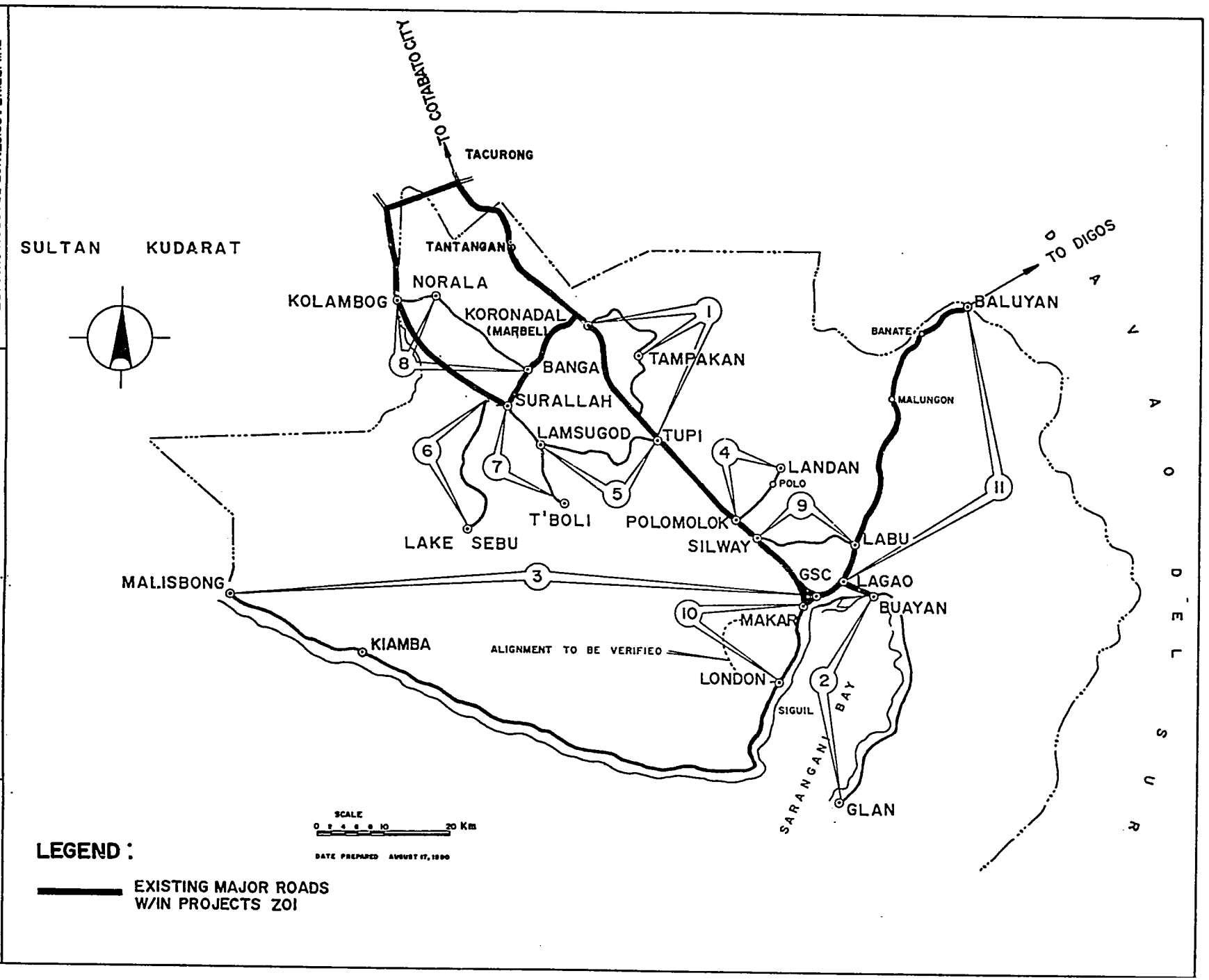
Two major roads, both part of the National Highway System (Maharlika Highway), connect the port to its hinterland: the Digos-Makar Road and the Marbel-Makar Road. They are shown on Figure 4-1, Location of Existing Roads. The Digos-Makar Road continues to Davao with a total distance of 155 kilometers. The Marbel-Makar Road continues to Cotabato City (and the port of Polloc) with a total distance of 147 kilometers.

A third major road is of great importance to the region. It provides access to the Allah Valley, one of the most important agricultural areas of the region. It starts at Tacurong, on the Cotabato-Makar road, and form a loop through Kolambog and Surallah to join the Cotabato Makar road again at Marbel. The length of this road is 51 kilometers.

A system of secondary roads connect the agricultural areas to the major roads. Eleven of these feeder roads are shown on Figure 4-1 and in Table 4-1. They were the subject of the General Santos City/South Cotabato Road Improvement Project as a portion of the Rural Infrastructure Fund (RIF) project undertaken by the Department of Public Works and Highways (DPWH) under a study by Louis Berger International, Inc., in joint venture with TCGI Engineers. The objective of this study was to perform feasibility studies for ten of the roads and completing final design for upgrading the National Highway linking General Santos City with Davao. The total length of these roads is 393 kilometers. Final design of these roads is now in progress.

The Makar-Davao Road passes through the city, over a heavily traveled street. The City Administration is concerned that in the future this street, already congested at peak hours, may become a serious bottleneck and has plans to build a diversion via Nuñez and Santiago A. Odi Streets, see Figure 4-2.

One road, presently secondary, is worthwhile mentioning. It connects Digos, on the Makar-Davao Road, with Midsayap, on the Makar-Cotabato Road, via Kidapawan. It is shown on Figure 4-3. There are presently no plans to develop this road. Should, however, this road become a major artery in the far future, it would provide a direct connection between Davao and the western part of Mindanao and a certain part of traffic could by-pass General Santos.



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MAKAR WHARF FEASIBILITY STUDY

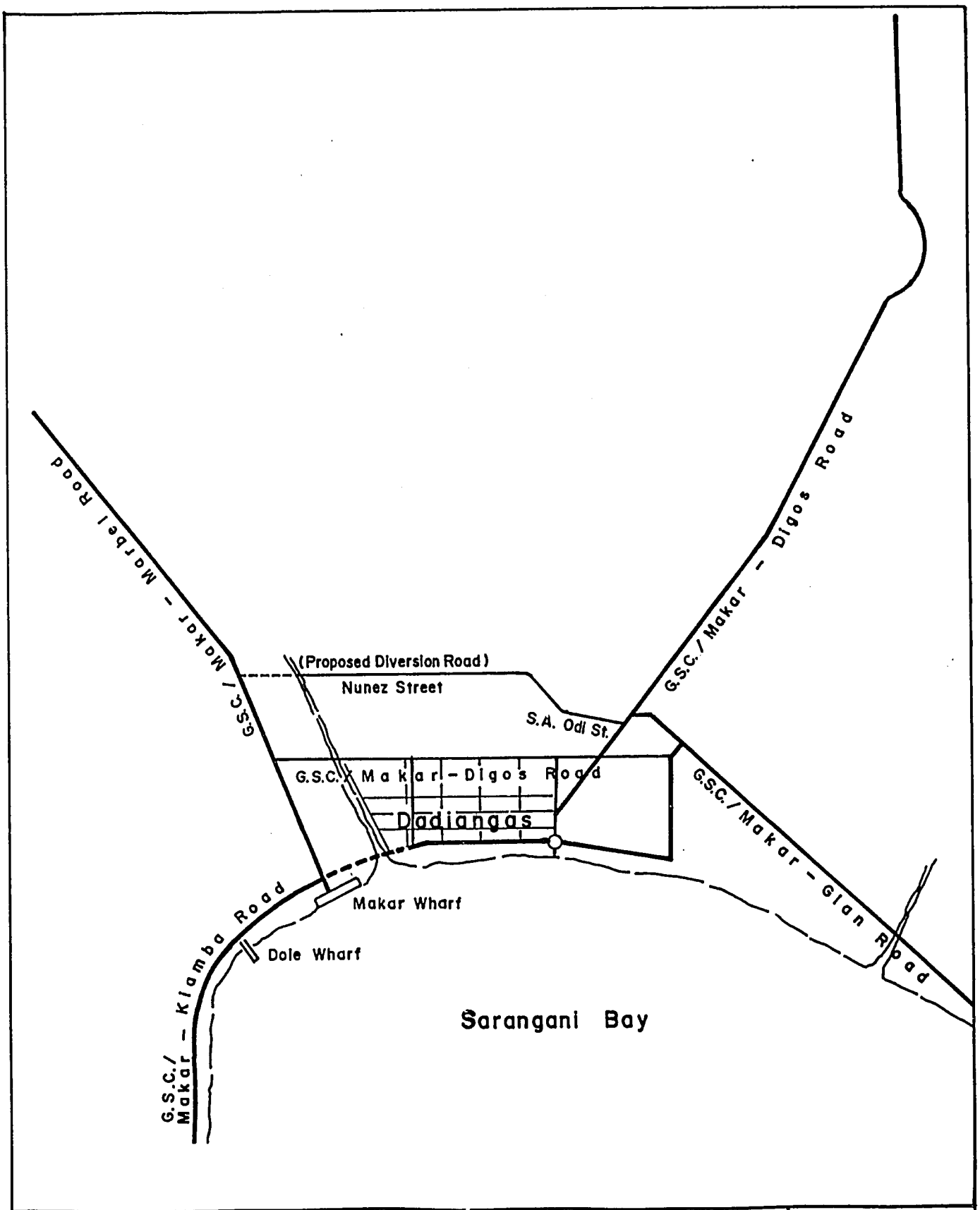
LOCATION OF EXISTING ROADS

FIGURE 4-1

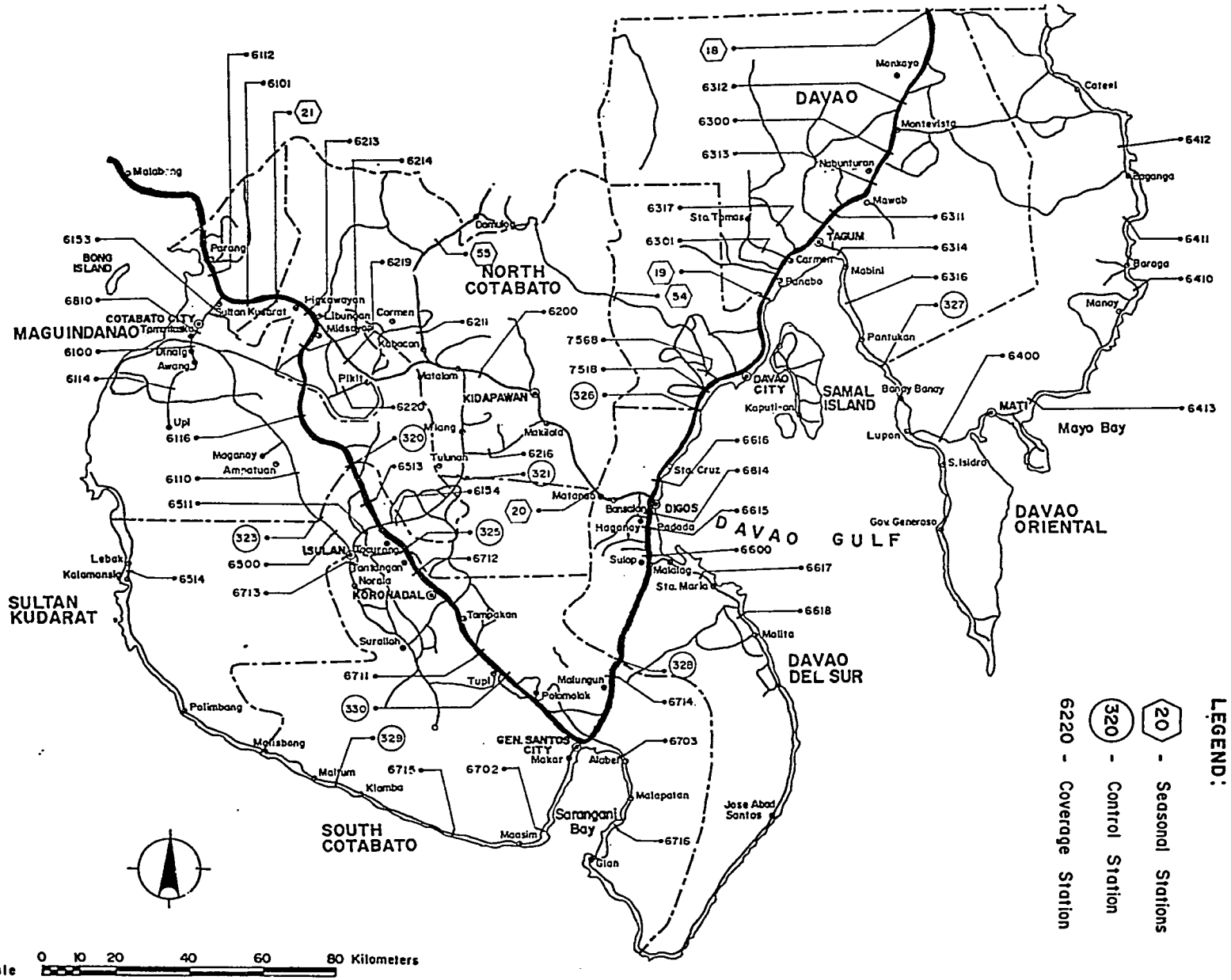
Table 4-1
ROADS OF THE RURAL INFRASTRUCTURE FUND PROJECT (RIF)

ROAD SECTIONS	STATION LIMIT	LENGTH (km)	EXISTING CONDITION	PROPOSED IMPROVEMENT
1. Koronadal-Tampakan-Tupi Road				
a. Koronal-Rotonda	1710.983 - 1715.883	4.8	Gravel/Fair	AC/DBST
b. Rotonda-Tupi	1715.883 - 1739.683	23.8	Gravel/Fair to Bad	AC/DBST
2. GSC/Buayan-Glan Road				
a. GSC/Buayan River-Lun Padido River	1670.216 - 1681.116	10.9	Gravel/Fair	PCCP
b. Lun Padido River-Glan	1681.116 - 1717.616	36.5	Gravel/Fair to Bad	AC/DBST
3. GSC/Makar-Malisbong Road				
a. GSC/Makar-Siguil River	1675.262 - 1689.662	14.4	Gravel/Fair	PCCP
b. Siguil River-Kalaong River	1689.662 - 1779.862	90.2	Gravel/Fair	DBST
c. Kalaong River-Malisbong River	1779.862 - 1795.762	15.9	Earth/Bad	DBST
4. Polomok-Landan Road				
a. Polomok-Polo	1688.789 - 1690.389	1.6	PCCP/Good	PCCP
b. Polo-Landan	1690.389 - 1693.789	3.4	Gravel/Fair to Bad	PCCP
	1693.789 - 1704.289	10.5	Earth/Bad	DBST
5. Surallah/Lamsugod-Tupi Road	1705.844 - 1741.144	35.3	Gravel/Bad	Gravel
6. Surallah-Lake Sebu Road	1746.418 - 1767.918	21.5	Gravel/Fair to Bad	Gravel
7. Surallah-T'boli Road	1745.918 - 1767.318	21.4	Gravel/Fair to Bad	DBST
8. Banga-Norala-Kolambog Road				
a. Banga-Norala	1738.933 - 1757.133	18.2	Gravel/Fair to Bad	DBST
b. Norala-Kolambog	1757.133 - 1762.133	5.0	Gravel/Fair to Bad	DBST
9. Labu-Silway 8	1641.213 - 1660.713	19.5	Gravel to Earth/ Bad	Gravel
10. GSC Bypass		unknown		
11. GSC/Lagao-Malungon-Baluyan Road	1664.656 - 1602.656	62.0	Asphalt/Badly Deteriorated	UPGRADING

PCCP = Portland Cement Concrete Pavement
AC = Asphalt Concrete
DBST = Double Bituminous Surface Treatment



PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0098-00	MAKAR WHARF FEASIBILITY STUDY	FIGURE 4-2
LOUIS BERGER INTERNATIONAL, INC. • LOCKWOOD GREENE INT'L • TRANS-ASIA (PHIL.), INC. • ERNST & YOUNG INT'L • CONSULTANT MANAGEMENT SERVICES, INC. • GLOBETROTTERS ENG'G CORP.	MAJOR ROADS IN THE CITY	



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MAKAR WHARF FEASIBILITY STUDY

TRAFFIC COUNT STATIONS

FIGURE 4-3

4.2 PHYSICAL ROAD CONDITIONS

A field survey was conducted for this Study to determine the conditions in which the roads are at present. The purpose of the survey was to gain an impression on the state of repair, without going into great details. It is important for this Study to know what constraints are imposed on the traffic to the port by the road conditions and how these constraints would affect the competitive position of the Makar Wharf relative to the other ports that may serve the same hinterland.

The major city streets are paved with concrete. The rural roads are mainly gravel surface in fair to bad condition and many roads are earth roads or simple trails. Even the national highways are not in prime condition over their entire length.

The Digos-Makar Road has rigid concrete pavement for the 9.4 kilometers, then has flexible pavement for an additional 44.3 kilometers, while its last section of 39.4 kilometers is badly deteriorated asphalt pavement. The Marbel-Makar Road is 52.8 kilometers long and paved with concrete. The road continuing from Marbel towards Cotabato has 6.4 kilometers of concrete pavement and then mostly gravel.

An inventory of the roads in the area is presented in Table 4-2. It shows that at the time of the survey 19.2 percent of the roads in the area had Portland Cement Concrete Pavement (PCCP), 12.3 percent had asphalt concrete (AC), 57.9 percent had gravel surface, 4.7 percent were earth or dirt roads, and 5.9 percent were trails.

The majority of the bridges of the National Highway and other major roads are of reinforced concrete, in good condition. Their width is approximately seven meters with 0.75-meter sidewalks. A number of timber bailey bridges were noted on secondary roads and two river crossings had no structures whatever.

4.3 ROAD IMPROVEMENTS

Asphalting of the deteriorated section Marbel-Tantanagan of the road to Cotabato is planned to start this year, with completion scheduled for 1994. Presently, reinforced concrete pipes are being laid and reinforced concrete box culverts are being built at the site. The cost of the project is estimated at P 50.8 million, with a dollar component of US$ 1.76 million.

Of the eleven roads of the RIF project, Sector 11, General Santos-Baluyan, is already in its final design stage for upgrading; Sector 10, the General Santos City Bypass Makar-London, has not yet a recommended alignment; six other roads of this series will be upgraded from gravel and

Table 4-2
ROAD INVENTORY

ROAD SECTION	STATION LIMIT	LENGTH (km)	TYPE	WIDTH (m)	CONDITION
Digos-Makar Road (Nat'l. Road)	1669.766 - 1664.656	5.1	PCCP		Good
	1664.656 - 1620.356	44.3	AC		Good
	1620.356 - 1581.156	39.2	AC		Bad
	1581.156 - 1576.856	4.3	PCCP		Good
Marbel-Makar Road (Nat'l. Road)	1672.724 - 1725.500	52.8	PCCP		Good
Makar-Malalag-Buayan Airport Rd.	1663.548 - 1668.600	5.0	PCCP		Good
Digos-Makar-Lagao-Buayan Diversion Rd.	1663.353 - 1663.416	0.1	PCCP		Good
Makar-Kiamba Road	1672.562 - 1675.262	2.7	PCCP		Fair
Buayan Airport-Glan Rd.	1669.437 - 1670.216	0.3	PCCP		Fair
Davao del Sur-South Cotabato Coastal Rd.	1670.217 - 1768.017	97.8	Gravel		Fair
	1768.017 - 1788.000	20.0	Earth/Trail		Bad
Surallah-Lake Sebu-Maitum Road	1747.370 - 1747.870	0.5	PCCP		Good
	1747.870 - 1790.370	42.5	Gravel		Good to Fair
	1790.370 - 1799.370	9.0	Earth		Fair
	1799.370 - 1819.370	20.0	Trail		Bad
Cotabato-AllahValley-Marbel Road (Koronadal-Surallah-Kolambog)	1725.583 - 1776.983	51.4	PCCP		Good
Midsayap-Dulawan-Marbel Road (Marbel-Tantangan Road)	1725.583 - 1731.950	6.4	PCCP		Good
	1731.950 - 1749.888	17.9	Gravel		Fair
*GSC/Makar-Malisbong Road	1675.262 - 1779.862	104.6	Gravel	10.0	Fair
	1779.862 - 1795.762	15.9	Earth	4.0-6.0	Bad
*Polomolok-Landan Road	1688.789 - 1690.389	1.6	PCCP	6.5	Good
	1690.389 - 1693.789	3.4	Gravel	10.0-14.0	Fair to Bad
	1693.789 - 1704.289	10.5	Gravel to	4.0-12.0	Fair to Bad
			Earth	4.0-12.0	Bad
*Banga-Norala-Kolambog Road	1738.933 - 1762.133	23.2	Gravel	9.0	Fair to Bad
*Labu-Silway 8 Road	1641.213 - 1653.713	12.5	Gravel	3.0-5.0	Bad
	1653.713 - 1660.713	7.0	Earth	3.0-5.0	Bad
*Koronadal-Tampakan-Tupi Road	1710.983 - 1715.883	4.9	Gravel	8.0	Fair
	1715.883 - 1739.683	23.8	Gravel	4.0-8.0	Fair to Bad
*Surallah/Lamsugod-Tupi	1705.844 - 1718.644	12.8	Gravel		Bad
	1718.644 - 1735.744	17.1	Gravel		Impassable for vehicles
*Surallah-T'boli	1745.918 - 1767.318	21.2	Gravel	8.0-10.0	Fair to bad
TOTAL LENGTH		677.8			

Sources: DPWH Summary of National Roads for 1988
*Rural Infrastructure Fund studies
Legend: PCCP = Portland Cement Concrete Pavement
AC = Asphalt Concrete

earth to all-weather paved roads; the last three roads are not recommended to be paved because the corresponding Internal Rate of Return is below 15 percent, the requirement set by the National Economic Development Authority (NEDA). When all sectors are paved, as recommended, the total of paved roads in the area will have increased by 255 kilometers and the percentage of paved roads will be 37.6 percent.

For later years, say after 1994, NEDA proposes investments in three other road sectors: (1) continuation of the Sector 10 Road along the southern coast, from Maitum to Lebak, with a budget of P 94.4 million; (2) upgrading of the road between Malalag and Jose Abad Santos, along the East coast of Davao del Sur, with a budget of P 98.2 million; and (3) the Infrastructure Development Project for Cultural Minorities, with a budget of P 2 million.

Most of these improvement projects will have the effect of removing constraints in the transportation of agricultural commodities to the port and of increasing the area of influence of the port. Where farm to market transportation is facilitated, production and the general standard of living increases, which also would mean greater consumption of goods by the affected people in the area.

4.4 ROAD TRAFFIC

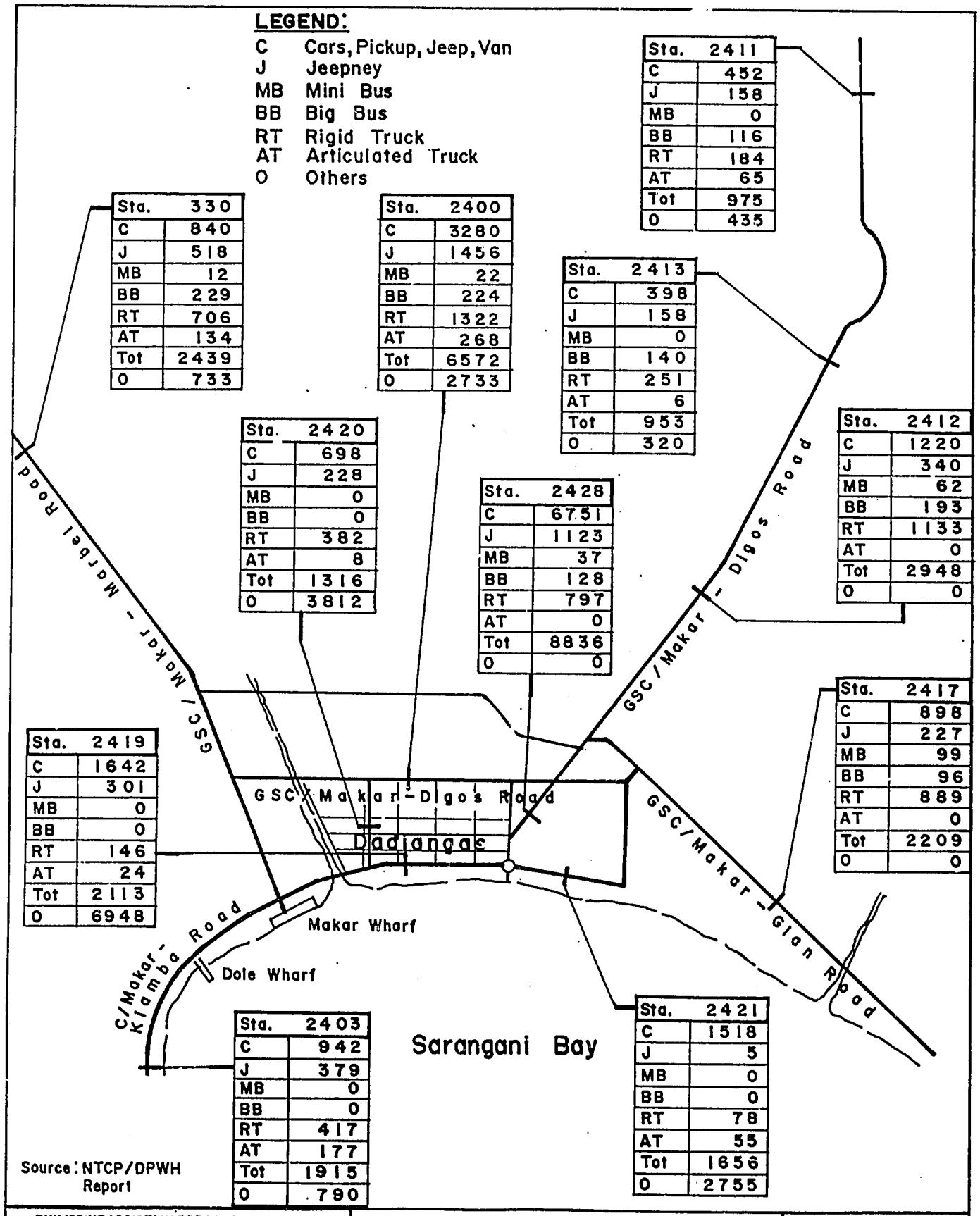
The port facilities around Davao and the port of Polloc, north of Cotabato City, are located in the southern part of Mindanao, close enough to General Santos City to be considered ports that compete with the Makar Wharf. The extent of that competition will depend, among others, on the efficiency of related transport facilities, such as roads.

For this Report, existing traffic data and related reports by others have been collected and reviewed to determine the traffic conditions on the road network of the area.

The National Traffic Count Program (NTCP) is a regular undertaking by the Infrastructure Planning, Research and Statistics Division (IPRSD) of the Department of Public Works and Highways (DPWH). The DPWH City and District Engineering Offices carry out the collection of field traffic data which are subsequently submitted to their Regional Offices for initial data processing. The processed data by the Regional Office are then submitted to IPRSD for further processing, analysis and compilation.

Figure 4-4, shows the location of traffic count stations in General Santos City and vicinity. Also shown are traffic volumes categorized by type of vehicle for each station.

The three seaports Davao City, Makar of General Santos City and Polloc of Cotabato City are directly inter-connected by the Maharlika Highway. Makar port, being located between the



Source: NTCP/DPWH Report

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MAKAR WHARF FEASIBILITY STUDY

1989 ANNUAL AVERAGE DAILY TRAFFIC (General Santos City)

FIGURE 4-4

other two ports by way of the Maharlika Highway, can be considered as a good alternate for both.

The Maharlika Highway section between General Santos City and Davao City has 11 traffic count stations, excluding those found under the cities of Davao and General Santos. The 1989 Annual Average Daily Traffic (AADT) along this road is 2330 vehicles per day. Of this daily traffic volume, 26% are trucks and the remaining 74% is shared by the other types of vehicles. The Maharlika Highway section between General Santos City and Polloc, Cotabato City, has 12 traffic count stations. The average 1989 AADT along this road is 1015 vehicles per day. Of this daily traffic volume, 24% are trucks and the remaining 76% is shared by the other types of vehicles.

Another source for traffic data is the Rural Infrastructure Fund Project Report, completed in October 1990 by Louis Berger International, Inc. jointly with TCGI Engineers. As far as Makar Wharf Project is concerned, the most valuable portion of this overall Rural Infrastructure Fund (RIF) project is the General Santos City/South Cotabato (GSC/SC) project report which covers feasibility studies of 10 road sectors for improvement and final design of General Santos City - Davao City national road for upgrading.

The scope of traffic study carried out under the GSC/SC project are: traffic manual count, roadside origin-destination interview, axle load scaling and travel time and delay.

The study of Makar Wharf Project is concerned more with truck traffic. The following list of RIF project roads shows the percentage of truck traffic based on the average daily traffic volume of each project road.

ROAD	TRUCKS IN %
Koronadal - Tampakan -Tupi	29.4
GSC/Buayan River - Glan	20.4
GSC/Makar - Malisbong	23.0
Polomolok - Landan	48.3
Surallah/Lamsugod - Tupi	17.4
Surallah - Lake Sebu	15.0
Surallah - T'boli	18.7
Banag - Norala - Kalambog	22.4
Labu - Silway 8	14.2
GSC/Lagao - Malungon - Baluyan	24.5

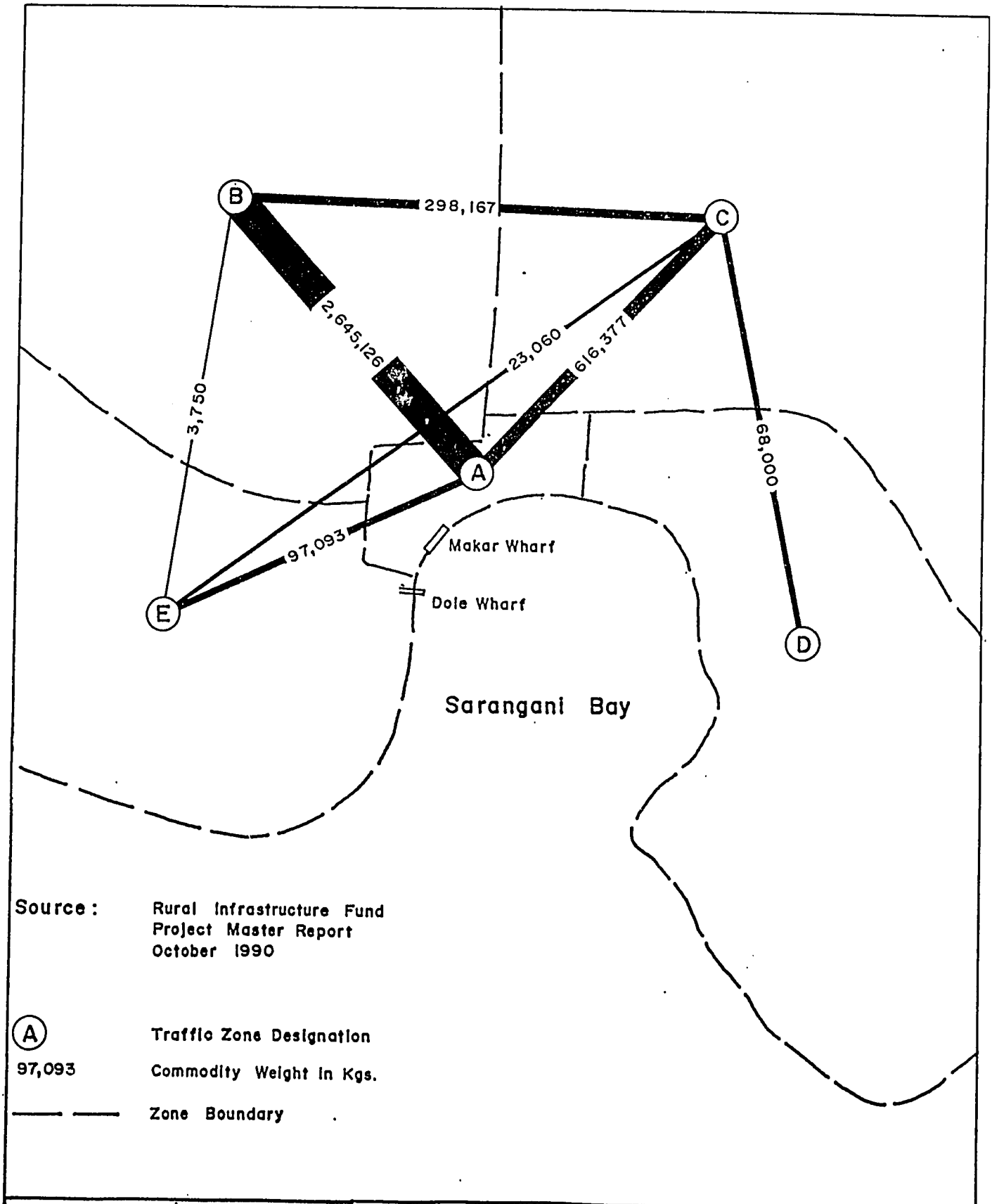
Trip desire lines were prepared for ten commodities with the corresponding percent of distribution:

01	Other Unprocessed Cereals, Agricultural Foodstuff and Cash Crops	32.17%
02	Copra	3.84%
03	Milled Rice	8.46%
04	Softdrinks and Beer	9.51%
05	Manufactured Foodstuffs, Consumer and Producer Goods	12.06%
06	Mineral Oil Products	11.22%
07	Cement	12.31%
08	Stone, Sand and Gravel	0.55%
09	Other Building and Construction Materials	2.77%
10	Fertilizer and Insecticides	7.11%

Figure 4-5, shows the summary of the trip desire lines for all ten (10) commodity categories. Of the total commodity weight of 3,751,573 kgs. surveyed, the highest commodity movement in the figure of 2,645,126 kgs. or 70.51% is between zone A and B, whereas, the lowest at 3,750 kgs. or 0.10% is located between Zone B and Zone E. Traffic Zone A specifically covers General Santos City, wherein Makar Wharf Project is located. The origin-destination data presented in this report could have been more valuable, if similar data had been made available for Makar Wharf, in which the present study is most interested.

In the absence of traffic data within the road section between the National Highway Junction and Makar Wharf, the Consultant's team conducted short-period manual traffic classification counts to determine the traffic characteristics and volume to and from Makar and the coastal towns beyond. The fractional traffic count has been adjusted to express it in 1991 Annual Average Daily Traffic as shown in Figure 4-6. 51% of the total roadway traffic comes from the direction of Makar and 49% goes toward the direction of Makar. In terms of vehicle type distribution, Figure 4-6, shows the following characteristics:

♦ Car	29.60%
♦ Jeepney	16.97%
♦ Mini Bus	0.16%
♦ Big Bus	0.05%
♦ Rigid Truck	9.93%
♦ Articulated Truck	0.74%
♦ Tricycle (Motorized)	19.57%
♦ Motorcycle	15.91%
♦ Others	7.07%
♦ Total	100.00%



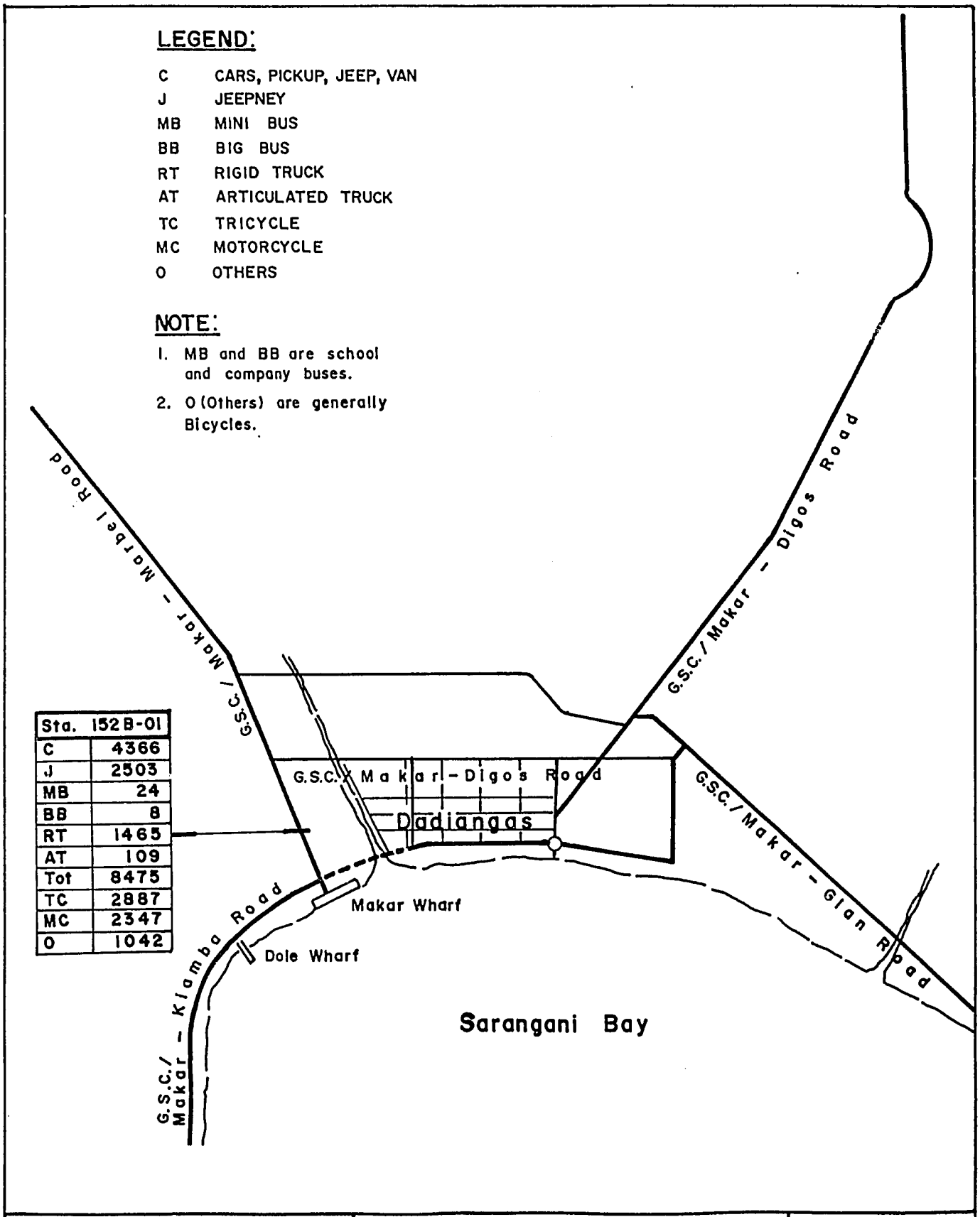
Source: Rural Infrastructure Fund Project Master Report October 1990

(A) Traffic Zone Designation

97,093 Commodity Weight in Kgs.

—— —— Zone Boundary

PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0098-00	MAKAR WHARF FEASIBILITY STUDY	FIGURE 4-5
LOUIS BERGER INTERNATIONAL, INC. • LOCKWOOD GREENE INT'L • TRANS-ASIA (PHIL.), INC. • ERNST & YOUNG INT'L • CONSULTANT MANAGEMENT SERVICES, INC. • GLOBETROTTERS ENG'G CORP.	TRIP DESIRE LINES SUMMARY OF COMMODITIES	



Sta.	152B-01
C	4366
J	2503
MB	24
BB	8
RT	1465
AT	109
Tot	8475
TC	2887
MC	2347
O	1042

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MAKAR WHARF FEASIBILITY STUDY

1991 ANNUAL AVERAGE DAILY TRAFFIC
GENERAL SANTOS CITY

FIGURE 4-6

Review of the NTCP and RIFP Reports showed that there are four instances where traffic count stations of both are in the same location. For purposes of determining the growth trend of vehicular traffic in the influence area from 1989 to 1990, traffic data of the four stations have been compared. Based on the overall figures of the four stations, the result shows that from 1989 to 1990, cars decreased by 10.7 percent, jeepneys increased by 127.6 percent, mini buses decreased by 82.6 percent, big buses decreased by 20.8 percent, rigid trucks decreased by 95.8 percent, and other vehicle types increased by 215.6 percent. In terms of all vehicles, excluding vehicles classified as "Others", there is an increase of 3.0 percent.

This traffic growth trend is not readily acceptable as a basis for updating the 1989 and 1990 traffic volumes to 1991 traffic volumes due to the short time base. More acceptable traffic growth factors are those set by feasibility studies carried out in the project's influence area, or from areas with similar characteristics in the form of land use, among others.

4.5 ROAD CAPACITY

The capacity of the roads in the project's influence area was determined and compared with the actual traffic. This gives a measure of the constraint that may hamper the traffic in and out of the port area. The theoretical capacity of two-lane two-way roads to carry an equivalent number of passenger cars, is given in the following table:

TWO-LANE TWO-WAY ROAD CAPACITY

Type	Passenger Cars Per Hour (PCPH)
Major Rural	2400 [1]
Minor Rural	1200 [2]
Urban Arterial	1800 [3]

[1] None/Light side friction
[2] Narrow/below standard
[3] Heavy side friction

Side friction in this context means the amount of establishments along the side of the road which would cause traffic to be affected by vehicles leaving and entering the roadway. It also includes the amount of vehicles that may for any other reason want to stop along the roadway, for example to pick up or discharge passengers or cargo.

To take all types of vehicles into account, the Highway Planning Manual of the Department of Public Works and Highways (DPWH) has established the following passenger car equivalents:

Vehicle Type	Passenger Car Equivalent (PCE)
Car	1.0
Jeepney	1.5
Mini Bus	2.0
Big Bus	2.0
Rigid Truck	2.0
Articulated Truck	2.0
Motor-Tricycle	2.5
Motorcycle	0.5

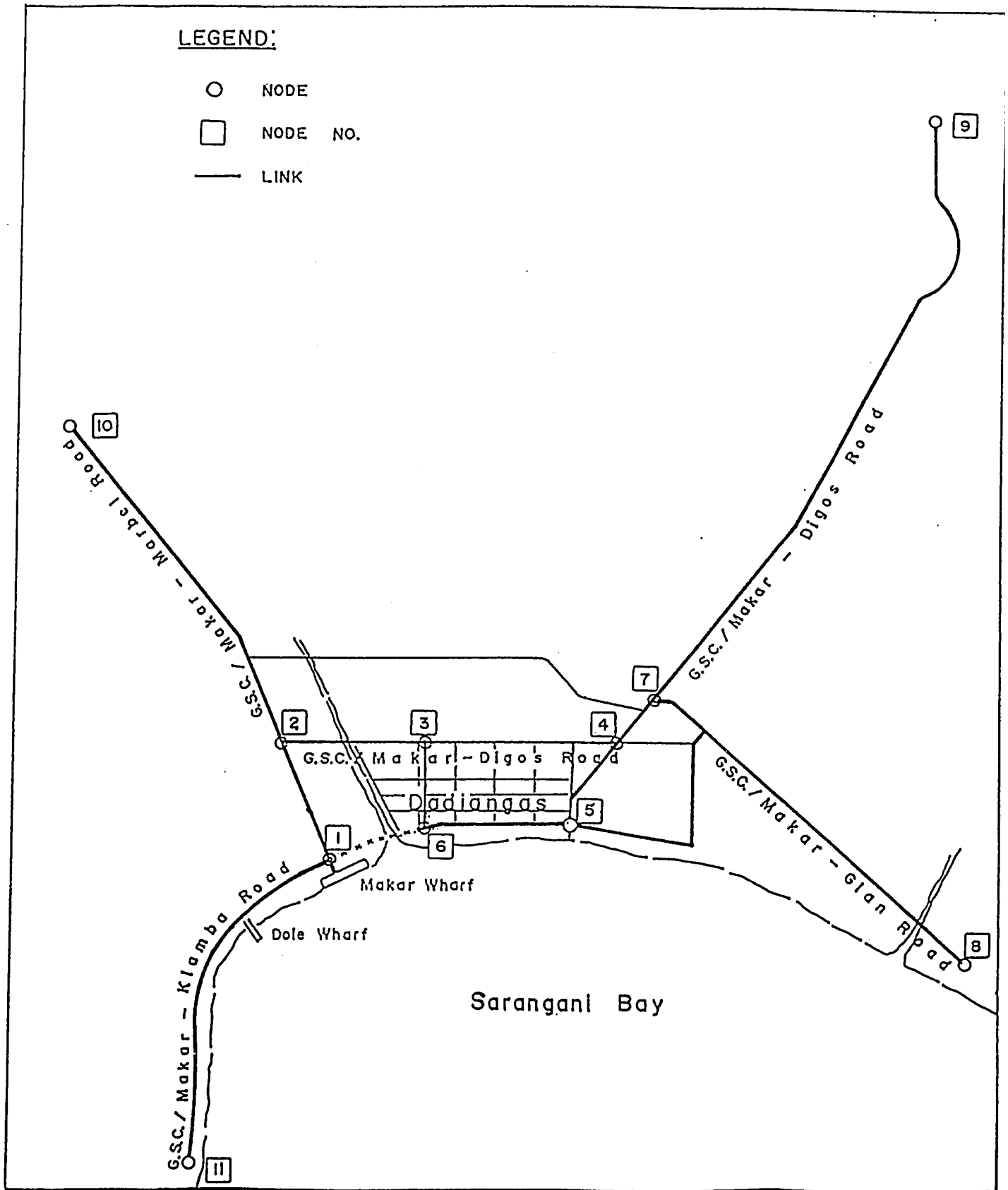
The classification "car" includes, in addition to automobiles - private or taxis - jeeps, pickups and vans.

The Consultant's road survey indicated that the existing traffic on the minor rural roads was far below the allowable capacity, a fact confirmed by previous reports on the roads of the area. No further investigation was conducted on these roads. The major roads leading to Makar Wharf, however, were analyzed for their capacity to carry the present and future vehicle traffic.

The major roads and streets in the vicinity of Makar Wharf are shown in Figure 4-7, together with the corresponding nodes. In Table 4-3 the relationship between traffic volume and road capacity is analyzed. The daily traffic volume, averaged over one year, is translated into a peak hourly volume, which is then compared with the road capacity, in accordance with the type of road. This was done for all major links between nodes in the area.

From Table 4-3 it can be seen that links 1-2 and 3-4, with v/c ratios of 0.82 and 0.71, carry heavy traffic. They presently exhibit unstable flow, with operating speeds in the vicinity of 35 kilometers per hour. If the proposed development plans in General Santos City and in South Cotabato are realized, these road links will eventually be saturated and attain a v/c ratio of 1.0 or more. Such condition will require widening of these links or the provision of alternate routes, such as 4-5, 5-6, and 6-1, or the proposed diversion road to the north, which would still leave the need to improve the link 1-2.

Road links 4-5, 5-6, and 3-6 exhibit a level of service between level B and level C as indicated by their v/c ratios. They have moderate traffic volume and most often at free flow condition. Road links 1-11, 2-10, 7-9 and 7-8 are at level of service A which requires a v/c ratio of 0.20 and less. No traffic congestion is expected along these road links, unless drastic changes in land use in the influence area occurs.



PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-C098-00	**MAKAR WHARF FEASIBILITY STUDY**	**FIGURE 4-7**
LOUIS BERGER INTERNATIONAL, INC. • LOCKWOOD GREENE INT'L. • TRANS-ASIA (PHIL.), INC. • ERNST & YOUNG INT'L. • CONSULTANT MANAGEMENT SERVICES, INC. • GLOBETROTTERS ENG'G CORP.	LINK AND NODE SYSTEM	

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Table 4-3
VOLUME - CAPACITY RELATIONSHIP

ROAD LINK	AADT		EXISTING VOLUME	CAPACITY	V/C RATIO
	MV	PCU	(pcph)	(pcph)	
1 - 2	13709	19725	1970	2400	0.82
3 - 4	8840	12784	1280	1800	0.71
4 - 5	8836	10340	1035	1800	0.58
5 - 6	7879	11709	1170	1800	0.65
3 - 6	4480	6910	690	1800	0.38
1 - 11	2570	3753	375	2400	0.16
2 - 10	3047	4757	475	2400	0.20
7 - 9	2948	4506	450	2400	0.19
7 - 8	2209	3406	340	2400	0.14

Note:

AADT	Annual Average Daily Traffic
MV	Mixed Vehicle
PCU	Passenger Car Unit
PCPH	Passenger Car Per Hour
V	Volume
C	Capacity

Source:

1. NTCP/DPWH Traffic Data
2. Consultant Estimate

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4.6 VEHICLE OPERATING COSTS

The vehicle operating cost (VOC) presented herein is derived from the National Road Improvement Project (NRIP) Final Report dated October 1989 prepared by Louis Berger International, Inc. in association with TCGI Engineers.

The vehicle operating costs presented in the NRIP Report are for each project road as shown in Table 4-4, 1988 Vehicle Operating Costs. In several cases, most of the project roads are composed of more than one type of surfacing and different surface conditions however, with single or uniform VOC applied over its whole length. In such a case, there is no way to identify the VOC for each surface type and corresponding surface condition. Where VOC values can not be derived directly from the NRIP report, estimates have been made by extrapolation based on NRIP report available values. The results are shown in Table 4-5.

Table 4-4

1988 VEHICLE OPERATING COST IN PESOS/KM

ROAD SURFACE		ROUGHNESS	VEHICLE TYPE					
TYPE	CONDITION	(in/km)	CAR	JEEPNEY	MINI BUS	BIG BUS	IGID TRUC	ART TRUCK
	Very Good	< 80	1.629	1.457	2.469	3.690	4.891	8.117
Portland	Good	80 - 110	1.775	1.588	2.690	3.860	5.116	8.491
Cement	Fair	110 - 140	1.921	1.718	2.912	4.030	5.342	8.865
Concrete	Poor	140 - 180	2.029	2.200	2.960	4.321	6.207	9.416
	Bad	180 - 230	2.137	2.682	3.007	4.612	7.072	9.968
	Very bad	230 >	NA	NA	NA	NA	NA	NA
	Very Good	< 70	1.425	1.275	2.160	3.229	4.280	7.102
Asphalt	Good	70 - 120	1.552	1.390	2.345	3.378	4.478	7.430
Concrete	Fair	120 - 170	1.680	1.504	2.547	3.527	4.675	7.757
or Bituminus	Poor	170 - 220	1.775	1.747	2.589	3.782	5.432	8.239
Surface	Bad	220 - 270	1.870	1.990	2.631	4.036	6.189	8.721
	Very bad	270 >	NA	NA	NA	NA	NA	NA
	Very Good	< 200	2.715	2.125	3.600	5.382	7.133	11.837
	Good	200 - 250	2.958	2.316	3.922	5.630	7.462	12.383
Gravel	Fair	250 - 300	3.202	2.506	4.245	5.878	7.791	12.929
or Earth	Poor	300 - 360	3.382	2.912	4.316	6.303	9.154	13.735
	Bad	360 - 450	3.561	3.318	4.386	6.728	10.318	14.541
	Very bad	450 >	NA	NA	NA	NA	NA	NA

Source: NRIP Report, Oct. 1989

NA: Not Available

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CHAPTER 5

THE EXISTING PORT

5.1 PORT LAYOUT AND DESCRIPTION

5.1.1 Location

The Port is situated at the head of the Sarangani Bay in General Santos City, South Cotabato, roughly midway along the southern coast of Mindanao.

General Santos City is composed of several urban and rural barangays or townships. Dadiangas, which is the principal town, is the administrative and social center of General Santos City. The Port of General Santos City is also commonly known as the Makar Wharf. It is located in Barrio Calumpang, Barangay of Labangal which is situated at about three km southwest of Dadiangas. The wharf's name was derived from its proximity to the mouth of the Makar River and Makar Cove in Sarangani Bay.

Sarangani Bay is about 16 km across at its widest and is about 33 km long from its entrance in the Celebes Sea. It is aligned roughly SSW-NNE and is very deep reaching 1450 m (791 fathoms) at its entrance. The port of General Santos at Makar is situated in the NW corner of the bay, south of a low headland known as Dumpao Point, which is a coral reef and north of another coral reef known as Calumpan Point. Roughly halfway between these two points is the mouth of Makar River which discharges into the Makar Cove. The southwestern tip of the existing wharf is about 350 meters away from the mouth of Makar River.

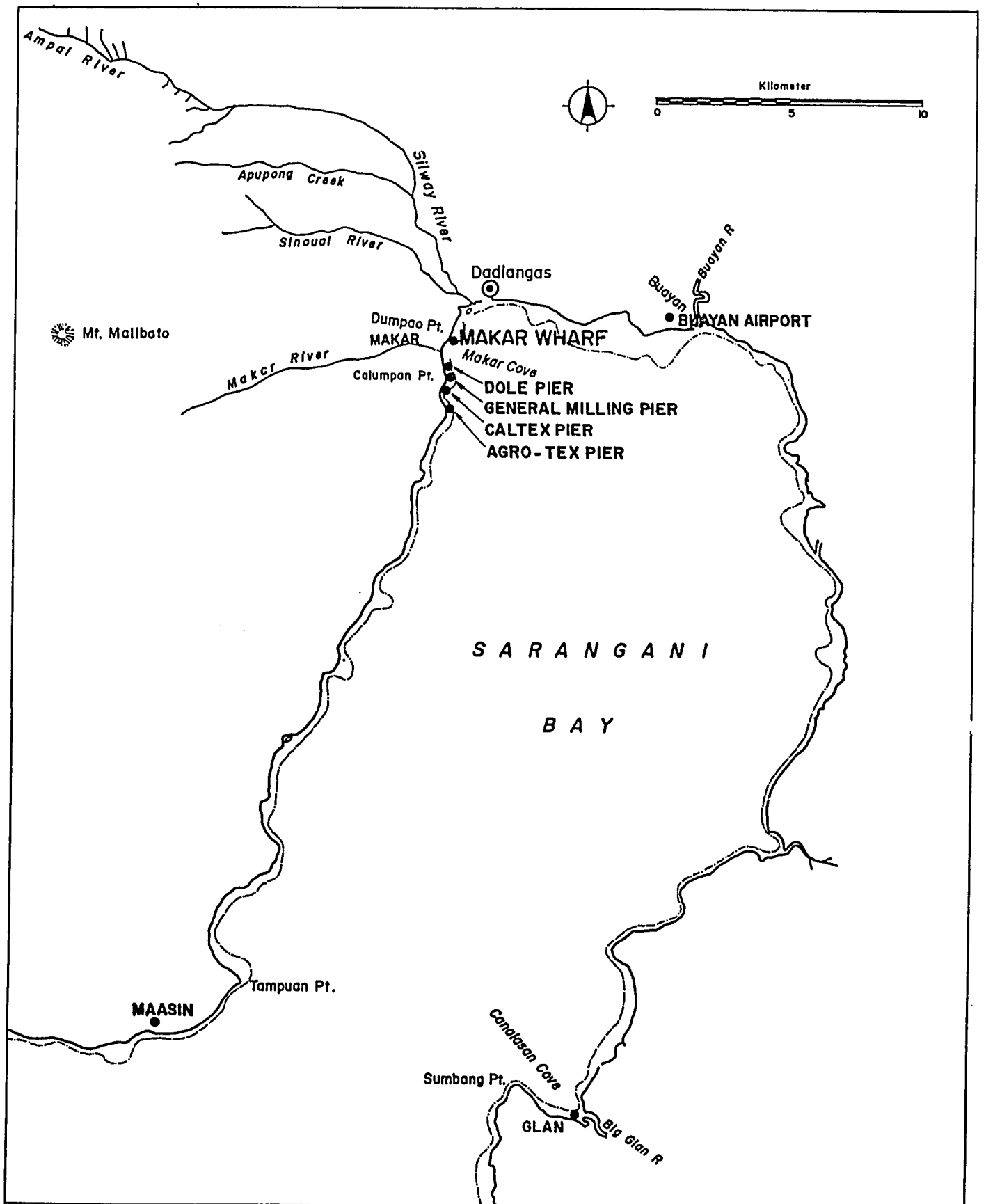
There are four private port facilities located South of Makar Wharf. One is owned by Dole Philippines, a fruit packing company, another belongs to Caltex Philippines, an oil company, and the third to General Milling Corp which handles the domestic export of grains and cereals. The fourth private port is currently under construction and is owned by Agrotex.

There is also another municipal port within the Sarangani Bay situated in Glan, South Cotabato, at the southeastern corner of the bay near its entrance.

A map showing the location of Makar Wharf and the private ports is presented in Figure 5-1.

5.1.2 Port Layout

The Port of General Santos City has a total land area of about 10.11 hectares with a docking length of 561 meters which could accommodate berthing spaces for about seven vessels at a



PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0089-00	MAKAR WHARF FEASIBILITY STUDY	FIGURE 5-i
LOUIS BERGER INTERNATIONAL, INC. •LOCKWOOD GREENE INT'L. •ERNST & YOUNG INT'L. •GLOBETROTTERS ENG'G CORP. •TRANS-ASIA (PHIL.), INC. •CONSULTANT MANAGEMENT SERVICES, INC.	LOCATION OF MAKAR WHARF	

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given time. Berth spaces at the wharf are numbered consecutively starting from the west proceeding to the east. Berths 1 through 4 are along the 261 meter length of the original wharf. Berths 5 through 7 are along the 300 meters of the newer wharf addition.

Port facilities in the area include an administrative building, fire station, elevated and underground water tanks, port lighting, concrete roadways, fire hydrants, five open storage areas, six private warehouses, three transit sheds, two amenity blocks, a passenger terminal, and offices of local shipping and cargo handlers, customs bureau, port police, palm oil storage tanks, truck scale house and weighbridge and others.

A plan showing the Port layout and location of the port facilities is shown in Figure 5-2. Based on the site development plan, a tabulation of the areas occupied by each of the buildings, structures and facilities inside the port is shown in Table 5-1. A pie chart showing the distribution of port area usage is shown in Figure 5-3. The chart indicates that port area utilization is about 75 percent inasmuch as open spaces constitute about 25 percent of the port area.

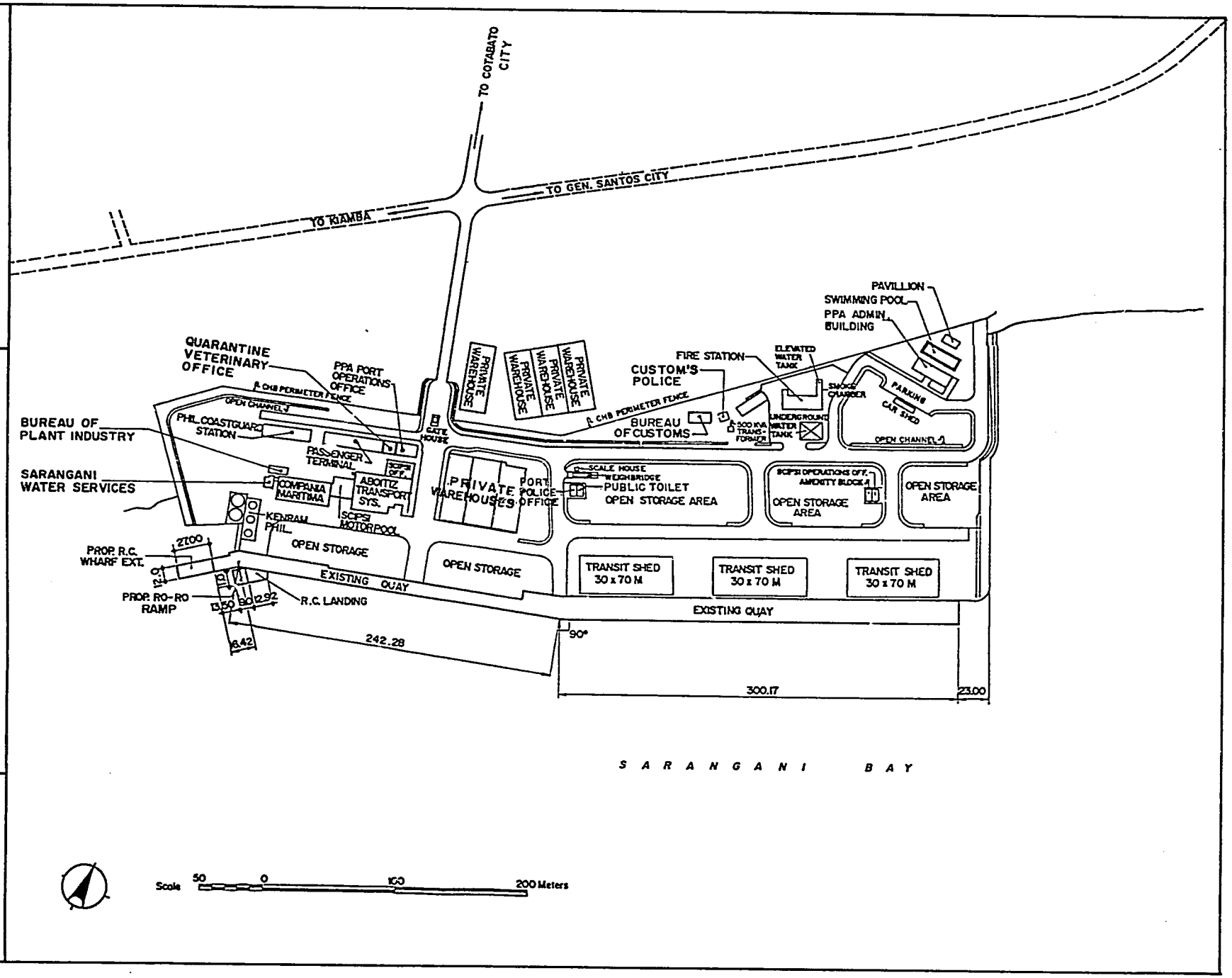
5.1.3 The Wharf

5.1.3.1 Wharf Structure

The wharf is a reinforced concrete structure which is a typical open-piled quay with raking piles. The total length of the quay is composed of about 153 bents spaced 3.00 to 5.00 meters apart. Rock bunds enclose the reclaimed areas and the fill material is retained behind the wharf by reinforced concrete sheet piles.

The original berthing face of the wharf was 21.00 meters long and aligned at about 18 degrees to the shoreline and lying roughly NE-SW. It was built in 1954 as a causeway with a reinforced concrete T-head pier with a design live loading of 200 pounds per square foot (psf). In 1958, both ends of the T-head were extended with two piers, 48 meters long each, and with the same design live loading of 200 psf. In addition, an area of 30 m by 32 m was reclaimed and a passenger and cargo shed were built on it. The third phase of development was completed in 1970 with the extension northeastward of about 60 meters together with a rock causeway and further reclamation behind the extension and the existing NE arm of the wharf. In addition, the wharf was extended southwestward a further 67.5 meters. Finally, at that time a 16.5-meter extension was built, angled at 22.5 degrees to the SE end. Design live loading for these extensions was increased to 300 psf. A typical cross section of this southern part of the wharf is shown in Figure 5-4.

The most recent extension to the wharf was completed in 1978, extending the northeastern end of the wharf by an additional 300 meters, that forms an angle of five degrees with the original quay line. A typical cross section of this Northern part of the wharf is shown in Figure 5-5.



PHILIPPINE ASSISTANCE PROGRAM SUPPORT
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
CONTRACT NO.: 492-0432-C-00-0090-00

LOUIS BERGER INTERNATIONAL, INC.
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• DIMETROTTAS ENG'G CORP.
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MAKAR WHARF FEASIBILITY STUDY

LAYOUT OF EXISTING PORT FACILITIES

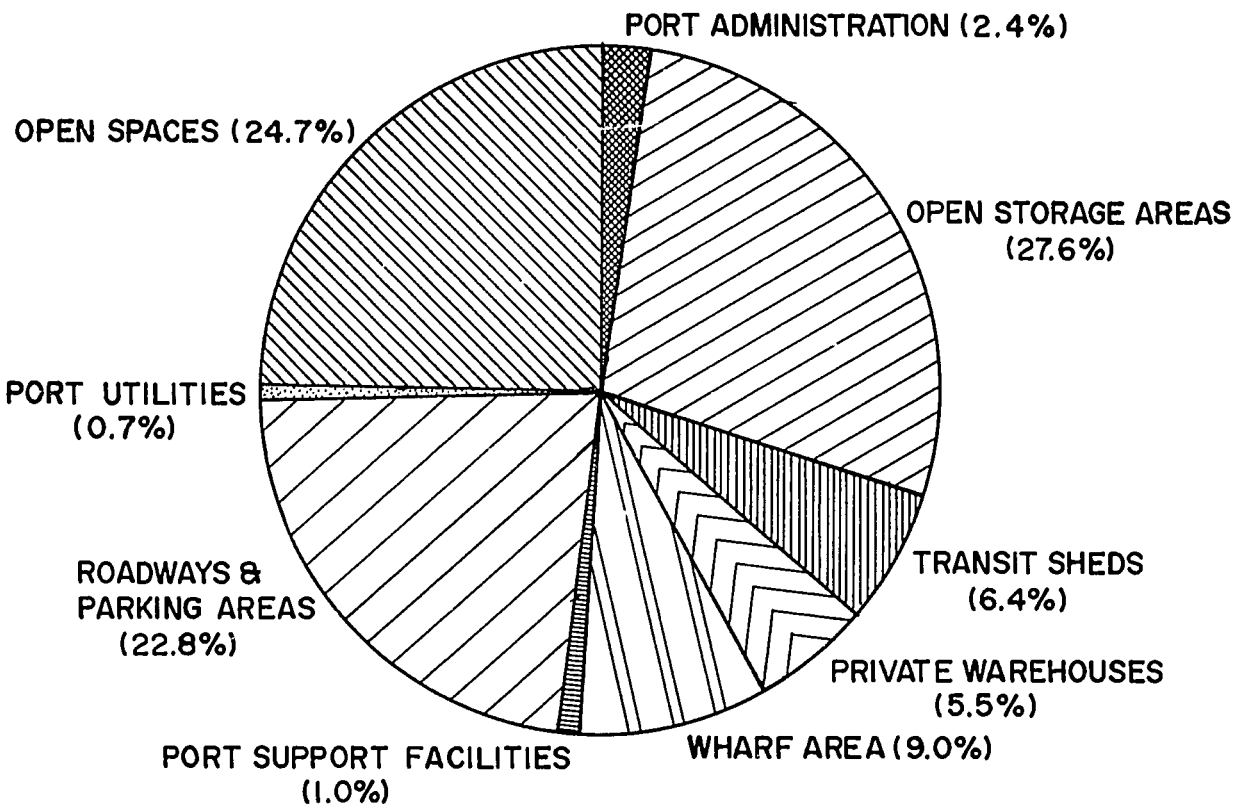
FIGURE 5-2

Table 5-1

DISTRIBUTION OF PORT AREA USE

PORT FACILITY	AREA (SQ.M.)	
PORT ADMINISTRATION		2,397
Administration Building	336	
Swimming Pool	220	
Pavilion	88	
Car Shed	68	
Port Operations Office	100	
Port Police Office	50	
SCIPSI Admin Bldg & Clinic	260	
SCIPSI Motorpool	255	
SCIPSI Operations Office	50	
Bureau of Customs	153	
Customs Record Stockhouse	36	
Bureau of Plant Industry	300	
Bureau of Animal Industry	50	
Sarangani Water Services	71	
Philippine Coast Guard	360	
OPEN STORAGE AREAS		27,925
Open Storage No. 1, Bituminous	6,850	
Open Storage No. 2, Bituminous	4,560	
Open Storage No. 3, Bituminous	2,950	
Open Storage No. 4, Concrete	3,100	
Open Storage No. 5, Concrete	3,465	
Open Storage beside Transit Sheds, Concrete	7,000	
PRIVATE WAREHOUSES		5,558
William Lines Inc	1,102	
Sulpicio Lines	685	
Eastern Shipping Lines	1,103	
Aboitiz Shipping	985	
Compania Maritima (Sampaguita Shipping)	736	
Go Thong Lines (Lorenzo Shipping)	325	
Kenram Oil Tanks	622	

PORT FACILITY	AREA (SQ.M.)	
TRANSIT SHEDS		6,480
Transit Shed No. 1	2,160	
Transit Shed No. 2	2,160	
Transit Shed No. 3	2,160	
WHARF AREA		9,050
Old quay area	2,780	
New quay area	6,270	
PORT SUPPORT FACILITIES		990
Weighbridge	100	
Truck Scale House	10	
Guest House	180	
Passenger Terminal Bldg	600	
Amenity Block No. 1	50	
Amenity Block No. 2	50	
ACCESS ROADWAYS & PARKING AREAS		23,046
PORT UTILITIES		665
Gate House	14	
Fire Station Building	328	
Elevated Water Tank	12	
Smoke Chamber	12	
Pumphouse	34	
Underground Water Tank	245	
Transformer Substation	20	
OPEN SPACES		24,989
TOTAL AREA OF PORT		101,100



Source - CONSULTANT'S SURVEY

PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0099-00	MAKAR WHARF FEASIBILITY STUDY	FIGURE 5-3
LOUIS BERGER INTERNATIONAL, INC. • LOCKWOOD GREENE INT'L • TRANS-ASIA (PHIL.), INC. • ERNST & YOUNG INT'L • CONSULTANT MANAGEMENT SERVICES, INC. • GLOBETROTTERS ENG'G CORP.	DISTRIBUTION OF PORT AREA USE	

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PHILIPPINE ASSISTANCE PROGRAM SUPPORT
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
CONTRACT NO.: 492-0452-C-00-0099-00

LOUIS BERGER INTERNATIONAL, INC.
•LOCKWOOD GREENE INTL.,
•ERNEST & YOUNG INTL.
•GLOBETROTTERS ENGR CORP.
•TRANS-ASIA (PHIL.), INC.
•CONSULTANT MANAGEMENT SERVICES, INC.

MAKAR WHARF FEASIBILITY STUDY

TYPICAL CROSS SECTION SOUTHERN PART OF WHARF

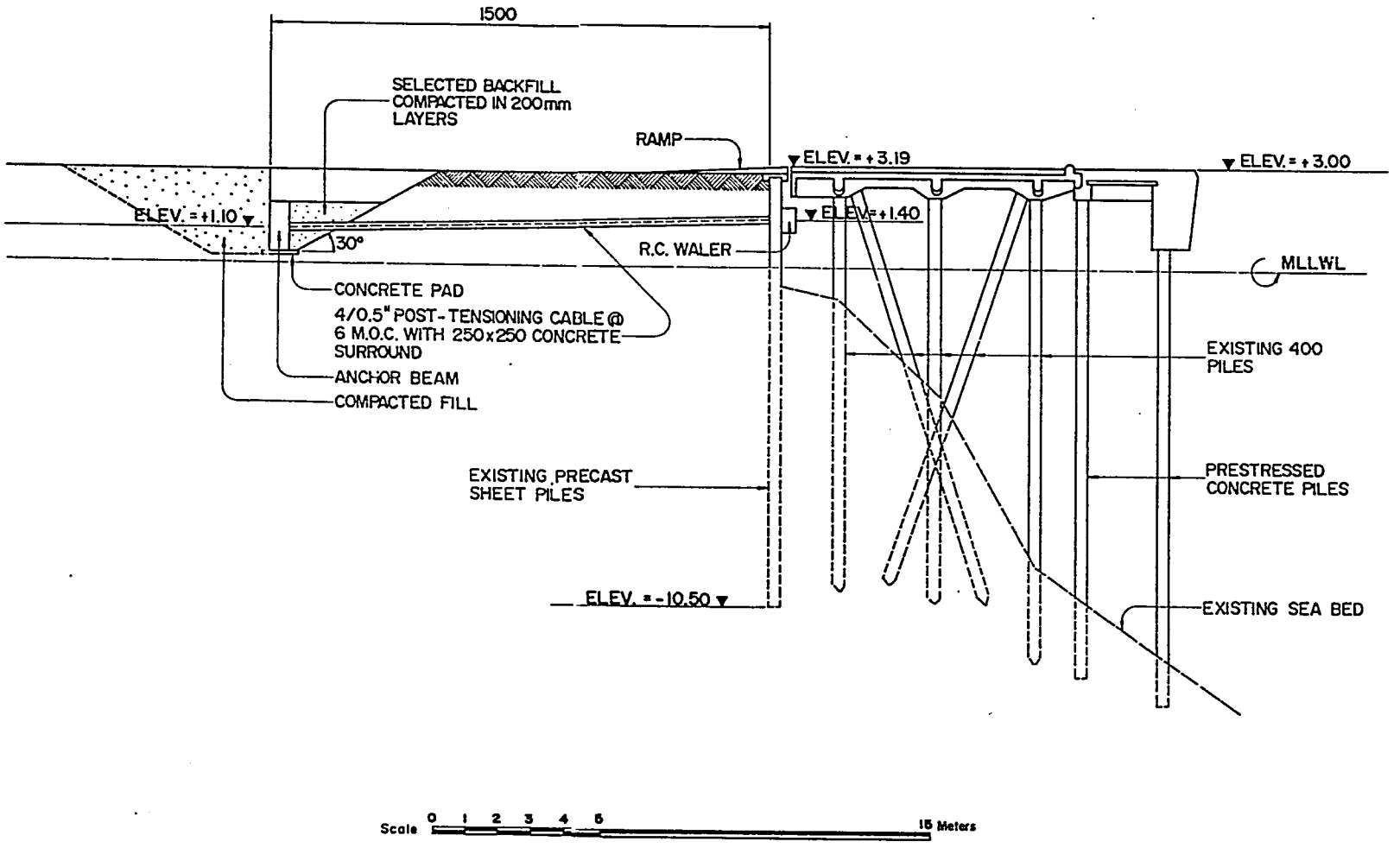
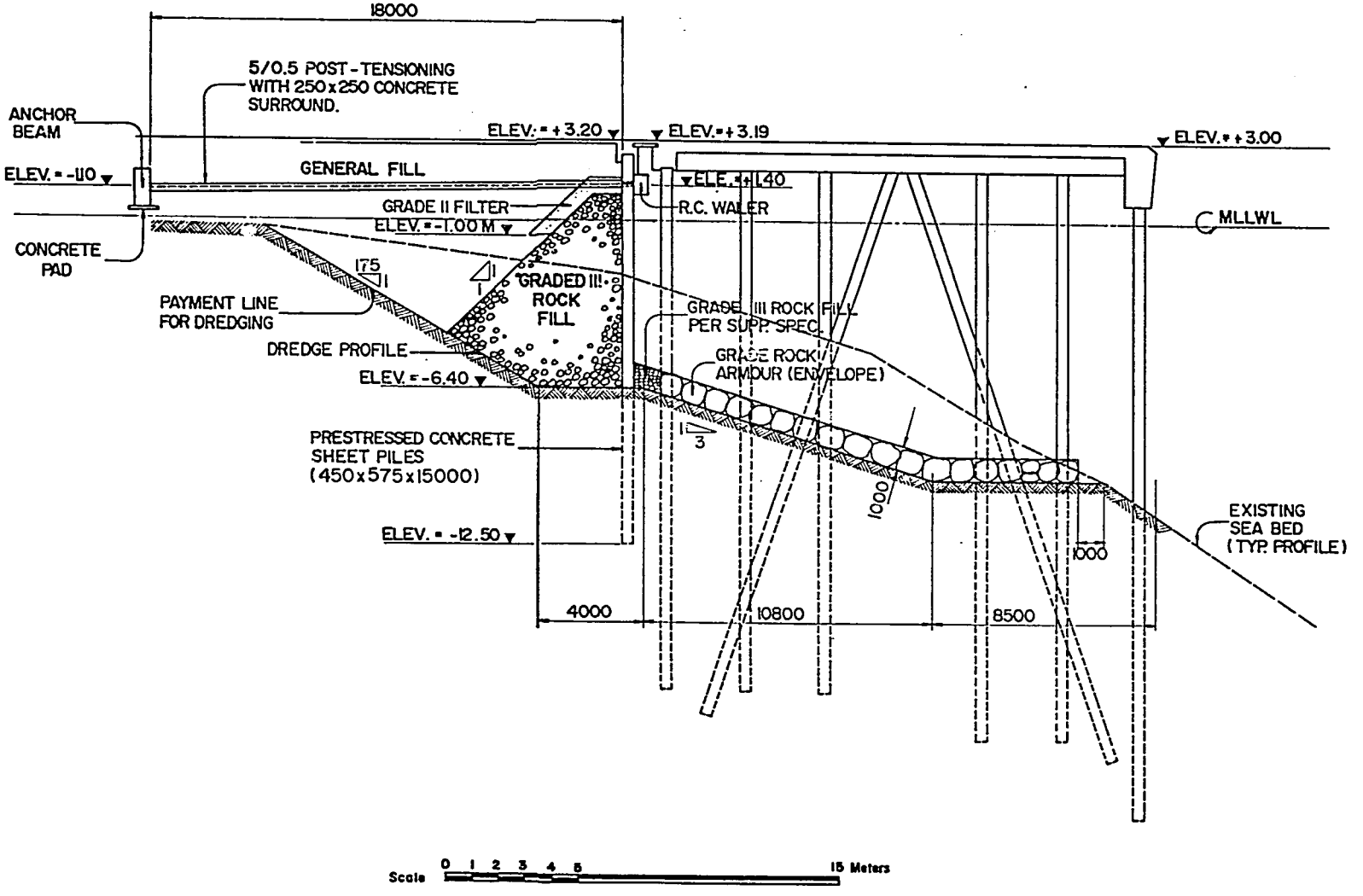


FIGURE 5-4



PHILIPPINE ASSISTANCE PROGRAM SUPPORT
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
CONTRACT NO.: 492-0482-C-00-0099-00

LOUIS BERGER INTERNATIONAL, INC.
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•ERNST & YOUNG INT'L.
•LOBENTHOTTER DRYG CORP.
•TRANS-ASIA (PHIL.), INC.
•CONSULTANT MANAGEMENT SERVICES, INC.

MAKAR WHARF FEASIBILITY STUDY

TYPICAL CROSS SECTION NORTHERN PART OF WHARF

FIGURE 5-5

Reclamation behind the extension furnished additional upland area. A design live loading of 300 psf was used for this quay extension. Also included in this development phase was the rehabilition of the existing quay, which is now commonly referred to on some drawings as the "old quay". The recent addition to the quay is referred to as the "new quay".

An ocular inspection of the top deck shows signs of repair. Cracks on the deck's wearing course, caused by temperature change and shrinkage, were patched with cement and epoxy grout. These cracks apparently do not affect the structural integrity of the deck slab.

Ongoing settlement of the earth fill behind the sheet pile walls were also observed. The difference in levels of the quay deck and the adjacent slab on fill was measured to be about a maximum of 60 mm. This is typically due to the long-term consolidation of the fill. The observed settlement, however, is not indicative of a major failure of the sheet pile system.

The Consultant conducted a brief inspection of the underdeck at the older section of the quay. It showed that maintenance and rehabilitation work had been made mostly by epoxy applications or injections and concrete guniting. Traces of patched concrete to replace spalled concrete were also noted. A significant number of cracks still existed on beams, pile tips and slab soffits in spite of the recent guniting repairs.

Beam cracks were observed mostly at the junction of the haunched beams and prismatic beams. Diagonal cracks brought about by flexural and shear overstresses were also observed. Flexural cracks at the midspans which reflect overloading of the beam under gravity loads are also visible. Longitudinal cracks at the bottom and sides of the beams were also noted. These cracks are probably due to the corrosion of the longitudinal reinforcements of the beams. Roughly, around 15 percent of the beams observed had visible cracks.

The slabs also showed signs of concrete patching and guniting. Cracks due to punching shear were observed. Some of these cracks are still progressing while some have been repaired. Some concrete spalling of the slab soffits were also observed. The damaged slabs represent about 10 percent of the slabs in the older quay.

The cracks noted were due to overloading of the wharf deck itself. The design load of the older deck was not intended for crane loads and the 1974 strengthening seems not to have been sufficient. At the time of inspection, a mobile crane was unloading cargo from a ship berthed near the area where most of the cracks were observed. The punching cracks on the underdeck may probably been brought about by the outriggers of the mobile crane used on the wharfside. In this regard, it is necessary to minimize, if not totally ban, the use of mobile cranes on the deck.

Recommendation for a thorough inspection and remedial measures are presented in another section of this Report.

5.1.3.2 Piles

Foundation piles for the wharf are of prestressed precast concrete. Each bent in the older quay which is 12 meters wide consists of five vertical piles and one batter pile. Each bent in the 19-meter wide newer quay has six vertical piles and two batter piles. A total of 199 piles were driven in the old quay and 556 piles in the new quay with a total of about 15,450 meters of pile length. Bearing capacity of the piles is about 60 metric tons.

A random ocular survey of the pile tips and jackets above the water level revealed cracks on the pile tips and jackets under the older quay area, especially between bent numbers 40 and 50. Some vertical piles were found to have horizontal cracks just below the beams and some batter piles were found to have vertical cracks at their tips, progressing into the beams. Cracks perpendicular to the pile axis were also noted. The cracks indicate that the piles were subjected to tension at one time or another, probably during earthquake or due to horizontal loads from vessels.

5.1.3.3 Fendering System

The fendering system of the wharf is intended to absorb the impact energy of the vessel berthing at the quay. Horizontal, vertical and diagonal tubular rubber fenders, about 400 mm in diameter, are suspended by means of galvanized steel chains. Vertical fenders had been installed at each of the 129 bents of the quay wall. However, at the time of inspection, all of the vertical fenders were missing, except at the southwestern corner of the quay wall. 21 out of 319 horizontal and diagonal fenders are also missing. Most of these missing fenders are those which are in front of Transit Sheds No. 1 and 2. In total, the missing fenders represent about 33 percent of the original number. The Philippine Ports Authority (PPA) has in previous years followed a program of replacing fenders as they are ripped off but fell behind in this task. At this point, the PPA has a budget appropriation of about ₱ 500,000 for the replacement and maintenance of the fender systems.

5.1.3.4 Mooring Accessories

Cast-iron mooring bitts or bollards are spaced every 18 meters on the edge of the deck. Single bitts of 30-ton capacity are installed in the "old" quay and double bitts (open-choke type) of 60-ton capacity are installed at the "new" quay.

5.1.3.5 Kerbs

Most timber kerbs at the quay edges have been replaced with concrete kerbs, although some timber kerbs are still intact at Berth No. 7. Ongoing maintenance activities continue to replace the old timber kerbs. Anchorage for the new concrete kerbs is provided by welding the

reinforcements to the anchor bolts originally intended for the timber kerbs. Some of the concrete kerbs already in place in the old quay, however, have already been damaged, probably by the Ro-ro vessel landing and also by heavy equipment.

5.1.3.6 Ladders

Steel ladders, spaced every 100 to 120 meters, are provided at the face of the dock. They serve not only to allow access to vessels of low freeboard and to small boats, but also as a safety measure for anyone who falls into the water. The ladders show a high degree of corrosion and need immediate replacement.

5.1.4 Buildings

The buildings within the port area comprise the following:

- Administration Building. This two-storey reinforced concrete building housing the Philippine Port Authority (PPA) Office is 10 m by 30 m in area with a flat roof deck. Situated at its rear is a 8 m by 28 m untiled swimming pool and a temporary pavilion building made of wood & bamboo sidings and nipa roofing. The open parking area at its front is concrete paved and a timber carshed with concrete columns is provided for eight cars.

- Guest House. This 10 m by 18 m bungalow type structure has four bedrooms, living room, dining room and kitchen.

- Fire Station Building. The building has two bays, one vehicle maintenance bay and equipment bay. However, no fire fighting vehicle exists at the port and the building is used for storage.

- Transit Sheds. There are three transit sheds which provide covered storage for cargo. The sheds are about 30 m by 72 m in size and made of locally fabricated steel trusses and aluminum roof sheeting on concrete columns and hollow blockwork walls. Shed No. 1 is leased by Trans-Asia Shipping and also houses the pilot's office. Shed No. 2 is leased by Fertim, a dealer in fertilizers. Shed No. 3 is leased by the National Food Authority.

- Private Warehouses. These private warehouses were erected by the shipping offices on lots leased from the PPA. The five warehouses are leased by the following shipping offices: Aboitiz Shipping, Sulpicio Lines, William Lines, Lorenzo Shipping, and Sampaguita Shipping. Sampaguita Shipping now occupies the warehouse previously owned and built by Compania Maritima. Each of the warehouses occupy an area of about 1000 square meters.

- Open Storage Areas. Of the five such storage areas, Nos. 1 to 3 are located behind the transit sheds. They are asphalt-paved but the paving is scoured due to normal wear and tear brought about by heavy container traffic. Repaving of the storage areas is now necessary. The two other open storage areas are located in front of the private warehouses near the older quay area. These storage areas are concrete paved.

- Passenger Terminal Building. The terminal can house approximately 300 passengers in the waiting area. A part of the terminal building is used by the PPA Port Operations Office and another part by the Bureau of Animal Quarantine.

- SCIPSI Administration Office and Motorpool. The South Cotabato Integrated Port Services, Inc. (SCIPSI) provides stevedoring and arrastre services for the port. The administration office is a two-storey building. A clinic for the port workers is also located in the building.

- Office Buildings of other government agencies. There are four of these offices. Two are occupied by the Bureau of Customs, another by the Philippine Coast Guard, and a fourth one by the Bureau of Plant Quarantine. These government offices do not pay rentals to the PPA.

- Amenity Blocks. There are two amenity blocks, one located at each of two of the open storage areas behind the Transit Sheds. Amenity Block No.1 houses the Ports Police Office and the Public Toilet. Half of Amenity Block No. 2 houses the SCIPSI Operations Office.

- Gate House. This is the control point of the port and is situated at the single entry and exit point of the port area. Only vehicles with pass stickers are allowed entry by the Port Police. Vehicles without stickers are charged an entrance fee of ₱ 5.00 per entry.

- Storage Tanks. The five oil storage tanks are owned and operated by Kenram Philippines and are being used primarily for palm oil.

5.1.5 Internal Roads and Open Spaces

All roads within the port area are concrete-paved, except the access road to the Passenger Terminal and the Philippine Coast Guard Office. Pavement consists of a 0.20-meter concrete slab, reinforced with wire mesh.

Five open storage areas occupy 20,925 square meters or 16.9 percent of the total port area. They are mostly paved with asphaltic concrete. 56,944 square meters, or 46.1 percent of the total area are open spaces, mostly unpaved.

5.1.6 Road Access

The roads in the immediate vicinity of Makar Wharf are shown on Figure 5-2. From the Gate House, a road, approximately 150 meters long, leads to an intersection. The road continues on a heavily traveled section in the general direction of Marbel and Cotabato. This section is presently the main connection to Dadiangas. At the intersection, the road to the Southwest leads to the industrial area of General Santos, including the proposed Tambler Agro-Industrial Complex. The road from the intersection to the Northeast leads directly to Dadiangas, but is not so heavily traveled, due to lack of paving and a sub-standard bailey bridge with a wooden deck. A one-kilometer section of this road is presently being paved with concrete.

At the North corner of the port area, in the vicinity of the Administration Building, is a paved road that leads to and ends at the port fence. This road was planned in 1972 with the idea of becoming at the proper time a second access to the port. That time would come when the port area is extended further to the West. It will be discussed in the chapter on future improvements.

5.1.7 Water Supply

Currently the City has an existing water supply system but its distribution is limited to city government centers and the public market. This water supply system is being operated by the city Water District of the Local Water Utilities Administration (LWUA). The rest of the City proper, especially the residential areas, rely for their water supply mainly on deep wells, shallow wells, pitcher pumps and jetmatic pumps.

Aside from the present water supply system, the LWUA under the Philippine Urban Development Project is currently making a Feasibility Study for the water supply system not only in the city proper (Dadiangas) but also for adjacent barangays such as Tambler, Labangal, Lagao, Bula and San Isidro. This study is expected to be completed in May 1991. Labangal is the barangay which has the jurisdiction over Makar Wharf.

Other sources of water are the recently completed six level II water supply systems undertaken by the Rural Water Works Sewerage and Sanitation Program of the Department of Local Government which are complemented by 96 level I water supply systems. Level I systems are those directly obtained from deep wells, shallow wells, free flowing and spring development. Level II are communal faucets serving several households.

There are two existing water supply system operating in the port of Makar: the Philippine Port Authority (PPA) water supply system and the Sarangani Water Supply Services, now known as the C. Limjap Water Services. The PPA water system consists of two 200 mm diameter deep wells, both 85 m deep. Both wells have submersible pumps and are powered by 40 HP. electric motors. The wells are said to be overflowing almost year round except in cases when droughts affect the area. Water from these wells is stored in a 890,000 liter underground concrete water tank. It takes 6-7 hours for the two submersible pumps to fill the concrete tank.

Atop the concrete tank is a turbine pump powered by a 225 HP diesel engine. Two additional pumps, each powered by a 100 HP electric motor, serve as an alternate water supply sources. These pumps are used to convey water into a 200 mm diameter pipeline located under the wharf's deck to supply berthed ships. These pipelines are in a deteriorated condition and the PPA engineers are planning to replace them. A 40,000-liter elevated concrete water tank is also existing which draws water from the underground water tank, for distribution to different port facilities and buildings by gravity. Pipelines for these facilities are found to be in good condition. The system has the capacity to supply water at the rate of 35,000 liters/hr.

C. Limjap Water Services acquired their franchise to operate a water system on Nov. 2, 1971. PPA was not in existence then, and the contract was between the Bureau of Customs and the Sarangani Water Supply Services, now called C. Limjap Water Services. The contract has a duration of 20 years. When PPA was created in 1977, it assumed jurisdiction over the Port facilities from the Bureau of Customs and honored the contract of C. Limjap Water Services. C. Limjap facilities include a 76 m deep well with a 100 mm diameter pipe and a pump powered by a 10 HP electric motor. It has also a concrete tank with a capacity of 140,000 liters. The water is being conveyed into a 75 mm diameter pipe by the use of a 15 HP electric motor which draws water from the tank. It has also an existing pipeline which is located along the top edge of the wharf and is in a very deteriorated stage. The system has the capacity to provide water to berthed ships at the rate of 15,000 to 20,000 liters/hour depending on the ship's location. In 1985, PPA tried to take over the facilities of C. Limjap Water Services. The matter was brought to court and a decision was made in favor of C. Limjap Services since the contract is still in force. However, the court also decided to give PPA a share of the market.

The water distribution for the berthed ships is being shared by the two water supply services. Seventy percent of the demand is being supplied by C. Limjap and 30 percent by PPA. This sharing is embodied in the court decision. In case of breakdown, system can supply the requirement. For the year 1990, PPA had supplied 35,577,000 liters of water; in 1989 21,658,730 liters; 31,397,000 liters in 1988; 24,126,000 in 1987 and 12,048,130 liters in 1986. Cost of water is currently ₱ 9.25/1000 liters. No record can be found at C. Limjap Water Services; they are currently charging at the rate of ₱ 12.50/1000 liters. If 70 percent of demand is supplied by C. Limjap Water Services it can be estimated that for the year 1990 alone, a total of 1,185,900,000 liters would have been supplied by the two water systems.

5.1.8 Sewerage and Drainage

Generally the City has no sewerage system. Septic tanks and leaching chambers are the only form of waste disposal. Storm drainage facilities don't exist either on some streets, although the City Engineer's office has managed to install a few on some major roads. Drainage inlets, open ditches and drainage pipes are the most visible drainage structures.

While the area is not prone to typhoons and strong storms, the City has a maximum recorded rainfall of 600 mm, causing some inundation in the Bula district which is the lowest portion of

the City.

The Port of Makar has an existing storm drainage and sewerage system. Storm drains consist mostly of reinforced concrete pipe with diameters of 490 mm to a maximum of 910 mm . A lined trapezoidal ditch is also existing. Generally no flooding has occurred in the entire port area.

Effluent from each building and amenities is being collected into septic and leaching chambers. It is conveyed by a 100-mm diameter cast iron pipe to catch drains, then into storm drainage system and finally to sea. Waste from vessels can not be accommodated and ships are being told to dispose of their waste at high sea.

5.1.9 Communications

General Santos City is not far behind in telecommunications. Long distance telephone calls for both domestic and overseas are being served by the Pilipino Telephone Corporation (PILTEC), Radio Communications of the Philippines (RCPI) and Philippine Telegraph and Telephone Corporation (PT & T). Direct distance dialing, however, is yet to be part of the system. Telegrams are being served by RCPI and PT & T.

The City has several private radio (AM & FM) and TV stations. Channel 4, the government TV station, is now being operated nationwide via satellite and is viewed at General Santos City through Channel 11.

National and regional dailies are regularly available. They are transported through the first available air transportation, or in the case of regional dailies, by land.

DHL, JRS, Allied and Libcap are some of the courier companies operating at General Santos City.

The City has three strategically located post offices in Dadiangas, Lagao and MSU-Tambler.

The Port of Makar has telephone connections and intercoms to communicate between offices. The telephone lines are only good for domestic calls within the city. Long distance calls are being made through an operator. Hand held radios are also available but their use is limited only to police operation.

5.1.10 Power

The advent of the energy crisis in the early 70's provided the needed impetus for the country's energy planners to pursue more vigorously the investigative activities geared towards the development of indigenous energy sources such as hydro, geothermal and coal. Foremost in these investigations was the search for geothermal steam for power generation purposes.

The discovery of an abundant reservoir of geothermal steam in Tongonan, Leyte, and the successful operation of all geothermal plants in the country prompted the country's energy planners to include geothermal power plants located on Mount Apo in the Power Development Program in Mindanao. In addition, coal and hydro systems, considered reliable as a means of generating power, were also included in the study. Likewise power barges (gas turbine or diesel engine driven), very useful for remote coastal areas, were considered. Their main advantage is that they can be relocated from one place to another.

The country's energy planners conducted some research on how to provide enough reliable power to Mindanao. Based on the sources given by the National Power Corporation (NPC) to avoid shortages of power, the construction of new power plants and the renovation of the old ones is part of the Power Development Program in Mindanao, as follows (see Table 5-2).

For the year 1991 - Adding a new gas turbine power barge and a new power plant "Agusan I No.1 and 2", with capacities of 61.2 MW and 80 MW respectively. Their existing power plant "Aplaya II No. 1 and 4" and "General Santos No.2" were out of operation due to some major repair work. Their capacity was 38.6 MW and 7.4 MW respectively. They are expected to operate again in the same year.

For the year 1992 - The existing power plant "General Santos No. 3", also out of operation due to some major repair, will be back on line. It has a capacity of 7.4 MW. Also a new diesel - generating power barge with a capacity of 36 MW will be added.

For the year 1993 - Addition of two geothermal power plants "Apo-1 Geo-1 and 2", with a combined capacity of 40 MW.

For the year 1994 - Addition of four new geothermal power plants "Apo 1 - Geo 3, 4, 5 and 6" with a combined capacity of 80 MW.

For the year 1995 - Addition of a new hydro power plant with a capacity of 278 MW.

For the year 1996 - Interconnection between the Leyte and Mindanao grids.

For the year 1998 - Addition of a new Agusan power plant with a capacity of 225 MW.

For the year 1999 - Addition of a new geothermal power plant, the "Apo II Geo", with a capacity of 120 MW.

Table 5-2
MINDANAO GRID
POWER DEVELOPMENT PROGRAM

YEAR	MONTH	PLANT ADDITION	PROPOSED CAPACITY NEW (MW)	PROPOSED CAPACITY SUB-TOTAL PER YEAR (MW)	EXISTING INSTALLED CAPACITY (MW)
1990	-	N O N E	-	-	1052.74
1991	FEB.	Power Barge-Gas Turbine	61.2	141.20	
	APR.	Agusan I No. 1 & 2	80.0		* (38.6)
	NOV.	Aplaya II No. 1 & 4			* (7.4)
	NOV.	General Santos No. 3			* (7.4)
1992	JAN.	Power barge-diesel	36.0	36.0	
1993	JUL.	APO I GEO - 1	20.0	40.0	
	JUL.	APO I GEO - 2	20.0		
1994	JAN.	APO I GEO - 3	20.0		
	APR.	APO I GEO - 4	20.0	80.0	
	JUN.	APO I GEO - 5	20.0		
	AUG.	APO I GEO - 6	20.0		
1995	JAN.	Hydro	278.0	278.0	
1996	JAN.	Leyte-Mindanao Interconnection	-		
1997	JAN.	-	-		
1998	JAN.	Agusan III	225	225	
1999	JAN.	APO II GEO	120	120	
2000	-	-	-	-	
2001	-	-	-	-	
2002	JAN.	Bulanog-Batang	222	222	
2003	JAN.	Cagayanin	160	160	
2004	JAN.	Coal	100	100	
2005	JAN.	Coal	100	100	

* ( ) - These figures are already included in the total installed capacity since these are just major repairs of existing generating units.

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For the year 2002 - Addition of the new Bulanog Batang power plant with a capacity of 222 MW.

For the year 2203 - Addition of the new Cagayanin power plant with a capacity of 160 MW.

For the years 2204 and 2005 - Addition of two new coal power plants, each rated at 100 MW.

The discovery of abundant geothermal steam power in Tongonan, Leyte, stimulates the energy planners to interconnect the Leyte and Mindanao grids by the year 1996. Excess power from Tongonan, Leyte, could then be shared with Mindanao and vice-versa. The system reliability becomes also greater.

In Table 5-3 Mindanao Power Grid-System Load Demand vs. Installed Capacity it is shown that the maximum forecast plant capacity per year is enough to supply expanding electrical load (demand). The increase in electrical load due to expansion and new residential, commercial and industrial facilities, is matched by an increase in plant capacity through new power plants.

The power demand of Makar Wharf will be small even after any proposed expansion, compared with the demand of the industry in the area, hence enough power will be available, if the grid capacity is expanded as planned.

Even with the best power system, power interruptions cannot be avoided due to natural phenomena such as storms, earthquakes, etc. They can cause trouble to the electrical equipment. Sometimes the cause is human error, equipment failure or system trouble. In the past, power service suffered from frequent and long outages, as shown in Figure 5-6. Frequency of outages ranges from 2 to 15 per month and total duration of outages from 1 to 50 hours a month.

A frequent reason is "outstage of the Tacurong-Klinan 138 KV line". NPC personnel indicate this is due to broken insulators by non-mechanical means beyond their control (sabotage). Other power outages were due to some major repairs and routine maintenance of their power plants such as Aplaya II No. 1 and No. 4, General Santos No. 2 and General Santos No.3.

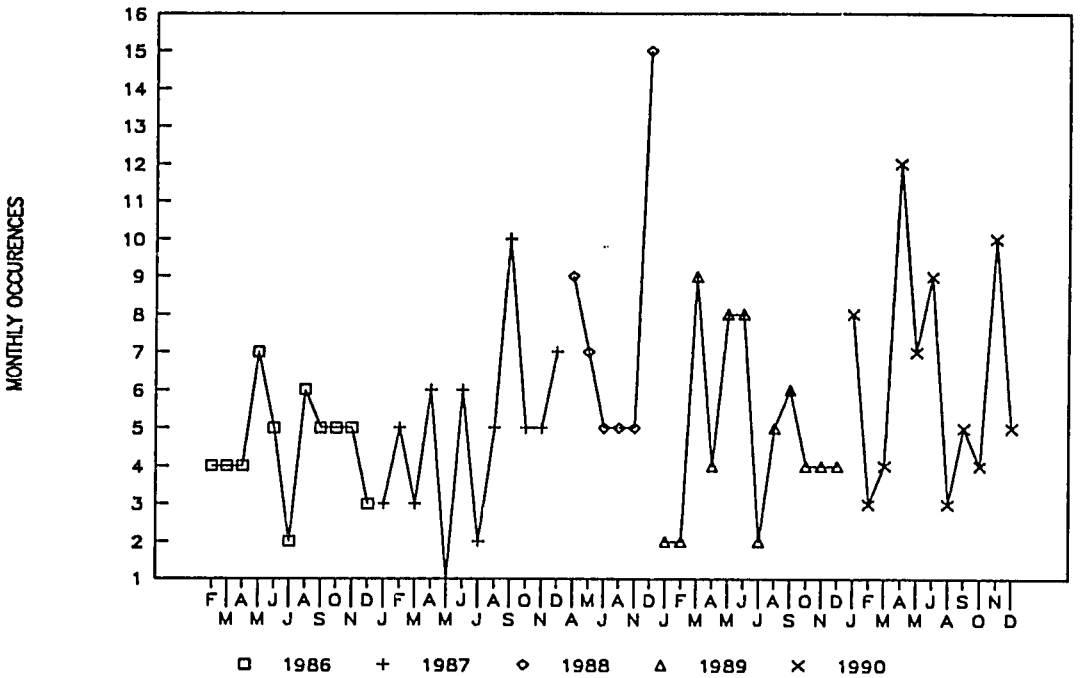
Even with the best power system there still are some factors that cause power failures. To mitigate the effects of power outages on the port operations at Makar Wharf, a standby generator set is recommended.

Table 5-3
MINDANAO POWER GRID
SYSTEM LOAD DEMAND VS INSTALLED CAPACITY

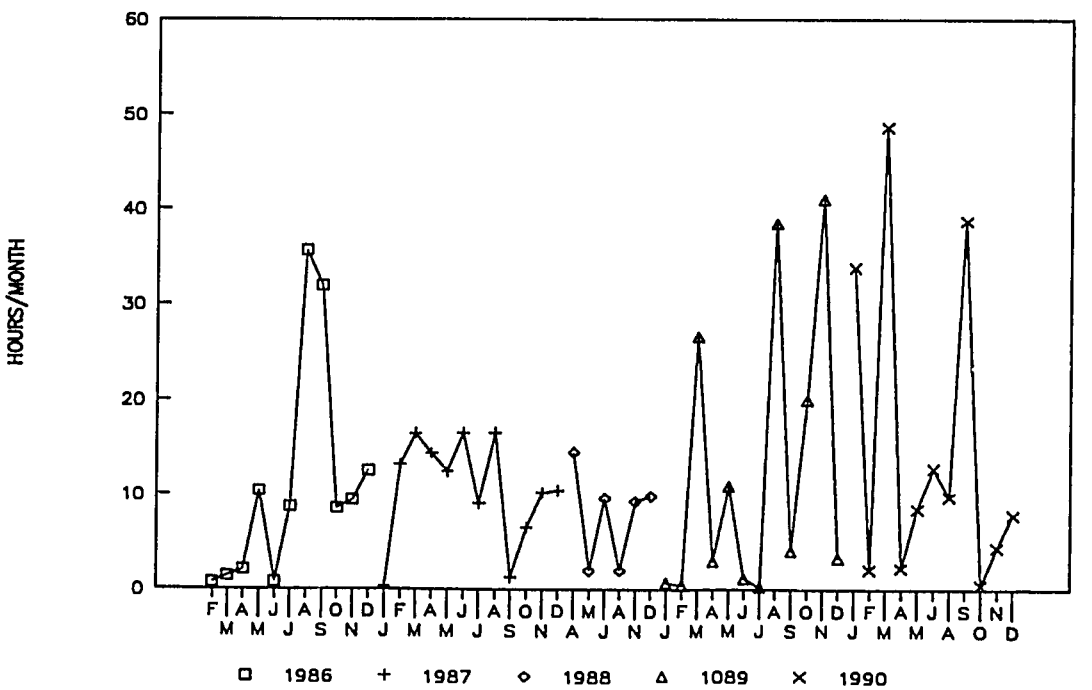
YEAR	DEMAND (MW)	INSTALLED NEW (MW)	INSTALLED TOTAL (MW)	DEMAND VS. INSTALLED CAPACITY	REMARKS
1987	531	-	1001.94	53%	Actual
1988	568	-	1001.94	56%	Actual
1989	611	50.8	1052.74	58%	Actual
1990	621	-	1052.74	59%	Actual
1991	801	141.2	1193.94	67%	Forecast
1992	881	36	1229.94	72%	Forecast
1993	943	40	1269.94	74%	Forecast
1994	1009	80	1350.00	75%	Forecast
1995	1080	278	1628.00	66%	Forecast
1996	1145	0	1628.00	70%	Forecast
1997	1213	0	1628.00	75%	Forecast
1998	1286	225	1853.00	69%	Forecast
1999	1363	120	1973.00	69%	Forecast
2000	1445	0	1973.00	73%	Forecast
2001	1532	0	1973.00	78%	Forecast
2002	1624	222	2195	74%	Forecast
2003	1721	160	2356	73%	Forecast
2004	1824	100	2455	74%	Forecast
2005	1934	100	2555	76%	Forecast

Figure 5–6
ELECTRIC POWER INTERRUPTIONS

Number of Occurences – Per Month



Duration – Total Hours per Month



Source: South Cotabato II Electric Cooperative, GSC

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5.1.11 Other Facilities

- Port Lighting. Illumination for night operations are provided by outdoor flood lights at strategic points on the quay and open storage areas. A 500 KVA Transformer Station is provided for the ports electrical requirements.

- Truck Scale House and Weighbridge.

- Security Fencing. A chain link security fence is provided to fence off the existing port. The fence is over two meters high topped by strands of barbed wires.

5.2 HARBOR CONDITIONS AND OPERATION

5.2.1 Entrance Channel

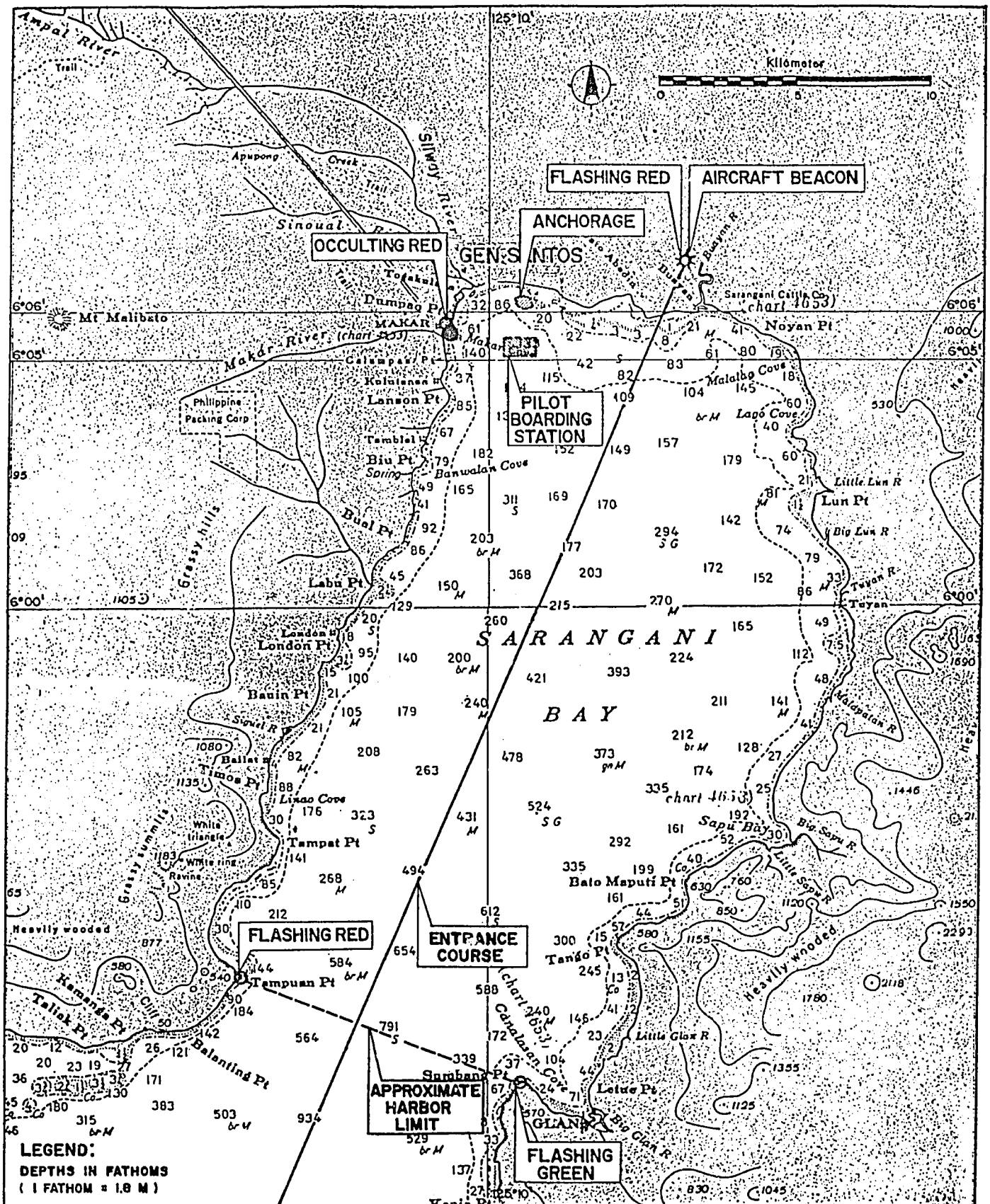
Figure 5-7 shows Sarangani Bay from its mouth to the head at Dadiangas. The Harbor Entrance is defined as a line approximately running between Sumbang Point on the East end of the entrance and Tampuan Point on the West end. The entrance is approximately 12 kilometers wide, with a water depth of about 1450 meters (791 fathoms). There is no defined or marked channel, the depth of the Bay such that navigation is free from hazards until 100 meters from shore. Small fishing boats constitute the only hazard on the approach to Makar Wharf.

5.2.2 Anchorage

As shown on Figure 5-7, the anchorage for ships waiting for a berth is located off Dadiangas, 12.5 kilometers from Makar Wharf. This distance is made necessary because of the great water depth off the wharf and to leave the fairway free for navigation. Water depth at the anchorage is about 27 meters (15 fathoms) and the sandy bottom provides good hold for anchors.

5.2.3 Traffic Separation

No officially designated ship traffic routes exist in the harbor, nor are any indicated on the nautical charts of Sarangani Bay. Traffic to the ports of General Santos is light, hence such designated routes seem unnecessary. However, a marked channel may avoid collisions with the many fishing boats that are working in the Bay, day and night.



LEGEND:
DEPTHS IN FATHOMS
(1 FATHOM = 1.8 M)

PHILIPPINE ASSISTANCE PROGRAM SUPPORT
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
CONTRACT NO.: 492-0432-C-00-0099-00

LOUIS BERGER INTERNATIONAL, INC.
•LOCKWOOD GREENE INT'L. •TRANS-ASIA (PHIL.), INC.
•ERNST & YOUNG INT'L •CONSULTANT MANAGEMENT SERVICES, INC.
•GLOBETROTTERS ENG'G CORP.

MAKAR WHARF FEASIBILITY STUDY

MAP OF SARANGANI BAY – HYDROGRAPHY AND NAVIGATION

FIGURE 5-7

5.2.4 Towage

Berthing and unberthing does not generally require the assistance of tugboats. In fact, no tugboat strong enough to furnish this service is available at Makar Wharf. A small boat, owned and operated by the Chief Harbor Pilot, is available for any assistance it may give.

5.2.5 Aids to Navigation

Standard aids to navigation, such as lighthouses, lighted beacons or marker buoys, are non-existent at Makar Wharf or in the Bay. Seamasters use natural physical features when entering and leaving port. As a consequence, arrivals and departures take place normally during daylight hours. Recommendations for the installation of navigational aids are given in another section of this Report.

5.2.6 Ship-to-Shore Communication

Direct ship-to-shore communication only exists between the pilot and the ship captain through a hand-held VHF radio set, using Channel 16. No such communication is possible now between the Port Manager's office and the ships.

5.2.7 Pilotage

The services of a pilot are compulsory for all foreign ships and for domestic ships of 50 Gross Registered Tonnage (GRT) and more. An incoming vessel generally notifies the offices of the Port Manager and the Pilot, 24 hours in advance of arrival. The Port Manager, through the Operations Chief, assigns a berth. The pilot on duty boards the ships at the Pilot Boarding Station, located approximately one mile from the Makar Wharf and shown on Figure 5-7, and conducts the inbound ship to its berth. There are two pilots and a Chief Pilot. The pilots work 24-hour shifts, three days active, three days standby, and three days off. Two pilots are available at all times, with one serving as the primary pilot and the other serving as a standby pilot. They work out of an office located in Transit Shed No. 1 at Makar Wharf. Pilots are licensed by the Philippine Coast Guard, after passing examinations, and given authorizations by the PPA to operate or maneuver vessels. The pilotage fee is fixed by the Philippine Ports Authority for every port where pilotage is mandatory, and is collected by the pilot.

5.2.8 Philippine Coast Guard

The duty of the Philippine Coast Guard is to guard against foreign invasions, entry of illegal aliens and illegal fishing, and to enforce marine safety laws and regulations. The Detachment assigned to General Santos has approximately a dozen men under a commanding officer. They

have one 65-foot and one 45-foot patrol boat. Both are all-steel and diesel powered, armed with high-caliber rifles. Their home port is the Makar Wharf. One vessel is typically berthed at the extreme West end of the wharf. The office is housed in a building near the Passenger Terminal.

5.3 PORT OPERATION

5.3.1 Port Administration

The Makar Wharf is the Base Port of the Port Management Office (PMO) - General Santos, of the Philippine Ports Authority (PPA). The jurisdiction of the Port Management Office (PMO) - General Santos, extends to all ports in Sarangani Bay, including all private ports, such as the Dole pier, the General Milling pier, the Caltex pier and the Agro-Tex pier presently under construction. Outside the Bay, the jurisdictional boundaries are not well defined. Should a new pier be put into operation, the PMO responsible for it would be determined by PPA in Manila or by conference between the two adjacent PMO's. The Port District Office in Davao is responsible for all PMO's in southern Mindanao and furnishes legal and engineering services. Also certain matters can be resolved by the District Office without going all the way to the head office in Manila. The PMO - General Santos manages only the Makar Wharf where it maintains its office. At all other ports it issues clearances for ships to enter and leave, regulates arrastre and stevedoring activities, and maintains statistics similar to those at Makar Wharf.

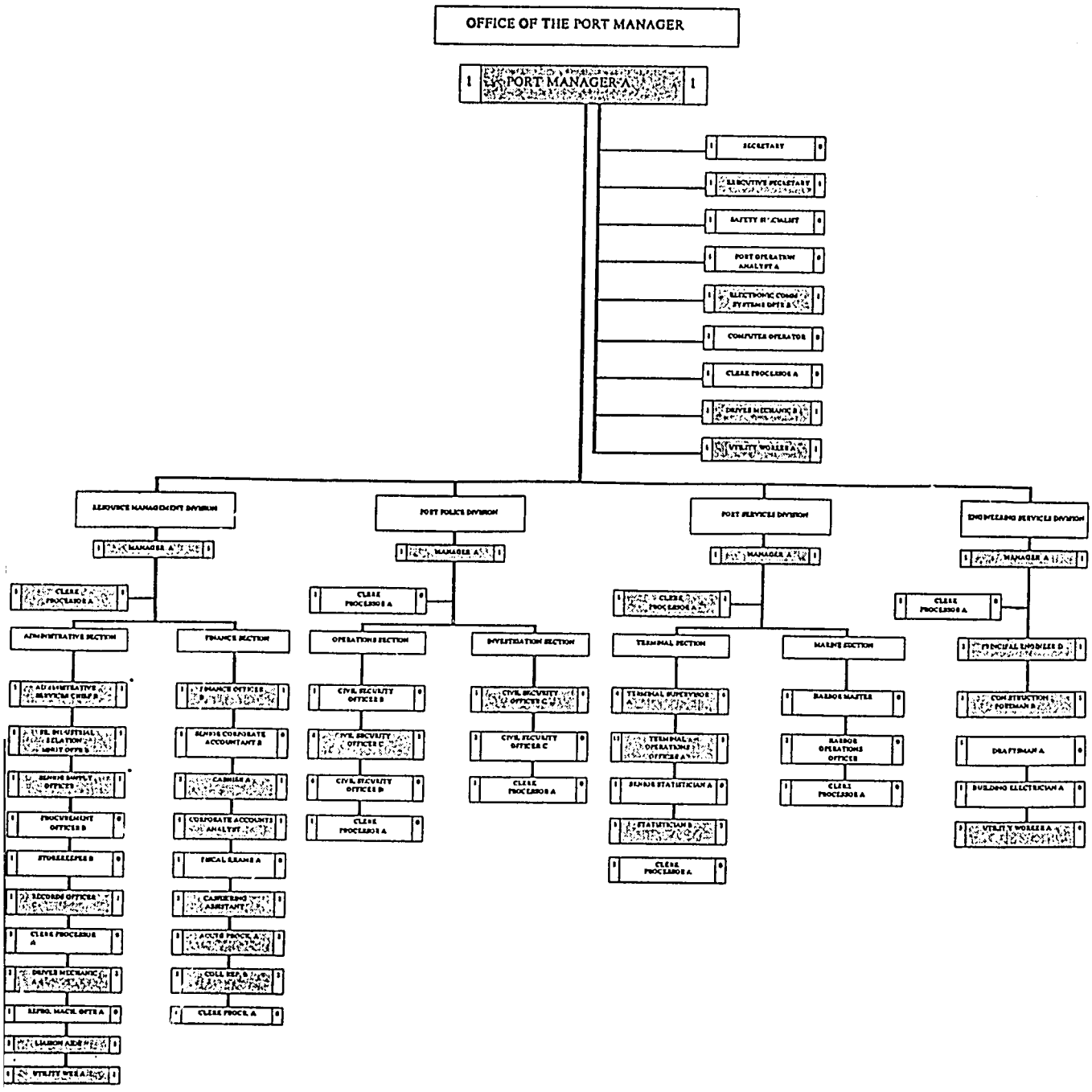
The Organizational Chart of the PMO - General Santos is shown in Figure 5-8. The PMO is headed by the Port Manager who has a direct staff of nine, of which only four positions are currently filled-up. The PMO is divided into four divisions, each under a Division Manager with his Clerk Processor.

The Engineering Services Division is responsible for the planning, design, and supervision of any new construction and of all maintenance activities at the PPA properties. However, due to the reduced staff at Makar Wharf all major engineering work is done at the District Office in Davao. The Engineering Services Division has a total of 12 positions but presently has filled up only the positions of Principal Engineer, Construction Foreman and four Utility Workers, in addition to the Manager, for a total of seven filled-up positions.

The Port Services Division is headed by its Manager with his Clerk and is divided into two sections. The Terminal Section is responsible for the operation of the terminal and the keeping of records and statistics. It has 26 positions, of which only 12 are presently filled up: four Terminal Supervisors, five Terminal Operations Officers, and three Statisticians. The Marine Section, with four positions and headed by the Harbor Master, would be responsible for the harbor and vessel operations but has presently no position filled up. Its functions are being fulfilled by the staff of the Terminal Section.

Figure 5-8

ORGANIZATIONAL CHART, PORT MANAGEMENT OFFICE - GENERAL SANTOS



Legend:

X	POSITION Y	Z

X Number of Total Positions

Y Civil Service Classification

Z Number of Filled-up Positions

• Concurrent

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The Resource Management Division is headed by its Manager and his Clerk and has two sections: The Administrative Section, with 15 positions, 7 of which are presently filled, is responsible for all administrative matters, while the Finance Section, with 19 positions, nine of which are presently filled, is responsible for all financial matters.

The Port Police Division, under a Manager and his Clerk, has two sections: the Operations Section has 14 positions, of which only two are filled at this time. The Investigation Section has four positions, of which only one is filled up at present. To fulfill its duty of assuring security in the port area, the staff is supplemented with 22 security guards under a contract with a private security firm. The Division is administratively dependent on the Port Manager but technically dependent on the Security Division of the Port Division Office in Davao.

In total, of the 110 positions, 48 are presently filled.

As described in another section of this Report, the port can effectively be run by the reduced number of personnel because the PPA has delegated many port functions to the private sector, in many fields exercising only regulatory and supervisory duties. Its three transit sheds are run by private shipping companies; the arrastre and stevedoring activities are handled by a private contractor; the cargo handling equipment belongs largely to the shipping companies, none to the PPA.

5.3.2 Marine Operations

The Makar Wharf is presently divided into seven berthing spaces which are numbered consecutively, starting from the West, proceeding to the East. Berths 1 through 4 are along the 261-meter length of the southern wharf and Berths 5 through 7 are along the 300-meter length of the northern wharf. Berths 1 and 2 are often occupied by either Navy or Coast Guard vessels. Berths 3 through 6 are being routinely worked by smaller general cargo, bulk, and breakbulk vessels. Berth 7 is mostly worked by container ships.

The General Port Regulations of the PPA specify that "first came/first served basis shall be the general rule in determining berthing priorities of vessels." On the other hand, "the allocation of a berth...shall be at the Authority's discretion." In practice, a priority system is used. Regularly scheduled liners have first preference. After that, foreign vessels and tramps are served on a first came/first served basis. Lacking a harbor master, the Port Operations Office assigns berths. The Regulations require a 24-hour advance request for a berth for vessels on scheduled runs and 36 hours for tramping vessels. Requests are made directly by the ship by radio or relayed through the local office of the shipping line. Arrival and departure schedules of the shipping lines may also be used as a basis for assigning berthing space. A grace period of two hours may be allowed for the scheduled liners.

5.3.3 Arrastre and Stevedoring Services

One private contractor, South Cotabato Integrated Port Services, Inc. (SCIPSI), now provides all arrastre and stevedoring services at the port, under a Management Contract with the PPA, dated March 13, 1989 and effective through March 1, 1997. Arrastre services are those performed on the wharf or on land in general, while stevedoring services are those performed aboard ship. The cargo handling services are contracted directly between the shipper and SCIPSI. They work out the number and composition of the gangs required and the time allotted for the gangs to perform the services. The services are billed at rates specified in the "Schedule of Cargo Handling Tariff for Domestic and Import/Export Cargo", established by the PPA.

The typical gang size is 25 people, comprising the labor force required to service a vessel for a continuous 24-hour period. Approximately one-half of the gang works on each of the two 12-hour shifts. If the type of cargo to be handled so requires, the gang size may be increased and may reach up to 40 workers, 20 on each of two shifts. The gang size is at the discretion of SCIPSI. Skilled operators, such as winchmen and signalmen are not included in the standard gang. These positions are staffed from a different and independent labor pool. SCIPSI has approximately 36 cargo-handling gangs under contract, their members considered permanent employees. A large pool of casual labor is available to supplement the gang forces, when necessary. Under present conditions, each gang will work approximately once every two weeks. The duration of each work time may vary from one day for a container ship to more than five days for a breakbulk vessel. Gangs are rotated in order that each gang has an equal chance to work.

Under the present contract, the PPA receives approximately 10 percent of the revenue received for the cargo-handling services. The remaining 90 percent are split 50-50 between the SCIPSI management (which thus gets 45 percent of the total revenue) and the SCIPSI labor force (which thus gets also 45 percent of the total). The gang members are paid on a lump sum basis, not by the hour. The members share the proceeds equally among themselves, with the foreman receiving a double share. For example, if a gang has 25 members, the portion allocated to the labor force is split into 26 shares, each of the members receiving one share and the foreman receiving two shares.

5.3.4 Cargo Handling

The Makar Wharf handles a wide variety of cargos. The commodities being shipped are discussed more thoroughly in other sections of this Report. For 1990, approximately 844,700 tons of cargo were shipped across the Makar Wharf. Of this total, inbound cargo represented approximately 319,600 tons (38 percent of the total), and the outbound cargo represented 525,100 tons (62 percent of the total). The type of cargo that is being handled (i.e., bulk, containerized, etc.) dictates to a large degree the efficiency which a given cargo can be transloaded. This section focuses on the operational aspects of the cargo handling task. It addresses the existing methods of packaging, handling, and delivering the freight. In addition,

it addresses the relationship between the type of cargo and the type of vessel employed. The existing records characterize the cargo packaging into three major categories; bulk, containerized, and non-containerized. Non-containerized cargo in this context will be called breakbulk, and may be pelletized, unitized, loose pieces, or roll on/roll off.

5.3.4.1 Bulk Cargo

Bulk cargo is that cargo which is handled in loose form without packaging. At the Makar Wharf, it includes dry commodities such as copra and corn or liquid commodities such as palm oil. In 1990, this form of cargo represented approximately 15.1 percent of the outbound, 15.3 percent of the inbound, and 15.2 percent of the total cargo (by weight) shipped across the wharf. In general, for outbound dry bulk cargo, small hoppers are charged outside of the Port complex, then brought to the wharf by flatbed trucks. The hoppers are then lifted by ship's gear, swung over the hold of the vessel, then discharged. The hopper is then swung back to the truck and released. At present, the observed maximum rate of moving dry bulk cargo from shore to ship is approximately 36 tons per working hour, using a five - man gang per shift.

Incoming bulk cargo is unloaded by grabs or by canvas-lined nets. If nets are used, a crew in the hold of the ship loads the net using shovels. When the net is full, the ship's gear brings in an empty net, unhooks, and then lifts the full net over to shore based droppers. As the ship's gear is handling the full net, the stevedores fill the empty net on the ship. At the hoppers, the nets are discharged, and the material is subsequently funneled to bags, which are individually filled, weighed, and sewn. From there, the bags are moved in pallet loads to awaiting trucks. Once the pallets are at the trucks, the bags are removed and restacked on the bed of the truck. After the operation is complete, the empty pallet is returned to the hoppers. The observed rate of dry bulk cargo unloading is approximately 20 tons per hour per hook.

Palm oil is the only liquid bulk cargo currently handled at the Makar Wharf. This oil is stored in five tanks near the south end of the facility. Bulk oil is received via tank trucks and subsequently charged into the tanks. The oil is pumped to the vessels using piping under the wharf deck. The present tanks have a capacity of approximately 1300 cubic meters. The existing pumps and pipes can deliver the oil to the ship at a rate of approximately 50 cubic meters per hour.

Kenram Phils., the sole producer of palm oil in South Cotabato and owner of the storage facilities, delivers 48 cubic meters of palm oil per day by ten-wheel tanker with a capacity of 16 cubic meters. It takes 30 minutes to unload each delivery truck into the storage tanks. 400 cubic meters of palm oil are shipped out every nine days. It takes eight hours for the 400 cubic meters to be loaded into the ship.

5.3.4.2 Containerized Cargo

Containerized cargo is that cargo which is handled in standard containerized units. These units come in standard container modules of 10-foot, 20-foot, and 40-foot units. The standard unit (TEU) is a 20-foot module which has an internal volume of 1280 cubic feet (36.2 cubic meters). A 10-foot unit is equivalent to a 1/2 TEU, a 40 foot container is equivalent to a 2.0 TEU. On the ship, the containers are either stacked in the hold or on the deck. For 1990, containerized cargo represented approximately 37.4 percent of the inbound cargo, 54.4 percent of the outbound cargo, and 48.0 percent of the total cargo (by weight) handled at the Makar Wharf. In 1990, a total of 41,502 TEU's were moved across the Makar Wharf. 20,294 of the TEU's were inbound, and 21,208 containers were outbound. Empty containers represented 9229 (45.5 percent) of the inbound, 2499 (11.8 percent) of the outbound, and 11,782 (28.4 percent) of the TEU's handled. The average weight of the containers handled in 1990 (including empties) was 9.8 tons per TEU.

For inbound container traffic (i.e., the container moving from the ship to the shore), the container is picked by ship's gear using either standard container lifting frame or by four independent lifting lines. The normal crew for the ship consists of a winchman, a signal man, two riggers, and one spotter. The ship's gear is positioned over the container, the lifting assembly is attached, then with the aid of a spotter, the box is lifted clear of the stack. The container is then swung to the wharf and held approximately four feet off the deck until the land crew can stabilize the container. After the container is stable, the truck backs under the load, the unit is positioned, lowered, then discharged onto either a container chassis or a flat-bed truck. The riggers position a small rolling ladder assembly adjacent to the truck. They climb the ladder, then unhook the lifting harness. The crane then shifts back to the ship as the loaded truck then moves out and an empty truck is positioned.

For outbound container traffic (i.e., the container moving from the shore to the ship), the container is brought to the side of the wharf using either container chassis or flatbed trucks. The container box is rigged and handled in a similar manner as that for the inbound container.

At present, the total crew required to handle the containers consists of one winchman, one signalman, two riggers, and one or two spotters on the ship, with an additional two riggers and two spotters and perhaps a foreman on the wharf. Therefore, the total arrastre/stevedoring crew size is approximately 11 men per shift. In addition to the arrastre/stevedoring crew, there will be the crew required to drive the trucks, and the checkers. Most of the vessels that handle containerized cargo at present are specifically equipped for containers. However, there are instances where a container is lashed to the deck of a non-container type vessel. Containers are typically handled by ship's gear. Occasionally, if ship's gear is not operable or is not available, the boxes are handled by a land-based mobile crane working off the deck of the wharf. Several of the winches on the existing fleet of vessels do not have the crane capacity to lift a heavy (i.e., greater than [illegible] tons) standard container unit nor a full 40-foot container unit. Hence, there are very few fully loaded 40-foot container units handled at the Makar Wharf.

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At present, approximately five percent of the inbound containers are unstuffed on the port facility. Unstuffing on the port grounds usually occurs inside or immediately adjacent to the existing Transit Sheds. Cargo is manually unloaded from the container and transferred into the transit sheds where the cargo is sorted and subsequently distributed to the end user. The majority of the unstuffing operations occur at one of the three privately operated containerized freight stations adjacent to the port.

Approximately 10 percent of the dry cargo container stuffing operations associated with outbound cargos are conducted on the port property. These stuffing operations are typically accomplished adjacent to the existing transit sheds. The majority of the offsite stuffing operations are conducted at one of the three privately operated containerized freight stations adjacent to the port. However, the majority of stuffing associated with the containerized shipments of live animals is conducted at the port. Live hogs and other livestocks are delivered to the port in private carriers. The animals are subsequently transferred into animal containers and held there for final loading. The hogs are held in the container cages for approximately 24 hours prior to being loaded on the container vessel. These hogs are watered and fed while still in the cages. Waste from the cages washes out onto the ground and flushes down through the storm sewer system. For 1990, approximately 250,000 head of hogs were shipped through the Makar wharf. Assuming 75 hogs per container, this would imply approximately 3300 containers. In general, these containers are shipped out full, and returned empty since there are fewer inbound live animals. The returning empty animal containers account for approximately 25 percent of the inbound empty container traffic.

Some container staging and stuffing areas are located well away from the port facility. For this type of operation, the containers enter or exit through the gate loaded, and proceed to the ship. In general, the majority of the container operations at the port are a just-in-time delivery system. There is very little on-site storage time required for containers that originate from or are destined for offsite facilities.

The individual shipping lines are responsible for providing the container handling equipment used on the port. At present, the fork trucks used to stack containers in the yard have an eight-ton capacity, making them unsuitable for handling loaded containers. Loaded containers are typically stacked and unstacked using mobile cranes.

According to the port statistics, the 1990 rate of loading and off-loading containerized cargo is approximately 6.6 TEU's per gang hour. The observed rate of loading and off-loading containerized cargo is closer to 4.5 containers per hour per gang. There may be some discrepancies in the records since some of the containers are loaded on passenger and general cargo vessels. It is possible that the gang time used to move containers on non-container vessels has been included in the non-containerized gang time statistics.

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5.3.4.3 Breakbulk Cargo

For 1990, breakbulk cargo represented 151,000 tons (47.5 percent) of the inbound cargo, 160,400 tons (30.3 percent) of the outbound cargo, or 311,400 tons (36.8 percent) of the total throughput cargo at the wharf. Breakbulk cargo can come in many forms including sacked goods, pelletized cargo, unitized cargo, ro-ro, and loose live animals. Each form of cargo exhibits varying degrees of handling efficiencies. Labor statistics are not available for each of these cargo forms, but based on observations, general conclusions were reached regarding the efficiency of each of the handling modes.

- Bagged Cargo

  Inbound and outbound sacked cargo operations are similar. Outbound sacked cargo is typically brought to the wharf on flatbed trucks. The sacked goods are then hand loaded into nets (approximately 30 sacks to a net) and subsequently lifted to the vessel hold using ship's gear. The nets are then spilled into the hold and the stacking crews move the sacks to the desired final position. The empty net is swung to the waiting trucks, then unhooked. The ship's gear is then attached to a full net and picked for the next cycle. In a typical sacked goods operation, there will be 8 to 10 stevedores working in the hold of the vessel, plus one winchman and one signalman. There is an additional 8 to 10 arrastre working on the trucks plus a checker and a spotter. The observed production rates for this style of operation was typically 13 to 15 crane cycles (24 to 30 tons) per hour per gang.

  If ship's gear is not available on the vessel, the stevedores and arrastres will hand load the goods, one piece at a time. Depending on the size and number of gangways available, the typical crew will consist of approximately 12 members per hold. The observed rate of cargo handling for this type of operation is approximately six tons per hour per gang.

  Bagged or breakbulk goods are typically delivered or received on the wharf using a just-in-time trucking system. Trucks are staged on the deck, and proceed directly out of the port. Occasionally, with operations such as the National Food Authority (NFA), bagged goods are delivered ahead of time and discharged into the transit sheds. When the cargo is to be shipped out, the sacks are loaded back onto trucks, transported to the edge of the wharf, and handled again there. Typically, bagged goods that are worked by the NFA will remain in the transit sheds for only approximately four days.

- Unitized and Pelletized Cargo

  The majority of the outbound unitized/pelletized cargo is shipped through the transit sheds. This cargo is brought from the transit shed using small fork trucks.

Occasionally, trucks will deliver pelletized cargo directly to the wharf, where it is subsequently lifted off the truck and discharged to the wharf. Most of the inbound pelletized cargo is case lots of bottled beverages. A significant amount of the outbound pelletized cargo is case lots of empty beverage bottles.

For inbound cargo, fork trucks on the ship will move the pallet from the ship to the wharf and set it down. A landbased fork truck then picks up the pallet and moves it to the intermediate destination. In most cases, there is a double handling of the pallet at the face of the wharf. Occasionally, ship's gear is used to move the pallets from the wharf to the ship and vice versa. The crew employs a special lifting frame which is inserted through the rungs of the pallet, attached to the crane, and lifted.

The observed rate of unitized and pelletized cargo movements on a fork truck type Ro-Ro operation was approximately 20 pallets per gang hour. For pallets of full bottles, this is approximately 30 tons per hour and for empty bottles, approximately 20 tons per hour. The observed rate of unitized and pelletized cargo movements using ship's gear is approximately 12 picks (15 tons) per hour.

- Ro-Ro Cargo

There are very few classical Ro-Ro operations at the Makar Wharf. This is due primarily to the fact that there are not many vessels equipped with a ramp which can reach the bullrail. No records are available to determine the frequency or tonnage of Ro-Ro cargo operations.

- Live Cargo

Most live cargo is shipped in container units and discussed in earlier portions of this chapter. Occasionally, livestock is also shipped loose on a container or other general cargo vessel. These animals are typically brought to the wharf in livestock trucks. An empty cage-type container is positioned at the rear of the truck, level with the bed. The gate to the container is then opened, and the animals are herded from the truck to the container. The cage is then lifted to the deck of the ship, and the animals are discharged onto the deck. It takes approximately 15 minutes to load and discharge one cage full of animals in this manner. For smaller vessels, the animals may be herded directly across the deck of the wharf, up a gang plank, and onto the ship.

The observed rate of inbound and outbound live cargo movement is approximately eight tons (i.e., 100 hogs) per gang hour using a 12-man gang.

5.3.5 Trucking Activities

Virtually all truckers are independent operators and not organized in a cooperative which could control the trucking procedures and rates. The traders or the shipping companies contact the independent truckers individually to haul cargo for them. Each truck that operates on the Makar Wharf is required to either acquire a one-year gate pass, or pay five pesos every time the truck enters the port. In 1991 the cost of the annual pass is 350 pesos; in 1990 it was 250 pesos. In general, the truck operators carry liability insurance for the vehicles. If damage or injury is caused due to negligence of the truck operator, the truck operator is obligated to pay. If damage or injury is caused due to the negligence of the shipping agent or the arrastres, then the shipper is obligated to pay.

Very few trucks and cargos are weighed either arriving or departing the port. Cargos are weighed at random (apparently 10 percent) using the port scales. For example, of a shipment of copra, only the first truckload was weighed. That weight was the basis for the estimated weights of the copra containers for the remainder of the shipment. The office of Port Operations is responsible for determining which trucks are to be weighed at the port scales. In practice, however, the shipper is generally the one who asks for the weight. Apparently, there is a rather informal agreement among the shippers and truckers as to which truck should be weighed.

It seems that none of the inbound containers are weighed. Only a few of the commodities are randomly weighed. These cargos include corn, finished rice, copra, steel, lumber, hogs, and fish meal. Other cargos are not required to be sampled for weight. If a truck has been weighed by a scale off the port, it is not weighed on the port scales.

5.3.6 Customs Authorities

The Bureau of Customs in General Santos City is located within the premises of the port.

Before the establishment of the PPA in 1972, the port's operational functions were previously the responsibility of the Bureau of Customs. Now, its primary function is to assess and collect revenues from imported articles and all other dues, fees, charges, fines and penalties accruing under the tariff and customs law. It has also the task to prevent and suppress smuggling and other frauds upon the customs. As such, it is also charged with the supervision over the entrance and clearance of vessels engaged in foreign and domestic commerce.

Regarding local export, before 1986 there used to be a levy imposed on the goods. Presently, no levy is being imposed on local export, in connection with the government's policy on encouraging the local export activities, apparently in an attempt to improve the country's import-export trade deficits.

When a foreign vessel arrives, "boarding formalities" are done by the Customs official prior to berthing. Before unloading, the Bureau of Customs requires the calling vessel to submit the

"Coasting Manifest". This manifest contains the list of all goods which the ship is supposed to be carrying including the passenger list and crew declaration list. Upon complying, a "Permit to Proceed" with the unloading is issued by the Bureau of Customs.

Customs officials are required to check and open imported containers in the presence of the consignees and shippers either on the dock or at the shipper's container yard. Each shipper has a bonded area in his container yard. Sometimes, when the containers go directly to the consignee's store or warehouse, Customs officials are required to witness the off-loading of the cargo. All foreign containers are supposed to be sealed at their source. When these seals are broken prior to Custom's inspection, the consignees are fined ₱ 1,000.

Containers declared as "empties" are also checked by Customs because their experience shows that they are not necessarily empty at times. As to bulk and breakbulk cargo, the weighing of truckloads is also monitored and supervised by the Customs and PPA. Trucks are weighed before and after loading of cargo. Incoming local cargo also goes through the Bureau of Customs but only in terms of confirming the manifest vis-a-vis the actual. This is to ensure that the proper tariff is being paid to PPA. Outbound export products are also examined by the Customs.

The Customs Collector has expressed his desire to have a single bonded area within the Port property to accommodate inbound foreign containers in order to facilitate inspection of the cargo as well as to improve security measures. Inasmuch as most of the tasks involve paperwork, he hopes that computerization of the system in the near future would be introduced.

5.3.7 Quarantine Authorities

5.3.7.1 Veterinary Quarantine Services

The Bureau of Animal Industry in General Santos City is under the Department of Agriculture. Its office is located within the Passenger Terminal Building inside the Port. It is headed by a Senior Quarantine Veterinary Officer. The staff includes two veterinary doctors and four rank-and-file personnel. The responsibility covers General Santos City and the entire South Cotabato province.

The Bureau performs the following functions: (1) quarantine operations and services on incoming and outgoing livestock and poultry; and (2) issuance of shipping permits and clearances for all livestock and poultry, meat and poultry products.

In particular, the Bureau has the task to perform veterinary checks on all animals, treat and vaccinate them, if necessary, and to dispose of them when health dangers pose a threat, as in a case in 1988 when about 53 hogs were found to be infected with anthrax which made it necessary to kill the hogs and bury them at a lot outside the port premises. It is the desire of

the Animal Quarantine Office to have an incinerator within the port area for special cases such as these. A separate area for holding live animals prior to shipment has been proposed.

Also part of the Bureaus's role is to inspect and examine animal feed ingredients and feed products going in and out of the port. Incoming foreign vessels are inspected by quarantine officials, as part of the composite boarding team, prior to berthing. After unloading, samples of the animal feed are taken for laboratory examination. Since there are no laboratories for such tests available in GSC or Mindanao, samples are shipped and tested in Manila. Normally, test results are returned to GSC after one month. At which time, the feed has probably been distributed and fed to the animals. The testing procedures described thus defeat their very purpose due to lack of facilities. In this regard, animal growers normally include antidotes in the animal's diet as a precaution.

5.3.7.2 Plant Quarantine Services

The Bureau of Plant and Industry in General Santos City is also under the Department of Agriculture. Its office is located within the port premises behind the Philippine Coast Guard Office. It is headed by a Senior Plant Quarantine Officer. Their lease agreement with the PPA is for 15 years with an option for another 15 years, in the amount of one peso per annum.

The Bureau's primary objective is to prevent the possible entry of plant pests and diseases originating from foreign countries which are not yet known to exist in the country as well as to prevent these disease and pest to go unabated to other countries.

For incoming foreign vessels, the quarantine officials board and inspect the arriving vessels to determine the presence of materials subject to plant quarantine inspection. The Bureau also inspects and issues clearance on departing vessels carrying plants and plant products, in international and domestic movement. The quarantine office is also responsible for fumigating containers and ships, if necessary, with owner-furnished pesticides.

An Import Permit for Plants issued by the Bureau includes post-entry quarantine conditions, which extend up to two years for permanent crops such as corn. Quarantine procedures require that the plants be visited from time to time within the quarantine period. Observation is made at private nurseries. When symptoms are noticed, specialists are consulted to contain the plant disease.

When necessary, plant samples for tests and observation are sent to the Davao Experiment Station where the test procedures are done by a pathologist. The existing facility for laboratory tests was funded jointly by the RP and Germany. However, it still suffers from lack of equipment, i.e., high-magnifying microscopes, and the absence of nurseries and greenhouses for plant observation.

Current bureau restrictions on plant export from General Santos City are planting materials for

certain bananas and cacao.

5.4 ONGOING AND PLANNED IMPROVEMENTS

5.4.1 Wharf Extension to the Southwest

Ongoing improvements for the wharf are being made to meet current demands of the port. They are funded by the PPA. These improvements include the extension of the southwestern end of the existing 12-meter wide wharf by an additional 27 meters. This is to provide additional berthing length at the existing 16.5 meter angled wharf extension. In addition, a roll-on/roll-off landing platform is being constructed simultaneously at the angled wharf to provide loading and unloading facilities for Ro-Ro vessels. At present, these vessels are moored perpendicular to the wharf, which is a difficult maneuver, destructive to vessel and wharf fender systems.

5.4.2 Wharf Extension to the Northeast

PPA has general plans to extend the existing quay towards the northeast by 180 meters and reclaim the land behind it as a back- up area. A container freight station of about 50 m by 100 m, about 170 meters from the quay would be part of this plan. The rest of the area would be open storage space for containers. The existing dead-end road beside the Administration office would be extended by about 130 meters passing through the private property behind the port area and connecting to the existing road, forming an access road for the container yard.

5.4.3 Proposed Corn Bulk Handling Facilities

The United States Agency for International Development (USAID) contracted with STV/Lyon Associates, Inc. the Study for the Development of Facilities to Handle Domestic Corn at the Ports of General Santos City, Davao and Cagayan de Oro. The consultant investigated the bulk handling facilitates as components of an integrated corn project and submitted his final report on 28 February 1991. The consultant, in his report, recommends that a concrete slipform facility be constructed at the Makar Wharf, with approximately 20,000 metric tons storage capacity, at an estimated cost of US$ 13.2 million. He further states that failure to make this conversion to bulk handling of corn will jeopardize and stifle the progress that can be achieved from other programs designed to aid the corn industry.

STV/Lyon Associates, Inc. recommend that Berth 7, the northernmost berth, now principally used for container operations, be dedicated to corn bulk carriers, by constructing three towers on the wharf at Berth 7. The towers would support an overhead ship loading system, including three spouts. The silos would be located in the open storage area between the northernmost

transit shed and the administration building.

It is not the task of this Consultant to judge the economic justification or the financial viability of this project. It is, however, necessary to analyze the future development of Makar Wharf for two cases, as far as the corn bulk handling facilities are concerned: how will development of Makar Wharf take place with and without the implementation of the project. In addition, in other chapters of this Report (although not yet in this Preliminary Report), the influence of the proposed location on the present and future operation of the port is analyzed and suggestions are made for a different location of the bulk handling facilities.

5.4.4 Container Freight Station

Presently some containers are being stuffed or unloaded in the port at or near the transit sheds. The majority of the containers, however, are stuffed and unloaded outside the port area. It has been proposed that the PPA build a container freight station in the port, where the transfer of cargo between trucks and containers can take place. The proposed location would be northeast of the Administration Building, on land to be reclaimed and incorporated into the port area. In other chapters of this Report (although not yet in this Preliminary Report), the necessity and possible size of the container freight station is analyzed.

CHAPTER 6

EXISTING PORT TRAFFIC

6.1 PORT STATISTICS

The analyses presented in this part of the Report could only be performed because the Philippine Ports Authority (PPA) decided to restructure its statistical system at the Makar Wharf starting with the year 1990. The new system contains a wealth of information on the types and characteristics of the ships calling at General Santos; the time ships spend waiting for a berth at anchorage, made fast at a berth, and serviced; the classification and types of cargo; the gross and net gang-hours spent servicing each ship; and the number and size of containers.

Statisticians at the Port Services Division at the Makar Wharf take the statistics from the ship manifests and other port control documents and place it in spreadsheet form into the computer. The information for 1990 was available to the Consultant as early as February 1991. The statistics is kept in several typical tables, by month, samples of which are shown in Tables 6-1 to 6-8, as follows:

I. Shipping Traffic (Table 6-1). This table shows:

a. a Control Number, giving the order of arrival of the ship. This number is also used in the other tables to identify the ship;
b. the name of the ship;
c. the voyage number, meaningful only to the ship, not to the port;
d. the last and the next port of call;
e. the type of ship;
f. the Gross Registered Tonnage (GRT), the Net Registered Tonnage (NRT), the Deadweight Tonnage (DWT), the beam and the length overall (LOA), of the ship;
g. the arrival time at anchorage and/or at berth;
h. the departure time from anchorage or berth; and
i. the waiting and service times.

II. Passenger and Labor Statistics (Table 6-2). This table shows:

a. the Control and Voyage Numbers;
b. the number of passengers disembarked and embarked, if any;
c. the total number of men working the ship;
d. the total number of gangs;

Table 6-1

TYPICAL PORT TRAFFIC STATISTICS

I. SHIPPING TRAFFIC STATISTICS

[x] DOMESTIC [ ] FOREIGN

[x] BERTH [ ] ANCHORAGE

PORT: GENERAL SANTOS

PIER/ZONE: MAKAR WHARF

MONTH: NOVEMBER YEAR: 1990

CTR. NO.	NAME OF VESSEL	VOY. NO./ REG. NO.	SHIPPING LINES/ OPERATOR	PORTS OF CALL		VESSEL PARTICULARS						DRAFT		ARRIVAL AT						DEPARTURE			TIME	
														ANCHORAGE			BERTH			ANCH/BERTH			WAITING	SERVICE
				LAST	NEXT	TYPE	GRT	NRT	DWT	BEAM	LOA	ARR.	DEPT.	DAY	HR.	MIN.	DAY	HR.	MIN.	DAY	HR.	MIN.	HRS	HRS
1	MT WARAY	39	MALAYAN TOWAGE	MANILA	MANILA	MT	262	136	536	7	45	4.00	4.00				21	19	20	29	6	0	0	178.67
2	EVER TRANSPORT	01	EVER LINES, INC.	BACOLOD	SAN CARLOS	OC	137	137	834	8	48	2.90	2.80				24	9	30	31	23	30	0	182.00
3	BARGE ALMA III	01	R I C	MANILA	MANILA	B	2462	2462	4700	15	95	2.50	5.00				24	19	20	29	10	30	0	111.17
4	WILCON IV	28	WILLIAM LINES, INC.	POLLOC	MANILA	C	3464	2647	4822	16	97	6.00	5.00				25	6	45	26	10	30	0	28.08
5	PHIL. PRINCESS	823	SULPICIO LINES, INC.	ZAMBOANGA	ZAMBOANGA	PC	4718	2993	8643	17	171	5.00	6.00				26	5	10	26	17	0	0	11.88
6	EDWIN	105	CANDANO SHIPPING LINES	MATI	MATI	GC	551	417	1000	9	52	3.00	4.00				26	6	0	27	9	30	0	27.50
7	A. MEGA I	23	ABOITIZ TRANSPORT SYSTEM	DAVAO	MANILA	C	7266	5135	12247	19	140	6.90	7.30				28	8	55	30	3	0	0	207.17
8	LORCON XI	16	LORENZO SHIPPING CORP.	DAVAO	MANILA	GC	1886	1045	3127	13	84	5.50	6.00				29	6	0	31	5	0	0	45.00
9	SULCON XV	10	SULPICIO LINES, INC.	POLLOC	MANILA	C	2933	2095	4903	15	97	6.00	6.00				29	10	40	30	15	55	0	29.25
10	GREAT RISER	09	SAMSHIPCO	LEYTE	DUMAGUETE	GC	700	584	1350	10	64	2.00	5.00				29	15	3	10	16	0	0	290.50
11	MANILA CITY	42	WILLIAM LINES, INC.	DUMAGUETE	DUMAGUETE	PC	2962	1648	4008	16	107	4.00	5.00				30	10	10	31	2	10	0	16.00
12	VISMIN	09	FILNOR SP. CARRIER	MANDAUE	MANDAUE	GC	300	140	600	12	69	3.10	2.90	30	3	7	30	16	50	31	4	0	13.72	11.17
TOTAL :							27641	19239	46770	157	1069	50.9	57										13.72	1138.39
AVERAGE :							2303	1605	3898	13	89	4	5											
MAXIMUM :							7266	5135	12247	17	171	6.9	7.3											

Legend:

MT - Motor Tug
GC - General Cargo
B - Barge
C - Container Ship
PC - Passenger/Cargo

GRT - Gross Registered Tons
NRT - Net Registered Tons
DWT - Deadweight Tons
LOA - Length Overall

Source: Philippine Ports Authority

Table 6-2

TYPICAL PORT TRAFFIC STATISTICS

II. PASSENGERS AND PORT LABOR

[x] DOMESTIC [ ] FOREIGN

[x] BERTH [ ] ANCHORAGE

MONTH: NOVEMBER YEAR: 1990

CTR. NO.	VOY. NO.	PASSENGER TRAFFIC		TOTAL NUMBER OF MEN	TOTAL NUMBER OF GANGS	GROSS GANG HOUR		NET GANG HOUR		IDLE GANG HOUR		REASONS FOR IDLE TIME	TOTAL CARGO TONNAGE HANDLED BY GANG	REMARKS
		DISEMBARKED	EMBARKED			DISCHARGING HRS:MIN	LOADING HRS:MIN	DISCHARGING HRS:MIN	LOADING HRS:MIN	DISCHARGING HRS:MIN	LOADING HRS:MIN			
1	01							0	0					No activity – for towing only
2	39			18	1	0	17	0	14.5	0	2.5		1,170.00	
3	01			36	2	0	105	0	91.5	0	13.5		4,080.00	
4	28	12	85	36	2	11	13	9.5	13	1.5	0		2,839.58	
5	23	323	525	18	1	11.5	10.5	10	10.5	1.5	0		1,267.42	
6	5			18	1	0	11	0	8.5	0	2.5		562.54	
7	23			36	2	19	19.5	16.5	17	2.5	2.5		5,033.72	
8	16			18	1	10.5	10.5	9	10.5	1.5	0		1,270.31	
9	10			18	1	16.5	22.5	15	22.5	1.5	0		1,218.30	
10	09			56	2	71	69.5	63	60.5	8	9		3,036.90	
TOTAL		557	610	254	15	139.5	278.5	123	248.5	16.5	30		18,498.77	

Source: Philippine Ports Authority

Table 6-3

TYPICAL PORT TRAFFIC STATISTICS
III. CARGO STATISTICS BY COMMODITY CLASSIFICATION
INWARD - BREAKBULK CARGO

PORT: GENERAL SANTOS
PIER/ZONE: MAKAR WHARF

[x] DOMESTIC [ ] FOREIGN
[x] BERTH [ ] ANCHORAGE

MONTH: NOVEMBER YEAR: 1990

CRTL. NO.	VOY. NO./ REG. NO.	TOTAL CARGO INWARD	01 LIVE ANIMALS	02 DAIRY PROD.	03 FISH & PREP.	04 PALAY/ RICE	05 CORN	06 WHEAT	07 FRUITS & VEG.	08 SUGAR	09 MOLASSES	10 ANIMAL FEEDS	11 BOTTLED CARGO	12 TOBACCO MFTRS	21 COPRA	23 LOGS	24 PULP & PAPER	27 FERTILIZER	28 CRUDE MINERAL	29 SCRAP METAL	32 REF. PET. PRODUCT	33 MINERALS FUELS
02	39	600								600.00												
04	28	196.85							2.03													
05	823	237.08	0.06	14.83	58.62	0.3		36.29						3			17.89					
07	23	22.51																				
09	16	20.91																				
10	10	191.42			64.55				2.6								26.46					
11	09	1200																1200				
12	42	16.47							5.8								0.13					
13	09	632.89											632.89									
TOTAL M.T.			0.06	14.83	123.15	0.3	0	36.29	10.43	600	0	0	632.89	3	0	0	44.48	1200	0 0	0	0 0	0

Table 6-4

TYPICAL PORT TRAFFIC STATISTICS
III. CARGO STATISTICS BY COMMODITY CLASSIFICATION
OUTWARD - BREAKBULK CARGO

CRTL. NO.	VOY. NO./ REG. NO.	TOTAL CARGO OUTWARD	01 LIVE ANIMALS	02 DAIRY PROD.	03 FISH & PREP.	04 PALAY/ RICE	05 CORN	06 SUGAR	07 FRUITS & VEG.	10 ANIMAL FEEDS	11 BOTTLED CARGO	12 TOBACCO MFTRS	23 LOGS	24 PULP & PAPER	27 FERTILIZER	41 COOKIN OIL	51 CHEMICALS	61 PLYWOOD & VENEE
02	39	570.00								570.00								
05	01	4,080.00					4,080.00											
04	28	309.5	307.35			0.04			0.50									
05	823	15.97			0.24	1.70			0.80					0.09				
07	23	1.25																
09	16	4.75	4.50															
10	10	32.00	32.00															
11	09	1,836.90		0.09		105.00	25.00			1,705.50								
TOTAL M.T.			343.85	0.09	0.24	106.74	4,105.00	0.00	1.30	2,275.50	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00

Source: Philippine Ports Authority

Table 6-5

TYPICAL PORT TRAFFIC STATISTICS

III. CARGO STATISTICS BY COMMODITY CLASSIFICATION

INWARD - CONTAINERIZED CARGO

[x] DOMESTIC [ ] FOREIGN

[x] BERTH [ ] ANCHORAGE

PORT: GENERAL SANTOS

PIER/ZONE: MAKAR WHARF

MONTH: NOVEMBER YEAR: 1990

CRTL. NO.	VOY. NO./ REG. NO.	TOTAL CARGO INWARD	01 LIVE ANIMALS	02 DAIRY PROD.	03 FISH & PREP.	04 PALAY/ RICE	05 CORN	06 WHEAT	07 FRUITS & VEG.	08 SUGAR	09 MOLASSES	10 ANIMAL FEEDS	11 BOTTLED CARGO	12 TOBACCO MFTRS	21 COPRA	23 LOGS	24 PULP & PAPER	27 FERTILIZER	28 CRUDE MINERALS	32 REF. PET. PRODUCT	33 MINERALS FUELS
04	28	793.17		90.00								1.37	8.00	48.00			30.08			17.63	
05	823	178.76			14.29	1.54						32.56					13.72				
07	23	561.07		27.37				17.50	30.00			55.18	8.91	38.26						66.04	
09	16	298.45											245.50				1.48		1.00		
10	10	227.51		2.38	2.00		3.00	2.19				40.06	18.00				8.44				
12	42	332.90		8.00								7.50									
17	04	416.16											162.00	36.00				56.00			
18	824	82.30												30.00			0.68				
19	09	721.51		37.00				29.77	16.00			34.50	67.80	32.09			0.18	189.75		31.26	
TOTAL M.T.			0.00	164.75	16.29	1.54	3.00	49.46	46.00	0.00	0.00	171.17	510.21	184.35	0.00	0.00	24.50	245.75	1.00	97.50	0.00

Table 6-6

TYPICAL PORT TRAFFIC STATISTICS

III. CARGO STATISTICS BY COMMODITY CLASSIFICATION

OUTWARD - BULK CARGO

[x] DOMESTIC [ ] FOREIGN

[x] BERTH [ ] ANCHORAGE

MONTH: NOVEMBER YEAR: 1990

CRTL. NO.	VOY. NO./ REG. NO.	TOTAL CARGO OUTWARD	01 LIVE ANIMALS	03 FISH & PREP.	04 PALAY/ RICE	05 CORN	07 FRUITS & VEG.	10 ANIMAL FEEDS	08 SUGAR	21 COPRA	26 TEXTILE FIBER	29 SCRAP METAL	32 REF. PET. PROD.	41 COCONUT OIL	63 MAN. OF METAL	71 MACH. & EL. EQUIP.	72 T/SPORT EQUIPT	91 GENERAL CARGO	X PALM OIL
04	28	365.00																	365.00
05	105	562.54								562.54									
TOTAL M.T.		927.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	562.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	365.00

Source: Philippine Ports Authority

Table 6-7

TYPICAL PORT TRAFFIC STATISTICS

IV. (a) NUMBER OF CONTAINERS HANDLED BY SIZE (in feet)

[x] DOMESTIC [ ] FOREIGN

PORT: GENERAL SANTOS

PIER/ZONE: MAKAR WHARF

MONTH: NOVEMBER YEAR: 1990

CTRL NO.	VOY. NO./ REG. NO.	INBOUND CONTAINERS BY SIZE																											
		E			M		P		T		Y		F		C		L			L			C		L				
		5	6	8	10	12	20	35	40	45	5	6	8	10	12	20	35	40	45	5	6	8	10	12	20	35	40	45
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)
04	28													15		64												
07	23						71									34		7										
10	10													6		45												
TOTAL		0	0	0	0	0	71	0	0	0	0	0	0	21	0	163	0	7	0	0	0	0	0	0	0	0	0	0

Table 6-8

TYPICAL PORT TRAFFIC STATISTICS

IV. (b) NUMBER OF CONTAINERS HANDLED BY SIZE (in feet)

[ ] DOMESTIC [x] FOREIGN

PORT: GENERAL SANTOS

PIER/ZONE: MAKAR WHARF

MONTH: NOVEMBER YEAR: 1990

CTRL NO.	VOY. NO./ REG. NO.	OUTBOUND CONTAINERS BY SIZE																											
		E			M		P		T		Y		F		C		L			L			C		L				
		5	6	8	10	12	20	35	40	45	5	6	8	10	12	20	35	40	45	5	6	8	10	12	20	35	40	45
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)
04	28													2		65												
07	23															198		14										
10	10													2		25												
TOTAL		0	0	0	0	0	0	0	0	0	0	0	0	4	0	289	0	14	0	0	0	0	0	0	0	0	0	0

Abbreviations: FCL - Full Container Load

LCL - Less Than Container Load

Source: Philippine Ports Authority

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e. the gross gang hours, discharging and loading;
f. the net gang hours, discharging and loading;
g. the idle gang hours, discharging and loading, and the reasons for idle time (mostly meal time); and
h. the total cargo tonnage handled by gang;

III. Cargo Statistics by Commodity Classification (Tables 6-3 to 6-6). This table shows:

a. the Control and Voyage numbers;
b. the total cargo handled; and
c. a series of columns, showing the tonnage of each category of cargo handled.

Table III appears for up to six different classes of cargo:

Breakbulk outward	Breakbulk inward
Bulk outward	Bulk inward
Containerized outward	Containerized inward

IV(a). Number of Containers Handled, by size (Table 6-7). This table shows:

a. the Control and Voyage numbers;
b. empty inbound containers, by size, from 5 to 45 feet;
c. FCL (full container load) inbound containers, by the same sizes;
d. LCL (less than container load) inbound containers, by the same sizes.

IV(b). Number of Containers handled, by size (Table 6-8). This table is similar to Table IV(a), except it shows containers handled outbound.

Tables I to III appear in several series:

Domestic ships at anchorage
Domestic ships at berth
Foreign ships at anchorage
Foreign ships at berth

Tables IV(a) and IV(b) appear in two series: Domestic Ships and Foreign Ships.

In addition, the Port Management at General Santos prepares a monthly report, reproduced as Table 6-9, that shows quantities for the current month and for the year to date. It shows on Sheet 1 the totals from Table 6-1, plus the berth occupancy rate; on Sheet 2 the cargo throughput, domestic, foreign and in transit, by type: breakbulk, bulk and containerized, and the number of passengers; on Sheet 3 the labor statistics for non-containerized cargo, domestic and

Table 6-9

TYPICAL PORT STATISTICS

MONTHLY REPORT

Sheet 1

SUMMARY STATISTICAL REPORT Port of: MAKAR WHARF	PDO: SOUTHERN MINDANAO PMO: GENERAL SANTOS

[x] Base Port	[x] Berth	[1] [0]	Month
[ ] Terminal Port			
[ ] Other Government Port	[ ] Anchorage	[9] [0]	Year
[ ] Private Port			

PARTICULARS	THIS MONTH	YEAR TO DATE
A. SHIPPING		
1. Number of vessels	67	55
Domestic	62	519
Foreign	5	36
2. Gross Registered Tonnage	173,661	1,341,328
Domestic	148,076	1,160,879
Foreign	25,585	180,449
3. Net Registered Tonnage	111,659	875,286
Domestic	96,379	762,025
Foreign	15,280	113,261
4. Deadweight Tonnage	290,504	2,187,897
Domestic	248,988	1,914,622
Foreign	41,516	273,275
5. Length of Vessel (m.)	5,811	45,802
Domestic	5,228	41,790
Foreign	583	4,012
6. Beam of Vessel (m.)	1,085	7,276
Domestic	989	6,914
Foreign	96	562
7. Draft of Vessel (m.)	307	2,569
Domestic	283	2,408
Foreign	24	161
8. Waiting Time (hrs.)	145	437
Domestic	110	366
Foreign	35	71
9. Service Time (hrs.)	3,818	28,234
Domestic	3,375	25,837
Foreign	443	2,397
10. Berth Occupancy Rate (%)	80.14	57.31
a. Total effective berth length (m.)	516	561
b. Spacing Factor (%)	1.00	1
c. Number of days	31	305

(continued)

Source: Philippine Ports Authority

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Sheet 2 (continued)

SUMMARY STATISTICAL REPORT Port of: MAKAR WHARF	PDO: SOUTHERN MINDANAO PMO: GENERAL SANTOS

[x] Base Port
[ ] Terminal Port
[ ] Other Government Port
[ ] Private Port

[x] Berth
[ ] Anchorage

[1] [0] Month
[9] [0] Year

PARTICULARS	THIS MONTH	YEAR TO DATE
B. CARGO AND PASSENGER		
1. Total Cargo Throughout (m.t.)	82,351	687,282
a. Domestic	76,411	619,331
Inbound	27,001	210,881
Breakbulk	15,459	112,324
Bulk	0	1,916
Containerized	11,542	96,641
Outbound	49,410	408,450
Breakbulk	12,229	120,140
Bulk	6,146	68,242
Containerized	31,035	220,068
b. Foreign	5,940	67,951
Import	5,940	56,578
Breakbulk	887	10,979
Bulk	5,000	45,464
Containerized	53	135
Export	0	11,373
Breakbulk	0	1,252
Bulk	0	0
Containerized	0	10,121
c. Transit Cargo	0	0
Domestic	0	0
Foreign	0	0
2. Total Passengers	6,688	92,439
a. Disembarking	3,152	39,309
b. Embarking	3,536	53,130

Source: Philippine Ports Authority

Sheet 3 (continued)

SUMMARY STATISTICAL REPORT Port of: MAKAR WHARF	PDO: SOUTHERN MINDANAO PMO: GENERAL SANTOS

[x] Base Port
[ ] Terminal Port
[ ] Other Government Port
[ ] Private Port

[x] Berth
[ ] Anchorage

[1] [0] Month
[9] [0] Year

PARTICULARS	THIS MONTH	YEAR TO DATE
C. LABOR STATISTICS FOR NON-CONTAINERIZED CARGO		
1. Domestic		
a. Total Number of men	954	10,084
b. Number of Gangs	53	562
c. Average number of men per gang	18.0	18.0
d. Total cargo handled by gang	22,834	302,622
e. Gang Hours Worked		
Gross	1,088	11,294
Net	963	9,975
Idle	125	1,319
f. Tonnage Handled/Gang Hour		
Gross	21.0	26.8
Net	23.7	30.3
g. Tonnage Handled/Man Hour		
Gross	1.2	1.5
Net	1.3	1.7
2. FOREIGN		
a. Total Number of men	270	1,800
b. Number of Gangs	15	100
c. Average number of men per gang	18.0	18.0
d. Total cargo handled by gang	5,887	57,695
e. Gang Hours Worked		
Gross	313	1,603
Net	287	1,443
Idle	26	160
f. Tonnage Handled/Gang Hour		
Gross	18.8	36.0
Net	20.5	40.0
g. Tonnage Handled/Man Hour		
Gross	1.0	2.0
Net	1.1	2.2

Source: Philippine Ports Authority

Sheet 4 (continued)

SUMMARY STATISTICAL REPORT Port of: MAKAR WHARF	PDO: SOUTHERN MINDANAO PMO: GENERAL SANTOS

[x] Base Port
[ ] Terminal Port
[ ] Other Government Port
[ ] Private Port

[x] Berth
[ ] Anchorage

[1] [0] Month
[9] [0] Year

PARTICULARS	THIS MONTH	YEAR TO DATE
D. CONTAINER TRAFFIC		
1. Total Container (in TEU)	4,688	32,298
a. Domestic	4,194	30,746
Inbound	2,275	15,145
Empty	1,345	6,557
Loaded - FCL	930	8,588
Loaded - LCL	0	0
Outbound	1,919	15,601
Empty	196	1,681
Loaded - FCL	1,723	13,920
Loaded - LCL	0	0
b. Foreign	494	1,552
Import	250	431
Empty	250	421
Loaded - FCL	0	10
Loaded - LCL	0	0
Export	244	
Empty	0	1,121
Loaded - FCL	244	223
Loaded - LCL	0	895
		0
E. LABOR STATISTICS FOR CONTAINERIZED CARGO		
1. Domestic		
a. Total containers handled	4,194	30,746
b. Gang Hours Worked		
Gross	629	4,813
Net	550	4,310
Idle	80	503
c. Number of Containers Handled per Gang Hour		
Gross	6.7	6.4
Net	7.6	7.1
2. FOREIGN		
a. Total containers handled	494	1,552
b. Gang Hours Worked		
Gross	50	192
Net	50	181
Idle	0	11
c. Number of Containers Handled per Gang Hour		
Gross	9.9	8.1
Net	9.9	8.6

Source: Philippine Ports Authority

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foreign; and on Sheet 4 the labor statistics for containerized cargo, all for domestic and foreign cargo.

The PPA, having jurisdiction also over the private piers in the area: Dole, General Milling Corporation and Caltex, keeps similar statistics for these piers.

Unfortunately, this detailed information is available only for the year 1990. It seems to be reliable, mainly because of the methodology for its preparation but also because of little other information that contradicts it. For previous years, the information is much more spotty and unreliable, because of contradictory numbers, even from the same source.

From the indicated monthly statistics the summary for the year 1990 was prepared as shown in Table 6-10 for domestic vessels and in Table 6-11 for foreign vessels. The number of vessels in domestic trade fluctuates between a low of 38 vessels in July and a high of 67 vessels in December. The distribution is relatively even, with the last months of the year showing a somewhat higher number of ships and the beginning months of the year a somewhat lower number. The months of June and July show the lowest number.

For the analysis of the container traffic and of the stuffing and unloading operation of containers, two sets of statistics were assembled from the statistical data of the PPA: In Table 6-12 the number of containers used by domestic ships, inbound and outbound, empty and full is given for each month of 1990, while in Table 6-13 the same data are given for the containers used by foreign ships. The data are given also for the different sizes of containers: 10 feet, 20 feet, and 40 feet, which then are converted into twenty-foot equivalent units (TEU).

6.2 CLASSIFICATION OF CARGO

The Philippine Ports Authority (PPA) divides all cargo into three types: breakbulk, bulk and containerized. The PPA keeps records on the amount of cargo moved through the port, separately for each of the three types. This allowed the Consultant to analyze in detail, at least for the year 1990, many factors that are of great importance for determining the capacity of the port to handle cargo at present and in the future. One of the most important factors is productivity or more specifically the amount of cargo that can be moved from wharf to ship or vice versa, in a given unit of time. This amount depends to a great degree on the form in which the cargo arrives at the port. In Chapter 8, the PPA records, including the labor productivity statistics, are combined with cargo handling observations by the Consultant's team and with the corresponding experience at other ports, to determine the productivity for each of the types of cargo. In fact, the types had to be divided into further sub-types, since the productivity is different for different forms within each type.

Bulk cargo consists basically of three commodities: copra and corn, both outbound; and fertilizer, inbound. Bulk corn and copra arrive at the port in boxes that are hoisted aboard ship

Table 6-10

1990 DOMESTIC SHIPPING STATISTICS - BY MONTH

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
NUMBER OF SHIPS	54	50	52	52	59	46	38	49	57	62	56	67	642
GRT													
TOTAL	111814	107886	108609	121176	121070	108079	89534	119035	125600	148076	145001	186550	1492430
AVERAGE	2071	2158	2179	2330	2052	2350	2356	2429	2204	2388	2685	2784	27986
MAXIMUM	7266	7266	7266	7266	7266	7266	7266	8544	8544	8544	8544	8544	93582
NRT													
TOTAL	73576	71345	71722	81163	79693	71475	58873	77181	80918	96379	94200	119521	976046
AVERAGE	1363	1427	1379	1561	1351	1554	1541	1575	1420	1555	1744	1784	18254
MAXIMUM	5135	5135	5135	5135	5135	5135	5135	5135	5135	5135	5135	5135	61620
DWT													
TOTAL	185933	179231	176411	188509	198990	176234	144876	198572	216875	248988	247725	324053	2486397
AVERAGE	3443	3585	3393	3625	3373	3916	3813	4052	3805	4016	4588	4837	46446
MAXIMUM	12247	12247	12247	12247	12247	12247	12247	17687	17687	17687	17687	17687	174164
LOA (M.)													
TOTAL	4193	3912	3959	4106	4586	3832	3192	4123	4659	5288	5107	6014	52971
AVERAGE	78	78	76	79	78	85	82	84	82	84	95	90	991
MAXIMUM	140	140	140	140	140	140	140	140	150	171	171	150	1762
BEAM (M.)													
TOTAL	643	574	614	630	761	631	524	702	846	989	876	1118	8908
AVERAGE	12	11	12	12	13	14	14	14	15	16	16	17	166
MAXIMUM	65	19	19	19	19	19	19	28	58	58	58	58	439
DRAFT-ARR.													
TOTAL	265	248	277	247	233	196	158	216.12	248.89	278	258	309.6	2934.61
AVERTAGE	5	5	5	5	4	4	4	4	4.37	4	5	4.62	53.99
MAXIMUM	7	7	7	7	7	7	7	7.2	8	8	8	7	87.2
DRAFT- DEP.													
TOTAL	259	250	252	269	249	213	185	222.11	257.33	287	262	340.09	3045.53
AVERAGE	5	5	5	5	4	5	5	5	4.51	5	5	5.08	58.59
MAXIMUM	8	7	7	8	7	7	9	7.3	7.3	7	7	8.6	90.2
TYPE OF SHIPS													
GEN. CARGO(GC)	27	19	24	21	29	19	15	23	32	32	22	27	290
CONTAINER(C)	12	13	12	18	12	13	12	13	15	18	17	21	176
PASS./CARGO(PC)	14	12	13	13	18	14	11	13	9	8	9	10	144
BARGE (B)	1	4	3								4	5	17
MOTOR TUG (MT)											2		2
TUG BOAT (TB)									1	4	2	4	11
FUEL BARGE (FB)		2											2

Source: Consultant's compilation from PPA data.

Table 6-11

1990 FOREIGN SHIPPING STATISTICS - BY MONTH

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
NUMBER OF SHIPS	2	4	4	2	1	5	1	6	5	6	2	0	38
GRT													
TOTAL	13001	19544	10760	14057	8601	29063	1066	34680	24092	25584	8299	0	188747
AVERAGE	6501	5369	2690	7029	4301	5813	1066	780	4818	5117	41485	0	84969
MAXIMUM	11070	9822	6721	9077	6670	13608	1066	10937	11721	12469		0	93161
NRT													
TOTAL	7300	13543	7403	9046	4926	19250	607	21173	14733	15280	5214	0	118475
AVERAGE	3650	3386	1851	4523	2463	3850	607	3529	2947	2859	2607	0	32272
MAXIMUM	5967	6439	4741	5582	3593	10262	607	7047	7272	6000		0	57510
DWT													
TOTAL	19026	3282	19796	7777	3440	44320	1585	59361	43630	41516	14916	0	258649
AVERAGE	9513	8206	4949	7777	3440	11080	1585	9894	8726	6919	7458	0	79547
MAXIMUM	15586	15178	10986	7777	3440	23560	1585	19815	18981	18886		0	135794
LOA (M.)													
TOTAL	241	456	386	266	82	586.6	89	708	614	583	214	0	4225.6
AVERAGE	121	114	97	133	41	117	89	118	123	97	107	0	1157
MAXIMUM	159	137	131	143	82	164	89	154	155	163		0	1377
BEAM (M.)													
TOTAL	31	42	57	38	12	71.8	14	111	89	96	37	0	598.8
AVERAGE	16	18	14	19	6	18	14	19	18	16	18.5	0	176.5
MAXIMUM	19	24	22	20	12	23	14	24	20	20		0	198
DRAFT-ARR.													
TOTAL	13	23	24	16	3	9	4	35	20.58	25.97	9	0	182.55
AVERAGE	7	6	6	8	2	5	4	6	4.12	5.19		0	53.31
MAXIMUM	8	6	7	8	3	5	4	8	5	7.72		0	61.72
DRAFT- DEP.													
TOTAL	12	18	26	10	3	5	3	26	18.87	23		0	144.87
AVERAGE	6	5	7	5	2	5	3	4	3.77	4.6		0	45.37
MAXIMUM	7	5	8	5	3	5	3	6	5.63	6		0	53.63
TYPE OF SHIPS													
GEN. CARGO(GC)	2	3	4		1	5	1	2	2	3	2		25
CONTAINER(C)		1						1	3	2			7
PASS./CARGO(PC)													0
BARGE (B)								3		1			4
MT													0
TUG BOAT (TB)													0
FUEL BARGE (FB)				2									2

SOURCE: Consultant's compilation from PPA data.

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Table 6-12
1990 DOMESTIC CONTAINER STATISTICS - BY MONTH

CONDITION	JAN			FEB			MAR			APR			MAY			JUN			JUL		
SIZE	10	20	40	10	20	40	10	20	40	10	20	40	10	20	40	10	20	40	10	20	40
INBOUND																					
EMPTY	101	544	3	77	340	16	80	504		63	574	5	74	579	17	64	662	13	64	662	13
FCL	201	649	3	183	562	4	202	802		138	696	5	174	694	7	275	858	4	275	858	4
TOTAL	302	1193	6	260	842	20	282	1306	0	201	1270	10	248	1273	24	339	1520	17	339	1520	17
TEU	151	1193	12	130	842	40	141	1306	0	100.5	1270	20	124	1273	48	169.5	1520	34	169.5	1520	34
OUTBOUND																					
EMPTY	39	87	10	9	196	15	44	240		11	332		1	93	1		32	19	7	155	
FCL	211	1384	7	262	1156	21	250	961	15	259	1207		303	1246	5		167	8	218	1335	16
TOTAL	250	1471	17	271	1352	36	294	1201	15	270	1539	0	304	1339	6	0	199	27	225	1490	16
TEU	125	1471	34	135.5	1352	72	147	1201	30	135	1539	0	152	1339	12	0	199	54	112.5	1490	32
GRAND TOTAL	552	2664	23	531	2194	56	576	2507	15	471	2809	10	552	2612	30	339	1719	44	564	3010	33
TEU	276	2664	46	265.5	2194	112	288	2507	30	235.5	2809	20	276	2612	60	169.5	1719	88	282	3010	66

CONDITION	AUG			SEP			OCT			NOV			DEC			TOTAL			GRAND		
SIZE	10	20	40	10	20	40	10	20	40	10	20	40	10	20	40	10	20	40			
INBOUND																					
EMPTY	65	644	27	37	807		24	1345	4	14	882	22	74	1049	44	737	8592	164		9493	
FCL	344	802	39	167	619		190	930	4	268	1112	27	241	1199	11	2658	9721	108		12487	
TOTAL	409	1446	66	204	1426	0	214	2275	8	282	1994	49	315	2248	55	3395	18313	272	0	21980	0
TEU	204.5	1446	132	102	1426	0	107	2275	16	141	1994	98	157.5	2248	110	1697.	18313	544		20554.5	
OUTBOUND																					
EMPTY	21	145	2		108	7	26	1996	4	14	68	2	26	506	4	198	3958	64		4220	
FCL	252	1333	36	150	1180	56	266	723	67	290	2189	47	225	1267	66	2686	14148	344		17178	
TOTAL	273	1478	38	150	1288	63	292	2719	71	304	2257	49	251	1773	70	2884	18106	408		21398	
TEU	136.5	1478	76	75	1288	126	146	2719	142	152	2257	98	125.5	1773	140	1442	18106	816		20364	
GRAND TOTAL	682	2924	104	354	2714	63	506	4994	79	586	4251	98	566	4021	125	6279	36419	680		43378	
TEU	341	2924	208	177	2714	126	253	4994	158	293	4251	196	283	4021	250	3139.	35419	1360		40918.5	

Source: Consultant's compilation from PPA data.

Table 6-13

1990 FOREIGN CONTAINER STATISTICS - BY MONTH

CONDITION	JAN			FEB			MAR			APR			MAY			JUN			JUL		
SIZE	10	20	40	10	20	40	10	20	40	10	20	40	10	20	40	10	20	40	10	20	40
INBOUND																					
EMPTY																	32	19			
FCL																	167	8			
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	199	27	0	0	0
TEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	199	54	0	0	0
OUTBOUND																					
EMPTY																	18				
FCL																	8				
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0	0	0	0
TEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0	0	0	0
GRAND TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	225	27	0	0	0
TEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	225	54	0	0	0

CONDITION	AUG			SEP			OCT			NOV			DEC			TOTAL			GRAND
SIZE	10	20	40	10	20	40	10	20	40	10	20	40	10	20	40	10	20	40	
INBOUND																			
EMPTY		20			73			250			195					0	570	19	589
FCL					2						13					0	182	8	190
TOTAL	0	20	0	0	75	0	0	250	0	0	208	0	0	0	0	0	752	27	779
TEU	0	20	0	0	75	0	0	250	0	0	208	0	0	0	0	0	752	54	806
OUTBOUND																			
EMPTY					11	1										0	29	1	30
FCL		119			146	6		174	35		190	9				0	637	50	687
TOTAL	0	119	0	0	157	7	0	174	35	0	190	9	0	0	0	0	666	51	717
TEU	0	119	0	0	157	14	0	174	70	0	190	18	0	0	0	0	666	102	768
GRAND TOTAL	0	139	0	0	232	7	0	424	35	0	398	9	0	0	0	0	1418	78	1496
TEU	0	139	0	0	232	14	0	424	70	0	398	18	0	0	0	0	1418	156	1574

Source: Consultant's compilation from PPA data.

and emptied into the hold. Bulk fertilizer is loaded by clam shell or canvas-lined net slings from the ship's hold into hoppers from which it is placed into bags. These two systems have somewhat different rates of handling, as discussed in detail in Chapter 8.

Containerized cargo is always handled in the same form, regardless of the commodity inside the container, hence no sub-types exist, unless full and empty containers would be so considered, since they receive somewhat different treatment in the port.

Breakbulk cargo not only has the most sub-types of the three, it also receives the most varied treatment at the port and is thus handled with the most varied productivity rates. These rates vary also with the commodity, to such a degree that no productivity rates can be specifically established for breakbulk cargo. Three sub-types could be distinguished: bagged or sacked cargo, palletized cargo and all other general cargo in loose pieces. However, within each sub-type the productivity rate can be very different. Palletized (and at the same time bagged) corn would be handled at different speeds and with different methods than palletized bottled cargo. As a consequence, breakbulk cargo is being treated in Chapter 8 as a single type.

The PPA system of statistics not only uses a classification in accordance with the types of shipping methods, such as bulk, container or breakbulk, but within these types distinguishes between the different commodities, as demonstrated in the tables of Section 6.1. This classification is used nationwide by all ports under the jurisdiction of the PPA.

6.3 CARGO MOVEMENT

The method now used, starting with 1990 by computer, to register the activities at the PPA ports, including Makar Wharf, is shown in Section 6.1. To present the entire series of tables in full in this Report would not only use up too much space, it also would not be too useful. A meaningful selection could be presented in this section. It would be necessary, however, to repeat the most significant numbers again in Chapter 7 where these numbers are used as starting points for the forecasts of the future traffic of commodities through the port, and in Chapter 8 where they are used to compare the present capability to move cargo through the port with the actual demand for such services. The same principle applies to the statistics for prior years which are much sparser.

6.4 CONTAINERIZATION

Containers are generally used to move high-cost, low-volume commodities or cargo that is especially sensitive, but not for high-volume, low-cost cargo, such as corn, copra, etc. Special conditions at the Makar Wharf have caused containers to be used for the shipment of such commodities as corn, copra, animal feed, rice and fish. Even hogs are shipped out in cages that

are built and handled like containers. The percentage of cargo that is moved in containers is still on the increase. While the 1971 report by Sir William Halcrow & Partners hardly mentioned containers, by 1990, 48 percent of all cargo was containerized -- 37.4 percent of all inbound cargo and 54.4 percent of all outbound cargo. The total number of Twenty-Foot-Equivalent Units (TEU'S) that year was 41,502.

The practice probably started with the shippers having many empty containers that had arrived with manufactured goods and that had no commodities to put into the containers on their way out. By now, empty containers are brought into the area for the explicit purpose of being loaded with bags of corn, etc. Reduction of pilferage and spillage, ease of handling, and the fact that most ships calling at Makar Wharf can carry containers, are factors that come to mind to explain the popularity of containers for commodities that under different circumstances would be shipped as breakbulk.

6.5 PASSENGER TRAFFIC

The passengers that are normally using the facilities of port of Makar are mostly local businessmen and local residents shuttling between the different ports of the country and General Santos. A total of 144 domestic passenger ships have made calls at Makar Wharf, loading or unloading a total of 107,853 passengers in 1990. Of this total, 45,687 passengers or 42 percent disembarked and 62,166 passengers or 58 percent have embarked.

The record compiled by PPA for a period of 10 years shows that passenger traffic has been relatively stable, with a high of 137,210 passengers in 1982 and to a low of 98,144 passengers in 1985. No pattern is discernible.

Monthly values for the year 1990 are presented in Table 6-14 and Figure 6-1, showing that arrivals and departures of passenger in General Santos have great seasonal variations. The peak month for passenger movements is April and the low month is July.

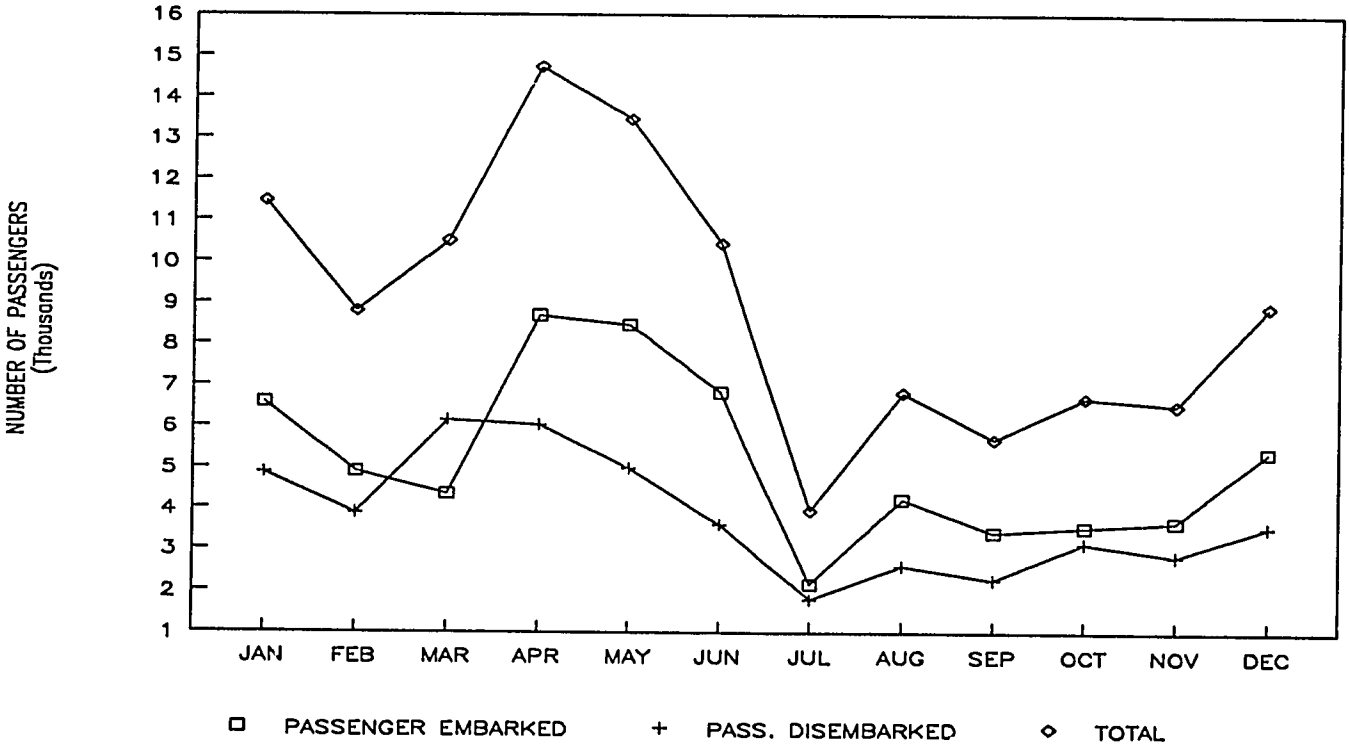
6.6 SHIP CHARACTERISTICS

The Makar Wharf at General Santos City is a general purpose port, open to the public. All sorts of commodities are moved through the port by almost all cargo handling methods: semi-bulk, breakbulk by all kinds of methods, and containers. Correspondingly, ships of all sizes and types are calling at Makar Wharf. Most ships are in the inter-island trade, belonging to Philippine shipping lines. Most ships were acquired second-hand, some of them converted by their new owners to their present use. All indications are that this trend will continue in the foreseeable

Table 6-14
NUMBER OF PASSENGER - 1990, BY MONTH

MOVEMENT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
EMBARKED	6588	4903	4359	8685	8454	6819	2149	4222	3415	3536	3666	5370	62166
DISEMBARKED	4862	3887	6133	6034	4983	3601	1793	2591	2273	3152	2841	3537	45687
TOTAL	11450	8790	10492	14719	13437	10420	3942	6813	5688	6688	6507	8907	107853

Figure 6-1
1990 PASSENGER STATISTICS



Source: Consultant's compilation from PPA data.

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future. Three major categories of cargo ships call at Makar Wharf, listed with their code in the PPA statistics:

Containership	Code C
General Cargo Ships	Code GC
Passenger Cargo Ship	Code PC

In addition, the following types of ships call at Makar Wharf:

Bulk Carrier	Code BLK
Tanker	Code MTK or TK
Tugboat	Code MTB or TB
Fuel Barge	Code FB
Barge	Code B

General characteristics of each type are described in the following four sections. Their draft, beam, and length overall, however, are described in separate sections; it is more convenient to have each of these data together, since they are necessary for the computation of the capacity of the port to handle them.

6.6.1 Containerships

All containerships in the domestic trade are converted general cargo ships. Consequently, none has a container crane. The port does not have a crane capable of handling containers, hence they are moved between ship and wharf by ship's gear which normally consists of the conventional combination of boom and winch. Most of the ships calling at Makar Wharf can carry a certain amount of containers. Some carry the containers in their hold, in which case they have no or little capability to carry also general cargo, but most ships carry both general cargo and containers.

The container capacity of the major vessels calling at Makar Wharf is presented in the table shown in section 6.7.5. It varies from a maximum of 500 Twenty-Foot-Equivalent Units (TEU's) to a minimum of 48 TEU's. In Table 6-15, the calls by container-carrying ships is presented, including the distribution according to the number of TEU's each ship can carry. It shows that all ships with a capacity of 100 TEU's or more are classified as containerships. In the capacity range of 0 to 100 containers, passenger cargo ships made many more calls by far than ships classified as containerships.

6.6.2 General Cargo Ships

After the introduction of the container and the container ship, the term "General Cargo Ship" has changed to mean a ship that can handle breakbulk cargo, with or without the capability to

Table 6-15

CALLS BY DOMESTIC SHIPS, 1990

DISTRIBUTION BY TEU - CARRYING CAPACITY

RANGE OF TEU / TYPES OF SHIPS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
0 - 100													
C	3	3	3	3	3	3	3	3	2	3	4	5	38
GC	1	1					1				2		5
PC	8	9	9	8	8	9	7	9	3	6	9	10	95
101 - 200													
C	2	3	3	3	2	3	2	3	2	3	4	2	32
GC	0	0	0	0	0	0	0	0	0	0	0	0	0
PC	0	0	0	0	0	0	0	0	0	0	0	0	0
201 - 300													
C	3	2	2	4	4	3	2	2	3	3	2	3	33
GC	0	0	0	0	0	0	0	0	0	0	0	0	0
PC	0	0	0	0	0	0	0	0	0	0	0	0	0
301 - 400													
C	2	2	2	2	2	2	2	2	2	0	0	0	18
GC	0	0	0	0	0	0	0	0	0	0	0	0	0
PC	0	0	0	0	0	0	0	0	0	0	0	0	0
400 - UP													
C	2	2	2	3	2	2	2	3	7	9	7	11	52
GC	0	0	0	0	0	0	0	0	0	0	0	0	0
PC	0	0	0	0	0	0	0	0	0	0	0	0	0

Legend : C - Container Ship
GC - General Cargo Ship
PC - Passenger Cargo Ship

Source: PPA Statistics

also carry containers. Although very few ships are presently classified as general cargo ships, most vessels can accommodate breakbulk cargo. In fact, all ships of the major shipping lines calling at Makar Wharf, are classified either as container ships or as Passenger Cargo ships; none of them is classified as general cargo ship. However, general cargo ships do call at Makar Wharf, but they are tramp ships, defined as those ships that have no regular schedule but only call at a port when they are specifically called to take on or deliver cargo. They are typically used at Makar Wharf to load such commodities as corn or rice and deliver them at specific ports where they would perhaps arrive faster than scheduled vessels or where the scheduled vessels do not call.

Some of the general cargo ships have hulls and holds that allow loading grains and other commodities in bulk.

Some of the smaller general cargo ships do not have masts and winches and are still loaded and unloaded by shoulder-carrying the cargo over the gang plank.

6.6.3 Passenger Cargo Ships

This type of ship is very important in the inter-island traffic because of the great amount of people travelling by sea between the various islands of the country. The passengers are mostly from low-income groups who cannot afford high fares. This means on the one hand that the accommodations aboard ship are minimally adequate, and on the other, that the ship owner has to complement his income by carrying also cargo. Hence, the term "passenger cargo ship". Even pure passenger ships carry their share of cargo. Economy of scale and the need to be able to travel in bad weather has led to ever larger ships in this category.

6.6.4 Other Ships

In addition to the three types of ships described in the preceding sections, a few other types are of certain importance at Makar Wharf. There are no ships in the domestic trade that can be classified as bulk carriers, although this classification does exist in the foreign trade where this type of ship is used mainly for the importation of fertilizer in bulk. Ro-ro Ships are using the port to an extent which has lead to the provision of a special ramp to serve them, which is presently under construction. These ships are not really being used for rolling loads; they have a stern ramp which often does not reach the top of the wharf with the present berthing method. They are now berthed perpendicular to the wharf, with the stern toward the wharf and the bow secured sometimes with an anchor. Due to the great depth at a short distance from the wharf, more often the bow is secured with two lines, which occupies a long stretch of wharf. This method is often not enough to hold the vessel in place, especially with strong south winds blowing at an angle to the ship. These winds push the vessel against the fender system of the wharf and the up-and-down movement of the ship due to the tides tends to rip the rubber tubes off their chains. Cargo is not rolled off the ship but rather handled with a fork truck on board

handing palletized cargo to a fork truck on the wharf.

Non-propelled barges often call at Makar Wharf. Some barges are rather large and transport bottles from Cebu. Others are used for carrying bulk cargos. They are moved by sea-going tugboats which are staying at Makar Wharf only temporarily, while their barges are loading or unloading. There is no tugboat stationed at the port, ships dock and undock by themselves. No tankers call regularly at Makar Wharf; the only liquid cargo requiring bulk handling is palm oil which is being shipped out in the regular tanks of cargo ships.

6.6.5 Draft

The draft of ships calling at Makar Wharf is limited to approximately eight meters which is somewhat less than the depth of water available along the face of the wharf. Occasionally, a ship with a greater design draft calls at the port, but can take on load only to the point where its draft reaches the maximum allowable of eight meters. The port statistics show that the maximum draft loaded was 8.6 meters in 1990. The ship either was berthed at a spot where the water depth was greater or was loaded to that draft at high tide and departed before low tide. Tables 6-16 to 6-18 present in numerical and graphic form the distribution of calls by domestic ships in various ranges of draft at departure. Table 6-16 shows that the vast majority of containerships have drafts in the range of four to seven meters. General cargo ships are mainly in the one to five-meter range, as shown on Table 6-17, while passenger cargo ships have again greater drafts: Table 6-18 shows them to be in the four to six-meter range. As ships get larger in the future, their draft will also be greater.

6.6.6 Beam

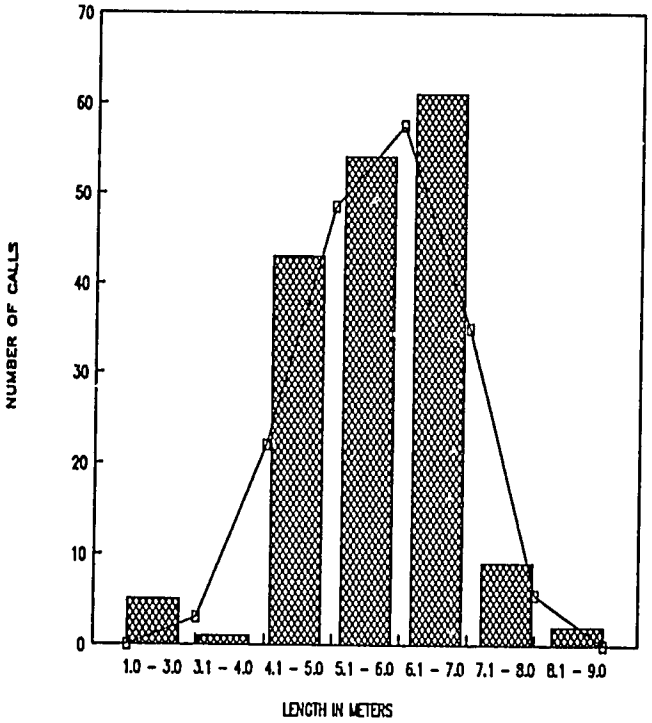
The beam or width of the ships calling at Makar Wharf is not of major concern. There are no narrow entrances or channels that restrict ship access to the wharf. On the other hand, the beam of a ship would be of importance to the stevedoring operation if shore-based cargo-handling equipment were used that would have to reach to the far side of the hold or deck of a wide ship. This is not the case at Makar Wharf where all cargo handling is done by ship's gear or by hand. Consequently, no further analysis is required for the beam of the ships at Makar Wharf.

6.6.7 Length Overall

The length overall (LOA) of a ship is the distance between the extreme forward point of a ship's bow to the extreme outward end of the ship's stern. It is one of the most important dimensions of a ship, since it governs the amount of space the ship requires at the berth.

Table 6-16
DISTRIBUTION OF DRAFT - 1990
DOMESTIC CONTAINERSHIPS

RANGE (M.)	NUMBER OF CALLS
1.0 - 3.0	5
3.1 - 4.0	1
4.1 - 5.0	43
5.1 - 6.0	54
6.1 - 7.0	61
7.1 - 8.0	9
8.1 - 9.0	2

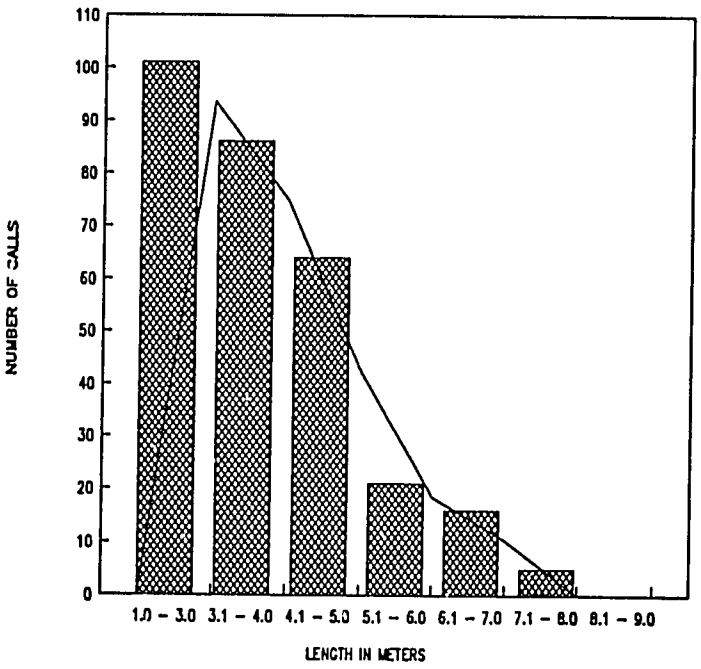


Note: "Draft" means draft of departure.

Source: Consultant's analysis from PPA data

Table 6-17
DISTRIBUTION OF DRAFT - 1990
DOMESTIC GENERAL CARGO SHIPS

RANGE (M.)	NUMBER OF CALLS
1.0 - 3.0	101
3.1 - 4.0	86
4.1 - 5.0	64
5.1 - 6.0	21
6.1 - 7.0	16
7.1 - 8.0	5
8.1 - 9.0	0

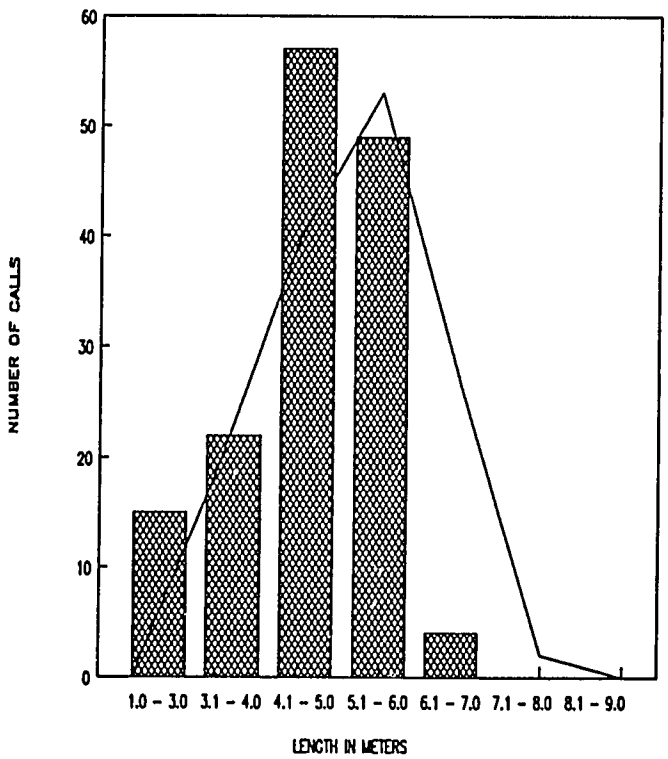


Note: "Draft" means draft at departure.

Source: Consultant's analysis from PPA data.

Table 6-18
DISTRIBUTION OF DRAFT - 1990
DOMESTIC PASSENGER / CARGO SHIPS

RANGE (M.)	NUMBER OF CALLS
1.0 - 3.0	15
3.1 - 4.0	22
4.1 - 5.0	57
5.1 - 6.0	49
6.1 - 7.0	4
7.1 - 8.0	0
8.1 - 9.0	0



Note: "Draft" means draft of departure.

Source: Consultant's analysis from PPA data.

The average LOA of domestic ships increased from 65 meters in 1980 to 83 meters in 1990; the LOA of foreign ships, however, decreased from 119 meters in 1980 to 111 meters in 1990. For all ships calling at Makar Wharf the average LOA increased from 70 meters in 1980 tc 84 meters in 1990. The longest domestic ship was 171 meters long while the longest foreign ship had a LOA of 164 meters.

Table 6-19 presents in numerical and graphical form the distribution by length overall of the calls by domestic ships in 1990. It shows that the LOA of a majority of ships falls within a range of 30 to 80 meters, with another major group in the range of 90 to 140 meters. Foreign ships (Table 6-20) are markedly longer, almost all of them falling in the range of 80 to 170 meters; one third of all foreign ships fall in the range of 80 to 110 meters. Analyzing the month with the largest number of ships calling at Makar Wharf, December 1990, and using the figures for December in Table 6-19, the corresponding distribution is shown graphically in Figure 6-2; the distribution is much more even, with several peaks, also evenly distributed over the entire range of 20 to 150 meters.

Te determine if there is any difference in the various types of ships, the analyses of Tables 6-21 to 6-23 was made. It shows that domestic containerships have lengths mainly in the 80 to over 120 range, while domestic general cargo ships are much shorter: the majority of them are between 40 and 80 meters long. Passenger cargo ships are in between, having one major group in the 60 to 80 meter range and another group in the 100 to 120-plus group. These differences are taken into account in the computation of the port's capacity and in the determination of the requirements for additional berthing space.

6.6.8 Tonnage

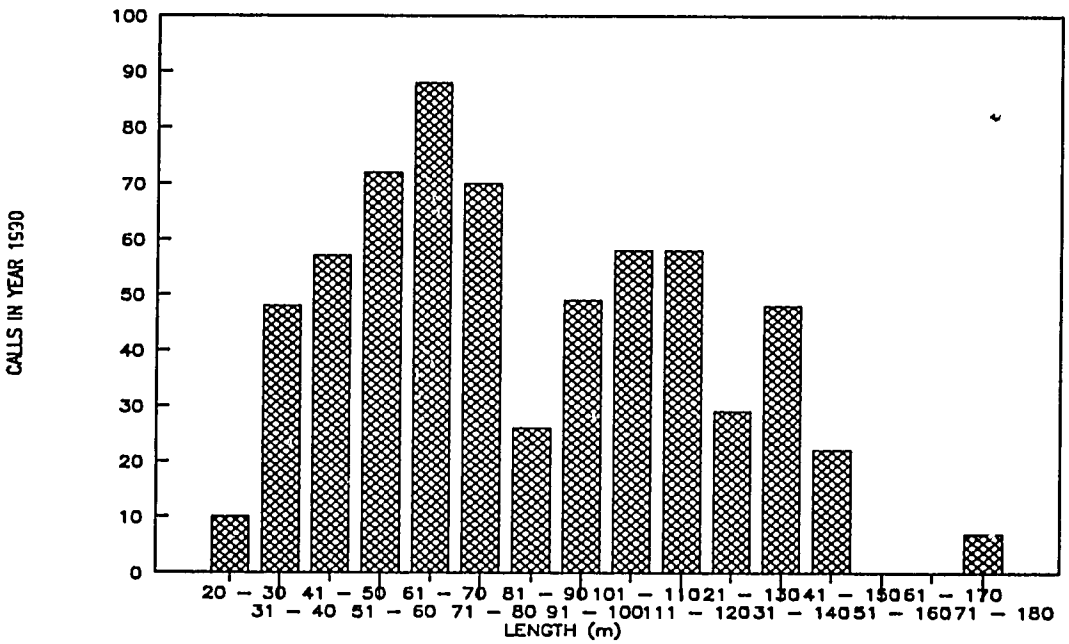
The gross registered tonnage (GRT) of the domestic ships varies greatly, as is shown in Table 6-24. One-third of all ships calling at Makar Wharf had a GRT between 200 and 700 tons. Another peak occurred between 900 and 1200 tons. one-third was between 2500 and 5000 tons, while 8 percent were the largest ships, between 7000 and 9000 tons. The average GRT for 1990 was 2325 tons.

A similar analysis for foreign ships calling at Makar Wharf shows no specific GRT characteristic, although foreign ships are larger, having an average GRT of 4967 tons, which also shows in Table 6-25: most foreign ships are in the 3000 to 12,000-ton range.

The analysis of the difference in tonnage between the various types of ships was done for Deadweight Tonnage (DWT) which is essentially the cargo carrying capacity. As shown in Table 6-26, containerships have basically a DWT of over 1000 tons. Two major peaks occur: one in the 3000 to 5000-ton range and the other in the 12,000 plus range. General cargo ships, as shown in Table 6-27, are very much smaller, almost all of them having a DWT of below 3000. Passenger cargo ships have a marked peak between 3000 and 5000 tons DWT, as shown in Table 6-28. This distribution is essentially the same as for the length overall.

Table 6-19
DOMESTIC SHIP DISTRIBUTION OF LENGTH OVERALL - 1990

LENGTH (M.)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
20 - 30									1	4	2	3	10
31 - 40	6	4	3	7	5	2		3	3	5	3	7	48
41 - 50	5	7	8	7	3	1	4	4	4	4	6	4	57
51 - 60	9	7	6	2	9	8	7	3	4	9	4	4	72
61 - 70	5	4	7	7	12	7	5	9	10	9	5	8	88
71 - 80	5	6	4	6	8	7	6	9	7	5	4	3	70
81 - 90	3	3	3	2	1			2	6		1	5	26
91 - 100	4	4	4	4	4	4	3	4	5	4	6	3	49
101 - 110	6	4	5	5	6	5	4	4	4	5	4	6	58
111 - 120	9	8	10	7	4	4	4	2	2	3	2	3	58
121 - 130		2			4	5	3	5	2		3	5	29
131 - 140	2	1	2	5	3	2	2	4	5	7	5	10	48
141 - 150									4	6	6	6	22
151 - 160													0
161 - 170													0
171 - 180						1				1	5		7
TOTAL	54	50	52	52	59	46	38	49	57	62	56	67	642



Source: Consultant's analysis from PPA data.

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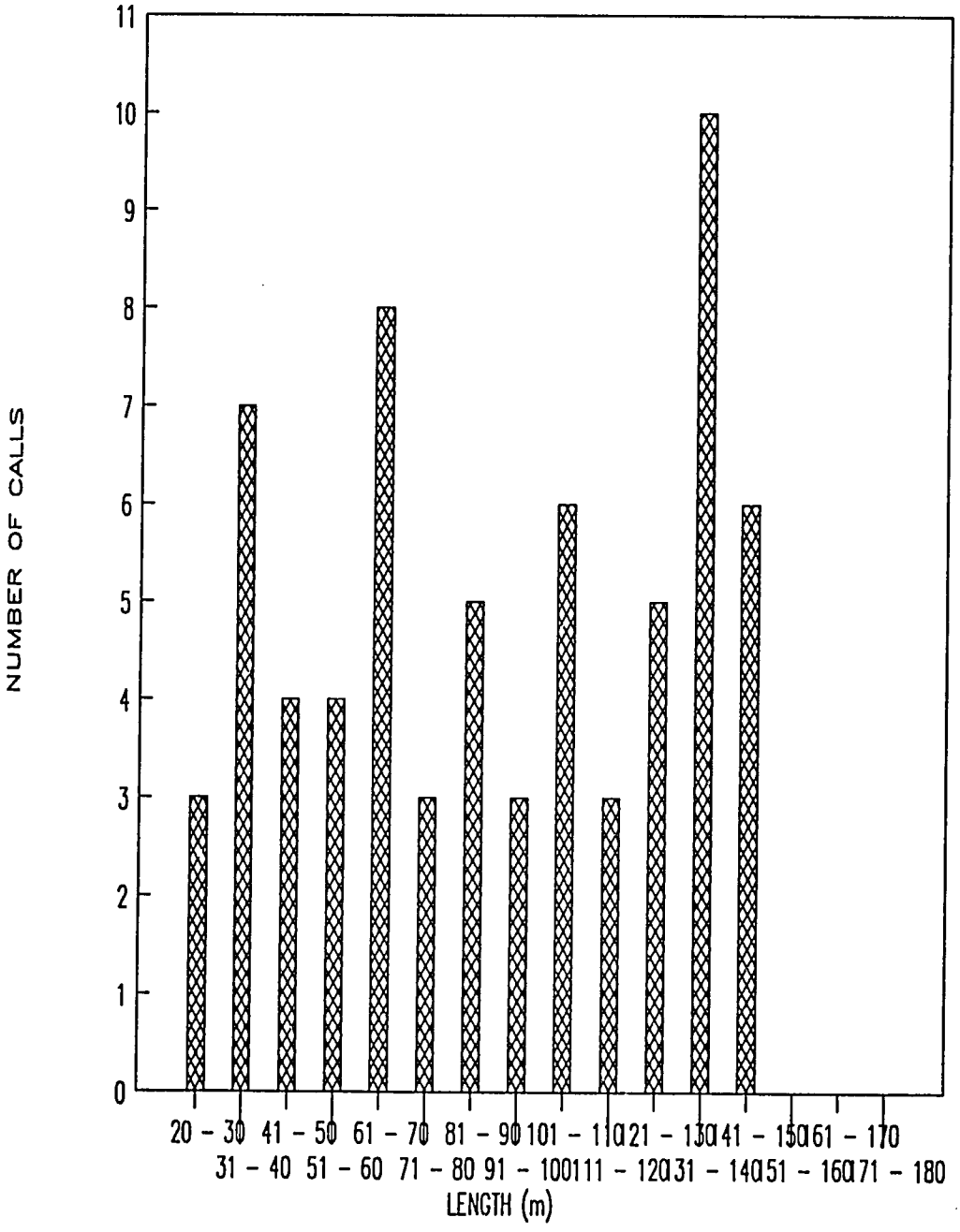
Figure 6-2
DISTRIBUTION OF LENGTH OVERALL - DOMESTIC SHIPS
PEAK MONTH (DECEMBER 1990)



Source: Consultant's compilation from PPA data.

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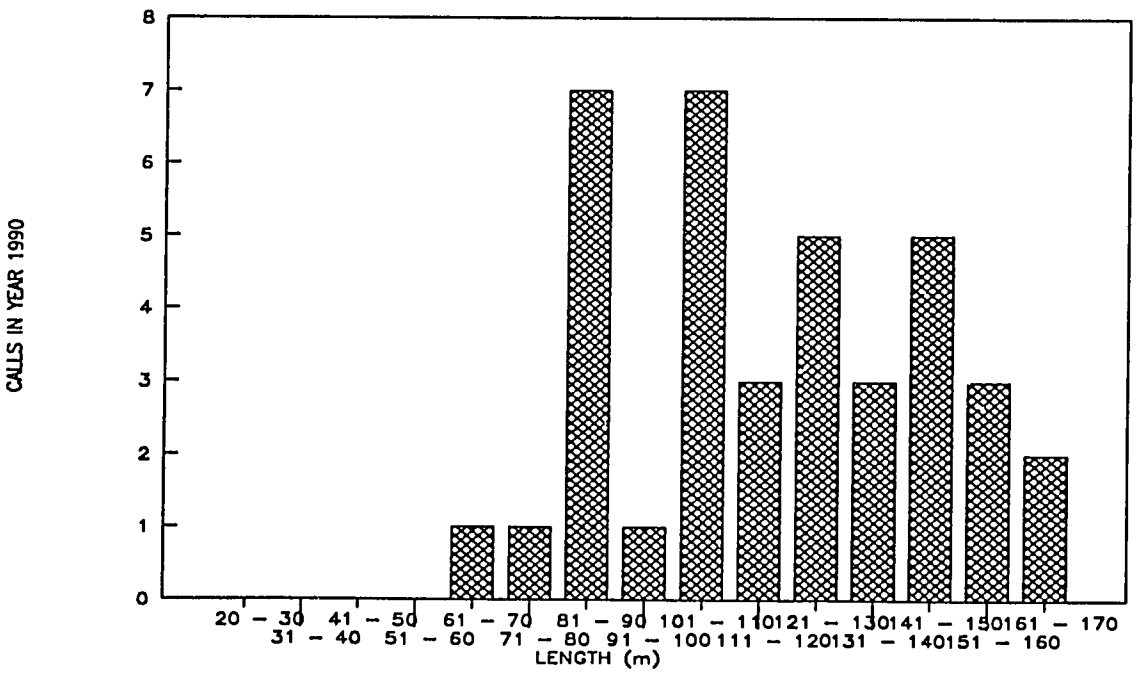
Table 6-20
FOREIGN SHIP DISTRIBUTION OF LENGTH OVERALL - 1990

LENGTH (M.)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
20 - 30													
31 - 40													
41 - 50													
51 - 60													
61 - 70			1										1
71 - 80			1										1
81 - 90	1	1			1	1	1	1	1				7
91 - 100			1										1
101 - 110		1				2		1		2	1		7
111 - 120								2	1				3
121 - 130		1		1		1			2				5
131 - 140		1	1					1					3
141 - 150				1						3	1		5
151 - 160	1							1	1				3
161 - 170						1				1			2
171 - 180													0
TOTAL	2	4	4	2	1	5	1	6	5	6	2	0	38



Source: Consultant's analysis from PPA data.

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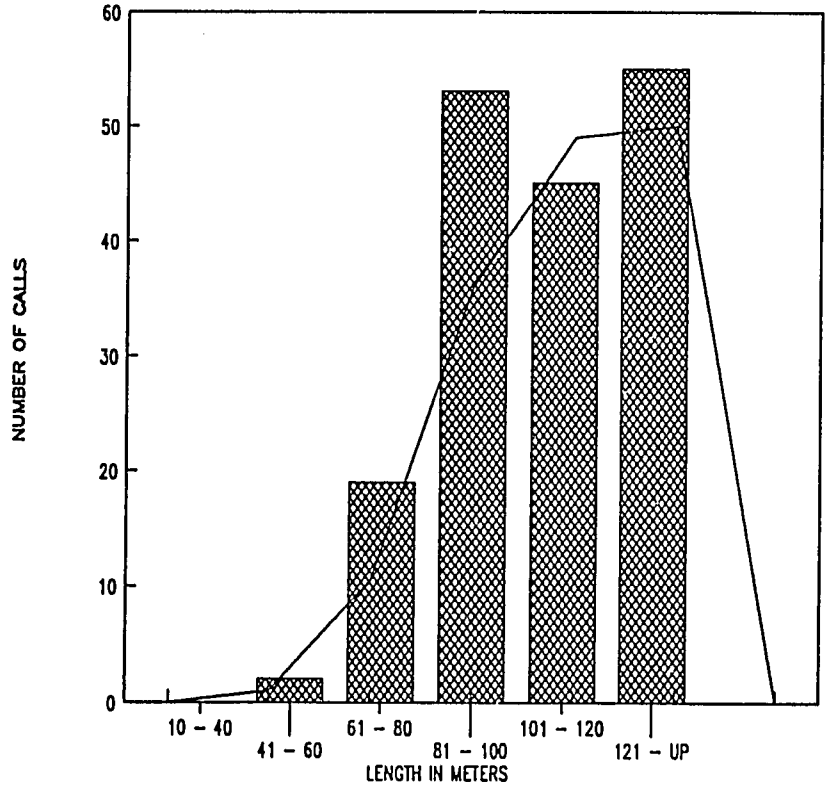
Table 6-21
DISTRIBUTION OF L O A (M.) - 1990
DOMESTIC CONTAINERSHIPS

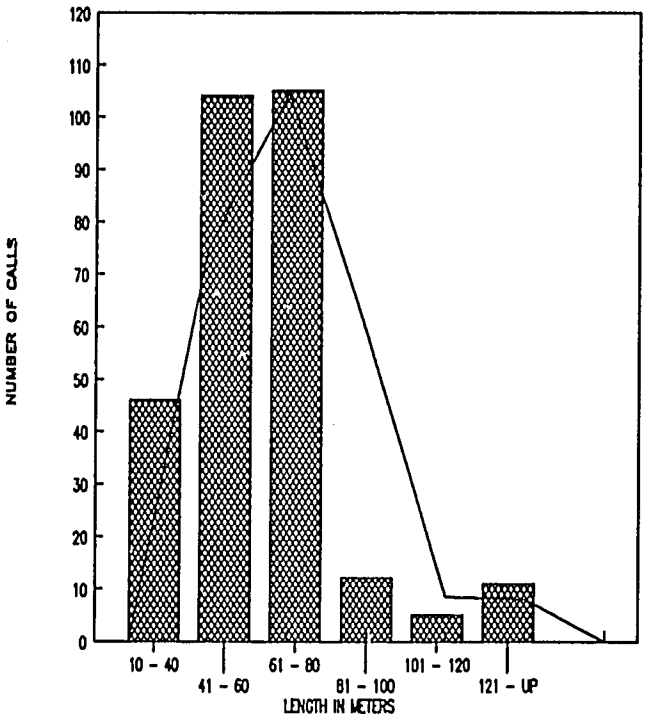
RANGE (M.)	NUMBER OF CALLS
10 - 40	0
41 - 60	2
61 - 80	19
81 - 100	53
101 - 120	45
121 - UP	55



Source: Consultant's analysis based on PPA data.

Table 6-22
DISTRIBUTION OF L O A (M.) - 1990
DOMESTIC GENERAL CARGO SHIPS

RANGE (M.)	NUMBER OF CALLS
10 - 40	46
41 - 60	104
61 - 80	105
81 - 100	12
101 - 120	5
121 - UP	11



Source: Consultant's analysis based on PPA data.

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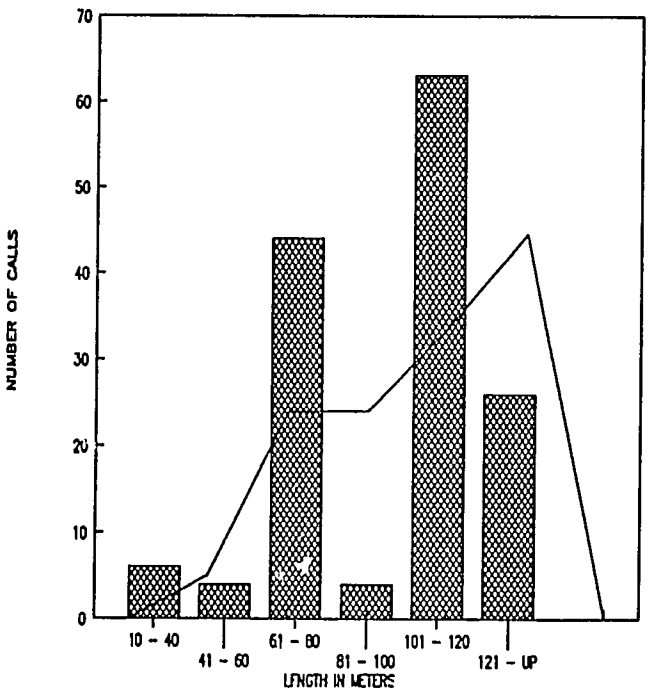
Table 6-23
DISTRIBUTION OF L O A (M.) - 1990
DOMESTIC PASSENGER / CARGO SHIPS

RANGE (M.)	NUMBER OF CALLS
10 - 40	6
41 - 60	4
61 - 80	44
81 - 100	4
101 - 120	63
121 - UP	26



Source: Consultant's analysis based on PPA data.

Table 6-24
DISTRIBUTION OF DOMESTIC GROSS REGISTERED TONNAGE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
NUMBER OF SHIPS	54	50	52	52	59	46	38	49	57	62	56	67	642
RANGE IN TONS													
50-100													0
101-150													0
151-200													0
201-250	6	3	3	6	5	2		3	8	9	5	8	58
251-300		1		2	3	4	2	3	3	1	6	2	27
301-400	3	6		2	1		1	1	2			4	20
401-500	5	4	10	7	6	4	5	3	4	5	2	4	59
501-600	3	2	2	1	6	4	3	2	4	4	4	2	37
601-700	1	1		1	3	3	1	1	1	1	1	2	16
701-800							1		1	3			5
801-900	2	1	1							1		3	8
901-1000	3	2	3	2	2	1		5	5	6		3	32
1001-1100	1	2		2		1	2	3	3	1	2	2	19
1101-1200	2	2	5	4	3	1	2	1		1	2		23
1201-1300			1										1
1301-1400			1						2	4	4	6	17
1401-1500													0
1501-1600													0
1601-1700													0
1701-1800					1				2				3
1801-1900	5	4	4	4	5	4	4	4	3	2	2	3	44
1901-2000			1		1								2
2001-2100		1											1
2101-2200													0
2201-2300													0
2301-2400	2	3	2	2	1	2	1	2	1			1	17
2401-2500	2												2
2501-3000	4	5	6	5	7	5	5	6	6	8	9	6	72
3001-4000	4	3	2	4	5	4	2	4	3	3	5	4	43
4001-5000	9	8	9	6	8	9	7	8	2	4	7	7	84
5001-6000													0
6001-7000													0
7001-8000	2	2	2	4	2	2	2	2	5	7	5	7	42
8001-9000								1	2	2	2	3	10
9001-10000													0
TOTAL	54	50	52	52	59	46	38	49	57	62	56	67	642

Source: Consultant's compilation from PPA data.

Table 6-25

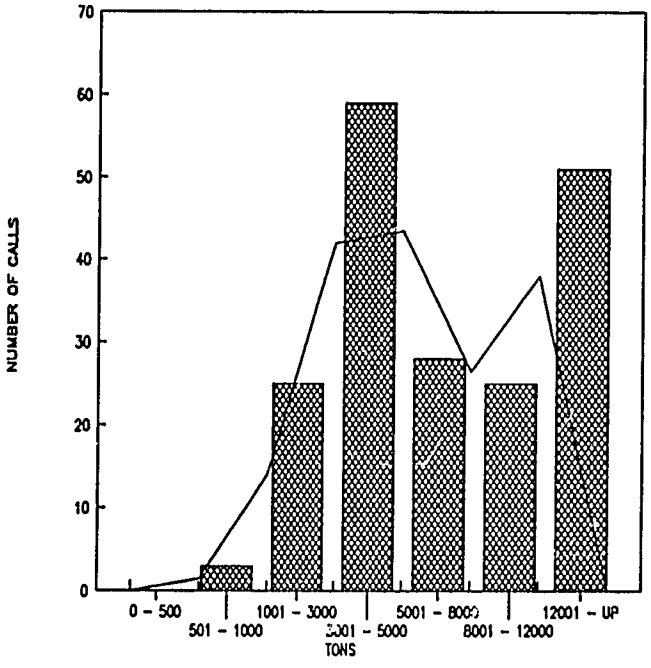
DISTRIBUTION OF FOREIGN GROSS REGISTERED TONNAGE-1990,BY MONTH

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	TOTAL
NUMBER OF SHIPS	2	4	4	2	1	5	1	6	5	6	2	0	38
RANGE IN TONS													
50-100													0
101-150													0
151-200													0
201-250													0
251-300													0
301-400			1										1
401-500													0
501-600													0
601-700													0
701-800													0
801-900													0
901-1000													0
1001-1100			1				1		1				3
1101-1200	1												1
1201-1300													0
1301-1400													0
1401-1500													0
1501-1600													0
1601-1700													0
1701-1800										2			2
1801-1900								1	1				2
1901-2000		1											1
2001-2100													0
2101-2200													0
2201-2300													0
2301-2400						1		1					2
2401-2500													0
2501-3000			1										1
3001-4000		1				2			1	2	1		7
4001-5000				1				1					2
5001-6000		1				1			1				3
6001-7000			1		1					1	1		4
7001-8000								2					2
8001-9000													0
9001-10000		1		1									2
10001-11000	1							1					2
11001-12000						1			1	1			3
TOTAL	2	4	4	2	1	5	1	6	5	6	2	0	38

Source: Consultant's compilation from PPA data.

Table 6-26
DISTRIBUTION OF D W T (TONS) - 1990
DOMESTIC CONTAINERSHIPS

RANGE (TONS)	NUMBER OF CALLS
0 - 500	0
501 - 1000	3
1001 - 3000	25
3001 - 5000	59
5001 - 8000	28
8001 - 12000	25
12001 - UP	51



Source: Consultant's analysis, based on PPA data.

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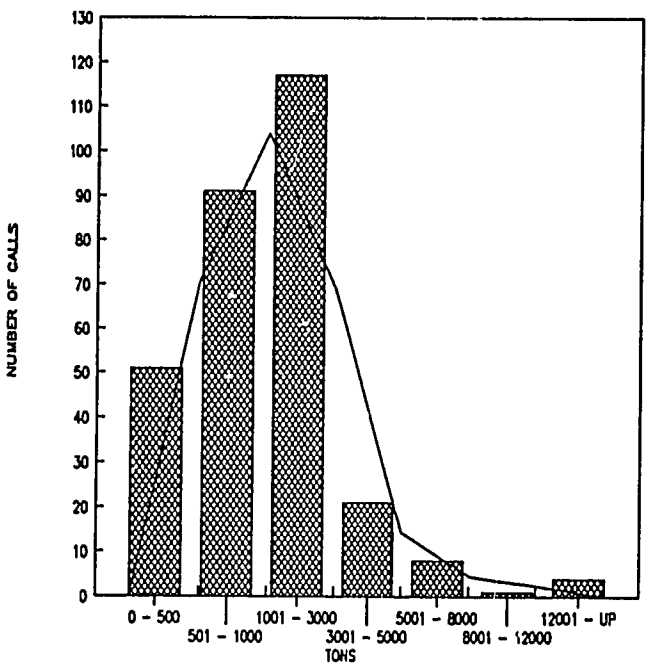
Table 6-27
DISTRIBUTION OF D W T (TONS) - 1990
DOMESTIC GENERAL CARGO SHIPS

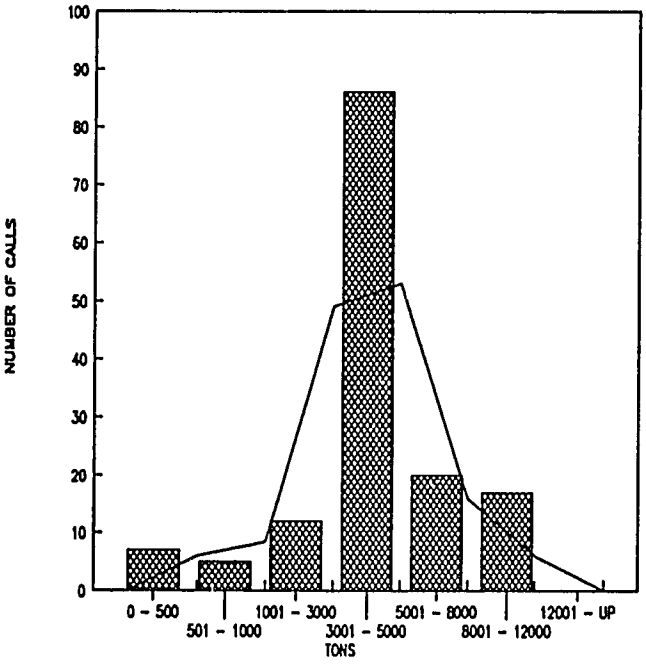
RANGE (TONS)	NUMBER OF CALLS
0 - 500	51
501 - 1000	91
1001 - 3000	117
3001 - 5000	21
5001 - 8000	8
8001 - 12000	1
12001 - UP	4



Source: Consultant's analysis, based on PPA data.

Table 6-28
DISTRIBUTION OF D W T (TONS) - 1990
DOMESTIC PASSENGER / CARGO SHIPS

RANGE (TONS)	NUMBER OF CALLS
0 - 500	7
501 - 1000	5
1001 - 3000	12
3001 - 5000	86
5001 - 8000	20
8001 - 12000	17
12001 - UP	0



Source: Consultant's analysis, based on PPA data.

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6.7 SHIPPING LINES AND ROUTES

6.7.1 Maritime Trade in the Philippines - Domestic

The 7,000 islands in the country may be grouped under three main island groups: Luzon Island, in the north: Visayas Island Group, in the center: and Mindanao Island, in the south. The Visayas have the greatest number of islands that are inhabited. Among them are Panay Island, Negros Island, Cebu Island, and Leyte Island.

The ship is the most economical and most common carrier in interisland and coastal commerce. More people travel on ships than on any other means of transportation in the Philippines interisland trade. Thus shipping has become a major industry in the Philippines.

6.7.2 Major Seaports in the Philippines - Domestic

As general background for the study of shipping at General Santos, the main ports and shipping lanes of domestic trade are presented here.

On Luzon Island. Manila and Batangas are the principal ports; Manila is the premier port of the Philippines - for domestic as well as foreign trade. Manila is the main terminus of the principal interisland lines to the Visayas Island and Mindanao Island groups.

In the Visayas. From east to west, Tacloban, the main port in the Leyte-Samar Island tandem; Cebu, the premier port of the Visayas; Dumaguete and Bacolod, on Negros Island; and Iloilo on Panay Island. The common routes are: Manila/Bacolod/Iloilo/Manila; Manila/Dumaguete/Zamboanga/Manila; and Manila/Cebu/Tacloban/Manila.

On Mindanao Island. In northern Mindanao, the three major ports are Iligan, Cagayan de Oro, and Surigao. Common routes are: Cebu/Iligan/Cagayan de Oro. And Cebu/Surigao/Cebu. In southern Mindanao Island, the principal ports are Davao, General Santos, Polloc, and Zamboanga. Polloc is the gateway of Cotabato City and its hinterland.

North-South Axis. The maritime trade in the Philippines is along a north-south axis with Manila the northern terminus and Davao at the southern end. In the center is the port of Cebu. All other routes from Manila to the Visayas Island and Mindanao Island are not as busy as the main north-south axis via Cebu. The port of General Santos lies along the main north-south maritime trading axis, since this route skirts Mindanao on its western shore.

6.7.3 Commodities of Domestic Trade

In general terms, the goods of commerce along the north-south axis may be said to be the exchange of manufactured goods from the north with raw materials from the south. Luzon Island as the country's industrial center; Mindanao Island, its agricultural base.

A detailed classification of those commodities would show the following group-classifications:

- From the north: fabricated metals; dairy products; bottled products; iron and steel materials; textiles; and general consumer goods.
- From the south: corn and rice; corn and cassava flour; coconut oil and copra; logs and lumber; fish and fish products; animal feeds and live animals.

6.7.4 Main Shipping Lines in the Philippines

Shipping, being the main transport mode, is a highly competitive industry. Especially the liner service from Manila to the major commercial-industrial cities in the Visayas and on Mindanao Island. Realizing the need for friendly competition, the 11 principal shipping lines in the country have formed an association for their mutual good, the "Conference of Interisland Shipowners and Operators" (CISO). The members of the Conference are:

1.	ABOITIZ SHIPPING CORP.	17 ships
2.	GOTHONG LINES, INC.	8 ships
3.	GEORGE & PETER LINES, INC.	7 ships
4.	ESCANO SHIPPING LINES, INC.	4 ships
5.	LORENZO SHIPPING CORP.	6 ships
6.	NEGROS NAVIGATION CO.	11 ships
7.	SOLID SHIPPING LINES CORP.	3 ships
8.	SULPICIO LINES CORP.	24 ships
9.	SWEET LINES, INC.	10 ships
10.	TRANS-ASIA SHIPPING LINES, INC.	7 ships
11.	WILLIAM LINES CO., INC.	19 ships

6.7.5 Main Shipping Lines Calling at Makar Wharf

Four members of the Conference dominate the seatrade at General Santos. With their fleet descriptions and container carrying capacity, they are:

1. ABOITIZ SHIPPING CORP.

1)	Supercon I	-	Containership (330 TEU)
2)	Mega Carrier I	-	Containership (500 TEU)
3)	Mega Carrier II	-	Containership (500 TEU)

2. LORENZO SHIPPING

1)	Lorcon	-	Containership (78 TEU)
2)	Lorcon	-	Containership (62 TEU)
3)	Lorcon Luzon	-	Containership (406 TEU)
4)	Lorcon Mindanao	-	Containership (406 TEU)
5)	Cagayan de Oro Express	-	Containership (117 TEU)

3. SULPICIO LINES

1)	Philippine Princess	-	Passenger-Cargo Ship (70 TEU)
2)	Sulcon XI	-	Containership (110 TEU)
3)	Sulcon XIV	-	Containership (203 TEU)
4)	Sulcon XV	-	Containership (135 TEU)

4. WILLIAM LINES

1)	William Container XI	-	Containership (250 TEU)
2)	William Container X	-	Containership (215 TEU)
3)	William Container IV	-	Containership (100 TEU)
4)	Manila City	-	Passenger-Cargo Ship (48 TEU)
5)	Zamboanga City	-	Passenger-Cargo Ship (48 TEU)

It may be noted that --

1. All but three ships calling at General Santos are containerships.

2. Only three passenger-cargo ships are calling at that port.

The most frequent calls of containerships is two times a month. Least frequent among the liners is once a month. Frequency of the passenger-cargo ships is four times a month.

Corn and rice contribute the greatest volume of commodities carried by ships from Makar Wharf. Most of these commodities are unloaded in the Port of Manila. A good amount of white (glutinous) corn is shipped to the corn-eating provinces of Cebu and Oriental Negros. Rice is transported on trampers from General Santos to southern islands as far as the Sulu Archipelago.

6.7.6 Shipping Routes

Shipping routes through General Santos are mainly along the Manila-Davao (north-south) axis. With the ports of Cebu, Zamboanga, and Polloc as transit ports. On the other hand, there is a regular secondary route from General Santos through the port of Zamboanga to Dumaguete then to Manila. Another, from General Santos through the port of Zamboanga to port of Iloilo then to Manila.

Invariably, ships from Davao bound to Manila make port at General Santos to top off their load with (1) corn, (2) rice, (3) fruits and vegetables, and (4) copra. Also, live animals, i.e., pigs on the hoof which are loaded in steel crates the size of 10 ft steel containers.

Shipping routes of liners are regulated. The regulatory body in the Philippines is the Maritime Industry Authority (MARINA). It is a body corporate with the Secretary of Transportation and Communications as Chairman of the Board. The four shipping lines licensed to trade at General Santos are: (1) Aboitiz Shipping; (2) Lorenzo Shipping; (3) Sulpicio Lines, and (4) William Lines. Their ships and routes are listed below. They are also shown on Table 6-29 and, with typical commodities they carry, on Table 6-30.

<u>Lorenzo Shipping</u>

1.	Lorcon Mindanao	-	Manila/Zamboanga/General Santos/Davao Davao/General Santos/Zamboanga/Manila
2.	Lorcon Luzon	-	Manila/Davao/General Santos/Manila
3.	Lorcon XI	-	Manila/Davao/General Santos/Manila
4.	Lorcon XII	-	Manila/Davao/General Santos/Manila
5.	Cagayan De Oro Express	-	Manila/Davao/Cebu/Manila

<u>Aboitiz Shipping</u>

1.	Supercon I	-	Manila/Davao/General Santos/Manila
2.	Mega Carrier I	-	Manila/Davao/General Santos/Cebu/Manila
3.	Mega Carrier II	-	Manila/Davao/General Santos/Cebu/Manila

Table 6-29
THE "BIG FOUR" SHIPPING LINES AND ROUTES

SHIPPING LINES AND SHIPS	DAVAO	GENERAL SANTOS	POLLOC	ZAMBOA-NGA	CAGAYAN DE ORO	CEBU	DUMAGU-ETE	ILOILO	MANILA
LORENZO SHIPPING									
LORCON MINDANAO - C	x<--	---x<---	--------	---x<---	--------	--------	--------	--------	---<
	:---	-->x----	--------	-->x----	--------	--------	--------	--------	-->x
LORCON LUZON - C	x<--	--------	--------	---x<---	--------	--------	--------	--------	---<
	:---	-->x----	--------	-->x----	--------	--------	--------	--------	-->x
LORCON XI - C	x<--	--------	--------	--------	--------	--------	--------	--------	---<
	:---	-->x----	--------	--------	--------	--------	--------	--------	-->x
LORCON XII - C	x<--	--------	--------	--------	--------	--------	--------	--------	---<
	:---	-->x----	--------	--------	--------	--------	--------	--------	-->x
CAGAYAN DE ORO - PC	x<--	--------	--------	--------	--------	--------	--------	--------	---<
	:---	--------	--------	--------	--------	-->x----	--------	--------	-->x
ABOITIZ TRANSPORT									
SUPERCON I - C	x<--	--------	--------	--------	--------	--------	--------	--------	---<
	:---	-->x----	--------	--------	--------	--------	--------	--------	-->x
MEGACARRIER I - C	x<--	--------	--------	--------	--------	--------	--------	--------	---<
	:---	-->x----	--------	--------	--------	-->x----	--------	--------	-->x
MEGACARRIER II - C	x<--	--------	--------	--------	--------	--------	--------	--------	---<
	:---	-->x----	--------	--------	--------	-->x----	--------	--------	-->x
SULPICIO LINES									
SULCON XI - C		x<--	--------	--------	--------	---x----	--------	--------	----
		----	--------	--------	--------	---x----	--------	--------	---x
SULCON XI - C		x<--	---x----	--------	--------	--------	--------	--------	---<
		----	--------	--------	--------	--------	--------	--------	-->x
SULCON XV - C		x<--	---x<---	--------	--------	---x<---	--------	--------	---<
		----	-->x----	--------	--------	-->x----	--------	--------	-->x
PHIL. PRINCESS - PC		x<--	--------	---x----	--------	--------	--------	--------	---<
		x---	--------	---x----	--------	--------	--------	-->x----	-->x
WILLIAM LINES									
WILCON XI - C	x<--	--------	--------	--------	--------	--------	--------	--------	---<
	x---	-->x----	--------	--------	--------	--------	--------	--------	-->x
WILCON X - C		x<--	-->x----	--------	--------	---x<---	--------	--------	----
		----	--------	-->x----	--------	-->x----	--------	-->x----	-->x
WILCON IV - C	x<--	--------	--------	--------	--------	--------	--------	--------	---<
	----	-->x----	--------	--------	--------	--------	--------	--------	-->x
MANILA CITY - PC	x<--	--------	--------	--------	--------	--------	---x----	--------	----
	----	-->x----	--------	--------	--------	--------	-->x----	--------	-->x
ZAMBOANGA CITY - PC	x<--	--------	--------	---x----	--------	--------	---x----	--------	----
	----	-->x----	--------	-->x----	--------	--------	-->x----	--------	-->x

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Table 6-30
DOMESTIC ROUTES AND CARGO STATISTICS

SHIPPING LINES	TRIPS	PORT OF CALLS		TYPES OF CARGOS		AMOUNT(T)	
ABOITIZ		LAST	NEXT	INBOUND	OUTBOUND	IN	OUT
MEGA I	1	DAVAO	MANILA	A. FEEDS,DAIRY PRO.	PALAY,FR.&VEG.,CORN,TEXT.FIBER	580	2400
	2	DAVAO	MANILA	A. FEEDS,TOBACCO,WHEAT	CORN,FISH PREP.TEXT.FIBER	1000	2900
	3	DAVAO	MANILA	DAIRY PRO.,WHEAT,FISH	FISH,RICE,PALAY,CORN	0	2800
MEGA II	1	DAVAO	MANILA	BOTTLED CARGO,WHEAT,A.FEEDS	L.ANIMALS,CORN,TEXT.FIBER	1600	3000
	2	DAVAO	MANILA	BOTTLED CARGO,WHEAT,A.FEEDS	L.ANIMALS,CORN,TEXT.FIBER	1200	1600
	3	DAVAO	MANILA	FISH,FRUITS,A.FEEDS	L.ANIMALS,CORN,TEXT.FIBER	1200	2800
SUPERCON I	1	DAVAO	MANILA	A.FEEDS,DAIRY PRO.,FRUITS	L.ANIMALS.FRUITS,CORN,FISH	0	1385
	2						
	3						
LORENZO							
LORCON XI	1	MANILA	MANILA	DAIRY PRO.,TOBACCO	L.ANIMALS,FRUITS,CORN,FISH	170	32
	2	DAVAO	MANILA	DAIRY PRO. FISH,FRUITS	L.ANIMALS,FRUITS,CORN,FISH	310	1600
	3						
LORCON XII	1						
	2						
	3						
LORCON LUZON	1	MANILA	DAVAO	IRON & STEEL,GEN. CARGO	L.ANIMALS,PLYWOOD	450	2000
	2	DAVAO	MANILA	GEN. CARGO	CORN,FRUITS,TEXT.FIBER	500	2000
	3	DAVAO	MANILA	BOTTLED CARGO,PULP&PAPER,TOB.	L.ANIMALS,CORN,FISH	160	1000
LORCON MINDANAO	1	ZAMBOANGA	DAVAO	BOTTLED CARGO,TOBACCO	L.ANIMALS,CORN,FISH	190	2600
	2	ZAMBOANGA	DAVAO	BOTTLED CARGO,TOBACCO	L.ANIMALS,CORN,FISH	700	1800
	3	ZAMBOANGA	DAVAO	BOTTLED CARGO,TOBACCO	L.ANIMALS,CORN,FISH	200	1900
WILLIAM LINES							
MANILA CITY	1	DUMAGUETE	DUMAGUETE	DAIRY PRO.,A.FEEDS,B. CARGO	FRUITS &VEG.,RICE	380	360
	2	PANDAN	PANDAN	A.FEEDS,MINERALS,PULP	FRUITS &VEG.,RICE	380	360
	3	DUMAGUETE	DUMAGUETE	FRUITS,PULP&PAPER,B.CARGO	FISH,FRUITS,LOGS	390	480
ZAMBOANGA CITY	1						
	2						
	3						
WILCON X	1						
	2						
	3						
WILCON XI	1	DAVAO	MANILA	MAN.METALS,WHEAT,DAIRY PRO.	LIVE ANIMALS,FRUITS	90	1300
	2	DAVAO	MANILA		LIVE ANIMALS,FRUITS	350	1100
	3	DAVAO	MANILA		LIVE ANIMALS,FRUITS	100	1600
SULPICIO LINES							
SULCON XI	1	CAGAYAN	MANILA	DAIRY PRO.,BOTTLED CARGO	FRUITS,FISH CORN	610	1200
	2	CEBU	MANILA	A.FEEDS,	LIVE ANIMALS,CORN	600	1800
	3	CEBU	POLLOC	A.FEEDS,	LIVE ANIMALS,RICE	550	1200
SULCON XV	1	POLLOC	MANILA	FISH.A.FEEDS.DAIRY PRO.PULP	FISH,FRUITS,TEXT.FIBER,CORN	300	600
	2	POLLOC	MANILA	L.ANIMALS,A.FEEDS,D. PRO.	FISH,FRUITS,TEXT.FIBER,CORN	450	800
	3	POLLOC	MANILA	L.ANIMALS,A.FEEDS,D. PRO.	FISH,FRUITS,TEXT.FIBER,CORN	500	750
SULCON IV	1	POLLOC	MANILA	FISH,FRUITS,PULP,A.FEEDS	L.ANIMALS,CORN,A.FEEDS	450	800
	2	POLLOC	MANILA	DAIRY PRO.,FISH,WHEAT,	L.ANIMALS,CORN,A.FEEDS,TEXT.FIB.	600	1800
	3						
PHIL. PRINCESS	1	ZAMBOANGA	ZAMBOANGA	L.ANIMALS,FISH,DAIRY PRO.	RICE,FRUITS,VEG.,CORN	420	850
	2	ZAMBOANGA	ZAMBOANGA	L.ANIMALS,FISH,DAIRY PRO.	RICE,FRUITS,VEG.,CORN	550	950
	3	ZAMBOANGA	ZAMBOANGA	L.ANIMALS,FISH,DAIRY PRO.	RICE,FRUITS,VEG.,CORN	350	1000

Source: PPA

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Sulpicio Lines

1.	Sulcon XI	-	Manila/Cebu/General Santos/Cebu/Manila
2.	Sulcon XIV	-	Manila/Polloc/General Santos/Manila
3.	Sulcon XV	-	Manila/Cebu/Polloc/General Santos/Polloc/Cebu/Manila
4.	Philippine Princess	-	Manila/Zamboanga/General Santos/Zamboanga/Iloilo/Manila

William Lines

1.	WILCON XI	-	Manila/Davao/General Santos/Zamboanga/Manila
2.	WILCON X	-	Manila/Polloc/General Santos/Zamboanga/Manila
3.	WILCON IV	-	Manila/Davao/General Santos/Manila
4.	MANILA CITY	-	Manila/Davao/General Santos/Manila
5.	Zamboanga City	-	Manila/Zamboanga/Davao/General Santos/Zamboanga/Manila

From the table, the following observations are made:

1. Ten containerships and two passenger-cargo ships from Davao call at General Santos enroute to Manila.

2. All four ships - three container and one passenger - of Sulpicio lines make General Santos their final destination in southern Mindanao Island.

3. On the Manila-Davao run, containerships proceed directly to Manila after departing from General Santos, except two out of seven ships.

4. The great amount of corn and rice carried by containerships from General Santos and discharged in Manila go to feed the large poultry and hog farms in and around Metro Manila (corn) and to feed the seven million people of Metro Manila (rice).

5. The copra and unrefined coconut oil from General Santos shipped directly to Manila are destined to the coconut oil refining plants in Metro Manila, for the production of margarine, shortening oil, and soap.

6. Sulpicio Lines ships terminate their voyage at General Santos after departing from the not-so-far port of Polloc. They unload fabricated metal and other goods and load corn, rice and copra, topping off their cargo at the port of Polloc with timber and more corn and cassava flour.

7. The passenger-cargo ships, in general, do not go to the big port of Cebu, neither directly to Manila. Instead, one goes to Zamboanga and Iloilo from General Santos; the second, from General Santos to Zamboanga before proceeding to Manila. This pattern of routes of passenger ships leaving General Santos and calling at ports in the Visayas Island group shows the large population of Visayan people who have settled in South Cotabato as businessmen, farmers and government personnel.

CHAPTER 7

TRAFFIC FORECAST

The traffic forecast provides the basis for dimensioning future port capacity. Predictions through the year 2010 are required for the present study; the use of such a long period obviously implies that predictions are subject to large margins of error. The Consultant cannot eliminate the uncertainty regarding future traffic flows, but can select an approach designed to reduce the consequences of uncertainty on the total cost of the final project (including the costs of providing port facilities and private sector costs such as ships' waiting time).

The first step in this approach involves using a range rather than a point forecast for each future commodity flow. A point forecast has a zero probability of yielding the correct tonnage for future years. The use of a range (interval) forecast improves this probability considerably: a "reasonable" value for each flow is selected after the analysis of available data to serve as the "mid-value forecast"; and the likely range is defined by selecting the values for the low forecast and the high forecast. Although the probability of a correct forecast range varies directly with the width of the range, this interval obviously cannot become too wide without losing its usefulness for port planning purposes.

The use of a range of predictions has a more important function, however, than increasing the probability of correctly predicting flows: it enables the planning team to see what the consequences are for the port operation if future flows are considerably above or below the forecast, and to see what actions (if any) need to be taken. In particular, the study team needs to know which flows, within those which may be reasonably predicted, present the "worst case" scenario for port costs and operation. This enables the team to verify if a proposed project is highly sensitive to variations in flows, or if it is a robust project, that is, one relatively insensitive to flows which are at the upper or lower side of the prediction interval.

The following examples of a robust and a sensitive solution clarify this point and illustrate its importance.

Suppose the project team has designed Project S for the expansion of a wharf, based on the mid forecast; it consists of a gantry crane and an additional berth. The low forecast is 30 % below the mid forecast, but the team verifies that it could not reduce the expense of the project to handle a lesser flow, since they could not provide 70 % of the crane or 70 % of the additional berth. Similarly, the team verifies that Project S can handle the high forecast, 45 % above the mid forecast, without increasing the ship waiting costs sufficiently to merit the provision of further expansion beyond the new berth and crane provided in Project S. The team has provided a robust solution.

Project T for expansion of another port provides an additional berth with a small amount of container-handling capacity and a shallow draft. If future traffic is 20 % below the forecast, the facility will not be needed at all; if 20 % above the forecast, ship waiting costs become excessive. The project is highly sensitive to flows and has a low probability of being the most satisfactory investment in handling future traffic. The team should investigate other options, such as a staged project to handle the low forecast flows at existing facilities and to provide deep-water berth(s) and efficient container facilities later if they prove to be needed.

In addition to the use of a forecast range, the Consultant relates the predictions to underlying trends and other factors which are expected to influence future flows. The search for underlying factors differs from the technique of assuming that the past rate of growth for a given commodity may simply be projected into the future. As an illustration, a commodity flow through a port may have grown at 5 percent per annum for a number of years; simple extrapolations of that growth rate predict even larger absolute increases in the flow, even though physical or biological constraints must eventually force it to level off or decline. Flows of another product may exhibit the opposite phenomenon; they may, for example, begin to grow very suddenly and rapidly because of shift in government policy or private investment. Still other flows may grow quickly at first, then level off -- a common situation when a new technology increases yields for an agricultural commodity. Knowledge of underlying factors thus helps to define the upper and lower ranges for the forecast, due to their usefulness in identifying probable shifts in production and ultimate constraints on future growth. It would not do to overstate the case, however. The Consultant uses these procedures to deal more effectively with uncertainty, rather than to create the illusion that uncertainty has been eliminated.

The choice of the width of the interval between the low and high forecast is dependent on the degree of uncertainty present in the underlying factors. Other things constant, the more uncertain and highly variable the underlying factors for a given commodity, the wider the range of predictions should be. This is a more pertinent consideration for a regional port such as Makar Wharf than would be the case for a major national port. Traffic predictions for large ports are aided by the law of large numbers, which serve to smooth out many flows and introduce a greater degree of predictability in the continuation of present trends in cargo traffic. For a regional port such as Makar, a number of specific and general economic factors affect future trends in the flow of a given commodity. Certain cargos may accompany fairly closely the growth of local population and per capita income -- imported wheat in a country with no local production provides a good example. Most cargo shipments are influenced to a considerable degree by prices and regulations in their respective national and international markets. Some flows may be influenced by a particular government decision -- using cement for road building may increase inbound cement movements until those programs are completed. Some flows may depend on the port facilities themselves: certain cargos (or large quantities of them) cannot pass through the port if it is not equipped to handle them efficiently and at a low unit cost. And still others may depend on a combination of the preceding factors -- precisely the case for the primary sector products now handled at Makar Wharf.

7.1 HISTORICAL PATTERNS OF CARGO HANDLING AT MAKAR WHARF

As late as the early 1970s, Makar Wharf was a very small, congested and poorly equipped port that had become a barrier to expansion of the economy of South Cotabato. It was subsequently expanded and upgraded in accord with the 1972 feasibility study by Sir William Halcrow and Associates. The amounts, types and direction of cargo handled have changed radically since that time, as seen in Tables 7-1 and 7-2. In 1970, cargo handled was only 30 % of its present volume; inbound cargo was almost equal to outbound cargo; foreign trade was very small; and container movement was negligible. Since then, domestic trade increased threefold (Figure 7-1), foreign trade grew swiftly (Figure 7-2) and now accounts for 9 % of total tonnage, and outbound traffic increased to 71 % of total tonnage in 1980 and then fell back to 62 % by 1990 (Figure 7-3). Containerized traffic now accounts for 48 % of total tonnage, and predominates in outbound domestic traffic (Figures 7-4 to 7-8).

Unfortunately, there are no statistics for bulk movements through Makar Wharf for the 1970-1989 period. In 1990, a new statistical procedure was adopted and 15 percent of total cargo movements were classified as bulk. These are not true bulk movements, however. They include attempts to facilitate break-bulk movements for fertilizers and corn. Bulk fertilizer has on occasion been removed from a ship's hold, dumped into a dockside hopper and bagged on the dock; outbound corn has been dumped into a bin, lifted to ship's hold and discharged through a trap door in bulk form into the hold. These are indications of the ingenuity and improvisation of shippers and the port administration to overcome the inefficiencies associated with handling of bags, even though they lack appropriate equipment.

Passenger traffic is an important activity at Makar Wharf, but is not particularly demanding of port facilities. The flow of passengers grew from 1980 to 1983, declined during the years of economic crisis in the mid-1980s, and has rebounded in recent years to about 120,000 passengers per year (Table 7-3 and Figure 7-9). There are about 16 thousand more outbound passengers than inbound passengers each year, indicating out-migration, at the same time as South Cotabato is receiving in-migration from neighboring provinces.

The commodity classification for domestic and foreign cargos handled at Makar Wharf are presented in Tables 7-9 and 7-5. In 1990, the classifications are much more detailed (Table 7-6); some commodities previously classified separately, such as bananas and empty bottles, are classified under new headings ("fruits and vegetables", "general cargo"). The data in Table 7-4 through 7-6 are used as references for the individual commodity forecasts for the 1990-2010 period (see Section 7.3).

Table 7-1

CARGO HANDLED AT MAKAR WHARF

1970-1990 (1,000t)

Tonnage Handled (1,000t)	1970*	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Domestic Trade												
Inbound	115	151	181	193	160	240	179	172	186	214	236	259
Outbound	129	356	367	380	449	415	485	543	451	569	541	512
Total	244	507	548	572	609	655	664	715	638	782	777	772
Foreign Trade												
Imports	10	28	19	41	24	17	35	39	43	52	36	60
Exports	0	78	46	24	20	23	15	22	36	25	36	13
Total	10	106	66	65	44	40	40	60	78	77	72	73
Total												
Inbound	125	179	200	234	184	257	213	211	229	266	272	319
Outbound	129	434	413	404	469	438	498	565	487	594	577	525
Total Handled	254	614	614	637	654	695	712	775	716	860	851	845

Source of basic data: Sir William Halcrow & Partners, 1972, Philippine Ports Feasibility Study; and Philippine Ports Authority

* Refers to 1970/71 year.

Note: Sums may differ slightly from totals due to rounding.

Table 7-2
CONTAINERIZED AND NON-CONTAINERIZED TRAFFIC
THROUGH MAKAR WHARF
1980-1990 (1,000t)

Item	1970[1]	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
CONTAINERIZED												
Domestic Trade												
Inbound	0[2]	54	66	94	79	77	78	79	89	102	105	119
Outbound	0[2]	65	89	138	156	181	184	187	182	204	196	274
Total	0[2]	119	155	232	235	259	262	266	271	306	301	393
Foreign Trade												
Imports	0[2]	0	0	0[3]	0	0	0	0	0	0	2	0[3]
Exports	0[2]	3	6	3	1	0	0	0	0	6	6	12
Total	0[2]	3	6	3	1	0	0	0	0	6	8	12
NON-CONTAINERIZED												
Domestic Trade												
Inbound	115	97	115	99	82	163	100	93	98	111	134	140
Outbound	129	292	278	241	293	234	300	356	269	364	344	237
Total	244	388	393	340	374	397	401	449	367	476	478	377
Foreign Trade												
Imports	10	28	19	41	24	17	35	39	43	52	35	60
Exports	0	76	41	22	19	23	14	22	36	19	30	1
Total	10	104	60	62	43	40	49	60	78	72	65	61
TOTALS												
Containerized	0[2]	122	161	235	236	259	262	266	271	312	309	405
Non-Containerized	254	492	453	402	417	437	450	509	445	548	543	438
Total Cargo	254	614	614	637	653	696	712	775	716	860	852	843

Source: Philippine Ports Authority; for 1970/71 year, Sir William Halcrow, Philippine Ports Feasibility Study.
[1] 1970/71 year.
[2] No container traffic is cited in the 1972 Halcrow study.
[3] Positive, but less than 500t.
Note: Sums may differ slightly from totals due to rounding.

Table 7-3

PASSENGER TRAFFIC PASSING THROUGH MAKAR WHARF

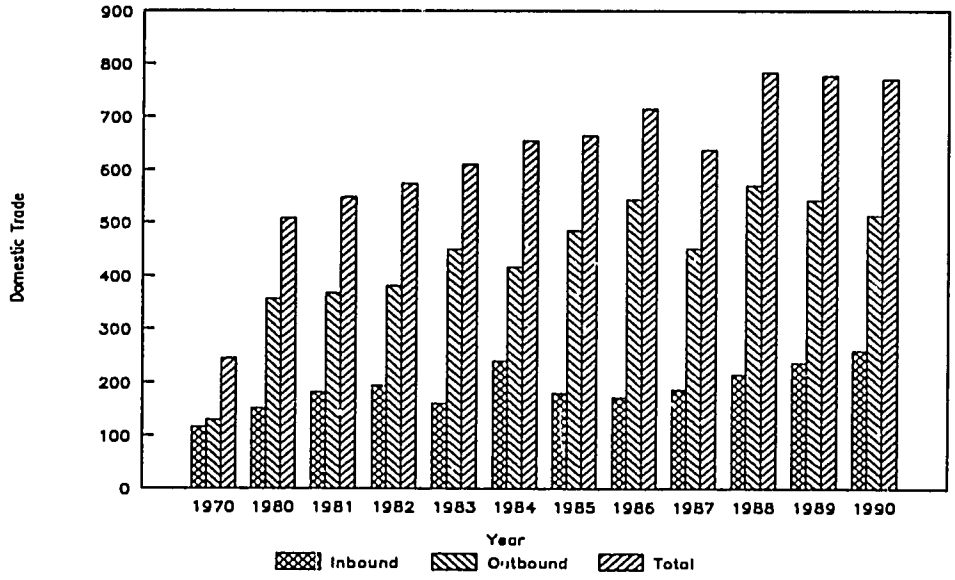
1980-1990 (1,000 passengers)

Direction	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Disembarked	55	61	65	63	47	45	45	51	51	55	46
Embarked	60	72	73	73	56	53	54	69	67	72	62
Total	115	132	137	136	103	98	99	120	119	127	108

Source: Philippine Ports Authority

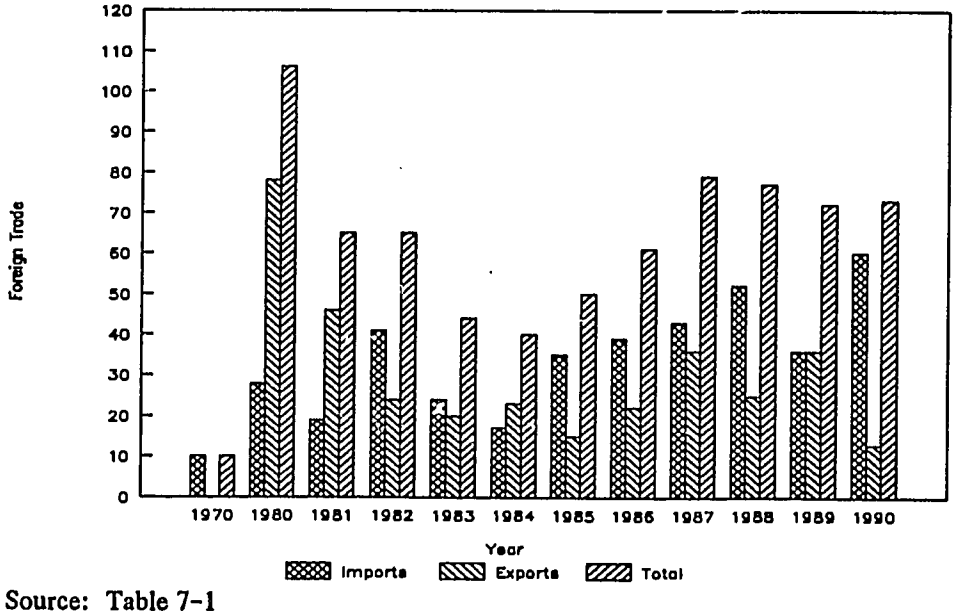
Note: Sums may differ slightly from totals due to rounding.

Figure 7–1
DOMESTIC CARGO HANDLED THROUGH
MAKAR WHARF, 1970-1990
(1,000t)



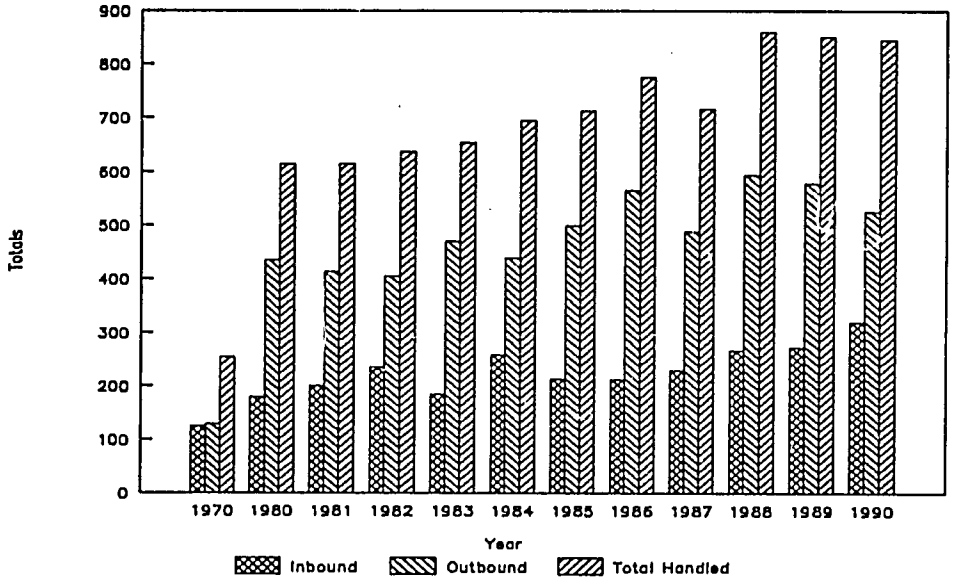
Source: Table 7-1

Figure 7–2
FOREIGN CARGO HANDLED THROUGH
MAKAR WHARF, 1970-1990
(1,000t)



Source: Table 7-1

Figure 7–3
TOTAL CARGO HANDLED THROUGH MAKAR WHARF, 1970–1990
(1,000t)



Source: Table 7-1

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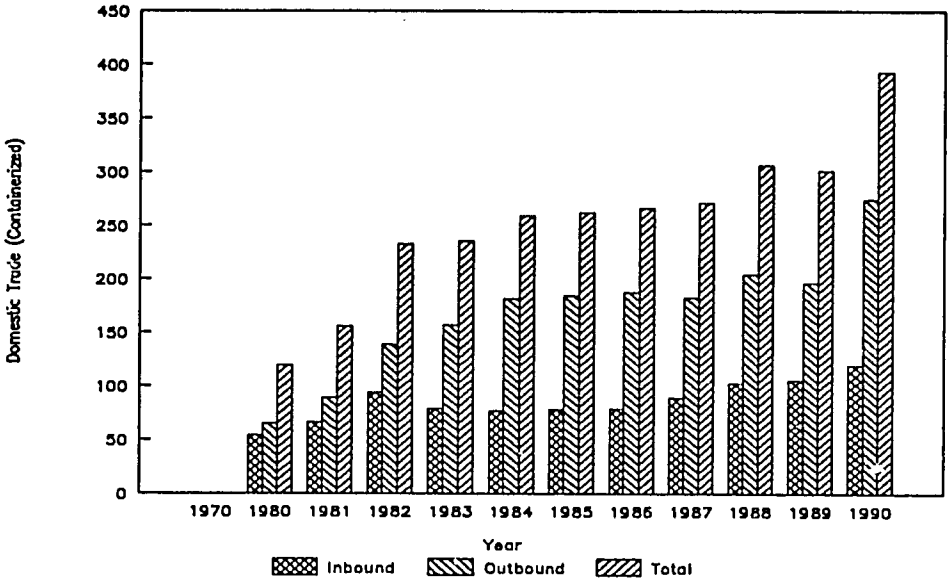
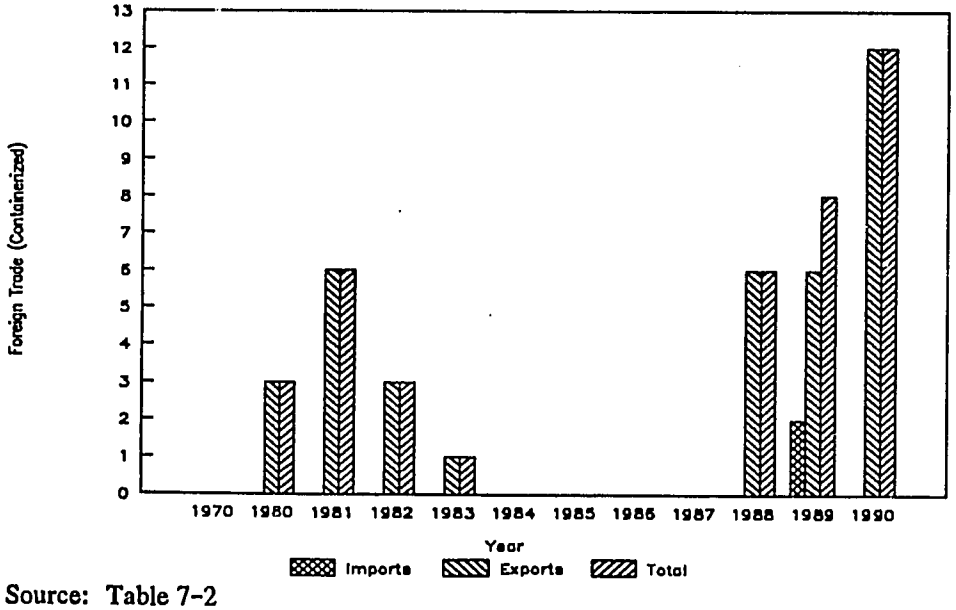
Figure 7–4
DOMESTIC CONTAINERIZED CARGO HANDLED
THROUGH MAKAR WHARF, 1970–1990
(1,000 t)



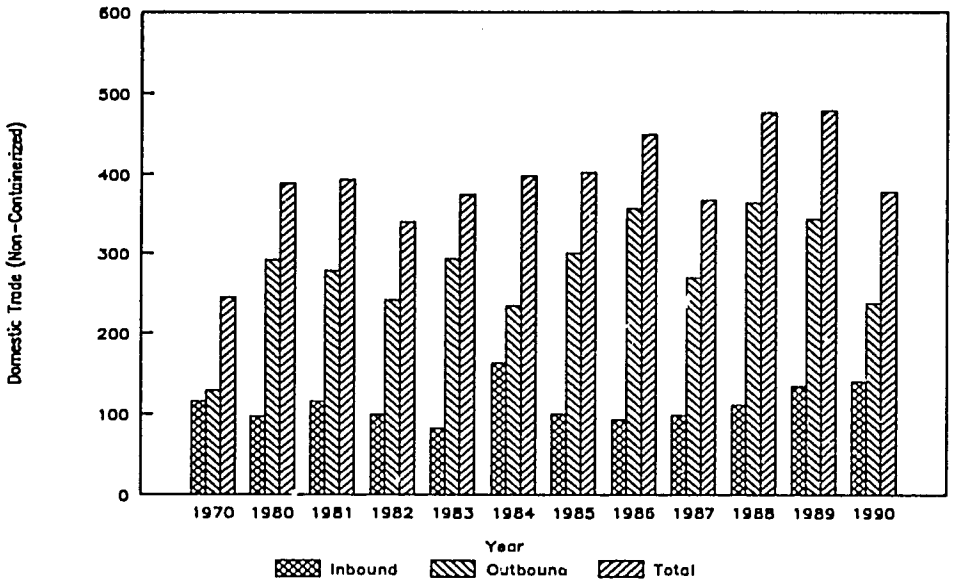
Source: Table 7–2

Figure 7–5
FOREIGN CONTAINERIZED CARGO HANDLED
THROUGH MAKAR WHARF, 1970–1990
(1,000 t)



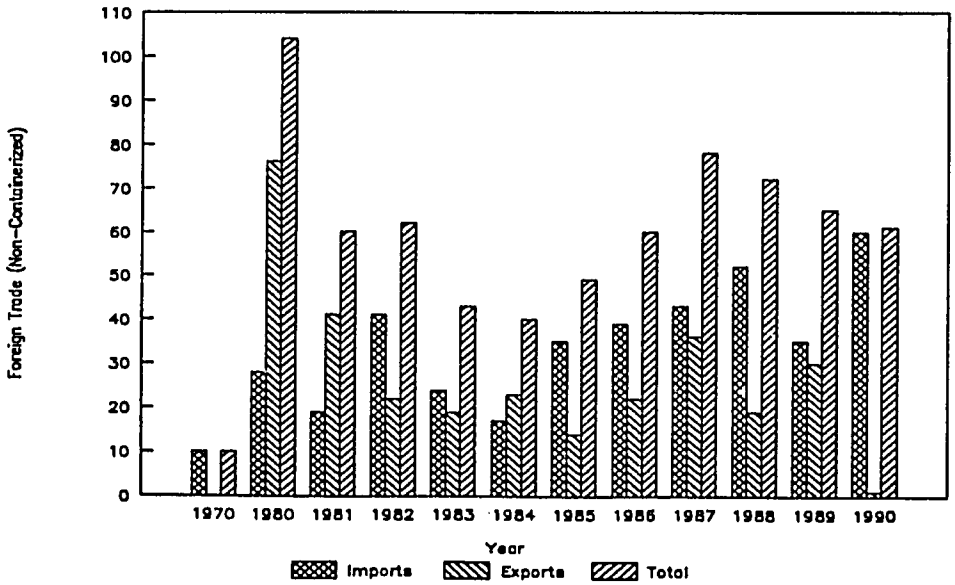
Source: Table 7–2

Figure 7–6
DOMESTIC NON-CONTAINERIZED CARGO HANDLED THROUGH MAKAR WHARF, 1970-1990
(1,000 t)



Source: Table 7-2

Figure 7–7
FOREIGN NON-CONTAINERIZED CARGO HANDLED THROUGH MAKAR WHARF, 1970-1990
(1,000 t)



Source: Table 7-2

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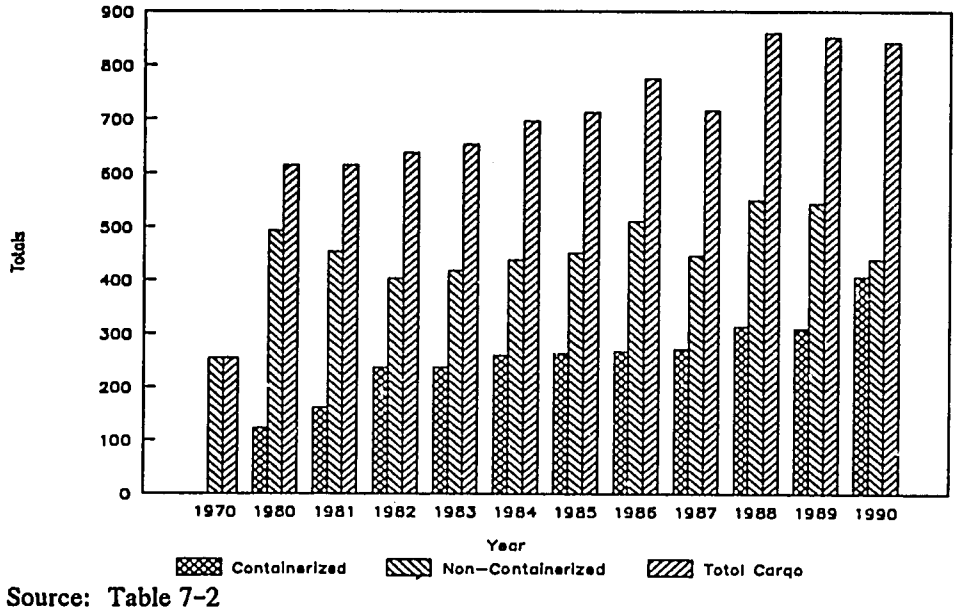
Figure 7-8

CONTAINERIZED AND NON-CONTAINERIZED CARGO HANDLED THROUGH MAKAR WHARF, 1970-1990

(1,000 t)



Source: Table 7-2

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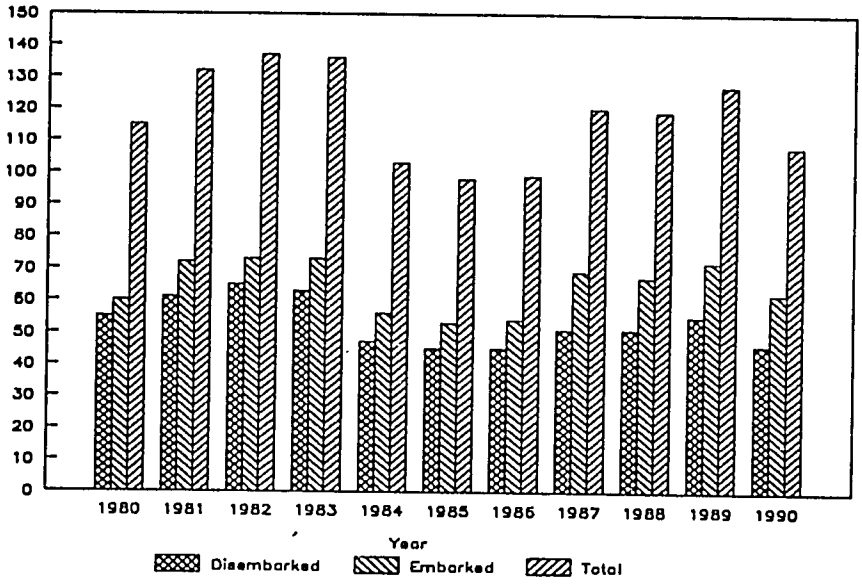
Figure 7–9

PASSENGER TRAFFIC PASSING THROUGH MAKAR WHARF
1980–1990 (1,000 passengers)



Source: Table 7–3

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Table 7–4

CARGOS HANDLED AT THE PORT OF GENERAL SANTOS, DOMESTIC TRADE: 1986–1990

(in metric tons)

COMMODITIES	1986		1987		1988		1989		1990	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
Corn	-	341,987	-	304,243	-	311,095	-	163,898	149	180,926
General Cargo	97,989	33,338	77,013	37,159	91,167	87,482	153,790	129,620	129,571 *	125,171 *
Copra	-	60,618	-	38,570	-	62,844	-	43,120	598	58,187
Palay & Rice	-	12,697	-	8,900	-	5,266	500	21,137	8,459	27,333
Canned Pineapple	-	30,690	-	20,653	-	24,326	-	11,170	-	-
Live Animals	-	20,460	-	22,064	-	24,854	10	24,794	1,463	31,730
Bottled Cargo	18,026	-	19,125	-	22,504	-	34,183	23	64,434	1,359
Fertilizer	15,600	-	13,300	-	5,650	-	14,843	-	17,184	126
Cement	8,004	-	9,500	-	7,500	-	6,084	-	2,099	5
Empty Bottles	-	8,981	-	9,582	-	16,522	-	27,189	-	-
Other Consumer Goods	14,932	-	49,432	-	71,504	-	8,387	-	-	-
Animal Feeds	8,359	12,360	7,760	8,736	2,220	-	7,187	91,012	12,640	82,495
Other Cereals	2,100	-	3,591	-	-	-	3,180	2,186	12,834	24
Sugar	6,931	-	6,766	-	5,135	-	7,657	-	10,037	51
Palm Oil	-	3,834	-	5,680	-	7,235	-	7,540	-	4,875
Cotton Lint	-	7,360	-	5,693	-	2,286	-	1,728	-	-
Banana	-	5,600	-	2,200	-	-	-	4,118	-	-
Scrap Cartons	-	-	-	-	-	3,416	-	3,244	-	-
Canned Fish Products	-	5,300	-	5,860	-	7,463	-	10,369	-	-
T O T A L	171,941	543,225	186,487	469,340	205,680	552,789	235,821	541,148	259,468	512,282

*Also includes fruits and vegetables, dairy products, fish and fish preparation, tobacco and manufactures, coconut oil, textile fiber, textile and garments, logs, lumber and other wood-based products, metal-based products, machinery, electrical and transport equipment.

Source: Philippine Ports Authority.

Table 7-5

CARGOS HANDLED AT THE PORT OF GENERAL SANTOS, FOREIGN TRADE: 1986-1990

(in metric tons)

	1986		1987		1988		1989		1990	
	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT	IMPORT	EXPORT
Live Animals	-	625	625	-	1,955	-	4,730	-	3,443	-
Fish	-	652	-	-	500	329	920	-	600	-
Fruits and Vegetables	-	9,010	-	12,382	-	11,352	-	-	-	11,315
Animal Feeds	-	-	-	-	-	-	668	18,713	13,791	-
Pulp and Paper	-	-	-	-	-	-	1,902	-	-	-
Fertilizer	38,588	-	41,859	-	49,781	-	31,444	-	40,868	-
Chemicals	-	-	-	-	-	-	-	-	39	-
Iron and Steel	-	-	-	-	-	-	-	-	427	-
Manufactures of Metal	-	-	-	-	-	-	-	-	787	86
General Cargo	-	-	49	-	-	-	28	23	171	1,412
Cotton Seeds	-	2,857	-	4,740	-	7,088	-	7,911	-	1,202
Lumber	-	-	-	-	-	2,454	-	1,323	-	-
Copra	-	9,000	-	8,422	-	-	-	2,790	-	-
Rice	-	-	-	10,000	-	-	-	5,000	-	-
Castor Beans	-	200	-	-	-	-	-	-	-	-
T O T A L	38,588	22,344	42,533	35,544	52,236	21,223	39,692	35,760	60,126	14,015

Source: Philippine Ports Authority; sums may differ slightly from column totals due to rounding.

Table 7-6
CARGOS HANDLED AT THE PORT OF GENERAL SANTOS,
DOMESTIC AND FOREIGN TRADE: 1990
(in metric tons)

COMMODITIES	DOMESTIC		FOREIGN	
	IN	OUT	IN	OUT
Live Animals	1,463	31,730	3,443	-
Dairy Products	2,666	15	-	-
Fish & Fish Preparation	7,886	18,723	600	-
Rice	8,459	27,333	-	-
Corn	149	180,926	-	-
Wheat	12,834	24	-	-
Fruits & Vegetables	1,704	31,536	-	11,315
Sugar	10,037	51	-	-
Animal Feeds	12,640	82,495	13,791	-
Bottled Cargo	64,434	1,359	-	-
Tobacco & Manufactures	5,392	1	-	-
Copra	598	58,187	-	-
Logs	8	57	-	-
Lumber	28	564	-	-
Paper & Pulp	2,285	4,774	11	-
Textile Fiber	24	4,736	-	-
Fertilizer	17,184	126	40,868	-
Crude Minerals	247	3	-	-
Metal Scrap	123	6,293	-	-
Ref. Petroleum Products	3,585	19	-	-
Mineral Fuels	26	5	-	-
Coconut Oil	1,381	149	-	-
Chemicals	2,140	213	39	-
Plywood & Veneer	221	98	-	-
Textile & Garment	243	73	-	-
Cement	2,099	5	-	-
Iron & Steel	10,344	375	427	-
Manufactures of Metal	18,542	992	787	86
Mach. & Electrical Equipment	5,440	875	-	-
Transport Equipment	1,413	496	-	-
Furniture	589	159	-	-
General Cargo	65,285	55,014	171	1,412
Palm Oil	-	4,875	-	-
T O T A L	259,469	512,281	60,137	12,813

Source: Philippine Ports Authority, Port of General Santos

7.2 GENERAL FACTORS INFLUENCING FUTURE TRAFFIC IN MAKAR WHARF

This section provides a brief description of general economic factors that are expected to influence future flows of goods through Makar Wharf, in addition to those already described in Chapter 2.

The growth rates of population and income provide indications of future demand for products that pass through Makar Wharf. At the national level, growth of these factors increases demand for local primary products and encourages the growth in outbound traffic; at the local and regional level, growth absorbs part of what might otherwise be shipped out, and creates a demand for inbound traffic. For manufactured goods, growth on the national and local levels tends to be complementary, increasing the demand for both inbound and outbound traffic.

The population of South Cotabato is estimated at 1,073,000 for 1990, comprising 24.1 % of the population of Region XI (which includes the provinces of Surigao del Sur, Davao del Norte, Davao del Sur and Davao Oriental, in addition to South Cotabato), 7.5 % of Mindanao and 1.8 % of the Philippines (Tables 7-7 and 7-8). During the last decade, the South Cotabato population grew at 3.9 %, considerably above the respective rates of 3.3 %, 3.0 % and 2.6 % for Region XI, Mindanao and the Philippines (Table 7-9).

Data on the gross domestic product (GDP) are not available on the provincial level; Region XI accounted for 7.2 % of GDP for the Philippines (Table 7-10). The regional GDP growth rate of 4.7 % for 1988-89 lagged behind that of Mindanao (5.3 %) and the Philippines (6.0 %); per capita GDP for Region XI was slightly above that of Mindanao and the Philippines as a whole, but growing more slowly than either that of Mindanao or the nation (Tables 7-11, 7-12 and 7-13). As seen in Section 2, South Cotabato has attracted immigrants from other provinces, an indication that its economic performance has been above the averages for Region XI and Mindanao in recent years.

Region XI provides 34 % of the primary sector production (agriculture, fishery and forestry) of Mindanao, and 12 % of that of the Philippines (Table 7-14); its growth rate has lagged behind that of Mindanao and the country as a whole (Table 7-15), but again South Cotabato leads the regional average (Chapter 2).

The primary sector occupies a very important position in the Philippine economy. It accounts for 27 % of 1990 GDP, a figure that approaches the 33 % for industry and 40 % for services (Table 7-16). As a comparison, Brazil's primary sector accounts for less than 10 % of its GDP. The share of the Philippine primary sector in GDP has remained remarkably stable over the last 15 years -- the same 27 % share was registered in 1975. Again, this contrasts with experience of many developing countries that have seen a marked decline in the relative importance of the agricultural share.

Table 7-7
POPULATION OF SOUTH COTABATO, REGION XI, MINDANAO AND THE PHILIPPINES: 1960-1990
(in thousand)

YEAR	SOUTH COTABATO	REGION XI	MINDANAO	PHILIPPINES
1960	295	1,353	5,384	27,088
1970	466	2,201	7,964	36,684
1980	770	3,347	10,906	48,098
1990	1,073	4,454	14,223	60,477

Source: 1990 Philippine Statistical Yearbook

Table 7-8
SOUTH COTABATO POPULATION AND SHARE OF REGIONAL, MINDANAO AND NATIONAL POPULATION: 1960-1990

YEAR	SOUTH COTABATO	% OF POPULATION OF		
		REGION XI	MINDANAO	PHILIPPINES
1960	295	21.8	5.5	1.1
1970	466	21.2	5.8	1.3
1980	770	23.0	7.1	1.6
1990	1,073	24.1	7.5	1.8

Source of Basic Data: 1990 Philippine Statistical Yearbook

Table 7-9
POPULATION GROWTH RATES: SOUTH COTABATO, REGION XI, MINDANAO AND PHILIPPINES: 1960-1990
(in percent)

YEAR	SOUTH COTABATO	REGION XI	MINDANAO	PHILIPPINES
Ten-Year Growth Rate				
1960 - 70	58.0	62.7	47.9	35.4
1970 - 80	65.2	52.1	36.9	31.1
1980 - 90	39.3	33.1	30.4	25.7
Average	54.2	49.3	38.4	30.7
Annual Growth Rate				
1960 - 70	5.8	6.3	4.8	3.5
1970 - 80	6.5	5.2	3.7	3.1
1980 - 90	3.9	3.3	3.0	2.6
Average	5.4	4.9	3.8	3.1

Source of Basic Data: 1990 Philippine Statistical Yearbook

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Table 7-10
GROSS DOMESTIC PRODUCT OF REGION XI, MINDANAO AND PHILIPPINES: 1981-1989
(in million pesos at constant 1972 prices)

YEAR	REGION XI	MINDANAO[1]	PHILIPPINES
1981	5,987	17,466	96,208
1982	6,169	17,871	98,999
1983	6,424	18,044	99,920
1984	6,300	17,574	93,927
1985	6,418	18,007	89,885
1986	6,678	18,825	91,166
1987	7,123	19,831	95,483
1988	7,378	20,705	101,398
1989	7,725	21,796	107,467

[1] Represents the sum of Gross Domestic Product for Regions IX, X, XI and XII.

Source of Basic Data: 1990 Philippine Statistical Yearbook

Table 7-11
GROWTH RATES OF GROSS DOMESTIC PRODUCT FOR REGION XI, MINDANAO AND PHILIPPINES: 1981-1989
(in percent)

YEAR	REGION XI	MINDANAO	PHILIPPINES
1981-82	3.0	2.3	2.9
1982-83	4.1	1.0	0.9
1983-84	(1.9)	(2.6)	(6.0)
1984-85	1.9	2.5	(4.3)
1985-86	4.0	4.5	1.4
1986-87	6.7	5.3	4.7
1987-88	3.6	4.4	6.2
1988-89	4.7	5.3	6.0

Source of Basic Data: 1990 Philippine Statistical Yearbook

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Table 7-12
PER CAPITA GROSS DOMESTIC PRODUCT,
REGION XI, MINDANAO
AND PHILIPPINES: 1981-1989
(in pesos at constant 1972 prices)

YEAR	REGION XI	MINDANAO[1]	PHILIPPINES
1981	1,731	1,533	1,942
1982	1,737	1,527	1,949
1983	1,762	1,500	1,920
1984	1,685	1,421	1,760
1985	1,673	1,420	1,644
1986	1,698	1,450	1,628
1987	1,766	1,484	1,663
1988	1,744	1,516	1,728
1989	1,809	1,556	1,783

[1] Average for Regions IX, X, XI and XII
Source: 1990 Philippine Statistical Yearbook

Table 7-13
GROWTH RATE OF PER CAPITA
DOMESTIC PRODUCT, REGION XI,
MINDANAO AND PHILIPPINES: 1981-1989
(in percent)

YEAR	REGION XI	MINDANAO	PHILIPPINES
1981-82	0.36	(0.4)	0.35
1982-83	1.44	(1.8)	(1.51)
1983-84	(4.37)	(5.3)	(8.31)
1984-85	(0.71)	(0.1)	(6.59)
1985-86	1.49	2.1	(0.97)
1986-87	4.00	2.3	2.15
1987-88	0.45	2.2	3.91
1988-89	1.97	2.6	3.18

Source: 1990 Philippine Statistical Yearbook

Table 7-14
GROSS VALUE ADDED IN AGRICULTURE, FISHERY AND FORESTRY, REGION XI, MINDANAO AND PHILIPPINES: 1981-1989
(in million pesos at constant 1972 prices)

YEAR	REGION XI	MINDANAO[1]	PHILIPPINES
1981	2,638	8,604	24,608
1982	2,688	8,765	25,378
1983	2,858	8,715	24,845
1984	2,878	8,788	25,409
1985	3,190	9,459	26,232
1986	3,315	9,923	27,110
1987	3,381	9,845	26,834
1988	3,442	10,052	27,771
1989	3,524	10,437	28,887

[1] Represents the sum of GVA in Agriculture, Fishery and Forestry for Regions IX, X, XI and XII.
Source: 1990 Philippine Statistical Yearbook

Table 7-15
GROWTH RATES OF GROSS VALUE ADDED IN AGRICULTURE, FISHERY AND FORESTRY FOR REGION XI, MINDANAO AND PHILIPPINES: 1981-1989
(in percent)

YEAR	REGION XI	MINDANAO	PHILIPPINES
1981-82	1.9	1.9	3.1
1982-83	6.3	(0.6)	(2.1)
1983-84	7.0	0.8	2.3
1984-85	10.8	7.6	3.2
1985-86	3.9	4.9	3.3
1986-87	2.0	(0.8)	(1.0)
1987-88	1.8	2.1	3.5
1988-89	2.4	3.8	4.0

Source of Basic Data: 1990 Philippine Statistical Yearbook

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Table 7-16
PERCENTAGE DISTRIBUTION GROSS DOMESTIC PRODUCT BY SECTOR, PHILIPPINES: 1975-1989
(in percent)

YEAR	GDP	SECTORS		
		AGRICULTURE FISHERY & FORESTRY	INDUSTRY	SERVICES
1975	68,437	26.8	34.1	39.1
1976	73,922	26.8	34.8	38.4
1977	78,467	26.5	35.6	38.0
1978	82,784	26.1	35.8	38.1
1979	87,962	25.7	36.4	37.9
1980	92,568	25.6	36.2	38.3
1981	96,207	25.6	36.3	38.1
1982	98,999	25.6	36.1	38.3
1983	99,921	24.9	36.0	39.2
1984	93,927	27.0	34.4	38.6
1985	89,904	29.2	32.3	38.5
1986	91,180	29.7	31.1	39.1
1987	95,371	28.1	32.0	39.9
1988	101,450	27.4	32.8	39.8
1989	107,143	27.1	33.2	39.8
1990	109,890	26.9	33.0	40.1

Source of Basic Data: 1990 Philippine Statistical Yearbook

The primary sector also remains the main source of employment in the Philippines, with 45 % of total employment at the national level, and 53 % and 55 % in Region XI and Mindanao, respectively (Tables 7-17 and 7-18). Personal expenditures are also very heavily concentrated in food purchases, averaging 55 % of total consumption expenditure for the Philippines (Table 7-19). For Region XI, 46 % of production by value comes from the primary sector, 20 % from industry and 35 % from services (Table 7-20).

The distribution of income for the Philippines is indicated in Figure 7-10 by the Lorenz curves for 1966 and 1988. The cumulative share of income is measured on the vertical axis; the cumulative fraction of families, on the horizontal axis. If income were perfectly distributed among families, the poorest 20 % of families would have 20 % of total family income, the poorest half would have 50 % of income, etc., and all points would fall on the 45 degree line of perfect equality (AB). The degree of inequality in a society is measured by ratio of the area between the Lorenz curve and the 45 degree line to the area of the triangle ABC. Thus, the greater the distance of a Lorenz curve from the 45 degree line, the greater the inequality. The Lorenz curve for 1988 is considerably closer to the 45 degree line than the curve for 1966, indicating that inequality among Philippine families has decreased significantly since 1966, although it is still rather high. Internationally, the Philippines presents an income distribution mid-way between countries with low inequality such as Australia and New Zealand, and those with high inequality, such as Gabon and Peru. An improving income distribution will reinforce the effect of rising population and income per capita on demand for foodstuffs and most consumer goods.

Governmental expenditures as a percentage of GDP have averaged slightly over 9 % in recent years, with small fluctuations of no clearly defined tendency; personal consumption in relation to GDP has increased over time to 76 % (Table 7-21). This level of governmental expenditures is not high in international terms and should not by itself be a barrier to growth; however, the increase in the percentage of personal consumption expenditures indicates a decline in savings and investment, and is probably one underlying reason for the rather modest goals in the Philippine economic development plan: an average growth rate in GNP of 3.4 % per annum, with a per capita increase of only 0.8 %, once the 2.6 % population increase is discounted (Table 7-22).

Foreign trade has become increasingly important to the Philippine economy over time. It is currently equal to 26 % of GDP, up from 15 % in 1975 (Table 7-23). The balance of trade has been somewhat erratic: in the 1975-1983 period, the balance was always negative, generating an internal crisis in the 1984-1988 period as major sacrifices were imposed on the domestic economy to produce relatively large surpluses in the balance of trade. The more recent improvement in the local economy has occurred as the surpluses first declined sharply from 1986 to 1988, and then became deficits. These deficits are especially worrisome, given the external debt of about $24 billion and consequent debt service payments that have made the Philippines a net exporter of capital to more developed countries over the last 15 years (Tables 7-23 and 7-24). The Philippine Assistance Program improved the domestic economic situation in 1990, and perspectives for the Philippine economy for the next few years have improved despite the

Table 7-17
EMPLOYMENT BY INDUSTRY: REGION XI,
MINDANAO AND PHILIPPINES: OCTOBER, 1989
(in thousands)

INDUSTRY	REGION XI	MINDANAO	PHILIPPINES
Agriculture, Fishery and Forestry	849	2,861	9,852
Mining and Quarrying	15	50	154
Manufacturing	103	316	2,298
Electricity, Gas and Water	5	20	83
Construction	59	140	911
Wholesale and Retail Trade	252	731	3,074
Transportation, Storage and Communication	58	171	1,095
Financing, Insurance, Real Estate and Business Services	23	48	398
Community, Social and Personal Services	230	791	3,972
Industry, Not Equally Defined	0	1	12
T O T A L	1,594	5,129	21,849

Source: 1990 Philippine Statistical Yearbook

Table 7-18
PERCENTAGE DISTRIBUTION OF EMPLOYMENT BY INDUSTRY: REGION XI
MINDANAO AND PHILIPPINES: OCTOBER, 1989
(in percent)

INDUSTRY	REGION XI	MINDANAO	PHILIPPINES
Agriculture, Fishery and Forestry	53.3	55.8	45.1
Mining and Quarrying	0.9	1.0	0.7
Manufacturing	6.5	6.2	10.5
Electricity, Gas and Water	0.3	0.4	0.4
Construction	3.7	2.7	4.2
Wholesale and Retail Trade	15.8	14.2	14.1
Transportation, Storage and Communication	3.6	3.3	5.0
Financing, Insurance, Real Estate and Business Services	1.4	0.9	1.8
Community, Social and Personal Services	14.4	15.4	18.2
Industry, Not Equally Defined	0.0	- [1]	- [1]
T O T A L	100.0	100.0	100.0

[1] Less than 0.1%.

Source of Basic Data: 1990 Philippine Statistical Yearbook

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Table 7-19
PERCENTAGE DISTRIBUTION OF PERSONAL CONSUMPTION EXPENDITURE BY PURPOSE, PHILIPPINES: 1989-1990
(in percent)

EXPENDITURE ITEMS	Y E A R		
	1988	1989	1990
Food	56.3	55.4	55.4
Beverages	2.3	2.3	2.4
Tobacco	2.2	2.2	2.2
Clothing and footwear	5.3	5.3	5.2
Fuel, light and water	3.1	3.1	3.0
Household furnishings	4.1	4.2	4.2
Household operations	9.3	9.4	9.4
Transportation/communication	2.3	2.3	2.2
Miscellaneous	15.1	15.8	16.0
T O T A L	100	100	100

Sources: 1990 Philippine Statistical Yearbook
The National Accounts of the Philippines, CY 1988 to CY 1990

Table 7-20
PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC PRODUCT OF REGION XI, BY SECTOR: 1987-1989
(in percent)

SECTOR	YEAR		
	1987	1988	1989
Agriculture, Fishery and Forestry			
Agricultural Crops	38.9	37.6	36.8
Livestock and Poultry	4.3	4.4	4.6
Fishery	1.3	1.3	1.3
Forestry	3.0	3.1	2.8
Sub-total	47.5	46.4	45.5
Industry			
Mining and Quarrying	1.7	1.6	1.4
Manufacturing	13.2	14.4	15.4
Construction	2.3	2.3	2.2
Electricity, gas & water	0.6	0.7	0.7
Sub-total	17.8	19.0	19.7
Service			
Transportation	3.9	3.9	3.8
Trade	21.1	21.2	21.2
Finance and Housing	3.6	3.6	3.5
Private Services	3.7	3.7	3.6
Government Services	2.4	2.2	2.7
Sub-total	34.7	34.6	34.8
Gross Domestic Product	100	100	100

Source of Basic Data: Economic and Social Statistics Office, National Statistical Coordination Board

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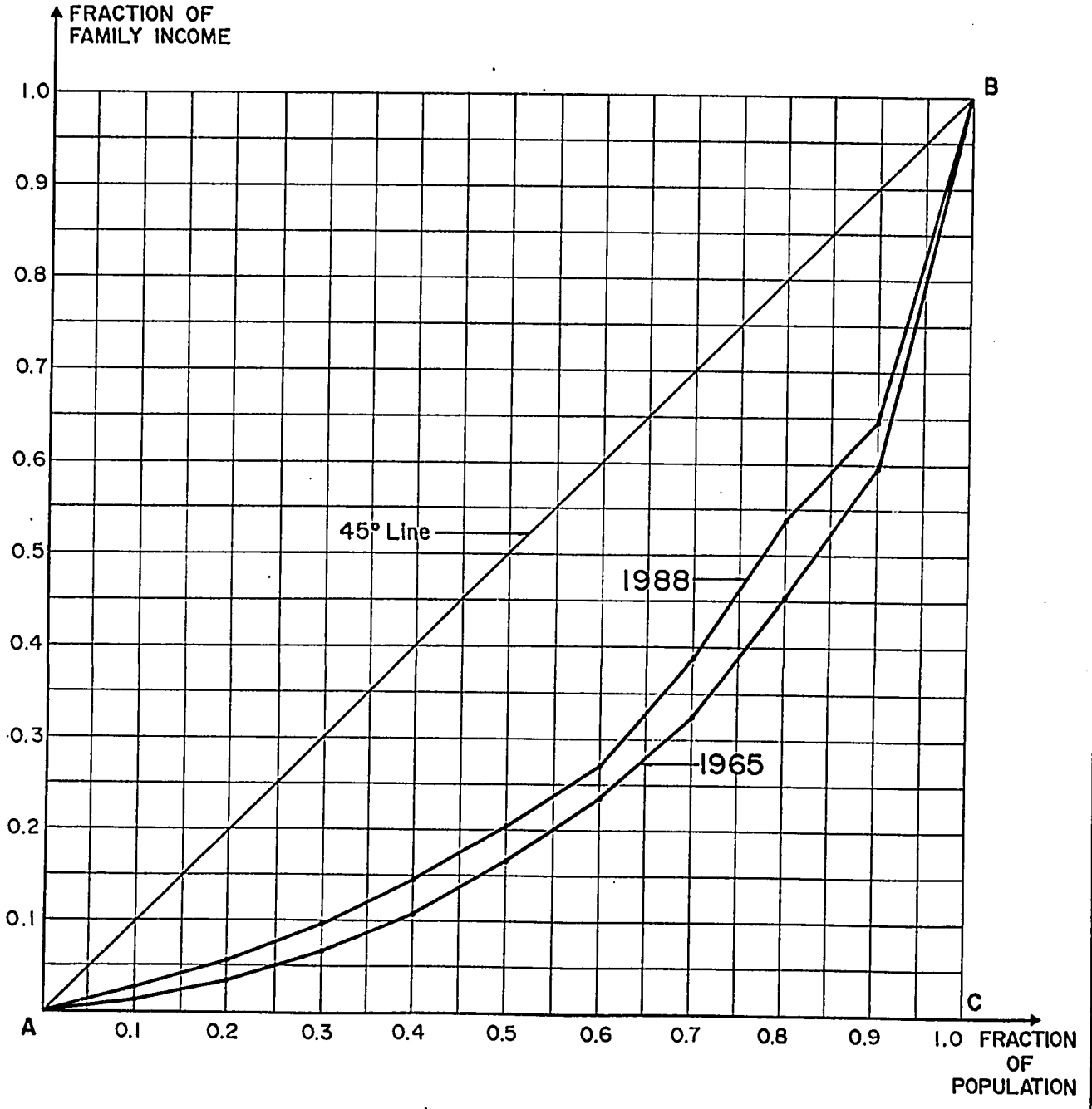

Source - Philippine Statistical Yearbook, 1990

PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0098-00	MAKAR WHARF FEASIBILITY STUDY	
LOUIS BERGER INTERNATIONAL, INC. •LOCKWOOD GREENE INT'L. •TRANS-ASIA (PHIL.), INC. •ERNST & YOUNG INT'L. •CONSULTANT MANAGEMENT SERVICES, INC. •GLOBETROTTERS ENG'G CORP.	LORENZ CURVES FOR TOTAL FAMILY INCOME DISTRIBUTION IN THE PHILIPPINES, 1965 and 1988	FIGURE 7-10

Table 7-21
PERSONAL CONSUMPTION AND
GOVERNMENT CONSUMPTION EXPENDITURES
IN RELATION TO GROSS DOMESTIC PRODUCT, PHILIPPINES: 1975-1990
(in million of pesos at constant 1972 prices)

YEAR	TYPE OF EXPENDITURES		PERCENTAGE SHARE OF GDP (%)	
	PERSONAL CONSUMPTION EXPENDITURES	GOVERNMENT CONSUMPTION EXPENDITURES	PERSONAL CONSUMPTION EXPENDITURES	GOVERNMENT CONSUMPTION EXPENDITURES
1975	46,515	7,263	68.0	10.6
1976	48,840	7,415	66.1	10.0
1977	51,416	7,485	65.5	9.5
1978	54,098	7,710	65.3	9.3
1979	56,718	7,995	64.5	9.1
1980	59,270	8,294	64.0	9.0
1981	61,617	8,598	64.0	8.9
1982	63,535	9,145	64.2	9.2
1983	65,348	8,788	65.4	8.8
1984	66,032	8,255	70.3	8.9
1985	65,977	8,221	73.4	9.1
1986	66,597	8,187	73.0	9.0
1987	70,409	8,774	73.8	9.2
1988	74,646	9,409	73.6	9.3
1989	78,929	10,358	73.7	9.7
1990	83,789	10,367	76.2	9.4

Sources of Basic Data: 1990 Philippine Statistical Yearbook
The National Accounts of the Philippines, CY 1988 to CY 1990

Table 7-22
AGGREGATE MACROECONOMIC TARGETS: 1990-1992

YEAR	VALUES (At constant 1972 prices)		GROWTH RATES (%)		SAVINGS AND INVESTMENTS (% TO GNP)		
	GROSS NATIONAL PRODUCT (P Billion)	PER CAPITA GNP (P)	GROSS NATIONAL PRODUCT (P Billion)	PER CAPITA GNP (P)	GROSS DOMESTIC INVEST-MENT	GROSS NATIONAL SAVINGS	GROSS FOREIGN SAVINGS
Actual							
1988	101.1	1,722	6.8	1.3	17.4	16.3	1.1
1989	106.8	1,778	5.7	1.3	18.7	15.4	3.3
Plan Targets [1]							
1990	110.4	1,784	3.4	0.4	19.1	12.7	6.4
1991	114.0	1,798	3.2	0.8	20.2	14.2	6.0
1992	118.2	1,822	3.8	1.4	22.3	17.9	4.4
Annual Average							
1990-92	114.2	1,802	3.4	0.8	20.5	14.9	5.6

[1] Average of low and high estimates
Source of Basic Data: 1990 Philippine Statistical Yearbook

Table 7-23
FOREIGN TRADE IN RELATION TO EXPENDITURES ON
GROSS DOMESTIC PRODUCT: 1975-1989
(in million pesos at constant 1972 prices)

YEAR	EXPORTS OF GOODS AND NON-FACTOR SERVICES	EXPORTS LESS IMPORTS OF GOODS AND NON-FACTOR SERVICES (NET FOREIGN TRADE)	EXPORTS/ EXPENDITURES ON GDP	NET FOREIGN TRADE/ EXPENDITURES ON GDP
1975	10,220	(3,056)	14.9	(4.5)
1976	12,120	(1,295)	16.4	(1.8)
1977	14,120	(154)	18.0	(0.2)
1978	14,657	(1,459)	17.7	(1.8)
1979	15,650	(3,115)	17.8	(3.5)
1980	17,741	(1,636)	19.2	(1.8)
1981	17,947	(907)	18.6	(0.9)
1982	17,486	(2,024)	17.7	(2.0)
1983	19,262	(2,484)	19.3	(2.5)
1984	20,846	2,671	22.2	2.8
1985	19,351	5,356	21.5	6.0
1986	23,560	7,758	25.8	8.5
1987	23,245	3,258	24.4	3.4
1988	26,931	261	26.5	0.3
1989	29,167	(4,775)	27.2	(4.7)
1990	29,055	(8,349)	26.4	(7.8)

Sources of Basic Data: 1990 Philippine Statistical Yearbook
The National Accounts of the Philippines CY 1988 to CY 1990.

Table 7-24
EXPENDITURES ON GROSS DOMESTIC PRODUCT AND
GROSS NATIONAL PRODUCT: 1975-1989
(in million pesos at constant 1972 prices)

YEAR	EXPENDITURES ON GDP	NET FACTOR INCOME FROM THE REST OF THE WORLD	EXPENDITURES ON GNP	NET FACTOR INCOME FROM THE REST OF THE WORLD/ EXPENDITURES ON GNP (%)
1975	68,437	(153)	68,284	(0.2)
1976	73,922	(586)	73,336	(0.8)
1977	78,467	(484)	77,983	(0.6)
1978	82,784	(306)	82,478	(0.4)
1979	87,962	196	88,158	0.2
1980	92,568	(36)	92,532	(0.04)
1981	96,207	(485)	95,722	(0.5)
1982	98,999	(1,460)	97,539	(1.5)
1983	99,921	(1,301)	98,620	(1.3)
1984	93,927	(2,283)	91,644	(2.5)
1985	89,904	(2,037)	87,867	(2.3)
1986	91,180	(1,676)	89,504	(1.9)
1987	95,371	(666)	94,705	(0.7)
1988	101,450	(357)	101,093	(0.4)
1989	107,143	(313)	106,830	(0.3)
1990	109,890	253	110,143	0.2

Sources of Basic Data: 1990 Philippine Statistical Yearbook
The National Accounts of the Philippines CY 1988 to CY 1990.

prospects of a continued slowdown or recession in many other countries. Nonetheless, a substantial proportion of the assistance is in the form of loans that, even on "soft" terms, do not provide a lasting solution to the debt problem.

7.3 FORECASTS OF FUTURE FLOWS BY PRODUCT

7.3.1 Corn

Corn is presently the largest single commodity shipped through Makar Wharf in terms of tonnage. Domestic demand should expand at the rate of 3-5% due to population growth and growth in the demand for pork and poultry; there are also prospects for placing small amounts on the Indonesian and other foreign markets if prices should fall on the domestic market.

Since 1986, the tonnages of outbound corn shipments and their percentages in total cargo handled at Makar Wharf are given below, with the port statistics (Tables 7-5, 7-6 and 7-7) for 1989 and 1990 for corn adjusted upward to compensate for the reclassification of corn grits as "animal feeds" in those years.

1986	342,000 t	(44 %)
1987	304,000 t	(43 %)
1988	311,000 t	(36 %)
1989	237,000 t	(28 %)
1990	247,000 t	(29 %)

These data indicate both a considerable variation from one year to the next and an underlying downward tendency (the above statistics include 80 % of the animal feed tonnage as corn).

The data, however, are puzzling with regard to corn production and use in South Cotabato and possible future flows of corn through Makar Wharf. According to the Bureau of Agricultural Statistics, in 1990 corn production in South Cotabato was 1,022,000 t; subtracting the 247,000 t shipped out through Makar Wharf leaves 775,000 t. Technical coefficients for live weight gain of animals and other data were used to estimate the use of corn for human and animal consumption in the province (Table 7-25). Despite generous assumptions that tend to overstate consumption, only 291,000 t are accounted for, plus 108,000 t shipped out through the General Milling wharf. This leaves an unexplained residual of 380,000 t. Seed reserves are small, but post-harvest losses may be large. Subtracting 25 % of the original harvest for these two items still leaves 124,000 t unaccounted for. In round numbers, there is a difference of 120 to 380 thousand tons between production and use of corn, an obvious problem for the projection of future outbound corn traffic.

Table 7-25
ESTIMATES OF CONSUMPTION OF CORN IN SOUTH COTABATO, 1990

		ITEM	TONS
1.		By population: 39.4 kg/capita x 1,073,000 persons	42,276
2.		By animals:	
	a.	Hogs 72,620 hogs slaughtered x 80 kg/hog x 3.1 kg corn/kg live weight	18,010
		Hogs shipped out through Makar Wharf: 21,730 t x 3.1 t corn/t live weight	67,363
		Breeding stock maintenance requirement = 1/3 of above	28,458
	b.	Chicken 186,510 broilers slaughtered x 1.45 kg/broiler x 2.2 lb corn/kg broiler	595
		1,432,710 other chickens x 0.12 kg/day x 365 days/year	62,753
	c.	Ducks 259,620 head x 0.12 kg/day x 365 days/year	11,371
		Assume equal amount of ducks slaughtered	11,371
	d.	Cattle 47,770 cattle maintained x 2 kg/day x 365 days/year	34,872
		5,660 cattle slaughtered, 400 kg/head, 6 kg corn/kg live weight	13,584
		T O T A L	290,653

Source: For consumption by population, Business Research Center, For hogs, chickens and ducks, Department of Agriculture; Consultants estimates.

Observation: The assumptions used in the estimations are believed to overstate consumption. For example, the upper values for ranges of kg of feed per kg live weight were used, and all feed was assumed to be corn; all live animal tonnage through Makar Wharf was assumed to be hogs; in reality it includes horses and carabao which are not normally fed corn; probably few cattle are fed corn, but consumption was inputed in the table.

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There are two relevant hypotheses regarding the effect of this unexplained residual of corn on future shipments through Makar Wharf: (a) the "missing corn" will appear as outbound traffic as post-harvest losses are diminished (due to improved marketing practices, better roads, and improved shelling and drying); and (b) there is no missing corn (production is overestimated) or it exists but is due to post-harvest losses that will continue at present levels (the atomistic nature of agricultural holdings and peace and order problems might be the underlying causes and not be solved in the study period).

The Consultant checked for sources of large, obvious errors in the production data. None were found. The Bureau of Agricultural Statistics employs an adequate sampling design and, like similar agencies in other countries, computes harvests based on equivalents of shelled corn. Despite correct procedures, however, estimating agricultural production is still an inexact process, and the possibility of sampling error increases in areas where peace and order problems exist. It is also possible that some of this corn is being marketed across provincial lines in areas where local deficits may occur. There may be a "shifting" pattern, where South Cotabato supplies nearby deficit areas of other provinces, and areas closer to the ports of those provinces supply some surpluses for export.

The factors that favor hypothesis (b) are more varied and credible than (a), and are used in formulating the low and mid forecasts of outbound corn flows. If the production data are correct and large losses are occurring, this hypothesis assumes that any reduction in losses will be small enough to be compensated for by increases in local consumption, so that this part of production will not appear at Makar Wharf. Hypothesis (a) is used in the high forecast, and results in substantial increases in corn arriving at Makar.

The forecast range for corn shipments from 1990 to 2010 are given in Table 7-26. Predictions for 1991 are low in all cases, due to the expected impact of the current drought; this does not affect the level of estimates for subsequent years.

In all forecasts, outbound movements of corn through Makar Wharf eventually decline as the limits on productivity are reached and competing demands take over. The high forecast is theoretically possible, but unlikely, since it requires that many favorable factors occur simultaneously. The high forecast is taken as an initial reference projection for a "what if" situation that could place considerable pressure on port operations.

The low forecast outbound shipments reach a maximum of 362 thousand tons in 1995, only slightly above the historic of 342 thousand tons registered in 1986. The mid forecast shipments peak at 590 thousand tons in the year 2000; the high forecast peaks at 1.3 million tons in 2005.

Table 7-26
OUTBOUND CORN TRAFFIC FORECAST RANGE WITH
AT MAKAR WHARF, 1990-2010

Year	Area (ha)	Yields (t/ha) Per Croping		Total Production	Losses and Local Use	Outbound at Makar
		Low 40%	High 60%	(1,000t)	(1,000t)	(1,000t)
LOW FORECAST						
1990	196	1.00	2.81	1,022	775	247
1991	191	1.00	2.63	945	745	200
1992	196	1.10	3.10	1,068	775	293
1993	191	1.16	3.25	1,092	775	317
1994	176	1.22	3.41	1,115	775	340
1995	171	1.28	3.58	1,137	775	362
2000	146	1.63	4.57	1,236	989	247
2005	146	2.00	5.00	1,387	1,262	125
2010	146	2.00	5.00	1,387	1,387	0
MID FORECAST						
1990	196	1.00	2.81	1,022	775	247
1991	194	1.00	2.63	945	745	200
1992	192	1.10	3.10	1,103	775	328
1993	190	1.16	3.25	1,146	775	371
1994	188	1.22	3.41	1,191	775	416
1995	186	1.28	3.58	1,237	775	462
2000	186	1.63	4.57	1,579	989	590
2005	186	2.00	5.00	1,767	1,262	505
2010	186	2.00	5.00	1,767	1,611	156
HIGH FORECAST						
1990	196	1.00	2.81	1,022	775	247
1991	194	1.00	2.63	945	745	200
1992	192	1.10	3.10	1,103	745	358
1993	190	1.16	3.25	1,146	645	501
1994	188	1.27	3.58	1,248	600	648
1995	186	1.40	3.93	1,358	560	798
2000	186	2.25	4.33	1,627	715	912
2005	186	3.00	6.00	2,232	912	1,320
2010	186	3.00	6.00	2,232	1,164	1,068

Source: For 1990, basic data from Bureau of Agricultural Statistics and Philippine Ports Authority; Consultant's estimates.

Other assumptions used to construct the forecasts are:

- for the low forecast, 5000 ha per year are assumed to shift out of corn cultivation and into other uses through the year 2000; the area in corn stabilizes thereafter at 146,000 ha; for the mid and high forecasts, the shift from corn to other crops is 2000 ha/year, also stabilizing in the year 2000;

- in all forecasts, production areas are divided into two groups; one has 40 percent of the area in corn, low yields and does not adopt hybrid yellow corn; the other, with 60 percent of the corn area, already has better yields; both groups improved their productivity at 5 percent per year until reaching their respective limits on yield; these limits are, for the low and mid-value forecasts, 2 t/ha per cropping on the "traditional" farms and 5 t/ha per cropping on high productivity farms; for the high forecasts, the limits are 3 t/ha and 6 t/ha per cropping;

- local use of corn (principally for animal feed) begins to grow at 5 percent per annum in all forecasts after 1995 (in the low and mid-value forecasts, this consumption came from reduced post-harvest losses through 1995, so that the item losses and local use remained unaltered from 1992-1995).

7.3.2 Live Animals and Frozen Meats

- Live Animals

  In 1990, a total of 31730 t of live animals were shipped out through Makar Wharf to other domestic ports; 1462 t were brought in from domestic sources and 3443 t from foreign sources (Table 7-27). Inbound shipments are a combination of larger animals for slaughter and improved breeding stock.

  Port statistics are aggregate for live animals rather than separately by type of animal; the port veterinarian, however, stated that approximately 250,000 hogs were shipped out in 1990, equivalent to 20,000 t; there were also shipments of carabaos, horses and cattle.

  The 1990 outbound tonnage represented a 28 percent increase over 1989 (Table 7-27). This is a partial explanation for the decline noted earlier in corn shipments through Makar Wharf from 1989 to 1990, since hogs comprise the major part of live animal outbound shipments.

  Hogs and poultry represent demands for corn, as noted above (see technical coefficients in Table 7-25); this links outbound livestock shipments to potential exports of corn. At low volumes, this may not be noticeable, and might be

compensated for by decreased post-harvest losses. Any major increases in livestock, however, will have a negative effect on outgoing corn flows.

There is also a corn-hog cycle in countries such as the Philippines that are self-sufficient in these commodities. When corn production falls, prices increase, and it becomes more profitable to market corn than to feed it to hogs, so hog production declines; in the next phase, the increased corn prices spur greater corn production, and the price of corn then falls. At the same time, the price of pork increases due to the earlier decline in hog production, so it becomes more profitable to feed corn to hogs than to market it. These cyclical and substitution effects yield a potential for substitution of one type of outbound traffic for another at Makar Wharf. Moreover, since about 70 percent of corn in the Philippines is used as animal feed, there is an economic incentive to produce hogs in corn-growing areas such as South Cotabato, rather than incur the relatively greater post-harvest losses and transport costs to send the corn to other areas for fattening hogs. This incentive exists whether the hogs are shipped out live or as processed meat. At least some increase in outbound shipments of animals and meats is therefore expected to be an underlying trend.

In the future, some meat may be processed in the General Santos area (either at Tambler or in other areas owned by agribusiness firms along the bay), and shipped out as chilled or frozen container traffic. This would require more economic container-handling facilities (including electrical outlets for reefers), and would reduce both outbound tonnages (for hogs by 30 percent) and the number of containers (a refrigerated TEU container can transport 18 t of processed meat, in comparison with only 6 t of live hogs). Currently, all animals shipped out through Makar Wharf are destined for other domestic ports. Meat processing companies have excess capacity in other areas, particularly in the National Capital Region; also, the Philippine tradition is to consume fresh, rather than frozen meat. Aside from custom, the frozen meat option is hindered by the loss of part of the nutritional value of the meat if the customer places it in the freezing compartment of the refrigerator, or if the meat thaws somewhere in the marketing chain and is refrozen. Frozen meat requires a very high degree of agribusiness integration, with reliable (and expensive) refrigerator equipment at every step of the marketing chain from slaughter to final consumer; agribusiness firms must have their own refrigerated trucks and franchised retail outlets for a complete line of poultry products. This is a more likely option for poultry than pork due to retailing factors and, from the production side, the lower feed requirement of poultry than pork per kg of live weight gain (1.8-2.2 kg versus 2.7-3.1 kg), and its higher dressing percentage (77 percent versus 70 percent).

The mid and high forecasts of outbound shipments in Table 7-28 assume that the current practice of shipping out live animals will continue throughout the study period. The mid-range estimate reaches a total of 69,524 t in the year 2010, and

Table 7-27
LIVE ANIMALS HANDLED AT MAKAR WHARF,
1986-1990 (t)

YEAR	DOMESTIC		FOREIGN	
	IN	OUT	IN	OUT
1986	-	20,460	-	625
1987	-	22,064	625	-
1988	-	24,855	1,955	-
1989	10	24,794	4,730	-
1990	1,462	31,730	3,443	-

Source: Philippine Ports Authority

Table 7-28
FORECAST RANGE OF SHIPMENTS OF LIVE ANIMALS
THROUGH MAKAR WHARF, 1990 - 2010 (t)

YEAR	LOW FORECAST		MID FORECAST		HIGH FORECAST	
	IN	OUT	IN	OUT	IN	OUT
1990	4,905	31,730	4,905	31,730	4,905	31,730
1991	3,617	24,824	4,822	32,999	6,028	33,317
1992	3,617	25,569	4,822	34,319	6,028	34,982
1993	3,617	26,336	4,822	35,692	6,028	36,731
1994	3,617	27,126	4,822	37,120	6,028	38,568
1995	3,617	27,940	4,822	38,604	6,028	40,496
2000	3,617	27,940	4,822	46,968	6,028	51,685
2005	3,617	27,940	4,822	57,144	6,028	65,964
2010	3,617	27,940	4,822	69,524	6,028	84,189

Source: For 1990, Phillipine Ports Authority; for other years, Consultant's estimates

Table 7-29
FORECAST RANGE FOR OUTBOUND SHIPMENTS
OF PROCESSED AND FROZEN MEATS
THROUGH MAKAR WHARF, 1990 - 2010 (t)

	LOW FORECAST	MID FORECAST	HIGH FORECAST
1990-1995	0	0	0
2000	0	13,320	16,622
2005	0	20,443	26,617
2010	0	29,109	39,374

Source: Consultant's estimates and Table 7-26.

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the high range, 84,189 t in that year. The mid-range estimate assumes a growth rate of four percent per year, in line with the Philippines' high rate of population growth, a modest increase in per capita income and a relatively high income elasticity for pork. The estimate also assumes that South Cotabato demand will grow somewhat more swiftly than exports (due to its greater rate of population growth), maintaining the five percent annual growth rate for internal use of corn. The high forecast uses a five percent annual growth rate for internal use of corn, along with a five percent annual growth rate for outbound shipments of live animals, which might occur with South Cotabato expanding its share in other domestic markets or modest Philippine exports. The low forecast considers the 1990 outgoing traffic abnormally high -- as a manifestation of the corn-hog cycle, or reflecting a one-time reduction of stocks of larger animals; the 1991 flow is the average of the 1988 and 1989 flows (24,824 t) and grows by three percent per annum until 1995, stabilizing thereafter. This scenario is coherent with a greater attractiveness for corn exports than for hogs, or with a gradual shift toward exporting frozen meat.

Imports of live animals are small, but have grown rapidly since 1987. Imports of animals for slaughter may be replaced by local production; the demand for breeding stock will level off as local stocks improve. These shipments are assumed constant at the 1989-1990 average in the mid-forecast, with the range defined at ± 25 percent of the mid forecast values.

- Processed and Refrigerated Meats

The low forecast assumes that no major cold storage and processing facilities are established by an agribusiness integrator, so flows of these products are nil. The mid forecast assumes they are available after 1995 and flows correspond to 70 percent of the difference between the high and low forecasts for live animals. The forecasts are given in Table 7-29. Processed and frozen meat shipments continue at zero in the low forecast, but reach 29,109 t in 2010 in the mid forecast, and 39,374 t in the high forecast.

- Fish and Fish Products

The volume of marine fish landed in General Santos City from 1980 to 1990 is given in Table 7-30. The figures show a large increase from 45 thousand tons in 1980 to 128 thousand tons in 1989; the latter figure, however, is only slightly more than the previous high of 123 thousand tons registered in 1985.

The data for canned fish handled at Makar Wharf are given in Table 7-31 for the 1986-1990 period. The domestic inbound shipment of 5485 t in 1990 is difficult to explain, unless the inbound canned fish was merely stored and shipped out again later. The outbound tonnage of canned fish was 13,023 t in 1990.

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Table 7-32 projects the supply and demand for fish in South Cotabato for the study period. The predicted increase in fish production from 1990 to 2010 is only six percent, from 151 thousand tons to 160 thousand tons, reflecting the problems of overfishing that are already occurring in nearby areas, forcing local fishermen to venture further out on the high seas. Local demand should increase at a faster rate, so that the surplus production falls throughout the period, from 120,356 t in 1990 to 95,432 t in 2010.

The SINGCONSULT study of marketing of fish in the region found that about 81 percent of the fish is sent by truck to other cities in Southern Mindanao, and part of the tuna is delivered to the Davao City airport for export. In Table 7-33, the remaining 19 percent of the catch from the cannery-grade tuna, equivalent to 22,868 t in 1990 (column 2); of this tuna, the cannable portion is 40 percent. In 1990, this estimate yields 9142 t; the estimated shipping tonnage is obtained by adding in the cans, water and cartons, yielding 15,239 t in 1990. The actual shipping tonnage through Makar Wharf is somewhat less, 13,023 t (column 4), and the cannable portion is correspondingly adjusted downward in column 3, to 7814 t, corresponding to only 34.2 percent of the cannery grade tuna. Unless there was an accumulation of stocks in 1990, the technical coefficients overestimate the flows through Makar Wharf, due to local consumption or other reasons.

Table 7-30
VOLUME OF MARINE FISH LANDED
IN GENERAL SANTOS CITY,
1980 - 1989 (t)

YEAR	COMMERCIAL	MUNICIPAL	TOTAL
1980	35,700	9,462	45,162
1981	40,300	8,600	48,900
1982	61,600	7,400	69,000
1983	63,400	9,800	73,200
1984	75,100	6,900	82,000
1985	99,500	23,500	123,000
1986	64,100	22,500	86,600
1987	92,000	12,441	104,441
1988	100,000	10,728	110,728
1989	117,376	10,773	128,149

Source: Feasibility Study (Final Report) for the Fishing Port Complex, General Santos Agricultural Processing Center by Singconsult Bureau of Fisheries and Aquatic Resources.

Table 7-31
CANNED FISH HANDLED AT
MAKAR WHARF, 1986 - 1990 (t)

YEAR	DOMESTIC		FOREIGN	
	IN	OUT	IN	OUT
1986	-	5,300	-	652
1987	-	5,860	-	-
1988	-	7,463	500	329
1989	-	10,369	920	-
1990	5,485*	13,023	600	-

Source: Philippine Ports Authority.

*Representing around 70% of the inbound and outbound domestic cargoes fish and fish preparation, i.e., 7,886 and 18,723 metric tons, respectively. The balance apparently consists of other types of fish preparation.

Table 7-32
PROJECTED FISH SUPPLY AND DEMAND, SOUTH COTABATO,
1990 - 2010

YEAR	PROJECTED FISH PRODUCTION[1] (t)	PROJECTED PROVINCIAL POPULATION[2] (1,000)	PROJECTED POPULATION OF PROVINCE LESS FISHING MUNICIPALITIES[3] (1,000)	FISH DEMAND[4] (t)	SURPLUS PRODUCTION (t)
1990	150,906	1,073	837	30,550	120,356
1991	151,615	1,127	879	32,084	119,531
1992	152,324	1,183	923	33,690	118,634
1993	153,033	1,242	969	35,368	117,665
1994	153,742	1,304	1,017	37,120	116,622
1995	154,452	1,369	1,068	38,982	115,470
2000	158,421	1,666	1,316	48,034	110,387
2005	160,000	1,931	1,545	56,392	103,608
2010	160,000	2,184	1,769	64,568	95,432

Sources:

[1] SINGCONSULT, Feasibility study on Fishing Port Complex, General Santos City; basic data from SINGCONSULT and Provincial Planning and Development Office of South Cotabato

[2] Based on the annual population growth rates of 5% for 1990-1995, 4% for 1996-2000, 3% for 2001-2005 and 2.5% for 2006-2010

[3] Refers to Alabel, Glan, Kiamba, Maasim, Maitum and Malapatan but excluding General Santos; these municipalities, which are self-sufficient in fish, are projected to cover 22% of South Cotabato's population from 1990 to 1995, 21% from 1996 to 2000, 20% from 2001 to 2005 and 19% from 2006 to 2010

[4] Based on fish consumption per capita of 36.5 kg.

Table 7-33
PROJECTED CANNED FISH PRODUCTION, 1990 - 2010 (t)

YEAR	SURPLUS PRODUCTION	CANNERY GRADE TUNA[1]	CANNABLE PORTION[2]	CANNED FISH EQUIVALENT[3]
1990	120,356	22,868	7,814[4]	13,023
1991	119,531	22,711	9,084	15,140
1992	118,634	22,540	9,016	15,027
1993	117,665	22,356	8,942	14,903
1994	116,622	22,158	8,863	14,772
1995	115,470	21,939	8,776	14,627
2000	110,387	20,974	8,390	13,983
2005	103,608	19,686	7,874	13,123
2010	95,432	18,132	7,253	12,088

Source: Consultant's estimates, based on Table 7-32

[1] Estimated at 19% as per 1989 data
[2] Estimated at 40% as per BFAR figure
[3] Based on BFAR estimate : 1 can of fish consists of 60% raw fish material
[4] Represents only 34.2% of cannable portion

Table 7-34
FORECAST RANGE FOR OUTBOUND DOMESTIC SHIPMENTS OF CANNED FISH, MAKAR WHARF, 1990 - 2010 (t)

YEAR	LOW FORECAST	MID FORECAST	HIGH FORECAST
1990	13,023	13,023	13,023
1991	11,406	13,480	15,140
1992	11,320	13,378	15,027
1993	11,227	13,268	14,903
1994	11,128	13,151	14,772
1995	11,019	13,022	14,627
2000	10,534	12,449	13,983
2005	9,914	11,717	13,123
2010	9,132	10,792	12,088

Source: For 1990, Philippine Port Authority;
for other years, Consultant's estimates

The last column of Table 7-33 thus becomes the high forecast of tonnage of canned fish shipped out of Makar Wharf (Table 7-34). Even in this high forecast, the 12,088 t shipped out in 2010 is less than at present (13,023 t). The mid forecast is 89 percent of the high forecast, and discounts the apparent overstatement of shipping given by the application of the technical coefficients for the 1990 year; the low forecast is 85 percent of the mid forecast, and might occur, for example, if overfishing becomes a major problem. The mid forecast shipments fall from the 13,023 t in 1990 to 10,792 t in 2010; the low forecast value for that year is 9132 t.

- Animal Feeds

Shipments of animal feeds through Makar Wharf exhibit erratic fluctuations in recent port statistics, as evidenced by the following figures (in tons):

	IN	OUT
1986	8,359	12,360
1987	7,760	8,736
1988	2,220	-
1989	7,855	109,725
1990	26,431	82,495

For 1989 and 1990, shipments of corn grits previously classified as corn apparently were reclassified as animal feeds, as noted earlier. Also, the category "animal feeds" may include feed consumed by the prawning farms. It is not clear why feed tonnages were abnormally low in 1988 -- inclusion under "general cargo" is one possibility.

The forecasts in Table 7-35 take the mean value of flows in 1986 and 1987 for the 1990 base year (excluding corn) and make incoming feed growth proportional to growth in outgoing live animals for the forecasts. Outgoing feed is assumed constant at the average of 1986 and 1987. The mid forecast outbound shipments are 10,548 t per year, and the inbound shipments grow from 8060 t in 1990 to 17,659 t in 2010. The range is given by $\pm$ 25 percent of the mid-forecast values; in 2010 the low forecast yields 9344 t of inbound cargo and 7911 t of outbound animal feeds; the corresponding figures for the high forecast are 21,386 t inbound and 13,185 t outbound.

Table 7-35
FORECAST RANGE FOR SHIPMENTS OF ANIMAL FEEDS (EXCLUDING CORN) THROUGH MAKAR WHARF, 1990 - 2010 (t)

YEAR	LOW FORECAST		MID FORECAST		HIGH FORECAST	
	IN	OUT	IN	OUT	IN	OUT
1990	8,060	7,911	8,060	10,548	8,060	13,185
1991	8,302	7,911	8,382	10,548	8,463	13,185
1992	8,551	7,911	8,717	10,548	8,886	13,185
1993	8,807	7,911	9,066	10,548	9,330	13,185
1994	9,072	7,911	9,428	10,548	9,797	13,185
1995	9,344	7,911	9,806	10,548	10,287	13,185
2000	9,344	7,911	11,930	10,548	13,129	13,185
2005	9,344	7,911	14,515	10,548	16,756	13,185
2010	9,344	7,911	17,659	10,548	21,386	13,185

Source: Consultant's estimates.

Table 7-36
FORECAST FOR OUTBOUND SHIPMENTS OF PALAY AND RICE THROUGH MAKAR WHARF, 1990-2010 (t)

YEAR	LOW FORECAST	MID FORECAST	HIGH FORECAST
1990	27,333	27,333	27,333
1991	12,288	18,067	18,067
1992	12,042	18,248	18,609
1993	11,801	18,430	19,167
1994	11,565	18,614	19,742
1995	11,334	18,801	20,335
2000	10,245	19,760	23,573
2005	9,261	20,768	27,328
2010	8,371	21,827	31,681

Source: For 1990, Philippine Ports Authority; for other years, Consultant's estimates.

7.3.3 Palay and Rice

In the 1986-1990 period, rice shipments through Makar Wharf were irregular, as seen in the following port statistics (in tons):

	IN	OUT
1986	-	12,697
1987	-	18,900
1988	-	5,266
1989	500	26,137
1990	8,459	27,333

Outbound rice shipments were unusually large in 1989 and 1990, with inbound shipments also occurring in these same years. The outbound shipments were apparently carryover stocks from the bumper crops in 1988 and 1989, mobilized in face of typhoon damage in other parts of the country. The drought in 1990 reduced palay production in South Cotabato from 187,000 t in 1989 to 134,000 t in 1990. The inbound shipment in 1989 is probably improved seed; in 1990, most inbound rice was probably rice brought in to cover an unexpected local deficit when harvests in the later part of the year were hurt by drought, as noted.

Rice yields per cropping are relatively high, an average of 3.5 t/ha for the 1986-1990 period. There is some room for improvement, however: yields were 4.0 t/ha per cropping in 1986, and yields of 5 or 6 t/ha are feasible. The irrigated area for rice may be expanded somewhat, and it is also possible to tap more upland areas for rainfed paddy cultivation (at the expense of corn production). South Cotabato's production in milled-rice equivalents, however, is about 118 kg/capita in recent years, a figure only slightly above the 102 kg/capita for the Philippines as a whole. (The Philippines has been basically self-sufficient in rice production in recent years, but may need to import in years of poor harvests). With its population growing faster than that of the country, South Cotabato may have difficulty providing for local demand in the future.

Table 7-36 presents the forecast range for the 1990-2010 period. The forecasts discount the outbound shipments in 1989 and 1990 as exceptional. The low forecast is the average for the 1986-1988 period for outbound rice (inbound shipments are predicted to be negligible), and declines by two percent per annum, a scenario consistent with maintenance of current yields, a slight increase in the irrigated area and the substantial increase predicted in demand within South Cotabato. Outbound flows decline from the atypical high of 27,333 t in 1990 to 8,371 t in 2010 in the low forecast.

The mid and high forecasts both consider the mean annual outbound traffic for the 1986-1990 period as the "normal" level for 1991, and this level is the basis for projecting future flows. The mid forecast assumes that outbound shipments increase at one percent per annum, i.e., that

South Cotabato will cover its own internal demand and generate a small surplus for domestic trade. The high forecast assumes a three percent growth rate for the study period, keeping pace with the Philippines' population and income growth. The mid forecast reaches an outbound flow of 21,827 in 2010; the high forecast, 31,681 t.

7.3.4 Fertilizers

Inbound fertilizer volumes depend on the type of nutrients imported, the amount of filler, the crop mix, and the levels of application by individual farmers. Port statistics for inbound fertilizer shipments through Makar Wharf over the last five years are given below:

1986	40,188 t
1987	51,159 t
1988	55,431 t
1989	46,287 t
1990	58,052 t

The port statistics provide no information on the chemical composition of the incoming fertilizer; the Consultant's spot checks and inquiries found much fertilizer to be a common NPK formula, 14-14-14, purchased in bags, with cases of the bagging being done on the dock with the use of a hopper. The 1990 inbound tonnage corresponds to an average application of 178 kg of fertilizer per ha of cultivated land in South Cotabato. (In reality, more intense dosages are used on some farms, particularly the Dole plantation and other commercial enterprises, while others, perhaps the majority of farmers with the smallest holdings, do not use any chemical fertilizer.)

Agronomic recommendations call for 90-150 kg/ha of nutrients per cropping of irrigated rice, and 150 kg/ha of nutrients per cropping of corn. The recommendations, however, call for two or three times more nitrogen than either phosphorus or potassium, while the 14-14-14 formula provides all in equal proportions. If most tonnages received through Makar Wharf are of the 14-14-14 formula, they may be reduced in the future as more nitrogen-rich fertilizers come in, with less filler and as techniques are developed to retain a greater percentage of nitrogen in the soil, reducing volitilization. This implies that shipments through Makar Wharf may increase less than applications of nutrients at the farm level. The low forecast assumes that nutrient use increases in direct proportion to corn production, since corn is the principal crop in explaining fertilizer demand. It also assumes a shift to fertilizers with less filler; more specifically, the assumption is that there is a one percent annual decrease in the fertilizer/nutrients ratio. The tonnage shipped in through Makar Wharf grows less than on-farm nutrient usage, and inbound shipments grow from 58,052 t in 1990 to 63,028 t in 2010 (Table 7-37).

The mid and high forecasts assume nutrient use increases in direct proportion to the mid and high forecasts for corn production. For the mid forecast, inbound fertilizer tonnage increases from 58,052 t in 1990 to 100,000 t yearly from 2005 to 2010; for the high forecast, inbound shipments reach 127 thousand tons yearly in the 2005-2010 period (Table 7-37). The mid

Table 7-37
FORECAST RANGE FOR INBOUND SHIPMENTS
OF FERTILIZER THROUGH
MAKAR WHARF, 1990 - 2010 (t)

YEAR	LOW FORECAST	MID FORECAST	HIGH FORECAST
1990	58,052	58,052	58,052
1991	57,471	58,052	58,052
1992	59,452	62,653	62,653
1993	60,167	65,094	65,094
1994	60,801	67,652	70,889
1995	61,355	70,265	77,138
2000	63,187	89,690	92,417
2005	66,967	100,369	126,783
2010	63,028	100,369	126,783

Source: Consultant's estimates.

Table 7-38
FORECAST RANGE FOR INBOUND
CEMENT SHIPMENTS THROUGH
MAKAR WHARF, 1990-2010 (t)

YEAR	LOW FORECAST	MID FORECAST	HIGH FORECAST
1990	4,611	14,450	14,450
1991	4,611	15,173	15,462
1992	4,611	15,931	16,544
1993	4,611	16,728	17,702
1994	4,611	17,564	18,941
1995	4,611	18,442	20,267
2000	4,611	23,538	28,425
2005	4,611	30,041	39,868
2010	4,611	38,340	55,917

Source: Consultant's estimates.

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forecast corresponds to 311 kg of fertilizer per year per cultivated hectare; the high forecast, to 393 kg/h. These figures are within the ranges indicated by agronomic recommendations and the corresponding corn production estimates for the study period given in Table 7-26 (more precise values of actual nutrient applications depend on the nutrient content of the fertilizers).

7.3.5 Cement

Inbound cement shipments show a marked decline in the port statistics:

1986	15,600 t
1987	13,300 t
1988	5,650 t
1989	6,089 t
1990	2,099 t

Cement for South Cotabato is supplied by a firm in Iligan and a firm in Davao City. Both affirmed that they send their cement by ship rather than by truck. Iligan is more distant and road transport is insecure; Davao City is much closer, but faces a difficult stretch of roadway south of Digos. This road will soon be repaired, however, and road transport might then be a less expensive option for the firm.

Some of the decline in inbound shipments in the port statistics may be due to the recession in 1990, along with a decline in road construction in South Cotabato and street paving in General Santos City and other urban centers which have used Portland cement for road surfaces. It may also be due to some shipments of cement being classified as general cargo. At present, relatively few buildings or houses employ a substantial amount of concrete; this is expected to change over time as wood and other local building materials become scarcer and wooden structures have to be replaced. There are, moreover, a number of major construction projects in progress in General Santos City, and numerous activities, such as cement block production, that require substantial amounts of cement and would appear to demand several times the amount of cement registered as such in the 1990 statistics (2099 t). Thus, for the mid and high forecasts, the average inbound traffic in 1986 and 1987 is taken as the adjusted 1990 amount to be used as the basis for the projections of future cargo flows. As currently planned, rural road-building programs will use asphalt surfacing for most important stretches, and road-building will consume only 5488 t of cement spread over the 1993-1995 period. In previous programs, however, the option for asphalt was excluded in favor of concrete, and this may occur again.

The forecast range is given in Table 7-38. The low forecast assumes the average for the 1988-1990 period (4611 t) as the basis for projections of future cargo, and maintains these flows at that level throughout the study period; this scenario is coherent with cement being supplied by truck from Davao. The mid forecast takes the 1986-1987 average as the basis for projections and assumes a growth rate of five percent per annum; the high forecast uses seven percent annual growth rate. In 2010, the mid and high forecasts reach 38,340 t and 55,917 t, respectively.

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7.3.6 Canned Pineapples, Fruits and Vegetables

Port statistics for outbound canned pineapples, bananas and fruits and vegetables are given in Table 7-39 for the 1986-1990 period.

In 1990, the classifications for domestic cargo of canned pineapples and bananas were dropped from port statistics; the category of fruits and vegetables appeared for the first time; fruits and vegetables had been the only category for these products in the statistics on foreign trade. Much of this cargo is apparently "overflow" from the Dole operation, shipped through Makar either to avoid having ships wait to use the Dole Wharf, or because smaller shipments can be more economically sent on scheduled liners docking at Makar than by vessels docking at Dole Wharf.

The forecast range is given in Table 7-40. The low forecast maintains the total tonnage at 54,116 t throughout the study period. Underlying circumstances that might maintain this level of shipments include stagnation in agribusiness investments while agrarian reform is implemented, and growth of outbound traffic occurring at Dole Pier rather than at Makar Wharf.

The mid forecast assumes a three percent annual growth rate for the period; the high forecast, a five percent growth rate through 2005, and a three percent growth rate from 2006 through 2010. Outbound shipments increase from the current 54,116 t to 97,830 t in 2010 in the mid forecast, and to 130,543 in that year in the high forecast.

7.3.7 Copra

The land area and production figures for copra during the 1980s are given in Table 7-43. The area planted remained constant at about 115,000 ha; yields increased from 7.89 t/ha in 1980 to 9.12 t/ha in 1986, then declined to 8.10 t/ha in 1989; production varied directly with yields, increasing from 908 thousand tons in 1980 to 1073 thousand tons in 1987, then declining to 935 thousand tons in 1989.

Projections for land area and production of coconuts are given in Table 7-42 for the 1990-2010 period (contrary to earlier tables, data were not available for 1990, and thus figures for 1990 are estimates). The area in coconut is expected to remain virtually constant at about 115 thousand tons in the high estimate, and decline to 108 thousand tons and 100 thousand tons by 2010 in the mid and low forecasts, respectively. Productivity is assumed constant at the 1980-1989 average of 8.23 t/ha, so that production varies directly with land area in the estimates. In the low forecast, production declines during the 1990-2010 period from 943 thousand tons to 825 thousand tons; in the mid forecast, from 946 thousand tons to 889 thousand tons. The high estimate predicts a small increase, from 950 thousand tons to 953 thousand tons.

Table 7-43 shows outbound shipments in domestic and foreign trade of copra and coconut oil handled at Makar Wharf from 1986 to 1990. In 1986, 69,618 t of copra were shipped out

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Table 7-39
PORT STATISTICS FOR DOMESTIC OUTBOUND SHIPMENTS OF PINEAPPLES AND BANANAS, AND EXPORT OF FRUITS AND VEGETABLES, MAKAR WHARF, 1986 - 1990 (t)

YEAR	DOMESTIC OUTBOUND		EXPORTS OF FRUITS AND VEGETABLES	TOTAL OUTBOUND TONNAGE
	CANNED PINEAPPLES	BANANAS		
1986	30,690	5,600	9,010	45,300
1987	20,653	2,200	12,382	35,235
1988	24,326	-	11,352	35,678
1989	18,338	4,118	18,713	41,169
1990	42,851*		11,315	54,166

Source: Philippine Ports Authority.
*Former categories of Pineapples and Bananas reclassified as "Fruits and Vegetables".

Table 7-40
FORECAST RANGE FOR OUTBOUND SHIPMENTS OF FRUITS AND VEGETABLES THROUGH MAKAR WHARF, 1990-2010 (t)

YEAR	LOW FORECAST	MID FORECAST	HIGH FORECAST
1990	54,166	54,166	54,166
1991	54,166	55,791	56,874
1992	54,166	57,465	59,718
1993	54,166	49,189	62,704
1994	54,166	60,964	65,839
1995	54,166	62,793	69,131
2000	54,166	72,795	88,230
2005	54,166	84,389	112,607
2010	54,166	97,830	130,543

Source: Consultant's estimates

Table 7-41
ESTIMATED LAND AREA, YIELD AND PRODUCTION OF COCONUT, SOUTH COTABATO, 1980 - 1989

Year	AREA		YIELD		PRODUCTION	
	Ha.	Growth Rate	Prod/ha (t)	Growth Rate	Volume (t)[1]	Growth Rate
1980	115,000	-	7.89	-	907,540	-
1981	115,000	0	8.22	4.18	944,922	4.12
1982	115,000	0	7.96	(3.16)	915,501	(3.11)
1983	115,000	0.09	7.83	(1.63)	901,201	(1.56)
1984	115,300	0.17	7.61	(2.80)	878,155	(2.56)
1985	116,967	1.44	8.35	9.72	976,255	11.17
1986	117,670	0.60	9.12	9.22	1,072,676	9.88
1987	116,708	(0.82)	8.86	(2.85)	1,033,776	(3.63)
1988	115,530	(1.0)	8.40	(5.19)	970,392	(6.13)
1989	115,531	(0.15)	8.10	(3.57)	935,227	(3.62)
Absolute Growth Rate		0.3		2.66		3.05
Average Annual Growth Rate		0.04		0.44		0.51

Source of Basic Data: Bureau of Agricultural Statistics

[1] In terms of husked nuts

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Table 7-42
PROJECTED LAND AREA AND PRODUCTION OF COCONUT,
SOUTH COTABATO, 1990 - 2010

Year	LOW FORECAST		MEDIUM FORECAST		HIGH FORECAST	
	Area[1] (has.)	Production[2] (t)	Area[3] (has.)	Production[2] (t)	Area[4] (has.)	Production[2] (t)
1990	114,590	943,076	114,994	946,401	115,397	949,717
1991	113,834	936,854	114,638	943,470	115,443	950,096
1992	113,083	930,673	114,286	940,574	115,489	950,047
1993	112,337	924,534	113,936	937,693	115,535	950,853
1994	111,596	918,435	113,588	934,829	115,581	951,232
1995	110,859	912,370	113,243	931,990	115,627	951,610
2000	107,201	882,264	111,437	917,126	115,673	951,989
2005	103,663	853,146	109,691	902,757	115,719	952,367
2010	100,242	824,992	108,004	888,873	115,765	952,746

Source: Consultant's Estimates

[1] Based on the declining growth rate of 0.66%, i.e., average for 1987 to 1989

[2] Based on the average yield (1980-89) of 8.23 tons per hectare

[3] Average of low and high estimates

[4] Based on the growth rate of 0.04%

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Table 7-43
OUTBOUND SHIPMENTS OF COPRA AND COCONUT OIL, DOMESTIC AND FOREIGN TRADE, MAKAR WHARF, 1986 - 1990 (t)

Year	DOMESTIC		FOREIGN	TOTAL
	Copra	Coconut Oil	Copra	
1986	606,018	-	9,000	69,618
1987	38,570	-	8,422	46,992
1988	62,844	-	-	62,844
1989	43,120	-	2,790	45,910
1990	58,187	149	-	58,336

Source: Philippine Ports Authority, General Santos City

Note: Except in 1990, there was no inbound shipments of copra and coconut oil during the period 1986 - 1990. Domestic inbound shipment of copra in 1990 was estimated at 598 metric tons while that of coconut oil was 1,381 metric tons.

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through Makar Wharf; subsequent figures varied widely, but were always significantly lower than in 1986, with 58,187 t shipped out in 1990 (net of coconut oil -- see item 7.3.9, below).

Table 7-44 shows the use of coconut in South Cotabato: about five percent is used for local consumption, seed or feed (or is waste), leaving 891 thousand tons for processing into copra, coconut oil and other products. Currently, an estimated 665 thousand tons are being shipped out of South Cotabato by land vehicles to processing facilities in other provinces. This amounts to 75 percent of the total available. The assumptions regarding this percentage are a key variable in predicting outbound shipments through Makar Wharf. The low forecast assumes that this percentage remains constant during the study period; under this assumption, outbound copra handled at Makar Wharf declines from 58 thousand tons in 1990 to 45 thousand tons in 2010 (Table 7-45). The mid forecast assumes that the proportion leaving South Cotabato by land declines to 50 percent by the end of the study period, and outbound shipments reach 90 thousand tons in 2010. The high forecast reduces the figure to 25 percent leaving South Cotabato by land routes, and results in 145 thousand tons of outbound shipments handled at Makar in 2010.

7.3.8 Inbound Agricultural Products

The port statistics for inbound flows of sugar and wheat through Makar Wharf are given below for the 1986-1990 period:

	Sugar	Wheat
1986	6,931	2,100
1987	6,766	3,591
1988	5,135	-
1989	7,656	3,180
1990	10,037	12,834

For the 1986-1988 subperiod, wheat was listed under "other cereal", a classification which does not appear in the statistics for 1989 and 1990. There is a sharp increase in inbound shipments of wheat and sugar from 1989 to 1990.

Table 7-46 presents the forecast range for the study period. The low forecast begins with the mean level for the 1989-1990 period, and increases at three percent per annum, slightly above vegetative population growth. The mid forecast uses a four percent growth rate starting from the 1990 value and accompanying vegetative growth and in-migration; the high forecast uses a five percent per annum growth rate, which would accompany both a high population growth rate and an increase in income per capita. In the low forecast, shipments increase to 30,439 t in 2010; in the mid forecast, 50,113 t; in the high forecast, 60,684 t -- almost three times the 22,871 t registered in 1990.

Table 7-44
COCONUT PRODUCTION, UTILIZATION AND DISTRIBUTION, SOUTH COTABATO, 1989
(In equivalent tons of husked nuts)

		Volume
Production:		935,227
Utilization:		
Seed		28,057 [1]
Feed		6,547 [2]
Waste		4,676 [3]
Food Consumption		
- Matured nuts		2,559 [4]
- Young nuts		2,436 [5]
Processed into copra, coconut oil, etc.		890,952
- Shipped out through Makar Wharf,	225.992	
- Transported out of South Cotabato by land vehicles, etc.	664,960 [6]	

Sources: Bureau of Agricultural Statistics
National Statistical Coordination Board
Philippine Ports Authority, General Santos City

[1] At 3% of total production

[2] At 0.7% of total production

[3] At 0.5% of total production

[4] At 2.48 kg/yr. per capita consumption x the estimated population of 1,032,000

[5] At 2.36 kg/yr. per capita consumption x the estimated population of 1,032,000

[6] Apparently absorbed by traders catering to coconut oil mills, desiccated coconut processors and other coconut processing plants located in Davao City, Davao del Sur Misamis Oriental, and Misamis Occidental.

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Table 7-45
FORECAST RANGE FOR OUTBOUND SHIPMENTS OF COPRA
AND OTHER COCONUT PRODUCTS
DOMESTIC AND FOREIGN TRADE, MAKAR WHARF, 1990 - 2010 (t)

Year	DOMESTIC		FOREIGN		TOTAL	
	Copra	Other Coconut Products [1]	Copra	Other Coconut Products [1]	Copra	Other Coconut Products [1]
LOW FORECAST [2]						
1990	58,187 [3]	149 [3]	-	-	58,187	149
1991	48,442	149	3,000	-	51,442	149
1992	48,123	149	3,000	-	51,123	149
1993	47,806	149	3,000	-	50,806	149
1994	47,490	149	3,000	-	50,490	149
1995	47,176	149	3,000	-	50,176	149
2000	45,620	132	2,652	-	48,272	132
2005	44,114	115	2,304	-	46,418	115
2010	42,658	97	1,956	-	44,614	97
MID FORECAST [4]						
1990	58,187	149	-	-	58,187	149
1991	63,006	180	3,600	52	66,606	232
1992	71,786	210	4,200	68	75,986	278
1993	80,512	240	4,800	82	85,312	322
1994	89,184	270	5,400	90	94,584	360
1995	88,913	300	6,000	112	94,913	412
2000	87,495	291	5,826	112	93,321	403
2005	86,124	282	5,652	112	91,776	394
2010	84,200	274	5,478	112	90,278	386

(continued)

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Table 7-45 (continued)
FORECAST RANGE FOR OUTBOUND SHIPMENTS OF COPRA
AND OTHER COCONUT PRODUCTS
DOMESTIC AND FOREIGN TRADE, MAKAR WHARF, 1990 - 2010 (t)

Year	DOMESTIC		FOREIGN		TOTAL	
	Copra	Other Coconut Products[1]	Copra	Other Coconut Products	Copra	Other Coconut Products
HIGH FORECAST[5]						
1990	58,187	149	-		58,187	149
1991	75,513	210	4,200	105	79,313	315
1992	90,636	270	5,400	135	96,036	405
1993	108,856	330	6,600	165	115,456	495
1994	127,049	390	7,800	180	134,849	570
1995	136,178	450	9,000	225	145,178	675
2000	136,232	450	9,000	225	145,232	675
2005	136,286	450	9,000	225	145,286	675
2010	136,340	450	9,000	225	145,340	675

Sources: Tables 7-43 to 7-44 and Consultant's Estimates

[1] Refer to coconut oil, dissicated coconut, young nut, etc.

[2] Based on the average share of copra outshipments from Makar Wharf to total production from 1986 to 1990, i.e., 27.1%

[3] Actual figures

[4] Maximum share of domestic copra outshipments to total production is projected to be 50%. Projections on other coconut products are midway between low and high forecasts.

[5] Maximum share of domestic copra outshipments to total production is projected to be 75%.

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Table 7-46
FORECAST RANGE OF INBOUND SUGAR AND WHEAT HANDLED AT MAKAR WHARF, 1990 - 2010

Year	LOW FORECAST	MID FORECAST	HIGH FORECAST
1990	16,854	22,871	22,871
1991	17,359	23,786	24,015
1992	17,880	24,737	25,215
1993	18,416	25,727	26,476
1994	18,969	26,756	27,800
1995	19,538	27,826	29,190
2000	22,650	33,855	37,254
2005	26,257	41,189	47,547
2010	30,439	50,113	60,684

Source: Consultant's Estimates

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7.3.9 Vegetable Oils

Port statistics register a small amount of vegetable oils handled at Makar Wharf. The most important is palm oil; the tonnages for the 1986-1990 outbound shipments of this oil are given below:

1986	3834 t
1987	5680 t
1988	7235 t
1989	7540 t
1990	4875 t

The 1990 port statistics also register 1381 tons of outbound coconut oil, plus 149 t inbound. There are no shipments registered for other years under the coconut oil classification. Both oils face anemic market prospects due to shifts in consumer preferences away from saturated fats; agribusiness marketing prospects are for demand to remain at its present level or to increase by perhaps, one percent per annum, due more to use of these oils in soaps than in foodstuffs.

The mid forecast uses 6000 t (the approximate average for the 1986-1990 period) as the outbound flow for the study period; the high and low forecasts are ± 25 percent of the mid forecast, or 7500 t and 4500 t, respectively.

These flows are inexpressive in terms of tonnage, but require a special tank and pump at dockside, along with appropriate containers on board ship.

7.3.10 Other Agricultural Products

In 1986, port statistics registered an outbound movement of 7360 t of cotton lint. This volume declined yearly until only 1728 t were shipped through Makar in 1989. No shipments of cotton lint were registered in 1990; either they ceased altogether or the shipments were classified with general cargo. Port statistics also reveal an outbound shipment of 2478 t of palm kernel in 1989, the only year in which that classification appears in the statistics. The more detailed cargo classification developed by the port authority for 1990 registers for the first time an expanded array of primary products; all new items have small amounts of cargo.

Due to the small tonnages involved and the lack of any data on tendencies, these products are grouped with general cargo in the traffic forecast.

7.3.11 Bottled Cargo and Empty Bottles

Inbound bottled cargo includes such items as soft drinks, beer, fruit concentrates and liquids for housekeeping chores, with outbound traffic composed of empty soft drink and beer bottles.

There is a substantial amount of this cargo through Makar Wharf, as seen in the following port statistics:

	Bottled Cargo (t)		Empty Bottles (t)
1986	18,026		8,980
1987	19,125		9,582
1988	22,504		16,522
1989	34,183	(23 t outbound)	27,189
1990	64,434	(1359 t outbound)	n.a.

These statistics present some difficulties. In 1990, the category "empty bottles" was suppressed; since only 1359 t of 1990 bottled cargo is listed as outbound, it appears that the nearly 30,000 t of empties should have been classified with general cargo. There is, however, an unexplained large increase in bottled cargo, from 34 to 64 thousand tons from 1989 to 1990, along with a decrease of over 100 thousand tons of general cargo in the same period. Further, the empty bottle tonnage increases in relation to bottled cargo, from about 50 percent in 1986 to 80 percent in 1989.

The forecast range takes the 1990 statistic at face value (subject to checking and revision); the mid and high forecasts assume that suppliers will continue to ship in bottled products rather than establish local bottling plants. The low forecast assumes a five percent annual growth rate through 1995, and then assumes that 50 percent of the market will be supplied from a local bottling plant that one of the current suppliers will bring into operation in that year (an equivalent hypothesis would be a shift toward usage of a private dock for part of this tonnage). The mid forecast assumes the same five percent annual growth rate with no local bottling facilities; the high forecast assumes no local bottling facilities and a six percent growth rate. In the mid forecast, total tonnage reaches increases from 64,434 t in 1990 to 170,963 t in 2010, compared with 85,481 t for the low forecast and 206,649 t for the high forecast (Table 7-47).

7.3.12 General Cargo -- Expanded Classification for Forecast Purposes

In the 1990 port statistics, a large number of items formerly grouped under the title of general cargo are listed separately; this has the advantage of providing a very detailed classification. The opposite may also have occurred, as noted previously, since the categories of empty bottles and some minor agricultural commodities, formerly listed individually, do not appear as separate items in the 1990 statistics. Table 7-48 presents the 1990 statistics for general cargo and all other items not discussed in previous items of this chapter. None of these other items involves large tonnages, and they are highly diversified, so that it is convenient to include them under an "expanded general cargo" label, that is, to consider them as general cargo in the traffic forecasts without confusing them with the specific category in port statistics. In Table 7-49, the 1986-1990 port statistics are presented with the original category of general cargo listed in the first three rows, with the other items listed as a group in rows 4-6, and the new expanded

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Table 7-47
FORECAST RANGE FOR INBOUND SHIPMENT OF BOTTLED CARGO THROUGH MAKAR WHARF, 1990-2010 (t)

YEAR	LOW FORECAST	MID FORECAST	HIGH FORECAST
1990	64,434	64,434	64,434
1991	67,656	67,656	68,300
1992	71,038	71,038	72,398
1993	74,590	74,590	76,742
1994	78,320	78,320	81,346
1995	82,236	82,236	86,227
2000	52,478	104,956	115,391
2005	66,977	133,954	154,420
2010	85,481	170,963	206,649

Source: For 1990, Philippine Ports Authority, for other years, Consultant's estimates.

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Table 7-48
GENERAL CARGO PASSING THROUGH MAKAR WHARF IN 1990, PLUS OTHER CATEGORIES OF FREIGHT NOT LISTED IN PREVIOUS TABLES (t)

ITEM	DOMESTIC		FOREIGN	
	IN	OUT	IN	OUT
General Cargo	65,285	55,014	171	1,412
Dairy Products	2,666	15	-	-
Tobacco Manufactures	5,392	1	-	-
Logs	8	57	-	-
Lumber	28	564	-	-
Paper & Pulp	2,285	4,774	11	-
Textile Fiber	24	4,736	-	-
Crude Minerals	247	2	-	-
Metal Scrap	123	6,293	-	-
Ref. Petroleum Products	3,585	19	-	-
Mineral Fuels	26	5	-	-
Chemicals	2,140	213	39	-
Plywood Veneer	221	98	-	-
Textile and Garment	243	73	-	-
Iron & Steel	10,344	375	427	-
Manufactures of Metal	18,542	992	787	86
Machinery and Electrical Equipment	5,440	875	-	-
Transport Equipment	1,413	496	-	-
Furniture	589	159	-	-
Total	118,601	74,761	1,435	1,498

Source: Table 7-6.

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Table 7-49
GENERAL CARGO AND OTHER CATEGORIES NOT CLASSIFIED IN PREVIOUS TABLES,
MAKAR WHARF, 1986 - 1990 (t)

	1986			1987			1988			1989			1990		
	IN		OUT	IN		OUT	IN		OUT	IN		OUT	IN		OUT
General Cargo Item															
Domestic	97,989		33,338	77,013		37,159	91,167		87,482	153,790		129,620	65,285		55,014
Foreign	-		-	49		-	-		-	28		23	171		1,412
Total Domestic and Foreign, Both Directions		131,327			114,221			178,649			283,461			121,882	
Other Categories not in Previous Tables															
Domestic	14,932		-	49,432		-	71,504		3,416	8,387		10,573	53,316		19,747
Foreign	-		3,057	-		4,740	-		7,088	1,902		9,234	1,264		86
Total Domestic and Foreign, Both Directions		17,989			54,172			82,008			30,096			74,413	
Expanded General Cargo	112,921		36,395	126,494		41,899	162,671		97,986	164,107		149,450	120,036		76,259
Total Both Directions		149,316			168,393			260,657			313,557			196,295	

Source: Tables 7-4, 7-5 and 7-48.

general category in the last three rows. (To emphasize, the latter classification is the Consultant's creation for the traffic forecast; it does not appear in the port statistics).

In 1986, inbound shipments were 113 thousand tons, outbound shipments were 36 thousand tons, and the total, 149 thousand tons. In 1990, inbound shipments were 120 thousand tons; outbound, 76 thousand tons; and the total, 196 thousand tons.

The shift in classification of a number of items in the port statistics from general cargo to separate categories is seen by comparing the 1989 and 1990 figures in Table 7-49. From 1989 to 1990, the inbound and outbound movements classified under other headings (excluding those of previous tables in this chapter) increased from 30 thousand tons to 74 thousand tons. This occurred despite an overall decrease in the expanded total of general shipments from 314 thousand tons to 196 thousand tons.

The last two rows of Table 7-49, containing the expanded general cargo totals, are the basis for the traffic forecast for this category. There is an increase from 1986, when 149 thousand tons were handled, to 1990, when 196 thousand tons passed through the wharf. There is also a sharp peaking in 1988 and 1989, clearly above the tendency, with 261 thousand tons handled in 1988, and 314 thousand tons in 1989. Two plausible explanation for the peaking of general cargo in those years are investments in local enterprises and upturns in consumer spending on durables (after the severe recession of the middle years of the decade); these explanations, if correct, also explain the return to a more "normal" growth line with the unfavorable economic and other circumstances of 1990.

Comparing 1986 to 1990, the expanded general cargo category showed an annual rate of growth of seven percent per annum; comparing 1987 with 1989, the growth rate is five percent per annum. These figures are in line with local growth in population and per capital income, and the peaks in 1988 and 1989 are not considered representative of the underlying tendencies (other than being illustrations of year-to-year fluctuations in the data). There is also a trend for outbound general cargo to grow: outbound flows were only 24 percent of the total in 1986, against 39 percent in 1990; in 1987, flows were nearly balanced, with outbound flows accounting for 48 percent of the total.

The forecast range is given in Table 7-50. Inbound flows are assumed to grow at five percent per annum in the mid forecast, in line with growth in population and per capita income, moderated somewhat by diversification in local production. The low and high forecasts use annual growth rates of two percent and seven percent, respectively. From the 1990 level of 120 thousand tons, inbound cargo reaches 178 thousand tons in 2010 in the low forecast, 319 thousand tons in the mid forecast, and 465 in the high forecast. Outbound flows are expected to grow at a slightly faster rate, with 3.5 percent, 6.5 percent and 8.5 percent used in the low, mid and high forecasts, reflecting the expected diversification of local production and consequent relative decrease in the need for inbound products and relative increase in the possibilities of shipping out a greater variety of goods. In the low forecast, outbound shipments increase from 76 thousand tons in 1990 to 152 thousand tons in 2010; for the mid forecast, outbound general

Table 7-50

FORECAST RANGE FOR EXPANDED CLASSIFICATION OF GENERAL CARGO HANDLED AT MAKAR WHARF, 1990 - 2010 (t)

	LOW FORECAST		MID FORECAST		HIGH FORECAST	
	IN	OUT	IN	OUT	IN	OUT
1990	120,036	76,259	120,036	76,259	120,036	76,259
1991	122,437	78,928	126,038	81,216	128,439	82,741
1992	124,885	81,691	132,340	86,495	137,429	89,774
1993	127,383	84,550	138,957	92,117	147,049	97,405
1994	129,931	87,509	145,905	98,105	157,353	105,684
1995	132,529	90,572	153,200	104,481	168,357	114,667
2000	146,323	107,571	195,526	143,149	236,129	172,420
2005	161,553	127,760	249,546	196,126	331,183	259,261
2010	178,367	151,739	318,491	268,710	464,501	389,840

Source of basic data: Table 7-49 and Consultant's estimates.

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cargo reaches 269 thousand tons in 2010; for the high forecast, 390 thousand tons.

7.3.13 Forecast Ranges for Total Cargo Handled at Makar Wharf, 1990-2010

Tables 7-51, 7-52 and 7-53 combine the forecast ranges given in previous tables to obtain the forecast ranges for total cargo shipments at Makar Wharf. Some caveats are in order: (1) there are small differences between the figures for the 1986-1990 period and the port statistics, due to differences in classifications and the Consultant's attempts to adjust for abnormal variations in a few of the 1990 statistics in order to use them as a basis for projections; (2) all forecasts exclude frozen meats (a substitute for live animal shipments); and (3) the low and high forecast totals are also the sums of the individual low and high forecasts for individual commodities; however, since they have little probability of occurring, they are labeled as "extreme" values.

Item (3) merits an additional clarification. The high forecast for corn, the most important commodity handled at the port in terms of tonnage, is very optimistic; it has almost no chance of occurring. The high forecast for outbound shipments of live animals is optimistic, and probably would cause a reduction in the outbound shipments of corn. Yet the item "Total High Extreme" in tables 7-51 and 7-52 adds these two high forecasts and all the other optimistic forecasts. In other words, it represents a series of unlikely events occurring simultaneously. The result is a forecast so high that it has almost no chance of occurring. It is merely a "what-if" scenario, or in Russell Ackoff's terminology, a reference projection that is useful for simulations designed to test if proposed port facilities would be able to handle a flow at the highest end of the range of estimates of future flows.

The mid forecast flow for outbound cargo increases from the (adjusted) 1990 figure of 523 thousand tons to 995 thousand tons in the year 2000, then declines to 732 thousand tons in 2010; the decline from 2000 to 2010 reflects the effect of increased consumption in South Cotabato of important agricultural commodities such as corn; the low extreme for outbound cargo peaks at 620 thousand tons in 1995; the high extreme reaches 1.96 million tons in 2005, and declines slightly to 1.88 million tons in 2010 (Table 7-51). For inbound cargo, the (adjusted) 1990 figure is 293 thousand tons in 1990. In the mid forecast, this climbs steadily and reaches 701 thousand tons at the end of the study period (2010); the low extreme reaches 375 thousand tons in 2010; the high extreme, 942 thousand tons (Table 7-52).

In Table 7-53, the figures for outbound and inbound tonnages are added to produce the mid forecast total tonnage, which increases from the (adjusted) 816 thousand tons in 1990 to a peak of 1.56 million tons in 2005, then falls slightly to 1.43 million tons in 2010. The low and high extremes (adding additional unlikely occurrences) yield their respective maximums of 934 thousand tons in 1995, and 2.82 million tons in 2010.

The forecast range for total tonnage can be considerably narrowed with relatively little probability of actual future flows falling outside of the range. The lower limit of the range, that is, the low forecast for total tonnage, is defined as the mean of the mid forecast and the low

Table 7-51
OUTBOUND CARGOS THROUGH MAKAR WHARF,
1986-1990, AND FORECAST RANGES, 1991-2010 (t)

ITEM		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	2000	2005	2010
CORN	LOW					247,000	200,000	293,000	317,000	340,000	362,000	247,000	125,000	0
	MID	342,000	304,000	311,000	237,000	247,000	200,000	328,000	371,000	416,000	462,000	590,000	505,000	156,000
	HIGH					247,000	200,000	358,000	501,000	648,000	798,000	912,000	1,320,000	1,068,000
LIVE ANIMALS	LOW					31,730	24,824	25,569	26,336	27,126	27,940	27,940	27,940	27,940
	MID	21,105	22,064	24,855	24,974	31,730	32,999	34,319	35,692	37,120	38,640	46,968	57,144	69,524
	HIGH					31,730	33,317	34,982	36,731	38,568	40,496	51,685	65,964	84,189
FROZEN MEAT	LOW					0	0	0	0	0	0	0	0	0
	MID	0	0	0	0	0	0	0	0	0	0	13,320	20,443	29,109
	HIGH					0	0	0	0	0	0	16,622	26,617	39,374
CANNED FISH	LOW					13,023	11,406	11,320	11,227	11,128	11,019	10,534	9,914	9,132
	MID	5,952	5,860	7,792	10,369	13,023	13,480	13,378	13,268	13,151	13,022	12,449	11,717	10,792
	HIGH					13,023	15,140	15,027	14,903	14,772	14,627	13,983	13,123	12,088
ANIMAL FEEDS W/O CORN	LOW					7,911	7,911	7,911	7,911	7,911	7,911	7,911	7,911	7,911
	MID	12,360	8,736	0	21,945	10,548	10,548	10,548	10,548	10,548	10,548	10,548	10,548	10,548
	HIGH					13,185	13,185	13,185	13,185	13,185	13,185	13,185	13,185	13,185
PALAY & RICE	LOW					27,333	12,288	12,042	11,801	11,565	11,334	10,245	9,261	8,371
	MID	12,697	18,900	5,266	26,137	27,333	18,067	18,248	18,430	18,614	18,801	19,670	20,768	21,827
	HIGH					27,333	18,067	18,609	19,167	19,742	20,335	23,573	27,328	31,681
FRUITS & VEGETABLES	LOW				0	54,166	54,166	54,166	54,166	54,166	54,166	54,166	54,166	54,166
	MID	45,630	35,235	35,678	41,169	54,166	55,791	57,465	59,189	60,964	62,793	72,795	84,389	97,830
	HIGH					54,166	56,874	59,718	62,704	65,839	69,131	88,230	112,607	130,543
COPRA	LOW					58,187	51,442	51,123	50,806	50,490	50,176	48,272	46,418	44,614
	MID	69,618	46,992	62,844	45,910	58,187	66,606	75,986	85,312	94,584	94,913	93,321	91,776	90,278
	HIGH					58,187	79,713	96,036	115,456	134,849	145,178	145,232	145,286	145,340
VEGETABLE OILS	LOW					4,875	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500
	MID	3,834	5,680	7,235	7,540	4,875	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
	HIGH					4,875	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500
GENERAL CARGO EXPANDED CATEGORY	LOW					76,259	78,928	81,691	84,550	87,509	90,572	107,571	127,760	151,739
	MID	36,395	41,899	97,986	149,450	76,259	81,216	86,495	92,117	98,105	104,481	143,149	196,126	268,710
	HIGH					76,259	82,741	89,774	97,405	105,684	114,667	172,420	259,261	389,840
TOTAL MID FORECAST W/O FROZEN MEAT		549,591	489,366	552,656	564,494	523,121	484,707	630,439	691,556	755,086	811,198	994,900	983,468	731,509
TOTAL LOW EXTREME						520,484	445,465	541,322	568,297	594,395	619,618	518,139	412,870	308,373
TOTAL HIGH EXTREME						525,758	506,537	692,831	868,051	1,048,139	1,223,119	1,427,808	1,964,254	1,882,366

Source: Earlier tables; Consultant's estimate.

Table 7-52
INBOUND CARGOS THROUGH MAKAR WHARF,
1986-1990, AND FORECAST RANGES, 1991-2010 (t)

ITEM		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	2000	2005	2010
LIVE ANIMALS	LOW					4,905	3,617	3,617	3,617	3,617	3,617	3,617	3,617	3,617
	MID	0	625	1,955	4,740	4,905	4,822	4,822	4,822	4,822	4,822	4,822	4,822	4,822
	HIGH					4,905	6,028	6,028	6,028	6,028	6,028	6,028	6,028	6,028
ANIMAL FEEDS	LOW					8,060	8,302	8,551	8,807	9,072	9,344	9,344	9,344	9,344
	MID	8,359	7,760	2,220	7,855	8,060	8,382	8,717	9,066	9,428	9,806	11,930	14,515	17,659
	HIGH					8,060	8,463	8,886	9,330	9,797	10,287	13,129	16,756	21,386
FERTILIZERS	LOW					58,052	57,471	59,452	60,167	60,801	61,355	63,187	66,967	63,028
	MID	40,188	51,159	55,431	46,287	58,052	58,052	62,653	65,094	67,652	70,265	89,690	100,369	100,369
	HIGH					58,052	58,052	62,653	65,094	70,889	77,138	92,417	126,783	126,783
CEMENT	LOW					4,611	4,611	4,611	4,611	4,611	4,611	4,611	4,611	4,611
	MID	15,600	13,300	5,650	6,089	14,450	15,173	15,931	16,728	17,564	18,442	23,538	30,041	38,340
	HIGH					14,450	15,462	16,544	17,702	18,941	20,267	28,425	39,868	55,917
SUGAR & WHEAT	LOW					16,854	17,359	17,880	18,416	18,969	19,538	22,650	26,257	30,439
	MID	9,031	10,717	5,135	10,836	22,871	23,786	24,737	25,727	26,756	27,826	33,855	41,189	50,113
	HIGH					22,871	24,015	25,215	26,476	27,800	29,190	37,254	47,547	60,684
BOTTLED CARGO	LOW					64,434	67,656	71,038	74,590	78,320	82,236	52,478	66,977	85,481
	MID	18,026	19,125	22,504	34,183	64,434	67,656	71,038	74,590	78,320	82,236	104,956	133,954	170,963
	HIGH					64,434	68,300	72,398	76,742	81,346	86,227	115,391	154,420	206,649
GENERAL CARGO (EXPANDED CLASSIF.)	LOW					120,036	122,437	124,885	127,383	129,931	132,529	146,323	161,553	178,367
	MID	112,921	126,494	162,671	164,107	120,036	126,038	132,340	138,957	145,905	153,200	195,526	249,546	318,491
	HIGH					120,036	128,439	137,429	147,049	157,343	168,357	236,129	331,183	464,501
TOTAL MID FORECAST		204,125	229,180	255,566	274,097	292,808	303,908	320,239	334,984	350,446	366,597	464,316	574,436	790,757
TOTAL LOW EXTREME						276,952	281,453	290,035	297,592	305,321	313,230	302,210	339,326	374,888
TOTAL HIGH EXTREME						292,808	308,758	329,153	348,421	372,144	397,494	528,774	722,585	941,948

Source: Earlier tables; Consultant's estimates.

Table 7–53

TOTAL CARGOS THROUGH MAKAR WHARF, 1986–1990, AND ADJUSTED FORECAST RANGES, 1991–2010 (t)

ITEM	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	2000	2005	2010
OUTBOUND CARGO													
MID FORECAST	549,541	489,366	552,656	564,494	523,121	484,707	630,439	691,556	755,086	811,198	994,900	983,468	731,509
LOW EXTREME					520,484	445,465	541,322	568,297	594,395	619,618	518,139	412,870	308,373
HIGH EXTREME					525,758	506,537	692,831	868,051	1,048,139	1,223,119	1,427,808	1,964,254	1,882,366
INBOUND CARGO													
MID FORECAST	204,125	229,180	255,566	274,097	292,808	303,908	320,239	334,984	350,446	366,597	464,316	574,436	700,757
LOW EXTREME					276,952	281,453	290,035	297,592	305,321	313,230	302,210	339,326	374,888
HIGH EXTREME					292,808	308,758	329,153	348,421	372,144	397,494	528,774	722,585	941,948
TOTAL CARGO													
MID FORECAST	753,666	718,546	808,222	838,591	815,929	788,615	950,678	1,026,540	1,105,532	1,177,795	1,459,216	1,557,904	1,432,266
LOW EXTREME					797,436	726,918	831,357	865,889	899,716	932,848	820,349	752,196	683,261
HIGH EXTREME					818,566	815,295	1,021,984	1,216,472	1,420,283	1,620,613	1,956,582	2,686,839	2,824,314
OUTBOUND CARGO RANGE													
LOW FORECAST					521,803	465,086	585,881	629,927	674,741	715,408	756,520	698,169	519,941
MID FORECAST	549,541	489,366	552,656	564,494	523,121	484,707	630,439	691,556	755,086	811,198	994,900	983,468	731,509
HIGH FORECAST					524,440	495,622	661,635	779,804	901,613	1,017,159	1,211,354	1,473,861	1,306,938
INBOUND CARGO RANGE													
LOW FORECAST					284,880	292,681	305,137	316,288	327,884	339,914	383,263	456,881	537,823
MID FORECAST	204,125	229,180	255,566	274,097	292,808	303,908	320,239	334,984	350,446	366,597	464,316	574,436	700,757
HIGH FORECAST					292,808	306,333	324,696	341,703	361,295	382,046	496,545	648,511	821,353
TOTAL CARGO FORECAST													
LOW FORECAST					806,683	757,767	891,018	946,215	1,002,624	1,055,322	1,139,783	1,155,050	1,057,76[illegible]
MID FORECAST	753,666	718,546	808,222	838,591	815,929	788,615	950,678	1,026,540	1,105,532	1,177,795	1,459,216	1,557,904	1,432,266
HIGH FORECAST					817,248	801,955	986,331	1,121,506	1,262,908	1,399,204	1,707,899	2,122,372	2,128,290

Source: Earlier tables; Consultant's estimates.

extreme; the upper limit of the forecast range for total tonnage is defined as the mean of the mid forecast and the high extreme. These figures are given in the last three rows of the table: in 2010, the low forecast is 1.06 million tons; the mid forecast, 1.43 million tons; the high forecast, 2.13 million tons. Figures 7-11 to 7-13 show the extreme values and the forecast range in graphic form.

7.3.14 Passenger Traffic

As mentioned earlier, passenger traffic is not particularly demanding of port facilities. In Makar Wharf, most passenger ships are also cargo ships; berthing time and space requirements are determined by the requirements for handling cargo, rather than passengers.

Passenger traffic does, however, create some congestion near the port gate and on the highway leading into the port; given the lack of bus or jeepney services, most passengers travel to and from the city by motor tricycle; this can result in a very substantial number of motor tricycles when a ship arrives with a large number of passengers. Outbound passengers also congregate at the food stands near the entrance to the port.

The port statistics for the totals for inbound and outbound passengers in the 1986-1990 period are given below:

	INBOUND	OUTBOUND	TOTAL
	(1,000 passengers)		
1986	45	54	99
1987	51	69	120
1988	51	67	119
1989	55	72	127
1990	46	62	108

The highest total for recent years, 127 thousand passengers in 1989, is somewhat below the historic high of 137 thousand passengers in 1982. Air traffic has become more competitive with sea travel over this period, as 58,400 passengers used Buayan airport for flights this year -- over half of the total for sea travel. This tendency will intensify if major construction is undertaken at Buayan Airport to accommodate larger, more efficient aircraft, and to provide direct access to the National Capital Region. Nonetheless, many lower and middle income travelers will continue to prefer the less expensive sea route; sea travel is very income-sensitive in the General Santos area, as indicated by the fall in travel in the mid-decade recession, the recuperation in the 1987-1989 period, and the subsequent drop during the 1990 recession.

The mid forecast is for 130,000 passengers yearly from 1991 to 2010. The high forecast assumes an initial adjusted passenger flow of 130,000 passengers in 1990 and a three percent

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Figure 7–11
FORECAST RANGE FOR TOTAL CARGO FLOWS THROUGH MAKAR WHARF
1990–2010, WITH EXTREME VALUES INDICATED (1,000t)

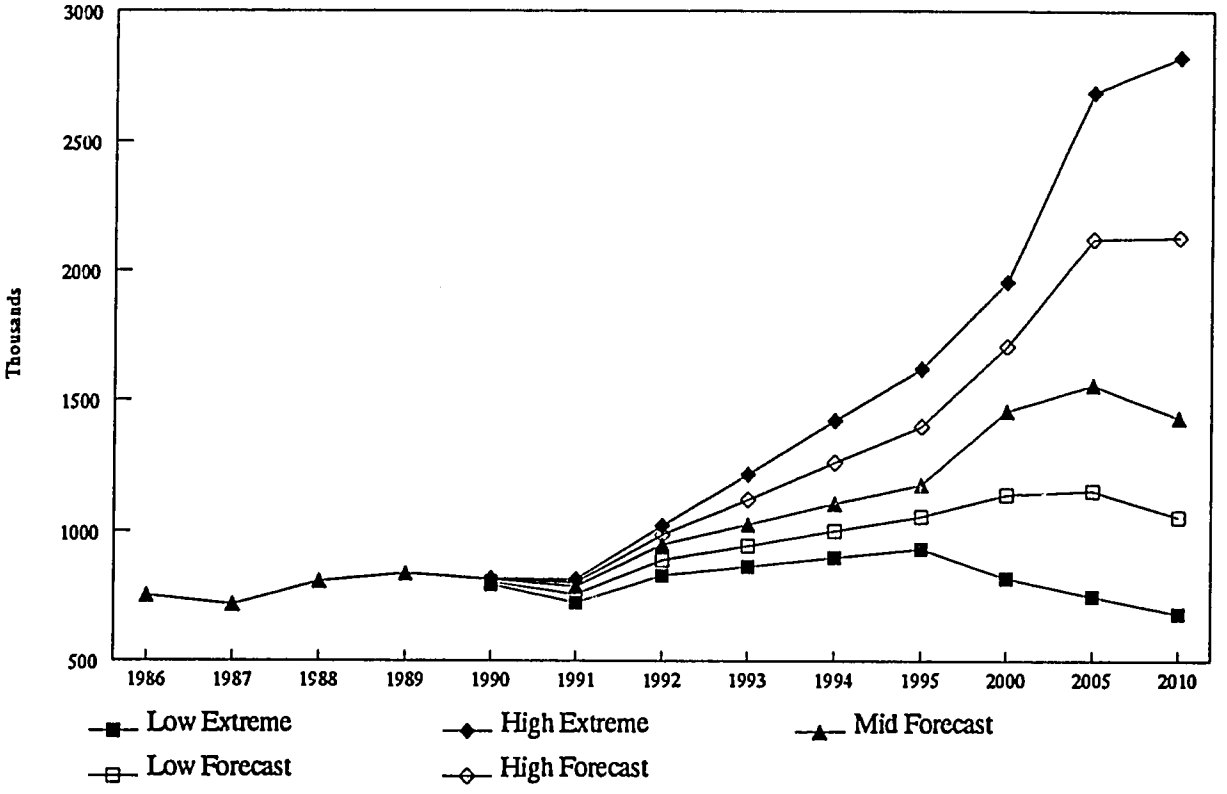

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Figure 7–12
FORECAST RANGE FOR OUTBOUND CARGO HANDLED AT MAKAR WHARF
1990–2010 (1,000t)

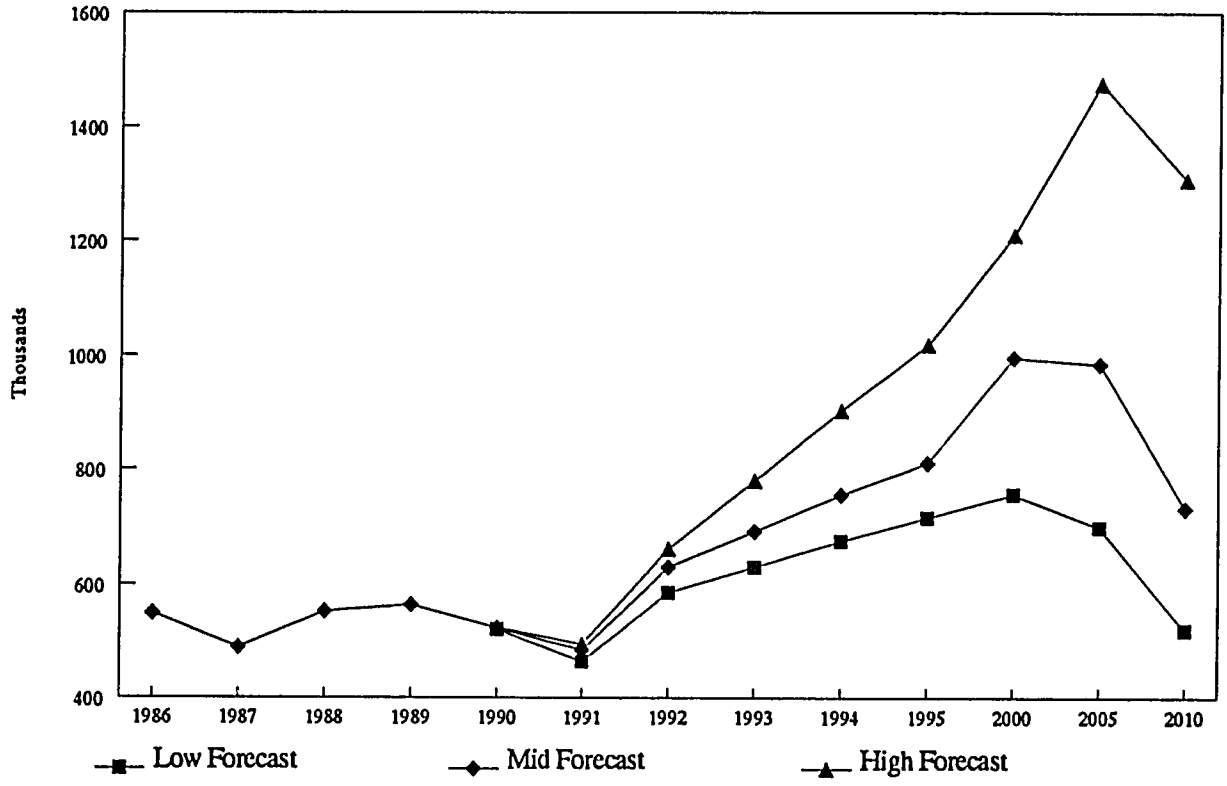

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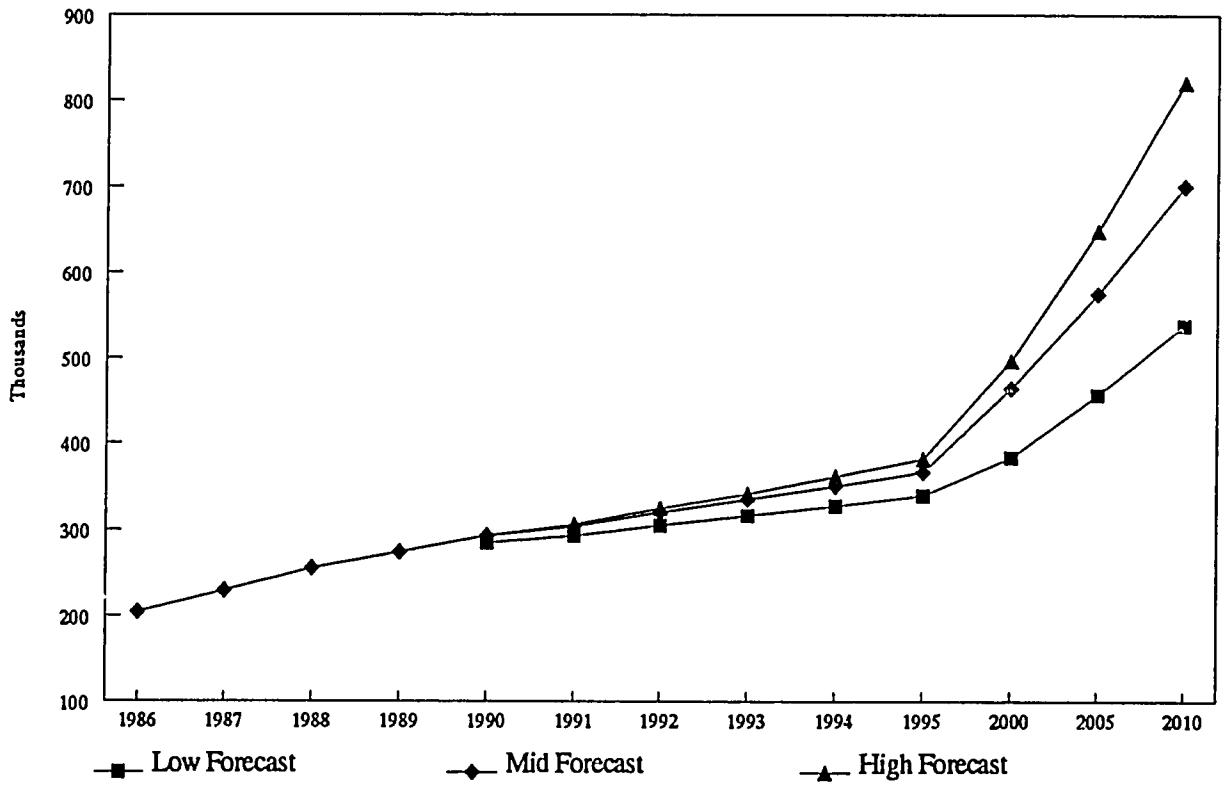
Figure 7–13
FORECAST RANGE FOR INBOUND CARGO HANDLED AT MAKAR WHARF
1990–2010 (1,000t)



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annual growth rate; and the low forecast, a one percent annual decline in passenger traffic.

The low forecast for the year 2010 is 106 thousand passengers; the high forecast, 245 thousand passengers (see Table 7-54 and the accompanying figure which shows these numbers in graphic form).

7.3.15 Foreign Trade

As seen earlier (Table 7-1), foreign trade declined during the 1980 decade, from 106 thousand tons in 1980 to 73 thousand tons in 1990. In percentage terms, the decline was more expressive: the foreign trade share of total cargo declined from 17 percent in 1980 to less than nine percent in 1990. Little containerized cargo is involved, and the types of cargo handled at Makar Wharf are such that foreign trade is expected to grow slowly in the future in absolute terms and to continue to decline as a percentage of total cargo.

7.3.16 Oil Prices

Increases in oil prices have a negative effect on demand and supply of most products in the Philippine economy; they played an important role in the 1990 recession, which resulted in a slight decline in total cargo handled. As Sperling points out, most industrial and service enterprises have reduced their dependence on petroleum; transportation's share of total petroleum consumption has increased to about three-fourths and is climbing, so that petroleum supply is becoming basically a transportation problem. This trend will continue, as a variety of technologies are becoming economic, including solar power for uses that range from heating water used by residences and industries to pumping water in rural areas.

Despite the destruction of oil wells and pipelines during the Mideast War, petroleum prices have stabilized. Major conflicts, rather than supply problems, may cause oil prices to fluctuate widely: Lee and colleagues estimate that the range of oil price fluctuations in future years will be from $4 to over $60 a barrel. Both Sperling and the Lee group, however, foresee average real prices over the next two decades remaining somewhat near present levels; from 20 to 40 years hence, petroleum reserves will become much more expensive to locate and extract. Alternative fuels, such as methanol and natural gas, are on the verge of becoming economically viable in transportation, as production and distribution technologies become feasible for large scale employment of these products, along with practical developments for motors. There may also be technological breakthroughs, such as the proposed Hansen cycle for internal combustion engines designed to run on ethanol.

In sum, high oil prices are not expected to have an important impact on the Makar Wharf improvement alternatives during the study period.

7.3.17 Qualitative Factors and Individual Commodity Forecasts

As mentioned during the individual commodity forecasts, past trends of shipments of some primary sector products could be drastically modified by investments in agribusiness processing facilities. Outbound shipments of live animals increased by approximately 50 percent from 1986 to 1990; in part, this is a manifestation of the corn-hog cycle, but there appears to be a strong upward trend underlying the increase. The proposed investments (at Tambler or other locations), to be undertaken by private firms with governmental support, could increase substantially the demand for meat relative to corn; this is the case of the slaughterhouse/cold storage facility, the corn oil factory, and the feed mill.

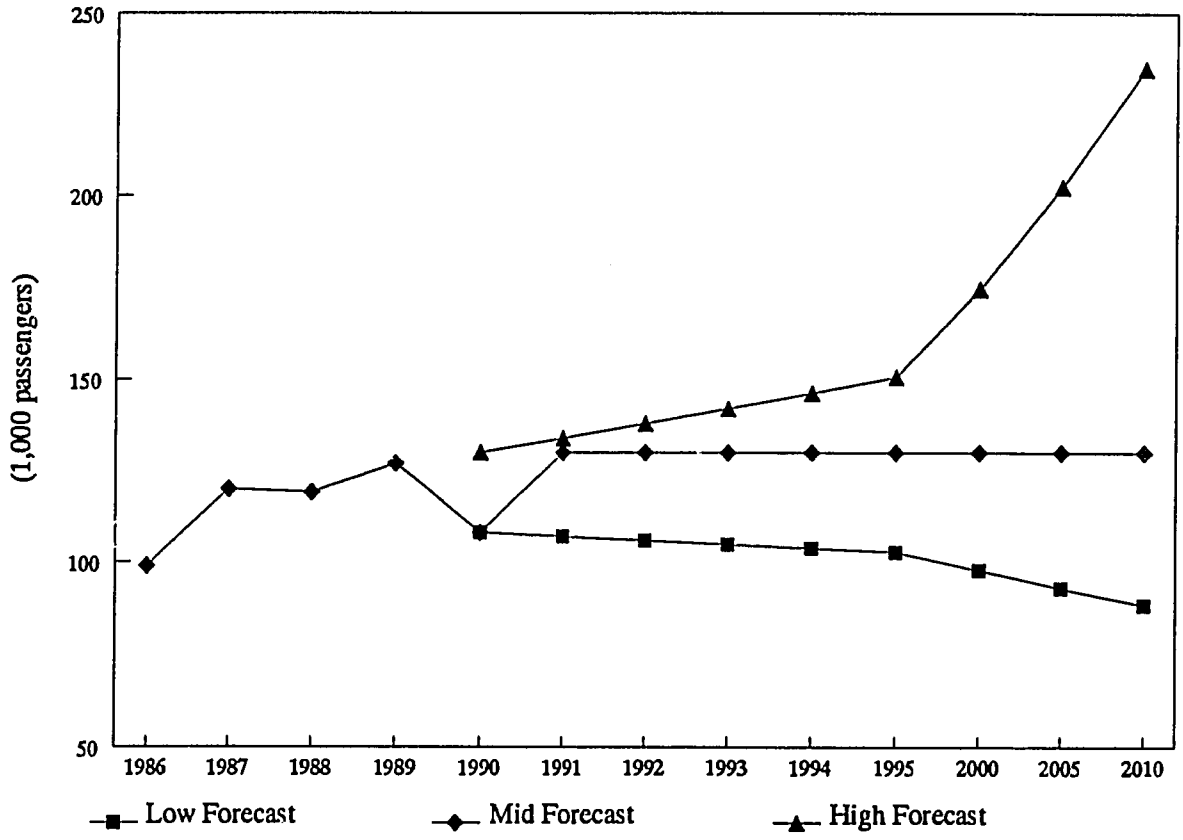
Competition for use of agricultural land among crops is also difficult to predict. The goal of improving substantially the net income of farmers with very small holdings requires at least a partial shift out of corn and into production of commodities with a greater value added.

For the purpose of port planning, therefore, facilities designed to hand a variety of products are more indicated than dedicated facilities unless, as in the case of vegetable oils, such facilities can be provided at low cost and no alternative way of handling the product is available.

The descriptive data in Chapter 2, coupled with the traffic forecasts in the present chapter, indicate that certain details of demand and supply of products should be considered in designing facilities and in selecting a strategy for port improvements. One key factor is the size of individual shipments, which is often very small, even for commodities that have large total flows in the annual data of port statistics. Primary products are a case in point. The marketing chain begins with very small farm-level production units, and often ends with a dispersed pattern of user demands, both temporally and geographically. Facility design should thus take into account such factors as the limited handling facilities at both the receiving port and the quantity and form desired by the final customer.

Table 7-54
FORECAST RANGE FOR PASSENGERS PASSING THROUGH
MAKAR WHARF, 1986-2010, TOTAL INBOUND AND OUTBOUND (1,000 passengers)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	2000	2005	2010
LOW FORECAST					108	107	106	105	104	103	98	93	88
MID FORECAST	99	120	119	127	108	130	130	130	130	130	130	130	130
HIGH FORECAST					130	134	138	142	146	151	175	203	235



Source: Table 7-3 and Consultant's estimates.

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CHAPTER 8

CAPACITY OF EXISTING PORT

The analysis of the capacity of the existing port facilities addresses two specific portions of the cargo handling operations. The predicted capacity of the ship-to-wharf interface, and the capacity of the wharf-to-yard interface. Each of these portions of the system effect the overall capacity of the existing port. The capacity of the wharf may exceed the capacity of the yard if there is other space outside of the existing facility which can accommodate the excess freight. At present, many of the demands for warehousing, storage, and sorting the existing inbound and outbound cargos are being met by the private sector operations residing outside the bounds of the port.

The Makar Wharf facility is in a transition mode between a general cargo terminal and a multi-purpose cargo terminal. In the 10 years since 1980, there has been a shift in the predominant type of cargo that is being handled at the wharf. In 1980, the cargo was primarily bagged goods and other breakbulk cargos. Containerized cargo represented approximately 20 percent of the 1980 total cargo. However, in 1990, containerized cargo represented approximately 48 percent of the total cargo handled at Makar. There has also been a corresponding improvement in the handling efficiencies of the cargos.

It is estimated that the proportional share of containerized cargo will continue to grow, but will not completely eliminate the need for the port to serve the breakbulk and bulk cargos over the next 20 years. There are many other issues which may also effect the trend for cargos in the future, including the types of new vessels that become available (i.e., bulk grain carriers, specialized container ships, etc.) and the retirement of some of the existing fleet of vessels which presently call on Makar Wharf. All of these factors greatly influence the capacity of the port facility. For this analysis, we have made numerous assumptions in order to predict the capacity of the existing facility. These assumptions include:

- The infrastructure beyond the bounds of the port can meet or exceed the demands of the port
- There is not a major shift in the type of commodity that is being handled by the port
- There is not a major shift in the mix of commodities that is being handled by the port
- The labor forces required to handle the additional freights are available
- There are no major modifications or additions to the existing Port facilities

- There are no major additions to the existing cargo handling equipment presently employed to move the cargo
- There will be a 24-hour continuous freight operation
- There are seasonal variations of the flow of commodities into and away from the port

8.1 SHIP TO WHARF INTERFACE

This section addresses the existing capacity of the ship to wharf interface assuming there are no facility improvements or major purchases of cargo handling equipment. It is assumed that there are operational and/or organizational changes which will enhance the present cargo throughput activities. For the purposes of this analysis, it will be assumed there are no other outside constraints to the flow of the cargo. As such, it is assumed that the transportation network and the cargo supply channels are operating at a level consistent with the maximum capacity of the existing wharf facility.

In 1990, approximately 844,000 tons of cargo were shipped through Makar Wharf. Of this amount, 128,000 tons (15 percent) were moved in bulk, 311,000 tons (37 percent) as breakbulk, and 405,000 tons (48 percent) were containerized. 678 vessels visited the port with a total combined service time of 34,707 hours. The total ship's waiting time at anchor was 466 hours. For bulk and breakbulk cargos, 757 gangs worked a gross of 15,259 hours. For containerized cargo, there were 6279 gross gang hours worked with an estimated 310 gangs. For an estimated average of 1.5 gangs per ship (based on 1990 records), the total working time for the ships was approximately 14,360 hours. The corresponding working time to service time ratio was 0.41 (14,360 hrs / 34,707 hrs). It is not known how many hours the terminal was effectively inoperable due to prevailing inclement weather conditions. The overall 1990 berth occupancy ratio for Makar Wharf, computed by the PPA was 0.619. The monthly berth occupancy ratio varied from a seasonal high of 0.833 in October to a seasonal low of 0.398 in July 1990. Because of this seasonal variation in demand, the maximum assumed annual berth occupancy rate used for this analysis is 0.62.

Observations at the terminal conducted by the Consultant indicate a variety of reasons for delays in the working time while the vessel is at berth. In general, the most significant delays are either due to equipment failure, or that cargos have not arrived at the terminal for shipment.

Ship's gear are most generally used to move cargo between the ship and shore. This gear does not always function properly. For containerized and bulk operations, these malfunctions completely stop the shipping activities. For breakbulk operations, the use of ship's gear is usually abandoned and the cargos are moved by hand. Higher wave activities at the wharf,

which are common in the afternoon hours, also prevent or hamper ship-mounted crane operations on some of the smaller vessels.

Significant delays of outbound cargo operations are due to the untimely arrival of cargo at the wharf. At present, many of the outbound freight activities are dependant on 'just-in-time' deliveries from facilities located outside of the Port. It is evident that the offsite transportation network does not adequately support the outbound shipping activities at Makar. Conversely, the Consultant did not observe any delays with inbound cargo operations due to the untimely arrival of landbased transportation services.

Labor forces at the Makar wharf are currently available 24 hours per day, 7 days per week. Allowing five hours per day for meals and breaks, the theoretical working time to service time ratio is 0.79 (19 hrs/24 hrs). Other unquantifiable factors contribute to the idle time of a vessel including the time required to berth and untie, equipment failure, and partial shutdowns due to weather. For the purposes of this analysis, the assumed practical upper bound for the working time to service time ratio is 0.60.

The fundamental approach is to first assume there are no physical improvements to the existing facility, and then assume that all cargo is being handled in a single form (i.e., either all in breakbulk, all in bulk, or all in containerized form). After that is determined, a future mix of cargo types based on historical trends will be assumed in order to calculate the most likely maximum capacity of the existing facility.

8.1.1 Breakbulk Cargo

Breakbulk cargo includes all cargos that are not containerized or bulk cargos. In general, these include bagged goods, pelletized goods, and other general cargos handled as loose pieces. The existing general cargo vessels range from approximately 164 meters to 16 meters in length with a weighted average length of approximately 70 meters (3000 Deadweight Tonnage (DWT)). As such, there is adequate space at the wharf to accommodate approximately eight average-sized breakbulk general cargo vessels (See Figure 8-1a). These vessels each contain approximately four holds. The existing rate of cargo handling per gang varies from approximately 25 tons per hour per hold for bagged corn to as low as six tons per hour per hold for mixed general cargo. Assuming a maximum production rate of 20 tons per hour per gang, the estimated maximum cargo throughput capacity at the ship to wharf interface at 100 percent berth efficiency is approximately 80 tons per hour per ship, or 640 tons per hour per facility.

Assuming 100 percent of the cargo is handled as breakbulk with an annual berth occupancy factor of 62 percent, a working time to service time of ratio of 60 percent, and 350 days of operation, the estimated maximum throughput capacity of the existing Makar Wharf is approximately 2,000,000 tons per annum. The existing cycle time and hook capacity of the ship's gear is the single largest limiting factor of the cargo transferring operation.

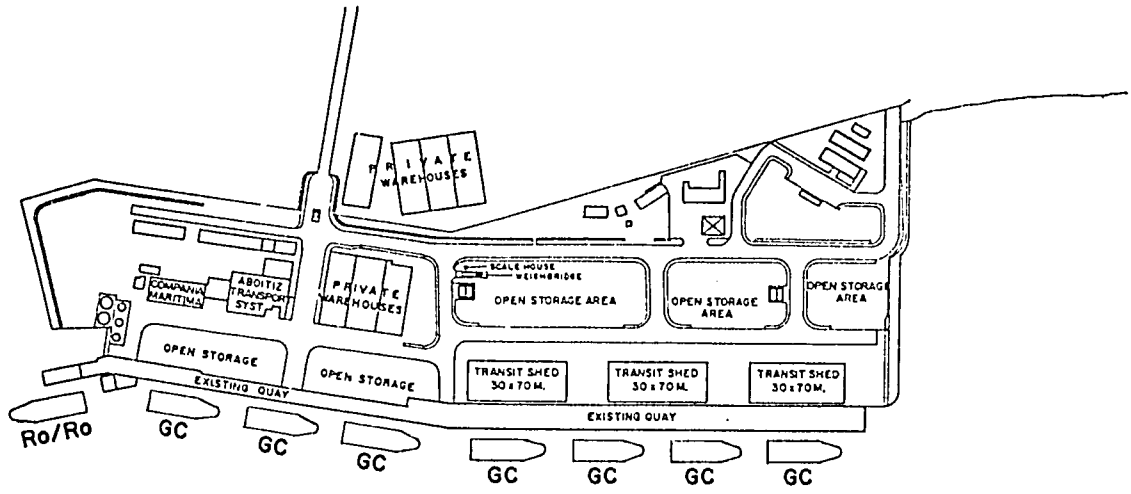

FIGURE 8-1a BREAKBULK CARGO

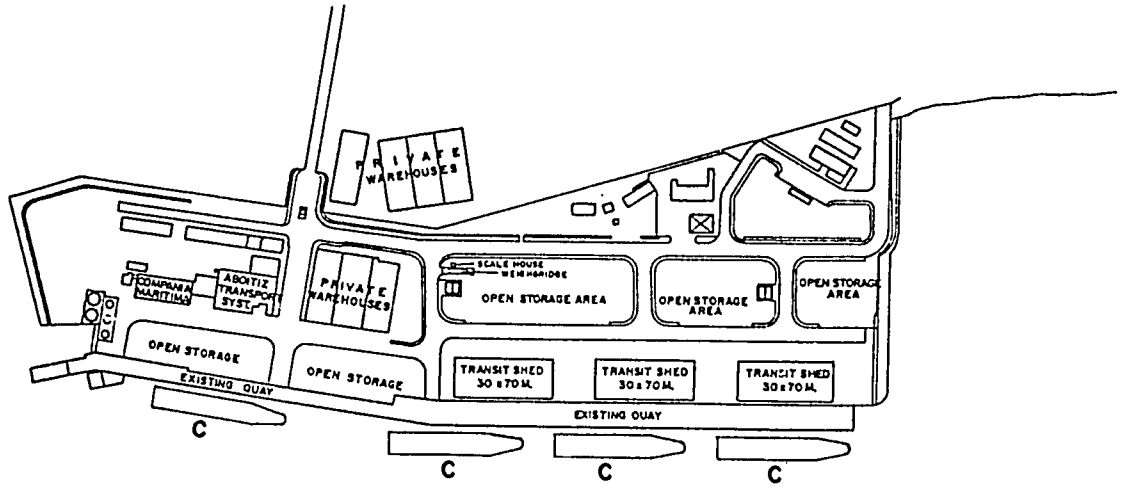

FIGURE 8-1b CONTAINERIZED CARGO

PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0099-00	MAKAR WHARF FEASIBILITY STUDY	FIGURE 8-1
LOUIS BERGER INTERNATIONAL, INC. • LOCKWOOD GREENE INT'L • ERNST & YOUNG INT'L • GLOBETROTTERS ENG'G. CORP. • TRANS-ASIA (PHIL.), INC • CONSULTANT MANAGEMENT SERVICES, INC.	BERTHING CONFIGURATION	

8.1.2 Containerized Cargo

For the purposes of this report, containerized cargo is assumed to be cargo shipped in the standardized twenty-foot equivalent units (TEU's). These containers may include specialty containers such as refrigerated units and open cage units used to transfer fresh and frozen meats, or livestock, respectively. The existing fleet of container ships which call at the Makar Wharf range from converted general cargo vessels (60 TEU capacity) up to the modern specialty container ships which are capable of carrying 500 TEU's. These ships range in length from 80 meters to 140 meters with a weighted average length of 120 meters. As such, the existing Makar facility can accommodate approximately four of the average container vessels (See Figure 8-1b). At present, the majority of the containers are being handled by ship's gear. Based on observations, the typical hook cycle rate of the ship's gear is approximately 4.5 TEU's per hour per crane with an average of four holds per ship. As such, assuming 100 percent berth efficiency, the maximum production rate is 18 TEU's per hour per ship, or 72 TEU's per hour per facility.

Assuming a 100 percent containerized cargo operation at the Makar Wharf with an annual berth occupancy factor of 62 percent, a working time to service time of ratio of 60 percent, and 350 working days per year, the estimated maximum throughput capacity of the existing Makar Wharf is approximately 225,000 TEU's per year. Using the average 1990 weight of 9.8 tons per TEU handled (includes empties), this corresponds to a maximum containerized freight capacity of approximately 2,200,000 tons per annum if all cargo were to be transferred in container form by container vessels.

8.1.3 Dry Bulk Cargo

The Makar Wharf does not have the equipment to deliver bulk dry cargo in the classic sense. The bulk cargo identified in the existing records is actually unitized or bagged cargo. For example, at present, outbound bulk copra arrives at the wharf in unitized boxes (approximately three tons per box). These boxes are subsequently lifted over and discharged into the hold of the vessel using ship's gear and the empty box is returned to the wharf. Conversely, inbound bulk cargo is typically loaded loose from the ships hold, bagged or unitized on site, then moved by truck away from the wharf. Corn is also occasionally shipped in a similar fashion. For the purposes of this Report, these dry cargo operations are classified as bulk even though they are actually a hybrid cargo operation.

At present, the existing fleet of bulk carriers which call at the Makar Wharf are typically general cargo vessels which have been temporarily converted to bulk carriers. These vessels range from 40 meters (700 DWT) to 70 meters (2000 DWT) with a weighted average length of 60 meters and an approximate average capacity of 1800 DWT's. The existing wharf can accommodate approximately eight average vessels at any given time (See Figure 8-2a). Assuming two holds per vessel, one crane per vessel, and an observed hook cycle time of five minutes, the estimated maximum rate of cargo transfer is approximately 36 tons per hour per ship, or 288 tons per hour

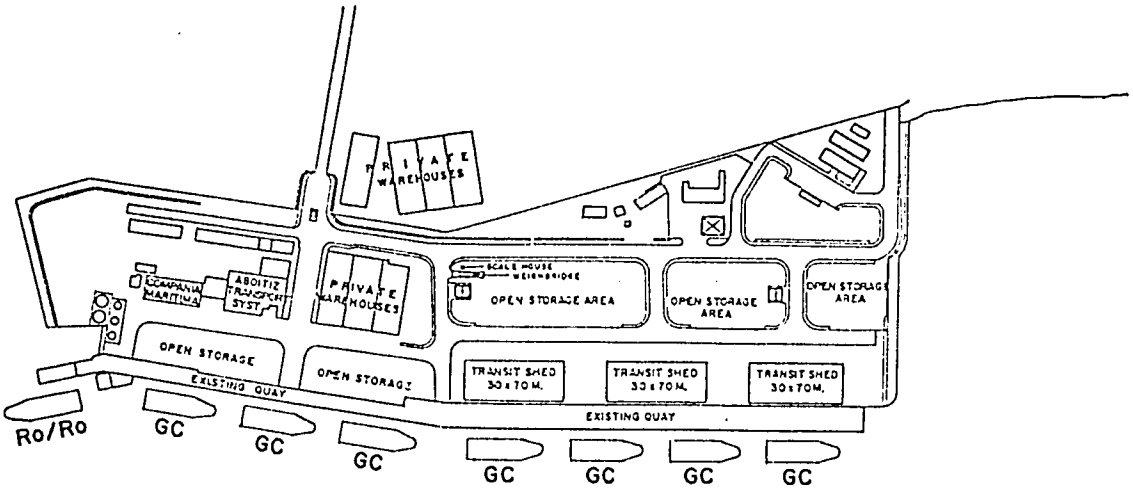

FIGURE 8-2a DRYBULK CARGO

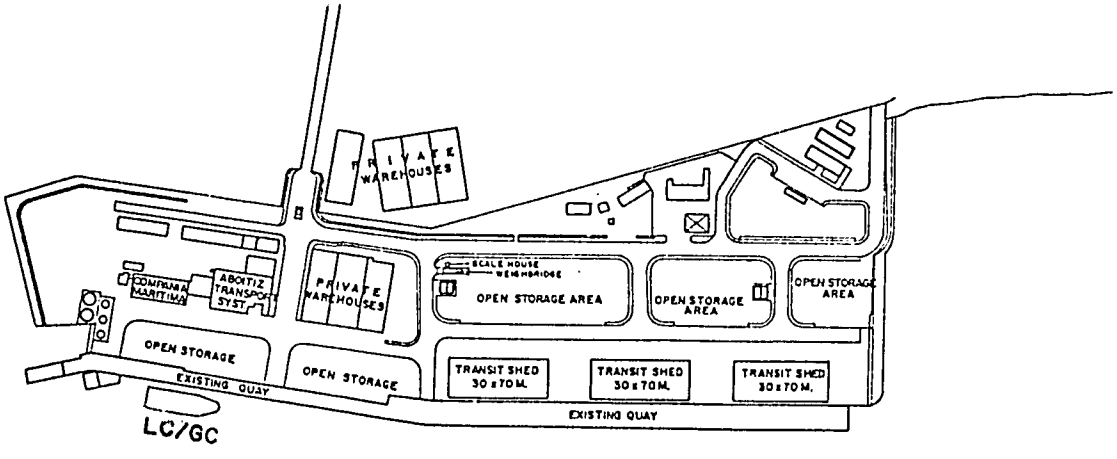

FIGURE 8-2b LIQUID BULK CARGO

PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0099-00	MAKAR WHARF FEASIBILITY STUDY	FIGURE 8-2
LOUIS BERGER INTERNATIONAL, INC. • LOCKWOOD GREENE INT'L. • ERNST & YOUNG INT'L. • GLOBETROTTERS ENG'G. CORP. • TRANS-ASIA (PHIL.), INC • CONSULTANT MANAGEMENT SERVICES, INC.	BERTHING CONFIGURATION	

per facility.

Assuming a 100 percent dry bulk cargo operation at the Makar Wharf with an annual berth occupancy factor of 62 percent, a working time to service time ratio of 60 percent, and 350 working days per year, the estimated maximum throughput capacity of the existing Makar Wharf is approximately 900,000 tons per annum. The existing hook cycle time and hook capacity of the ship's gear is the single largest limiting factor of the cargo transferring operation.

8.1.4 Liquid Bulk Cargo

At present, palm oil is the only liquid commodity that is handled in bulk at the Makar Wharf. The liquid is brought to the port in trucks, transferred to the existing tankage for storage, and subsequently delivered to the vessels using portable pipelines assembled on the deck. Only one berth space is capable of receiving liquid bulk cargo (See Figure 8-2b). At present, there are four vessels which call at the Makar Wharf that are capable of transferring bulk liquid cargo. These vessels average 100 meters in length and can accommodate approximately 1000 tons of palm oil per shipload in conjunction with other containerized and breakbulk cargos. Oil is stored in the ballast tanks of the vessels. All of these ships primarily accommodate containerized or break bulk cargos.

At present, the availability of bulk liquid cargo vessels is the single largest constraint to the shipment of liquid bulk cargos. A liquid bulk carrier vessel calls at the Makar Wharf approximately once every nine days.

8.1.5 Other Vessels

Commercial passenger vessels, Navy vessels, and Philippine Coast Guard vessels also call at the Makar Wharf. The commercial passenger vessels contribute to the total revenues received by the Port, and have therefore been included in the overall port statistics. However, neither the Navy nor the Coast Guard pay for berth space or for wharfage, and therefore are not accounted for in the Port statistics. The Coast Guard is primarily a transient vessel which occupies berth space without transferring any cargos. Conversely, the Navy vessels which visit the port usually load outbound grain cargo.

No information is available at present to properly estimate the total number of days nor the total annual berth space that is occupied by the Navy or the Coast Guard. However, these vessels do contribute to the berthing demands at Makar. In addition, all vessels which accommodate passengers are also employed to carry other containerized and break bulk cargos. The presence of the passengers contribute to a minor extent to the demand for berth space. For the purpose of this analysis however, passengers are not specifically addressed in the context of the cargo handling capabilities of the Makar Wharf facility.

8.1.6 Combined Capacity of the Existing Wharf

In the previous sections of Chapter 8, the existing capacity of the Makar Wharf was developed using the assumption that only one form of cargo was being handled. In order to determine the overall capacity of the facility, it is appropriate to first discuss the mix of vessels that call at Makar, and then predict what this mix of vessels will be carrying.

A matrix was generated (See Table 8-1) using the observed mix of vessels at the Makar Wharf coupled with the observed cargo handling rates, the historic berth occupancy ratios, and the historic working time to service time ratios. For the analysis, berths are as indicated in Figure 8-3. Berth 1 is the Ro-Ro ramp presently under construction, and therefore did not contribute to the 1990 capacity of the wharf. Berth 2 is the present location of the liquid bulk cargo operation. Berths 2 and 3 are presently used by the majority of the passenger vessels, and the non-revenue vessels such as the Coast Guard and the Navy. When not occupied otherwise, Berths 2 and 3 are also the preferred location for the bulk grain and bulk copra operations. In the table, the berth occupancy ratio is adjusted down for Berths 2 and 3 to account for the non-revenue and passenger vessels which also occupy these berths. Berths 4 and 5 are the preferred locations for break bulk operations. Berth 6 seems to be shared between containerized and break bulk activities, and Berth 7 is primarily used for containerized cargo operations.

For the purposes of the model, the cargo handling rates (at 100 percent efficiency) were determined, based on observations at Makar Wharf. The assumed maximum (i.e., 100 percent efficiency) production rates for the various vessels are computed as follows:

Bulk Carrier	=	1 crane/ship x 3 tons/pick x 12 picks/hr
	=	36 tons per hour per ship
Mixed Breakbulk	=	2 cranes/ship x 1.25 tons/pick x 12 picks/hr
	=	30 tons per hour per ship
Breakbulk (Grain)	=	2 cranes/ship x 2 tons/pick x 12 picks/hr
	=	50 tons per hour per ship
		(or 100 tons per hour per ship with 4 holds)
Container	=	3 cranes/ship x 4.5 TEU/hr/crane x 9.8 tons/TEU
	=	132 tons per hour per ship

The mathematical model was tested using the 1990 values for working time to service time ratios (0.41) and the assumed maximum production rates for the vessels noted above (see Figure 8-3a). The results agree quite well with the existing performance at the Makar Wharf; 843,900 tons predicted versus the 1990 actual of 844,700 tons (See Table 8-1). In addition, the modeled cargo mix is also very close to the actual cargo mixes for 1990. Therefore, it was determined that the mathematical model is valid for other combinations of cargo supplies and cargo mixes.

Table 8–1
EXISTING WHARF THROUGHPUT CAPACITY MODEL

WHARF THROUGHPUT ESTIMATE (MODEL FOR CY 1990) BERTH / CARGO TYPE	1 Ro-Ro/ Break Bulk	2 Bulk/Pass/ Liquid	3 Bulk/ Pass.	4 Break Bulk (Mixed)	5 Break Bulk (Grain)	6 Break Bulk (Grain)	6 Container	7 Container
LENGTH OF BERTH (m)	40	70	75	75	60	120	120	120
PEAK SHIPPING RATE (@100% Eff.) (TONS/HOUR)	14	36	36	30	50	100	132	132
(TONS/YEAR)	122640	315360	315360	262800	438000	876000	1156320	1156320
BERTH OCCUPANCY RATE	0	0.46	0.5	0.65	0.65	0.41	0.24	0.65
WORKING/SERVICE TIME	0	0.41	0.41	0.41	0.41	0.41	0.41	0.41
WORKING DAYS/YR	350	350	350	350	350	350	350	350
ANNUAL THRUPUT (TNS/YR)	0	57032.64	61992	67158	111930	141204	109105.92	295495.2
ANNUAL THRUPUT (TNS/M/YR)	0	815	827	895	1866	1177	909	2462

SUMMARY

Total Servicable Berth Length (m)	520	
Overall Berth Occupancy Ratio	0.615	(Versus 0.619 Actual)
Total Cargo Throughput (tns / annum)	843,918	(Versus 844,701 tons Actual)
Total Cargo Throughput (tons/meter/annum)	1,623	
Total Bulk Cargo (tns / annum)	119,025	14.1 % (Versus 127,984 Tons [15.2%] Actual)
Total Break Bulk Cargo (tns / annum)	320,292	38.0 % (Versus 311,437 Tons [36.9%] Actual)
Total Containerized Cargo (tns / annum)	404,601	47.9 % (Versus 405,281 Tons [48.0%] Actual)

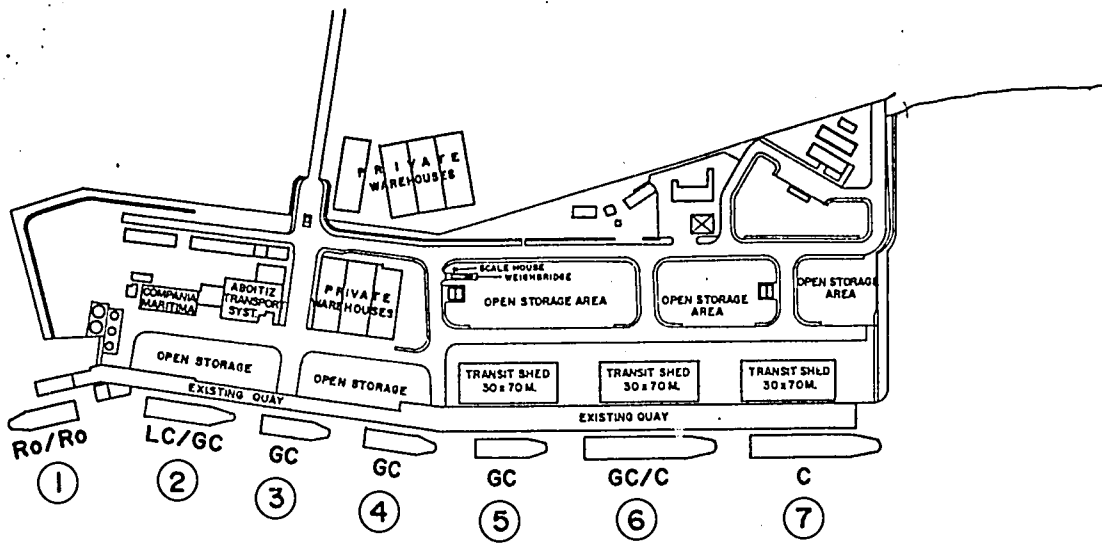

FIGURE 8-3a MULTIPURPOSE CARGO

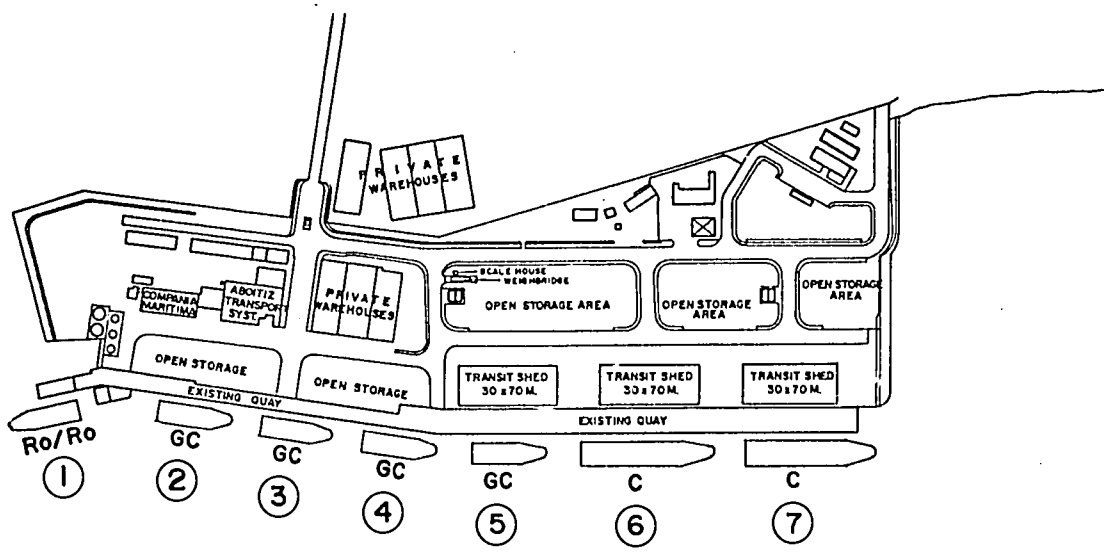

FIGURE 8-3b MULTIPURPOSE CARGO

PHILIPPINE ASSISTANCE PROGRAM SUPPORT UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT CONTRACT NO.: 492-0452-C-00-0099-00	MAKAR WHARF FEASIBILITY STUDY	FIGURE 8-3
LOUIS BERGER INTERNATIONAL, INC. • LOCKWOOD GREENE INT'L. • TRANS-ASIA (PHIL.), INC. • ERNST & YOUNG INT'L. • CONSULTANT MANAGEMENT SERVICES, INC. • GLOBETROTTERS ENG'G. CORP.	BERTHING CONFIGURATION	

Based on the predictions of the future cargo traffic at Makar Wharf coupled with the historical trends over the last 10 years, the most likely maximum practical capacity of the existing ship to wharf interface is approximately 1,250,000 tons per year. This is based on the assumption of an annual berth occupancy rate of 62 percent (same as 1990), a working time to service time ratio of 60 percent (by increasing the supply of cargo to the wharf), a twenty-four hour per day cargo operation, working 350 days per year. The assumed cargo mix is 14 percent bulk, 39 percent breakbulk, and 47 percent containerized (see Table 8-2). Berth 1 is a specialty berth serving only Ro-Ro or barge type vessels. Therefore, a lower berth occupancy rate (0.30) is assumed. In addition, it is assumed that Berths 2 and 3 will continue to serve passenger vessels and other non-revenue generating vessels. As such, berth occupancy rates of 0.46 and 0.50 are appropriate for these two wharf positions.

Based on historical trends, there is potential for containerized cargo to increase with corresponding reductions in the amount of cargo shipped as bulk and breakbulk (see Figure 8-3-b). Using the assumption that containerized cargo represents 66 percent of the total cargo throughput with break bulk and bulk cargos at 21 percent and 13 percent respectively, the estimated maximum capacity of the existing ship to wharf interface is 1,325,000 tons (see Table 8-3). This is based on the assumption of an annual berth occupancy rate of 62 percent (same as 1990), a working time to service time ratio of 60 percent (by increasing the supply of cargo to the wharf), a twenty-four hour per day cargo operation, working 350 days per year.

If an even greater working time to service time ratio can be achieved, there is potential for larger cargo throughputs at the Makar Wharf. A working time to service time ratio of 0.75 is consistent with an 18 hour work day (24 hour shift with three hours for meals plus additional time losses for berthing and equipment failures). For an annual berth occupancy rate of approximately 0.59, and working 350 days per year, the estimated annual cargo throughput is approximately 1,570,000 tons using the present (1990) cargo mix (see Table 8-4). If container traffic is increased to approximately 65 percent of the total volume handled, the throughput may be increased even further to 1,650,000 tons (see Table 8-5).

It is recognized that a port facility which primarily serves an agricultural industry will have large seasonal variations in the demand for shipping. As such, it is reasonable to assume that the present trend will continue for lower berth occupancy rates during the summer months (June and July) and higher berth occupancy rates during the harvest months (October through December). Therefore, there may be some months with berth occupancy rates approaching 90 percent and other months with berth occupancy rates of 40 percent or lower. There will continue to be significant waiting times in the busier shipping months.

8.2 WHARF TO YARD INTERFACE

This section addresses the existing capacity of the wharf to yard interface assuming there are no facility improvements, but there are operational and/or organizational changes which could

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Table 8-2
EXISTING WHARF THROUGHPUT CAPACITY MODEL
(EXISTING CARGO MIX)

BERTH CARGO TYPE	1 Ro-Ro/ Break Bulk	2 Bulk/Pass/ Liquid	3 Bulk/ Pass.	4 Break Bulk (Mixed)	5 Break Bulk (Grain)	6 Break Bulk (Grain)	6 Container	7 Container
LENGTH OF BERTH (m)	40	70	75	75	60	120	120	120
PEAK SHIPPING RATE (@100% Eff.)								
(TONS/HOUR)	14	36	36	30	50	100	132	132
(TONS/YEAR)	122640	315360	315360	262800	438000	876000	1156320	1156320
BERTH OCCUPANCY RATE	0.3	0.46	0.5	0.65	0.65	0.41	0.24	0.65
WORKING/SERVICE TIME	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
WORKING DAYS/YR	350	350	350	350	350	350	350	350
ANNUAL THRUPUT (TNS/YR)	21168	83462.4	90720	98280	163800	206640	159667.2	432432
ANNUAL THRUPUT (TNS/M/YR)	529	1192	1210	1310	2730	1722	1331	3604

SUMMARY

Total Servicable Berth Length (m)	560	
Overall Berth Occupancy Ratio	0.592	
Total Cargo Throughput (tns / annum)	1,256,170	
Total Cargo Throughput (tons/meter/annum)	2,243	
Total Bulk Cargo (tns / annum)	174,182	13.9 %
Total Break Bulk Cargo (tns / annum)	489,888	39.0 %
Total Containerized Cargo (tns / annum)	592,099	47.1 %

Table 8-3
WHARF THROUGHPUT ESTIMATE
PRACTICAL MAXIMUM THROUGHPUT WITH INCREASED CONTAINERIZATION AND INCREASED EFFICIENCIES

BERTH CARGO TYPE	1 Ro-Ro/ Break Bulk	2 Bulk/Pass/ Liquid	3 Bulk/ Pass.	4 Break Bulk (Mixed)	5 Break Bulk (Grain)	6 Break Bulk (Grain)	7 Container
LENGTH OF BERTH (m)	40	70	75	75	60	120	120
PEAK SHIPPING RATE (@100% Eff.) (TONS/HOUR) (TONS/YEAR)	 14 122640	 36 315360	 36 315360	 30 262800	 50 438000	 132 1156320	 132 1156320
BERTH OCCUPANCY RATE	0.3	0.46	0.5	0.65	0.65	0.65	0.65
WORKING/SERVICE TIME	0.6	0.6	0.6	0.6	0.6	0.6	0.6
WORKING DAYS/YR	350	350	350	350	350	350	350
ANNUAL THRUPUT (TNS/YR)	21168	83462.4	90720	98280	163800	432432	432432
ANNUAL THRUPUT (TNS/M/YR)	529	1192	1210	1310	2730	3604	3604

SUMMARY

Total Servicable Berth Length (m)	560	
Overall Berth Occupancy Ratio	0.581	
Total Cargo Throughput (tns / annum)	1,322,294	
Total Cargo Throughput (tons/meter/annum)	2,361	
Total Bulk Cargo (tns / annum)	174,182	13.2 %
Total Break Bulk Cargo (tns / annum)	283,248	21.4 %
Total Containerized Cargo (tns / annum)	864,864	65.4 %

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Table 8-4
WHARF THROUGHPUT ESTIMATE
(PRACTICAL MAXIMUM THROUGHPUT WITH EXISTING CARGO MIX AND WITH INCR. WORK TIME)

BERTH CARGO TYPE	1 Ro-Ro/ Break Bulk	2 Bulk/Pass/ Liquid	3 Bulk/ Pass.	4 Break Bulk (Mixed)	5 Break Bulk (Grain)	6 Break Bulk (Grain)	6 Container	7 Container
LENGTH OF BERTH (m)	40	70	75	75	60	120	120	120
PEAK SHIPPING RATE (@100% Eff.)								
(TONS/HOUR)	14	36	36	30	50	100	132	132
(TONS/YEAR)	122640	315360	315360	262800	438000	876000	1156320	1156320
BERTH OCCUPANCY RATE	0.3	0.46	0.5	0.65	0.65	0.41	0.24	0.65
WORKING/SERVICE TIME	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
WORKING DAYS/YR	350	350	350	350	350	350	350	350
ANNUAL THRUPUT (TNS/YR)	26460	104328	113400	122850	204750	258300	199584	540540
ANNUAL THRUPUT (TNS/M/YR)	662	1490	1512	1638	3413	2153	1663	4505

SUMMARY

Total Servicable Berth Length (m)	560	
Overall Berth Occupancy Ratio	0.592	
Total Cargo Throughput (tns / annum)	1,570,212	
Total Cargo Throughput (tons/meter/annum)	2,804	
Total Bulk Cargo (tns / annum)	217,728	13.9 %
Total Break Bulk Cargo (tns / annum)	612,360	39.0 %
Total Containerized Cargo (tns / annum)	740,124	47.1 %

Table 8-5
WHARF THROUGHPUT ESTIMATE
(PRACTICAL MAXIMUM THROUGHPUT WITH INCREASED CONTAINERIZATION AND INCREASED EFFICIENCIES)

BERTH CARGO TYPE	1 Ro-Ro/ Break Bulk	2 Bulk/Pass/ Liquid	3 Bulk/ Pass.	4 Break Bulk (Mixed)	5 Break Bulk (Grain)	6 Break Bulk (Grain)	7 Container
LENGTH OF BERTH (m)	40	70	75	75	60	120	120
PEAK SHIPPING RATE (@100% Eff.)							
(TONS/HOUR)	14	36	36	30	50	132	132
(TONS/YEAR)	122640	315360	315360	262800	438000	1156320	1156320
BERTH OCCUPANCY RATE	0.3	0.46	0.5	0.65	0.65	0.65	0.65
WORKING/SERVICE TIME	0.75	0.75	0.75	0.75	0.75	0.75	0.75
WORKING DAYS/YR	350	350	350	350	350	350	350
ANNUAL THRUPUT (TNS/YR)	26460	104328	113400	122850	204750	540540	540540
ANNUAL THRUPUT (TNS/M/YR)	662	1490	1512	1638	3413	4505	4505

SUMMARY

Total Servicable Berth Length (m)	560	
Overall Berth Occupancy Ratio	0.581	
Total Cargo Throughput (tns / annum)	1,652,868	
Total Cargo Throughput (tons/meter/annum)	2,952	
Total Bulk Cargo (tns / annum)	217,728	13.2 %
Total Break Bulk Cargo (tns / annum)	354,060	21.4 %
Total Containerized Cargo (tns / annum)	1,081,080	65.4 %

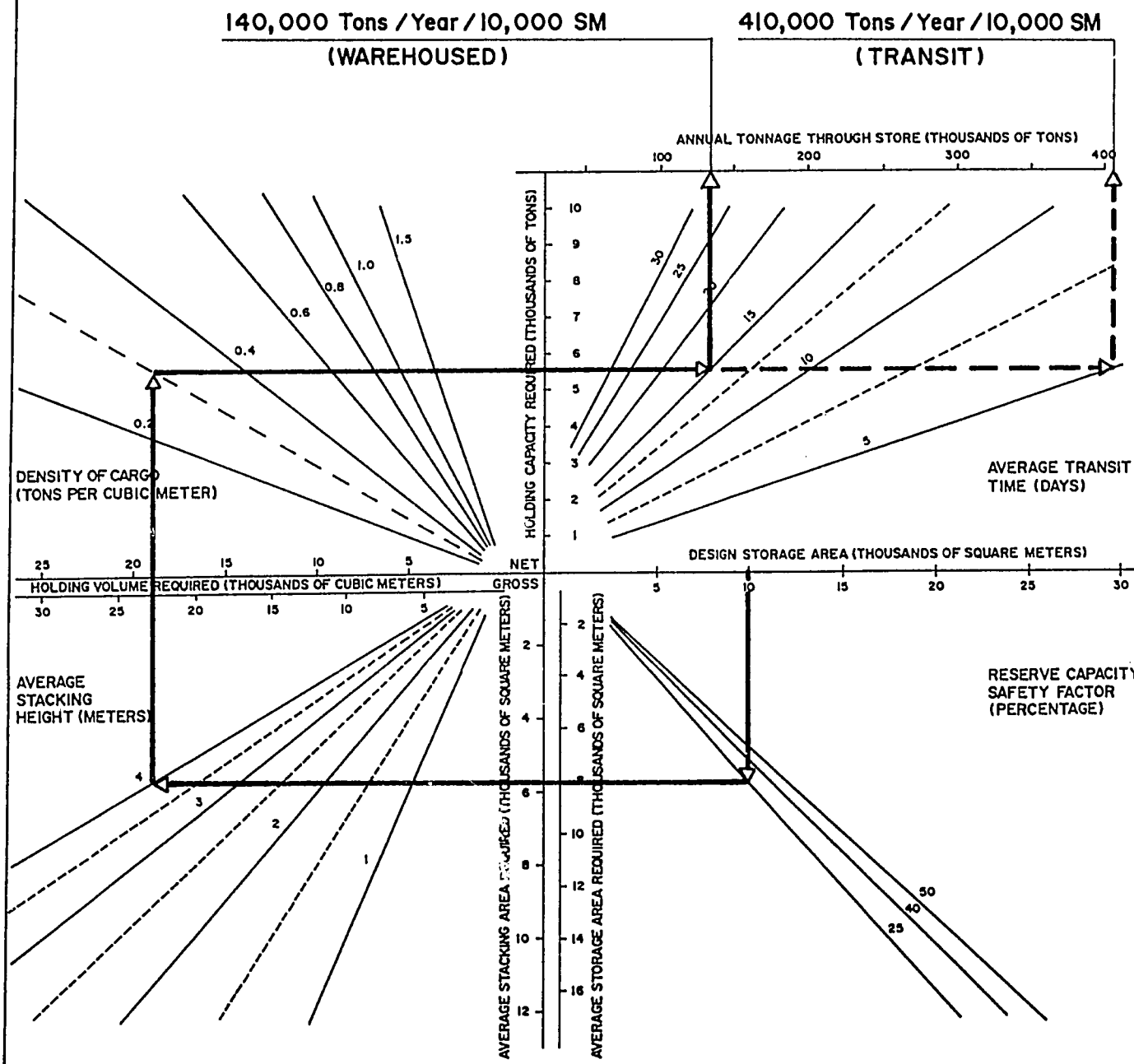
enhance the present cargo throughput activities. For the purposes of this analysis, it is assumed there are no other outside constraints to the flow of the cargo. As such, it is assumed that the transportation network and the cargo supply channels are operating at a level consistent with the maximum capacity of the existing yard facility.

The basic approach to this analysis is to predict the maximum capacity of each of the building structures assuming they are being used exclusively as either transit storage or warehouse storage of commodities. In addition, the maximum capacity of each of the existing open storage areas is predicted assuming they are being used exclusively as either open storage for commodities, or storage for containers. After the capacity of each of these components has been predicted, an assumed use consistent with historical trends at the facility is used to determine the maximum capacity of the wharf to yard interface.

8.2.1 Storage Structures

As described in Chapter 5, the existing port facilities include eight structures which are suitable for covered storage of commodities. The annual throughput capacity of these facilities depends largely on the type of commodity being stored and on the length of time that the commodity resides in the structure. For the purposes of this analysis, nomographs included in the "Port Development - Handbook for Planners in Developing Countries" published by the United Nations Conference on Trade and Development (UNCTAD) were used. The fundamental approach is to use the nomographs and guidelines as an analytical tool rather than a design tool. By normalizing the nomograph to a unit size, a coefficient of efficiency was derived for the individual structures. These coefficients were then applied to the actual areas inside the existing buildings in order to predict the annual capacities of the structures. The input variables were the assumed product to be stored (i.e., bagged grain with a heavy density or general cargo with a lighter density), and the storage time. For the transit shed analysis, the assumed transit time within the shed was five days. For the warehouse analysis, the assumed holding time for the commodity was 15 days. Other commodities and other holding times may be appropriate for future uses of the facility, but these values appear to be consistent with the present style of operation.

Figure 8-4 is used to predict the throughput capacities of the existing buildings assuming the product is bagged grain. Unit storage throughput coefficients are developed for a unit storage area of 10,000 square meters. The input values assumed a reserve capacity of 25 percent, a stack height of four meters, and an average density of 0.3 ton per cubic meter. These storage coefficients are developed for fifteen-day (warehouse) and five-day (transit) holding times. The resulting coefficients are 140,000 tons per year per 10,000 square meters of building and 410,000 tons per year per 10,000 square meters of building for warehoused or transit commodities respectively. Similarly, Figure 8-5 is used to predict the throughput capacities of the existing buildings assuming the commodity is general cargo. The input values assume a reserve capacity of 25 percent, a stack height of 1.5 meters, and a cargo density of 0.2 ton per cubic meter. The resulting coefficients are 40,000 tons per year per 10,000 square meters or



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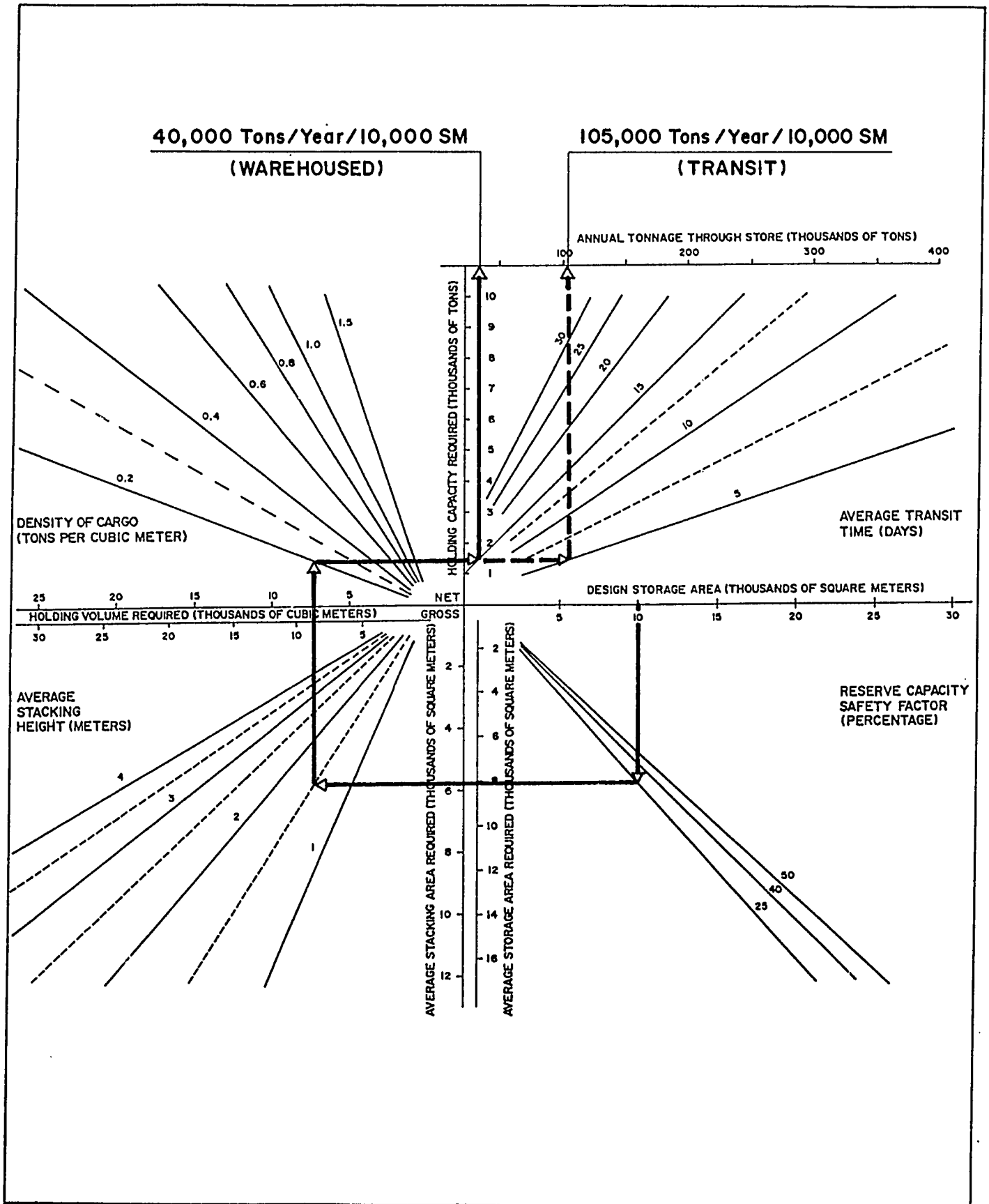
MAKAR WHARF FEASIBILITY STUDY

BUILDING CAPACITIES
BAGGED GRAIN

FIGURE 8-4



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MAKAR WHARF FEASIBILITY STUDY

BUILDING CAPACITIES
GENERAL CARGO

FIGURE 8-5

105,000 tons per year per 10,000 square meters of building for warehoused or transit general cargo commodities respectively.

The most likely maximum transit shed throughput capability is approximately 70,000 tons per annum, with a corresponding maximum warehouse throughput capability of 51,000 tons per annum (See Table 8-6). This assumes that two of the three transit sheds (4320 square meters) are used for bagged grain commodities and one of the three transit sheds (2160 square meters) are used for general cargo. In addition, three of the five existing warehouses (3097 square meters) are used for bagged grain, and two of the five existing warehouses (1914 square meters) are used for general cargo. The results vary significantly depending on the product being stored and the length of time the product remains in the building. Maximum capacities for the individual buildings are also presented for other mixes of cargos and mixes of holding times for the commodities in Table 8-6.

It is recognized that each of the eight storage buildings at the port (11,491 square meters total storage) are typically leased and operated by private tenants. As such, the port has little control over the actual operational efficiencies of the facilities. Based on present usage by the tenants, it is inappropriate to assume that any of the buildings will ever be operated at their optimum capacity.

8.2.2 Open Storage

As described in Chapter 5, the existing port facilities include five zones (20,925 square meters total area) which are suitable for uncovered storage of commodities. The annual throughput capacity of these zones is highly dependant on the type of commodity being stored and on the length of time that the commodity resides in the zone. For the purposes of this analysis, nomographs included in the "Port Development - Handbook for Planners in Developing Countries" published by UNCTAD were used. The fundamental approach is to use the nomographs and guidelines as an analytical tool rather than a design tool. By normalizing the nomograph to a unit size, a coefficient of efficiency was derived for the individual storage areas. These coefficients are then applied to the actual areas inside the existing storage zones in order to predict the annual capacities of these areas. The input variables are the unit area, the assumed product to be stored (ie general cargo or containers), and the storage time. For the analysis of the general cargo open storage areas, a five-day transit time within the zones is assumed with a reserve capacity of 25 percent (See Figure 8-6). For the containerized cargo storage analysis, a seven-day holding time for the commodity is assumed with a maximum stack height of three containers (See Figure 8-7). For general cargo, the storage coefficient is 65,000 tons per year per 10,000 square meters. For containerized cargo, the storage coefficient is 250,000 TEU's per 100,000 square meters. Other commodities and other holding times may be appropriate for future uses of the facility, but these values appear to be consistent with the present style of operation.

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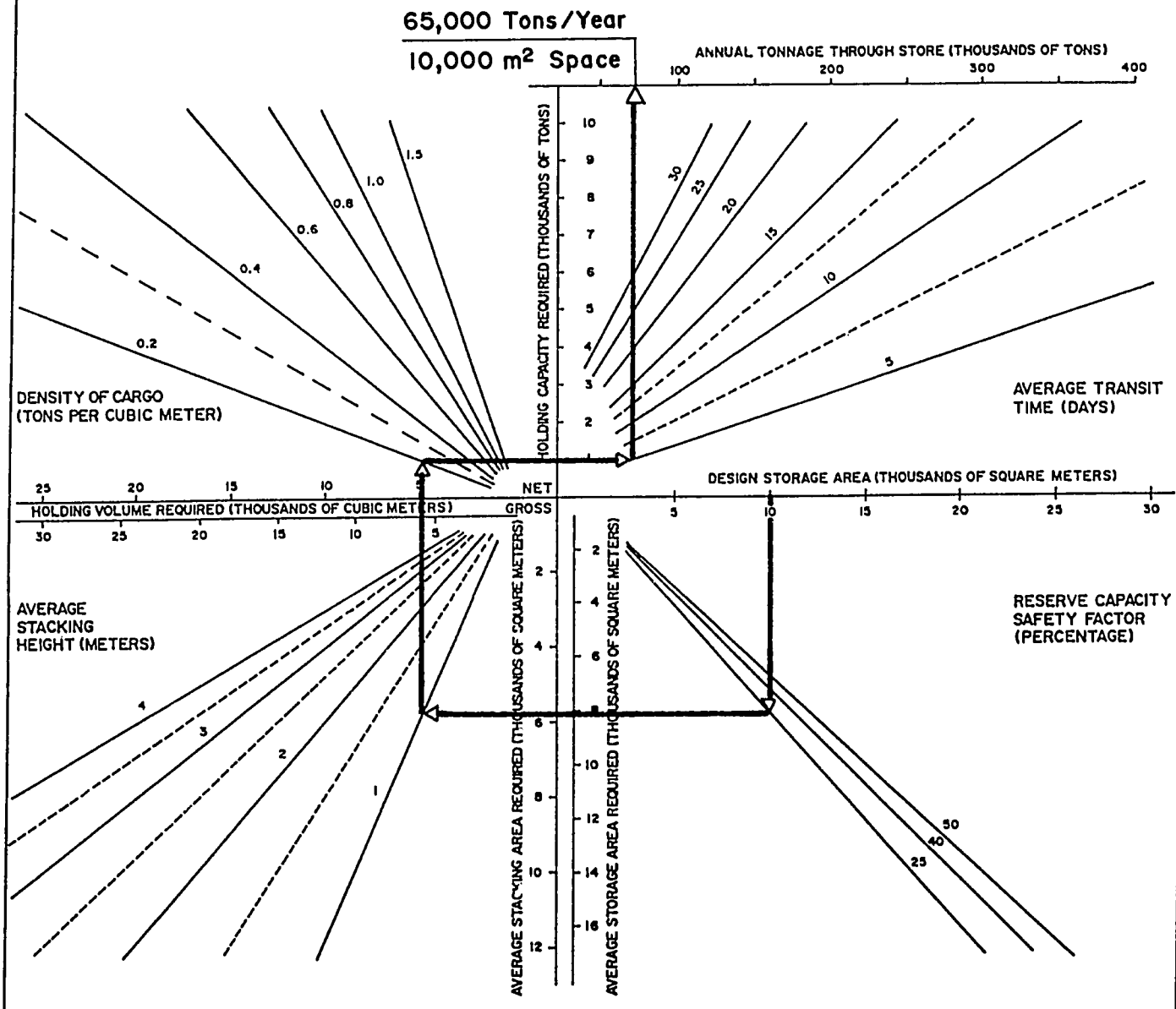
Table 8-6
EXISTING SHED CAPACITIES AT MAKAR WHARF

		TRANSIT USAGE (T)		WAREHOUSE USAGE (W)			
TYPE OF CARGO		GENERAL CARGO (GC)	BAGGED GRAIN (SG)	GENERAL CARGO (GC)	BAGGED GRAIN (SG)		
STACKING HT. (m)		1.5	4	1.5	4		
STORAGE INTERVAL (days)		5	5	15	15		
TONNAGE/10,000 sm		110000	105000	40000	140000		
FACILITY	AREA (sm)	Annual Capacity	Annual Capacity	Annual Capacity	Annual Capacity	ASSUMED USE	ASSUMED CAPACITY
Transit #1	2160	23760	22680	8640	30240	T-SG	22680
Transit #2	2160	23760	22680	8640	30240	T-SG	22680
Transit #3	2160	23760	22680	8640	30240	T-GC	23760
William	1007	11077	10574	4028	14098	W-SG	14098
Sulpicio	977	10747	10259	3908	13678	W-SG	13678
Eastern	1113	12243	11687	4452	15582	W-SG	15582
Aboitiz	1194	13134	12537	4776	16716	W-GC	4776
Compania Maritima	720	7920	7560	2880	10080	W-GC	2880
TOTALS	11491	126401	120656	45964	160874		120134 TONS/ANNUM

** For Assumed Use **

Warehouse Capacity = 51014 Tons per Annum

Transit Shed Capacity = 69120 Tons per Annum



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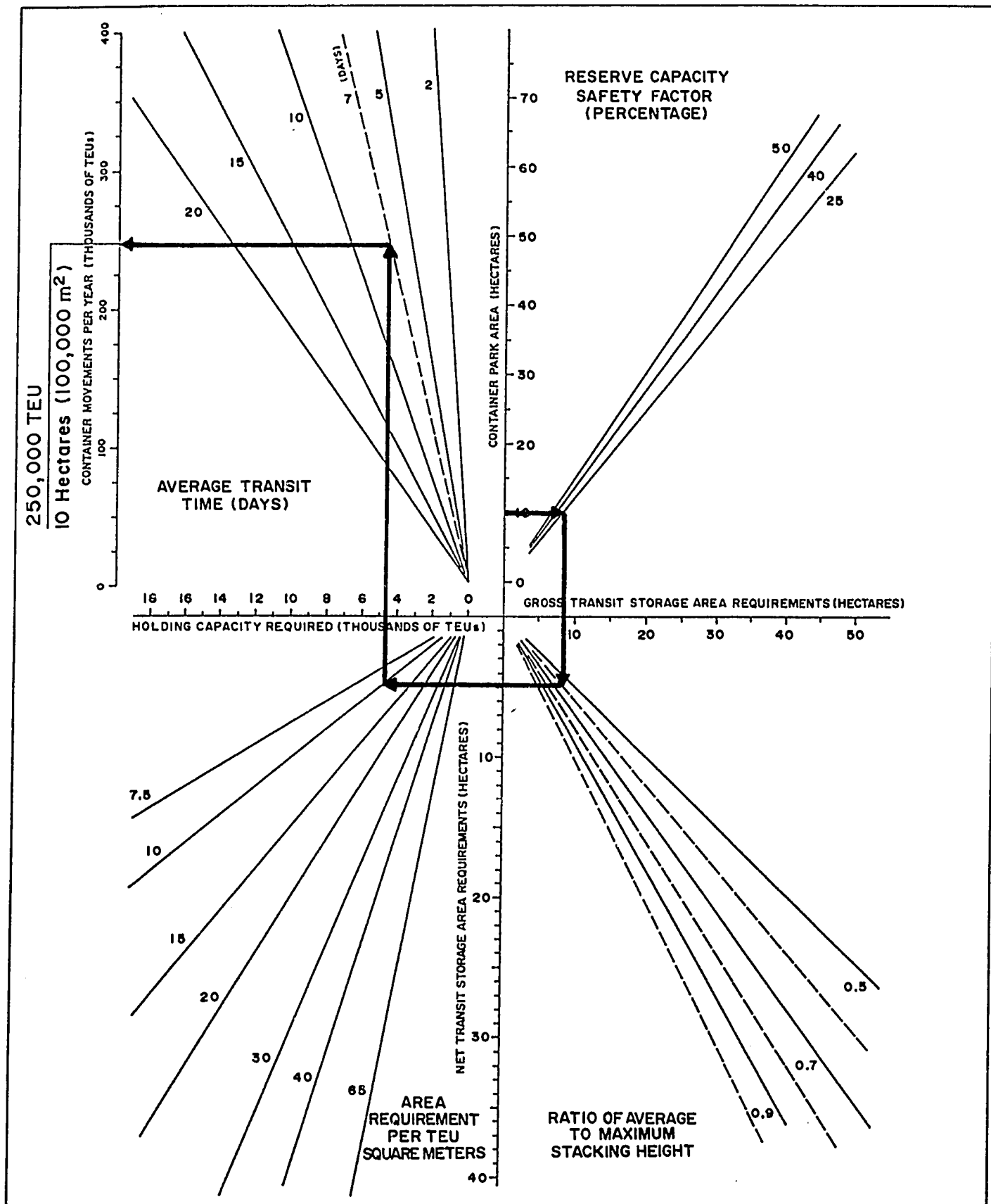
MAKAR WHARF FEASIBILITY STUDY

YARD CAPACITY FOR GENERAL CARGO

FIGURE 8-6



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MAKAR WHARF FEASIBILITY STUDY

YARD CAPACITY FOR CONTAINERIZED CARGO

FIGURE 8-7

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Based on the present usage patterns, the most likely maximum open storage throughput of approximately 42,700 tons per annum with a corresponding maximum container storage throughput of 35,900 TEU's per annum (See Table 8-7). This is based on the assumption that the storage areas near the existing transit sheds (14,360 square meters) will be used for containers, and the storage areas near the south end of the wharf (6565 square meters) will be used for storage of general cargo. The results vary significantly depending on the product being stored and the length of time the product remains in the storage zone. Maximum values are also presented in Table 8-7 for other mixes of cargos and other holding times for the commodities.

It is recognized that most of these zones are leased and operated by private tenants. As such, the port has little control over the actual operational efficiencies of the facilities. Based on present usage by the tenants, it is inappropriate to assume that any of the open storage areas will be operated at their optimum capacity.

8.2.3 Liquid Storage

At present, palm oil is the only commodity that is stored and shipped as bulk liquid. The existing tankage have a total capacity of approximately 900 cubic meters (800 tons). Assuming a holding time of seven days, the practical upper limit of liquid palm oil throughput is approximately 40,000 cubic meters (36,000 tons) per year.

Table 8-7
EXISTING YARD CAPACITIES AT MAKAR WHARF

		GENERAL CARGO	CONTAINERIZED CARGO		
Stacking ht.		1	3		
Storage Interval (days)		5	7		
Capacity		65000 (tns/10,000 sm)	250000 (TEU's / 100,000 sm)		
Location	**Area (sm)**	**Annual Capacity (TONS/YEAR)**	**Annual Capacity (TEU'S/YEAR)**	**Assumed Usage General Cargo**	**Containers**
Storage #1	6850	44525	17125		17125
Storage #2	4560	29640	11400		11400
Storage #3	2950	19175	7375		7375
Storage #4	3100	20150	7750	20150	
Storage #5	3465	22523	8663	22523	
TOTALS	20925	136013	52313	42673	35900 •

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NOTE: 35,900 TEU's/yr is approximately equal to 359,000 tons/yr (includes empties)

APPENDIX A

WIND AND RAIN DATA

Table A-1
WIND AND RAIN DATA FOR GENERAL SANTOS - 1989
Sheet 1

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
Jan. 1, 1989	3	360	0
2,	4	040	T
3,	2	040	0
4,	2	320	0
5,	1	40	0
6,	4	140	T
7,	4	360	0
8,	3	360	0
9,	1	360	T
10,	2	360	0
11,	1	360	T
12,	4	360	0
13,	1	360	2.5
14,	5	360	0
15,	3	320	2
16,	2	360	T
17,	2	360	2
18,	2	0	0.5
19,	3	360	0
20,	3	180	T
21,	3	180	0
22,	8	180	T
23,	2	180	1
24,	4	140	3
25,	3	140	0
26,	4	140	0.5
27,	2	180	0
28,	3	140	0.2
29,	4	140	0
30,	8	180	0
31,	2	140	0.4

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
Feb. 1, 1989	5	180	12
2,	4	180	8
3,	6	180	0
4,	3	180	3
5,	3	180	37.2
6,	2	180	40.6
7,	1	180	T
8,	3	180	7.6
9,	5	180	0
10,	5	180	0.6
11,	1	40	T
12,	3	180	0.2
13,	3	180	T
14,	2	180	0
15,	4	360	T
16,	5	360	T
17,	3	360	0
18,	2	180	T
19,	3	360	0
20,	2	360	0.5
21,	3	360	0
22,	2	360	0
23,	2	360	0
24,	3	360	0.3
25,	1	360	1.6
26,	4	360	1.4
27,	4	180	T
28,	1	180	27.2

Source : PAGASA

Legend : T - Trace

Table A-1
WIND AND RAIN DATA FOR GENERAL SANTOS - 1989
Sheet 2

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
Mar 1, 1989	2	180	0
2,	3	40-180	0.4
3,	4	180	0
4,	6	180	35
5,	3	180	8
6,	1	0	42.5
7,	3	40	0
8,	5	40	0
9,	1	VAR	4.5
10,	5	40	0
11,	2	VAR	T
12,	4	40	0.2
13,	2	VAR	3.9
14,	2	320	0.2
15,	5	140	0.5
16,	1	0	T
17,	1	140	2.4
18,	4	180	T
19,	4	VAR	0
20,	1	360-40	0
21,	4	40-140	0
22,	2	VAR	0
23,	4	VAR	T
24,	2	140	0
25,	4	140	0
26,	2	180	0
27,	7	180	0
28,	8	180-220	0
29,	3	40	0
30,	7	40	0
31,	5	VAR	0.8

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
Apr. 1, 1989	4	360	4
2,	4	180	0
3,	6	180	0
4,	5	180	0
5,	5	360	T
6,	4	180	0
7,	1	180	10
8,	3	360	T
9,	5	180	0
10,	6	180	0
11,	4	360	0
12,	3	180	60
13,	2	180	600
14,	1	180	219
15,	1	220	70
16,	3	360	95
17,	2	360	18
18,	2	360	0
19,	3	180	0
20,	6	180	4.9
21,	3	180	T
22,	4	180	0
23,	3	180	0
24,	6	180	0
25,	5	180	0
26,	5	180	0
27,	5	180	0
28,	5	180	294
29,	1	180	0
30,	3	180	0

Source : PAGASA

Legend : T - Trace

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Table A-1
WIND AND RAIN DATA FOR GENERAL SANTOS - 1989
Sheet 3

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
May 1, 1989	4	220	0
2,	5	220	T
3,	3	140	0
4,	5	140	0.2
5,	4	40	T
6,	4	140	T
7,	4	140	6
8,	2	140	T
9,	2	40	0.5
10,	3	360	0
11,	2	140	0
12,	3	40	4.2
13,	2	140	T
14,	2	180	0.5
15,	3	140	T
16,	3	220	T
17,	9	140	16.6
18,	2	140	T
19,	2	140	6
20,	3	140	8
21,	5	140	0
22,	5	140	0
23,	3	140	T
24,	3	140	T
25,	5	180	T
26,	7	140	3.5
27,	4	180	3
28,	4	140	T
29,	4	140	0
30,	5	110	0
31,	3	140	17

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
June 1, 1989	2	140	118
2,	5	180	0
3,	4	180	0
4,	3	180	85
5,	3	140	8
6,	4	220	258
7,	1	180	5
8,	3	180	5
9,	3	180	10
10,	3	180	0
11,	2	40	0
12,	2	140	40
13,	2	180	0
14,	5	180	0
15,	5	180	T
16,	2	180	T
17,	2	140	0
18,	2	180	56
19,	4	180	0
20,	3	180	0
21,	2	180	40
22,	2	140	4
23,	5	140	0
24,	1	180	2
25,	6	180	20
26,	1	140	3
27,	2	180	T
28,	2	180	T
29,	3	180	T
30,	5	180	366

Source : PAGASA

Legend : T - Trace

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Table A-1
WIND AND RAIN DATA FOR GENERAL SANTOS - 1989
Sheet 4

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
July 1, 1989	4	320	0.5
2,	2	160	1
3,	3	140	0
4,	1	180	T
5,	7	180	0
6,	3	180	0
7,	2	180	0
8,	4	140	T
9,	4	140	1
10,	4	180	7.1
11,	2	220	T
12,	4	180	0
13,	6	180	0
14,	3	180	1.5
15,	5	180	1
16,	4	180	11
17,	2	140	0.5
18,	3	360	1.5
19,	2	180	12
20,	1	180	0.6
21,	2	180	T
22,	2	40	0
23,	4	180	0
24,	3	180	1
25,	4	140	0
26,	3	180	0
27,	4	180	0
28,	6	320	1
29,	2	0	0
30,	5	180	10.5
31,	4	320	4.7

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
Aug 1, 1989	4	180	T
2,	4	180	0
3,	5	180	0
4,	5	180	0
5,	5	180	0
6,	5	180	0
7,	6	180	0.5
8,	3	180	T
9,	1	32	1.6
10,	6	180	20.1
11,	5	270	22.7
12,	4	180	0.6
13,	2	180	T
14,	6	180	0
15,	6	180	0
16,	2	180	2.5
17,	5	180	0
18,	5	180	2
19,	3	140	16
20,	3	180	4
21,	3	140	0.6
22,	4	180	3
23,	4	180	0.6
24,	5	180	T
25,	2	180	T
26,	2	180	T
27,	3	180	T
28,	3	90	T
29,	2	180	T
30,	3	140	24.6
31,	5	180	0

Source : PAGASA

Legend : T - Trace

Table A-1

WIND AND RAIN DATA FOR GENERAL SANTOS - 1989

Sheet 5

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
Sept 1, 1989	6	160	0
2,	5	140	0.5
3,	4	140	2.8
4,	3	90	T
5,	2	140	0
6,	2	180	0
7,	2	180	1
8,	2	180	0
9,	-	220	0
10,	9	220	0
11,	7	220	0
12,	6	140	1
13,	5	140	1
14,	4	140	34.4
15,	5	180	T
16,	5	140	0
17,	1	180	0
18,	6	140	0
19,	2	340	0
20,	2	140	4
21,	1	40	0
22,	8	140	0
23,	5	140	1
24,	6	140	1.5
25,	6	140	0
26,	6	140	0
27,	5	140	0.5
28,	4	140	29.5
29,	6	140	T
30,	5	140	T

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
Oct. 1, 1989	5	180	3.2
2,	5	180	T
3,	2	320	2
4,	3	140	0
5,	6	180	T
6,	5	180	0
7,	3	180	0
8,	2	180	1
9,	2	180	2.9
10,	2	220	1
11,	1	180	0
12,	4	180	37.4
13,	2	360	0.2
14,	3	180	18.2
15,	3	140	0
16,	3	90	T
17,	3	180	3
18,	2	270	0
19,	2	180	0.4
20,	3	180	0
21,	5	180	5
22,	4	180	T
23,	2	180	0
24,	4	180	0
25,	6	180	10.7
26,	3	180	0.5
27,	5	180	2.8
28,	3	180	46.8
29,	3	180	0
30,	3	180	T
31,	5	180	0

Source : PAGASA

Legend : T - Trace

Table A-1
WIND AND RAIN DATA FOR GENERAL SANTOS - 1989
Sheet 6

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
Nov 1, 1989	3	180	1
2,	5	180	11
3,	6	180	0
4,	2	140	1
5,	6	180	0
6,	5	180	T
7,	3	180	0
8,	1	180	5.8
9,	5	140	T
10,	0	0	5.5
11,	4	140	7.6
12,	3	180	0
13,	2	140	4
14,	2	360	6.6
15,	1	180	2
16,	4	180	1
17,	2	180	0
18,	2	180	0
19,	2	180	0
20,	3	180	0
21,	3	180	0
22,	3	180	0
23,	6	180	0
24,	3	180	0
25,	2	180	4.8
26,	4	180	0
27,	7	180	0
28,	2	180	0
29,	1	180	T
30,	6	180	36

DATE	MAXIMUM WIND VELOCITY m/s	DIRECTION	RAINFALL (mm)
Dec. 1, 1989	3	220	0
2,	3	180	0
3,	3	180	0
4,	5	180	0
5,	3	180	0
6,	2	180	0
7,	5	180	T
8,	5	180	0
9,	4	180	0
10,	5	180	0
11,	5	180	4
12,	5	180	0
13,	4	180	3
14,	5	180	0.3
15,	5	180	3.5
16,	2	180	13.2
17,	2	180	0.4
18,	1	90	1
19,	3	360	0
20,	5	360	0
21,	3	360	0
22,	2	360	0
23,	3	180	0
24,	3	180	0
25,	5	40	0
26,	4	180	0
27,	2	360	1
28,	2	40	0
29,	2	40	0
30,	2	40	0
31,	4	40	0

Source : PAGASA

Legend : T - Trace