

Port Authority of Guam
(Government of Guam)



**New Master Plan
for the
Commercial Port of Guam**

Interim Report

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TAMS CONSULTANTS, Inc.
J. Agi & Associates, Inc.

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CHAPTER I

INTRODUCTION AND ECONOMIC BACKGROUND

INTRODUCTION

While Guam is the primary focus of the economic studies that are described in this report, the island also serves at the present time as a trans-shipment point and entrepot for other islands in Micronesia. Therefore, the economic prospects of the Commonwealth of the Northern Marianas Islands, the Federal States of Micronesia and Palau are also reviewed in this chapter.

Guam

Guam is the southernmost island of the Marianas chain of islands, located 3,300 nautical miles west of Hawaii--which makes it the westernmost piece of U.S. soil. It is the largest and most heavily populated island in Micronesia, with about 157,000 permanent and temporary residents living in 209 square miles. The original inhabitants of Guam and the other Marianas are the Chamorros, and Chamorro traditions are still very strong. Today, however, the population is a mixture of peoples with varying ethnic backgrounds, including Filipino, American, Spanish, Japanese and Polynesian.

With the landing of Ferdinand Magellan in 1521, Guam and the other Marianas islands were claimed by Spain, though that country had no permanent presence until the 17th century. Two and a half centuries of Spanish rule were ended in 1898 when Guam was ceded to the United States as a result of the Spanish-American War.

Until 1950, the island was administered by the U.S. Navy (except for the period of Japanese occupation in World War II). In 1950, Guam was placed under a civilian administration but the first governors were still appointed by the President of the United States. It was only in 1971 that the first elected governor took office. In addition to the governor, Guam has a unicameral legislature made up to 21 senators elected at-large for two-year terms. As a U.S. territory, Guam is represented in the House of Representatives by an elected, non-voting delegate.

Other Islands of Micronesia

Other islands in Micronesia of interest to this study are located in the Commonwealth of the Northern Marinas Islands (CNMI), the Federated States of Micronesia (FSM) and the Republic of Palau.

The Northern Marinas include Saipan, Tinian, Rota and four smaller islands. Total land area is 177 square miles and current population is about 42,000, including 18,000 aliens. The islands were also claimed by Spain during Ferdinand Magellan's voyage and permanent Spanish settlement dated from 1668. When Spain lost Guam in 1898, she sold the Northern Marinas to Germany, which held them until 1914, when they were taken over by Japan. At the end of World War II, the U.S. was granted trusteeship over much of Micronesia and until 1976 the U.S. interest in the Northern Marianas was largely military. The years 1976-1978 constituted a period of transition towards self-government, which was formalized in 1978 when the Commonwealth of the North Marinas Islands was established. In 1986, qualified residents of the CNMI were declared U.S. citizens.

The Caroline Islands, lying south of Guam and extending over 2,000 miles from east to west include the Federated States of Micronesia, with about 105,000 people on more than 600 islands which total 271 square miles, and Palau, with about 15,000 people living in an area of 178 square miles. The Carolines were also taken from Germany by Japan in 1914 and formed a part of the Japanese empire for about three decades. In 1945 the islands became a part of the Trust Territories of the Pacific Islands, administered by the United States under a United Nations trusteeship. Four of the five districts in the Carolines, Pohnei, Truk, Yap and Kosrae ratified a constitution in 1979 that established the present nation of the Federated States of Micronesia and also entered into a 5-year Compact of Free Association with the United States. In 1981, the fifth district, Palau, became the Republic of Palau but, to date, a formal treaty defining its relationship with the United States has not been ratified by the country's people. Thus, while Patau has a functioning elected government, its status remains unclear.

OVERVIEW OF GUAM'S ECONOMY

Present Situation

Guam is largely a service economy with most people employed by and deriving income from the service industries. There is no mining and very little manufacturing. The agricultural and fishing sectors are minuscule and stagnant.

The four major sectors of the economy, which generate most of the demand for commercial port facilities and services, are tourism, military activities, local private and public consumption and the construction industry. The first two sectors are exogenous to the local economy in that their level of activity is determined by forces over which Guam has little or no control. They also provide, directly or indirectly, most of the island's employment and income. The local consumption and construction sectors are in part reactive to the level of activity in the tourism and military sectors but also respond to such independent variables as the population growth and federal subsidies and grants.

In recent years, tourism has been the main engine of economic growth and progress. The growth of the tourist industry has fueled the boom in the construction industry, while the expanded employment and income generated by tourism and construction has raised per capita incomes and consumption by the island's population. Only expenditures by military installations in Guam has shown little growth during this period.

Future Prospects

Guam's economy has witnessed a rapid, double-digit rate of growth in recent years. The near-term outlook is excellent, mainly because of the continued expansion of tourism. Despite periodic efforts to diversify the economy by promoting exports and import substitution programs, it is generally agreed that, for the foreseeable future, Guam will remain service economy because of the lack of natural resources, small market size and relatively high labor costs.

Recently, the Government of Guam has moved to provide an economic policy framework to guide future development and agencies such as the Department of Commerce, Guam Economic Development Authority and the Territorial Planning

Commission are playing an active role. This appears to be a response to concerns expressed by local business representatives on the earlier lack of the goal-oriented economic policy. Officials have noted that, as yet, there is no direct linkage between economic policy and land-use planning and current land-use legislation, including zoning, needs to be updated in order to provide effective guidelines for development. The consequences of earlier passivity include localized shortages of potable water, inadequate sewers and power generation and distribution facilities, growing labor problems and regional development imbalances. There is also the more fundamental concern about whether economic growth at any cost is good for local population and whether unregulated inflow of foreign labor and capital will bring with it a gradual loss of cultural identity.

To grapple with these and other related issues, the Government of Guam has sought to redefine the socio-political situation of the island and to obtain for it the Commonwealth status. The proposed draft of the Commonwealth Act, now under review by the US Congress, would not only grant Guam a greater measure of political self-determination, but would also substantially change its economic relationship with the United States.

TOURISM

Tourism generates demand for port facilities in two ways. First, there are the material needs of the tourist themselves, including food, supplies, duty free goods, transport vehicles, etc. all of which have to be imported. The port area also provides space and facilities for water-related tourist recreation including open sea and dinner cruises, sightseeing, sport fishing, diving, sailing and so on. Only the first aspect of tourism is examined below. The tourist use of port facilities is reviewed in Chapter II.

Present Situation

Nearly 669,000 visitors arrived in Guam in 1989 including 659,000 by air and 10,000 by sea. Some 556,000--or 83%--came from Japan, followed by 43,000 or 6% from the United States and 23,000 or 3% from Northern Marianas. According to a survey conducted in 1989, more than 60% of all visitors to Guam are young (in their twenties) and are employed as administrative or office workers. They stay in Guam an average of four days and spend close to \$1,000

on local purchases, including over \$500 on merchandise. Most come to Guam because of the beautiful seas, proximity to Japan and attractive price.

Tourist travel from Japan has grown rapidly in recent years, averaging a growth rate of 13% annually since 1984. Much of it has been due to the affordability of foreign travel to most Japanese and to the fact that foreign travel from that country is only now beginning to have a mass appeal. It is believed that travel to Guam--now representing only 6% of Japan's foreign travel--could have grown much faster had it not been for the lack of hotel facilities on the island which kept the airlines from increasing flight frequencies.

Future Prospects

There are several major reasons for believing that tourism to Guam will continue its rapid growth during the period under review.

- (a) Favorite Destination: The residents of Japan and other Far Eastern countries like Guam. It is beautiful, it is U.S. soil, it is close and, for them, it is cheap. And, almost every day there is more for the tourists to do (and spend their money on). For many, it is their first foreign vacation.
- (b) Interest in Travel: The Japanese are increasingly able and willing to travel abroad. This has been mostly as a result of high personal incomes, favorable exchange rates and universal education.
- (c) Government Encouragement & Promotion: The Japanese Government is actively encouraging foreign travel as one way to reduce its foreign trade surpluses. Its official goal to send 10 million Japanese abroad by 1992 may already be attained in 1990. The U.S. Government, for its part, promotes Japanese tourism to Guam by waiving its entry visa requirements. Both the U.S. and Guam governments actively promote tourism in Japan and other Asian countries.
- (d) Business Investment: Japanese business has been investing heavily in Guam's tourist industry. In addition to 3,950 existing hotel rooms and 4,000 under construction, applications have been filed to build another 10,000 rooms by the year 2000. Japanese business has a vested interest in the success and growth of tourism in Guam.
- (e) New Markets: As more Far Eastern countries become prosperous and relax restrictions on foreign travel, their citizens have become interested in traveling abroad. The markets in South Korea, Taiwan, Hong Kong, Malaysia, Thailand and other countries have not

been seriously tapped until now, but their potential for Guam is great.

Based on the above, it is reasonable to assume a two-digit growth rate for tourism in the near-term with the slower and declining growth rates in the more distant future.

MILITARY INSTALLATIONS

Present Situation

(a) Background

Guam has been of direct interest to the military ever since the United States acquired the island from Spain at the turn of this century. At first, Guam served as a coaling station for US Navy ships, only to become a forward bastion of US defenses in the World War II. During that period and for many years thereafter, the whole island was in effect a US military base. Opened to the outside world in 1962, Guam remains home to major installations of the US Navy and the Air Force. Even today, the President of the United States has the authority to close Guam's commercial port and airport in peacetime without local consent or approval.

(b) Present Role

The Navy and Air Force, as well as a small Coast Guard contingent, are represented on Guam. The military contributes to Guam's economy in direct expenditures (\$445 million in 1988 compared with local government expenditures of \$277 million), income generation (approximately 44% of the gross territorial income in 1988) as well as civilian employment (about 6000 in 1988). Military installations occupy one-third of the island's land area and, together with military dependents, account for about 15% of the island's population. Because many military personnel live and shop off-base and their dependents hold jobs in the local economy, the integration of the civilian and military is widespread and thorough.

(c) Military Impact on the Commercial Port

In 1989, about 28% of all commercial port traffic consisted of military shipments. For the military, 85% of all its cargo and equipment moved through the commercial port. Military cargo brought to Guam is destined not only for the needs of local detachments but is also distributed by the US Navy supply ships to the US fleet at sea in the Western Pacific and Indian Oceans. Only ammunition, classified cargo and cargo transshipped to remote areas not served by US commercial carriers utilize the Navy's berthing facilities on the southern side of Apra Harbor. Demand for commercial port facilities on the part of the military is not only the function of the number of US military personnel on Guam but it also reflects the nature and changes in the military missions, weapons systems and military technology.

Future Prospects

(a) Near-term Developments

The level of military activity in Guam in recent years has been generally flat. The reduction in the USAF presence when the 3rd Air Division moved to Hawaii and the B-52G mission was changed to a conventional one, was partly offset by the addition of another US Navy vessel (USS Haleakala) to the fleet homeported in Guam. The total military population on the island declined from 23,600 in 1985 to 22,400 at the end of 1988. Another cut of about 1000 positions is expected when the USAF 60th Bomb Squadron and its B-52's is withdrawn from Andersen AFB later in 1990.

It is difficult to prognosticate the future of US military establishment in Guam, not only because of the very nature of military activities but also because of the rapidly changing geo-political situation in the world. In general terms, the recent easing of tensions in Europe and the demands for cuts in military spending suggest further decline in the overall level of military activities. On the other hand, the lack to date of comparable easing of military tensions in Asia and Guam's strategic role as the location of the most forward military bases in this part of the world on U.S. soil give reasons to believe that the military presence on the island will continue during the period under review.

(b) The Transfer of Subic Bay Naval Base
and Clark AFB to Other Locations

These two bases are major US military installations in the Philippines. They are home to 18,000 US military personnel and 20,000 dependents. They also employ 68,000 local civilian personnel. The base agreement between the United States and Philippines expires in 1991 and it now appears that it may not be renewed or that it will be substantially modified. Guam and Singapore have been mentioned as alternate locations for the two bases.

A total or even major transfer of these facilities to Guam is not possible for a number of reasons. Among those mentioned to the consultants, were the incompatibility of many military missions now performed by the two bases in the Philippines with the location and facilities in Guam. To illustrate, the size and draft of naval installations at Apra Harbor are insufficient to handle all naval vessels now using the Subic Bay. Guam also lacks adequate ship repair facilities and skilled personnel to perform ship repairs. Similarly, Andersen AFB could not provide the tactical support facilities available at the Clark AFB. Just as important is the fact that between them the Subic Bay and Clark AFB installations employ more local labor than the entire labor force on Guam and more than half of Guam's total civilian population. It is, however, reasonable to expect that should the Subic Bay and/or Clark AFB close, the existing military missions will be dispersed throughout the region including Guam.

CONSTRUCTION SECTOR

Present Situation

In Guam, construction is the principal form of investment activity and a barometer of the Island's near-term expectations. For the last few years, Guam has been in the midst of a construction boom which shows no signs of letting up.

According to the Department of Public Works, total construction expenditures from permits issued are expected to reach \$300 million in 1989, up 80% from the year before and up 445% from the level reached 10 years ago. The number of construction employees on payroll during the first quarter rose from 1240 in 1983 to 5910 in 1990. The latter figure is less than it could have

been because of the difficulties experienced by the industry in finding construction workers.

Construction industry in Guam can be grouped into four distinct categories including local residential and commercial, public works, military and tourism. According to an industry spokesman, in the most recent period tourism accounted for 40-50% of all construction activity including hotels, resorts, condominiums and golf courses. It was followed by private local construction (20-30%), mostly in residential units, office buildings and shopping facilities. Military construction done by private contractors, which consists of housing for military personnel, storage facilities and repairs, was third with some 20%, while the public works projects, including post offices, utilities, port expansion and road repairs came in last with about 10%.

Of the four segments, tourist construction has been most dynamic and has been almost totally financed by foreign (Japanese) investments. There has been also substantial activity in private local construction and public works projects. Only the military construction showed little growth in recent years and actually declined since 1987.

Future Prospects

All available information points to a quantum jump in the level of construction activity in the next ten years. The Governor of Guam recently stated that near-term growth could result, within a few years, in construction activities averaging \$800 million annually, compared with \$300 million in 1989.

According to an industry spokesman, the level of military construction should remain steady at about \$60 million annually and could actually drop if the current construction freeze continues. However, substantial growth in military construction will take place if the Naval Air Station is moved to the Andersen AFB or if some US military missions are transferred to Guam from other Western Pacific countries.

Tourism will remain the most dynamic segment of the construction industry. The proposed tripling of hotel rooms on Guam before the year 2000 will require an early and substantial expansion of construction activity and imports. And this does not include the anticipated construction of new condominiums, water-related resorts and 10 new golf courses.

A parallel, albeit somewhat slower, growth rate can be expected in public works construction to provide necessary infrastructure including water, power, sewers and roads. Substantial outlays will be needed not only to construct new facilities but also to repair and replace existing infrastructure some of which is quite old and undermaintained. This growth will be propelled, in part, by a recent \$53 million bond issue for public improvements, as well as a commitment by a consortium of developers to provide funding for needed sewerage and water distribution lines in areas where a number of hotels are planned or under construction.

There will be also continued growth in residential, office and commercial construction to upgrade existing homes, build new ones to accommodate future population growth and to provide office and commercial facilities for higher levels of economic and tourist activities.

LOCAL CONSUMPTION

Local consumption demand for imports needs to be defined before it is studied and projected. In essence, it is a residual category (total imports less imports by the military, the tourist industry and construction firms). It is local because transshipment demand for imports and exports is considered elsewhere in this report and it is called consumption because, apart from construction considered above, there is virtually no investment or export activity in Guam which would require imports of raw or semi-finished materials.¹ About 90% of all goods consumed locally are imported and virtually all of these imports are manufactured products for final consumption.

Local consumption demand for imports is determined primarily by the size and growth of population, employment, per capita income and the extent of import substitution programs.

Population

The current year (1990) is the decennial population census year and only estimates of the present population are available. According to these sources, Guam's permanent population numbers 131,000, excluding military personnel and dependents (22,400) and temporary migrant workers (3,400 in

¹ The only local industry importing semi-finished goods for manufactured exports is one small textile plant.

Septemer 1989). The US Bureau of Census estimates in its medium projection that Guam's permanent population will be 159,000 and 218,000 in the year 2000 and 2020 respectively.

Employment

For the past several years Guam's economy has worked under the conditions of full employment. The current unemployment rate of 2.3% is the lowest ever recorded by the Guam Bureau of Labor Statistics and lower than in any state in the United States. During the five year period ending in 1989, total employment grew at 8.6% annually and the employment in private sector at 13.8% annually. At 53,270 in September 1989, Guam's total payroll employment was at its highest level ever and everyone who wanted could find work.

Recently released official forecasts show further growth in total payroll employment with the sharpest increases projected for the tourist and construction industries (Table I-1). Already, serious labor shortages have emerged in both industries and it is reportedly not uncommon for some hotels to pirate employees from other establishments. To cope with this problem, the island will have to depend increasingly on migrant labor and on greater participation in the labor force by the homemakers, teenagers and the retirees. The Government has recently sent a mission to the Philippines to facilitate the movement of temporary migrant workers.

TABLE I-1
PAYROLL EMPLOYMENT FORECASTS

	March		Percent Growth
	1989	1992	
Total Payroll Employment	52,110	65,247	25
Public Sector	17,610	18,385	4
Private Sector	34,500	46,862	36
Construction	5,910	9,749	65
Tourism (hotels)	3,730	6,130	64
Other	24,860	30,983	25

Source: Bureau of Labor Statistics

Per Capita Income

Territorial Income accounting in Guam is still in its infancy and surrounded by a great deal of controversy. To illustrate, depending on the source and definition, per capita income estimates for 1988 ranged between

\$7,470 and \$20,200. The estimate used in this study employs the per capita adjusted gross income estimates for individuals, which have the advantage of being more consistent and offering longer historical trends.

According to this source, per capita income, unadjusted for inflation, had risen by 10.5% annually between 1983 and 1988. After adjustment for intervening price increases in the United States, where most Guam local consumption imports originate, the real per capita income grew at about 6% annually.

Import Substitution Programs

Projections of imports can be affected by import substitution programs which, in turn, depend on the current status and future prospects for Guam's manufacturing and agricultural sectors. A brief analysis of both sectors is presented below.

Manufacturing: Guam has no natural resources used in manufacturing and only a limited entrepreneurial tradition in industrial production. Its market size is too small and labor costs too high to allow it to compete with foreign goods at home and in the world markets.

According to the recent (1987) census of manufacturing industries, manufacturing sales actually dropped between 1977 and 1987 and, in 1987 accounted for only 5% of total business receipts.

Guam is a duty free port allowing opportunity to import materials for manufacturing duty free. It is also a participant in two major trade programs--Headnote 3(a) of the US Tariff Code and the Generalized System of Preference--both of which benefit export-oriented manufacturing. Despite these advantages, the island has failed to develop any viable industry, in part because of Customs restrictions on goods shipped to the mainland US. The proposed Commonwealth Act addresses many of the problems affecting Guam's manufactured exports to the United States and its passage should help the industry grow in the more distant future. In the meantime, there is a limited potential for capturing greater local market share through a cottage scale industry and handicraft manufacturing.

Agriculture and Local Fisheries are the smallest sectors in Guam's economy, accounting for less than 1.5% of the Gross Territorial Product. They have stagnated in recent years and the output of some major products has actu-

ally declined. The Island is far from self-sufficient in food production and depends on imports for most of its food supplies.

Agricultural development is a limited long term proposition. As long as its costs are high and production inefficient it will be less expensive to import food than to produce it locally. The potential for any exports of food faces the further obstacle of non-existent or inadequate pest control facilities.

Local fisheries are limited in output. There are only about four locally-based full-time fishermen. Most of the fish landed from Guam's nearby waters are from part-time fishermen and charter-boat owners, who may sell through the Guam Fishermen's Cooperative or directly to hotels, or may give their catch to friends. Nearly half these fish are reef fish caught a short distance from shore. Some larger fish may be caught on banks located 30 to 50 miles south of Apra Harbor. Local fishermen have commented on falling catches and the outlook for large scale fishing within Guam's waters is not bright.

One possibility for import substitution does lie in aquaculture. The Port is currently reviewing a proposal for a shrimp farm in Piti Channel and a report on aquaculture prepared by a senior staff member in the Department of Commerce foresees potentials for raising tilapia and shrimp at other sites.

OVERVIEW OF THE ECONOMY OF THE CNMI

Present Situation

The economy of the Commonwealth of the Northern Marianas Islands (CNMI) has certain similarities to that of Guam. It, also, is largely oriented towards services, with strong tourism and construction sectors, concentrated largely in Saipan. Government services also make up a significant proportion of the economy, albeit far less than in 1978 when government jobs accounted for 45% of all jobs--compared to 15% now.

The economy differs from that in Guam, however, inasmuch as Commonwealth status means that the CNMI is exempt from various U.S. laws, such as the Jones Act, minimum wage provisions and some immigration requirements. Because of these differences, plants for the manufacture of garments have been attracted to the CNMI and the transfer of frozen fish from purse seiners to transport vessels, which was a growing activity at the Port of Guam in the

early 1980's, is now done at Tinian. Also, under the Covenant with the U.S. Government in 1978 and a further agreement in 1985 the CNMI will continue to receive federal funds for capital improvements and government operations for most probably another 8-9 years, in addition to being eligible for all categorical federal programs available to the states and territories. As a result, the Commonwealth has considerable public sector-financial resources relative to its population and economic base. However, infrastructure needs are substantial--the road network dates from World War II, the water and sewerage systems need to be greatly expanded and new port facilities are essential.

Future Prospects

The population of the CNMI is quite young and a high rate of population growth is foreseen (among citizens). Because of its position on the learning curve, a relatively high rate of increase in productivity is foreseen in the CNMI's Overall Economic Development Strategy document.

Actual growth will stem primarily from the continued expansion of tourism and from expenditures for the construction of infrastructure and tourism facilities--the latter being made possible by Federal funds and outside investment. In the manufacturing sector, no further permits will be issued for plants to produce garments and it is intended that, over time, the aliens who make up most of the work force in these plants will be repatriated. Any growth in manufacturing, therefore, will need to come from improvements in productivity.

Restraints on economic growth include the present state of infrastructure, a small labor force that needs additional training and, perhaps, in the future, the fact that only about 18% of the land is privately owned and available for commercial development. In the near term, however, a continuation of the very high rates of growth experienced in recent years is foreseen.

OVERVIEW OF THE ECONOMIES OF THE FSM AND PALAU

Present Situation

The economic bases of the Federated States of Micronesia (FSM) and Palau are subsistence agriculture and fishing, a limited tourism and the

recycling of U.S. funds through government salaries and contracts for various services. The earlier subsistence economy that was self-sufficient has been replaced by one that is dependent upon imports. Thus, the economy of the FSM has become essentially a consumption-driven economy dependent upon payments from the U.S. under the Compact of Free Association. Before significant growth can be realized, a transition to a higher level of self reliance will be necessary and U.S. payments under the Compact are intended to assist in this transition. A minimum of 40% of the funds must be spent on capital projects, but so far almost all of these capital funds remain unspent. At this point, adherence to earlier traditions, the lack of institutions needed for a market economy, the lack of resources other than marine products and the fact that relatively small population is spread over several hundred thousand square miles of ocean makes a transition to a production economy very difficult.

In Palau, U.S. funds are limited, because of the failure to ratify a compact similar to that approved in the FSM but the tourism sector is beginning to grow as a result of a direct air link to Japan. Also, a Taiwanese group is investing in a fish transshipment facility in Palau to take advantage of the direct air link.

Future Prospects

The outlook for the FSM is one of rather slow growth, with increased spending for infrastructure as capital projects are developed and greater advantage is taken of the U.S. funds allocated for this purpose. While population growth rates in the FSM are relatively high, natural increase may be offset by out-migration. Already, Yapese and Trukese may be seen working in Guam in low-skill occupations.

Palau may grow more rapidly, particularly if its tourism sector should take off and closer links are forged with Japan. The institutional base for a market economy and the development of a skilled work force will still be needed, however. Rapid growth in the near future, therefore, is unlikely.

CHAPTER II

GUAM PORT TRAFFIC

SHIPPING SERVICES

Shipping services to Guam reflect its present status as an integral part of the United States that is also a consumer of more and more East Asian products and a center for the transshipment and re-export of goods to other islands in Micronesia. Also reflected is the growth of trade with Australia.

In discussing shipping services, it is necessary to take note of two factors which may affect the manner in which the Commercial Port is utilized. The first is that trade between Guam and the mainland United States is classified as domestic commerce. Therefore, the Merchant Marine Act of 1920, commonly referred to as the Jones Act, applies to this trade and the transport of goods is reserved to United States flag carriers. This means that foreign flag carriers cannot carry goods and merchandise between mainland U.S. or Hawaii and Guam even as part of longer trade routes linking the U.S. to the Far East, Australia and New Zealand. Normally, the vessels that are used would also have to be built in the United States but title 46, Section 11 of the U.S. Code allows foreign-built vessels to engage in trade between the mainland and Guam as long as they are U.S. owned--a fact that is important to American President Lines in the utilization of its J-9 vessels. One advantage of the commonwealth status that is being sought by Guam could be exemption from the Jones Act. Since the CNMI and American Samoa are already exempt from the provisions of this act, the feeling is that it could affect the costs of transshipment through Guam.

The second factor is that the rates of domestic carriers in the mainland U.S.-Guam trade are subject to regulatory control by the Federal Maritime Commission or, in the case of intermodal cargo, the Interstate Commerce Commission. Should Guam become exempt from the Jones Act, either through achieving commonwealth status or by other means, rates would be free of such controls. They would become subject to competitive pressures but presumably U.S. carriers would become eligible for operating differential subsidies on their Guam services, just as they are eligible now for such subsidies on their services to foreign ports. For destinations beyond Guam, domestic carriers are

members of steamship conferences which set the applicable rates. Whether such a conference would come into existence for Guam services, should exemption from the Jones Act be obtained, cannot be known at this time. It may be noted, however, on the trade between Guam and various ports in the Far East that is carried by foreign lines, these lines set their own rates.

Existing Steamship Services and Routes

At the present time regular service to Guam is provided by two domestic carriers in the mainland U.S.-Guam trade, four lines in inter-regional trade between Guam and the Far East and Australia and six lines in intra-regional trade between Guam and other islands in Micronesia. Two of the intra-regional lines operate joint services with the inter-regional lines and may be subsidiaries of those lines.

Mainline U.S.-Guam Services

(a) American President Lines

American President Lines (APL) operates three weekly services from the U.S. West Coast to the Far East. One of these weekly services calls at Guam on the westbound leg before continuing on to Taiwan and Japan. Cargoes on these routes are fully containerized. Typically, some 250-300 containers are off-loaded on each call at Guam and a like number are picked up. Forty-foot containers predominate, accounting for 82% of the total off-loaded at Guam. Another 10% are 20-foot containers and 8% are 45-foot. Fourteen percent of the containers are reefers, all of which are 40-foot long. While all inbound containers are full, only 25% of the containers picked up by APL vessels are loaded. As a rule each vessel tries to pick up all the empties consigned to it, since they are needed at Kaohsiung, the next port of call. However, because of tight schedules, they may on occasion be left for the following week's vessel.

Vessels used by APL on the Guam service at present are either C-8's, which have a capacity of 1,000 FEU's, or J-9's, which are foreign-built vessels with a capacity of 1,350 FEU's. The Commercial Port at Guam does not have a deep enough channel or enough depth at berth to accommodate C-9's or C-10's. If APL's application to serve Hawaii is approved, however, enough

containers would normally be off-loaded in Honolulu to permit a C-9 to come into Guam.

(b) Sea Land Services

Sea Land took over the Pacific routes and ships of United States Lines when the latter company went bankrupt two or three years ago. The weekly service to Guam departs from the U.S. West Coast and calls at Hawaii before coming to Guam. It then continues to Okinawa and Kaohsiung before returning to the U.S. The service, like all others of Sea Land is fully containerized. Normally from 200 to 250 containers are off-loaded at Guam and a similar number are picked up. Forty-foot containers account for 81% of all containers. About 15% are 20-foot containers and only 4% are 45-foot containers, though this percentage will rise in the future. Some 10% of the containers handled by Sea Land are 40-foot reefers. As with APL only about 25% of Sea Land's outbound containers are loaded.

The ex-U.S. Lines vessels operated by Sea Land on its service to Guam are older vessels, ranging from 670 feet to 813 feet in length. Most of them are in the Lancer class, which have a capacity of 650 FEU's, though the largest vessel, the Sea Land Trader, has a capacity of about 930 FEU's.

Far East-Guam Services

(c) Kyowa Shipping Company

This shipping line, based in Japan, operates five services between ports in the Far East and Guam. Two services, from Hong Kong, Keelung and Pusan and from Pusan, Kobe and Yokohama are tri-weekly. Another service, from Singapore and Manila, calls every four weeks and continues on to Saipan. Two monthly services operate from Kobe and Yokohama, call at Saipan before reaching Guam and then continue on to the FSM or, through a joint service, to Palau.

Almost all of the Kyowa vessels handle both break-bulk and containerized cargoes, with an average of 300 to 400 tons of break-bulk cargo and 75 containers being off-loaded on each call. Some Kyowa vessels, however, may carry virtually entire cargoes of neo-bulk commodities such as reinforcing steel, with typical cargoes of 3,000 to 4,000 tons plus a few containers on

deck. Almost 95% of the containers are 20-foot; there are few 40-foot containers. Containers aboard these vessels are generally handled by ships' gear.

Since the vessels used in these services may also serve smaller ports in Micronesia, they are much smaller than pure container ships and average about 5,000 g.r.t. and 350 feet in length.

(d) Kambara Kisen Co.

This line operates a tri-weekly service to Guam and Saipan from Pusan, Hong Kong and Keelung and under the names Palua Shipping Co. and Far East Micronesia Line continues on to Palau and Yap. The interval may soon be shortened to about 15 days with two vessels operating, each on a monthly schedule. This line also carries both containers and break-bulk cargoes aboard combination vessels. Containers are predominantly 20-foot and are typically handled by ships gear. The number of containers off-loaded in Guam on each call seems to be about the same as the Kyowa Line, though vessels of the Kambara Kisen Co. appear to be somewhat larger (about 7,500 g.r.t.) and the unitized break-bulk cargo recorded during a sample month in 1980 was about 1,650 tons.

(e) NYK Line

This major Japanese Line has normally operated a monthly service from Japanese ports to Guam, Saipan and ports in the FSM, which in combination with the service of the Kyowa Line has provided twice a month service to Pohnpei and other ports in the FSM. In recent months, however, NYK has had at least one vessel out of service and, therefore, has operated a joint service with Kyowa Line, using the vessel Asian Lily.

(f) Zim Israel Navigation Co.

An Australian subsidiary of Zim Lines operates a service linking Guam with major east-coast Australian ports and, through transshipment, ports in New Zealand. Service frequency is about 25-28 days. This service is operated with full container ships which are discharged with the Port's container cranes. Over 90% of the containers on this service are 20-foot. Approximately 100-150 containers may be off-loaded on each call. Vessels are modest in size, averaging a little over 500 feet in length.

Intra-Regional Services

(g) Saipan Shipping Co.

For a number of years Saipan Shipping Co. has provided a weekly barge-tug service to Saipan and Tinian. Approximately 30-40 containers are loaded out each week, containing transshipments or goods exported by suppliers in Guam. A similar number are unloaded, half of which may be empty but others may contain garments destined for U.S. markets or equipment and supplies returning to Guam. About 40% of these containers are 40-foot. In addition, small amounts of break-bulk cargo are carried--usually vehicles or construction equipment. The barges currently in use are 186 and 200 feet long.

(h) Seabridge Pacific Co.

Within the last year or so Seabridge Pacific Co. has established a competing service to Saipan and Tinian using comparable vessels. About the same number of containers are handled as on the Saipan Shipping Co. service and they appear to contain the same mix of goods. During the sample period, however, Seabridge Pacific Co. carried a higher proportion of 40-foot containers --about 56%.

(i) Angvuta Shipping Co.

This firm operates a single vessel between Guam and Rota, in the Northern Marianas, and provides a weekly service. Typical volumes per voyage are 6-8 containers and 50-60 tons of break-bulk cargo.

(j) Taputso-Saipan

This firm has operated an irregular service between Guam and Rota--handling only break-bulk cargoes which were generally loaded with a forklift truck. It appears, however, that this service has been suspended and it may have been replaced by a similar service started by another group in mid-1989. Vessels are less than 100 feet in length and cargoes average about 25 tons.

(k) Palau Shipping Co.

This company provides a service to Yap and Palau jointly with the Far East Micronesia Line and Kambara Kisen Co., using vessels of the last-named line; see (d) above.

(l) The Tiger Line

This line provides a joint service to Truk, Yap and Palau with the Kyowa Line, using vessels of that line; see c-4 above.

Summary of Services

Table II-1 on the following page provides a summary of regularly scheduled cargo services calling at Guam. In addition to these liner services, vessels may also call on an induced basis with specialized cargoes. Examples may include ro-ro ships discharging autos and light trucks, as well as vessels calling to discharge salt, basaltic and silica sand, etc. or to pick up scrap being exported to mills in East Asia.

Also, as discussed later in this chapter, a growing number of passenger vessels are either calling at Guam or are based here for several months of the year.

Finally, the Commercial Port is also used by two types of fishing vessels: purse seiners which are substantial vessels, averaging 200 feet in length and 1,060 g.r.t., that call at Guam to load provisions and salt plus fuel; and tuna longliners which discharge their loads of fish for air shipment to Japan and then load salt, ice and fuel for their next trips.

The impact of this mix of vessels and activities upon the facilities of the Commercial Port are discussed later.

PORT TRAFFIC - GENERAL

This section reviews the current port traffic, including both cargo and passenger movements. Only Commercial Port traffic is considered; cargo handled over private and military facilities is outside the purview of the master plan.

Cargo movements consist of three separate categories: domestic and foreign imports and exports, transshipments and fishing. This section describes

**TABLE II-1
EXISTING SHIPPING SERVICES**

Carriers	Frequency of Service	Type of Service	Routing or Area Served
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Domestic Carriers

a	American President Lines	Weekly	Containers	U.S. West Coast, Guam, Kaohsiung
b	Sea-Land Service Inc.	Weekly	Containers	U.S. West Coast, Honolulu, Guam Kaohsiung

Inter-Regional Carriers

c-1	Kyowa Shipping Co.	Tri-weekly	Mainly Containers Some Break-bulk	Hong Kong-Keelung-Pusan-Guam
c-2	Kyowa Shipping Co.	Tri-weekly	Mainly Containers Some Break-bulk	Pusan-Kobe-Yokohama-Guam
c-3	Kyowa Shipping Co.	Every 4 wks	Containers, Break-bulk	Singapore-Manila-Guam-Saipan
c-4	Kyowa Shipping Co.	Monthly	Containers, Break-bulk	Kobe-Yokohama-Saipan-Guam
c-5	Kyowa Shipping Co.	Monthly	Containers Break-bulk	Kobe-Yokohama-Saipan-Guam-Pohnpei Kosrae-Majuro
d	Kambara Kisen Co. and Far East Micronesia Line (plus Palau Shipping Co.)	Tri-weekly (now--may soon be monthly)	Containers Break-bulk	Pusan-Hong Kong-Keelung-Guam-Saipan
e	NYK Line	(Jointly with No. c-5 above at the present time)		
f	Zim Israel Navigation Co.	25-28 days	Containers	Sydney-Melbourne-Brisbane-Guam

Intra-Regional Service

g	Saipan Shipping Co.	Weekly	Containers Break-bulk	Guam-Saipan-Tinian
h	Seabridge Pacific Co.	Weekly	Containers Some Break-bulk	Guam-Saipan-Tinian
i	Angyuta Shipping Co.	Weekly	Containers Break-bulk	Guam-Rota
j	Taputso-Saipan	2-3/month	Break-bulk	Guam-Rota
k	Palau Shipping Co.*	Tri-weekly	Containers Break-bulk	Saipan-Guam-Yap-Palau
l	The Tiger Line**	Monthly	Container Break-bulk	Saipan-Guam-Truk-Yap-Palau

There are also induced calls for sporadic cargo requirements, such as various bulk commodities, some neo-bulk items, vehicles and scrap.

* Palau Shipping Co. and Far East Micronesia Line have joint services with Kambara Kisen Co. (see d above).

** The Tiger Line has joint service with Kyowa Shipping Co. (see c-4 above).

domestic and foreign imports and exports; then looks at transshipment and, finally, fishing.

Passenger traffic reviewed at the end of this section includes both cruise travel and the people and vessels that use the commercial recreational facilities located within Apra Harbor.

IMPORTS AND EXPORTS

The analysis of imports and exports considers their volumes, direction, composition and physical characteristics.

Traffic Volume

Historical growth trends in the volume of port traffic are presented in Table II-2. Since 1980, the total volume of imports and exports recorded by the Port has nearly doubled (from 656,000 revenue tons to 1,277,000 revenue tons) rising at 7% annually or more than three times as fast as projected in the last Master Plan.¹

Cargo information shown in the tables is produced by the Port of Guam Authority as part of its billing department's operations. It is recorded for fiscal years and is presented in terms of the tons shown on the bills of lading, which are normally revenue tons.² The fiscal year of the Port Authority runs from October 1st through September 30th of the following year.

Port records identify transshipments as those goods that are discharged from one vessel and loaded aboard another vessel without leaving the Port. The tonnage figures recorded by the Port show inbound transshipments separately from imports. However, transshipments are tabulated again as a part of exports and are thus counted twice. This is appropriate from a cargo handling standpoint but it means that the figures must be adjusted for the purposes of economic projections. Since transshipments represent the imports and exports of other countries or commonwealths, they must be subtracted from the recorded export figures before future imports and exports are forecast.

¹ Maruyama & Associates-Dravo Van Houten, Inc. Commercial Port of Guam Master Plan, Guam, February 1981.

² Revenue ton figures include a mixture of weight tons and measurement tons that results in the highest revenue to a ship owner and operator.

TABLE II-2

PORT TRAFFIC BY TRADE AREA
(000 Revenue Tons)

Fiscal Year	Imports			Exports(a)			TOTAL
	Domestic (U.S.)	Foreign	Total	Domestic (U.S.)	Foreign	Total	
1980	390,110	125,399	515,509	91,458	48,768	140,226	655,735
1981	463,432	138,959	602,391	132,335	38,213	170,548	772,939
1982	360,234	133,925	494,159	108,248	28,048	136,296	630,455
1983	365,527	223,322	588,849	130,768	42,936	173,704	762,553
1984	437,764	276,881	714,645	157,031	49,477	206,508	921,153
1985	459,033	273,921	732,954	127,003	58,476	185,479	918,433
1986	481,122	318,823	799,945	142,999	69,854	212,853	1,012,798
1987	461,230	330,447	791,677	146,299	92,248	238,547	1,030,224
1988	523,320	296,571	819,891	145,667	118,068	263,735	1,083,626
1989	650,747	348,732	999,479	154,792	122,324	277,116	1,276,595

(a) Exports include transshipments

Source: Port Authority of Guam

Review of port cargo data indicate the need for a further adjustment to net out what may be referred to as "hidden transshipments". These consist of goods contained in larger shipments consigned to distributors and dealers in Guam which are then re-exported to the other islands of Micronesia. Like the recorded transshipments, future growth in the volume of these "hidden transshipments" is dependent upon the economic prospects of these other island countries or commonwealths.

As a result of these adjustments, which are discussed later under transshipments, the following net figures are derived for 1989 imports and exports:

Imports:	975,700 rev. tons;
Exports:	125,100 rev. tons.

Unduplicated total transshipments in 1989 were about 152,000 rev. tons (see below).

Direction of Cargo Traffic

Table II-2 shows that nearly two thirds (63%) of Guam's domestic and foreign commerce in 1989 was with the United States of America. This compares with 73% in 1980 suggesting that Guam is becoming less dependent on its economic ties with the USA.

After the United States, Guam's major trading partners are Japan, South Korea, Taiwan and Hong Kong. Japan is the main source of vehicle and equipment imports, while South Korea and Taiwan provide most of Guam's construction material imports. All but a few thousand tons of the exports from Guam are commodities related to military activities destined mostly for the mainland United States but also for U.S. military installations in the Philippines and South Korea.

Composition of Cargo Traffic

Statistical reporting on the composition of imports and exports ceased after 1984. The Department of Commerce has recently resumed processing foreign trade data for 1988 but this information will not be ready in time for this study.

Because of this, an alternate method has been developed to classify exports and imports by their end use. Using a sample survey of the bills of

loading and other published sources, base year imports have been grouped into four major categories including the imports for the tourist industry, military installations, construction activity and for local (private and public) consumption. Using the same sample survey, over 90% of the exports have been classified as military-related cargo. The balance includes some miscellaneous foreign exports--frozen by-catch of tuna vessels, scrap metals, household goods, etc.--and the output of a single textile plant in Guam.

Based on this classification, the base year (FY 1989) imports and exports have been allocated as follows:

<u>Commodity Group</u>	<u>000 Rev. Tons</u>
<u>Imports</u>	
Tourist Industry	188.2
Military Installations	165.8
Construction Activity	146.4
Local Consumption	<u>475.3</u>
Total	975.7
<u>Exports</u>	
Military Installations	112.8
Locally Generated	<u>12.3</u>
Total	125.1
TOTAL IMPORTS & EXPORTS (ADJUSTED)	1,100.8

Physical Attributes of Import and Export Traffic

Physical attributes refer to the method of cargo handling. In Guam, most port cargo is containerized. In 1989, 81% of the total foreign trade cargo (including some transshipments) was containerized. This compares with 86% for 1980. The intervening decline in containerization rate can be explained by the fact that the US trade, which is fully containerized, grew more slowly than the trade with other countries (such as Japan, South Korea, Taiwan and Hong Kong) which still ship a substantial part of their cargo in conventional break-bulk or ro-ro vessels. The respective growth of containerized and break-bulk cargo during the 1980s is shown in Table II-3.

For containerized cargo, the preferred container type has been the 40' container. It represented over 80% of container movements on the Guam-USA route and 58% of all container cargo movements. In the Far East commerce, 20'

TABLE II-3

PORT TRAFFIC BY HANDLING METHOD
(000 Revenue Tons)

Fiscal Year	Container			Break-Bulk			TOTAL
	Imports	Exports	Total	Imports	Exports(a)	Total	
1980	444,085	118,733	562,818	71,424	21,493	92,917	655,735
1981	515,159	159,485	674,644	87,232	11,063	98,295	772,939
1982	410,223	128,767	538,990	83,936	7,529	91,465	630,455
1983	431,981	165,479	597,460	156,868	8,225	165,093	762,553
1984	516,214	194,039	710,253	198,431	12,469	210,900	921,153
1985	541,657	169,072	710,729	191,297	16,407	207,704	918,433
1986	601,849	200,799	802,648	198,096	12,054	210,150	1,012,798
1987	622,463	226,008	848,471	169,214	12,539	181,753	1,030,224
1988	657,281	242,748	900,029	162,610	20,987	183,597	1,083,626
1989	769,959	263,603	1,033,562	229,520	13,513	243,033	1,276,595

(a) Exports include transshipments.

Source: Port Authority of Guam

containers still predominate in part because of the lack of fully containerized vessels on these routes.

The distribution of container traffic by size during the 1980-89 period is shown in Table II-4. It can be observed that this period has also registered a significant growth in the largest (45') containers while other container sizes have virtually disappeared from port traffic. Not shown in the table is the breakdown of 40' containers into the conventional and reefer containers. The latter category accounted for estimated 12% of all 40' containers in 1989.

Transshipments

Transshipments recorded by the Port in 1989 totalled 99,738 rev. tons, including 71,788 rev. tons coming in from the mainland United States and 27,950 rev. tons arriving from foreign ports, including the Far East, Australia and the CNMI. As discussed above, this figure does not include "hidden transshipments" which are goods consigned to distributors and dealers in Guam that are then re-exported to other islands in Micronesia. Also, a minor adjustment is needed to allow garments which are included in domestic exports as revenue tons but tabulated under inbound transshipments from foreign ports as weight tons, to be included in the final total as revenue tons.

As a result of the detailed tabulation of two sample months it has been determined that, except for about 8,300 rev. tons of miscellaneous exports to the Far East, all foreign exports are, in fact, transshipments, either explicit or "hidden". Therefore, if 90,200 rev. tons (which represents inbound transshipments tabulated by the Port minus the estimated weight tons of garments coming in from the CNMI) and 8,300 rev. tons of miscellaneous exports are subtracted from total foreign exports of 122,300 rev. tons, the result is an estimate of "hidden transshipments" in 1989 of 23,800 rev. tons. Transshipments of garments from plants in the CNMI to the U.S. mainland was about 38,000 rev. tons in 1989. Adding these three components, yields the following estimate of unduplicated transshipments:

Tabulated inbound transshipments (adjusted)	90,200 rev. tons
"Hidden" transshipments	23,800
Transshipped garments	<u>38,000</u>
TOTAL TRANSSHIPMENTS	152,000 rev. tons

TABLE II-4
CONTAINERS HANDLED BY SIZE
 (Number of Containers)

Fiscal Year	Other	20-Foot	27-Foot	40-Foot	45-Foot	Total
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UNLOADED

1980		8,219	476	13,030		21,725
1981		8,652	113	16,992		25,757
1982		6,943	52	14,013	28	21,036
1983		7,972	64	14,573	127	22,736
1984		9,062	38	15,545	364	25,009
1985		8,579	17	16,062	299	24,957
1986		10,530	18	17,338	358	28,244
1987	13	12,485	1	22,935	500	35,934
1988	14	13,234	2	19,924	1,011	34,185
1989	3	13,314	1	20,476	1,577	35,371

LOADED

1980		8,198	677	12,934		21,809
1981	4	8,731	127	17,041		25,903
1982		6,829	54	13,885	28	20,796
1983		7,772	62	14,480	127	22,441
1984		9,251	38	15,509	348	25,146
1985		8,231	19	15,879	315	24,444
1986		10,356	15	17,508	365	28,244
1987	12	11,815	1	22,333	488	34,649
1988	13	13,229	3	20,174	988	34,407
1989	1	12,881	1	19,911	1,561	34,355

FISHING ACTIVITIES

Three types of fishing vessels utilize facilities in Guam and each represents a very distinct fishery. Two of these vessel types use facilities in the Commercial Port.

In 1980 a number of purse seiners called at the Port for the purpose of transferring their catch, consisting primarily of skipjack tuna, to reefer vessels destined to canneries in the Far East and elsewhere, as well as for reprovisioning and refueling. Because of the search for lower costs and, for U.S. owners, relief from taxes, the transfer of fish is now done at ports such as Tinian, where 130,000 tons of fish were transferred last year, or at sea. Purse seiners still call at Guam, however, for reprovisioning, refueling, repairs and rest and recreation for their crews. In fiscal 1989, 338 visits by purse seiners were recorded, with an average stay of 3-1/2 to 4 days. Reprovisioning by purser seiners may account for about 20,000 tons each year of food and provisions and perhaps 12-15,000 tons of salt.

Beginning in 1986 Japanese, and now Taiwanese, longliners have called at Guam to land their catches of yellowtail and bigeye tuna, which are long-lived species marketed in Japan for sashimi. It is a market in which freshness and quality are paramount and Guam has grown as a port for this fishery because of its excellent air service to Japan and its proximity to prime fishing areas within the waters of the F.S.M. According to the Fresh Tuna Longline Transshipment Study of the spring of 1989, about 120 Japanese and 45 Taiwanese longliners, plus a few of other countries regularly unload their catch in the Commercial Port. In fiscal 1989 the Port recorded 1,293 visits by these vessels. There are some differences in fishing techniques and the proportion of the two tuna species caught by each. The Japanese boats are larger and may bring in 16-20 tons on each trip; they bait more hooks when setting their lines and fish deeper. The Taiwanese vessels have less capacity, only 8 to 10 tons per trip, they bait fewer hooks and fish shallower. As a result, they may catch more bigeye tuna. Each group believes that its technique results in a higher quality catch.

The vessels operate on roughly a three week cycle, though the Japanese vessels may be out longer than the Taiwanese boats, given their higher capacity, and at the end of each trip they spent roughly 3½ to 4 days in Guam. On any given day there may be 25 to 30 longliners in the Port. The fish are

unloaded in the early evening and, after they are graded, placed in specially designed boxes and loaded into Conex containers. Planes to Japan leave in the early morning and within a day or so each captain knows the price his boat's fish have received on the market. The longliners purchase relatively few provisions in Guam but they do buy some fresh foods, ice, and fuel for their next trips.

U.S. Customs requires documentation of the fish that are landed but there are problems in the paper trail so that overall data on the tonnages, as well as other information of economic or biological interest is not readily available. In 1988 about 6,800 tons of tuna were airshipped to Japan and in 1989 the figure was between 7,000 and 8,000 tons.

The third type of fishing is local fishing, including charter fishing, in the waters around Guam. A range of species are caught, including various reef fish, mahimahi, wahoo and blue marlin. Most of the local fishermen are part-time or operate and crew charter boats. There are only four full-time commercial fishing vessels. Fish that are caught may be sold through the Guam Fishermen's Cooperative, sold directly to hotels or given to friends and relatives. Recorded tonnages are relatively low, fluctuating between 320 and 500 tons during the past six years.

All but a few of the vessels engaged in local fishing are based in the Agana Marina. This facility will be discussed later, together with various water sports activities.

PASSENGER TRAFFIC

Apra Harbor has become a port of call for a number of larger cruise ships. Nineteen such ships totalling 209,700 g.r.t. and carrying over 9,000 passengers called in Apra in 1989 as shown in Table II-5. In addition, a 120 passenger cruise ship homeported in Apra between January and April of each year, offers four and five day cruises to Saipan, Rota and ports in the F.S.M.

The U.S. Coast Guard, which certifies and periodically inspects all larger passenger vessels homeported in Guam, reports that there were 20 commercial passenger vessels homeported in Guam in early 1990. They included the cruise vessel noted above, motor ships, catamarans and trimarans, dive boats,

TABLE II-5
PORT OF GUAM
PASSENGER SHIP TRAFFIC IN 1989

Name	GRT	Nationality	Passen- gers	TIME IN PORT				Itinerary (Ports of Call)
				Arrival		Departure		
				Date	Time	Date	Time	
Utopia	9,587	Japanese	450	1/9	11:54	1/10	19:05	Japan - Saipan
New Utopia	11,564	Japanese	500	1/10	08:11	1/12	12:17	Saipan - Sendai
Sunflower #7	7,511	Japanese	500	1/10	06:53	1/11	20:35	Sendai - Saipan
Sunflower #7	7,511	Japanese	300	2/8	07:50	2/9	21:57	Japan - Saipan
Sunflower #7	7,511	Japanese	300	3/5	07:00	3/5	08:00	Saipan - Japan
New Utopia	11,564	Japanese	590	3/29	07:07	3/29	21:00	Japan - Saipan
Utopia	9,587	Japanese	584	3/30	07:16	3/30	20:35	Japan - Saipan
New Utopia	11,564	Japanese	517	5/3	05:55	5/3	17:05	Saipan - Japan
Nippon Maru	11,564	Japanese	522	5/3	10:24	5/3	22:06	Japan - Saipan
Fair Star	21,620	Australian	1,149	6/12	06:57	6/13	20:02	Japan - Britain
Nippon Maru	11,564	Japanese	485	7/26	12:00	8/3	12:00	Japan - Japan
Coral Princess	9,639	Hong Kong	400	7/29	10:01	7/31	21:06	Japan - Saipan
New Utopia	11,564	Japanese		8/9	07:00	8/10	20:33	
Utopia	9,587	Japanese	500	8/8	08:00	8/9	20:00	Japan - Saipan
Sunflower #7	7,511	Japanese	315	8/13	12:46	8/14	21:58	Japan - Saipan
Fairstar	21,620	Australian	450	10/27	08:19	10/27	20:18	Britain - Japan
Utopia	9,587	Japanese	584	12/27	20:35	12/28	20:33	Sendai - Saipan
Sunflower #7	7,511	Japanese	500	12/29	07:26	12/31	21:00	Sendai - Saipan
New Utopia	11,564	Japanese	500	12/31	07:07	12/31	18:00	Japan - Saipan
Total Vessels: 19	209,730		9,146					

cabin cruisers, launches and one submarine. A list of all commercial passenger vessels homeported in Apra is shown in Table II-6. The total passenger carrying capacity of these vessels is 1,096 passengers, excluding three launches contracted by the U.S. Navy to provide passenger transport within the port area. Aside from one berth that is regularly used by commercial passenger vessels, the Apra Harbor area includes the Harbor of Refuge and another marina in the Piti Channel, one private yacht club on Drydock Point, and a marina for military personnel, all of which are used by commercial and privately-owned recreational craft.

Future Trends

A substantial increase in the number of commercial passenger vessels and in the passenger carrying capacity is planned by companies using the Apra Harbor area. During 1990, as many as six new vessels with a total capacity of 2,106 passengers may be based in the Harbor during at least part of the year, if space can be found to berth them. They, too, are listed in Table II-6. The list includes only those vessels which have advised the U.S. Coast Guard of their plans to use Apra Harbor. Several new large cruise ships have also made plans to call Guam in 1990.

TABLE II-6
COMMERCIAL PASSENGER VESSELS
HOMEPORTED IN APRA IN FEBRUARY 1990

Name of Vessel	Type of Vessel	Passenger Capacity	Type of Activity	Remarks/Location
<u>I. EXISTING</u>				
Micronesia Dream	Catamaran	149	Day & Evening Cruises	Apra Harbor
Polynesian Princess	Power/Sail	149	Day & Evening Cruises	Apra Harbor
Stars & Stripes	Catamaran	149	Day & Evening Cruises	Harbor of Refuge
Umidori	Trimaran	49	Sightseeing & Snorkeling	Harbor of Refuge
Umidori II	Trimarin	49	Sightseeing & Snorkeling	Harbor of Refuge
Sea Odyssey II	Monohull	60	Sightseeing & Diving	Harbor of Refuge
Oz	Catamaran	36	Sightseeing & Snorkeling	Harbor of Refuge
Iruka	Monohull	54	General Recreation	Harbor of Refuge
Helsal	Sail	49	General Recreation	Apra Harbor
Pura Vida	Sail	32	General Recreation	Harbor of Refuge
Chamorrta	Monohull	49	Diving & Sightseeing	Harbor of Refuge
Revenge	Monohull	20	Diving & Sightseeing	Harbor of Refuge
Sea Odyssey	Monohull	24	Diving	Harbor of Refuge
Reef Runner	Monohull	12	Diving	Harbor of Refuge
Z Best	Cabin Cruiser	49	Charter Fishing	Harbor of Refuge
Atlantis V	Submarine	46	Underwater Sightseeing	Harbor of Refuge
Oceanic Grace	Cruise Ship	120	Multi-Day Cruises	Apra (Jan-Mar only)
Sub-Total		1,096		
<u>II. PROPOSED</u>				
Sound of Seto	Cruise Ship	800	Multi-Day Cruises	Apra (High Season only)
Courageous	Excursion	799	Harbor Cruises	N/A
JAL/Pacific Star	2 Catamarans	2x149= 298	Day & Evening Cruises	N/A
Micronesia Dream II	Catamaran	149	Day & Evening Cruises	N/A
Ocean Fast	Hydrofoil	60	Coastal Tours & Diving	Apra Harbor
Sub-Total		2,106		
TOTAL		3,202		

CHAPTER III

PORT TRAFFIC FORECASTS

GENERAL

Port traffic forecasts have been prepared from three different perspectives, each of which is needed for the port master planning process. Initially basic, best judgment estimates of the future volume of port traffic have been prepared. These estimates have been made separately for major cargo flows including imports, exports, transshipments and tuna fishing. Next, these forecasts have been expressed in terms of cargo handling characteristics as container and break-bulk/neo-bulk cargo. Finally, alternative cargo forecasts have been developed to estimate the effects of other less likely but nevertheless possible, development scenarios.

The basic approach to port traffic forecasting used herein has been to segment major cargo flows into subgroupings with common economic characteristics. For each subgrouping one or more independent socio-economic variable has been identified which helps explain and predict its future trend. Individual segments for the period under review have been projected and then aggregated to arrive at the combined port traffic forecast.

Only cargo forecasts are presented here. The outlook for cruise passenger traffic and water-related tourist activities in Apra Harbor and elsewhere is discussed elsewhere in this report.

BASIC FORECASTS OF IMPORTS AND EXPORTS

Total Imports in Base Year

Imports are the single most important cargo flow at the Commercial Port, accounting for over 70% of the total port traffic in fiscal 1989. They have been segmented into the following four major subgroupings as follows:

<u>Subgrouping</u>	<u>FY 1989</u> <u>000 Rev. Tons</u>	<u>Percent</u> <u>of Total</u>
Tourist Industry	188.2	19.3
Military Installations	165.8	17.0
Local Consumption	475.3	48.7
Construction Activity	146.4	15.0
Total	975.7	100.0

As noted earlier, imports comprise only the commodities consumed in Guam. Commodities imported into Guam for subsequent re-export to Micronesia are handled as transshipments.

Tourist Industry Import Forecasts

Base Year Estimates

The method used to estimate the figure shown above for base year imports by the tourist industry is presented below.

Base Year (FY 1989) Estimates for Tourist Industry

Total tourist expenditures:	
668,700 tourists x \$944 per tourist	\$631,253,000
Value of imported inputs (from SRI study): \$631,253,000 x 22%	\$138,876,000
Unit value of imports--updated from 1983 commodity data (\$/ton)	\$738
Volume of tourist industry imports (tons)	188,197
Total volume of imports (tons)	975,700
Tourist industry share of total imports	19%

Sources: Stanford Research Institute, Economic Benefits of Tourism to Guam, Menlo Park CA 1986; Merrill & Associates, Visitor Exit Survey, Guam 1986; Department of Commerce; Port Authority of Guam; Guam's Visitors Bureau; U.S. Department of Commerce.

Based on the above, the tourist industry imports are estimated at 188,200 tons in FY 1989. This is a conservative estimate as it is based on direct tourist expenditures and does not take into account hotel imports (supplies, replacements, etc.) that may be included in the hotels' overhead costs.

Forecasts

Tourist expenditures are a function of the number of tourists and their per capita expenditures. Guam is the favorite destination of younger, lower income Japanese tourists. This trend is expected to continue, particularly if

Guam is successful in opening new tourist markets in other less affluent Asian countries. If this is the case, future tourist expenditures will reflect primarily the growth in the number of tourists.

Despite its remarkable growth in recent years, Guam's tourism potential has been limited by the lack of tourist facilities. As a result, there is at present a substantial pent-up demand in Japan for Guam vacations which will materialize once the various hotel and resort projects now under construction are finished and opened for business. It is assumed here, probably conservatively, that the number of visitors to Guam will rise as follows:

1989-1995	12% annually
1995-2000	9%
2000-2005	6%
2005-2010	3%

This compares with the actual average annual growth of 13% during the 1984-89 period.

Military Installation Import Forecasts

As reviewed earlier in this report, there is very little known about the plans for the military installations on Guam. Even the spokesmen for the military establishment profess to be baffled by the rapidly changing geo-political and military situation in the world and the Pacific region.

In view of past trends and future uncertainties, it is most reasonable to assume status quo in the level of military use of commercial port facilities during the period under review. This "no growth" assumption underlies our best judgment forecast for the military component of the commercial port traffic.

Local Consumption Import Forecasts

Local consumption imports are determined primarily by the growth of population, of real per capita income and import substitution programs. According to forecasts presented earlier in this study, Guam's population is projected to rise at 2% annually through the year 2020 and not much can be expected from import substitution programs in manufacturing and agriculture.

It is more difficult to project the real per capita income growth. As we have seen, the real (adjusted for inflation) per capita income of individuals has grown at 6% annually in recent years. Much of this growth can be

explained by the rapid rise in employment and income of the tourist industry, offset only in part by the lagging growth of civilian employment and income from the military installations on the Island. It is reasonable to assume that the future development in those two exogenous sectors will bracket the growth of individual per capita incomes. Taking this approach, the real per capita income should grow at rates that may gradually decline from 5.5%-6.0% in the 1989-95 period to 2% in the 2005-10 period. Combined with the projected population growth, the effective demand for local consumption imports will rise as follows:

<u>Period</u>	<u>Average Annual Growth Rate</u>
1989-1995	7.7%
1995-2000	7.0
2000-2005	5.6
2005-2010	4.0

Construction Import Forecasts

According to the sample survey of consignees conducted as part of this study, some 15% of imports through the Commercial Port in FY 1989 were destined for the construction industry. This may be on the low side, as not all construction imports were consigned to the construction firms.¹

Based on the volume of building projects and allowing for the fact that not all projects will be implemented, it seems reasonable to expect that construction in the tourist sector (45-50% of the total), will grow initially (1989-95) faster than tourism itself to meet the backlog demand. Later, this growth should approximate the expected growth in tourism.

For military construction (20% of the total), there may be a slight decline in 1990 because of the recently declared construction budget freeze, to be followed by a constant level of construction activity.

The growth in residential construction (25% of the total) will reflect primarily the projected population growth with some adjustment for improvements and housing for migrant labor. These latter variables are difficult to predict with any degree of accuracy. Hence, it is simply assumed that the

¹ These estimates exclude cement imports which are unloaded over privately-operated port facilities.

combined effect of all variables will result in an annual growth of 3% during the period under review.

Local public works construction (10% of the total) will grow fast during the 1989-95 period and slower later on. Its growth is estimated at half way between the growth of tourist and residential construction.

The combined growth rate for individual subsectors of the construction industry will be as follows:

<u>Period</u>	<u>Average Annual Growth of Construction Imports</u>
1989-1995	9.4%
1995-2000	6.8
2000-2005	5.0
2005-2010	3.0

These are long-term trend forecasts. In reality, the construction industry and its imports are very cyclical. Actual imports in any one year may be considerably higher or lower than suggested by the forecast.

Summary Import Forecasts

Table III-1 summarizes basic, best judgment import forecasts for the Commercial Port. According to this table, imports through the Port will rise from 975,700 revenue tons in FY 1989 to over 3.2 million tons at the end of the review period.

TABLE III-1
IMPORT FORECASTS FOR THE COMMERCIAL PORT
(000 Revenue Tons)

<u>Year</u>	<u>Tourist Industry</u>	<u>Military Installations</u>	<u>Local Consumption</u>	<u>Construction Activity</u>	<u>Total Imports</u>
1989	188.2	165.8	475.3	146.4	975.7
1995	371.5	165.8	733.4	250.9	1521.6
2000	571.7	165.8	1026.7	348.6	2112.8
2005	765.0	165.8	1348.1	444.8	2723.7
2010	886.6	165.8	1640.7	515.5	3208.6

Exports

Roughly 90% of the true exports from Guam are military goods including personal vehicles, household goods and equipment being sent back to the United

States. The remaining 10% consists of a small volume of garments processed locally and a range of miscellaneous items, including scrap metals, frozen fish (by-catch and tuna rejected from sashimi shipments), household goods, etc. Most of the exports are not expected to grow in the future: the military exports because of expected budget cuts and longer tours of duty, the garments because of the U.S. Customs quotas and the fish for reasons noted below. Exports of scrap and some other items may grow with the economy but these make up a small fraction of total exports. In the long run, the Commonwealth status for Guam and the general rise in the prosperity of the region may encourage local manufacture for exports.

The combined effect of these divergent trends will probably mean little change in the overall volume of exports during the period under review. Accordingly, no export growth is assumed initially and only marginal increases thereafter. Total exports will rise from 125,100 revenue tons in FY 1989 to 168,000 revenue tons in the year 2010.

BASIC FORECAST OF TRANSSHIPMENTS

Transshipment volumes may come from two sources--one is continued transshipments of goods to other areas of Micronesia, particularly the CNMI, the FSM and Palau; the other would be the possible growth of Guam as a location for receiving goods, either in larger shipments or from a number of sources, processing or assembling them and re-exporting them to other countries around the Pacific Rim.

Transshipment to/from Other Micronesian Islands

The three major sectors of the economy of the Commonwealth of the Northern Marianas Islands are tourism, construction and general consumption. A fourth sector, the manufacture of garments, is discussed below. Also, there is a military presence on Tinian but it is relatively small.

During the 1990-1995 period, tourism demand is expected to remain very strong and new facilities are being developed to meet this demand. A continued growth rate of 13% is forecast. Propelled by the demand for new hotels and a major program of infrastructure development, funded in part by Covenant funds, the estimated growth rate for the construction sector in this period is at least 15%. Other sectors of the CNMI's economy may grow at a more moderate

Port Authority of Guam
(Government of Guam)



**New Master Plan
for the
Commercial Port of Guam**

Interim Report

March 1990

TAMS CONSULTANTS, Inc.
J. Agi & Associates, Inc.

rate and based on the Commonwealth's Overall Economic Development Strategy, a rate of 6% is estimated. The weighted average of these three growth rates is about the same as the rate that would result if the Overall Economic Development Strategy targets for productivity increases are met and the total population grows as projected. Averaging these two approaches indicates a growth rate for the economy and for imports of 9.8% annually to 1995.

In subsequent years population growth is projected to moderate, as natural increase slows and some alien workers are repatriated. Some slowdown in productivity increases is also assumed, so the resulting growth rate for the 1995-2000 period is 7.3% annually. After the year 2000, population may continue to grow at a lower rate and productivity increases will slow further. The resulting growth rate for the year 2000 to 2010 period is 5.3% annually.

The transshipment of garments manufactured in the CNMI is expected to grow no faster than increases in productivity, since no new plants are being permitted. The volume of transshipped garments, therefore, will grow at the rate of 6% until 1995, 3% from 1995 to the year 2000 and zero thereafter.

The new port project in Saipan, referred to as "Charlie Dock", is expected to be completed by 1994 or 1995. With more goods originating in the Far East, this will allow more direct shipment of goods to the CNMI rather than transshipment through Guam. Therefore, it is assumed that the volume of transshipped goods destined for CNMI will begin to decline in 1996; and the year 2000 about 50% will have been lost. In the following years Guam will continue to transship about half of what it would have without port improvements in Saipan.

Given the slow growth forecast for the economies of the Federated States of Micronesia and Palau, it is assumed that total exports and transshipments to these islands will grow at a rate of 1% above the rate of population growth. This allows for some investment in infrastructure funded by U.S. funds under the Compact of Free Association. The current rate of population growth in the FSM is about 3.4% annually; in Palau it is only 0.7% annually. These growth rates are based on projections prepared in 1988 by the South Pacific Commission and presumably they reflect current levels of out-migration. A weighted average figure of 4.2% annually is used for estimating the level of future transshipments and re-exports to the FSM and Palau.

It is also assumed in the basic forecast that the interplay of competitive factors and new entrants into the trade between Honolulu, Micronesia and Guam will be such that Guam's share of transshipments to the FSM and Palau will not increase or decrease.

The basic, best judgment estimates of future transshipments via Guam to and from the CNMI, the FSM and Palau that result from the above considerations are as shown in Table III-2.

TABLE III-2
TRANSSHIPMENTS TO/FROM OTHER ISLANDS OF MICRONESIA

	Revenue Tons			
	1990	1995	2000	2010
CNMI (excluding Garments)	95,100	151,000	108,000	180,900
Garments	40,300	53,900	62,500	62,500
FSM, Palau, etc.	28,600	35,100	43,100	66,300
	164,000	240,800	213,600	309,700

Potential of Guam as a Transshipment Center

Guam's potential as a center for the transshipment of goods moving between the U.S. mainland and various countries in the Far East, Southeast Asia, Australia and New Zealand was discussed at some length in the 1981 Master Plan for the Commercial Port.

The geographic factors pointed out in that earlier report and what they mean, in terms of voyage distances, sailing times and costs, have not changed in the intervening decade. The overall geopolitical situation and the size and structure of Guam's economy have, of course, changed significantly.

In terms of Guam's potential as a major transshipment center, changes in its economy since 1980 would tend to further reduce this potential. Guam has evolved as primarily a service-oriented economy with generally higher costs than surrounding countries and territories. Unemployment is very low and no large pool of semi-skilled or skilled labor exists. Furthermore, Guam is still subject to the provisions of the Jones Act, though this may change if Commonwealth status should be achieved. The fact that Guam's manufacturing sector consists of one small plant and a few cottage industries is testimony to the fact that prospects are rather poor for significant processing of raw

or intermediate materials into finished goods. Such processing would be a necessary adjunct to large-scale transshipments, inasmuch as geographic factors militate against the use of Guam as a Western Pacific transshipment center.

Given their protected status under the Jones Act, discussions were held with the local and headquarters personnel of both U.S. carriers regarding the potential for feeder services and related transshipment activity based at Guam. Outside of limited interchanges (e.g. APL might bring in some containers destined for Okinawa that would be loaded out on Sea-Land ships for shipment to their destination) the likelihood of transshipment at Guam, in conjunction with feeder service is considered to be minimal. What is considered more likely is that one of the trans-Pacific services may stop at Guam on the eastbound leg, thus competing with Japanese and other carriers in carrying goods from Eastern Asian ports to Guam.

Offsetting Guam's relatively high costs and small pool of available labor is a reasonably well-developed infrastructure and network of support services, including excellent communications. For this reason, Guam may grow as a business and financial center for U.S. Firms doing business in Asia. Already, there are some 300 Foreign Sales Offices, which have located in Guam to take advantage of the tax benefits offered, and the Guam Economic Development Authority (GEDA) is involved in promoting an office complex in the area of the old Guam hospital. While prospects are bright for this type of activity, few, if any, physical shipments would be involved. GEDA is also pressing for the development of some light industry as an alternative to tourism but, once again, these would be industries in areas such as watch assembly or robotics, which would depend more on airfreight than waterborne shipments.

Outside of the new exports that are considered possible later in the planning period, significant volumes of transshipments to places other than the other islands of Micronesia are not foreseen.

FUTURE SHIPMENTS OF FISH

The volume of fish landed at Guam and shipped to other destinations is governed much more by relative costs at Guam and competing ports and by various exogenous factors than it is by such variables as the growth of the market or, in the short term, overall harvests and potential yields.

As an example, it was noted earlier that what had been a growing activity at the Commercial Port, the transshipment of frozen tuna from purse seiners to reefer containers, declined and ended in the mid-1980's. High labor costs in Guam played a role but much more important was the failure of canneries in United States, which were replaced by canneries in American Samoa and Southeast Asia. As a consequence, U.S. flag vessels were replaced by those sailing under foreign flags and transshipment now takes place in Tinian, where port charges and labor costs are lower and tax exemptions are available or transfer may take place at sea.

Because of its existing port infrastructure, network of agents and frequent flights to Japan, Guam has now, however, become a major transshipment point for chilled fresh tuna destined for sashimi. Approximately 165 longliners use Guam for air shipment of their tuna catches and some operators and their agents are quite optimistic about further growth. Others, however, cite the restraints upon growth and the threats to Guam's position. These include recently enacted limits on the number of Japanese vessels allowed to land fish outside of Japan, investments by Taiwanese entrepreneurs in alternative transshipment facilities in Palau and technological changes, such as blast freezing to supercold temperatures that would remove the time constraint on getting the fish to market. It is not impossible that the current activity of transshipping chilled tuna at Guam could disappear as quickly as it came.

Consequently, it is very difficult to forecast future volumes with any confidence. The tonnage of chilled tuna currently landed at Guam is estimated to be 7-8,000 tons annually. For the basic, best judgment forecast it is considered likely that future tonnage will not be significantly higher than this, though in the forecast allowance is made for a modest increase--up to about 9-10,000 tons annually.

For the planning of future port facilities it should be noted that, while purse seiners are expected to continue landing their fish at Tinian or transferring them at sea, the advantages of Guam as a place for reprovisioning, bunkering and vessel repair, as well as for crew rest and relaxation, are considerable. Therefore, calls by purse seiners for these purposes should continue at least at current levels for the foreseeable future.

Summary of Basic Port Traffic Forecasts

Aggregate commercial port traffic forecasts are presented in Table III-3. The total volume of port cargo is projected to rise from 1.26 million revenue tons in FY 1989 to 3.7 million revenue tons in the year 2010.

FORECAST BY MODE OF SHIPMENT

In FY 1989, 80% of total port traffic was containerized. Included in this figure was transshipment traffic which was 97% containerized and domestic traffic with the United States whose degree of containerization was nearly 100%. On the other hand, only 48% of foreign traffic in the same year was shipped in containers.

In recent years, foreign traffic has been the fastest growing segment of Guam's maritime commerce. There are reasons to believe that, in the foreseeable future, trade with foreign countries will grow faster than the trade with the United States. If this is the case, the overall degree of containerization may decline slightly in the near-term future (as it actually did between 1980 and 1989), unless the containerization rate for foreign traffic grows faster than its volume.

The prospects for faster containerization of Guam's foreign traffic are limited by three considerations. First, auto imports, which represent a substantial share of the total, will continue to be imported by Ro-Ro ships. Second, some construction materials, which are imported primarily from East Asia, cannot be containerized. Finally, Guam is one of several ports of call for the vessels carrying foreign cargo. Other ports of call either do not have container handling facilities or are too small to justify full container service. For all these reasons, it seems unlikely that containerization rate for foreign traffic will grow faster than its volume. Accordingly, it is assumed here that containerization will decline slightly from its present level of 80% as shown in Table III-4.

TABLE III-3
AGGREGATE FORECASTS
(000 Revenue Tons)

Year	Imports	Exports	Trans- shipments*	Fishing	Total
1989	975.7	125.1	152.0	7.5	1,260.3
1995	1,521.6	125.1	240.8	9.5	1,897.0
2000	2,112.8	131.5	213.6	9.5	2,467.4
2005	2,723.7	144.6	257.2	9.5	3,135.0
2010	3,208.6	167.6	309.7	9.5	3,695.4

* Transshipments are unduplicated--that is they are shown for one direction (inbound or outbound) only. For cargo handling requirements, this figure should be doubled.

TABLE III-4
CARGO FORECAST BY MODE OF SHIPMENT
(000 Revenue Tons)

Fiscal Year	Imports			Exports			Transshipments*			Total		
	Container	Break- Bulk	Total	Container	Break- Bulk	Total	Container	Break- Bulk	Total	Volume	% Container	% Break- Bulk
1989	746.2	229.5	975.7	111.6	13.5	125.1	147.4	4.6	152.0	1,252.8	80.0	20.0
1995	1,163.7	357.9	1,521.6	111.6	13.5	125.1	233.6	7.2	240.8	1,887.5	80.0	20.0
2000	1,605.7	507.1	2,112.8	117.0	14.5	131.5	207.2	6.4	213.6	2,457.9	79.0	21.0
2005	2,070.0	653.7	2,723.7	128.7	15.9	144.6	249.5	7.7	257.2	3,125.5	78.0	22.0
2010	2,438.5	770.1	3,208.6	149.2	18.4	167.6	300.4	9.3	309.7	3,685.9	78.0	22.0

* Unduplicated

ALTERNATIVE FORECASTS

General

Alternative port traffic forecasts are needed to illustrate the possible, though less likely, range of future demand for facilities in the Commercial Port. In this study, low and high growth scenarios are identified for each major cargo flow and their impacts upon these cargo flows are quantified--mainly by reference to the basic, best judgment forecast. In turn, all low and high forecasts are aggregated to obtain low and high port traffic forecasts.

Imports

Tourist Industry Imports

Low Forecast - There are two aspects of tourism which may be adversely affected in the future. On the supply side, Guam may be unwilling or unable to provide all the labor force needed to operate the many new hotels and resorts under construction or in the planning stage. Also on the supply side, inadequate utilities may slow down the tourist growth rate. On the demand side, tourism may grow less than expected if Japan's economy goes into recession, if the yen exchange rate weakens substantially or if Japan-U.S. relations should change in unforeseen ways.

High Forecast - If all hotels and resorts now under construction or on the drawing board are completed on schedule, the present room capacity will triple before the year 2000. If these rooms, are to be filled at a normal occupancy rate, tourist arrivals will need to grow faster than projected in this study.

Military Installations

In the low forecast, the present momentum in defense cuts is assumed to continue and to include the Asian theater of military operations. It is also assumed that the U.S. military presence in the Far East will be reduced absolutely, rather than dispersed to bases such as Guam.

For the high forecast, it is assumed that military threats or instability in Asia will continue and that some military missions of Subic Bay

Naval Base and Clark AFB will be moved from the Philippines to Guam. This forecast does not include any specific volume estimates directly related to such a move but only an estimate of greater military imports, assuming an increased level of military activities on the Island. Under this scenario, there will be a substantial rise in military imports during the 1989-95 period but little or no growth thereafter.

Local Consumption

For the low forecast, the same population growth is assumed as for the basic, best judgement forecast but the per capita income growth rate is reduced to reflect slower growth in the tourist and military sectors, the two main pillars of the local economy.

In the high forecast, the population growth rate is increased to allow for more immigrant labor. Also, the per capita income growth rate is increased to reflect faster growth in tourism and military complex for reasons explained in the high forecasts of these two sectors.

Construction

The construction industry is a reactive economic sector in that its growth reflects the level of activity in other economic sectors, primarily tourism, military and local consumption. Accordingly, the low growth scenario for construction reflects the consequences of low growth in the other economic sectors. Similarly, the high growth scenario for construction reflects the improved growth prospects of the other sectors.

Exports

Since about 90% of all true exports stem from military activities, the low export scenario is the same as low scenario for military installations that is described above.

The high export forecast focuses on the economic liberalization and diversification that may result from the proposed Commonwealth status. Specifically, if Commonwealth status is attained before 1997, there is a possibility of a large inflow of capital and skilled labor from nearby Hong Kong seeking safety, investment opportunities and free access to the U.S. market.

Should this happen, new export industries would spring up overnight contributing also to parallel imports of raw and semi-finished material imports. In time, however, this growth might lead to local opposition if there are no significant benefits to the local economy and it could be thwarted by U.S. protectionist measures.

Alternative Forecasts--Transshipments

Low Forecast

This estimate is based on the following alternative scenarios for the three major components of transshipments:

- The economy of CNMI will continue to grow but at a somewhat lower rate than that developed for the basic estimate, with productivity increases of about half the targeted rates. Growth rates during the forecast period would be as follows:

1989-1995:	6.5% annually:
1995-2000:	4.8% annually:
2000-2010:	3.7% annually.

Furthermore, Charlie Dock will be completed one year earlier than expected and by 1999, 50% of Guam's transshipment traffic to the CNMI will have been lost.

- The transshipment of garments manufactured in CNMI will not grow beyond 1989 levels and will decline after the year 2000 by 3% annually.
- Total exports and transshipments to the FSM and Palau will grow no faster than the population and competitive factors, including new entrants on routes from mainland U.S. or Hawaii to Micronesia will result in a loss of 25% of Guam's share of total cargo moving to Micronesia within the next five years.

High Forecast

This estimate is based on the following scenarios for the major components of transshipments:

- The economy of CNMI will grow at the same relatively high rate of growth as in the basic estimate for the next five years but it is further assumed that productivity will continue to increase at 6% annually until the year 2000 and will increase at about 4% annually after that. Growth rates during the forecast period would, therefore, be as follows:

1989-1995:	9.8% annually:
1995-2000:	8.3% annually:
2000-2010:	6.3% annually.

Charlie Dock will be completed in 1995, as expected, but its completion will result in the loss of only 30% of Guam's transshipment traffic to CNMI by the year 2000.

- Garment exports by CNMI will grow as forecast in the basic estimate.
- The economy of the FSM will grow at a rate that is 3% above population increase and in Palau a growth rate of 7% annually will be achieved after 1995 as a result of investments in tourism. Also, the interplay of competitive factors and the selection of Guam as a hub by certain of the lines serving Micronesia will result in Guam's share of cargo moving to that area by 25% in the early 1990's.

Alternative Forecasts--Fish Landings

Low Forecast

In this estimate, it is assumed that the restrictions on the number of Japanese vessels able to land their catch at Guam will have a substantial effect and that up to 50% of the Taiwanese fleet will move to new bases in Palau and elsewhere. As a result, landings of chilled tuna in Guam might drop to about 50% of their present level or about 4,000 tons annually.

High Forecast

In this estimate, it is assumed that there will be no effective restrictions on the number of Japanese longliners landings at Guam and no economic restraints on vessel operations. It is also assumed that the number of Taiwanese vessels operating out of Guam will grow in accordance with more optimistic estimates. Resulting landings of fish will then be in the range indicated by estimates contained in the 1989 Longliner Study or some 15-18,000 tons annually.

Summary Alternate Port Traffic Forecasts

Table III-5 summarizes all port traffic forecasts for the basic, low and high growth alternatives. According to these figures, the aggregate port traffic volume may range from 2.6 million revenue tons to 6.2 million revenue

TABLE III-5
AGGREGATE ALTERNATIVE FORECASTS
 (000 Revenue Tons)

Year	Imports	Exports	Trans- shipments	Fishing	Total
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BASIC

1989	975.7	125.1	152.0	7.5	1,260.3
1995	1,521.6	125.1	240.8	9.5	1,897.0
2000	2,112.8	131.5	213.6	9.5	2,467.4
2005	2,723.7	144.6	257.2	9.5	3,135.0
2010	3,208.6	167.6	309.7	9.5	3,695.4

LOW

1989	975.7	125.1	152.0	7.5	1,260.3
1995	1,351.6	125.1	189.2	4.0	1,669.9
2000	1,705.0	119.0	146.9	4.0	1,974.9
2005	2,056.9	107.4	163.9	4.0	2,332.2
2010	2,329.8	92.4	182.8	4.0	2,609.0

HIGH

1989	975.7	125.1	152.0	7.5	1,260.3
1995	1,889.5	125.1	154.8	18.0	2,187.4
2000	2,884.9	201.4	288.2	18.0	3,392.5
2005	4,105.0	295.9	372.4	18.0	4,791.3
2010	5,311.0	395.9	481.3	18.0	6,206.2

tons at the end of the forecast period depending on the set of underlying assumptions.

For the first 11 years of the master plan period (1989-2000), the average annual traffic growth rate will range from 4.2% for the low growth forecast to 6.3% for the basic growth forecast and to 9.4% for the high growth forecast. This compares with an average annual growth rate of 7.0% actually attained during the 1980-1989 period.

FUTURE PASSENGER TRAFFIC

Based on the growth rates discussed earlier in this chapter, the number of tourists visiting Guam annually is expected to grow as follows:

TABLE III-6

ESTIMATED ANNUAL NUMBER OF VISITORS TO GUAM

1989	669,000
1995	1,300,000
2000	2,000,000
2005	2,675,000
2010	3,100,000

In looking at passenger vessels that use port facilities now or may do so in the future, it is necessary to look at two totally different markets. The first type is based upon cruise ships with overnight accommodations that offer cruises of several days to two months or more. These vessels may range in size from vessels that are about 300 to 350 feet long with accommodations for 120-150 passengers to ships that are 500 to 800 feet long and typically accommodate 600 to 800 passengers.

The second market consists of day excursions and evening dinner or dance cruises for those tourists staying in Guam. Vessels involved in this service may range in size from oversize yachts, carrying 100 to 150 passengers and often of a multi-hull design, up to larger vessels with capacities of 750 passengers or more. Vessels serving both types of traffic are listed in Table II-6 of the preceding chapter.

Extended Cruise Traffic

In 1989 approximately 9,150 people arrived in Guam on cruises originating in ports in Japan, Europe or the U.S. With the introduction of the

Oceanic Grace and the Sunflower, a new dimension is added and, now, an estimated 1,500 people each year take three and four day cruises from Guam to Saipan, Palau or ports in the FSM.

Both categories of passengers are expected to grow roughly in proportion to the total number of visitors. This does not translate to a corresponding increase in the berthing facilities required, however, since the vessels offering multi-day cruises that are, or will be, based in Guam operate now at relatively low load factors (and it will be a while before the capacity of existing and new vessels in this market will be absorbed). Those based elsewhere called 18 times in 1989. As traffic grows, the size of vessel in both these services may be expected to increase, so the number of vessels or calls will not increase proportionately. Estimates of future traffic are as follows:

	<u>Guam-Based Vessels</u>		<u>Visiting Vessels</u>	
	<u>No. of Passengers</u>	<u>No. of Vessels</u>	<u>No. of Passengers</u>	<u>No. of Vessels</u>
1995	2,900	2	18,000	33
2000	4,500	2	27,000	39
2005	6,000	3	36,500	41
2010	7,000	3	42,000	42

Local Excursion Traffic

The local excursion traffic is very different from the extended cruise market. Day cruises and dinner/dance cruises are included in many tour packages and are very popular. At the present time three larger boats, each with a capacity of 149 passengers, and ten smaller boats (excluding dive boats, charter fishing boats and the submarine) with an average capacity of 47 passengers are engaged in this market. This fleet has a total capacity of almost 800 passengers and may sail once or twice a day, four or five days a week, through much of the year. If average load factors of 80% on the larger boats and 60% on the smaller boats are used and vessels work an average of nine months, total patronage is about 150,000 per year or close to 25% of all visitors. If this traffic were to grow at the same rate as tourists as a whole, then by 2010 about 700,000 visitors may take one or another of these day or evening cruises. Some tourists coming to Guam for a second time may look for other activities but this may be offset by those who may have missed such a

trip the first time. If growth and patronage on this estimated scale should occur, larger vessels will undoubtedly be introduced, and already this trend is seen, with the anticipated introduction later this year of a vessel with a capacity of 799 passengers. If an average vessel capacity of 500 is considered for the largest vessels, while the 149 passenger vessel is assumed to still be popular and 75 is used for the smallest vessels, about 3 large vessels, 5 mid-range and 15 small vessels will be involved in this market and will require some type of berthing space, either in the Harbor of Refuge (for the smaller vessels) or in Apra Harbor itself.

CHAPTER IV

EXISTING PORT OF GUAM

APRA HARBOR

Apra Harbor, where the Port of Guam is located is a natural harbor used by Spanish fleets and later by the U.S. Navy. In 1944 and 1945, after Guam was retaken from the Japanese, the Harbor was greatly improved by the construction of the Glass Breakwater atop Luminao Reef and Calalan Bank. This provided a larger sheltered anchorage area 4 miles long and 1.5 miles wide (Plate 1). The average depth of water in the Outer Harbor and the Middle Ground is over 100 feet deep. Within these areas there are 4 anchorages for commercial vessels and 3 that are reserved for the Navy.

South of the Main Harbor is the Inner Harbor, which is entirely within the Naval Reservation. The north side of the Main Harbor is bounded by the Glass Breakwater, and in the northeast is Cabras Island where the Commercial Port is located. Cabras Island Channel, which lies north of two large shoals, serves the Port area. This channel is 700 feet wide and over 40 feet deep until it approaches the berths themselves.

LAND AREA

Prior to 1969, all the land around Apra Harbor was owned and controlled by the Navy. In that year the Navy transferred 62 acres to the Government of Guam for port uses. About half of this original area is occupied now by the Commercial Port; the remainder is leased to various private firms for periods of 50 or 60 years. Most of the income from these leases goes to the Guam Economic Development Administration, though the Port shares in recent increases in the rent. Among the lessees are the four petroleum companies in Guam, the Island's sole cement importer, a vessel and fishnet repair firm and a trucking company. In 1983 a 32-acre parcel north of the Port was transferred to the Government of Guam by the Navy, which permitted expansion of the Port's container yard, in accordance with the 1981 Master Plan. East of these parcels is a 133-acre parcel that was transferred in 1985 and includes much of the rest of Cabras Island. This parcel will accommodate the expansion of the container yard, the first stage of which is due to start shortly. Most of the

area, to the extent it is not required for container yard expansion, may be used for the proposed Cabras Island Industrial Park.

More recently, other lands, including the Glass Breakwater--and the strip of land lying behind it--and a 208-acre parcel--which includes the Piti Channel and Sasa Bay, the area lying west of Marine Drive and south of the Navy and Cabras Island Power Plants and much of the spit of land known as Drydock Point--have been transferred by the Navy to the Government of Guam for the use of the Port Authority of Guam. Much of this last parcel consists of environmentally sensitive areas and shallow inlets that cannot be developed. An updated land-use plan for all of these land areas will be prepared as a part of the current study.

Certain restrictions have been placed on the future disposition of these lands--primarily on the terms of future lease or sale--and, in some cases, the Navy reserves the right to use specific facilities with three days advance notice.

EXISTING PORT FACILITIES

Commercial Port

What is now the Commercial Port is a series of wharves and facilities that were started in 1964 and completed in 1969. Originally the facilities constituted an extension of other Naval facilities in Apra Harbor and the numbering system for the berths reflects the old Navy designations. These facilities are shown in Plate 2.

Berth F(oxtro)-3 is a 753-foot long marginal wharf that consists of a steel sheetpile bulkhead that was placed in front of an earlier deteriorated sheetpile wall and a concrete cap that extends below the waterline. Behind this bulkhead is an 85-foot wide paved apron in front of Shed 1. Water depth alongside varies from 21 feet adjacent to Berth F-2 to 30+ feet at the outer end.

This berth is currently occupied almost exclusively by a mix of purse-seiners and longliners, awaiting provisions, refueling and, in the case of the longliners, discharging their catches of tuna. If a measure of feet-hours of occupancy is used, vessels other than fishing

vessels occupied the berth for less than 3% of the total in 1989. Fishing vessels used 93% of the available foot-hours. In several months this measure of occupancy was over 100%--which may be explained by the fact that four or five longliners may raft out from the bulkhead in a single boat length.

Shed 1 is a reinforced concrete structure 122 feet wide and 452 feet long that is located behind Berth F-3. Because of differences in the floor slope and that of the outside paved areas, the front of the shed is at the same grade as the apron but the rear has a series of raised truck docks. Except for three bays (out of 15) that are used for salt storage the shed is occupied by businesses involved in or serving the tuna fisheries.

Behind Shed 1 is a triangular area largely occupied by an oil drum storage area that is part of the fishing vessel support operation.

Berths F-4, 5 and 6 make up the heart of the Commercial Port. These berths total 1,950 feet in length and may accommodate two full container vessels, three smaller break-bulk and container vessels, a number of the smaller vessels (60' to 200') that serve the other islands or any combination of the above. The wharf itself consists of a steel sheet-pile bulkhead with a concrete cap that extends below the low water mark. In the westernmost portion of the wharf there is a 100-foot wide apron between the face of the wharf and Shed 2. Elsewhere, the paved apron extends back into the container yard. Water depth alongside is 34-35 feet, though 150 feet in front of Berth 6 there are some coral heads only 22 feet below the water's surface. Vessels berthing at Berth F-6 must maneuver around the obstruction. If there is no vessel at Berth F-5, maneuvering may add 45 minutes to berthing time; if a vessel is occupying Berth F-5 more time will be required or it may not even be possible to berth or unberth a ship.

Using the same measure of foot-hours for occupancy levels, in 1989 vessels took up about 40% of the available foot-hours; in some months the figure was close to 50%. This was primarily by cargo vessels, though longliners also use Berth F-6, and, on occasion, the other two

berths if space is available. These vessels used 8% of the total foot-hours available. Not included in these figures is the use of Berth F-6 for the mooring of a small drydock belonging to the Port and leased to Cabras Marine Co. While these average figures indicate a moderate level of occupancy, on certain days--when a containership, plus one or two smaller combination break-bulk/container ships or inter-island vessels are lined up and a clutch of longliners occupy part of Berth F-6, the port has both the appearance and reality of substantial congestion.

Two rail-mounted container cranes serve all three berths; with a rail gauge of 50 feet, they are able to pass in front of Shed 2.

Shed 2 is a reinforced concrete structure, 122 feet wide and 452 feet long, that is the twin of Shed 1. Like Shed 1, it has a series of raised truck docks at the rear. The western end is occupied by a duty-free shop, one fishing company (upstairs) and several importers. Most of the space, however, is used by the Port for receipt and storage of break-bulk and unitized cargo pending customs clearance. It is not intensively used. The area behind Shed 2 is used for storing neo-bulk commodities such as reinforcing steel, etc.

The former Container Freight Station (CFS) is similar in construction to Sheds 1 and 2 but smaller in size, being 80 feet wide by 302 feet long. It also has raised truck docks at the rear. The CFS is no longer used for its intended purpose but is, instead, used as a repair facility and maintenance shop by APL, Sea-Land and Cabras Marine Corp.

The present Container Yard extends from Shed 2 to close to the end of Berth 6 (the last 200 feet or so is occupied by a feed mill that is being dismantled and containers used by some fishing companies) and from 75 feet behind the rear container crane rail to a fence line near Route 11. It contains about 15.2 acres.

A salient feature of the container yard is that most of the area was originally laid out for a chassis operation for 20-foot and 40-foot containers. Because of increasing traffic and a sharp rise in the

number of containers handled, the Port has converted over to what is primarily a stacked operation. (Containers are typically block-stacked, in blocks that are five or six containers wide and two or three high.) While the Port has changed over to a different mode of operation, the lines of dolly blocks used for the chassis operation remain in place and act as a restraint to the development of a more suitable layout. Also, there is no system for numbering individual cells for containers and marking the pavement and light standards accordingly. As a result, while the general location of a container is posted as it comes in, it is not always easy to retrieve them. The yard is also dotted with typhoon tie-downs that are no longer used. Other elements that inhibit a more rational layout include a substation behind Berth F-5 (the container crane mechanics' shop is also located here), the CFS and the feed mill that is being demolished.

Expansion of the Container Yard is expected to be started shortly. Phase I of this expansion will provide an additional 12.5 acres. After allowing for a wider-gauge crane (which would reduce the available area somewhat) it is estimated that the expanded container yard will contain 26.5 acres. In Phase II, the existing yard is to be resurfaced. Changes in the yard layout are also a part of this work; it is important that the new yard layout be consistent with the type of operation that is foreseen and that the entire 26.5 acres be conceived and operated as a single unit.

The Equipment Maintenance Facilities are located behind Shed 1 and include the 24,000 sq.ft. Maintenance and Repair Building, a 3,600 sq.ft. Equipment Shed, a small filling station and open yard space for equipment storage and staging.

Other Port Facilities in Apra Harbor

In addition to the Commercial Port itself, there are other facilities along the northern rim of Apra Harbor that are used for port purposes or allied functions. One of these facilities is operated by the Port Authority of Guam; the others are in the area covered by long-term leases.

H(otel) Wharf is a former Navy ammunition wharf located on the sheltered side of the Glass Breakwater about a mile west of the Commercial Port. This 500-foot long structure is composed of fill bounded by a steel sheetpile bulkhead with a concrete cap that extends below the low water mark. The Navy formally transferred this facility, together with the Glass Breakwater and the remains of Pier D(og), to the Government of Guam in October 1989, but retained the right to use the wharf with 72 hours advance notice if it perceived a need for it. This restriction will end in October 1992 and, so far, the Navy has not exercised this right. The Port operates the wharf primarily as a passenger vessel facility. The Oceanic Grace uses H Wharf regularly during the periods that she is based in Guam and excursion vessels also use it. In addition, the wharf is used for exports of scrap metal and for the import of cars and light trucks carried aboard car carriers when space in the Commercial Port is unavailable. Water depth at this wharf is about 32 feet.

Berth F(ox trot)-2 is located at a right angle to Berth F-3. It is taken up entirely by long-term leases and is used for the delivery of cement and the repair and restoration of large fish nets, as well as ship repair. The berth face occupied by vessels unloading cement and purse seiners undergoing minor repairs or unloading or loading fish nets. The depth of water at this berth varies from 21 feet adjacent to Berth F-3 to 30 feet at the cement facility.

Berth F-1 and G(olf) Pier, with their attendant tankage, are both petroleum handling facilities--one under long-term lease from the Port and the other covered by a management agreement with a private operator. In 1989 these facilities were used for the import of some 6,060,000 barrels of petroleum products destined for civilian uses in Guam, as well as handling about 1,050,000 barrels exported to other islands. Berth F-1 was originally built for the now-defunct GORCO but it is now leased by Shell Guam Inc. and is also used by Esso Eastern Inc. G Pier was previously leased by Mobil Oil Co. but in 1989 the facility was rehabilitated by the Port and is now managed by PRI South

Pacific Inc. and is used by both PRI and Mobil. This pier is also frequently used to moor purse seiners that may be awaiting provisions, etc.

PORT EQUIPMENT

The two largest pieces of equipment in the Commercial Port are rail-mounted Container Cranes (Gantries) 1 and 2. Container Crane 1 was installed in 1971, at which time it was already a used crane, having been acquired from Pacific Far East Lines. It has a lifting capacity of 30 long tons. Container Crane 2, with a lifting capacity of 40 long tons, was acquired in 1979. Both cranes have a 50-foot rail gauge and are limited in their height and reach. They can usually pick up containers stacked up to four high above a vessel's deck and can reach ten rows out (their outreach is 150 feet from the center-line of the two rails). This is not enough for the vessels used by APL and Sea-Land on the guam route, which have 13 rows of containers and could have containers stacked up to six high. Both these lines load their vessels at the present time with three rows of empties on the outboard side when they leave the West Coast and these are not touched in Guam. Particularly, Container Crane 1 is considered to be in poor condition and has a high failure rate.

For the handling of containers in the yard, the Port currently has three rubber tire-mounted gantries, or transtainers, which can stack containers four-high and five wide with room for a truck lane on one side. The rubber tired wheels can be rotated 90° to move the transtainers laterally from one stack to the next. Ruts have developed in the asphalt paving where these transtainers operate and where the wheels have been turned the pavement has failed. Reinforced concrete pads are needed where these pieces of equipment are operating. Two of the transtainers are over ten year old, have insensitive controls and lack anti-sway devices and "flippers" for easy centering of the spreader bar atop the containers. Working with these units, therefore, is slow and tedious. The third transtainer is only a year old and, when it's working, functions very well. However, it has a history of extended downtime because of inadequate protection of the generator windings against the corrosive salt atmosphere in Guam. Earlier problems with the computerized controls have been corrected and the manufacturer has provided the Port with a spare generator. Since it has eight smaller wheels instead of four large ones,

however, the areas where it can work are limited to those where the pavement is relatively smooth.

Other container-handling equipment includes one Hystainer, which can only stack two-high and is outfitted for 40-foot containers only; one toplifter, which has a stacking limit of three 8-foot high containers. (This toplifter is currently the only piece of equipment available for delivering containers when a large containership is in Port and both container cranes are working); and a sideloader, suitable for stacking empties, which is now back in service. For moving containers about the yard, the Port has 24 tractors (about 80% are in operating condition) and has 12 chassis on order. Right now the Port uses APL and Sea-Land chassis under an understanding with these two lines.

The Port has a range of other equipment, for handling break-bulk, neo-bulk and unitized cargoes, including a 20-ton Hyster, three 10-ton Hysters, five 5-ton forklifts and a number of 3-4 ton forklifts. Most of these are in operating condition.

Also, the Port has a 140-ton Manitowoc mobile crane that is quite old and is not working at the present time. This crane, or a replacement, could be used effectively for unloading rebar or lumber and, if equipped with a spreader bar, for unloading containers that are carried as deck cargo or break-bulk ships.

By the time of this report, the Port may have already received a new toplifter and additional forklift trucks. The Port is also proceeding with the acquisition of two additional transtainers with tight specifications on corrosion protection and maintainability.

WORKING HOURS

Vessels are worked at the Port 24 hours a day, seven days a week. Under recently extended hours, the Port is nominally open for deliveries five days a week from 6 AM to 7 PM. Within the Port's operating arm, the Terminal Division (responsible for the storage and delivery of containers and other cargoes) and the Transportation Division (responsible for operating all equipment) work the same hours. Ideally, the daytime hours are covered with two eight hour shifts, with a five hour overlap in the busiest period (less an hour for lunch). Often, however, staff shortages make one extended shift and

the payment of overtime necessary. Night shifts depend upon the hours needed to work a ship. A full shift consists of 11 hours (7 PM to 7 AM) less a one hour break, though often less time is required. The third operating division, the Stevedore Division (responsible for working the vessel itself) normally works an 8 AM to 5 PM day shift and a "long shift" at night, from 7 PM to 7 AM. Those on the day shift may work extended hours and receive overtime if a vessel is being worked.

WHARF CAPACITY

In estimating the current capacity of the Commercial Port, only Berths F-4, 5 and 6 are considered. For all practical purposes, Berth F-3 is fully occupied by fishing vessels. The number of cargo vessels using this berth is extremely limited. Since H Wharf is devoted primarily to passenger vessels, it makes little contribution to the cargo-handling capacity of the Port--outside of some exports of scrap and occasional imports of automobiles and light trucks.

Cargo vessels calling at the Port have been divided into three basic types:

- Type A - Full containerships;
- Type B - Combination container/break-bulk vessels;
- Type C - Small inter-island barges and vessels.

The proportion of cargo handled by each of these types in 1989 was as follows:

- Type A - 60% of total cargo;
- Type B - 25% of total cargo;
- Type C - 15% of total cargo.

The Port's container cranes were used to work the Type A and Type C vessels. Type B vessels, however, were generally worked with ships gear, either because of the fact that the container cranes were in use or because of possible interference between the vessel's cargo masts and booms in the stowed position and the spreader bar and lines of the container crane.

Analyses of cargo handling operations and actual ship records indicate that the following handling rates were achieved during the same sample month:

Type A: 19.65 Containers or 346.4 Rev. Tons/Crane Hour
 38.42 Containers or 677.2 Rev. Tons/Ship Hour (avg. of 1.95 cranes)
 Average Time at Berth: 16.10 hours or 1.30 times working time

Type B: 6.13 Containers or 78.6 Rev. Tons/Gang Hour
9.43 Containers or 120.8 Rev. Tons/Ship Hour (avg. of 1.54 gangs)
Plus Break-bulk: 35.1 Rev. Tons/Gang Hour
Plus Break-bulk: 53.2 Rev. Tons/Ship Hour
Combined handling rates
54.8 Rev. Tons/Gang Hour
83.7 Rev. Tons/Ship Hour
Average Time at Berth: 38.6 hours or 1.15 times working time

Type C: (5.96 Cont. + 9.0 Rev. Tons of B.B.) or 85.6 Rev. Tons/Vessel Hour
Average Time at Berth: 26 hours or 3.83 times working time

In the case of Type A vessels (full containerships), productivity rates are comparable to those found in most well-run ports and observation of container-handling operations suggest that these rates would be higher were it not for the inability of the transtainers to handle the containers in the storage area more rapidly. The low productivity in handling containers with ships gear in the cast of Type B vessels is evident. With Type C vessels, the number of containers carried is quite small and preparation time has a greater impact. Also containers may be stowed athwartship, thus requiring that they be turned 90° and often they must be secured with cables and other devices. Clearly, the extended time spent at berth by these inter-island vessels relative to their actual working time reflects the fact that most are based in Guam and use a berth on a "when available" basis.

Estimate of Practical Operating Capacity

(1) Noting that the larger containerships will occupy both Berth F-5 and Berth F-6, leaving room only for longliners to be berthed astern of them; (2) affording these containerships priority berthing as is the current practice; and (3) also noting the relative proportions of total cargo handled by each type, given current trade patterns: the practical operating capacity of the Commercial Port can be estimated as follows.

If a berth occupancy factor of 0.28 is used for the type A vessels (full containerships), which is appropriate for vessels of this nature arriving on a semi-scheduled basis, it would not leave enough time for other vessels. Therefore, a factor of 0.24 is used. the following amounts of cargo might be discharged or loaded if cargo volumes were uniform throughout the year.

$$0.24 \times \frac{677.2}{1.30} \times 8,760 = \underline{1,090,000 \text{ rev. tons/year}}$$

If a berth occupancy factor of 0.42 is used for the Type B vessels (combination container/break-bulk vessels) but it is recognized that container ships already occupy two of the three berths for 24% of the time, the following volume might be handled:

$$(0.42 + 0.18 + 0.18) \frac{83.7}{1.15} \times 8,760 = 490,000 \text{ rev. tons/year}$$

This is consistent with the ratio of cargo carried by Type B vessels to that carried by Type A vessels. Therefore, this amount will be used. Considering the number of Type C (inter-island) vessels that might occupy the length of berth available, if no other vessels were present, an occupancy factor of 0.65 would be appropriate for the berths but the actual number of vessels worked would be limited by the number of cranes. Accordingly, with only two cranes available a crane usage rate of 0.5 is used and the following cargo volume may be handled:

$$(0.50 - 0.24) \times 2 \times \frac{85.6}{\text{Say } 1.5} \times 8,760 = 260,000 \text{ rev. tons/year}$$

This figure is slightly low but essentially consistent with the ratio of cargo carried by Type C vessels to that carried by Type A vessels.

If there were no month to month variation, port capacity would, therefore, be:

$$1,090,000 + 490,000 + 260,000 = 1,840,000 \text{ rev. tons/year}$$

The ratio of the average month to the peak month in 1989 was 0.829, so the annual capacity figure should be reduced accordingly to allow for some peaking:

$$1,840,000 \times 0.829 = 1,520,000 \text{ rev. tons/year}$$

The presence of fishing vessels on Berths F-4, 5 and 6 does not have a major effect upon the capacity of these berths, since they generally use space that is not used by other vessels. Overall, they may reduce the capacity by about 2.5% Practical operating capacity of the Commercial Port under current operating conditions, therefore, is:

$$0.975 \times 1,520,000 = 1,475,000 \text{ rev. tons/year}$$

This figure is quite close to the 1989 cargo volume of 1,405,000 rev. tons (including transshipments both in and out). This bears out what can be observed--that Berths 4, 5 and 6 are operating at very close to capacity at the present time.

CONTAINER YARD CAPACITY

The capacity of the container yard is a function not only of the area of the yard but also the manner in which it is operated. The basic choice is between a chassis-based operation and a stacked operation. The former method is often preferred since it is more straightforward and it is easier to store, locate and retrieve containers. It requires from 30 to 40% more land area, however, than a stacked operation. The latter requires a greater degree of organization but is more frugal in its use of land. At the Port of Guam, a stacked operation is the predominant form right now--largely because of land restraints--and the analysis will be based upon this type of operation.

Because of several factors related to how the yard is operated now and current space restraints, the analysis first addresses the yard area that would be required to accommodate existing containerized cargo movements with desired operating conditions. Subsequently, the capacity of the yard is taken as a proportionate share of the present traffic level.

In estimating the yard area required, the following operating parameters are assumed:

1. Inbound containers are to be grounded and transtainers used for stacking and retrieval. Stacking to be in a 1:2:1:2:1 pattern to minimize the moves required and thus, the cost of retrieval.
2. Each day, 20% of the inbound containers are to be mounted on chassis ahead of time to expedite delivery; space is provided for these containers.

3. Outbound empties are to be grounded and stacked an average 2.5 high in a dense stack using a sideloader.
4. Outbound full containers are to be grounded and stacked in the same pattern as inbound containers but with 25% additional allowance for stacking containers by vessel.
5. Average dwell time for containers is:
 - Inbound containers - 7 days
 - Outbound containers - 5 days
 - Outbound full containers (export and transshipment) - 9 days

In 1989 an average of 1,460 containers were handled each week, with approximately equal numbers being inbound and outbound. If the peaking factor (peak month to average month) that is used above for wharf capacity is applied here, then the Commercial Port may have handled as many as 1,760 containers in some weeks--710 20-foot containers and 1,050 40-foot containers, with half being inbound and half outbound. Table IV-1 shows the calculation of container yard space required to properly handle this number of containers.

Table IV-1 indicates that close to 18 acres of space are needed to handle the number of containers moving through the Port in 1989, with the operating parameters noted above. If two vessels should arrive on successive days, as occurs now with APL and Sea Land, there is further peaking in the yard, as additional containers are coming in before the containers from preceding vessels can be delivered from the yard. The effect of this peaking from closely-spaced vessels is to increase the area required to 19.3 acres. Thus, capacity of the present container yard is roughly 80% of the traffic actually handled in 1989--assuming a basic transtainer operation and dwell times that are not excessive. Therefore, the container yard is currently operating at levels exceeding its capacity and this is evident in the crowding found at the yard. Furthermore, the condition is exacerbated by the fact that chassis-mounted containers occupy 6.5 acres in the yard, so the transtainer operation is limited to 8.7 acres--compared with a need for 14 to 15 acres if the operation is to be run smoothly, with efficient storage and retrieval.

Present Yard Operations

Over three-quarters of the container movements in the Container Yard are generated by the weekly calls of APL and Sea Land vessels and calls by other pure containerships. When the vessels are being worked by the two

TABLE IV-1
CONTAINER YARD REQUIREMENTS

1)	Inbound Ground Storage;		
	20' Containers - $355/7 = 51$ blocks @ 1,650 sq.ft.	84,150 sq.ft.	
	40' Containers - $526/7 = 76$ blocks @ 3,150 sq.ft.	239,400	
2)	Chassis Storage:		
	20% of ground storage:		
	20' - 355		
	40' - <u>526</u>		
	$881 \times .2 = 177$ @ 872 sq.ft	154,350	
3)	Outboard Empties 75% of outbound containers x 5/7		
	$0.75 \times 5/7 \times 355 + 2.5 \text{ high} \times 8 \times 20$ (40' x 320') =	12,800	
	Aisle 35' x 320	11,200	
	$0.75 \times 5/7 \times 526 + 2.5 \text{ high} \times 8 \times 40$ (40' x 920') =	36,800	
	Aisle 35' x 920	32,200	
4)	Outbound Full: (25% of outbound containers x 9/7 x 1.25 diversity factor)		
	$0.25 \times 9/7 \times 355 = 114/7 \times 1.25 = 21$ blocks @ 1,650 sq.ft	34,650	
	$0.25 \times 9/7 \times 526 = 169/7 \times 1.25 = 30$ blocks @ 3,150 sq.ft	94,500	
5)	Aisle space in Ground Storage Area	78,000	
	(2 aisles, 60' x 650' traversing container area)		
		778,050 sq.ft.	
			Need 17.9 acres

container cranes, few or no deliveries of containers to consignees are made from the yard. The two transtainers that are normally operating must be used to handle the import containers. (The new Mitisobishi transtainer has a history of low availability because of outstanding problems and can not be used in certain rutted areas in the yard.)

If these vessel calls occur on consecutive days, the nondelivery of containers from the yard leads to further congestion--namely imported containers stacked two and three high--causing many rehandlings of containers. This rehandling often leads to the references to the containers' locations being lost, necessitating a yard survey to reestablish their locations.

The lack of sufficient chassis also aggravates the above problem because import containers can not be mounted on chassis ready for delivery. Much of the yard space devoted to the stacking of inbound containers and outbound empties is in the area formerly used for chassis storage of containers. The dolly blocks in the chassis storage area and interferes with its efficient use for the stacking of containers. The area can be striped and numbered for both chassis storage and the stacking of containers thus providing a ready reference for first-time users of the yard.

Preventive maintenance should be scheduled for all equipment. This is particularly important as new equipment is phased in. Regular maintenance plus adequate spare parts, and operator training provides reliable equipment operation when needed.

CHAPTER V

REQUIRED FACILITIES AND OPTIONS FOR PROVIDING THEM

EXPANSION TO 2000

Forecasts of cargo to be handled in the future by the Commercial Port indicate the need for an almost threefold expansion of cargo handling capability by the Year 2010, as well as a substantial need for additional passenger facilities.

The first step of expansion has already been taken by the Port, with the expansion of the Container Yard from about 15 acres to 26.5 acres. This expansion will provide just about enough container storage area to meet the Port's projected requirements through 1995, provided that improvements such as the removal of existing dolly blocks, repaving, striping and the installation of reinforced concrete runways for the transtainers are undertaken in the existing yard. The next set of steps will be those needed to match the capacity of the wharf to that of the expanded container yard.

Initially, the most effective step will be to improve productivity across the wharf, through the acquisition of new equipment and the institution of an effective program of preventive maintenance. Once again, the Port has taken the first step by proceeding with the acquisition of new transtainers, which will remove some of the current restraints on the productivity of the existing container cranes. The next step will be the acquisition of two new container cranes--one to replace the existing Container Crane 1 and one to provide additional capacity. The new container cranes should have a 100' gauge and have the outreach needed to reach all 13 rows of containers on a Panamax vessel. These cranes should also be higher, so that containers up to five or six high above the deck can be handled. In addition, it is suggested that a modern replacement be acquired for the older 140-ton mobile crane that is now seldom if ever used because of its deteriorated condition. This new mobile crane will enable neo-bulk cargoes to be handled more rapidly and also, if equipped with a spreader bar will allow much better handling rates for the 20' and 40' containers carried aboard the combination vessels, which are now handled by ships gear. With new pieces of equipment, it is estimated that the

container cranes should be able to regularly achieve handling rates of 25 containers/hour when working full containerships and rate of 8 to 10 containers/hour should be achievable when the mobile crane is discharging containers carried aboard the combination vessels. With the added container crane and higher productivity the Port will be able to handle traffic through 1995 and a bit beyond.

For the next stage of expansion, two options may be considered. These options are shown on Plate 3. Option 1 involves the extension of the wharf face of Berth F-6, about 900 feet to the east. This will ultimately allow three full container berths along this face, though initially the additional length will be of greater benefit to the various combination vessels that will continue to call at the Port, as well as the inter-island vessels. If this is done and the container yard is further expanded to provide a total of 37 to 40 acres, the practical operating capacity of the Port will be increased to about 3,200,000 rev. tons annually. If the basic forecast of future traffic is borne out, then the Port will be able, with this improvement, to handle projected cargoes through Year 2003. This alternative will require that the area of the proposed Industrial Park be reduced by 11.5 to 14 acres in order to meet the needs of the container yard in this phase of expansion. A figure as low as 7 acres can be reached by a program of demolition of under-used facilities and relocating others that is described below.

Option 2 involves the relocation of all fishing vessels to another site in Apra Harbor. (Alternative sites for a facility to serve these vessels are discussed below.) Berth F-3 will thus be released to serve the various combination vessels calling at the Port, which may continue to be unloaded with ships gear or would be unloaded with the new mobile crane. This alternative is expected to be lower in cost than Option 1, since pier structures in the water depths needed by fishing vessels are significantly less expensive than bulkheading where depths of 35' or 40' are needed. The practical operating capacity of the wharf under Option 2 will be about 2,760,000 rev. tons/ year. This is somewhat less than the wharf capacity under Option 1 but it means that container yard requirements will also be somewhat less--about 33-36 acres. About 4.5 of the 6.5 to 9.5 additional acres needed could be gained by demolishing the Container Freight Station and Shed 2 and by relocating the Seamen's

Club. Additional acreage could be gained by utilizing the parking area between the Administrative Building and the maintenance area for maintenance equipment storage and maintenance, providing replacement parking area on the other side of Route 11 (in front of the coral hillocks) and devoting the entire area behind Shed 1 to the storage of neo-bulk cargoes. Shed 1 would need to be rehabilitated under this option, since salt storage has resulted in damage to the sprinkler system, electrical system and portions of the structure itself. With the above program of demolition and relocation it may be possible to reduce encroachment into the Industrial Park area in this stage of expansion to virtually zero.

Inasmuch as some of the newer and larger containerships used now in the trans-Pacific trade will be entering the Guam service during the next 10 years, if the Port is capable of receiving them, the Port should seek technical and financial assistance from the U.S. Army Corps of Engineers in order to proceed with the project of deepening the channel in front of Berths F-4 and F-5 and removing the obstruction in front of Berth F-6 that was outlined in the Corps' 1983 Feasibility Study. Should Option 1 for port expansion be selected in the period before Year 2000, assistance might also be sought from the Corps for the extension of the channel and further deepening by Berth F-6.

Alternative Sites for the Relocation of Fishing Vessels

The relocation of fishing vessels under Option 2 offers a chance to provide a modern facility with minimum distances from berthside to the sorting and packing area. In addition to facilities for sorting and packing, it will be necessary to provide office space for operators or their agents, enclosed storage for salt, space for some reefer containers and an area for a relocated ice plant.

Possible sites for this new facility are shown on Plate 3. They are as follows:

- Site A: Reconstruction and Expansion of Pier D(og);
- Site B: Expansion of the Old Coast Guard Ramp;
- Site C: Adjacent to Drydock Point.

Each of these sites has certain drawbacks. Site A requires that utilities be extended beyond the passenger facility at H Wharf and must be carefully planned and operated to avoid conflict with that facility and also to avoid

any degradation of either Family Beach or the reefs lying offshore from that beach. Site B appears initially to be quite attractive and a plan has been developed for fishing support facilities by an outside group. This site, however, is bracketed by petroleum berths, which may represent a safety and environmental hazard for any fishery activities. Site C, at Drydock Point, would require an entirely new facility offshore from land that is still owned and controlled by the U.S. Navy. These various sites will be considered further as the study progresses.

EXPANSION BETWEEN 2000 AND 2010

Four possible options for further expansion of the Commercial Port are shown in Plate 3. Two of these options would have the same outcome and are considered as two options only because of what may be done prior to Year 2000. The third option is simply a further extension to the east of Option 1 for 1990-2000 expansion. The last option would involve new facilities on the south side of Piti Channel.

The first two options for further expansion amount to simply adding Option 2 of the 1990-2000 expansion stage to Option 1, or vice-versa, depending upon the option selected in the first period. This means that Berths F-4, 5 and 6 will be extended to the east by 900 feet and fishing activities will be relocated away from Berth F-3. In addition, a fourth container crane will be added to the 2,850 foot long wharf and the container yard will be expended to 46 to 50 acres. The program of demolition and relocation described in the preceding section might also be carried out to reduce the 20 to 24 acres that would need to be taken from the Industrial Park under these options. The resulting overall practical operating capacity of the Port would be about 4,100,000 rev. tons/year, which will accommodate the traffic foreseen in Year 2010 with the basic forecast.

The third option for expansion is linked to Option 2 of the 1990-2000 period, inasmuch as that option minimizes any encroachment by the expanded container yard into the area currently proposed for the Industrial Park and the option discussed here would involve the development of new berths and a container yard on the south side of Piti Channel. Thus, the area intended for the Industrial Park would be reduced by no more than two acres. This option, however, would be more expensive and would result in a "split" operation,

which is normally less efficient than a unified port area and may be appropriate only if "dedicated" berths, each operated by a separate shipping line, are considered. The practical operating capacity of the Port with this option would total about 4,400,000 rev. tons/year, which is more than adequate to handle traffic in 2010 under the basic forecast.

The fourth option is linked to Option 1 of the 1990-2000 period and involves the extension of the channel and the wharf face of Berths 4, 5 and 6 another 900 feet to the east. At the same time, a fourth container crane would be acquired. Also, the container yard would be expanded to 46-50 acres. The overall practical operating capacity with this option would be about 4,200,000 rev. tons/year. Again, this is greater than the level of traffic forecast by the Year 2010.

In addition to expansion of the Commercial Port and the possible relocation of fishing activities, additional berthing for passenger vessels will be needed. The existing passenger facility provided by H Wharf will need to be expanded to accommodate at least two vessels at a time. The length of the wharf may be about 1,000 feet, with dolphins placed outside of this length to provide about 1,200 feet of mooring length. Rather than providing additional berths for visiting passenger vessels it may be more economical to provide landing stages for launches to serve vessels at anchor, as is done in many Caribbean countries.

Facilities to serve the vessels expected to offer day and evening cruises in Apra Harbor or to Cocos Island, etc. will be discussed in subsequent reports.

COSTS OF NEW FACILITIES

The following cost estimates for the various port expansion options are based upon current costs in Guam. They are, however, preliminary in nature and are intended primarily to show the order-of-magnitude cost of each of the major options. No borings have been made, though earlier studies have been reviewed, and certain assumptions have been made regarding the extent to which the coral may be cemented, as depths increase, in the areas not yet dredged. Removal of material and the proper seating of sheetpiles for the bulkheads will become more and more difficult as the depth alongside each berth is increased.

Expansion To 2000

As noted earlier in this chapter, two basic options have been developed for the initial steps of Port expansion - one of which will carry the Port to the Year 2003 and the other to Year 2000, if the basic forecast proves to be correct.

Both options provide for the early acquisition of two new container cranes (one replacement and one to add to capacity) and a new pile-supported crane rail to allow a 100-foot gauge for the new cranes. The estimates below include the outlays for these cranes even though they should be acquired and installed during the next few years. The remaining parts of the expansion work will probably not be needed until after 1995. The estimates do not, however, include the cost of acquiring other items of equipment, such as the 140-ton mobile crane, new chassis and tractors, etc.

Total costs for each option therefore, are estimated as follows:

Option 1 - Extend the Wharf 900' to the East

Acquire 2 cranes & install new rail	\$11,750,000
Dredging of new berth (35' now, 40' future)	6,250,000
Construct wharf (incl. bulkhead, ship services, crane rails & paving to rear of cranes)	13,500,000
Expand container yard (12 acres avg.)	<u>2,100,000</u>
	\$33,600,000
Engineering and Contingencies	<u>6,400,000</u>
TOTAL	\$40,000,000

Option 2 - Relocate Fishing and Clear Underutilized or Inappropriate Buildings

Acquire 2 cranes & install new rail	\$11,750,000
Dredging of Berth F-3 to 30'	100,000
Relocation of fishing activities	3,500,000
Removal of Shed 2 and CFS, plus restoration of the area*	1,750,000
Expand container yard (3.5 acres avg.)	<u>600,000</u>
	\$17,700,000
Engineering and Contingencies	<u>1,800,000</u>
TOTAL	\$19,500,000

*A further option is the relocation of the existing maintenance and the adjacent parking area (behind the Administration Bldg.) and development of replacement parking north of Route 11 at a cost of about \$650,000.

Expansion After 2000

For expansion after Year 2000 (or if Option 1 is selected, after Year 2003) four options have been developed.

The first option will consist of adding the 1990-2000 Option 2 to Option 1 (assuming Option 1 is undertaken in the initial ten-year period.) The cost of this addition will be:

\$19,500,000 less the cost of 1 crane
and the crane rail on the existing wharf = \$12,500,000

The second option is the reverse of the first (Option 2 is undertaken in the 1990-200 period and Option 1 is added after Year 2000). The cost added in the second 10-year period will be:

\$40,000,000 less the cost of 1 crane
and the crane rail on the existing wharf = \$33,000,000

The combined cost, covering port expansion from the present until Year 2010 under the basic traffic forecast, will be the same in both cases -- or \$52,500,000.

The third option, which most appropriately may be added to Option 2 for the 1990-2000 period, since the overall intent would be to minimize extent to which land intended for the proposed Industrial Park may need to be reallocated to container yard requirements. The cost of this third option would be:

Dredging	\$ 6,250,000
Wharf (incl. bulkhead, ship services, crane rails & paving to rear of crane	27,000,000
Provide new container yard (13 acres)	2,800,000
Relocate existing road	200,000
Two container cranes	<u>9,000,000</u>
	\$45,250,000
Engineering & Contingencies	<u>11,250,000</u>
TOTAL	\$56,500,000

This option includes two new berths, since a single berth that is separate from the other berths does not provide enough additional capacity to meet cargo-handling needs in 2010. The addition could, however, be made in two increments, the first of which would cost \$32,000,000. If the total cost of this option is added to the cost of Option 2 (completed in the 1990-2000 period), the aggregate cost to meet cargo handling needs in Year 2010 will be

\$76,000,000 or \$23,500,000 more than the first two options for meeting these needs.

The fourth option for expansion in the 2000-2010 period consists of a further extension to the east. It would be combined with Option 1 of the 1990-2000 period, since that option provides the initial extension to the east. The cost of this further extension would be:

Dredging	\$ 6,250,000
Wharf (incl. bulkhead, ship services crane rails & paving to rear of cranes)	13,500,000
Expand container yard (11 acres)	1,950,000
One Container crane	<u>5,000,000</u>
	\$26,700,000
Engineering & Contingencies	<u>5,300,000</u>
TOTAL	\$32,000,000

The combined cost of this option with Option 1 in the 1990-2000 period will be \$72,000,000, or \$19,500,000 more than the cost of the first two options for meeting cargo handling requirements in the Year 2010 under the basic traffic forecast.

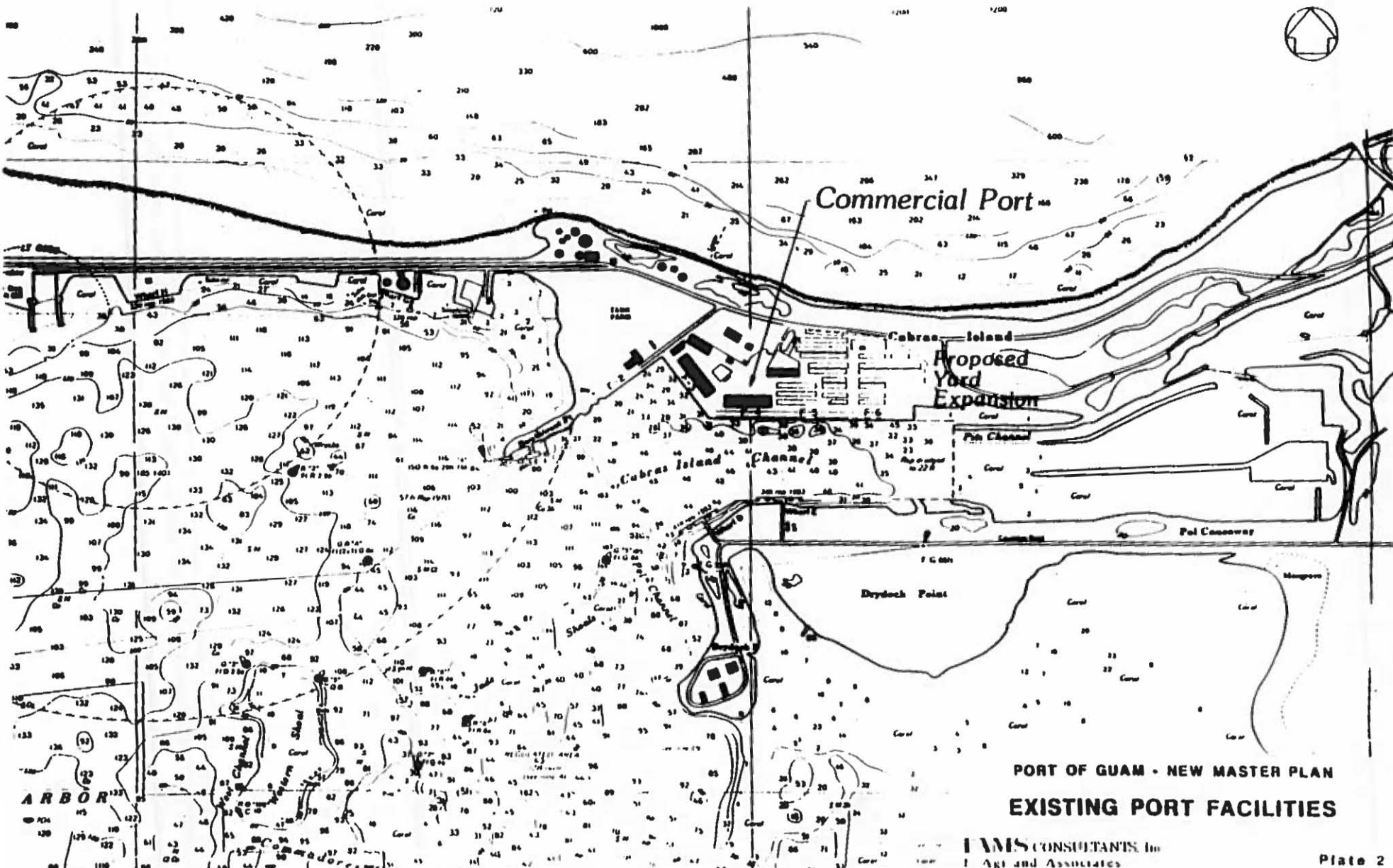
Other Facilities

In addition to cargo facilities, there will be a need for expanded passenger vessel facilities at H Wharf to accommodate ships offering extended cruises, as well as new facilities elsewhere for the berthing of vessels offering day and evening cruises. The manner in which they may be accommodated and the cost of new or expanded facilities will be considered in a subsequent report.



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EXISTING CONDITIONS

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