GMP
ASSOCIATES, INC.
Engineers/Architects

Port Authority of Guam
Master Plan

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Prepared for:
The Port Authority of Guam

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Executive Summary

Economic Assessment

Guam, an unincorporated territory of the United States, is the largest and southernmost island in the Marianas Archipelago which lies 3,700 miles west-southwest of Honolulu, 1,500 miles east of Manila, 1,500 miles south-southwest of Tokyo, and 3,100 miles north-northwest of Sydney.

Guam's Port Authority was organized in March 1950 as a division of the Department of Commerce within the Government of Guam. In 1966, the Commercial Port was established as a separate department of the Government of Guam and in October 1975, the Commercial Port was renamed the Port Authority of Guam (PAG), and reestablished as a public corporation and autonomous agency of the Government of Guam.

The PAG is the only commercial seaport in the Territory and as the primary seaport in Micronesia, serves as a transshipment point for the entire Western Pacific region. Equipped to handle the diversified interests of containerized, breakbulk, fish, as well as passenger traffic, the port provides direct service to Hawaii, the U.S. mainland, Asia, and Micronesia.

Current Economic and Market Conditions

Guam's Economy and Market. Guam continues to change in economic structure and outlook. Tourism's rapid, and most recently uneven, growth has placed a powerful new force at work in the economy that is not yet clearly defined. A great deal of economic reordering will occur as the traditionally dominant defense industry in Guam undergoes restructuring.

Though less pronounced than when Guam was almost entirely employed as a US military base, actions taken by both federal and local governments continue to play a dominant role in determining the economic patterns and well being of the community. Important economic changes, however, will come from actions the military will be taking under the BRAC (Base Realignment and Closure) report. Additionally, Guam's defense structure will be impacted by decisions made on the operational status of military bases in other areas of the Pacific.

Guam is uniquely capable of developing into a major mass market destination for East Asia's rapidly rising numbers of overseas tourists. As global standards of living rise in the 21st century, the demand for leisure products will certainly grow. Likewise, rising living standards in the Asia-Pacific

region will create greater demand for leisure travel, for which Guam is an attractive destination. For the first time, over 1 million visitors arrived in Guam in 1994. By the end of 1994, Guam could justifiably claim to be a major tourist destination. And, in the first six months of 1995, visitor arrivals were up 23 percent (to 644,159) over the same period in 1994 (524,659).

Guam's economy slowed in 1992 to 1993 with the decline of offshore investment and with real income undercut by inflation and natural disasters. A turnaround has been in progress since 1994, however. An over-production in several segments of residential structures led to a subsequent drop in construction employment. But, lingering hotel needs appear to have held construction jobs above 8,000 in 1995.

One of the broadest measures of economic activity, business tax receipts, showed evidence of improvement in first-quarter 1995. While it is not clear which segment of retail—luxury end which caters mostly to tourists, or regular sales to residents—grew the most, it is certain that the arrival of both big box retailers (Cost-U-Less, K-Mart) and a Hawaii-based luxury department store (Liberty House) contributed to the sales boost.

Asia-Pacific Market. Redesign and expansion of Apra Harbor will be based in large part on the size of external market demand and the revenue stream which that generates. A critical element in the plan involves assumptions about cargo shipping and related harbor demands that are projected to rise from the growth of the Asia/Pacific market. It is presumed that Apra Harbor will be affected in some manner by the exceptional economic growth of the nations in the region and the likelihood that the entire region will remain the world's fastest expanding trading market throughout the next half century.

The Pacific Island Market. Prior Apra Harbor master plans of 1981 and 1990 have dealt with Guam's prospects for trade and transshipment with the surrounding Mariana and Micronesian islands of the Pacific. In the brief years since those reports were released, the newly independent nation of Palau that was anticipated then has materialized, and should begin to produce increased activity as estimated in the 1990 plan.

It is evident, however, that the income growth—and even the population growth—anticipated for the Federated States of Micronesia (FSM) may fall below what was expected in earlier surveys. This is attributable primarily to the FSM's increasingly constrained financial condition and outlook, and secondarily to the increased likelihood of emigration resulting from the less prosperous outlook. As a consequence, the assumptions in this master plan are based on lower consumption and import levels than had been projected for FSM in the 1990 master plan. This will affect the overall regional transshipment assumptions for Apra Harbor development.

Shipping and Port Demand

Demands on Apra Harbor. Due in part to the momentary recovery in construction, shipping requirements for Guam appear to have moved back to near their peaks of 1991. In that year, just over 2 million revenue tons were handled by the Port, up largely because of the record levels of construction occurring at that time.

It is evident that absolute levels of tonnage resulting from tourist activity have risen an annual average of at least 10 percent through the first half of the current decade. This rate, which constitutes a slight decrease in the rates set during the 1980s, is very close to the rate of change in visitor arrivals, thus allowing a reliable correlation for future estimates.

With respect to the nature of military shipments through the commercial port, there is little reason to expect a significant change unless there is a considerable change in the number of personnel stationed on Guam. The number has remained at just over 10,000 for most of the past ten years.

Asia-Pacific Shipping Traffic and Port Demand. This market will likely exist only as a result of extensive marketing and competitive pricing by Guam. It is likely that diverting trans-Pacific transshipments to Guam will result in additional costs, rather than savings to carriers. Asia's markets are, however, changing and could conceivably develop new conditions that offset those costs. At present, though, little trans-Pacific transshipment enters Apra Harbor outside the Matson–American President Lines (APL) extension from Hawaii to Kaohsiung.

Among Guam's market competitors for the Asia-Pacific shipping routes are the established ports in New Zealand, Singapore, Hong Kong, Taiwan, South Korea, and Japan.

Pacific Island Shipping and Port Demand. In light of the relatively small sizes of the economies of the Pacific Islands surrounding Guam, shipping schedules are light and sometimes inconsistent. Since port facilities are limited, smaller freighters are required to call on these islands after having received transshipment at major ports in the region. As the volume to these island markets rises, the added cost of moving through Guam rather than directly from the U.S. and Asia will become an issue that could very well lead to a decline in volume of regional transshipment handled by Apra Harbor, especially (but not only) if these islands choose to expand their harbors for larger carriers. At present, the additional wharfage, loading, and steaming expenses of moving cargo through Apra Harbor to these islands is more than offset by the costs of developing infrastructures to move larger ships with small cargoes directly to these small island communities. For some islands, this will always be the case. For others, it will remain the case only if Apra Harbor takes major steps to improve its efficiency and cost ratios.

Demand for Fishing Facilities. The appearance of sizable commercial activity in Apra Harbor has been a recent phenomenon. The rise of long-line tuna catch being transshipped through Guam is the more recent result of fundamental changes in Japan's import market relating to new trade agreements and rising incomes in that country. These events placed new demands on foreign sources of many highly priced products, among them, freshly transported fish for sashimi consumption in Japan resulting in a marked increase in the presence of foreign fishing fleets in Apra Harbor.

Until then, Guam's fishing industry had been relatively small, consisting of local catch and market activity. One of the consequences to Guam of the 1985 Plaza Accord was a dramatic rise in tuna transshipment from 5,364 tons in 1986 to 6,772 metric tons in 1988, and 15,000 metric tons in 1989.

In 1995, two events resulted in a significant increase in port calls for purse seiners: (1) the Port Authority of Guam waived wharfage fees for purse seiners, and (2) direct frozen tuna transshipments from Guam to Asian canneries was initiated. In March 1995, Casamar, Inc., began shipping frozen seiner tuna to Thai tuna canneries via American President Lines' (APL) refrigerated containers. The container operation is estimated to be 35 percent cheaper than transport by conventional reefer vessels and, from a packer's perspective, refrigerated containers are easier to manage and handle than an entire reefer vessel of tuna.

Market and regional policy conditions appear likely to restrain growth of Guam's fish transshipment industry. Plans of neighboring island states as well as Taiwan and the Philippines to expand fish-shipping infrastructure are often accompanied by aggressive policy moves to divert shipments away from Guam and toward the funding of that infrastructure.

Demand for Passenger Transportation Facilities. Guam is currently called upon approximately 30 times per year by an average of 15 separate international passenger ships. Total seaborne passenger arrivals to Guam have declined and risen sharply for only a modest overall increase since the 1990 Master Plan despite its prediction that arrivals would have doubled from the 9,000 recorded in 1989 to 18,000 in 1995. The volatility in traffic levels has made it difficult to determine what trend or consistency might be attached to this Port activity or to any rise in the future.

Early estimates for 1995 (based on mid-year numbers being 17 percent ahead of 1994) are that arrivals could perhaps regain the 1992 record. A very important signal from this recovery is that it appears, as with that of 1992, to be linked to the overall rise in tourist traffic to Guam. Although the percentage increase is not proportionate, it still provides a correlation in signal and direction that will be important to consider in anticipating passenger demands on the Harbor.

Future Demands on Apra Harbor

Future Cargo Demands. Three forms of freight demand that help shape the outlook for Apra Harbor's utilization are future growth in local freight demand, Pacific island demand, and Asia-Pacific regional demand which encompasses the entire Pacific Rim from North to South America, Australasia, and Asia. Each of these three markets faces very different growth and routing prospects.

Demand on container yards within the Asian Market is rising rapidly and is expected to continue doing so for the indefinite future. The prospects for an expanded transshipment role for Guam, however, is not automatic in the view of industry analysts.

The final determinant of a regional container transshipment facility materializing in Guam is likely to be industry participants' willingness to invest heavily in any container facilities to be built at the Harbor. International companies, however, have already committed hundreds of millions of dollars towards the expansion of Kaohsiung, Singapore, and other Asian harbors. For Apra to induce them to lay out millions more here, the mass of allied or synchronized traffic Guam must promise would at the very least have to reach 2.5 million TEU per year.

Future Pacific Island Transshipment Demands. The extent to which this traffic will grow depends largely on income growth and infrastructure development in the island communities surrounding Guam. Future economic developments in the Pacific island states surrounding Guam are likely to be sizable when considered in the context of these individual communities, but it is not clear that they will be large when compared to Guam's forecasted economic growth. Nor is it clear that their growths will produce positive or negative consequences for Guam's commercial activity. For example, Palau's purpose in developing a new international airport is to obtain direct flights from Asia and Hawaii. Similarly, FSM, Palau, and Saipan's motives for expanding harbor facilities is to obtain direct, rather that Guam-transshipped commercial activity and goods shipment.

To the extent that these and other commercial efforts are successful, Guam's role as the "hub" for the neighboring islands will diminish. These new island developments expect to offset developmental costs through the savings incurred by eliminating the costs of intermediate handling of goods and services on Guam, plus the new revenues (public and private) that are expected to be generated. These attempts could disrupt current commercial patterns and may cause irrational (non-economic) pricing and regulatory policies in the region to which Guam's public and private players must be ready to respond.

Future Fishing Industry Demand. It is important that, inasmuch as Japan's consumption of sashimi defines this

product market for the western Pacific, this market's chronic instability be kept in mind—both seasonal and longer term variations. Seasonal variations in demand for fresh tuna do not affect the general extent to which harbor facilities may be developed. Longer term changes may. The prime factors affecting the market longer term would be growing evidence of excessive competition that drives tuna prices down, causes fleets to be bid (or required) to move to other competing ports, or causes depletion of tuna stock and the rise in price but the impoverishment of fishing companies with dwindling harvests.

A forecast of the regional fishing industry's growth and performance in both fresh and processed product is weakened by the fact that demand arising out of a prospering Asia is virtually limitless, albeit perhaps not for the sashimi traffic which would involve Guam. Against this is a resource whose bound is limited but unknown and will doubtlessly always be misjudged. The result of these conditions is a highly cyclic industry in terms of sustainable production, which means that construction of facilities to serve the industry requires an investment group that either has a very strong hold on the core market or has the capacity to endure lengthy periods of negative cash flow.

The relative newness of the region's fresh fish transshipment industry, together with the variance in data availability, hamper efforts to generate a forecast of activity. Current evidence is that, absent any major change in the policies of surrounding Pacific states, the volume of this type of fishing activity moving through Guam has stabilized in the neighborhood of 10,000 metric tons per annum. This is in line with the 15-year forecast of the 1992 Duenas and Associates report of 9,500 tons.

Assuming that the decade of sashimi imports by Japan has established the primary market size, significant change in activity for this product for Guam is likely to come only because of actions taken by neighboring jurisdictions such as the Republic of Palau, the Federated States of Micronesia, and the Commonwealth of the Northern Marianas (Saipan). For example, Palau's intention to expand its airport and air-cargo handling capacities in the near future may eliminate the current cost advantage that Guam derives from having access to direct two-way air traffic with Japan. Similarly, completion of on-going harbor expansions in Saipan could result in declines in Apra Harbor's traffic.

An advantage that Guam could develop, would be the capacity to provide more cushion than other states can, between offloading the catch and placing it on flights to Japan—a matter of some importance and difficulty for the fishing fleet. However, uncertainty over future policies of neighboring states to decrease fish traffic through Apra Harbor, presents real problems for planning harbor development. Typical of these policies are the licensing policies in the FSM, which require that all vessels authorized to fish within their Exclusive Economic Zone (EEZ) use FSM ports for transshipment. This prohibition of tuna transshipment through Guam has contributed to the decline in port

call and offloading activities in Guam. A regional economic agreement—among Guam, FSM, Palau, CNMI, and perhaps even the Marshall Islands—that encompasses fishing, immigration and labor, tourism, and similar economic interests may be the only viable mechanism to resolve Guam's dilemma.

The possibility of joining the market for canned and frozen product would entail considerable adjustment of local resource (particularly labor) costs but would present the container transshipment segment as well as the fishing segment of the Harbor design with a variety of greater options. The extensive advantage that Asian canneries hold in cost and productivity, however, render this aspect of the fishing industry an unlikely component of the Harbor's future without very generous treatment of the industry by both the federal and local governments.

Future Passenger Transportation Demand. The determinants of this market tend to have more to do with the nature of ocean destinations along which cruise ships wind their way than with the state of harbor conditions. Extensive expansion of the Harbor's passenger facilities would require evidence of both rising traffic and a rising industry willingness to cover the costs of more elaborate docking and transitting facilities.

Demand on the Port would probably increase only if an aggressive marketing program were to be developed. In essence, this means that Harbor expansion for passenger service is almost entirely dependent on the extent to which authorities determine to pursue cruise clients capable of paying for the considerable cost of such an expansion. External growth that financially justifies construction of major transit facilities is not likely to be a natural outgrowth of those markets for several decades.

Existing Port Conditions

Apra Harbor, a natural port formed by a protected lagoon, serves both the Commercial Port of Guam and the U.S. Navy. The waterways are protected by Orote Peninsula on the south, and by Cabras Island, Luminao Reef, and the Calalan submarine bank on the north. It has been used since the pre-Spanish days as a principal entry point into Guam.

From its initial establishment in 1952 until 1969, the Commercial Port was located in Inner Apra Harbor. In 1964, the U.S. Navy began design work for the new Commercial Port at its present location on Cabras Island. Requiring approximately 600,000 cubic yards of fill acquired from dredging areas now called Berth F-3 and F-6, the construction was completed in December 1969. At completion, the water depth was 30 feet below MLLW (mean low low water) along approximately 800 feet of Wharves F-3, and 35 feet below MLLW along 1,950 feet of Wharves F-4 to F-6. Piti Channel was dredged to 22 feet and extended approximately 400 feet beyond the Port's east boundary.

Facilities in the Commercial Port

What is now the Commercial Port is a series of wharves and facilities that were started in 1964 and completed in 1969. Primary facilities include the following:

- Berths F-1, F-2, F-3, F-4, F-5, and F-6
- The Port Administration Building
- Container Freight Station
- Transit Sheds 1 and 2
- Container Yard
- Equipment Maintenance Facility
- Golf and Hotel Piers
- Family Beach
- Piti Channel/Harbor of Refuge
- Agana Marina
- Agat Marina

Infrastructures

Cabras Island, including the Commercial Port, is serviced by the Public Utility Agency of Guam (PUAG) as well as the U.S. Navy. The PUAG service line is supplied by the Asan springs, and has a capacity of 250 gallons per minute (approximately 350,000 gallons per day).

The Port of Guam is currently served by a 50,000 gallon per day package sewage treatment plant located near the main entrance to the port area. The Public Utility Agency of Guam (PUAG) has completed the design of a new pump station adjacent to the existing sewage treatment plant. When completed, the sewage will be collected at the pump

station, pumped along the pipe paralleling Route 11, to an existing gravity sewer system along Marine Drive.

All electrical power on Guam is pooled from the generators at Piti, Cabras, and Tanguisson. In October 1972, the Navy and the Guam Power Authority (GPA) agreed to a pooling agreement which provides for the joint use of power generation, transmission, and distribution facilities. The agreement calls for the GPA and the Navy to share equitably in the responsibilities and costs of operating the island-wide power system.

Route 11 provides access to the Commercial Port area as it branches off the island's main arterial, Route 1 (Marine Drive). In 1990, Route 11 was realigned to provide 12-foot travel lanes with 10-foot wide shoulders along the 100-foot wide right-of-way corridor, and turning pockets at the entrance to the Administration building parking lot and to the Container Yard sentry station. The 1992 *Guam 2010 Highway Master Plan* concluded that Route 11 is not subject to become congested. Accordingly, no short-term or long-term highway improvements have been, nor are they now recommended.

Route 18, also known as Causeway Road or Drydock Island Road, services the Harbor of Refuge, Aqua World, Marianas Yacht Club, and Dry Dock Island, along with the Navy's fuel point at Delta Pier. It is a straight, 2-lane paved road with grass-lined shoulders. As Drydock Island is recommended for development as a major, new tourist attraction, and public recreational area, Route 18 should be improved to the same standards as Route 11 on Cabras Island.

Navigational Aids

Apra Harbor was charted by the National Ocean Service (NOS), Charting and Geodetic Survey (Department of Commerce), the agency charged with surveying and charting of the coasts and harbors of the United States and its territories. In addition to the NOS Chart, a Notice to Mariners is published weekly by the National Imagery and Mapping Agency (NIMA) to advise mariners of important matters affecting navigational safety, including hydrographic discoveries, changes in channels, navigational aids, etc. Finally, the U.S. Coast Guard station on Guam is charged with overseeing all navigational waters within Micronesia. A local Notice to Mariners is broadcast over the radio for any immediate and/or temporary deficiency within any of these waters.

About every four years, the USCG conducts an analysis of all the navigational aids within a specific area as part of its Waterway Analysis Program. The most recent analysis performed for Apra Harbor was completed in 1995 when it was determined that the harbor's navigational aids are satisfactory for all mariners.

Earthquake Damages

The Port of Guam suffered severe damage from a Richter magnitude 8.1 earthquake on August 8, 1993 which induced soil liquefaction, settlement, and lateral spreading. The earthquake was centered in the Marianas trench approximately 50 kilometers south of Guam.

A construction contract for "Earthquake Repairs—Berths F-3 through F-6" was begun on October 23, 1996 with an expected construction duration of 18 months. The project calls for repairs of Wharves F-3 through F-6 of all damages caused by the earthquake. Wharf F-5 will be completely replaced with a new 540-foot wharf on concrete pilings at an estimated construction cost of $12,100,000.

Land Use

Leases

Prior to 1969, all land around Apra Harbor was owned and controlled by the U.S. 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 up to 50 years. Most of the income from these leases goes to the Guam Economic Development Administration, though the Port shares in the rent. Among the lessees are the three 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 accommodated Phase I of the container yard expansion and is planned to further expand the yard to 50 acres. Most of the remaining area has been leased out and will be used for the proposed Cabras Island Industrial Park.

The Port Authority of Guam leases portions of several buildings and open spaces within the Commercial Port area to a variety of tenants including some non-commercial port users such as water recreation activities, passenger ship docking, dinner cruises, and net repair/storage.

The Guam Economic Development Authority (GEDA) is the lessor for the fuel facilities located on Cabras Island including the tank farm areas for Shell Guam, and Mobil. In addition to the petroleum companies, GEDA leases property to the Kaiser Cement, Casamar (net repair), and the Guam United Warehouse Corporation (trucking).

Cabras Island Industrial Park

In 1992, the Guam Legislature passed Bill No. 475, which the Governor signed as Public Law No. 21-124. The Act authorized the Port Authority of Guam to lease to the *Cabras Island Developers* an area adjacent to port to be developed as the Cabras Island Industrial park. The Park's Master Plan, which was prepared in 1992 calls for five development phases, with a total implementation schedule of 10 years. Under the terms of PL 21-124, the lessee must develop the park's infrastructure, a master plan, and a development schedule. To date, the plan has not been implemented.

Forecasts and Demand-Capacity Analysis

A dependable forecast of future demands and conditions is essential for ascertaining future requirements for port functions, facilities, and operations. The accuracy of such forecasts depends on the occurrence of assumed future events which cannot be assured in advance. In addressing planning factors, we considered it appropriate to develop a "base case" regarding the outcome of future events and circumstances. The scenario assumes the continuance or occurrence of fundamental political, economic, and social events. These factors are listed in Table 4.1. Notwithstanding the considered care with which these assumptions were determined, future events, particularly those long-term, could cause some of the underlying assumptions to become invalid. Accordingly, we also identified variances to the base case. These variations could cause either an increase in port activity (the optimized case) or a decrease (the constrained case) from the most likely base case.

The plan itself is based on the demands that result from the assumptions and factors listed under the base case, the most likely event. Where potentially significant, the plan considers the likely impacts of a variance from the basic assumptions.

Short Term Demand Forecast

Imports and Exports. The importation of goods for local consumption is the single most important cargo flow at the Commercial Port of Guam, accounting for nearly half the total port traffic in 1994. Local consumption should rise in direct relation to the island's per capita income and population growth.

Tourist related activity, including construction, is purely a function of the number of tourists visiting Guam and their level of expenditures. Tourism is likely to grow quite healthily, albeit slowing to about 10 percent annually over the forecast period. Like tourism, the double digit growth in construction activity should slow and it is expected that over the forecast period, construction traffic will increase to about 2 percent.

The United States is continuing to reassess its military presence throughout the world. Unfortunately, prediction of events, and its direct and indirect impacts on Guam are extremely difficult. In view of past trends and future uncertainties, it is reasonable to assume the status quo in the level of military use of commercial port facilities for the foreseeable future. This nominal "no-growth" scenario represents our best judgment of the military component of the future commercial port traffic. For purposes of forecast-

ing tonnages, we assume that military traffic will grow at a rate of 1.0 percent per year.

In summary (the details are shown in Table 4.2), traffic into and out of the Port is expected to rise from 1,865,513 revenue tons in 1996 to 2,216,356 tons by the year 2000.

Transshipments. Transshipment traffic through the Commercial Port can be separated into two parts: (1) the transshipment of goods to other areas in Micronesia, particularly the CNMI, the FSM, and Palau, and (2) the receiving processing, assembling, and/or re-exportation of goods received from various destinations and destined for areas outside Micronesia.

Like Guam, the three main economic sectors of other Micronesian islands are tourism, construction, and general consumption. However, like Guam, the economic growth is expected to slow, and this fact coupled with more direct shipments into these areas, is expected to reduce the amount of transshipments through Guam. Unless Guam takes a very aggressive marketing stance and establishes a very competitive pricing structure, there will be very little opportunity for Guam to establish itself as a major transshipment center. Over the forecast period, transshipment traffic through the Commercial Port is expected to grow around 1.5 percent.

Tuna Shipments. Guam's existing port infrastructure, network of agents, and frequent flights to Japan has made it a major transshipment point for chilled fresh tuna destined for Japan.

Presently, a large fleet of longliners uses Guam for air shipment of their tuna catches and some operators and their agents are quite optimistic about further growth. However, the industry is governed much more by the relative costs at Guam, air freight limitations, and licensing policies of other countries, than by such variables as the growth of the market or the overall harvests versus potential yields. Consequently, it is extremely difficult to forecast the future transshipment levels of chilled tuna. In 1992, the total volume of fish coming out of Apra Harbor declined to about 5,390 mt but by 1993 had increased to 7,104 mt. For this report, we assume that tuna transshipments will continue through Guam, but that transshipment volumes will remain constant.

Cruise and Excursion Traffic. Past evaluations of extended cruise travel have predicted that cruise vessel passenger counts would grow roughly in proportion to the total number of visitors. This has not occurred, however. While visitor counts has climbed significantly over the long term, cruise vessel traffic has been flat, and has even declined during some periods. For the short-term, therefore, cruise vessel traffic is predicted to grow only slightly from approximately 8,000 passengers in 1996 to 9,700 by the year 2000.

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. The industry is very robust, is growing in proportion to tourism counts, and should remain a major player in the Commercial Port for the foreseeable future. If this traffic grows at the same rate as tourism (10 percent annually) as expected, then nearly half a million visitors would be sailing annually on one of the day excursions by the year 2000.

Intermediate to Long Range Forecast

Guam is not expected to evolve easily into a major transshipment center for destinations outside of Micronesia. Therefore, transshipment activity will increase only slightly for the foreseeable future. In addition, military presence on the Island should remain stable, and construction activity will probably slow further as tourism's growth rate declines. Local consumption will continue to rise in direct relationship to population and per capita income growth, with the only significant increase in activity being generated by tourism. Predicting what will occur with the fishing and passenger vessel industry is much more difficult because past activity has been erratic. The best approach to addressing these two sectors would be to expect growth to be flat to slightly rising, with careful monitoring of its actual change rate.

Tourism, Military, Construction, Local Consumption, and Transshipments are expected to rise to 2.46 million revenue tons by the year 2000 and to 3.45 million revenue tons by 2025. For planning purposes, tuna shipments are projected to rise from 10,000 metric tons in the year 2000 to 15,000 tons in 2025, and passenger travel is projected to rise from 15,000 in 2000 to 19,000 in 2025.

Demand Capacity Analysis

Wharves. In estimating the current capacity of the Commercial Port, only Berths F-4, F-5, and F-6 will be considered as, for all practical purposes, Berth F-3 is fully utilized by fishing vessels. Since H(otel) 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. The estimated annual capacity of the existing piers is 2,057,868 revenue tons, which is close to the 1994 cargo volume of 1,940,000 revenue tons (includes transshipments in and out). This leads to the conclusion that F(oxtrot) wharves are operating at near capacity levels.

Container Yard. Container yard capacity 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. However, it requires 30 to 40 percent more land area than a stacked operation. The stacked operation requires a greater degree of organization, but is more frugal in its use of land. At the Port of Guam, a mixture of both of these storage methods is being used.

The calculations detailed in Section 4, show that approximately 20 acres of space are needed to handle the estimated number of containers that moved through the Port in 1995. Moreover, if two vessels should arrive on successive days, there will be peaking, as additional containers are coming in before the containers from the preceding vessel can be delivered from the yard. The effect of this is that an increase in the area is required.

Recommendations

Port Expansion Requirements

In the last fifteen years, at least five planning documents have assessed existing operations, estimated future port demands, and identified an array of capital improvements for Apra Harbor to meet anticipated future demands. These planning documents include: *Commercial Port of Guam Master Plan* (1981); *Apra Harbor Interim Survey Report and Environmental Statement* (1983); *Evaluation of Commercial Port Docking Facility* (1988); *New Master Plan for the Commercial Port of Guam* (1990); and *Cabras Island Industrial Park Master Plan* (1992).

A comparison of the forecasts prepared for this report with that of these earlier reports clearly shows that our forecast for cargo tonnage is in line with the two more recent forecasts made by TAMS and Duenas in 1990 and 1992, respectively. Although there are some specific differences, the aggregate tonnages are not substantially different. The 1981 forecasts vary significantly from the other three forecasts since they did not account for Guam's rapid growth of tourism experienced in the late 1980s, after the report was written.

Thus, the forecasted demand that served as the fundamental basis for the recommendations of the 1990 Master Plan is essentially unchanged. Because our forecasts in the intermediate to longer term are lower than that which were envisioned in 1990, the facilities, land, and equipment recommendations that were made in 1990 are in fact more conservative from a demand-capacity point of view. One can conclude then, that the recommendations of the 1990 Master Plan remain valid from a demand-capacity viewpoint.

Notwithstanding the fact that the demand-capacity basis for the 1990 recommendations remain fundamentally unchanged, port expansion needs call for reassessment for the following three reasons:

- The impending closure/disestablishment/realignment of selected U.S. Navy facilities within the Inner Apra Harbor. Under the terms of the Base Realignment and Closure (BRAC) Commission recommendations of 1995, the Ship Repair Facility (SRF), Fleet Industrial Supply Center (FISC), Naval Activities (NAVACTS), and Public Works Center (PWC) are specifically and variously due for closure or reorganization. These pending actions provide an opportunity for the Port Authority and the Government of Guam to capitalize on existing wharfage and facilities within the U.S. Navy-controlled Inner Apra Harbor to augment Guam's own facilities in the Commercial Port area.

- Potential for gains in productivity and efficiency should selected port - related functions be performed by private entrepreneurial enterprises rather than by a government sponsored agency. The Port Authority and the Government of Guam have already taken steps in this direction by the leases they have signed for the Cabras Island Industrial Park and for parts of the Harbor of Refuge. Other areas and activities could be similarly structured.

- Although the economic forecasts and resulting demand - capacity analyses present a less than optimistic vision for Apra Harbor becoming a Singapore - or Hong Kong-like regional transshipment center, the conclusions do not consider the potential and probable effects of optional and intense marketing efforts to entice industry, shippers, fishers, and others to use Apra Harbor. By developing a marketing plan and undertaking an intensive marketing effort, Apra Harbor development need not necessarily be held hostage to passively responding to the natural forces of external economics.

Commercial Port Needs

The availability of selected Navy-held lands and facilities within the Inner Apra Harbor area provides the Port Authority with development and expansion options that were not available when the previous master plan was completed in 1990. With more available space, existing industries will have more flexibility and options for long range planning. At the same time, to remain competitive with other Pacific nations, Guam must develop an aggressive marketing program. The availability of Inner Harbor properties provides an opportunity to re-think Guam's port planning and marketing strategies. PAG and the Government of Guam must actively expand the existing industries and open up new industries at the Commercial Port to keep Guam economically competitive. Guam has a unique opportunity to plan its future port operations. The functions that must be accommodated (and hence, sited) by the Port Authority are listed below:

- Container/Breakbulk Terminal
- Transshipment Center
- Fishing Industry Facilities
- Fuel Supply and Storage
- Port Headquarters/Administration Offices
- Commercial/Passenger Cruise Travel
- Dinner Cruises and Day Trips
- Recreational Boating Facilities

- Water Recreation Areas
- Retail Center
- Warehousing

Constraints/Conditions/Planning Factors

BRAC Reuse Plan. Although Guam's naval facilities were spared from closure in previous base realignment decisions, portions of the U.S. Navy facilities within the Inner Apra Harbor were included in the wave of BRAC (Base Realignment and Closure) '95 (BRAC IV) closure and realignment recommendations. Among the facilities affected by the BRAC action with potentially direct beneficial impact are the FISC (Fleet Industrial Supply Center) and portions of the NAVACTS (Naval Activities). Other entities such as the SRF (Ship Repair Facility) and the PWC (Public Works Center) certainly will affect the Commercial Port, but in a more indirect manner.

The availability of naval properties presents new challenges in completing the master plan. Because negotiations between the Government of Guam and the U.S. Navy are ongoing and remain inconclusive as of this writing, an alternative that assumes the availability of specific facilities within the navy-controlled Inner Apra Harbor has its risks. However, it is a virtual certainty that at least some of the naval facilities will be returned to the Government of Guam.

Growth Scenario with Active Marketing. Earlier, we stated that since the demand forecasts of this report were essentially unchanged from the demand forecasts that had been made in the 1990 master plan, but that the forecast makes no presumption on the role of marketing. The availability of the Navy's Inner Harbor facilities provides a unique opportunity for the Port Authority and Guam to actively and aggressively attempt to influence the outcome of regional and world economic forces.

Active marketing means competing in the global market, an extremely competitive arena where large national ports aggressively pursue all the business it can garner. To be effective, Guam must choose to develop a sophisticated marketing program to entice business its way, with the full knowledge that it does not lie along any of the major shipping lanes. It must compete on equivalent terms with for example, Singapore, which is strategically positioned directly along one of the busiest sea lanes in the world.

Vision to Become a Transshipment Center. Notwithstanding the fact that Apra Harbor's cargo tonnages for transshipment to other Pacific destinations has not increased significantly in the recent past, it remains entirely plausible that effective marketing can alter the seemingly natural course of future events. For Apra Harbor to develop into a new major port, it will be fundamentally dependent upon the emergence of sizable and sustainable regional transshipment traffic destined to and from major international ports

not presently served by Guam. We take the view that innovative thinking and aggressive marketing could create a win-win situation for both Guam and the potential investor/developer. The availability of naval properties in the Inner Harbor certainly adds a new dimension to strategic thinking.

The task of getting out to attract the world to Guam is critical—conventional demand forecasts show that the world is unlikely to move toward Guam without some very creative marketing. In particular, efforts will have to focus intensely on inducing massive private investment. In light of the extremely high capital requirements, it is likely that Guam may have to reinvent the management and operating style of the port. Such a philosophical shift may perhaps be a greater challenge than the marketing effort itself, but it will certainly be a prerequisite to attaining the vision.

Leases. PAG leases several areas to various tenants. Section 3 of this report describes in detail the various existing leases within Commercial Port lands. Although leases provide income for PAG, they also take away valuable real estate within the Commercial Port. These areas will not be available for long term PAG use. However, increased productivity and efficiency may result if private enterprises perform functions previously provided by Government sponsored agencies.

Explosive Safety Quantity Distance (ESQD). To safeguard against development in dangerous areas, hazard zones have been established by the Department of Defense for various quantities and types of stored explosives. This zone is designated as the Explosive Safety Quantity Distance (ESQD). The Ammunition Wharf (Kilo) ESQD arc of 7,210 feet (emanating from Orote Point) affects the western-most end of Glass Breakwater as well as the mouth of Apra Harbor. No Commercial Port lands are located within this ESQD arc.

Dredging, Filling, and Physical Land Limitations. Guam's cargo traffic will continue to grow as its population increases and as other cargo producing markets are developed. The need for wharfage space and storage area will increase with this growth in cargo. One alternative to meet this need is to create more usable wharfage and storage area by increasing the land area, converting more waterfront area to docks, or free up more inland area for storage. There are a number of challenges that confront the port planner.

Much of the waterfront areas usable for docking are already in use. Additional areas, such as the area fronting Golf Pier and the inner harbor, are in shallow waters with ocean depths in some areas less than 30 feet. For Guam to develop into a transshipment center, Apra Harbor must be able to accommodate larger ships with drafts from 40 to 46 feet.

As cargo traffic increases, additional wharfage areas will be required. To increase docking capacities, one option is to expand the docks by creating additional wharves. Unfortunately, the logical areas to expand the docks are within deep waters and will require large amounts of fill or lengthy piles.

Although areas near the Glass Breakwater are ideal for docking of ships, the narrow area behind the wharfage limits the type of activity that can be accommodated in this area. Maneuverability and storage space will be limited due to the narrow land. Filling of this area to increase the storage area will also be costly due to the deep waters.

Layout Alternatives

Container Operations/Deep Draft Berths. Container cargo operations are currently supported at wharves F-3 through F-6, which share space with the sometimes conflicting requirements of the fishing fleet, cruise ships, and break bulk cargo. To accommodate the projected increases in cargo to Guam in the coming years, it is prudent to plan for an orderly expansion of the storage capability of Commercial Port.

However, from an economic and market-demand perspective, the need to expand cargo handling capabilities to accommodate post-Panamax class of vessels is not immediate. An aggressive and innovate marketing effort, coupled with improved and expanded facilities could, at some point in the future, cause Guam to become a desirable transshipment point for the Asia-North America trade. Until then, it does not make economic sense for the PAG to invest scarce resources in developing berths and facilities to support a class of vessels that have yet to show interest in Guam. The prudent action is for Guam to improve operations at its existing container port, selectively expanding it to accommodate near to mid-term demands. Guam should have an on-the-shelf plan, however, that can be implemented once its marketing efforts bear fruit and generates real interest in deep-berth post-Panamax transshipment activities.

Expansion of the container yard's capacity can be accomplished in stages. The recommended sequence consists of the following phases:

1. Relocate the fishing fleet and cruise ship functions to Victor Wharf in Inner Apra Harbor.

2. Install two new cranes, relocate the electrical substation from behind Wharf F-5 to the rear of the container yard.

3. Demolish the container freight station and Storage Shed 2 to new facilities in the Cabras Island Industrial Park.

4. Dredge Wharf F-3 to 30 feet.

5. Relocate the port headquarters to Cabras Island Industrial Park.

6. Relocate the parking lot at the main gate.

7. Extend Wharf F-6 by 900 feet to accommodate two, 700 feet long ships, add an additional container crane, and expand the container yard to the western boundary of Cabras Island Industrial Park.

In the longer run, for Guam to effectively market itself as a transshipment center, it must, as a minimum, have the capability to accommodate today's and tomorrow's large container ships. Most of the world's shipping lines use large post-Panamax vessels that typically have a laden draft of between 40 and 46 feet. The depths at the F-Wharf area are about 34 feet, while the depth within Inner Apra Harbor draft is between 26 to 35 feet. Hence, substantial work will be required at the existing facilities if Apra Harbor is to prove attractive to these classes of vessels.

Three alternatives to accommodate post-Panamax class vessels were considered.

As an objective, each of the three alternatives aims to off-load/dock a minimum of one C11 (5GVC) class container vessel which requires approximately 1,200 feet of wharf frontage, a draft of approximately 46 feet, and about 50 acres of container yard per berth.

Construction of a floating pier between Wharves G and H. There are at least three distinct advantages of siting a floating pier at Apra Harbor to accommodate post-Panamax vessels. The primary advantage of a floating pier is that it minimizes impacts to the underwater flora and fauna in Apra Harbor by eliminating the need for large fills. Second, floating piers are resistant to seismic activity since they are supported by buoyant forces as opposed to rigid supports. A third advantage of a floating pier is that existing port operations need not be significantly impacted during construction since the pier can be constructed elsewhere and towed to its final location. In addition, under a floating pier scenario, no port operations will have to be relocated or eliminated.

There are, however, major disadvantages to locating a floating pier between Wharves G and H for the berthing of post-Panamax ships. Of particular significance is that the area between Wharf G and Wharf H lacks sufficient backland area which can be utilized as a container storage yard. Consequently, the nearest area which is suitable for a container storage yard is the 42 acres currently designated for Lot 1 and Lot 2 of the Cabras Island Industrial Park.

In addition to being approximately sixteen percent smaller than the optimal 50 acres of container yard, the Industrial Park site would be located almost two miles away from the proposed floating pier. To convey containers from the floating pier to the container yard would require improvements to the breakwater to accommodate an additional lane

of traffic, or alternatively, to accommodate a tracked container delivery system (e.g., railroad tracks). Both container delivery alternatives will require large capital expenditures which may make such a proposal cost prohibitive.

Construction of a pier and container yard on new fill located between Wharves G and H. This alternative proposes a fixed pier to allow the area between Wharves G and H to be used for the berthing of deep draft ships. The proximity of the proposed container yard to the proposed wharf allows use of much of the traditional container handling equipment, e.g., front loaders. In addition the layout eliminates much of the double handling of containers since containers will generally not have to be moved excessive distances to be stored.

There are, however, disadvantages. The primary disadvantage is the large amounts of fill required to construct the required wharf frontage and container yard space. Such a project is subject to opposition since some coral and other marine life habitat are likely to be eliminated or affected during construction. In addition, the fuel tank farm located north of Route 11 will have to be relocated and new fuel lines will have to be installed to service the relocated fuel tanks. There will also be considerable cleanup and certification costs associated with the relocation of the fuel tank farm.

The proposed pier would also be located within the ESQD arc generated by the anchorage of the Maritime Prepositioned Ship(s) in Outer Apra Harbor.

Conversion of the Ship Repair Facility (SRF) area into a deep draft wharf. Finally, the Navy has announced its intention to close its Ship Repair Facility (SRF) at the juncture of Inner and Outer Apra Harbors. The SRF site offers distinct advantages which include over 3,000 feet of existing Wharf G space in good condition, potential for an additional 2,500 feet of wharf with 50 to 60 foot depths, central location, 100 to 150 acres of backland, and good road access. Although construction would require capital expenditure in the millions of dollars, it would be more economical than the effort that would be required either on Cabras Island (present Commercial Port area) or anywhere else in Inner Apra Harbor.

Conversion of a portion of the SRF area to accommodate deep draft vessels is recommended for the following reasons:

- A port located at the SRF area will be able to operate more efficiently since fourth-generation post-Panamax cranes can be utilized at the site.

- There is sufficient room to locate a container yard adjacent to the wharf.

- Fixed ports generally have lower maintenance costs than floating ports.
- There is sufficient room for expansion of wharf frontage and associated container yard space if the need arises.
- Operation of a wharf located at the SRF area will be less labor intensive.
- A port located at the SRF area may allow Apra Harbor to be more cost competitive with ports located along the northern great circle route.

Fishing Facilities. The port's service to longliners and purse seiners has steadily increased. Currently, wharves F-2, F-3, and F-4, are used by both types of fishing vessels in competition with break bulk carriers, container ships, and even passenger cruise vessels from time to time. Facilities at these wharves are generally inadequate to meet current demands. The alternatives are for either a significant improvement to the existing area or relocating the function elsewhere within the harbor.

While improvements can be made to the present site, such an investment makes little sense particularly when far better and suitable facilities will soon become available as the Navy returns significant portions of piers and backlands to the Government of Guam. Moreover, continued shared use of the area with break bulk ships and container ships will result in continued congestion and inefficient operations.

The alternative—relocating the fishing industry requirements to Victor Wharf in the Inner Harbor—allows for future growth and could encourage private development of much of the infrastructures by the industry itself. Victor wharf offers an excellent long-term location for fisheries activities.

Fuel Supply and Storage. Commercial fueling activities presently take place at Wharves F-1 and F-2, Golf Pier, and in waters in their immediate vicinity. Two companies currently distribute POL products on Guam—Shell Oil and Mobil Oil. According to Mobil officials, current utilization rates of their existing storage is high, but its storage capacity should be adequate to meet its needs at least for the next 5 to 7 years. Shell Oil's recent acquisition of Exxon's fuel facilities increased it's storage capacity by 177,000 barrels. Shell plans to continue using the existing storage tanks at Cabras Island and has no need or plans to develop and construct additional storage facilities. Officials of both Mobil and Shell Oil agreed that the existing fuel facilities at Cabras Island are satisfactory and will remain adequate to meet all their needs for the short- to mid-term.

Port Headquarters/Administrative Offices. The Port Authority headquarters is presently housed in a single building in the backlands of Wharf F-3. As the need for

contiguous open container space becomes a priority item, existing structures within the current container yard should be relocated. There is no compelling and critical reason to site the Port headquarters adjacent to the wharf and container area.

Three alternatives were considered for an alternate location:

1. Cabras Island Industrial Park
2. Drydock Island
3. Ship Repair Facility Area

We recommend that the Port Headquarters and general administrative service facilities be relocated to the Cabras Island Industrial Park. While both Drydock Island and the SRF area offer attractive advantages, higher and better use can be made.

Commercial/Passenger Cruise Travel. The availability of Victor Wharf in the Inner Harbor areas through BRAC presents new options to service cruise travel needs. The Draft BRAC Business Reuse Plan recommends that a portions of Uniform and Victor Wharf be revitalized as an international passenger cruise terminal area. We concur.

Dinner Cruises and Day Trips. Local excursion cruises, including dinner and dance cruises and local day time cruises, is a market with great potential on Guam. Two alternate locations are available—Victor Wharf in the Inner Harbor and Drydock Island. The Draft BRAC Business Reuse Plan proposes that the northern part of the Victor Wharf area be reused as a dinner cruise terminal. We concur with the recommendation.

Relocating the existing dinner/day cruise operations from scattered locations in the Outer Harbor/Harbor of Refuge areas, will consolidate related activities of competing vendors and promote efficiency and customer service, as well as easing their management, control, and operations.

Recreational Boating Facilities. Surrounded by the Pacific Ocean and Philippine Sea, many recreational boaters call Guam their home. Presently, at the eastern end of Piti Channel, Aqua World and Umidori Cruises (Harbor of Refuge) together manage about 84 boat slips and landside leases for dive tours, fishing charters, dinner cruises, and an *Atlantis* submarine venue. If the commercial dinner/day cruise businesses (including the *Atlantis* submarine) and the fishing charters are relocated to the Inner Harbor and Drydock Island, more privately-owned boats can be accommodated in this area. Additionally, the return, or alternatively, joint-use, of Sumay Cove that lies next to the closing Ship Repair Facility (SRF) will provide additional boat slips for the general population.

Water Recreation Areas. Water recreation facilities are currently located at various locations throughout the outer harbor. Family Beach, an open, sandy beach primarily used by local residents for picnics and swimming, is located immediately west of Pier Dog; Hotel Wharf is used in part for cruise vessel docking; Golf Pier and the old Seaplane Ramp is used by diving and jet ski operators; and the Marianas Yacht Club operates out of Drydock Island. Consolidation of public recreation functions at a single location will promote the safety, efficiency, and effectiveness of these facilities.

Drydock Island, an area soon to be released by the Navy to GovGuam, is the preferred location for consolidation. The presence of limited existing recreation facilities in the immediate vicinity of the releasable portion of Drydock Island offers an opportunity to consolidate, expand, and improve the level of service being provided. The area could be developed into a combined theme park, recreation area, and a cruise/day travel terminal. Concurrent preservation of adjacent wetlands and marine sanctuaries would add to the overall attractiveness of the proposal.

Retail Centers. While retail facilities are not a responsibility nor function of a Commercial Port, in Guam's case their close proximity and integration with port-related facilities make joint planning essential. Two areas are recommended for consideration as retail developments:

- Victor Wharf in the Inner Harbor
- Drydock Island

Warehousing. While dockside warehouses are neither required nor in fact, desirable, warehouses that are located in relative proximity and easily accessible by land transport means, is critical for efficient port operations. Moreover, the suggested relocation and demolition of structures adjacent to wharves F-3, F-4, F-5, and F-6 for breakbulk and container operations will in turn increase the demand for warehousing. Cabras Island Developers is currently tasked to develop Cabras Island Industrial Park. Notwithstanding that GovGuam may negotiate a swap of areas to develop (Cabras Island for portions of Victor Wharf), the lessee and the PAG should move forward with plans for developing the industrial park, including the construction of new warehouse space.

Summary of Recommendations

- Relocate the fishing fleet from the F-Wharf area to Victor Wharf in the Inner Harbor.
  - ▸ Consider the private development of fisheries support facilities at Victor Wharf by the Cabras Island Developers in exchange for a reduction in development requirements at the Cabras Island Industrial

Park. Open negotiations with Cabras Island Developers to explore such an exchange.

  - Upon successful negotiation of an exchange of development sites, dedicate the released portion of the Cabras Island Industrial Park for further expansion of the container yard.

- Relocate cruise vessel docking from F-Wharf area to Victor Wharf in the Inner Harbor. Consider negotiating with the Cabras Island Developers for private capital development of a new terminal/arrival facility in the Victor Wharf area.

- Dedicate Wharves F-2 and F-3 to break bulk operations. Dedicate Transit Shed 1 as a covered break bulk storage facility.

- Demolish Transit Shed Number 2, Maintenance and Repair Shop, Rig/Welding Shop, Security Office, and Container Freight Station. Work with the Cabras Island Developers to construct replacement facilities in the Cabras Island Industrial Park.

- Relocate the Port Headquarters and shipping agency offices to a new facility at the Cabras Island Industrial Park. Site the new Port Headquarters such that it serves as a visible "gate" to the Port and its facilities.

- Consider demolishing the Port Administration and SeaLand Offices to create additional open space for break bulk storage.

- Install two new cranes, and relocate the electrical substation from behind Wharf F-5 to the rear of the container yard.

- Dredge Wharf F-3, F-4, F-5, F-6 to -40-feet at the western end and to -36 feet at the eastern end. Reconstruct 1,000 feet of bulkhead at the western end of the F-Wharves.

- Extend Wharf F-6 by 900 feet to accommodate two, 700-foot long ships. Add a sixth container crane.

- Expand the Container yard to the western boundary of the Cabras Island Industrial Park.

- Upon progress toward the establishment of a regional transshipment center, develop a deep-draft transshipment facility to accommodate post-Panamax class of vessels at the SRF area as described in the Draft Business Reuse Plan.

- Relocate commercial dinner cruise, day cruises, diving/scuba operations from the Harbor of Refuge, Piti Channel, Hotel Wharf, and other Outer Harbor areas to Victor Wharf and Drydock Island.

- Dedicate the Harbor of Refuge to the recreational needs of private vessel owners. Negotiate with the Navy for joint use of Sumay Cove adjacent to the SRF area for additional use by private boat owners.

- Develop the area west of Fuel Dock D on Drydock Island as a public water recreation area.

- Limit areas within the MPS ESQD to public water recreation activities (eliminate commercial diving/jet skiing operations). Prohibit the construction of permanent facilities within the ESQD arc.

- Encourage the development of privately-financed retail/tourist centers on Drydock Island and in the vicinity of the proposed cruise ship terminal on Victor Wharf.

- Store hazardous wastes awaiting shipment for disposal at the Navy's FISC in the Inner Harbor. Conclude appropriate support agreements/contracts either with the Navy. Demolish existing, unlicensed hazardous waste facility on Cabras Island.

- Store used batteries and used oil through Navy facilities in the Inner Harbor. Complete support/contractual arrangements with the Navy for them to accept and dispose of these materials at a mutually agreed upon cost.

- Retain fueling facilities at its present location. In the long-term, if additional storage capacity is required, use off-site storage terminals.

- Maintain existing navigation markers and aids. Continue working with the U.S. Coast Guard to ensure continued compliance with maritime standards.

Section 1

Introduction and Market Analysis

ASSOCIATES, INC.
Engineers/Architects

Section 1

Introduction and Market Analysis

1.1 Introduction to Guam

Guam, an unincorporated territory of the United States, is the largest and southernmost island in the Marianas Archipelago. The 30 mile long island ranges from 5 to 8.5 miles in width, and has a total land mass of 212 square miles. It lies 3,700 miles west-southwest of Honolulu, 1,500 miles east of Manila, 1,500 miles south-southwest of Tokyo, and 3,100 miles north-northwest of Sydney.

Formed through an uplift of undersea volcanoes, Guam is composed of two distinct geologic areas of about equal size. The northern part is a high coralline limestone plateau rising up to 850 feet above sea level. The southern region, being volcanic in origin, is mountainous with elevations of 700 to 1,300 feet. Apra Harbor, one of the largest protected harbors in the Pacific, is located on the central western side of the island. Guam's major physical features are identified in Figure 1.1.

Guam is the westernmost territory of the United States, and having the finest deep water harbor between Hawaii and the Philippines, serves as a gateway to the dynamic and rapidly growing East Asia economies. A crossroads of Pacific, Asian, European, and American explorations, religious expeditions, military conquests, civilian commerce and

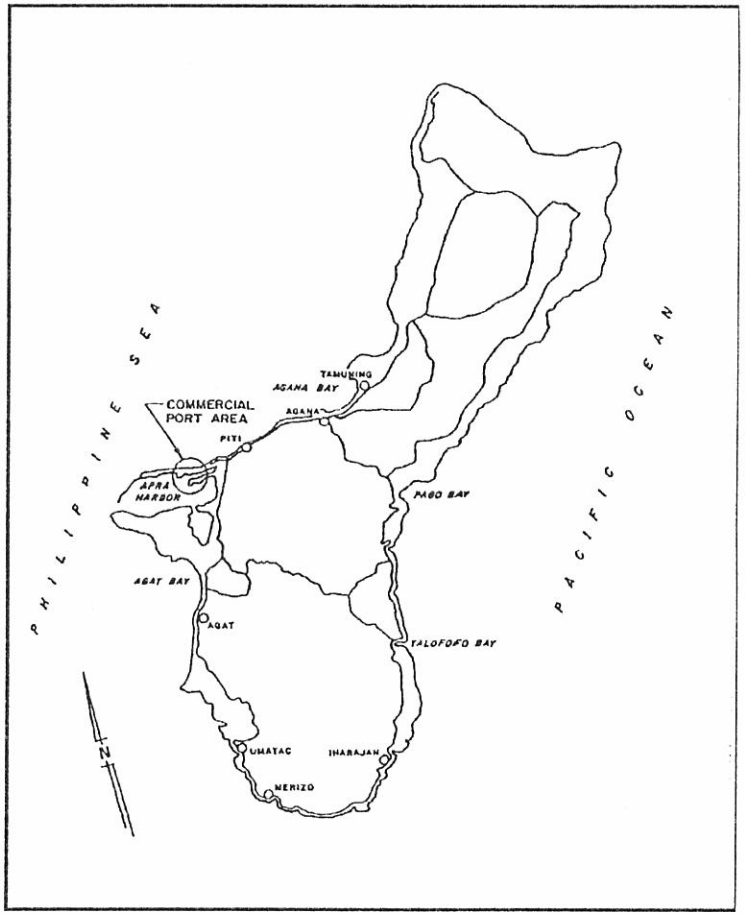

Figure 1.1 Territory of Guam

multi-cultural exchanges over the last 400 years, Guam has been a Western Pacific hub for a century. With its strategic location and harbor, it has served as an important base for American military operations since 1898, and can be expected to continue in that role as well as assuming greater importance in Pacific trade activities.

Guam's estimated 1995 population of 149,249 is diverse in ethnic origin—40 percent Chamorro, 24 percent Filipino, 15 percent Caucasian, 5 percent Micronesian, and one percent, Other Asian. The remaining 15 percent is a mix of ethnic groups.

Guam's Organic Act established local self-government in 1950. Until then, the U.S. Navy administered the island. With the passage of the Act, the people of Guam became United States citizens but, because Guam is a territory, citizens lack voting rights in the federal government—they cannot vote in Presidential elections. Representing Guam in the U.S. House of Representatives is a member who cannot vote on the House floor, but can vote in committees. Since Guamanians do not vote nationally, they do not pay federal taxes. The Organic Act provides for Guam income taxes to "mirror" federal income taxes—the Guam income tax law is the federal law with the revenue going to the Government of Guam.

In addition to tax laws, as an unincorporated territory, other federal laws do not automatically apply. As an example, U.S. import tariff laws do not apply, thus making Guam a duty free port. Similarly, some federal banking and transportation laws and regulations apply to Guam, while others do not. As a duty-free port, Guam provides an easy means for moving raw materials for manufacturing. Guam is a participant of two major trade programs which benefit export-oriented manufacturing. General Headnote 3(a) of the Harmonized Tariff Schedule of the United States (HTSUS) provides for the duty-free treatment of goods from U.S. insular possessions. The Generalized System of Preferences (GSP) program, permits developing countries and territories greater access to markets of developed nations. Provisions may vary upon the nation allowing access to be an advantage. Guam in particular, is a beneficiary territory to the following countries: Japan, Australia, Canada, and the European Common Market.

There has been a movement in Guam since the 1970s to convert its relationship with the U.S. from a territory to a commonwealth, similar to the Commonwealth of the Northern Mariana Islands (CNMI) just north of Guam, or the Commonwealth of Puerto Rico. The decision requires lengthy and broad-based negotiations and approvals by the legislatures of both Guam and the U.S. A change in political status, however, is not expected to materially alter Guam's link with the U.S., and therefore, its economic path in the 21st Century.

Guam's Port Authority was organized in March 1950 as a division of the Department of Commerce within the Government of Guam. It was originally located on 24.5 acres of

U.S. Navy property in the Inner Apra Harbor region. In 1966, the Commercial Port was established as a separate department of the Government of Guam and in October 1975, the Commercial Port was renamed the Port Authority of Guam (PAG), and reestablished as a public corporation and autonomous agency of the Government of Guam. The Port serves as a transshipment point for the Western Pacific region. Equipped to handle containerized, breakbulk, fish, as well as passenger traffic, the port provides direct service to Hawaii, the U.S. mainland, Asia, and Micronesia.

On August 8, 1993, Guam was rocked by an earthquake registering 8.1 on the Richter scale. The Port sustained major damages to its berthing facilities, especially berth F-5, which was deemed beyond repair by the consulting engineer retained by the Port. The damages affected cargo operations including those of Matson Navigation Company and Sea Land. A construction contract to repair berths F-3, F-4, and F-6, and to reconstruct berth F–5 was awarded in October 1996. Approximately 540 linear feet of new pier is being constructed to replace berth F-5.

1.2 Current Economic and Market Conditions

1.2.1 Guam's Economy and Market. Guam continues to change in economic structure and outlook. Tourism's rapid, and most recently uneven, growth has placed a powerful new force at work in the economy that is not yet clearly defined. A great deal of economic reordering will occur as the traditionally dominant defense industry in Guam undergoes restructuring. As income levels in Micronesia rise, there is some expectation that Guam will ultimately become a regional processing distribution center for the Western Pacific, boosting the third major component of its economy, regional trade and services.

Though less pronounced than when Guam was almost entirely employed as a US military base, actions taken by both federal and local governments continue to play a dominant role in determining the economic patterns and well being of the community. Until recently, no other industrial segment on the island approached government operations in its influence over jobs. Total employment at year-end 1995 was 65,130, excluding uniformed military personnel, but including federal civilian workers. Of the 65,130 employed, 46,040 (70.7 percent) worked in the private sector, while the remaining 29.3 percent or 19,090 worked for government. Federal employees, mostly civilians working for the military, numbered 6,120 (9.4 percent) while the Government of Guam employed 12,970 (19.9 percent) of all civilian employees. Hence, total government employment still accounts for almost one-third of all jobs. This unusually high ratio has had an even more potent impact with the decision of The Government of Guam at the beginning of this decade to raise government wages considerably above the average private sector rates. Table 1.1 presents Guam's vital statistics and Table 1.2 summarizes employment characteristics.

Table 1.1
Statistical Summary of the Economy of Guam

	1988	1989	1990	1991	1992	1993	1994	93/92 % Change	94/93 % Change
Population	126,434	129,254	133,152	136,226	139,371	142,589	145,881	2.3	2.3
Civilian Employment (March)	47,510	52,110	56,080	61,690	69,580	68,420	65,800	-1.7	-3.8
Personal Income ($ Millions)	1,327.9	1,433.4	1,679.9	1,995.9	2,209.7	2,247.2	NA	1.7	---
Gross Island Product ($ Millions)	1,729.5	1,897.5	2,312.5	2,667.4	2,902.1	2,916.8	3,011.0	0.5	3.2
International Trade ($ Millions)									
Exports	8.9	NA	NA	84.5	86.1	112.8	92.5	31.0	-18.0
Imports	96.3	NA	NA	NA	NA	NA	NA	---	---
Surface Cargo (000 Revenue Tons)	1,152.4	12,977	1,532.9	2,033.3	1,062.6	1,114.0	NA	4.8	---
Air Cargo (000 lbs.)	46,846	109,948	84,609	65,382	58,856	68,464	90,301	16.3	31.9
Tourism									
Visitors (Air) (Thousands)	576.1	658.5	769.9	728.7	863.1	775.1	1,076.4	-10.2	38.9
Tourists (Air) (Thousands)	472.4	560.0	441.9	NA	NA	NA	NA	---	---
Government (FY) ($ Millions)									
Revenues	360.4	447.7	547.4	655.2	690.8	689.9	NA	-0.1	---
Expenditures	277.3	283.7	363.1	526.7	537.3	573.2	NA	6.7	---
Gross Business Income ($ Millions)									
Wholesale	38.5	73.7	73.5	139.5	97.8	68.5	69.9	-30.0	2.0
Retail	894.9	963.2	1,127.3	1,167.1	1,306.5	1,334.1	1,393.1	2.1	4.4
Services	399.3	464.3	553.1	667.2	779.1	809.5	878.7	3.9	8.5
Total:	2,552.8	3,116.7	4,109.4	4,488.5	4,996.4	4,728.2	4,906.4	-5.4	3.8
Military Expenditures (FY) ($ Millions)									
Personnel	298.8	361.8	231.1	401.9	450.3	474.9	NA	5.5	---
Construction	85.7	63.2	57.9	68.8	78.3	117.1	NA	49.6	---
Others	91.2	81.3	38.2	100.5	156.0	156.0	NA	0.0	---

Source: Guam Department of Commerce

Table 1.2
Employment by Industry
(Persons Employed)

	1988	1989	1990	1991	1992	1993	1994	93/92 % Change	94/93 % Change
Agriculture	209	227	237	290	420	382	260	-9.0	-31.9
Construction	4,616	5,832	8,604	10,471	12,467	9,980	8,760	-19.9	-12.2
Manufacturing	1,904	1,851	1,871	1,948	2,065	1,771	1,900	-14.2	7.3
Transport & Utilities	2,635	3,166	3,520	3,700	4,346	4,231	5,200	-2.6	22.9
Wholesale	1,544	1,691	1,711	1,851	2,045	2,209	2,080	8.0	-5.8
Retail	7,773	9,177	9,558	10,554	12,060	12,232	12,250	1.4	0.1
Finance, Insurance, & Real Estate	2,151	2,134	2,242	2,450	2,722	2,696	2,740	-1.0	1.6
Services	9,196	9,765	10,109	11,867	13,534	13,290	12,990	-1.8	-2.3
Total, Private Sector	30,028	33,843	37,852	43,131	49,659	46,791	46,180	-5.8	-1.3
Federal Government	7,100	7,025	6,955	6,726	7,202	7,692	6,960	6.8	-9.5
GovGuam	10,375	10,552	11,278	11,893	12,708	13,937	13,430	9.7	-3.6
Total, Public Sector	17,475	17,577	18,233	18,619	19,910	21,629	20,390	8.6	-5.7
Grand Total:	47,503	51,420	56,085	61,750	69,569	68,420	66,570	-1.7	-2.7

Source: Guam Department of Commerce

1.2.1.1 Defense Industry. The American military has maintained bases on Guam of varying strengths in both personnel and equipment since the turn of the century. In 1993, the Navy—principally at Apra Harbor—had 7,836 active duty personnel stationed on the island. The Air Force—at Andersen Air Force Base—had 2,550. Small number of personnel from the Army (56), Marines (55), and the Coast Guard (142), rounded out the total military active duty presence at 10,639. When dependents are added, the number rises to 22,000. Additionally, about 7,000 civilians were employed by the defense industry and Guam was home to more than 5,000 military retirees. In 1994,

total annual spending was estimated at $750 million, including funds from Section 30 of the Organic Act, and generated a multiple of that in direct and indirect incomes. Its average pay being double that of Guam's service economy, the military is Guam's only high-pay industrial employer.

Important economic changes, however, will come from actions the military will be taking under the BRAC (Base Realignment and Closure) report. Additionally, Guam's defense structure will be impacted by decisions made on the operational status of military bases in other areas of the Pacific. Military activity could decline as much as 20 percent, or increase as much as 30 percent over the next 8 years, depending on the outcome of these considerations. Because the military still plays a significant role, Guam's economic outlook remains dynamically attached to U.S. national security interests. Estimates are that, because of the skill and income levels involved in the defense segment, the removal of one defense job actually translates into removal of 2-½ jobs from the whole economy. For this reason, the proposed BRAC reduction of defense jobs in the second half of this decade by 1,100 to 1,200 workers, instead of the originally anticipated 4,000, is a welcome modification of plan. Despite the reduction in job losses, BRAC will continue to have a sizable impact on all other sections of the economy.

Impacts, however, will be considerably less than what they would have been, had the reductions occurred ten years ago when federal and local government dominated even more of the economy. Over the past decade, private employment has grown to account for two-thirds of Guam's total job count even while public job levels have continued to rise. This constitutes a significant change from 1984 when the private employment was not much more than one-half the total number of jobs—government payrolls accounted for 48 percent of the total jobs in 1984. Between 1984 and 1994, private sector employment grew by 156 percent while government payroll grew only 22 percent.

Long after the 1995 base realignment and closing decisions are made, Guam will remain a highly valued strategic post in the Western Pacific. As much of the euphoria over the end of the Cold War is justified and a welcome change globally and in the Asia-Pacific region, strategic interests of the U.S. will continue to require access to ports in the Western Pacific. This will not change in the near future. Nor will the presence of the American military end on Guam in the foreseeable future.

Speculation on what U.S. military presence may be in Guam beyond 2001 does not lend itself to quantitative assessment, but it is safe to say that it will not be substantially different from what will evolve after the BRAC 95 series of closures and realignments. Defense will not be a growth industry in the next 5 to 10 years, but it will remain an important balancing force against cyclical fluctuations in the unpredictable market-driven tourism sector and the services it generates.

1.2.1.2 Tourism. Guam is uniquely capable of developing into a major mass market destination for East Asia's rapidly rising numbers of overseas tourists. As global standards of living rise in the 21st century, the demand for leisure products will certainly grow. Likewise, rising living standards in the Asia-Pacific region will create greater demand for leisure travel, for which Guam is an attractive destination.

As many as 25,000 of the nearly 30,000 additions to private sector jobs over the past decade can be attributed to tourist arrivals which grew by almost three quarters of a million between 1984 and 1995. The job increase of 7,500 in the service sector during that decade was comprised largely of additional hotel workers to meet rising tourism needs. The same applies to the 7,000 job increase in retail, and the nearly 4,000 job increase in transportation and utilities. The result is that direct and indirect revenue generated by tourism is now likely to account for almost one billion dollars, or nearly one third of Guam's gross production.

Construction jobs have been driven by tourism growth as well. Its rise from 1,800 in 1984 to a peak of 12,500 in 1992 was almost entirely due to the demand for increased tourist facilities and attendant resident housing in those years. Hotel room inventory, which rose by 50 percent in those years, appears to still be inadequate. Work to increase that inventory has helped keep construction employment and activity from declining more sharply from the record levels reached in 1992.

The tourist industry will be the single economic sector that will drive Guam's growth over the next 5 to 10 years. Guam is already a major destination in the Western Pacific, especially for Asian tourists. It offers tropical climate and a taste of American life close to Asia. The only U.S. territory closer to Asia is Guam's northern neighbor CNMI, which, though a major tourist destination, is much smaller than Guam.

Guam's tourist industry took off in the mid 1980s after the dramatic drop in the market value of the American dollar against major currencies, especially against the Japanese yen. In 1984, Guam received 368,620 tourists, up 5 percent from the previous year. The total rose every year until 1990 when it was up 112 percent to 780,404 from 1984. (In the same period, tourists to Hawaii increased 44 percent.) In 1991, total arrivals were down for the first time in a decade.

Although Typhoon Omar hit Guam with vengeance in September 1992, tourist traffic rose to 876,742 that year. But, the next year, when Guam was hit by an 8.1 earthquake that damaged a number of tourist facilities and infrastructures, arrivals dropped to 784,018. At the same time, the benefits of global currency exchanges that had made travel much cheaper and generated much of the speculative demand for U.S. assets by Japanese buyers had been exhausted. It was no coincidence, for instance, that tourist traffic to both Hawaii and Guam peaked in the 1990 to 1992 period. By then, global currency markets had fully

adjusted to the new regime in which the dollar was at its lowest value against the yen since World War II.

The industry, however, has shown remarkable resilience—for the first time, over 1 million visitors arrived in Guam in 1994. By the end of 1994, Guam could justifiably claim to be a major tourist destination. And, in the first six months of 1995, visitor arrivals were up 23 percent (to 644,159) over the same period in 1994 (524,659).

1.2.1.3 Construction and Retail. Guam's economy slowed in 1992 to 1993 with the decline of offshore investment and with real income undercut by inflation and natural disasters. A turnaround has been in progress since 1994, however. An over-production in several segments of residential structures led to a subsequent drop in construction employment. But, lingering hotel needs appear to have held construction jobs above 8,000 in 1995. All indications are that the number of building permits issued recovered by over 30 percent to their second highest year on record in 1994, after having steadily declined from their 1991 record.

In the first quarter of 1995, employment in services was up from the end of 1994 and back nearly to the peak of 1992, a reflection of gains in tourism arrivals. Building permits, one of the best leading indicators of future building activity as well as overall economic expansion, have turned around strongly since peaking in 1991, then declining.

Total building permits amounted to $794.2 million in 1991, up nearly 550 percent over the previous 5 years. The gain was widespread, occurring across the residential, hotel and condominium, and commercial and industrial categories. As rapidly as they had risen, total permits dropped even more rapidly from 1991 to 1992, but the slide ended in that year. Total building permits in 1992 amounted to only 46 percent of the 1991 peak. They then rose nearly 32 percent in 1993, and another 36 percent in 1994 (based on data from the first three quarters).

Government building permits increased the most in 1993-94—airport expansion representing a large part of government building activity. Hotel and condominium permits dropped from $279.1 million in 1991 to $69.6 million in 1992, %56.6 million in 1993, and $9.0 million in 1994 (first 3 quarters only) when no major hotel projects were authorized. Residential permits were down 56 percent from 1993 and 61 percent from their 1991 peak but nevertheless showed considerable strength at $135.5 million. The number of housing units authorized for building on Guam has remained remarkably stable at slightly over 1,100 units since 1987. The exception, again, was in 1993 when the total unit count rose to 2,033.

One of the broadest measures of economic activity, business tax receipts, showed evidence of improvement in first-quarter 1995. While it is not clear which segment of retail—luxury end which caters mostly to tourists, or regular sales to residents—grew the most, it is certain that the

arrival of both big box retailers (Cost-U-Less, K-Mart) and a Hawaii-based luxury department store (Liberty House) contributed to the sales boost.

As retailers sort out their respective markets and establish their niches, retail sales will likely be volatile for some time, but the overall trend in retail sales should be upward as the economy gathers momentum. The upswing in retailing indicates a general economic rebound and in particular the resurgence in tourism.

1.2.2 The Asia-Pacific Market. Redesign and expansion of Apra Harbor will be based in large part on the size of external market demand and the revenue stream which that generates. A critical element in the plan involves assumptions about cargo shipping and related harbor demands that are projected to rise from the growth of the Asia/Pacific market. It is presumed that Apra Harbor will be affected in some manner by the exceptional economic growth of the nations in the region and the likelihood that the entire region will remain the world's fastest expanding trading market throughout the next half century. An assessment of that market's condition and outlook is provided here. The manner in which that market is likely to affect Apra Harbor is discussed in a later section.

Growth in total Asia trade, as measured in currency, has occurred at unusually high rates through most of the past three decades. While total world trade rose approximately 10 percent per annum compounded in value between 1970 and the end of 1994, the average compound rate for Asia alone was almost twice that. Total Asia trade increased thirty-five times above its 1970 level. The rest of the world trade rose fourteen times. Excluding Japanese trade, Asia trade rose an average 16 percent compound per year in value just from 1980 to 1994, up 22 percent in the last year. Annual average growth for the industrial nations including Japan was less than 7 percent.

In some years, a significant amount of Asia's trade growth with the rest of the world was caused by increases in the value of the yen and by rising unit values rather than by the volume of trade. However, growth in shipping measured by volume and container movement in the Pacific, exceeded that of the rest of the world, rising a compound 15 percent per annum during the 1980's compared to the world average rise of 5 percent. Consequently, of the world's 4.2 billion metric tons of seaborne cargo for 1992, Asia/Pacific accounted for 2 billion almost 50 percent, compared to 30 percent in 1980. (USCINCPAC)

High levels of economic growth over much of the 1970's and 1980's in Korea, Taiwan, and southeast Asian nations caused rapid trade growth. In 1995, these economic growth rates appear to have averaged near the levels shown in Table 1.3. The growth of exports since 1970 is captured in Table 1.4 and import data are shown in Table 1.5.

It is probable that even without much change in other conditions, these exceptional rates of growth will be registered by Korea, Taiwan, and the southeast Asian nations for the next decade. Their skills, demographic trends, and national aspirations make it probable that increases could slow only gradually on their own.

Table 1.3
Economic Growth of Asian Nations

Nation	Rate	Nation	Rate
Hong Kong	5.9%	Indonesia	6.8%
Malaysia	9.3%	Philippines	4.9%
Singapore	8.2%	South Korea	9.6%
Taiwan	6.5%	Thailand	8.5%

Source: IMF Financial Statistics

Table 1.4
Exports by World and Region
(Billions of U.S. Dollars)

	1970	1980	1990	1994
World	283.4	1,845.4	3,424.9	4,283.1
Industrial Nations (less Japan)	200	1,114	2,166	2,512
Asia (including Japan)	32	130	740	1,166

Source: IMF Financial Services

Table 1.5
Import Data

Source of Imports	1995 Growth in Imports (%)
Southeast Asia	25.7%
China	13.4%
Far Eastern NIE's[1]	19.3%

Source: IMF Financial Statistics

[1] Newly Industrialized Economies

The entry of China as a major new market force in the region makes the prospects for sustained trade growth in Asia/Pacific even more probable. Data for southeast Asian countries suggest that their economies and trade activity would have difficulty slowing unless China were to experience serious internal political turmoil, thus halting its ongoing consumer and industrial revolutions. Even with the recent slowing of China's economy, growth was very near 10 percent during most of 1995.

Although data from China is incomplete, it has become evident that in a span of a little more than five years, ten percent of China's population, the equivalent of a complete-

ly new nation of 100 million paying consumers, emerged as new active market participants. The emergence of this store of buying capacity surprised the region's markets and raised commercial activity and trade levels far more rapidly than had been forecasted.

One consequence of this development has been the quintupling of intra-regional trade from $59 billion to $240 billion between 1986 and 1993, an incredible average compound annual rate of 25 percent. This and similar growth in inter-regional trade has helped produce shipping and port requirements in the region that are considerably greater than previously planned.

The outlook is for only slightly slower growth if security and political order do not persist (see Table 1.6). A major driving force is that as much as 1-2 percent more of China's population will enter Asia's paying consumer market annually for the foreseeable future. That amounts to an additional 12 to 25 million consumers from that country alone each year that will be putting fresh demands on the region's markets. The result is that by 2010, roughly 700 million people in India, Indonesia and China will come to market with average incomes equal to that of Spain, and consumption levels that should raise intra-regional trade by more than five times. (World Bank)

In the context of this dramatic market evolution, the ports of Asia will continue to move toward intense congestion. Already, Hong Kong and Singapore are the world's most crowded container ports. Hong Kong handles the highest number of containers—more than 11 million TEUs (Twenty-Foot Equivalent Units, the standard unit for quantifying containers)—and Singapore, the most ships—95 thousand for a total of 623 million gross tons. With these and most other Asian ports increasingly stretched beyond their capacities, it is possible that ports in the surrounding Pacific waters may acquire new roles not likely to have come their way under conditions that were normal in the past. It should be noted, however, that Singapore is already in the process of constructing more container yards and wharfage to double the port's capacity to nearly 24 million TEUs early into the next decade. Similarly, Kaohsiung intends to double its capacity to 12 million TEUs, and Hong Kong has massive expansion plans as well.

These roles could range from ship building/repair, transshipment, and container storage, as well as service to the fishing and manufacturing industries. The extent to which Guam's Apra Harbor would succeed in capturing clients in some of those activities is a key determinant to be explored later in this master plan. At present, the harbor provides limited service to destinations other than the surrounding Pacific island communities.

1.2.3 The Pacific Island Market. Prior Apra Harbor master plans of 1981 and 1990 have dealt with Guam's prospects for trade and transshipment with the surrounding Mariana and Micronesian islands of the

Table 1.6
Summary of WSTS Liner Trades
(Percent Change)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	% Gr 90-95	% Gr 95-00
U.S. from World	1.6	-0.2	9.2	8.8	11.2	11.6	5.4	6.9	7.7	5.7	4.7	8.0	6.1
U.S. to World	6.9	12.2	9.0	-3.2	15.2	13.4	7.0	5.5	5.3	6.2	6.3	9.1	6.1
Japan from World	3.6	5.6	2.9	-4.0	12.5	17.8	9.8	3.6	4.4	6.4	6.0	6.7	6.0
Japan to World	12.3	-2.6	7.1	-2.0	4.7	3.5	5.8	7.1	7.4	6.1	5.8	2.1	6.4
Far East NIEs from World	12.1	17.1	14.6	8.7	13.7	15.6	10.7	11.0	10.8	10.5	10.5	15.9	10.7
Far East NIEs to World	1.3	9.7	7.5	2.8	8.5	14.3	10.2	9.1	9.6	9.4	9.2	8.5	9.5
Hong Kong from World	13.5	22.8	20.0	10.3	16.1	19.3	12.7	12.8	12.5	11.8	11.8	17.6	12.3
Hong Kong to World	-1.2	2.4	-2.0	-4.8	-0.8	12.9	10.8	10.8	10.8	10.0	10.0	1.4	10.5
South Korea from World	22.0	5.6	11.6	7.0	12.4	17.9	8.6	8.6	8.7	8.7	6.8	10.8	8.7
South Korea to World	1.0	5.3	18.9	5.6	12.3	16.6	11.3	9.7	10.5	10.6	10.4	11.6	10.5
Taiwan from World	1.8	22.5	10.9	8.1	11.6	8.4	9.9	10.4	10.1	10.0	9.7	12.2	10.0
Taiwan to World	2.2	14.4	3.8	2.8	8.0	13.1	9.3	8.3	8.6	8.3	8.1	8.3	8.6

Source: Guam Department of Labor

Pacific. In the brief years since those reports were released, the newly independent nation of Palau that was anticipated then has materialized, and should begin to produce increased activity as estimated in the 1990 plan. This will not alter that portion of the earlier forecast.

It is evident, however, that the income growth—and even the population growth—anticipated for the Federated States of Micronesia (FSM) may fall below what was expected in earlier surveys. This is attributable primarily to the FSM's increasingly constrained financial condition and outlook, and secondarily to the increased likelihood of emigration resulting from the less prosperous outlook. As a consequence, the assumptions in this master plan are based on lower consumption and import levels than had been projected for FSM in the 1990 master plan. This will affect the

Table 1.7
Gross Business Revenues, Saipan (CNMI)
(x 1,000)

	1990	1991	1992	92/91 Change
Agriculture, fishing	913.5	6,649.4	1,457.2	-78.1
Air Transportation	3,814.6	6,099.5	2,626.4	-56.9
Banking	20,495.4	14,626.9	10,091.5	-31.0
Construction	80,036.9	125,621.8	105,891.4	-15.7
Garment Manufacturing	162,541.3	263,439.2	272,796.4	3.6
Other Manufacturing	9,485.5	8,362.5	5,706.3	-31.8
Hotels/motels	87,812.0	93,932.0	117,462.5	25.1
Restaurants/bars	29,896.3	36,154.7	38,101.7	5.4
Retail trade	162,103.6	264,191.9	283,141.3	7.2
Wholesale trade	72,331.8	81,771.6	103,286.2	26.3
Shipping	7,142.1	10,342.7	10,807.8	4.5
Professional services	29,438.9	36,057.8	34,626.8	-4.0
Petroleum	14,146.7	12,824.4	13,494.3	5.2
Land lease	134,202.5	71,079.7	16,078.8	-77.4
Transportation services	29,036.2	9,427.6	10,899.3	15.6
Gas Service Stations	6,365.4	8,863.3	10,674.8	20.4
Freight forwarding	1,310.4	3,173.5	2,171.9	-31.6
Other	328,863.7	441,827.9	396,382.2	-10.3
Totals:	1,179,936.9	1,494,446.3	1,435,696.8	-3.9

Source: CNMI Department of Finance

overall regional transshipment assumptions for Apra Harbor development.

In light of the uneven growth Saipan has experienced, it is not clear how actual growth from that market will fit the forecasts made in earlier master plans for the Harbor. As seen in Table 1.7, several important sectors experienced difficulty in 1992, the last year for which data exist.

Future export levels from Saipan are also becoming less certain in light of changing U.S. and Asian market and labor agreements. Nonetheless, total trade shipments relating to the island's garment manufacture and tourism should rise for the foreseeable future. How much of that will move through direct shipment to and from Saipan will remain obscure until it becomes clear about what types of ships and cargo consolidation will be preferred by lines calling on Saipan's new Charlie Dock.

1.3 Shipping and Port Demand

1.3.1 Demands on Apra Harbor. Due in part to the momentary recovery in construction, shipping requirements for Guam appear to have moved back to near their peaks of 1991. In that year, just over 2 million revenue tons were handled by the Port, up largely because of the record levels of construction occurring at that time. The level declined to 1.45 million tons in 1993 according to the Port Authority.

Table 1.8
Surface Cargo Tonnages

Fiscal Year	Revenue Tons
1988	1,170,364
1989	1,376,333
1990	1,532,910
1991	2,014,157
1992	1,865,208
1993	1,445,409
1994	1,938,638
1994	1,963,272

Source: Bank of Hawaii

For fiscal year 1996, 1,192,056 tons were processed through May. This is 165,362 tons less than the comparable period in 1995, and represents a decline of 12.2 percent. At that rate, the total expected tonnage in fiscal year 1996 would be 1,724,107 tons. The decline is attributable to the end of the island's present surge in construction activities. Although construction material arrives mostly in breakbulk form, container volume has also risen with the recent recovery. It too, is likely to drop again before rebounding as Guam's population and income increases.

A breakdown of demand on port facilities and volume by sectors cannot be precise in many instances. Once imports by commodity are roughly estimated, it can be used to display some relationship between the construction industry and total revenue tons. The military component of freight through the commercial port is primarily personnel possessions which can be precisely measured. Revenue tonnage attributable to tourism versus residents' requirements is the most dynamic component. It can be isolated and projected only roughly through translation of expenditure values to volume. Procedures used in the 1990 Port Master Plan to provide these estimates are still considered valid and are used in part here to allow meaningful comparison between

Figure 1.2 Containers at Commercial Port, Apra Harbor

that year and the recent changes in the sector performance and forecasts. The portion of tonnage for transshipment excluded from the totals below is estimated to have been about 225,000 tons in 1994.

Tourism's Impact on Cargo Volume. Assuming the validity of ratios used in the 1990 Master Plan, as derived from the 1986 SRI (Stanford Research Institute) study, a rough estimate of 1994 tonnage volume attributable to tourism would be just over 306,000 tons. This would be a 63 percent increase to the volume increase in tourist arrivals for that time period and would result in a 15.8 percent share of Port tonnage for 1994, down from the 19 percent estimated for 1989. The actual share and tonnage level are lower when calculated in terms of expenditure reports.

Based on the formula derived by SRI in 1986 to determine the proportion of port volume attributable to tourism, the visitor expenditure appears to have accounted for closer to 14.5 percent of port activity in 1994. A limited modification of the formula results in the following:

Total visitor expenditures (1994)	$1,076.4 billion
Times the import value of goods consumed by tourism sector[1]	0.22
Value of tourist-related imports	$237 million
Divided by value of imports[2]	950/ton
Volume of tourist-related imports (tons)	250,000
Divided by:	
Total port volume of revenue tons[3]	1,725,000
Total volume/tourist consumption	14.5 %

[1] Value used in the 1986 SRI study

[2] Estimated WPI (wholesale price index) and commodity adjustment. A modest compound wholesale inflation rate of 5 percent average from the base year of 1989 is used to provide ton unit values comparable to the 1990 report. This unit ton value increase considerably offsets the greater rise in tonnage that would otherwise have been derived. The actual inflation rate, depending on weightings of various commodities directed toward the tourist industry, is more likely to be higher than lower with a result that total revenue tons attributable to tourism would be even less than presented in the table above.

[3] Because of incomplete data for 1993 and 1994, transshipment volume is estimated for those years on the basis of historical patterns and projections. The estimate of 250,000 revenue tons for FY 1994 is subject to change which would alter the industry proportions described herein to some extent.

The dramatic rise in the Port's revenue tons for other purposes would appear to have been the cause of tourism's smaller share of total port tonnage. If the data is reliable, it is evident that absolute levels of tonnage resulting from tourist activity have risen an annual average of at least 10 percent through the first half of the current decade. This rate, which constitutes a slight decrease in the rates set

during the 1980s, is very close to the rate of change in visitor arrivals, thus allowing a reliable correlation for future estimates.

Military Shipments. With respect to the nature of military shipments through the commercial port, there is little reason to expect a significant change unless there is a considerable change in the number of personnel stationed on Guam. The majority of these shipments are made up of household goods belonging to active duty personnel and their dependents. These two categories of personnel have each remained just over 10,000 respectively for a combined total of 21,000–22,000 persons for most of the past ten years. Per capita tonnage of personal goods may have risen slightly with some income growth, a prospect that seems born out by the preliminary report of 212,000 tons in 1994, up 26 percent from 1988 or just over 4 percent per annum compounded.

As a result of the sharp rise in total port tonnage, the military tonnage proportion of the total was a record low of just over 12 percent in 1994 (based on total revenue tons of 1,725,000), down from the 17 percent of 1989 and 30 percent in 1984. Shipment of these personal items has traditionally constituted 90 percent of Guam's export tonnage. Until another form of export is developed by Guam, outgoing tonnage will continue to be dominated by military household goods.

Construction's Impact on Cargo Volume. Most of the cargo imported through the Port for construction enters in breakbulk form. This makes the volume estimated less exact than container volumes. Correlating the real (uninflated estimate) levels of construction permits on a partially lagged basis, the estimates of Table 1.9 can be made regarding tonnage of construction cargo through the port:

Table 1.9
Construction Cargo Tonnage

Year	Tons	Percent of Total
1989	146,400	15.0
1990	510,000	28.3
1993	234,000	25.5
1995	420,000	24.3

Source: Guam Economic Development Authority

It appears that the proportionate increase in construction's share of tonnage was a primary determinant of the reduced share that tourism commanded in 1994. The effects of likely declines in construction in the near term are discussed in the outlook.

Local Consumption's Impact on Port Volume. The least complicated approach to determining this component of Port cargo would be to consider it as a residual since the other components are more easily measured. A potentially useful method when data is more complete will be to correlate local consumption to real personal income growth and add in tonnage attributable to investment in capital equipment. Capital equipment investment data are not easily obtained at present, however. As a result, that correlation is not statistically reliable in this case, and the two approaches are combined to estimate a fairly close approximation of local consumption's share of the Port's total revenue tonnage.

The residual after military, tourism, and construction estimates is approximately 49 percent, essentially the same as the 48.7 percent reported in 1990. However, this proportion resulted after a rapid rise in both the construction and the tourism tonnage during 1994. Had those levels of activity been closer to lower preceding year levels, local consumption's 845,000 tons would have approached 60 percent of total tonnage during the year. The absolute levels of this component should continue to rise in direct relation to the island's income and population growth.

1.3.2 Asia-Pacific Shipping Traffic and Port Demand. This market will exist only as a result of extensive marketing and competitive pricing by Guam. (See Table 1.10 for gross volumes of the Asia market.) Earlier master plans have adequately presented the reasons why Guam will not naturally develop into a transshipment center. It is likely that diverting trans-Pacific transshipments to Guam will result in additional costs, rather than savings to carriers. Asia's markets are, however, changing and could conceivably develop new conditions that offset those costs. At present, though, little trans-Pacific transshipment enters Apra Harbor outside the Matson–American President Lines (APL) extension from Hawaii to Kaohsiung.

Container traffic across the Pacific involves a number of routes, not all of which are evenly expanding. The largest set of routes between North America and Asia is not the fastest growing one, and it appears that it will continue to grow more slowly than routes in the western Pacific (and especially slower than traffic moving west from Asia through the Suez Canal) for the foreseeable future.

North American traffic (both eastbound and westbound container traffic) has become less consistent in volume from year to year when compared to Asia regional traffic. Eastbound container traffic declined by 3.3 percent in 1988 and then again by 12.7 percent in 1990. Its subsequent growth, except for the recovery of 14.5 percent in 1991, has been relatively modest. The industry outlook is for growth in this container traffic to rise an average of 6 percent for the balance of the current decade. After its 12 percent rebound in 1994, growth in westbound container movements has slowed to an annual rate of under 6 percent and is expected to remain slightly lower than the eastbound volume for the

Table 1.10
Imports and Exports by Country
(Dollars)

Country	Trade	1978	1979	1980	1981[1]	1982[1]	1983	1984[2]
Australia	Export	0	7,370	7,911,628	540,774	N/A	9,498	1,366
	Import	3,886,280	6,137,274	6,199,288	2,007,275	N/A	3,606,747	254,611
Hong Kong	Export	193,741	510,812	8,669,038	521,176	N/A	786,715	57,600
	Import	11,584,563	11,858,282	14,734,033	7,651,183	N/A	18,779,940	5,438,713
Japan	Export	850,578	681,510	7,298,640	14,613,738	N/A	1,874,764	759,607
	Import	27,942,114	31,193,562	44,983,940	17,573,052	N/A	121,720,759	29,210,285
New Zealand	Export	0	0	21,158	521	N/A	376	0
	Import	1,543,476	1,989,616	1,675,952	456,887	N/A	2,620,269	428,924
Philippines	Export	449,000	217,850	459,078	6,956,026	N/A	267,638	19,962
	Import	4,293,740	6,898,835	7,237,614	3,468,019	N/A	7,861,496	1,701,722
Taiwan	Export	9,694,946	6,821,810	958,980	40,604,984	N/A	184,764	18,360
	Import	5,454,970	5,124,900	5,596,707	3,805,102	N/A	11,586,250	2,302,140
USA	Export	7,829,110	11,143,071	5,941,994	4,451,681	N/A	9,755,227	550,569
	Import	134,073,322	144,550,235	133,818,739	59,005,071	N/A	143,167,305	44,228,141
Other Countries	Export	11,795,035	4,008,444	12,100,661	1,281,363	N/A	1,724,798	184,322
	Import	177,299,418	235,498,490	328,564,538	260,847,090	N/A	325,383,806	34,320,881
Micronesia[3]	Export	18,534,033	21,017,691	17,682,310	7,529,236	N/A	24,620,918	6,075,987
	Import	2,101,679	2,541,727	1,372,742	592,833	N/A	1,355,426	198,715
Totals:	Export	49,346,443	44,408,558	61,043,487	76,499,499	N/A	39,224,728	7,667,773
	Import	368,179,562	445,792,921	544,183,553	355,406,512	N/A	636,081,997	118,084,132

Source: Economic Research Center, Department of Commerce, Government of Guam

1 Figures are for the first six months in 1981. 1982 data were not available.
2 Figures are for the first three months of 1984
3 Includes CNMI, FSM, Republic of Palau, and Marshall Islands

rest of the decade. (Most South American traffic traverse the southern Atlantic and Indian Oceans as they are more economical.)

East-west traffic volume with Asia's newly industrialized economies (NIEs) of Hong Kong, South Korea, and Taiwan, however, has proven an exception in 1995. As reported by the NIEs themselves, container flows from the U.S. will rise by over 22 percent this year and could continue to grow significantly faster than the balance of westbound volume in the near term. This suggests that other segments of the westbound traffic may be quite low if the 6 percent growth proves correct for the whole.

In contrast to the east-west traffic, container volume is rising at very high rates in the north-south and intra-Asian routes. The intra-Asian routes in particular should remain the fastest growing in the world for the next several decades. At present, the intra-Asian volume is likely to rise by more than 16 percent in 1995 to exceed 5.5 million TEUs. The forecast for the balance of the decade is an annual average growth of over 10.5 percent that will raise that market's total volume of containers to over 9 million TEUs.

Future patterns of cargo movements from Australasia north are not as clearly defined, especially in its predominantly raw material and breakbulk form. The movement of bulk carriers from Australia to Asian ports is one of the largest volumes of traffic in the world—directed primarily to Japan, Korea, and to a lesser extent, Chinese ports. The volume of containerized consumer goods flowing along this north and south route outside of intra-Asian routes themselves is certain to grow; but though it will pass closer to Guam, its volume is small and does not present an automatic prospect for transshipment at Apra Harbor.

Among Guam's market competitors for the Asia-Pacific shipping routes are the established ports in New Zealand, Singapore, Hong Kong, Taiwan, South Korea, and Japan. Some of their plans are described below to facilitate an understanding of the Pacific market.

New Zealand. New Zealand is one of the largest seafaring trading countries, on a per capita basis, in the Pacific. The *Dairy Board* reports that it alone exports one billion tons of products per year, or two million pounds per resident. As Asian needs and tastes for dairy products grow, New Zealand is expected to become the major foreign supplier of those demands—the volume of exports will become quite large, raising the country's shipping needs considerably.

The Port of Auckland is and expects to remain the primary channel of those exports. Though Wellington and lessor ports are being diverted to, Auckland expects to double its size to handle increasing amounts of transshipment and act as a regional hub for international traffic. In light of the small populations of the Pacific which transshipment might

serve, it is not clear what the nature of that international traffic would be. Current New Zealand shipping line arrangements are very specific in geographic focus. Auckland, as well as New Zealand in general, possess exceptional harbor assets, but location and surrounding market are likely to keep it committed essentially to current shipping services. While yacht design and construction will remain one of the country's specialties, ship building and repair should not grow substantially as a result of the country's high labor costs and low immigrant labor interest.

Singapore. Singapore vies with Hong Kong in claiming the most container traffic in the world at near 12 million TEUs per year. The Port Authority plans to double that capacity in the coming years through a four-phased land reclamation and computerized terminal installation process. The expansion will add 300 more cranes to supplement their existing 400 quay and yard cranes, and is expected to increase ship entry to over 150,000 per year from the current 85,000, although the introduction of very large carriers (6,000 TEUs) makes that estimate imprecise. Automation of container handling is to be a central aspect of this harbor expansion. Reduction of manpower is expected to keep the cost per container competitive with Hong Kong where the labor component should remain quite high.

Singapore's fully integrated and streamlined harbor is in keeping with of the country's overall reliance on technologically superior facilities and processes. Ship building, while not as massive as in some other ports of Asia, is being computerized and automated as much as possible. On the other hand, there has been a relative decline in ship repair, which is considered too labor- and skill-intensive, low-end work, and dirty. Repair is also costly in terms of inventory buildup and labor volume. Singapore's conclusion is that it will remain largely the domain of cheap labor, third world countries.

Nevertheless, Singapore is expected to remain an important ship repair center based on its ability to accommodate emergency non-scheduled repairs as a major terminal and because of its geographical location with respect to the lucrative Asia-India-Africa-Europe shipping lane. The volume for short order repair work at this crossroads remains high enough to keep yards from folding despite the uncertainty of unscheduled repairs. Some change in Singapore's role as a crossroads is possible, however, when VLCs are introduced and shipping alliances consolidate.

Hong Kong. Hong Kong's successful container shipping operation contrasts dramatically from that of Singapore's in a number of ways. One of the most important is that the government of Hong Kong has virtually nothing to do with the ultimate design or operation of the port in direct opposition to Singapore. After auctioning water front for the construction of shipping berths, the harbor's land reclamation and development is financed and designed entirely by

private companies to meet their needs. In this fashion, the Port Development Board facilitates harbor development only as the market will support it, without any taxpayer subsidy but with considerable net revenue to the government.

The totally private process has caused the emergence of various modes of cargo handling that public authorities would not have considered or regarded reasonable. The primary mode to emerge, unique to Hong Kong at least in its magnitude, is the mid-stream or lighter handling of containers from ocean-going freighters to shore. Although the process requires double handling of containers, the savings on land and gantry infrastructure costs, as well as the mid-stream flexibility, appear to offset the extra handling costs. Over one third of all containers moved by the port now go through mid-stream operations.

A second process that private investors have devised to the surprise of government officials has been large multi-level container warehouses and freight consolidation centers. These institutions have risen to partially offset the fragmented nature of the harbor's berthing and container locations. If current forecasts prove correct, Hong Kong with its scattered container yards, must adjust significantly to meet the needs of emerging shipping alliances. Facilitating the meeting of disparate routes for shipping consortia will require the expansion of very large terminals and this may not be achievable before those alliances form.

Taiwan. Taiwan sees the rise of shipping alliances as a prelude to the expansion of its Kaohsiung harbor. Today, Kaohsiung and Keelung harbors together handle over 7,000,000 containers annually. Taiwan claims that Kaohsiung alone will be able to match Singapore's 12 million TEUs after planned expansions are completed. Kaohsiung's envisions its role to be the transshipment point for freight sailing from China's east coast on small coastal vessels seeking consolidation and forwarding via large ocean-going ships. The latter need not be VLCs to justify this plan. However, if VLCs materialize, there are few other ports that can accept them. Most that can (Pusan, Inchon, and Kobe) and are located to handle the eastern China freight, are already crowded, and would be unable to take on large increases in export that the late-developing regions of China are expected to produce.

Kaohsiung's expansion depends upon reconciliation between Taiwan and China. Until a political resolution is found, private and public efforts to expand the harbor will remain relatively modest. As it is not clear whether shipping alliances or whether very large ships will be introduced, or whether they will survive, Kaohsiung's development is uncertain.

1.3.3 Pacific Island Shipping and Port Demand.

In light of the relatively small sizes of the economies of the Pacific Islands surrounding Guam, shipping schedules are light and sometimes inconsistent. Since port facilities are

limited, smaller freighters are required to call on these islands after having received transshipment at major ports in the region. Much of that transshipment moves through Apra Harbor and is representative of changes in levels of volume handled in the region. As best can be estimated considering the possibility of double counts and hidden transshipments, the levels and growth patterns of Table 1.11 should apply to the region's transshipment and port needs.

Table 1.11
Transshipment Revenue Tonnage

	1979	1984	1989	1994
	45,000	65,000	152,000	250,000
Compound Annual % Change		8 %	18 %	10.5 %

Source: Guam Port Authority

The estimated 10 percent rate of growth for the first half of the 1990s is a reflection of continued growth in garment exports from Saipan as well as the rise in consumer and infrastructure needs of FSM, Palau, and the Marshall Islands. However, growth of service from other ports in Australasia and the Philippines is not documented sufficiently to determine if it is growing more rapidly. Forecasts of growth for this form of harbor traffic will be affected by prospective levels of competition arising from other ports in the Pacific and Asia. Major shipping carriers that serve Guam are listed in Table 1.12.

As the volume to these island markets rises, the added cost of moving through Guam rather than directly from the U.S. and Asia will become an issue that could very well lead to a decline in volume of regional transshipment handled by Apra Harbor, especially (but not only) if these islands choose to expand their harbors for larger carriers. Table 1.13 lists shipping distances for traffic that currently moves through Guam on its way to selected Pacific island destinations.

At present, the additional wharfage, loading, and steaming expenses of moving cargo through Apra Harbor to these islands is more than offset by the costs of developing infrastructures to move larger ships with small cargoes directly to these small island communities. For some islands, this will always be the case. For others, it will remain the case only if Apra Harbor takes major steps to improve its efficiency and cost ratios.

1.3.4 Demand for Fishing Facilities. The appearance of sizable commercial activity in Apra Harbor has been a recent phenomenon. While there is a history of local small boat fishing in Guam, this activity has been also frequently as well served by other small harbors on the island, as by Apra. The rise of long-line tuna catch being transshipped through Guam is the more recent result of

Table 1.12
Existing Shipping Services

Carriers	Frequency	Type	Area Served
Matson Navigation Co.	Weekly	Containers	US West Coast, Guam, Kaohsiung
Sea-Land Service	Weekly	Containers	US West Coast, Guam, Honolulu, Kaohsiung
Kyowa Shipping Co.	Various	Containers/ Breakbulk	Hong Kong, Keelung, Pusan, Guam, Kobe, Yokohama,pore Singapore, Manila, Saipan,
Kambara Kisen Co & Far East Micronesia	Tri-Weekly	Containers/ Breakbulk	Pusan, Hong Kong, Keelung, Guam, Saipan
Zim Israel Navigation	25-28 days	Containers	Sydney, Melbourne, Brisbane, Guam
Saipan Shipping Co.	Weekly	Containers/ Breakbulk	Guam, Saipan, Tinian
Seabridge Pacific Co.	Weekly	Containers/ Breakbulk	Guam, Saipan, Tinian
Angyuta Shipping Co.	Weekly	Containers/ Breakbulk	Guam, Rota
Taputso-Saipan	2-3 Months	Containers	Guam, Rota
Palau Shipping Co.	Tri-Weekly	Containers/ Breakbulk	Saipan, Guam, Yap, Palau
The Tiger Line	Monthly	Containers/ Breakbulk	Saipan, Guam, Chuuk, Yap, Palau

Source: Guam Port Authority

fundamental changes in Japan's import market relating to new trade agreements and rising incomes in that country. These events placed new demands on foreign sources of many highly priced products, among them, freshly transported fish for sashimi consumption in Japan resulting in a marked increase in the presence of foreign fishing fleets in Apra Harbor.

Determining port call data accurately for fishing vessels presents a significant challenge. While data is available, they often conflict. For example, in 1994, the Guam Department of Commerce records show that 1,512 longliners called at the Port. For the same year, a study by Michael P. Hamnett, et.al., titled *The Contribution of Tuna Fishing and Transshipment to the Economies of American Samoa, Guam, and the Commonwealth of the Northern Marianas Islands* cites the Port Authority of Guam as the source for estimating total port calls at 1,197 longliners. Later in the same report, a figure of 1,509 is cited. Using the latter table as the source, longliner port call data is estimated in Table 1.13.

Virtually all of these longliners consist of vessels from Taiwan and Japan. Vessels of other flags, most commonly, Korea, Honduras, and the U.S., are only seen occasionally. For example, in 1994, 67 percent of the port calls at Apra Harbor were made by 271 Taiwanese vessels and 32 percent by 73 Japanese ships—only one percent of the total port calls were vessels of other flags. Data for the first seven months of 1995 show a similar breakdown—74.9

percent being made by 218 Taiwanese and 24.8 percent by 53 Japanese longliners.

Table 1.13
Estimated Longliner Port Calls at Apra Harbor

Year	Port Calls	No. Based in Guam
1990	1,450	328
1991	1,078	233
1992	846	246
1993	1,089	270
1994	1,509	348
1995	2,580	480

Source: Michael P. Hamnett, et.al., *The Contribution of Tuna Fishing and Transshipment to the Economies of American Samoa, Guam, and the Commonwealth of the Northern Marianas Islands.*

Until the second half of the 1980s, Guam's fishing industry had been relatively small, consisting of local catch and market activity. In 1985, the Plaza Accord resulted in the Japanese yen rising 62 percent in value and placing a great number of expensive imported items within reach of a larger market in Japan. With that it became instantly feasible to charter air delivery of fresh fish produce from distant sources to supplement the country's dwindling local harvest of fish for sashimi. One of the consequences of the 1985 Plaza Accord was a dramatic rise in tuna transshipment from 5,364 tons in 1986 to 6,772 metric tons in 1988, and 15,000 metric tons in 1989.

The concentrated stimulus of that currency revaluation may not be easily repeated, as normal population and economic growth of Japan now almost exclusively defines the fresh fish market patterns for Guam. Those weakening forces, combined with the retreat of the yen against the dollar, very likely served to restrain the rapid growth of Guam's fishing activity. Total transshipment of tuna for 1993 was 7,104 tons, up 1,600 tons from the 1992 total, but less than half the record total of 15,000 tons set in 1989.

As with longliners, accurately determining the number of purse seiner calls at Apra Harbor is difficult. The figures shown in Table 1.14 are based on numbers from the Port Authority of Guam (for 1992 through 1994) and from the Department of commerce (for 1995).

Two events in 1995 caused a significant increase in purse seiner port calls: (1) the Port Authority of Guam waived wharfage fees for purse seiners, and (2) direct frozen tuna transshipments from Guam to Asian canneries was initiated. In March 1995, Casamar, Inc., began shipping frozen seiner tuna to Thai tuna canneries via American President Lines' (APL) refrigerated containers. The container operation is estimated to be 35 percent cheaper than transport by conventional reefer vessels and, from a packer's

perspective, refrigerated containers are easier to manage and handle than an entire reefer vessel of tuna. For APL, the operation provides the benefit of backhauling full refrigerated containers to Asia instead of the normally empty loads.

Table 1.14
Estimated Purse Seiner Port Calls at Apra Harbor

	1992	1993	1994	1995
U.S.	71	71	63	*
Japan	16	13	16	*
Korea	60	91	45	*
Taiwan	40	64	68	*
Other	31	18	9	*
Total:	214	257	201	330

Source: Port Authority of Guam and Department of Commerce
* Data not available

According to the Guam Department of Commerce, in 1994, port call expenditures per fishing vessel were $474,900 for purse seiners and $21,522 for long liners. Combined, the fishing industry was estimated to have generated approximately $155 million in direct spending. About 250 local employees are currently employed in the industry.

Market and regional policy conditions appear likely to restrain growth of Guam's fish transshipment industry. Establishment of this product industry within the fishing region of the western Pacific has led to use of several island bases for the harboring and servicing of growing fishing fleets as well as transshipment of some of the catch via air back to Tokyo. Several private transport companies have risen to service this new market, and commercial airlines have become important carriers as well. Plans of neighboring island states as well as Taiwan and the Philippines to expand fish-shipping infrastructure are accompanied by aggressive policy moves to divert shipments away from Guam and toward the funding of that infrastructure. Guam's inability to prevent those new developments and its neighbor's policies of exclusion have been an important factor in the slowing growth of fish transshipment through Apra Harbor.

Patterns of Pacific fishing for the purpose of canning have altered significantly over the past decade, but have not affected Guam to any meaningful extent. It remains a small player in the market for processed fish industry, and the level of reject tuna sent on to canneries in Asia continues to be unclear as a result of the varied manner in which fishing fleets choose to dispose of the non-sashimi grade products.

1.3.5 Demand for Ship Repair Facilities. Assessing world shipping supplies suggests that a severe aging crisis is developing. Existing freight and charter rates

Table 1.15
Shipping Distances

	Guam	Honolulu		San Francisco	
		Direct	Via Guam	Direct	Via Guam
Koror, Republic of Palau	712	3,988	4,030	5,720	5,765
Chuuk, Federated States of Micronesia	590	3,028	3,908	4,931	5,643
Pohnpei, Federated States of Micronesia	906	2,685	4,224	4,641	5,959
Majuro, Republic of the Marshall Islands	1,554	1,895	4,872	3,892	6,607
Pago Pago, American Samoa	3,156	2,276	6,474	4,150	8,209
Nauru	1,550	2,614	4,868	4,540	6,603

Source: U.S. Naval Oceanographic Office, H.O. Publication No. 151

throughout the world are discouraging construction of new vessels. The result is that the average age of the world fleet will rise from the 16-year level of 1993 to easily exceed a disturbing and unsustainable 20 years by the end of the present decade.

The consequence of this aging has been some recovery in the recently depressed ship repair industry. But even that and new ship building that began to grow again in 1994 was fought over by major Asian nations for what has come to be regarded as the privilege of losing the least money while still keeping their shipyards open. Capacity utilization of the yards is up significantly from the lows of 1992, but the earnings of Asian shipyards have not reflected that.

Several conditions are causing this. They are essentially interrelated. The most important is that the ship building and repair industry is extremely cyclical and thus sometimes suicidally competitive. As a result of heavy building and repair orders a decade ago, existing capacity was expanded in many fabrication ports, and repair yards or floating docks expanded or developed where none existed before. Within a span of 10 years, the Persian Gulf area has become a major competitor to the world's largest repair center of Singapore. Price differentials still favor Singapore, but it is clear that many owners are moving from the Mediterranean and European repair yards to the Middle East.

Table 1.16
Guam Tuna Transshipment Industry Annual Totals

Species	1986	1987	1988	1989	1990	1991	0992	1993
Tuna Transshipped (in Metric Tons)								
Albacore	1.07	0.62	1.35	3.00	2.21	0.57	0.78	5.79
Big Eye	2,842.92	1,651.48	3,589.16	7,950.00	7,023.61	4,641.92	2,898.45	3,693.46
Yellow Fin	2,278.63	1,323.68	2,876.75	6,372.00	5,088.56	4,809.98	2,258.58	3,066.38
Black Marlin	107.28	62.32	135.44	300.00	248.30	171.18	77.95	132.58
Blue Marlin	107.28	62.32	135.44	300.00	176.68	179.13	127.22	165.62
Striped Marlin	5.36	3.12	6.77	15.00	2.73	6.02	4.77	24.88
Swordfish	5.36	3.12	6.77	15.00	9.59	5.07	6.75	9.09
Other	16.09	9.35	20.32	45.00	32.29	22.84	15.17	6.45
Totals:	5,364.00	3,116.00	6,772.00	15,000.00	12,583.97	9,826.71	5,389.66	7,104.25
Tuna Transshipped (as % of Total Catch)								
Albacore	0.02%	0.02%	0.02%	0.02%	0.02%	0.01%	0.01%	0.08%
Big Eye	53.00%	53.00%	53.00%	53.00%	55.81%	47.19%	53.78%	51.99%
Yellow Fin	42.48%	42.48%	42.48%	42.48%	40.44%	48.90%	41.91%	43.16%
Black Marlin	2.00%	2.00%	2.00%	2.00%	1.97%	1.74%	1.45%	1.87%
Blue Marlin	2.00%	2.00%	2.00%	2.00%	1.40%	1.82%	2.36%	2.33%
Striped Marlin	0.10%	0.10%	0.10%	0.10%	0.02%	0.06%	0.09%	0.35%
Swordfish	0.10%	0.10%	0.10%	0.10%	0.08%	0.05%	0.13%	0.13%
Other	0.30%	0.30%	0.30%	0.30%	0.26%	0.23%	0.28%	0.09%
Totals:	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Source: Office of Natural Resources Development, Department of Commerce, Government of Guam, "1993 Summary of Tuna Transshipment Activity on Guam"

Note: Breakdown of tuna species for 1986-1989 and total metric tons for 1989 and 1992 are estimates; Individual figures may not exactly add up to total figures due to rounding.

Comparative costs as well as steaming time are critical determinants of yard choice, and it appears that many repair yards in Asia (outside Singapore) will need to remain subsidized in order to attract clients and stay alive within the price characteristics of this industry. Consequently, while the world's aging fleet is likely to remain a long-term source of repair work, indications are that this will not be profitable or consistently profitable work.

1.3.6 Demand for Passenger Transportation Facilities. Guam is currently called upon approximately 30 times per year by an average of 15 separate international passenger ships. Their arrivals tend to be bunched both in terms of the time of year and day of call. In 1989, three vessels called within two days in January. But two vessels called on one day only one other time—in May with 520 passengers a piece. Heaviest passenger traffic occurred in January, March, June, and December, but the heaviest ship traffic occurred in January, March, August, and December, when three ships called each month. The patterns have altered only slightly since, and aside from the tendency for some ships to call on the same day, there appears to be little pressure on the Port at present than to have to improve the transit and transportation facilities. Mooring space is adequate for the extent of traffic.

Total seaborne passenger arrivals to Guam have declined and risen sharply for only a modest overall increase since the 1990 Master Plan despite its prediction that arrivals would have doubled from the 9,000 recorded in 1989 to 18,000 in 1995. After rising quickly to a record 13,668 in 1992, passenger arrivals declined to under 9,000 in the two following years, recovering to just over 10,000 in 1994. The volatility in traffic levels has made it difficult to determine what trend or consistency might be attached to this Port activity or to any rise in the future.

Early estimates for 1995 (based on mid-year numbers being 17 percent ahead of 1994) are that arrivals could perhaps regain the 1992 record. A very important signal from this recovery is that it appears, as with that of 1992, to be linked to the overall rise in tourist traffic to Guam. Although the percentage increase is not proportionate, it still provides a correlation in signal and direction that will be important to consider in anticipating passenger demands on the Harbor.

1.4 Future Demands on Apra Harbor

1.4.1 Future Cargo Demands. Three forms of freight demand that help shape the outlook for Apra Harbor's utilization are future growth in local freight demand, Pacific island demand, and Asia-Pacific regional demand which encompasses the entire Pacific Rim from North to South America, Australasia, and Asia. Each of these three markets faces very different growth and routing prospects. And many of the prospects for the Asia-Pacific market in particular will not become evident for some time, making it

critical that the Harbor be capable of incremental and intensely customer-focused expansion.

Outlook for Guam's Economy and its Cargo Demands. Guam's population has grown more rapidly in the past ten years, barring military buildup, than during any other period, averaging 3,000 in the last five recorded years. It is likely that the current population growth of just under 2.5 percent per annum will continue through the balance of this decade and into the next. This, plus a likely continuation of over 10 percent in visitor population on the island, should increase the island's de facto population at least 10 percent annually in the foreseeable future. It is safe to say that as long as that trend is sustained, the island's import volume will need to rise by nearly 10 percent per annum even without any rise in real incomes and per capita consumption.

The absence of a reliable index of inflation for the economy has made it difficult to gauge or project the rise in real incomes (and thus per capita demand in volume terms). Growth in terms of total gross territorial production (GTP) recovered from the pronounced pause of 1993—when growth was negative by perhaps as much as 5 percent after some estimates of inflation are factored in. Nevertheless, it seems unlikely that the high double-digit growth rates experienced during the turn of the decade will be approached again.

The unadjusted rate of 3.3 percent growth in GTP estimated for 1994 may be exceeded during the balance of this decade, but real growth in uninflated volume terms is likely to be in the low single digits, especially as the current expansion in construction matures. Since resident population growth is not much below that total income figure, it seems probable that per capita income will not rise much in real terms.

Barring any major regional military crisis, growth in tourist arrivals will continue to be the prime determinant of Guam's economic performance for the foreseeable future. Estimates are difficult to project from the most recent patterns in which arrivals declined by 10 percent in 1993 before then recovering by a remarkable 39 percent in 1994. This swing of 400,000 in number of arrivals is not likely to be repeated often, but its occurrence makes clear that not only can their levels change quickly, there cannot be complete certainty of a sustained direction despite Asia's proximity.

Growth of the room inventory to at least 10,000 rooms by the end of the century should allow the visitor arrival number to rise to near 2 million. The resulting job growth should approach the 30,000 experienced over the past ten years, and the industry should be accounting directly and indirectly for nearly 2 billion dollars in expenditures—equal to almost one-half the value of total production of Guam's economy in the year 2000.

As stated earlier, what role the military will play on Guam in the coming years is yet to be determined. The end of the Cold War has left the U.S. with changing emphasis and missions to perform in the Pacific. This, and the need to reduce federal budget deficits, has led to various reductions in military presence throughout the western Pacific, including on Guam.

However, changing military missions are altering the willingness of neighboring nations to host U.S. forces, and it has become apparent that even those forces the U.S. wants to keep in the Pacific may have to be relocated, some perhaps to Guam. Although it is beyond the ability of anyone to predict the scope and timing of any such relocation, it is likely that notwithstanding the current downsizing, Guam's defense role will not decline much more in the future, and could in fact, rise again within a decade.

Holding the military constant, construction declining, and tourism rising by the figures shown in Table 1.17, suggests a possible range of tonnage increase without consideration of transshipment. Total revenue tons resulting in the year 2000 from these growth rates do not vary greatly—2,134,000 tons to 2,165,000 tons. The biggest variation would probably come from a more rapid decline in construction.

Future Asia-Pacific Cargo Transshipment Demands. Demand on container yards within the Asian Market is rising rapidly and is expected to continue doing so for the indefinite future. The current inadequacy of port facilities has become a matter of acute concern and has prompted the UN's Economic and Social Commission for Asia and the Pacific to call for up to $2.3 billion in construction of container berths throughout the region. Hong Kong's container traffic growth of 16 to 30 percent over the first half of the decade and Singapore's similar rise is already creating severe bottlenecks that will worsen in the coming years.

Table 1.17
Average Annual Percent Change
1995 - 2000

	Low	High
Local Import Volume	3.5%	5.0%
Tourist Volume	9.0%	11.0%
Construction Volume	-3.5%	-5.0%
Military Volume	-0.5%	---
Average Weighted Change	2.1%	2.4%

Major expansions are planned for Karachi, Ho Chi Minh, Tianjin, and other large ports along the Asian continent. But the rate at which these ports will relieve the congestion is in question. More remote ports, such as Guam or Subic

Bay, could perhaps become candidates for handling some of the container load. However, market opinion is that development of the well situated Subic Bay into a transshipment center makes sense only under a worst-case scenario—for example, great congestion or political chaos in either or both Hong Kong and Kaohsiung.

The prospects for Guam would be no more likely in the view of industry analysts. As indicated in the Harbor Master Plans of 1981 and 1990, Guam is geographically too far removed from the sea lanes between major markets to allow efficient trans-Pacific transshipment activity at Apra Harbor to develop naturally. Figures 1.3 and 1.4 show major shipping lanes. A decision to detour from the most heavily traveled circle routes entails considerable addition in steaming days. That state of affairs has not altered, nor will it, unless the important markets of the future and their trading relationships with one another are significantly different from those that determine today's sea lane patterns. The difference in operating and financing costs between the indirect US-Guam-Asia route and the direct US-Asia route ranges between $250,000 and $400,000 (not including the $150,000 cost in and out of Guam, including container handling) depending on the specific destination and the size of the ship[1]. Table 1.18 lists shipping distances from various ports to Guam.

In light of the extraordinary dynamics emerging in the Asian markets, it is possible that new routing patterns of importance will be created in the coming decades. How much they could involve Guam is central to the Master Plan's consideration of transshipment facilities. Considerable attention must be focused on what the realistic possibilities are of major sea lanes either forming where none are now or being diverted from existing great circle routes to Guam.

As stated above, the difficulty of planning is reflected in the serious doubts that major container contractors have with developing a regional container transshipment facility at an even more central Subic Bay. The industry's consensus continues to be that such a development would have to be considered pioneering in nature and require a long-term

[1] For the diversion of a longer trip via Guam to make economic sense, low container costs achievable only when spread over one of the new class of 6,000 TEU ships or something similar would be required. Guam could accommodate these ships which are currently being directed entirely at the faster growing Asia-Suez-Europe-U.S. route, away from the Pacific. If such ships move to the Pacific (they are too large to navigate the Panama Canal and can call on a limited number of west coast ports) a diversion to Guam could be justified if Apra Harbor could move at least 10,000 containers in a 24-hour period. A 24-hour turnaround of a 6,000 TEU ship and its smaller feeder ships would require facilities that investors could not afford to stand idle the rest of the week. Several 24-hour turnaround sessions during a week would be required to financially justify the investment in equipment. Assuming a 55% utilization rate common to the industry, four such sessions—24,000 TEU arrivals per week—would be required. This compares with the current arrival rate of slightly less than 1,000 TEU.

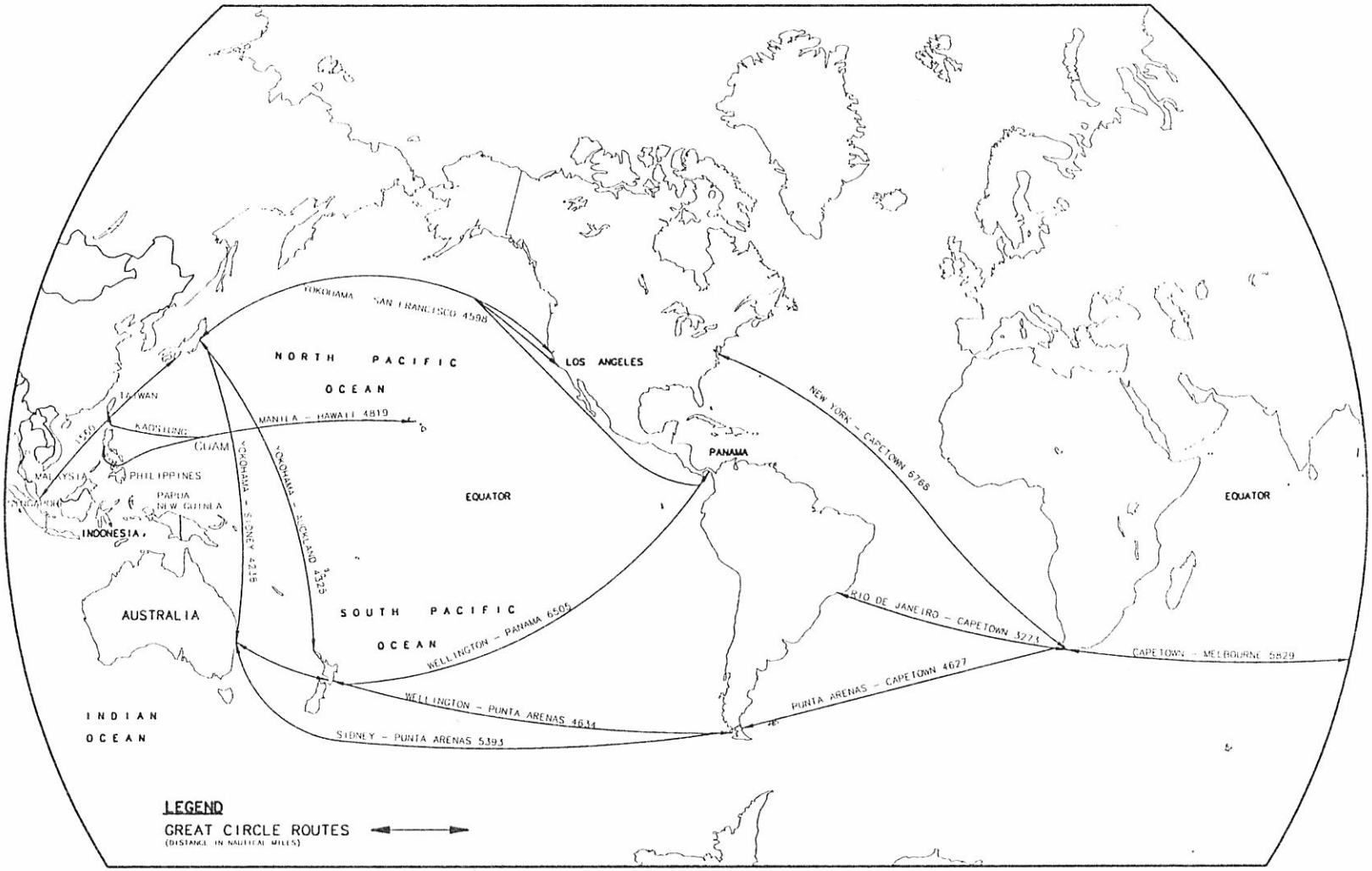

Figure 1.3 Major Shipping Lanes of the World

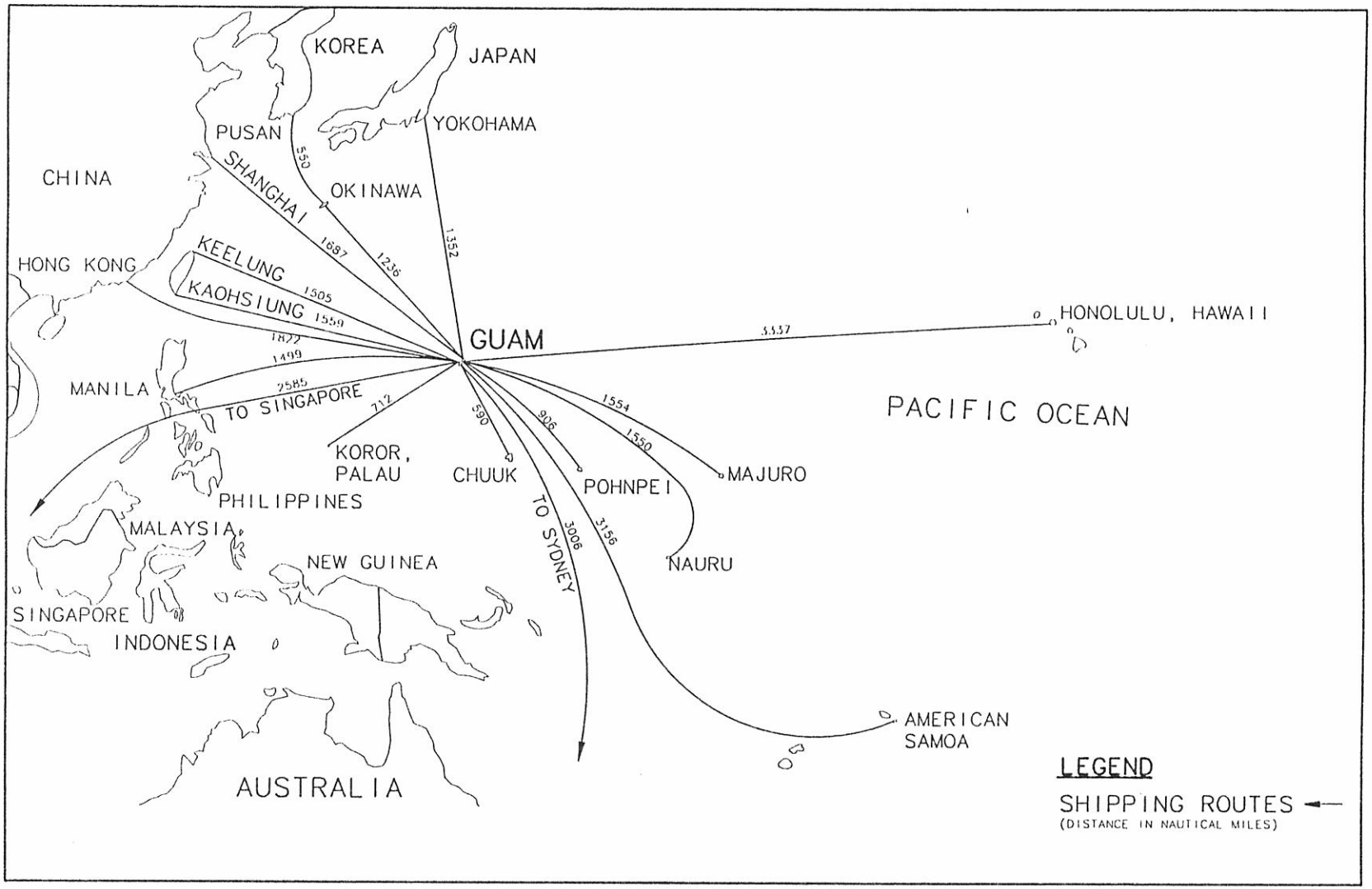

Figure 1.4 Shipping Distances from Guam

Table 1.18
Sailing Distances for Pacific Ports—Nautical Miles
(Generally over routes that afford the quickest passage)

	Guam	San Francisco		Panama	
		Direct	Via Guam	Direct	Via Guam
Guam	---	5,053	---	7,988	---
Yokohama, Japan	1,352	4,536	6,405	7,682	9,340
Kaohsiung, Taiwan	1,559	5,737	6,612	8,860	9,547
Keelung, Taiwan	1,505	5,617	6,558	8,718	9,493
Shanghai, China	1,687	5,502	6,740	8,566	9,675
Hong Kong	1,822	6,044	6,875	9,195	9,810
Manila, Philippines	1,499	6,299	6,552	9,347	9,487
Singapore[1]	2,585	7,353	7,638	10,505	10,573
Sydney, Australia	3,006	6,448	8,059	7,674	10,994

	Guam	Yokohama		Shanghai	
		Direct	Via Guam	Direct	Via Guam
Auckland, New Zealand	3,497	4,789	4,849	5,148	5,184
Sydney, Australia	3,006	4,330	4,358	4,636	4,693

	Guam	Honolulu		San Francisco	
		Direct	Via Guam	Direct	Via Guam
Koror, Republic of Palau	712	3,988	4,030	5,720	5,765
Chuuk, Federated States of Micronesia	590	3,028	3,908	4,931	5,643
Pohnpei, Federated States of Micronesia	906	2,685	4,224	4,641	5,959
Majuro, Republic of the Marshall Islands	1,554	1,895	4,872	3,892	6,607
Pago Pago, American Samoa	3,156	2,276	6,474	4,150	8,209
Nauru	1,550	2,614	4,868	4,540	6,603

Source: U.S. Naval Oceanographic Office, H.O. Publication No. 151

[1] Data indicates growing shift from Singapore/Pacific–U.S. to Singapore/Atlantic–U.S.

view—a market must be built, it will not materialize naturally. In essence, both Apra Harbor and Subic Bay will be required to create markets—most importantly, ensure heavy concurrent use of the port by numerous cargo carriers—if additional international transshipment of any significant quantity is to appear at either port. Ultimately, the final determinant of this materializing in Guam is likely to be industry participants' willingness to invest heavily in any container facilities to be built at the Harbor. International companies, however, have already committed hundreds of millions of dollars towards the expansion of Kaohsiung, Singapore, and other Asian harbors. For Apra to induce them to lay out millions more here, the mass of allied or synchronized traffic Guam must promise would at the very least have to reach 2.5 million TEU per year.

Future Pacific Island Transshipment Demands. The extent to which this traffic will grow depends largely on income growth and infrastructure development in the island communities surrounding Guam. Future economic developments in the Pacific island states surrounding Guam are likely to be sizable when considered in the context of these individual communities, but it is not clear that they will be large when compared to Guam's forecasted economic growth. Nor is it clear that their growths will produce positive or negative consequences for Guam's commercial activity. Regional economic comparisons are given in Table 1.19.

Up to now, the FSM, Palau, CNMI, and to some extent, the Marshall Islands, have all looked to Guam as the primary source of services and for product transshipment to meet their economies' needs. In response, many Guam-based companies have established branches or subsidiary presence in these Pacific island communities to supply everything from financing and insurance to automobiles. Guam has served as the communication and transportation center through which these island states can economically move information and goods. These activities have grown as income levels of the client island communities have risen over the past decade of development. To varying degrees, these income effects will continue, though quite unevenly, as some states acquire new financial resources, while others seem destined to deplete theirs. The net effect should be some growth in Guam's activity for these islands.

But, for several reasons, Guam will face new uncertainties. This growth will experience surges linked with the initiation of new development programs and is likely to be uneven, a matter that will challenge Guam service providers attempting to achieve consistent performance. Second, these development programs are aimed specifically at establishing commerce and infrastructure that is free of dependence on other regional support such as Guam's. For example, Palau's purpose in developing a new international airport is to obtain direct flights from Asia and Hawaii. Similarly, FSM, Palau, and Saipan's motives for expanding harbor

Table 1.19
Pacific Island Economic and Demographic Indicators

	FSM			CNMI	Palau	Marshall Islands		
Year	GDP	Population	Per Capita GDP	Per Capita GDP	Per Capita GDP	GDP	Population	Per Capita GDP
	($ Mil)	(000)	($)	($)	($)	($ Mil)	(000)	($)
1981	---	---	---	---	---	27.2	32.9	824
1982	---	---	---	---	---	30.6	34.3	891
1983	110.0	89,415	1,230	---	2,345	36.5	35.7	1,023
1984	---	---	---	---	---	39.5	37.2	1,063
1985	---	---	---	---	---	38.4	38.7	992
1986	---	---	---	---	---	49.0	40.3	1,216
1987	---	---	---	---	---	55.1	41.9	1,315
1988	---	---	---	16,159	---	61.9	42.7	1,449
1989	144.8	97,881	1,479	---	---	63.7	44.4	1,435
1990	154.7	100,577	1,538	---	5,084	68.7	46.2	1,487
1991	167.8	103,251	1,625	---	5,427	71.8	48.0	1,495
1992	174.1	104,284	1,669	10,327	5,684	79.3	50.0	1,587
1993	194.2	105,326	1,844	---	---	83.6	52.0	1,608
1994	203.1	106,380	1,909	---	---	89.4	54.1	1,653
1995	---	---	---	---	---	95.5e	56.2e	1,700e

Source: Bank of Hawaii

facilities is to obtain direct, rather that Guam-transshipped commercial activity and goods shipment.

To the extent that these and other commercial efforts are successful, Guam's role as the "hub" for the neighboring islands will diminish. These new island developments ex-

pect to offset developmental costs through the savings incurred by eliminating the costs of intermediate handling of goods and services on Guam, plus the new revenues (public and private) that are expected to be generated. This expectation may not necessarily be achieved. These attempts could disrupt current commercial patterns and may cause irrational (non-economic) pricing and regulatory policies in the region to which Guam's public and private players must be ready to respond.

If the economics surrounding Guam grow robustly over the coming years, there will be a paradoxical result for Guam. Strong growth will offer new commercial and income opportunities for Guam. But, strong growth in those islands will likewise support many local developments that no longer need Guam's participation. The latter possibility appears to be more likely in the area of fish harvesting and transshipment. Small sizes of consumer markets on these islands, however, are likely to keep transshipment through Guam from falling below current levels.

As Table 1.20 suggests, total transshipment tonnage has risen modestly with the economic activity of regional island states. The relatively flat economic performance of those states in recent years suggest that this trend is not likely to accelerate except during period of major infrastructure development, and that it may be some time before visitor and income growth increase enough to raise transshipment requirements on Apra Harbor.

1.4.2 Future Fishing Industry Demand. Numerous studies have pointed to an extensive shift of the fishing industry from eastern and central Pacific regions to the western Pacific. Some of the shift has resulted from relocation of canning facilities. However, an issue of importance in this shift has been dramatic increases in Japanese imports of sashimi tuna. Indeed, most of the recent dynamic of the Pacific industry has arisen from the rapid emergency of that product and market.

Table 1.20
Total Transshipments by Surface

Year	Tons (000)
1985	123.3
1986	169.5
1987	155.6
1988	86.7
1989	99.7
1990	277.3
1991	314.1
1992	314.1
1993	244.5

Source: 1993 Guam Economic Review

This development defines what is currently the most important aspect of the outlook for the fishing industry in Guam.

It has been suggested that canning of tuna could perhaps become a viable industry for Guam to consider, but that appears to be a weak prospect and would require assessment beyond the scope of this master plan. Consideration of port development takes into account only the industry's current focus on shipment of fresh fish.

It is important that, inasmuch as Japan's consumption of sashimi defines this product market for the western Pacific, this market's chronic instability be kept in mind—both seasonal and longer term variations. Seasonal variations in demand for fresh tuna do not affect the general extent to which harbor facilities may be developed. Longer term changes may. The prime factors affecting the market longer term would be growing evidence of excessive competition that drives tuna prices down, causes fleets to be bid (or required) to move to other competing ports, or causes depletion of tuna stock and the rise in price but the impoverishment of fishing companies with dwindling harvests.

All of the above are current issues of discussion. And each is a matter that will not be easily resolved. If, as some forecast, the number of long-liners in the regional waters around Guam rises to over 1,000 while purse seine catches continue their dramatic rise, demand for port fishing facilities will rise sharply, but very likely will not be sustainable given the magnitude of break with past fish reproduction patterns.

This raises questions about the extent to which expansion of port fishing facilities should occur. And it affects the matter of how extensively smaller Guam harbors should be developed. Certainly, continuation of this market's expansion places unwanted pressure on local fishing participants challenged with a growing availability of "reject" fish landed on Guam by the fleets. Development of facilities for local fishing will also continue to be affected by the extent to which fish interception by international fleets reduces the domestic catch.

A forecast of the regional fishing industry's growth and performance in both fresh and processed product is weakened by the fact that demand arising out of a prospering Asia is virtually limitless, albeit perhaps not for the sashimi traffic which would involve Guam. Against this is a resource whose bound is limited but unknown and will doubtlessly always be misjudged. The result of these conditions is a highly cyclic industry in terms of sustainable production, which means that construction of facilities to serve the industry requires an investment group that either has a very strong hold on the core market or has the capacity to endure lengthy periods of negative cash flow. Given the unacceptability of the latter condition, Guam must become either the only preferred port for this activity or it must be conservative in its investment and expect periods of low or unprofitable activity frequently over the coming 20 to 30-year period.

The relative newness of the region's fresh fish transshipment industry, together with the variance in data availability, hamper efforts to generate a forecast of activity. Current evidence is that, absent any major change in the policies of surrounding Pacific states, the volume of this type of fishing activity moving through Guam has stabilized in the neighborhood of 10,000 metric tons per annum. This is in line with the 15-year forecast of the 1992 Duenas and Associates report of 9,500 tons.

Assuming that the decade of sashimi imports by Japan has established the primary market size, significant change in activity for this product for Guam is likely to come only because of actions taken by neighboring jurisdictions such as the Republic of Palau, the Federated States of Micronesia, and the Commonwealth of the Northern Marianas (Saipan). For example, Palau's intention to expand its airport and air-cargo handling capacities in the near future may eliminate the current cost advantage that Guam derives from having access to direct two-way air traffic with Japan. Similarly, completion of on-going harbor expansions in Saipan could result in declines in Apra Harbor's traffic.

An advantage that Guam could develop, would be the capacity to provide more cushion than other states can, between offloading the catch and placing it on flights to Japan—a matter of some importance and difficulty for the fishing fleet. Aside from the catch that flies on dedicated planes serving some of the islands, most catch must move via rigidly scheduled, or hotly contested freight capacity. Fleet costs saved through access to a more flexible preflight holding (and perhaps a regional auction) facility on Guam, for example, could offset all but policy barriers put up by other competing island states.

Uncertainty over future policies of these states to decrease fish traffic through Apra Harbor, presents real problems for planning harbor development. Typical of these policies are the licensing policies in the FSM, which require that all vessels authorized to fish within their Exclusive Economic Zone (EEZ) use FSM ports for transshipment. This prohibition of tuna transshipment through Guam has contributed to the decline in port call and offloading activities in Guam. Since no fish are being caught in Guam's waters (because of small quantities, low qualities, excessive U.S. regulations and permits, and requirements of on-board observers), such a prohibition, if enforced, will virtually eliminate Guam as a player in the fishing industry. However, as ports in the FSM cannot presently accommodate all the fish caught, Guam continues—for the moment—to experience some port activity. A regional economic agreement—among Guam, FSM, Palau, CNMI, and perhaps even the Marshall Islands—that encompasses fishing, immigration and labor, tourism, and similar economic interests may be the only viable mechanism to resolve Guam's dilemma.

FSM's efforts to develop fish handling facilities in Yap and Chuuk may be sufficiently successful to ultimately dispense with such direct prohibitions. But, in any event, it appears that Guam will for some time be challenged by both official

and commercial efforts of neighboring states to move a greater share of the fish product through their ports. If they are successful, and the entire market for fresh fish transshipment has been satisfied—specifically in Japan—the fish fleet requirement for Apra Harbor should remain at or below its present levels.

Limited offloading at FSM ports is believed to have contributed to the declining availability of cargo space for Guam agents to transport the tuna to the Japanese sashimi market on commercial carriers operating out of Guam. Agents have reported that the commercial air carriers have been increasing cargo space allocations for tuna offloaded in the FSM and Palau, while decreasing allocations for tuna offloaded at Guam's Commercial Port. Presently, about 95 percent of Guam's air cargo requirements are reserved for tuna transshipment.

In light of the Government's financial bounds, the extend to which Apra Harbor fishing facilities are developed will be affected by the interest of private groups sure of the terms on which the market can repay their investment. The possibility of joining the market for canned and frozen product would entail considerable adjustment of local resource (particularly labor) costs but would present the container transshipment segment as well as the fishing segment of the Harbor design with a variety of greater options. The extensive advantage that Asian canneries hold in cost and productivity, however, render this aspect of the fishing industry an unlikely component of the Harbor's future without very generous treatment of the industry by both the federal and local governments.

1.4.3 Future Demand for Ship Repair. Diversification of Guam's economy is a major objective of the redevelopment of Apra Harbor. Included in the desired diversification is the restoration of the industrial base of the economy in the form of ship repair, and perhaps building within the expanded harbor. At present, Guam's labor availability and costs relative to those of the region make development of such an industry challenging.

Navy facilities made available by BRAC, and a greater freedom to include private forces in the harbor's expansion will be critical to creation of this sector. It is important, that, as in other aspects of the Harbor's future development, the ship repair and construction program become a private concern. This will not only result in creation of an efficient operation, it will be being based on true market expectations, help determine the extent to which it can be competitively developed without draining public funds.

The regional market for ship repair and construction is quite advanced. Korea leads in construction of large vessels. Surplus quantities of vessels and excess production capacity in Korea and other large ship building centers in Asia has frequently moved those centers aggressively into ship repair with very low charges. The volatility in volume and price that characterizes this industry proves especially

difficult for small producers that from time to time may be shut entirely out of a shrinking market. Unless a small repair yard can develop a niche that ignores the larger market fluctuations, its survival is doubtful.

The fact that Guam does not now lie on a major trans-Pacific shipping route poses a significant challenge to its goal of establishing and maintaining a ship repair industry. No ship repair facility exists today unless it lies at the terminus of a major shipping route. This is true for yards dependent on scheduled overhauls, but especially is true for those who service emergency repair needs to the shipping concerns. Yards that provide emergency repairs must be in ports with intense traffic to support the large parts and materials inventories needed to respond to a variety of unanticipated repair requirements. The sporadic demand of a light traffic harbor could not economically or financially justify such a standing inventory.

In light of Guam's relative cost and labor disadvantages as well as the depth of many Asian shipyards, development of a production and marketing specialty is critical to the design of any ship repair facility in Apra Harbor. The ability to successfully identify and design such a specialty does not reside with government bureaus. Such a design will require a high level of market awareness and responsiveness found only with a private developer of the facility.

Apra Harbor can offer an advantage as a regional repair facility to the growing number of Pacific island fishing and small cargo vessels not able to traverse the great distances required to reach repair yards in the Philippines or Asia. It is thus possible that Guam's remote location can result in the satisfactory development of a facility despite its labor and cost conditions. However, even this smaller beginning will require the marketing and operating responsiveness of a private developer.

For a more detailed discussion of ship repair industry potentials, the reader is directed to the Draft Business Reuse Plan for Naval Facilities at Apra Harbor.

1.4.4 Future Passenger Transportation Demand. The determinants of this market tend to have more to do with the nature of ocean destinations along which cruise ships wind their way than with the state of harbor conditions. Many successful cruise destinations to which pleasure vessels journey are served from shore by tenders rather than by dock facilities. In light of Apra Harbor's sheltered characteristics, that is not necessary, and berthing and direct embarking is an easy and preferable process of dispatching passengers. Moreover, unless concerns are high regarding dock aesthetics, improvements to existing Harbor docks and access facilities could serve an expanded passenger traffic through Apra.

Given this outlook, extensive expansion of the Harbor's passenger facilities would require evidence of both rising traffic and a rising industry willingness to cover the costs of

more elaborate docking and transitting facilities. Current estimates are that the number of cruise vessels plying the Asian waters will be growing rapidly for the foreseeable future. It is not clear whether the rather modest increase in such vessels calling on Guam since 1989 is a reflection of market preference or ease of visitor entry. It is possible that growth might be restrained by inadequate transiting facilities. However, there is no evidence of that at present.

Asia's total cruise activity is not likely to triple before 2020, nor should Guam acquire more than a proportionate share of that. At most, this would mean major foreign cruise vessels calling an average of one per week (56 per year) rather than the current average of one every third week (20 per year). In spite of the tendency of these cruises to concentrate in just a few months of the year, this would be an increase in demand that could possibly be met with improvement of existing docks if timing of arrivals were orchestrated to sustain or preferably better the current spacing of calls.

Demand on the Port would probably increase only if an aggressive marketing program were to be developed. In essence, this means that Harbor expansion for passenger service is almost entirely dependent on the extent to which authorities determine to pursue cruise clients capable of paying for the considerable cost of such an expansion. External growth that financially justifies construction of major transit facilities is not likely to be a natural outgrowth of those markets for several decades.

1.5 Summary of Market Assumptions

The following conclusions can be drawn from the market considerations that were presented in this section.

- Apra Harbor as a major transshipment center. At present, there is little concrete and defensible evidence within the Pacific market to suggest that Apra Harbor will move naturally beyond its present relative position to become a major regional or international transshipment center. The forces of location, market patterns, past investments, and technology point to growing container traffic that continues to, and prefers (for financial and time reasons) to bypass Guam. For these conditions to be overcome, considerable effort will have to be exerted by the Port Authority.

  The primary actions that would be required to alter this outlook would be:

  - Official, aggressive, and permanent harbor marketing and offering of investor benefits
  - An open policy to privatize all functions except general port management

- Development of a value-added service or assembly (e.g., convenient and rapid customs clearance and quality control facilities)

- Shipping agreements and schedules with an assurance of immediate or otherwise quick transfer of containers for onshipment (especially in light of days lost in detouring to Guam)

For many of these conditions to emerge, the private industry and investment will have to be allowed to take the lead and define the ultimate scope and nature of development. Joe Murphy, editor emeritus of the *Pacific Daily News*, summarizes this thought when he discusses the gains made in private sector employment on November 8, 1995:

> "...we can become a more prosperous, self-sufficient island, without having to keep asking Uncle Sam for help. None of this, however, is going to happen just because we want it to happen. We've go to work at it, to provide the opportunities, and the infrastructure, and above all, a welcoming, encouraging government prepared to offer a hand."

Indications are that while small manufacturing or value added activity could utilize the relinquished U.S. Navy facilities, neither their wharf conditions or the adjacent warehousing structures will accommodate container traffic of any significance. No sizable advantage emerges from those facilities for that activity, and it is doubtful that breakbulk cargo would be transshipped through Apra unless substantial value were added to it.

- Development of a Fishing Port. As robust as it appears at present, the role of the fresh fish market as a force in expansion of a port facility is not mature or reliable enough for publicly designed or financed development. Moreover, as a relatively narrow product market even in future years, it will require the quick market responsiveness of private investors to keep any related harbor improvements gainfully employed and not subsidized. Hence, development will require complete privatization of the facilities and operations.

In order to broaden the facility's usefulness and concurrently reduce Guam's concentration on the narrow sashimi market, consideration should be given to inviting fish processing groups to invest in harbor and plant development. Competitive conditions around the Pacific are intense enough, however, that considerable changes in law and policies with respect to use of migrant labor, availability of

energy, preferential tax treatments, and boat crew regulations is likely to be required. As in the case of container and bulk cargo capacity development, the role of private investment be central.

- Development of Passenger and Pleasure Cruise Facilities. The frequency of calls by ocean-going passenger ships is not rising rapidly, though growth should continue over the coming decades. At this juncture in time, the fact that calls are less than three per month suggests that the port capacity is more than adequate, even if they are not as attractive as desired. Public investment in limited modification of transit facilities at shipside could perhaps be justified to improve the arrival's first impressions of Guam, but the argument could be made that the rustic nature of Guam's facilities are in fact part of the port's attraction as a travel destination.

Section 2

Assessment of Existing Port Conditions

ASSOCIATES, INC.
Engineers/Architects

Section 2

Assessment of Existing Port Conditions

2.1 Apra Harbor

Apra Harbor, a natural port formed by a protected lagoon, serves both the Commercial Port of Guam and the U.S. Navy. The waterways are protected by Orote Peninsula on the south, and by Cabras Island, Luminao Reef, and the Calalan submarine bank on the north. It has been used since the pre-Spanish days as a principal entry point into Guam. In 1565, 44 years after Ferdinand Magellan first set foot on Guam, Spain colonized the island and established Apra Harbor for provisioning her golden galleons and other merchant ships. Fort Santa Cruz on Orote Peninsula was constructed to support this mission.

Following its defeat in the Spanish-American War in 1898, Spain ceded Guam to the United States. The U.S. Navy was charged with administering the island for use initially as a coaling station, and later as a key naval base in the western Pacific. The first American dredging of Piti Channel was performed in 1904 which was followed by 10 years of causeway construction between Cabras Island and the main island.

Shortly before the outbreak of World War II, the Navy initiated efforts to strengthen its fortifications at Apra Harbor. Construction began on

Figure 2.1 Aerial View of Apra Harbor

petroleum, oil, and lubricants (POL) storage and fueling facilities, the Glass Breakwater (named in honor of Captain Henry Glass), seaplane facilities, military housing, and other harbor improvements. For the most part these were only partially completed when Guam was captured by the Japanese on December 10, 1941. During their occupation, the Japanese constructed a 4,500-foot coral airstrip on Orote Peninsula.

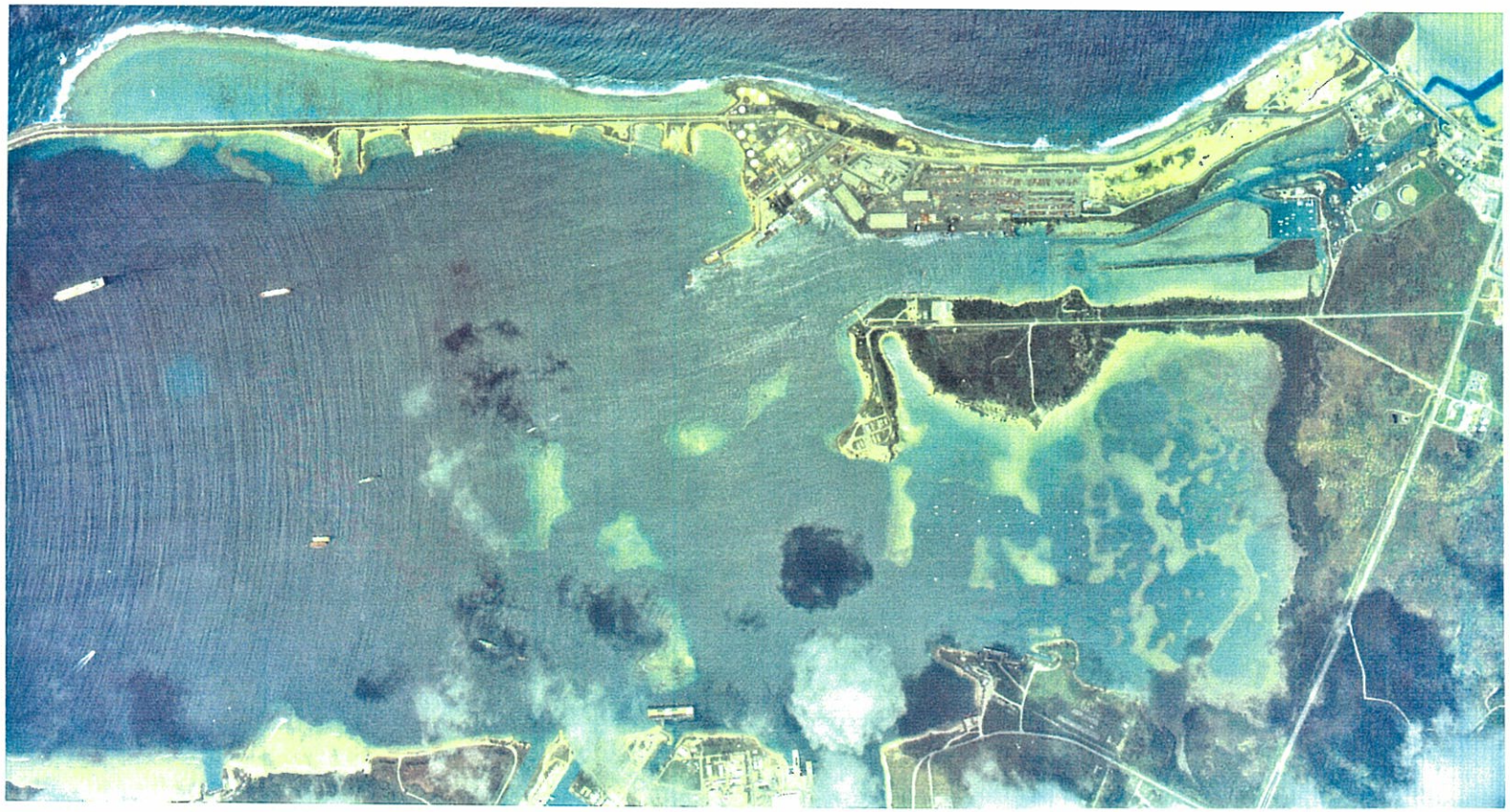

Figure 2.2 Aerial Photo of the Commercial Port Area

Following the recapture of Guam, and through 1950, various improvements including the dredging of 10 to 15 million cubic yards in the harbor area, the filling of approximately 400 acres of the lagoon and mangrove periphery of the harbor, construction of approximately 17,000 linear feet of the Glass Breakwater from Cabras Island to the end of Calalan Bank, and the removal of over 290 derelict ships were completed. Completion of the Glass Breakwater provided a larger sheltered anchorage area 4 miles long and 1.5 miles wide.

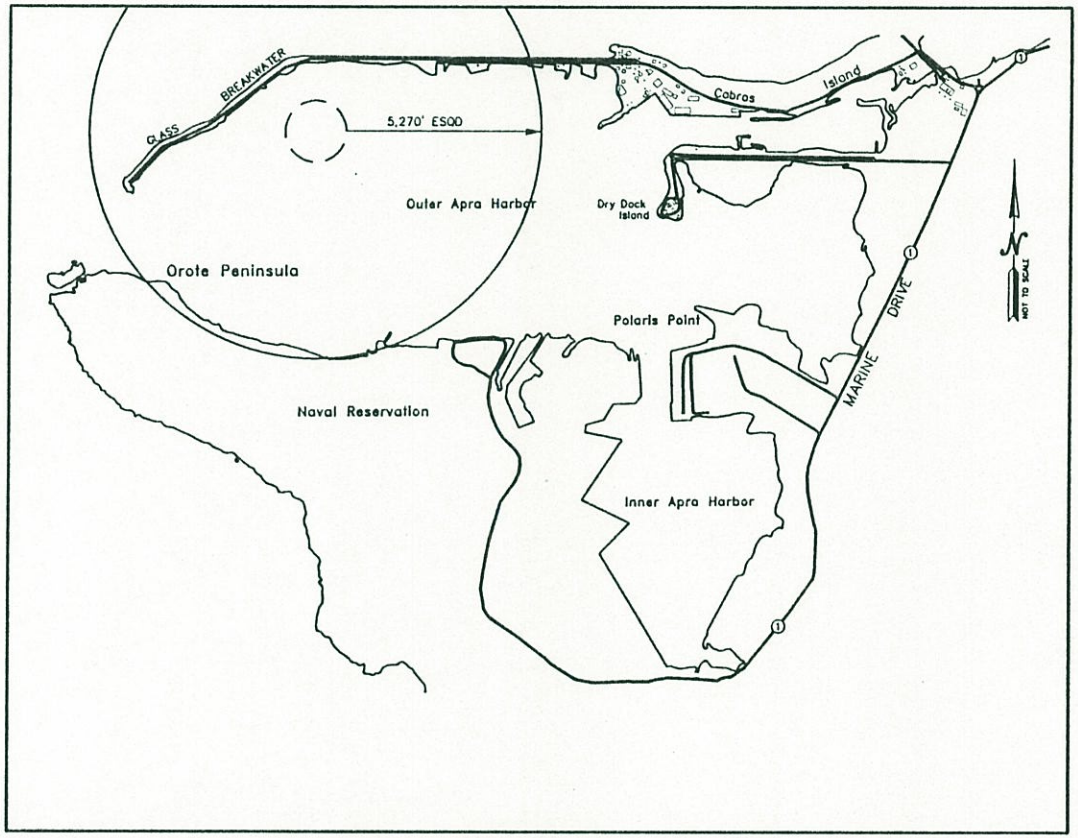

Figure 2.3 Outer and Inner Apra Harbors

From its initial establishment in 1952 until 1969, the Commercial Port was located in Inner Apra Harbor. It occupied 24.5 acres along 2,190 feet of berthing space at a depth of approximately 28 feet. Four warehouses provided 113,000 square feet of storage space. In 1964, the U.S. Navy began design work for a new Commercial Port at its present location on Cabras Island. Requiring approximately 600,000 cubic yards of fill acquired from dredging areas now called Berth F-3 and F-6, the construction was completed in December 1969.

At completion, the water depth was 30 feet below MLLW (mean low low water) along approximately 800 feet of Wharves F-3, and 35 feet below MLLW along 1,950 feet of Wharves F-4 to F-6. Piti Channel was dredged to 22 feet

and extended approximately 400 feet beyond the Port's east boundary.

The Commercial Port serves as a vital lifeline for the Guam economy. Because of Guam's insular location, waterborne commerce costs constitute a significant portion of the cost of all goods and services. The average depth of water in the Outer Harbor is over 100 feet. Within this area, there are four anchorages for commercial vessels and three that are reserved for the U.S. Navy. The Inner Harbor is entirely within the Naval Reservation, although negotiations are on-going for the release of parts of the Ship Repair Facility (SRF), the Fleet Industrial Supply Center (FISC), and Naval Activities (NAVACTS) areas under the provisions of BRAC IV (Base Realignment and Closure, 1995).

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, where it rises up to 35 feet or less.

The U.S. Army Corps of Engineers, working in partnership with the Port Authority, is designing shore protection along a 3,100-foot long stretch of Route 11B, the Commercial Port Road. The Corps' preliminary recommendation is to construct a 25-year level toe protection for the seawall that fronts Route 11B on Cabras Island. The plan envisions a protective stone apron in front of the existing seawall to prevent the erosion of foundation material and to provide the added benefit of reducing overtopping. In late 1994, the Corps estimated that the project would cost approximately $1.5 million.

The Corps of Engineers is also evaluating shore protection along two reaches of Route 11B at the entrance to Cabras Island near the existing power plants. Totaling 325 feet in length, the Corps' plan suggests a 2.3-foot single layer revetment of 1,200 to 2,400 pound stones on a 2.2-foot underlayer of 150 to 200 pound stones. This project is estimated to cost $563,400.

2.2 Land Area

Prior to 1969, all land around Apra Harbor was owned and controlled by the U.S. Navy. In that year the Navy transferred 62 acres to the Government of Guam for port uses. 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.

The Navy more recently transferred land lying south of the Glass Breakwater and a 208-acre parcel that includes the Piti Channel and Sasa Bay, areas lying west of Marine Drive and south of the Navy and Cabras Island Power Plants, and much of the Dry Dock Point spit, to the Government of Guam for use by the Port Authority of Guam.

A more detailed discussion of these former Navy lands is presented in Section 3 of this plan.

2.3 Facilities in the 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. Figure 2.4 shows the layout of the Commercial Port area.

2.3.1 Berth F(oxtrot)-3. Berth F-3 is a 750-foot long marginal wharf (station 0+00 to 7+50) that consists of a steel sheet pile bulkhead that was placed in front of an earlier deteriorated sheet pile wall and a concrete cap that extends below the water line. It is oriented approximately NW to SE. Behind this is an 85-foot wide paved apron in front of Shed 1. Maintenance dredging was conducted in this area in 1992 and as a result, the water depth along Berth F-3 has been increased.

The earthquake which struck Guam on August 8, 1993, caused only minor damage to wharf F-3. According to the Engineering Status Report by Liftech Consultants, Inc., operational clearance to use wharf F-3 was issued on August 14, 1996 after completion of visual inspections. The consultant recommended that (1) while mobile cranes could be used, their outriggers should be located at least 15 feet from the face of the bulkhead, and (2) loaded containers and other heavy bulk cargo should not be stored in the area between the wharf face and the canopy of Transit Shed No. 1.

The 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. It is a heavily used pier and during the peak of the fishing season, it is not unusual to see 10 to 12 fishing vessels tied up abreast, offloading their catch.

2.3.2 Berths F-4, F-5, and F-6. These wharves make up the heart of the Commercial Port. Running West to East, these berths total 1,953 feet in length (station 7+50 to 27+03) and may accommodate two full container vessels, three smaller breakbulk and container vessels, a number of the smaller vessels (60 to 200 feet) 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.

Maintenance dredging of this area was conducted in 1992 to increase depths. There is an obstruction 150 feet in front of Berth F-6. Coral heads are present at depths of 22 feet

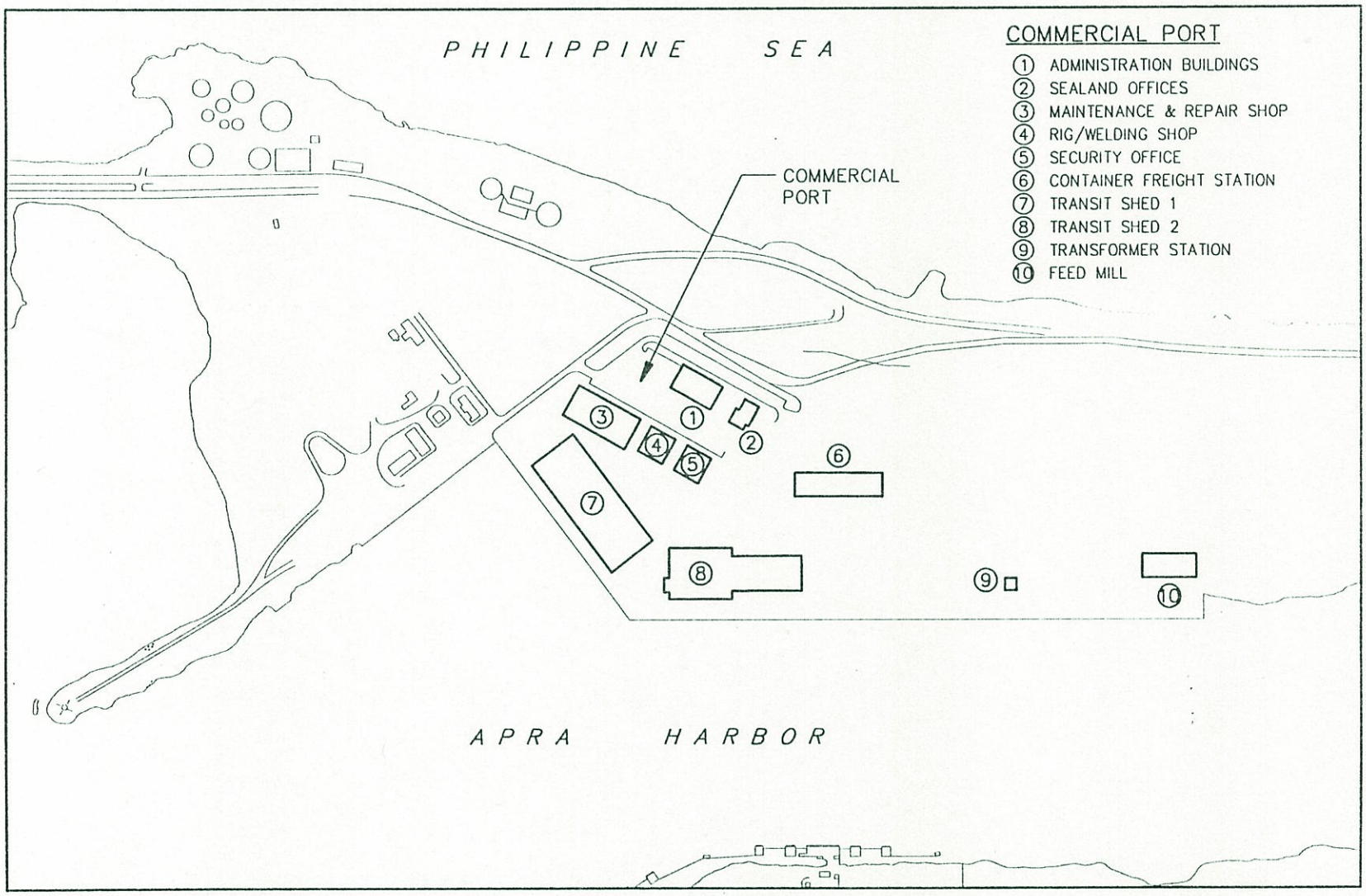

Figure 2.4 Commercial Port Area

below the water's surface. This makes it very difficult for certain vessels to berth at Berth F-6. In some instances, if a vessel is occupying Berth F-5 this obstruction may prevent a ship from maneuvering into and out of Berth F-6. However, in most instances it simply takes much longer to berth at F–6.

Figure 2.5 Wharf F-4

Unfortunately, Berth F-5 was severely damaged in the August 1993 earthquake and is currently unable to support vessel operations. The damage to Berth F-5 limits offloading operations and renders a large section of landside wharf space useless. According to Liftech Consultants, Inc., the entire 1950 ft length of bulkhead and crane runway at berths F-4, F-5, and F-6 rotated clockwise about station 7+50 and translated as much as 24 inches towards the water. A 560–ft section between stations 16+75 to 22+35 was severely damaged due to soil liquefaction, settlement, and lateral spreading. Additionally, (1) surface cracks were noted to extend into the container yard as far as 250 feet from the face of the wharf, (2) crane runway cross struts were damaged, (3) large "bird baths" were formed along the full length of wharves F-4 to F-6 with smaller baths in the container yard itself, (4) the concrete cap at the top of the steel sheet pile bulkhead developed vertical cracks, and (5) the crane stowage concrete and steel anchors embedded in the wharf were badly damaged.

In evaluating the damage, the consultants recommended that (1) all traffic and shipping activity be prohibited between stations 15+50 and 23+50 and fenced off for a distance of 105 feet from the face of the wharf, (2) container cranes could be operated beyond stations 15+50 and 23+50, (3) mobile cranes could be used beyond stations 15+50 and 23+50 provided outriggers were located at least 15 feet from the face of the bulkhead during loading operations, (4) loaded containers and other heavy bulk cargo not be stored

between the crane rails at the wharf beyond stations 15+50 and 23+50, and (5) only empty containers be stored immediately behind the fenced area.

Three rail-mounted container cranes service the usable space along these berths, the most recent addition being purchased from Subic Bay in 1991. A rail gauge of 50 feet allows the cranes to pass in front of Shed 2. These cranes were load tested to 125% of their rated load following the August 1993 earthquake and found to be mechanically sound. Although the cranes themselves were undamaged, the tie-downs for the two Paceco Cranes were in the damaged portions of the wharf and hence new temporary tie-downs were constructed at berth F-4 for the two cranes.

Figure 2.6 View Towards Wharves F-5 and F-6

2.3.3 Port Administration Building. This 2-story, 25,400 square foot concrete building immediately off of the Cabras Island Road serves as the administrative headquarters of the Port Authority and also accommodates many of the shipping and shipping-related business concerns. The building's tenants as of early 1996 were:

- Ambyth Shipping & Trading
- Angyuta Shipping Company
- Atkins Kroll
- Cabras Marine Corporation
- Dongwon Industries
- Guameco Corp. (Dongwon)
- Iwashita Enterprises
- Maritime Agency of the Pacific
- Matson Navigation Company
- Mighai International Inc.
- Pacific Maritime Agency
- U.S. Department of Immigration
- Unterberg Jurgen

2.3.4 Transit Shed 1. This Shed is a reinforced concrete structure 122 feet wide and 452 feet long that is located behind Berth F-3. Grade changes in the surrounding areas are used to take the elevation of the Shed's floor from ground level at the front, to a series of raised truck docks out back. Except for three bays (out of 15) that are used for salt storage, the shed is occupied by businesses either involved in or serving the tuna fisheries. Those businesses leasing space in early 1996 included:

- Dongwon Industries
- ICF Guam Co., Ltd.
- Guam Gold Star
- Guam Green Globe
- Guam Marine Hardware
- Ice Factory
- Iwashita Enterprises
- Maruwa Shokai Guam
- Ocean Terminal/Diamond
- Pacific Network, Inc.
- Polar International, Inc.
- Salt Factory

Behind Shed 1 is a triangular oil drum storage area that is part of the fishing fleets' support operation.

2.3.5 Transit Shed 2. This Shed is the twin of Shed 1. It is identical in size and construction, and also has a series of raised truck docks at the rear. These western end of the Shed 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 breakbulk and unitized cargo pending customs clearance. It is not intensively used and plans call for it to be

renovated and turned into office space for Port personnel. The area behind Shed 2 is used for storing neo-bulk commodities such as reinforcing steel.

Figure 2.7 Shed 2

2.3.6 Container Freight Station (CFS). The former 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 docks at the rear. The CFS is no longer used for its original purpose. It is instead, used as a repair facility and maintenance shop by Matson Navigation Company (10,800 square feet, inside), Sea-Land (11,082 square feet, inside and 9,600 square feet outside), and the Cabras Marine Corporation (4,328 square feet, outside).

2.3.7 Container Yard. The yard was expanded in 1990/91 and now covers approximately 26.5 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 to what is essentially 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 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 and the CFS.

2.3.8 Equipment Maintenance Facilities. These facilities are located behind Shed 1 and include the 24,000 square feet Maintenance and Repair Building, a 3,600 square foot Security Office, a small filling station, and open yard space for equipment storage and staging.

Figure 2.8 Container Freight Station

2.4 Other Port Facilities

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.

2.4.1 Hotel Wharf. This 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 sheet pile bulkhead with a concrete cap that extends below the low water mark. The Navy formally transferred this facility, together with 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 is perceived a need for it.

The Port has leased out portions for various commercial activities, including passenger/cruise ship docking and administrative offices, diving and jet ski recreational rentals, and net repair and storage for fishing boats. The Oceanic Grace uses H Wharf regularly during the periods that she is based in Guam and excursion vessels 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.

Among Lessees of Hotel Wharf in early 1996 were the following businesses:

- Guam Dolphins Marine
- Guameco Corp. (Dongwon)
- Inter-Island Shipping Company
- Kloppenburg Enterprises, Inc.
- Nautilus Guam
- Pacific Development
- Sanko Bussan (Guam) Co., Ltd.
- Sea Princess Guam, Inc.
- Yu Sheng Fisheries Guam, Inc.
- Z Fishing Company

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

2.4.3 Berth F-1 and G(olf) Pier. These facilities, with their attendant tankage, serve as 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. It is now leased by Shell Guam, Inc., and is also used by Esso Eastern, Inc. G Pier is also frequently used to moor purse seiners while they await reprovisioning.

Storage tanks, managed or owned by Mobil Oil Guam, Esso Eastern, and Shell Guam are located within the Industrial Area north of Berths F-1 and F-2. The total capacity provided is 625,270 barrels of petroleum products.

Figure 2.9 Family Beach from Pier D(og)

2.4.4 Family Beach. The inner harbor portion of the Glass Breakwater just west of Pier D(og) is known as Family Beach. It is an open, sandy beach primarily used by local residents for picnics, jet skiing, and swimming. Access to the beach is limited to a coral road, and there are no paved parking lots. Immediately offshore, a commercial enterprise(s) is operating a ski/water recreation business. In an effort to assure the safe use of the waters, the Department of Parks and Recreation is preparing a Recreational Water Use Master Plan (RWUMP) for the area. The proposed plan would allow up to six jet ski courses to be laid-out along designated locations in the inner waters of the Glass Breakwater.

2.4.5 Piti Channel—Aqua World and the Harbor of Refuge. With its large protected water area, Apra Harbor has recently become the venue for a variety of water-oriented recreational activities. These activities include both commercial and privately-owned boats and other mechanized water crafts. The commercial activities include tourist jet skiing, SCUBA diving, and banana-boating as well as day and evening dinner cruises.

Commercial vessels are berthed in one of two areas in the Piti Channel—Aqua World or the Harbor of Refuge. Both areas are at the eastern end of the Piti Channel, east of the Commercial Port. The Piti Channel east of the Commercial

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Port, is only 60 to 70 feet wide, has a depth of 8 feet or less at mean low water, and in places, shoaling limits usable depths to only 4 feet. Crafts with 8 foot draft can pass for the most part, but on occasion have had to remain outside the harbor. At the eastern end, the branch of the channel leading to the Aqua World area is crossed by a submerged pipeline owned by Shell Guam, Inc. The pipeline supplies the storage tanks of the Guam Power Authority (GPA) and restricts water depth to 8 feet.

Aqua World, Inc., has a management and use lease with the Port Authority of Guam (PAG) for the area immediately adjacent to the GPA storage tanks. They have a total of 34 boat slips with 30 active permits. As of this writing, seven boats are on the waiting list, some wait listed for as long as 18 months. Five of the seven are commercial vessels over 50 feet for which no space are currently available.

In addition to the boat area, Aqua World manages nine landside leases. The tenants operate dive tour boats and fishing charter boats. Aqua World has expressed an interest in expanding and improving the lease area, but to date have not been successful in negotiating terms with the PAG Board of Directors. Included in their list of improvements are upgrades to the access road, relocation of utility poles, and dredging for both maintenance and for increasing the draw depth.

Umidori Cruises holds a similar lease for the Harbor of Refuge. The refuge area has a total of 50 boat slips, but no permits have been issued as of this writing. Three landside leases have been issued by Umidori—to Umidori Cruises (dive charter boat operations)/Stars and Stripes (dinner cruises), Natassia Cruises (water recreation rentals), and to Atlantis Submarine. There are plans to construct a boat haul out yard in the area. An earthquake in 1993 damaged the parking lot and fuel tanks. The most pressing problem in the Harbor of Refuge is that the Piti Channel is too narrow and shallow. Wakes of passing boats have eroded the banks along the channel.

2.4.6 Agana Marina. Agana Marina (also known as the Agana Boat Basin) is located on the waterfront of Guam's business and administrative center. Built in the pre-World War II era, the marina consists of two small lagoons formed by a series of breakwaters consisting of earth fill retained by steel sheet piles. It is located in the 4-mile long crescent-shaped Agana Bay which extends from Saupon Point to Adelup Point. The bay has a 1-mile deep indentation and is fringed by a coral limestone reef platform for a distance of about 2,500 feet offshore.

The marina as it exists today was constructed by the U.S. Army Corps of Engineers under the authority of Section 107 of the Rivers and Harbors Act of 1960. Improvements were completed in October 1977 at a cost of $1.2 million. The Corps-built project consists of an entrance channel that is 860 feet long, 120 feet wide, and 12 to 15 feet deep; a 1.2 acre turning basin 12 feet deep; a main access channel

that is 540 feet long, 80 feet wide, and 10 feet deep; a revetted mole 1,135 feet long; an east breakwater 200 feet long; a west breakwater 525 feet long; a 250-foot long wave absorber; three circulation channels; and navigation aids. The lagoon contains floating slips and moorings and has a total capacity of about 122 boats. Other boats are on blocks or are on trailers for storage or maintenance/repairs.

There are currently 52 active boat slip permits. For boats less than 30 feet in length, there is no waiting period. For larger vessels, those between 30 and 60 feet, there is a 1-2 year waiting period. A proposal has been made to expand the marina by placing the boat slips removed from the Agat Marina (see Agat Marina below) in the outer basin of the Agana Marina. For now, the PAG is rebuilding its administrative/office building at the marina.

On January 12, 1988, Typhoon Roy caused waves to overtop and

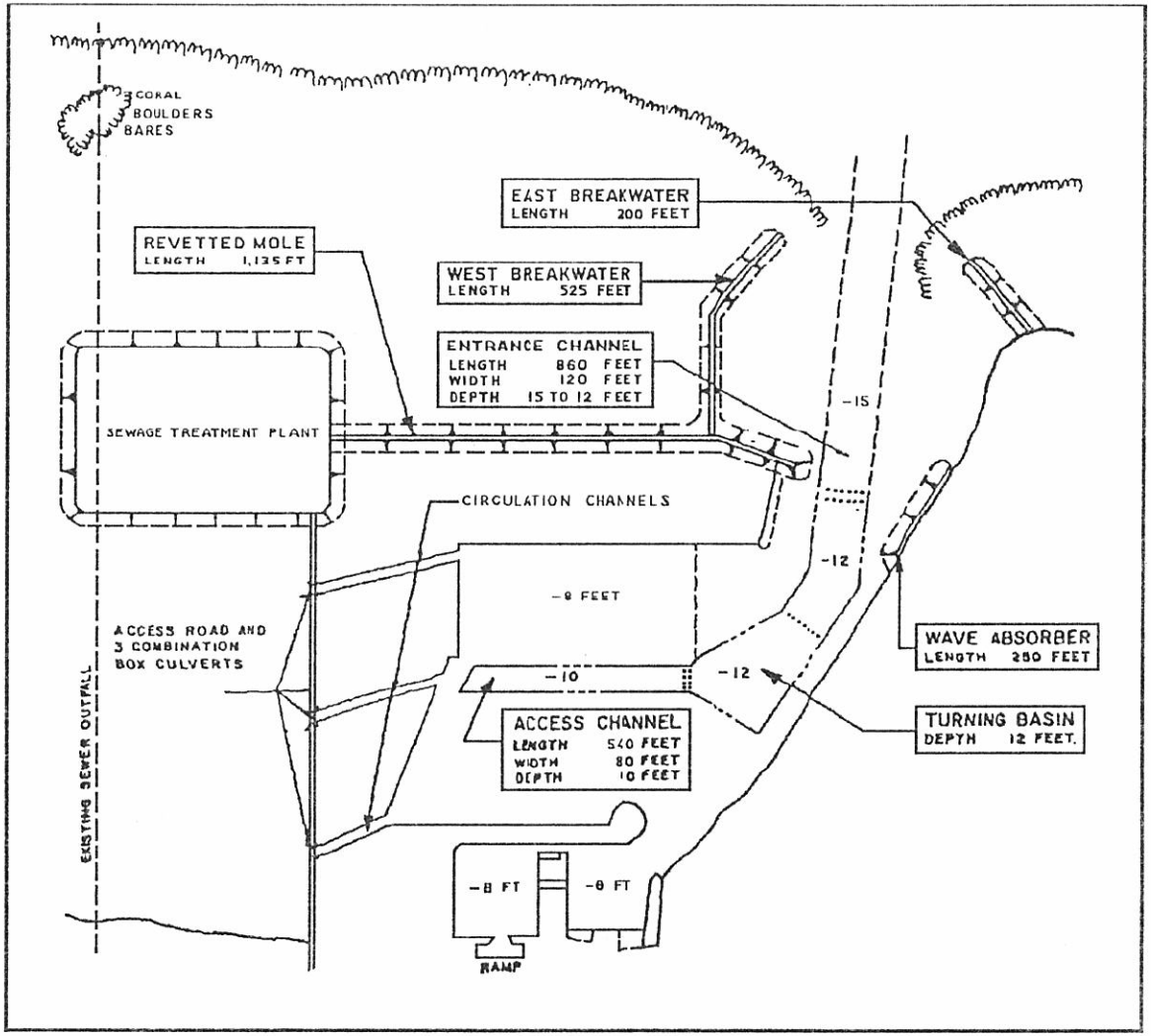


Figure 2.10 Agana Marina

damage the marina's revetted moles. About 1,000 linear feet of the harbor-side revetment were eroded and at least two armor stones were displaced from the east breakwater structure. The Corps of Engineers, however, determined that despite the damage, the structure is sound and repairs are not immediately required.

2.4.7 Agat Marina. The Agat Marina is a relatively new facility having been in operation approximately five years. It was built by the U.S. Army Corps of Engineers under the authority of Section 107 of the Rivers and Harbors Act of 1960. The project was completed and dedicated in March 1989, and construction of shore-side facilities by the Government of Guam was completed in September 1990.

The marina consists of an entrance channel 930 feet long, 120 feet wide, 14 feet deep; a turning basin 120 feet long, 150 feet wide, 7 to 11 feet deep; a main access channel 500 feet long, 75 feet wide, 9 feet deep; two breakwaters 985 feet long and 50 feet long, respectively; and two revetted moles 180 feet long and 300 feet long.

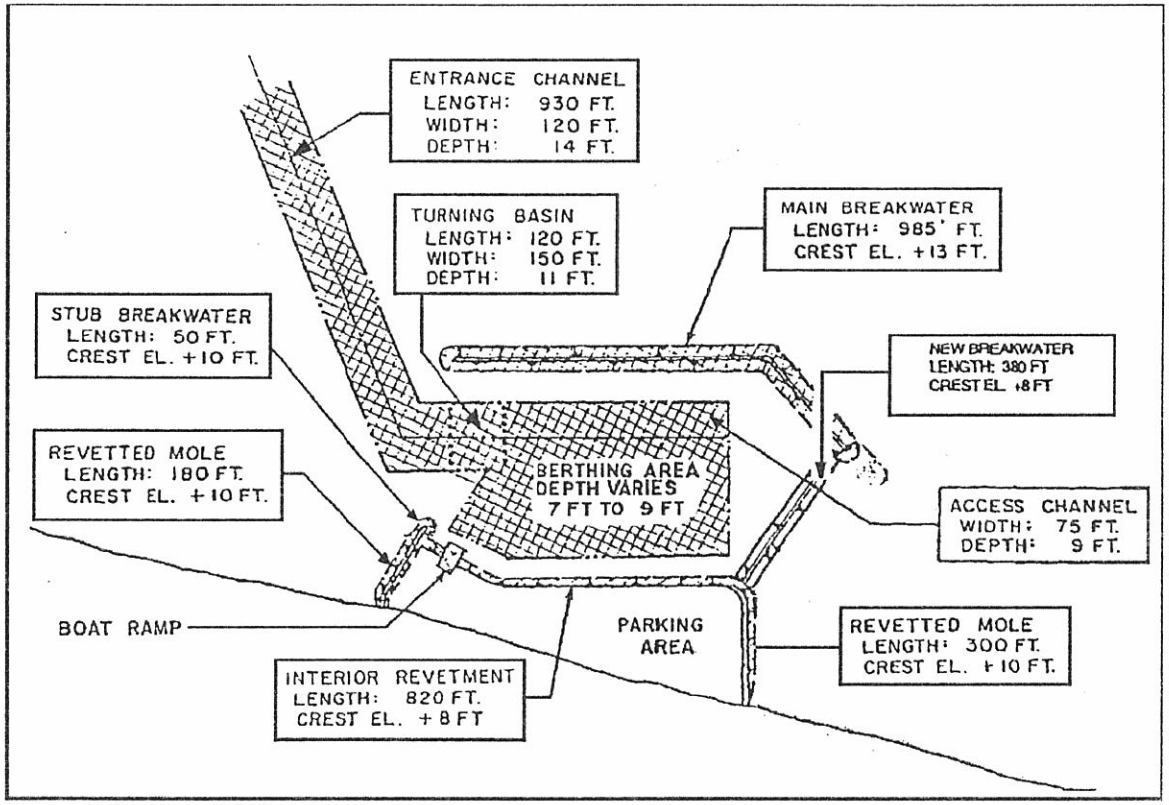


Figure 2.11 Agat Marina

Located in the village of Agat in the southwestern coast of Guam, the marina was designed to accommodate 162 boats with supporting shore side facilities for fuel, loading, car and trailer parking, water hookups, and pump-out facilities. The marina also has a full-service restaurant for approximately 40 customers and an outdoor dining area. At present there are 81 active permits. There is no waiting list for small vessels, but 48 larger vessels are on the waiting list. The marina's draft capacity is 7 feet. One portion of the marina, that area adjacent to D-Dock remains undredged.

Following the marina construction, it was discovered that wave setup from 10 to 15 foot surf on the reef edge would cause high velocity currents to enter the marina in a north to south direction. This led to two problems for the marina: (1) the first row of berths became unusable; and, (2) a shoal developed on the north side of the berthing area. In response the Corps of Engineers developed a corrective scheme to reduce the current velocities and shoaling. However, because the marina costs have reached the limit for federal participation, the Corps determined that the estimated $600,000 cost for the corrective work must be borne by the Government of Guam. In November 1990, the Port Authority requested the Corps to design the needed modifications. These documents were completed in September 1991 for advertisement and award by the Government of Guam.

In addition to the marina problems, beach erosion has occurred along the highway both north and south of the marina. The Corps of Engineers has recommended that north of the marina shoreline protection be provided along a 165-foot length. The proposal consists of a revetment using a single 3-foot layer of 2,400 to 4,800 pound stones and a 2.7-foot underlayer of 150 to 200 pound stones. The Corps estimated the cost at $375,300 in February 1995.

The Corps also has recommended a similar revetment be constructed south of the marina along a 650-foot length. The construction cost for this section was estimated at $1,163,300 in 1994.

In late 1995 there was an outstanding proposal to increase the capacity for larger vessels. The plan proposes to remove 24 docks (48 berths) and convert them for larger vessel use, significantly increasing the marina's revenues. At present there are 60, 25-foot docks that can accommodate a total of 120 small vessels that are up to 25 feet in length. Only 49 vessels are moored at these 60 docks. Hence, 71 berths, or 35.5 docks are vacant. If 24 of these vacant docks are converted, 12 to 14 larger vessels can be accommodated from the waiting list.

2.5 Port Equipment

The three largest pieces of equipment in the Commercial Port are rail mounted Container Cranes (Gantries) 1, 2, and 3. Container Crane 1 was installed in 1971, at which time it was already a used crane, having been acquired from Pacif-

ic 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 centerline of the two rails). Container Crane 3 was purchased from the Navy Station in Subic Bay.

For handling 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 degrees 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 years old, have sensitive controls and lack the 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 is working, functions very well. However, it has a history of extended downtime because of the 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 a 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. For moving containers about the yard, the Port has 24 tractors (about 80 percent of which are in operable condition). Currently, the Port uses both Matson Navigation Company and Sea-Land chassis under and agreement with these two lines.

The Port has a range of other equipment for handling breakbulk, 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 operational.

By the time this report is completed, 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 rigid requirements for improved corrosion protection and maintainability.

2.6 Working Hours

Vessels are worked at the Port 24 hours a day, seven days per week. Under recently extended hours, the Port is nominally open for deliveries five days a week from 6 a.m. to 7 p.m. Within the Port's operating arm, the Terminal Divi-

sion (which is responsible for the storage and delivery of containers and other cargoes) and the Transportation Division (which is responsible for operating all of the equipment) work the same hours. Ideally, the daytime hours are covered with two eight hour shifts, with a five hour overlap during the busiest period (less one hour for lunch). Often, however, staff shortages result in one extended shift with overtime provisions. Night shifts depend on the hours needed to work a ship. A full shift consists of 11 hours (from 7 p.m. to 7 a.m.) less a one hour break, though less time is often required.

The third operating division, the Stevedore Division (which is responsible for working the vessel itself) normally works an 8 a.m. to 5 p.m. shift and a long shift at night, from 7 p.m. to 7 a.m. Those on the day shift may work extended hours and receive overtime pay if a vessel is being worked.

2.7 Infrastructures

2.7.1 Water Supply. Cabras Island, including the Commercial Port, is serviced by the Public Utility Agency of Guam (PUAG) as well as the U.S. Navy. The PUAG service line is supplied by the Asan springs, and has a capacity of 250 gallons per minute (approximately 350,000 gallons per day). In addition, PUAG and the U.S. Navy have an agreement whereby the Navy would supply a maximum of 300,000 gallons per day. The Navy's water supply is from Fena Reservoir and water treatment plant.

Cabras Island is served by a loop system connected to the Navy's 20-inch water line along Marine Drive and also to the 500,000 gallon reservoir of PUAG's Piti-Asan service area. The 16-inch, 12-inch, and 8-inch system can deliver far more water to the Commercial Port and other users on Cabras Island than is available from present sources and under existing agreements.

PUAG has also installed a new Agana/Asan/Piti 16-inch water line, but it has not been placed in service. The final phase of the project is to upgrade and improve the Piti Reservoir to a capacity of 2 million gallons. When this phase is completed, the new 16-inch water line should improve water pressures in the Cabras Island area.

2.7.2 Sewage Disposal. The Port of Guam is currently served by a 50,000 gallon per day package sewage treatment plant located near the main entrance to the port area. The plant is an extended oxidation unit with an 8-inch ocean outfall. The concrete encased outfall can be seen entering the water on the north side of Cabras Island. An earlier sludge-drying bed has been removed, so sludge is pumped out approximately every six months.

The Public Utility Agency of Guam (PUAG) has completed the design of a new pump station adjacent to the existing sewage treatment plant. A Notice to Proceed has been issued as this is being written (April 1996) for the construction of the new pump station and a force main line. When

completed, the sewage will be collected at the pump station, pumped along the pipe paralleling Route 11, to an existing gravity sewer system along Marine Drive. The gravity sewer eventually discharges its effluent into the Agana Sewage Treatment Plant near the Agana Boat Marina. The new pump station is designed for a capacity of 150 gallons per minute and is intended to carry the future sewer loads of the Port and of the proposed Cabras Island Industrial Park. Construction is expected to be completed by January 1997. The existing package treatment plant will be demolished upon completion of the pump station and force main.

2.7.3 Power Supply. All electrical power on Guam is pooled from the generators at Piti, Cabras, and Tanguisson. In October 1972, the Navy and the Guam Power Authority (GPA) agreed to a pooling agreement which provides for the joint use of power generation, transmission, and distribution facilities. The agreement calls for the GPA and the Navy to share equitably in the responsibilities and costs of operating the island-wide power system.

The Commercial Port lies adjacent to GPA's Cabras 1, 2, and 3 baseload generators. The Navy's Piti Power Plant is located at the junction of Marine Drive and Route 11, the main access to the Commercial Port. Power to the port is supplied via overhead power lines and transmission systems.

2.7.4 Roads.

2.7.4.1 Route 11. Route 11 provides access to the Commercial Port area as it branches off the island's main arterial, Route 1 (Marine Drive). Originally, Route 11's alignment followed the southside of Cabras Island (past the old Seaman's Club) towards the Administration Building. In 1990, however, Route 11 was realigned along the northern side of Cabras Island. The realignment project provided 12-foot travel lanes with 10-foot wide shoulders along the 100-foot wide right-of-way corridor, and turning pockets at the entrance to the Administration building parking lot and to the Container Yard sentry station. There were no improvements to Route 11 beyond the Administration Building. Beyond the Administration building, the road is paved, but not fully marked, up to Hotel Wharf. At Hotel Wharf, access to Pier D(og) and Family Beach is via a pot-holed coral road.

In 1992, the Department of Public Works completed its *Guam 2010 Highway Master Plan*, which provided recommendations for programming and implementing highway projects designed to address Guam's highway needs through 2010. Traffic flow is quantified in terms of the ratio of hourly traffic volume to hourly capacity (V/C) on a highway link. V/C ratios of 1.0 or less indicate reasonably smooth flow. Ratios between 1.01 and 1.15 indicate moderate congestion and V/C ratios greater than 1.16 is an indicator of severe congestion. The analysis of deficient links in 1995 show that Route 11 is not projected to become

congested. Accordingly, no short-term or long-term highway improvements have been, nor are they now recommended. If, however, properties are developed along Cabras Island past the Administration Building (unlikely in the near term due to ESQD restrictions), Route 11 should be extended to carry major industrial traffic movements. Such improvements would extend the road with the same design parameters as the existing improved Route 11, that is, with 12-foot wide traffic lanes (one in each direction) and 10-foot wide shoulders on each side.

2.7.4.2 Route 18. Route 18, also known as Causeway Road or Drydock Island Road, services the Harbor of Refuge, Aqua World, Marianas Yacht Club, and Dry Dock Island, along with the Navy's fuel point at Delta Pier. It is a straight, 2–lane paved road with grass-lined shoulders. Originally constructed by the Navy as an access road to the former SRF drydock island and the Navy fuel wharves, Delta and Echo, Route 18 is an old, pot-hole ridden road. A Navy-owned POL (Petroleum-Oil-Lubricant) easement runs parallel to the road, approximately 20 feet off the westbound lane's shoulder. There are protected wetlands along the eastbound side of the road.

The *Guam 2010 Highway Master Plan* did not provide any recommendations for improvements to Route 18 as it was considered military property at the time of the study. Since Drydock Island is pending return to GovGuam as excess military property, it is incumbent upon GovGuam to improve the road to facilitate port-related developments. As Drydock Island is recommended for development as a major, new tourist attraction, and public recreational area, Route 18 should be improved to the same standards as Route 11 on Cabras Island. That is, the highway should be widened to two full 12-foot travel lanes with 10-foot wide shoulders. Care must be taken, however, to prevent encroachment and potential damage to the existing POL lines that run parallel to the existing road.

2.8 Navigational Aids

Apra Harbor was charted by the National Ocean Service (NOS), Charting and Geodetic Survey (Department of Commerce), the agency charged with surveying and charting of the coasts and harbors of the United States and its territories. The most recent chart of Apra Harbor, Chart Number 81054 is dated April 1993. Among the information included in the chart are the following:

- Currents at the Apra Harbor entrance are:
  - Maximum flood current of 1.5 knots, setting North to Northeast
  - Maximum ebb current of 3 knots setting Southwest
  - Slack water occur 30 minutes before low water and 45 minutes before high water

- The prevalent set of currents at the harbor entrance is generally to the South or Southwest regardless of the tide, but a set to the North or Northeast may be experienced, especially during the summer months

- Heavy westerly swells sometime make the entrance of Outer Apra Harbor dangerous for several days in a row. This condition occurs when a typhoon builds up in the area, progresses Northwest, and then curves to Northeast. Beacons and buoys are sometimes destroyed or carried away at such times.

- Tides & currents. The mean tidal range at Apra Harbor is 0.3m (1 ft), while the spring range is 0.7m (2 ft)

- Navigational markers are present at the entrance to Outer Apra Harbor, near Spanish Rocks, and at the entrance to Inner Apra Harbor, near Polaris Point.

- A Regulated Area exists from an unmarked approach point (Alpha Hotel) at the entrance to Outer Apra Harbor. The regulations for this area are published by the Defense Mapping Agency Hydrographic/Topographic Center (DMAHTC) in DMAHTC Publication 126, or are made available through weekly Notice to Mariners. These information are available from the Commander, 14th Coast Guard District, Honolulu, Hawaii.

- Submerged Submarine Operating Areas are present at the entrance to Outer Apra Harbor and other designated areas. Extreme caution is advised as submarines may be submerged in these areas. Vessels should navigate in these waters using considerable caution.

In addition to the NOS Chart, a Notice to Mariners is published weekly by the National Imagery and Mapping Agency (NIMA) in a joint arrangement with the National Ocean Service and the U.S. Coast Guard, to advise mariners of important matters affecting navigational safety, including hydrographic discoveries, changes in channels, navigational aids, etc. In addition to keeping mariners informed generally, the information published in the Notice to Mariners is particularly designed to simplify the correction aboard oceangoing ships of charts, sailing directions, light lists, and other publication products by NIMA, NOS, and the U.S. Coast Guard.

Finally, the U.S. Coast Guard station on Guam is charged with overseeing all navigational waters within Micronesia. A local Notice to Mariners is broadcast over the radio for any immediate and/or temporary deficiency within any of these waters. Once the deficiencies are announced, the Coast Guard attempts to correct the situation (for example, no light on a buoy) as quickly as possible. About every four years, the USCG conducts an analysis of all the navigational aids within a specific area as part of its Waterway Analysis Program. The analysis is based on buoy light

tests, interviews with local mariners, and other information. The most recent analysis performed for Apra Harbor was completed in 1995 when it was determined that the harbor's navigational aids are satisfactory for all mariners. No deficiencies were noted.

2.9 Hazardous Waste Facilities

The Guam Regional Hazardous Waste Transfer Station was constructed to accommodate short-term storage of packaged, labeled, and containerized hazardous wastes generated on Guam and other Pacific Islands prior to shipment to EPA-approved disposal sites in the Continental U.S. Located east of the Port Authority's container yard and west of the proposed Cabras Island Industrial Park on 0.23 acres of land, the major components of the facility include:

- One, single-story, 600 square foot, noncombustible building with reinforced concrete floor, cement masonry unit walls and concrete roof
- Reinforced concrete unloading area
- Reinforced concrete holding tanks
- Reinforced concrete septic tank and leaching field

In November 1990, the PAG entered into a Management Agreement with *Unitek Environmental Services* to have them operate the Guam Regional Hazardous Waste Transfer Station. The following year, the Port applied for a permit from the Guam Environmental Protection Agency (GEPA) to operate the facility under the provisions of the Resource Conservation and Recovery Act (RCRA).

GEPA reviewed the application, and in October 1991 provided a Notice of Deficiencies (NOD) to PAG that cited a number of deficiencies, chief among them being the lack of conclusive information to show that the facility is outside the boundaries of the 100-year flood plain. GEPA noted that PAG failed to show the facility on the Flood Insurance Rate Map (FIRM) as evidence of not being in the flood plain.

In a January 1993 follow-up action, GEPA notified PAG that since the Authority had failed to correct the deficiencies sited in their October 1991 memorandum, the RCRA permit application was denied. Subsequently, in June 1993, Unitek, as the facility "operator," submitted a revised application. That application was also denied—for essentially the same reasons as the previous application from the Port Authority. GEPA understood that a floodplain study was being performed to verify changes to the 100-year flood plain, but when no new information had been received by January 1995, it again notified PAG that the RCRA permit was denied.

Having failed to secure the necessary permit, the facility is not being used for its originally intended purpose.

2.10 Earthquake Damages

The Port of Guam suffered severe damage from a Richter magnitude 8.1 earthquake on August 8, 1993. The earthquake was centered in the Marianas trench approximately 50 kilometers south of Guam. The Port sustained serious damage to the container terminal, berths F-4, F-5, and F-6, and minor damage to berth F-3. The earthquake induced soil liquefaction, settlement, and lateral spreading.

On August 12, 1993, PAG retained Liftech Consultants, Inc., to provide engineering services to assess damages to the wharf and backlands, provide temporary solutions to operate the facility with restrictions, and provide reconstruction recommendations and designs for damaged areas. The following discussion is taken from Liftech's engineering report.

2.10.1 Wharf Structure at Berths F-3, F-4, F-5, and F-6, and Crane Runway Girders at Berths F-4, F-5, and F-6.

- Landside and waterside rails and the waterside bulkhead had a visible horizontal offset. A visual inspection of the waterside face of the bulkhead indicated vertical hairline cracks throughout its length, with larger cracks at the intersection of Berths F-3 and F-4.

  Trenches at the newly constructed tie-down beams indicate at least two of the cross beams have been badly damaged at their connection to the waterside rail girder.

- Sheet piles were intact. The seams between sheets had not opened. Some minor corrosion at the base of the wall was observed.

- No settlement was observed under proof load.

- The survey taken shortly after the earthquake in August indicates that the entire 1,950 foot length of bulkhead and crane runway at berths F-4, F-5, and F-6 rotated clockwise about 1:5000 about station 7+50. Both structures have also translated as much as 24 inches towards the water.

  The original 50 foot rail gage has increased by 1 inch at station 20+00 and shortened by 1-¾ inch between stations 21+00 and 22+00.

2.10.2 Backlands, including Utility Trenches, Water lines and Storm Drains.

- The backlands are damaged for a distance of approximately 250 feet behind the face of the wharf. Three prominent rows of cracks run parallel to the wharf at 69 feet, 92 feet, and 250 feet from the

wharf face. Cracks closest to the wharf have opened up as much as 9 inches. At several container tie-downs, sand appears to have boiled up to the surface due to liquefaction.

- No settlement was observed under proof load. A 10 inch main was damaged near the warehouse shed. This was repaired.

2.10.3 Berth F-4, F-5, and F-6. No abnormal sea bed movements were observed between the pre-earthquake and post-earthquake channel sound readings.

2.10.4 Paceco Cranes 338 and 852 and Hitachi Crane (Container Gantry Cranes).

- Minor cracks were found. The cracks probably were pre-existing to the earthquake. All cracks were repaired prior to certification.

- The cranes were load tested to 125% of rated load. All mechanical functions, including main load hoisting, boom hoisting, gantry and trolley travel and brakes, were tested. All mechanisms functioned properly and were certified.

2.10.5 Crane Stowage Tie-Downs.

- The crane stowage concrete and steel anchors embedded in the wharf are badly damaged. The cranes were secured by this hardware when the earthquake struck.

- The Hitachi crane can be stowed in its present location.

- Since the permanent stowage brackets and tie-downs for the two Paceco cranes are located in the damaged portion of the wharf, the cranes cannot be stowed in their present positions. Temporary tie-downs were constructed at berth F-4 for both cranes. The tie-downs were designed for a 120 mph wind, 70% of the design typhoon wind speed for Guam.

2.10.6 Current Operation and Limits. Based on results of the investigation, operational clearance was issued for berth F-3 on August 14, 1993, and for berths F-4 and the undamaged portions of berths F-5 and F-6 on August 20, 1993, with the following limitations:

2.10.6.1 Berth F-3. Mobile cranes could be used, provided outriggers were located at least 15 feet from the face of the bulkhead during the loading operations. Loaded containers and other heavy bulk cargo should not be stored

in the area between the wharf face and the warehouse canopy.

2.10.6.2 Berths F-4, F-5, and F-6. All traffic and shipping activity was prohibited between stations 15+50 and 23+50. The area was fenced off for a distance of 105 feet from the face of the wharf. Container cranes could be operated beyond stations 15+50 and 23+50. Mobile cranes could be used beyond stations 15+50 and 23+50, provided outriggers were located at least 15 feet from the face of the bulkhead during the loading operation. Loaded containers and other heavy bulk cargo could not be stored between the crane rails at the wharf beyond stations 15+50 and 23+50. Only empty containers could be stored immediately behind the fenced area. A clear 6 foot lane had to be maintained between the fence and the nearest empty container.

2.10.7 Repairs. A construction contract for "Earthquake Repairs—Berths F-3 through F-6" was given a Notice to Proceed on October 23, 1996. Black Construction is the prime contractor and the construction duration is 18 months. The project calls for repairs of Wharves F-3 through F-6 of all damages caused by the earthquake. However, since Wharf F-5 is beyond economical repair, it will be completely replaced with a new wharf on concrete pilings. Approximately 540 linear feet of new pier will be constructed in replacing Wharf F-5. The total estimated construction cost is $12,100,000.

Section 3

Existing Land Use

GMP
ASSOCIATES, INC.
Engineers/Architects

Section 3

Existing Land Use

3.1 Background

Land-Use Plans establish and depict the manner in which major areas of land are used. Such plans explain the functional interrelationships of various land units to each other and to the larger community or region. The plans attempt to answer why land is used in a particular way and seeks to balance competing land uses in an effort to optimize land utilization. Land use planning is largely subjective and judgmental and often cannot be evaluated in objective terms—it has been described as an exercise in the art of rational line drawing. It's outcome can be highly contentious, as it can and often determines, what activities or functions are permissible, what are prohibited, and under what special conditions certain activities can be permitted. Figure 3.1 shows the existing land-use patterns for Cabras Island and its immediate vicinity.

As discussed earlier in Section 2.2, prior to 1969, all land around Apra Harbor was owned and controlled by the U.S. 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 up to 50 years. Most of the income from these leases goes to the Guam Economic Development Administration, though the Port shares in the rent. Among the lessees are the three 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 accommodated Phase I of the container yard expansion and is planned to further expand the yard to 50 acres. Most of the remaining area has been leased out and will be used for the proposed Cabras Island Industrial Park.

In recent years, the Navy has also transferred land lying south of the Glass Breakwater and a 208-acre parcel that includes the Piti Channel and Sasa Bay, areas lying west of Marine Drive and south of the Navy and Cabras Island Power Plants, and much of the Dry Dock Point spit, to the Government of Guam for use by the Port Authority of Guam. However, much of this 208-acre parcel contains environmentally sensitive areas and shallow inlets that cannot be developed.

Restrictions have, however, been placed on the future disposition of these lands primarily on the terms of future

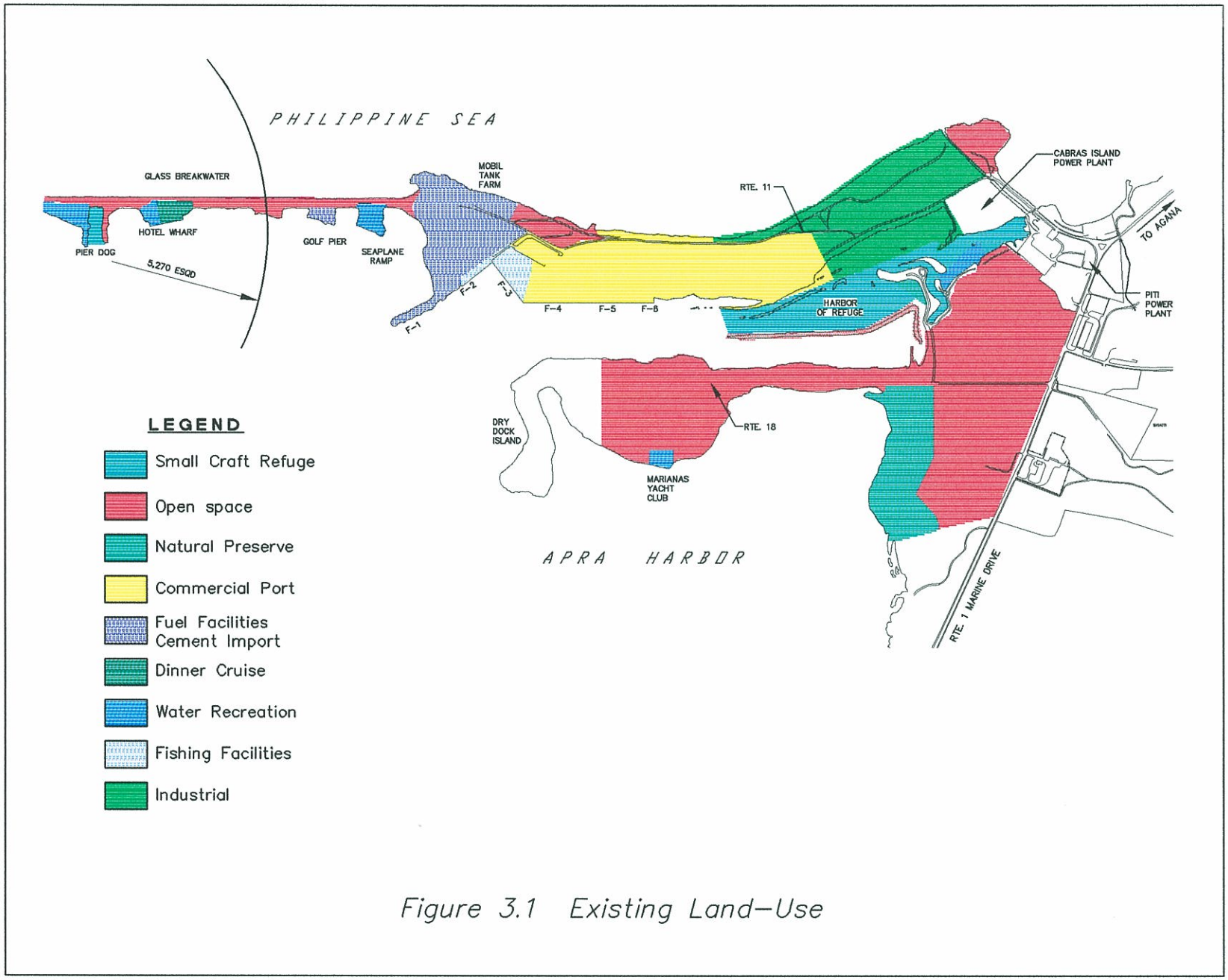


Figure 3.1 Existing Land–Use

Table 3.1
Properties Leased for Multiple Years

Lessee	Location	Area	Start Date	Lease Duration	Lease Purpose
Cabras Island Developers	Lot 1 & 2 of Parcel 1, Land Management Dwg E4-82T158	42.2 acres	Dec 8, 1993	50 Years	Development
Marianas Yacht Club	Part P1, Apra Harbor (Adjacent to Drydock Island)	4,000 sm	Dec 12, 1994	30 Years	Recreation/Club
Mobil Oil, Guam	Golf Pier		Apr 1, 1990	30 Years	Storage
Umidori Cruises	Harbor of Refuge for Vessels		Jan 20, 1994	5 Years	Refuge
Unitek Environmental Services	Hazardous Waste Facilities	600 sf	Nov 2, 1990	10 Years	Haz Waste
Ocean Terminal/Diamond Ko	Warehouse #1	10,044 sf	Feb 1, 1988	10 Years	Duty Free

lease or sale and, in some cases, the Navy reserves the right to use specific facilities with three days advance notice.

3.2 Leased Properties

The Port Authority of Guam leases portions of several buildings and open spaces within the Commercial Port area to a variety of tenants—primarily shipping line agents—under operating lease agreements. Administrative space is leased at a monthly rate of $1.37/square foot, while warehouse space is leased at $.53/square foot (inside) and $.37/square foot (outside). Terms of the lease agreement are generally monthly. In addition, there are several leases that have been negotiated on a longer term basis. These are listed in Table 3.1. The Port Authority has also leased various open space areas on Cabras Island to non-commercial port users. These include water recreation activities, passenger ship docking, dinner cruises, and net repair/storage. The monthly rate for these open space lease agreements is $.37 per square foot.

The Guam Economic Development Authority (GEDA) is the lessor for the fuel facilities located on Cabras Island.

Table 3.2
Properties Leased Under GEDA Agreements

Lessee	Location	Area Size	Commence Date	Expiration Date	Options	Lease Purpose
Casamar Guam	Cabras Industrial Park, Lot 5	5.2 acres	Apr 1, 1970	Mar 31, 1990	7, 10- year terms	Net Repair
Esso Eastern, Lot #2	Cabras Industrial Park, Lot 2	5 acres	Oct 1, 1969	Oct 1, 1989	7, 10-year terms	Oil Storage
Esso Eastern, Lot #3A	Cabras Industrial Park, Lot 3A	3.214 acres	Jan 18, 1971	Jan 18, 1991	7, 10-year terms	Oil Storage
Esso Eastern Pump/Pipeline	Cabras Industrial Park		Jul 11, 1986	Sep 30, 1989	7, 10-year terms	Oil
Gorco/Shell Dogleg Pipeline	Cabras Industrial Park					Oil
Gorco/Shell GEDA Pipeline	Cabras Industrial Park, Lot 7	78,647 sf	Jun 13, 1969	Jun 12, 1979	3, 10-year terms	Oil
Gorco/Shell Main Lease	Cabras Industrial Park					Oil
Gorco/Shell Main Pipeline	Cabras Industrial Park					Oil
Gorco/Shell Outfall Pipeline	Cabras Industrial Park					Oil
Guam United Warehouse Corp	Cabras Industrial Park, Lot 4	3.8 acres	Oct 31, 1972	Oct 31, 1992	7,10-year terms	Trucking
Kaiser Cement Lot 5 (Partial)	Cabras Industrial Park, Lot 5 (Partial)		Jan 14, 1971	Mar 14, 1991	7, 10-year terms	Cement
Kaiser Cement Lot 6	Cabras Industrial Park, Lot 6	1.65 acres	Jan 14, 1971	Mar 14, 1991	7, 10-year terms	Cement
Mobil Oil Guam Lot #1	Cabras Industrial Park, Lot 1	5.7 acres	Mar 20, 1970	Mar 19, 1990	7, 10-year terms	Oil
Mobil Oil Guam Lot #3B	Cabras Industrial Park, Lot 3B	1.9 acres	Mar 4, 1971	Mar 4, 1991	7, 10-year terms	Oil

Note: Of expired agreements, all tenants/licensees have fully exercised all options to extend as stipulated in the agreements.

These facilities include the tank farm areas for Shell Guam, and Mobil (In the past year, Mobil Oil bought out the operations of BHP Petroleum and Shell Oil is presently in the final stages of acquiring all of the Exxon interests), and their associated fuel pipelines. As described earlier, most of the income from these leases goes to the Guam Economic Development Agency (GEDA), although the Port Authority shares in the rent. in addition to the petroleum companies, GEDA leases property to the Kaiser Cement, Casamar (net

repair), and the Guam United Warehouse Corporation (trucking). Table 3.2 lists these GEDA agreements.

3.3 Cabras Island Industrial Park

In 1992, the Guam Legislature passed Bill No. 475, which the Governor signed as Public Law No. 21-124. The Act authorized the Port Authority of Guam to lease to the *Cabras Island Developers* an area adjacent to port to be developed as the Cabras Island Industrial park. The park area is described as "those two tracts of land designated as Lot No. '1' and Lot No. '2,' within Parcel 1 as shown on Land Management Drawing No. E4-82T158." Figure 3.3 shows the general location of the industrial park.

Figure 3.2 Oil/Fuel Storage, Cement Silo, and Net Repair Facilities

In 1992, the Port Authority of Guam contracted for the preparation of the Cabras Island Industrial Park Master Plan. The plan identifies goals for the industrial park as three-fold:

- Provide land and facilities for those critical activities necessary for essential Commercial Port functions;
- To alleviate traffic congestion between the Commercial Port and Tamuning by providing warehouse and storage facilities in close proximity to the Commercial Port; and
- Create additional opportunities for compatible development of commercial activities where the essential functions of the Commercial Port are not impaired.

The General Land-Use Plan for the Cabras Island Industrial Park sets out three classifications of land use (see Figure 3.4). These land uses are:

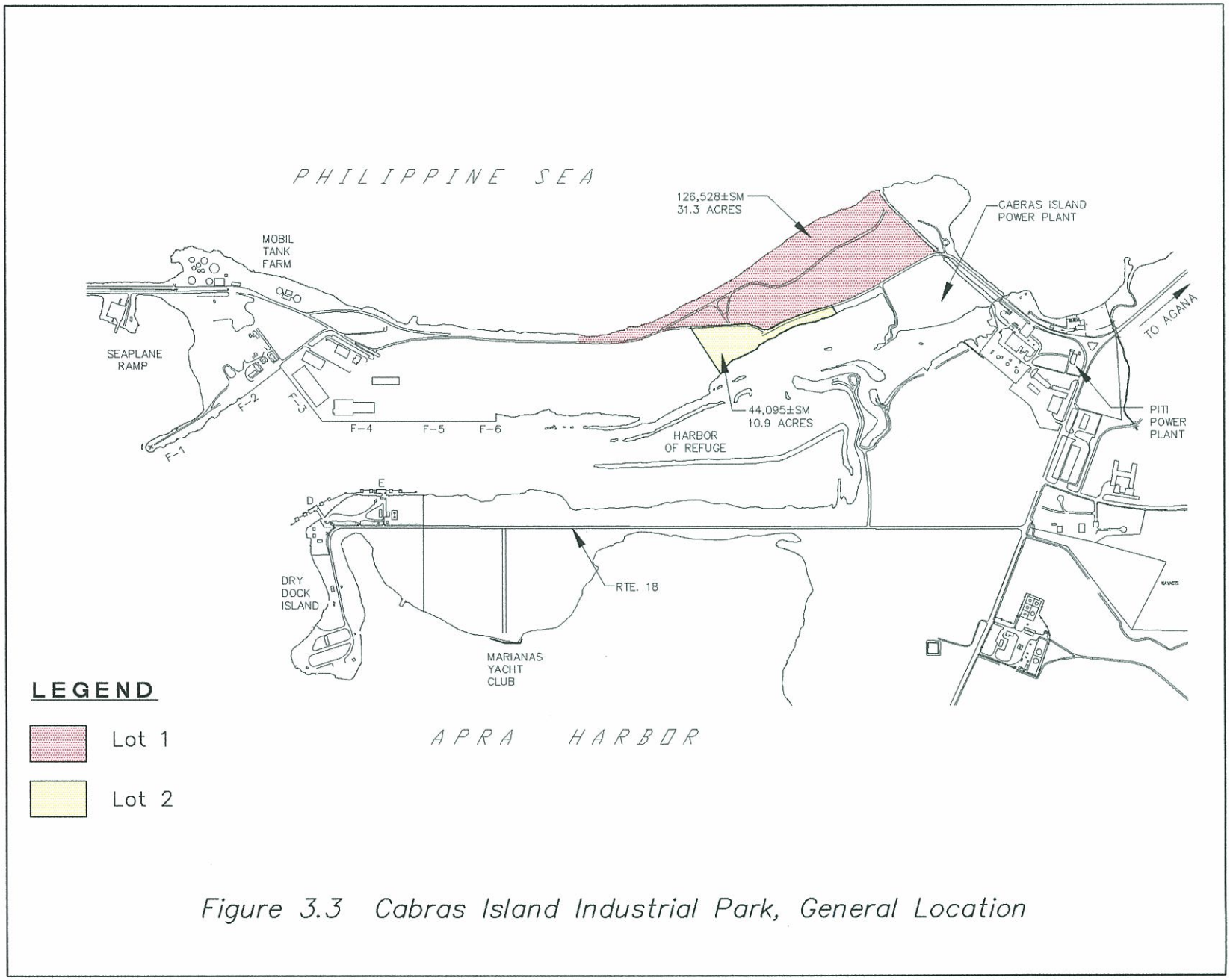


Figure 3.3 Cabras Island Industrial Park, General Location

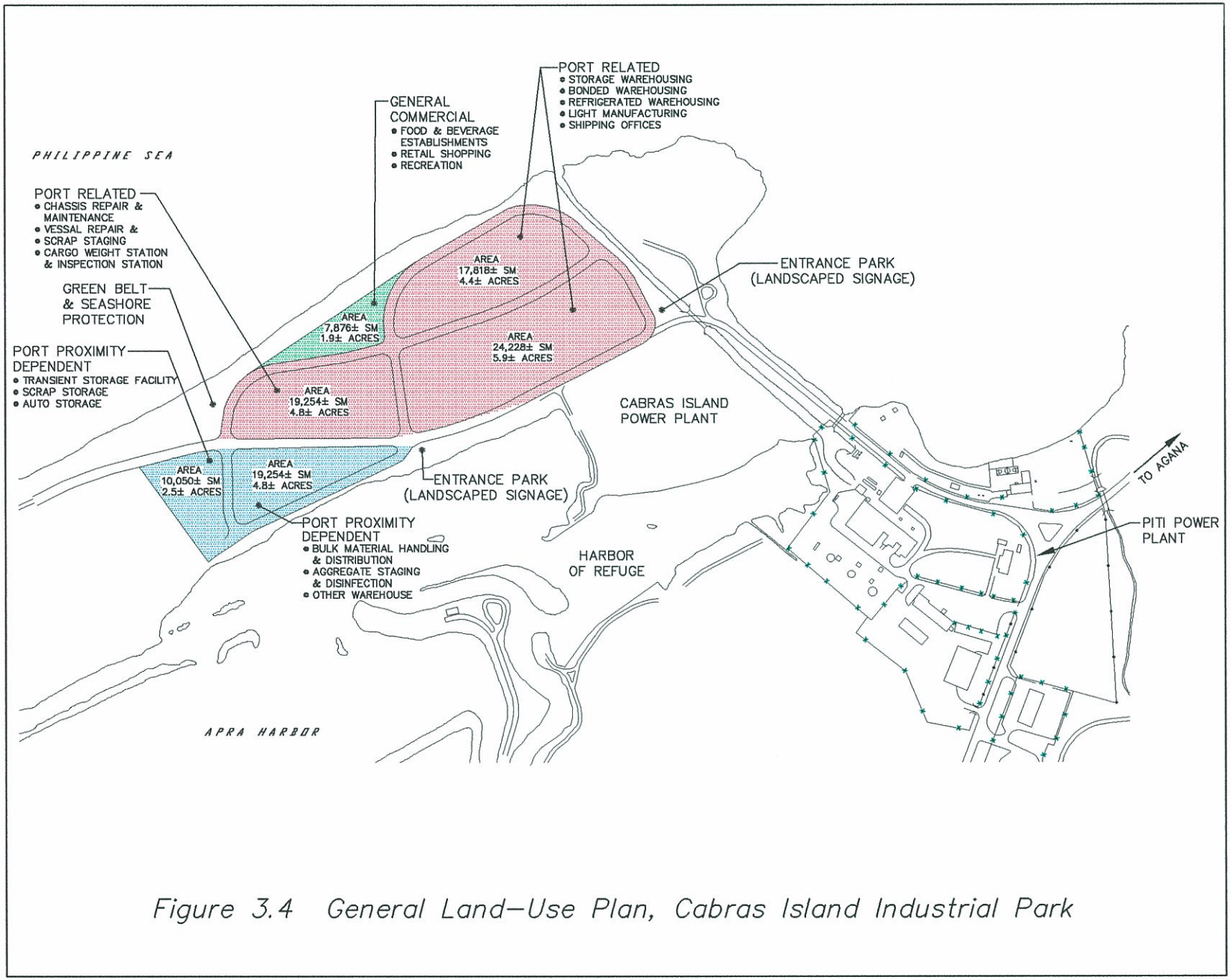


Figure 3.4 General Land–Use Plan, Cabras Island Industrial Park

- Port Proximity Dependent. A service or product that is transportation bound, and must for economic or public safety reasons be in close proximity to the port. Examples activities include repair maintenance services to chassis, vessel repair facilities or staging areas; mandatory new vehicle holding areas; safety inspection station for containers, chassis and other uses; scrap staging areas; aggregate staging and disinfection; hazardous waste handling; and so forth.

- Port Related. Any activity that provides a product or service that supports the critical activities of the port. This would include activities such as warehousing, light manufacturing, storage, and so forth.

- General Commercial Uses. This would include commercial activities. However, priority would be given to enterprises which provide a service to the businesses, workers, or customers/passengers, who are located within the greater port area.

The plan calls for the portion of Lot 2 closest to the Commercial Port to be developed as port proximity dependent. Areas farther from the Commercial Port are designated as a combination of port proximity dependent and port related. General commercial uses are designated in areas where lot size and orientation do not allow for sufficient space for port proximity or port related services. General commercial uses are also permitted in Lot "B", Parcel 1, as this is a remote location from the Commercial Port and is not suitable for port proximity dependent uses. Water dependent uses (i.e., functions that require a location with direct access to seacraft; access to water as a resource in manufacturing or processing; or passenger or cargo loading, etc.) are to be possibly located along the shoreline of Lot 2. Before such activities can be designated, however, a series of feasibility and environmental studies need to be completed.

The master plan calls for five development phases, with a total implementation schedule of 10 years. Under the terms of PL 21-124, the "Lessee must construct infrastructure at the Park, subject to the terms of the Lease, including site preparation, filling, grading, a sewer system, a storm drainage system, a water distribution system, a power distribution system, roads, curbs and gutters, street lighting, landscaping and associated facilities." Other requirements on the Lessee (Cabras Island Developers) include requirements to, "...prepare and submit to the Authority [Port Authority] for its approval a proposed master plan for the development of the Park, including a construction and development schedule....within twenty-four (24) months after commencing construction of the infrastructure commence construction of the first five hundred thousand (500,000) square feet of buildings to accommodate existing Port requirements." To date, the plan has not been implemented. According to the Port Authority's Officer in Charge of Property Planning and Development, the commencement date for this lease agreement has been pushed to June or July, 1996.

3.4 Cabras Island Power Plant

The Guam Power Authority (GPA) has jurisdiction over the Cabras Island Power Plant area. The power plant currently has three base-load generators online, and has plans to construct a fourth base-load generator in the near future. The fuel tanks between the power plant and the Harbor of Refuge are also under the jurisdiction of the GPA. The Navy's Piti Power Plant, which lies between the Cabras Island Power Plant and Route 1, has recently been turned over to the Guam Power Authority as part of a Navy/ Government of Guam Customer Service Agreement. The Navy's power plant was identified as an excess federal land under the Guam Land Use Plan (GLUP) 1994 initiative.

3.5 Military Lands

In 1974, subsequent to the initial transfer of 62 acres of port berthing area to GovGuam in April 1969, the Secretary of Defense required the Navy to determine excess lands and to initiate the process to transfer these lands to GovGuam. The 1969 transfer had enabled Guam's Port Authority development, but did not include submerged lands.

In response to the Secretary of Defense directive, the Navy completed the Guam Land Use Plan 1977 study which resulted in most of the Cabras Island port area being determined as excess to DoD needs. These excess areas also included portions of Drydock Island and the coastline at Piti.

Congress followed the Navy study by authorizing (Section 818(a)(1) of Public Law 96-418, the Brooks Amendment) the Secretary of the Navy to "convey, without monetary consideration, to the Government of Guam all right, title, and interest of the United States ... approximately 927 acres of land located on Cabras Island and within the northern portion of the Apra harbor Naval Complex, Guam ...." The section stipulated that the turnover "shall be made at such times, and shall be subject to such terms and conditions, as the Secretary considers to be in the interest of national defense."

At the time the transfer was authorized, the Navy still required use of Hotel Wharf for its ammunition operations. The mission required a 7,210-foot ESQD (Explosive Safety Quantity Distance) setback, encumbering a large portion of the otherwise transferable excess lands. Hence, the Navy developed a two phase plan to transfer excess parcels:

Phase I. Transfer parcels outside the Hotel Wharf ESQD arc. This transfer was completed in October, 1985

Phase II. Transfer remaining areas when the Hotel Wharf ESQD arc is removed.

a. The Secretary of the Navy, however, issued a temporary waiver to the Hotel Wharf ESQD arc allowing

Guam immediate access to parcels in Phase II. Based on the pending transfer of ammunition operations from Hotel to Kilo Wharf, the waiver allowed the Navy to transfer all but four parcels through a quitclaim deed in October 1989. The deeds, however, included restrictive terms and conditions based on the Hotel Wharf ESQD arc.

b. Following completion of Kilo Wharf and cessation of ammunition handling activities at Hotel Wharf, in June 1993 the Navy forwarded quitclaim deeds for the remaining 92 acres of excess lands, and a cancellation of the restrictive terms in the quitclaim deeds of 1989. These deeds, however, were not accepted by GovGuam. In February 1996, the Navy followed-up the previous action. At the time this is being written, the matter remains under review by GovGuam.

Thus, although Parcel 1 (subsurface/underwater portions immediately fronting Wharves F-1 through F-6) and Parcel 1 (REM) (coastline area immediately north of the commercial port's administrative area), have been used by GovGuam since 1969, these two parcels have never been officially transferred. They represent two of the quitclaim deeds presently being reviewed by GovGuam. The other two quitclaim deeds are Parcels 2 and 3 on Drydock Island that total about 31.5 acres.

On Drydock Island, the Navy currently uses fuel wharves "D" and "E" in the northern portion, while the Ship Repair Facility maintains a recreational beach area and the Support Craft Maintenance in the southern portion. The latter facility, however, was not in active use. Hence, in November 1993, the Navy issued a 2-year license to the Port Authority for about 2 acres at the southern tip of Drydock Island (sometimes referred to as Drydock Point). The license permitted the PAG to use the area for the berthing of commercial tug boats and for performing minor repairs.

One reason for Guam's reluctance to accept the terms of the quitclaim deed centered on the specific language of the Brooks Amendment, where "conveyance of the property ... shall be subject to the condition that any disposal by sale or lease of any part or all of the property by the Government of Guam shall only be for a monetary consideration equal to or in excess of the fair market value ... and any such monetary consideration received by the Government of Guam ... shall be paid to the United States." Among GovGuam's concerns was that if any part of the lots were ever returned to the original landowners or their heirs, or to the Chamorro Land Trust Commission, the requirement would prove problematic. Additionally, arguments were presented that the payment of sale/lease proceeds to the United States might be reasonable if Guam were to dispose of the parcels now, but if Guam were to sell the property years from now, then payment should be retained by Guam.

In 1995, Congress approved the recommendations of the President and the Defense Base Closure and Realignment Commission in the fourth round of military base closures. Among the approved closures was the Ship Repair Facility

(SRF) at Apra Harbor, Guam, which occupy lands at the end of Drydock Island. Until then, primary interest in the Brooks Amendment had been on its impact on the proposed Phase II transfers discussed earlier. The BRAC action brought "Phase III" to the forefront. Phase III consists of the remaining property at Drydock Island where the Navy fuel piers (Wharves Delta and Echo) and some of the SRF's facilities are located. Since the BRAC action had officially determined that the SRF lands on Drydock Island were excess to U.S. Navy needs, interest was renewed with regard to the quitclaim deeds that had been proposed.

While Guam and the Navy reopened dialogue on the quitclaim deeds, Congress simultaneously addressed Guam's concern with the specific language of the Brooks Amendment. The Amendment had designated the United States as the sole recipient of the sale fees or lease payments of any lands that may be transferred from GovGuam to others. In passing PL 104-201 authorizing appropriations for fiscal year 1997 military activities for the Department of Defense, Congress, in Section 2836, provided that "Section 818(b)(2) of the Military Construction Authorization Act, 1981 (Public Law 96-418; 94 Stat. 1782), relating to a condition on disposal by Guam of lands conveyed to Guam by the United States, shall have no force or effect and is repealed." Thus execution of the four remaining quitclaim deeds, as well as the return of the SRF portion of Drydock Island appears imminent.

Section 4

Forecasts and Demand-Capacity Analyses

ASSOCIATES, INC.
Engineers/Architects

Section 4

Forecasts and Demand-Capacity Analysis

4.1 Forecasting Assumptions

A dependable forecast of future demands and conditions is essential for ascertaining future requirements for port functions, facilities, and operations. The accuracy of such forecasts depends on the occurrence of assumed future events which cannot be assured in advance. The forecast, moreover, becomes more speculative for longer forecast periods. That is, while predictions three to five years into the future can be made with a reasonable level of confidence, it is far more difficult to achieve equal levels of confidence for forecasts that look further into the future. These difficulties are even more pronounced in determining the outlook of an economic entity that is dominated by a travel industry that is subject to dynamic fluctuations and generally unpredictable behavior as is the case with Guam.

To address these concerns, we considered it appropriate to develop a "base case" regarding the outcome of future events and circumstances that would influence demand on Apra Harbor. The scenario assumes the continuance or occurrence of fundamental political, economic, and social events. These factors are listed in Table 4.1. Notwithstanding the considered care with which these assumptions were determined, future events, particularly those long-term, could cause some of the underlying assumptions to become invalid. Accordingly, we also identified variances to the base case. These variations could cause either an increase in port activity (the optimized case) or a decrease (the constrained case) from the most likely base case.

The plan itself is based on the demands that result from the assumptions and factors listed under the base case, the most likely event. Where potentially significant, the plan considers the likely impacts of a variance from the basic assumptions.

The assumptions and data were compiled from information furnished by the Guam Department of Commerce, the Guam Visitor's Bureau, International Shipping Data, historical information from the Port Authority of Guam, published reports on the growth of Asia, and Guam's demographic data.

These assumptions reflect shipper optimism that market growth potential is sufficiently large to make speculative new routes profitable. If actual events do mirror the Base Case assumptions, then the forecast presented below should be a fair barometer of what the Port Authority of Guam can expect in the coming years. However, any one of the above

Table 4.1
Forecasting Assumptions and Alternative Case Scenarios

Constrained Case	Base Case	Optimum Case
1. Maintenance problems with regard to the three rail-mounted cranes will not be resolved and necessary facility and infrastructure improvements will not be accomplished at the Port.	1. Maintenance problems with regard to the three rail-mounted cranes will be resolved and necessary facility and infrastructure improvements will be accomplished at the Port.	1. Maintenance problems with the three rail-mounted cranes will be resolved and necessary facility and infrastructure improvements will be accomplished through privatization of selected port functions.
2. Hotel expansion and new construction as currently envisioned and tabulated by the Guam Visitors Bureau will not be completed by the year 2005.	2. Hotel expansion and new construction as currently envisioned and tabulated by the Guam Visitors Bureau will be completed by the year 2005.	2. Hotel expansion and new construction as currently envisioned and tabulated by the Guam Visitors Bureau will be completed by the year 2000.
3. U.S. Federal shipping subsidies will end at the end of 1997.	3. U.S. Federal shipping subsidies will continue throughout the forecast period.	3. U.S. Federal shipping subsidies will continue throughout the forecast period.
4. The Japanese market for sashimi declines, or Pacific fishing disputes and/or depletion problems arise.	4. The Japanese market for sashimi will continue to exist, and Pacific fishing disputes and/or depletion problems will not become a factor.	4. The Japanese demand for expensive grades of sashimi continues to rise and no fishing disputes occur.
5. Major world trading markets will not remain sufficiently dominant to retain existing sea lanes.	5. Major world trading markets will remain sufficiently dominant to retain existing sea lanes.	5. World trading markets will expand and create additional sea lanes.
6. There will be no growth in cruise and pleasure travel into and out of Guam.	6. Current growth in cruise and pleasure travel will continue.	6. The number of cruise vessels calling on Guam will increase significantly.

Constrained Case	Base Case	Optimum Case
7. The environmental and infrastructure carrying capacity of the Island of Guam will severely constrain future growth to a level very much lower than the rates experienced in recent years.	7. The environmental and infrastructure carrying capacity of the Island of Guam will constrain future growth to a level somewhat lower than the rates experienced in recent years.	7. Constraints in the environmental and infrastructure carrying capacity of the Island will be rapidly alleviated.
8. Continued cutbacks in U.S. military spending will result in a decrease in the actual number of military personnel and dependents on Guam.	8. The actual number of U.S. military personnel and dependents on Guam will remain stable during the forecast period.	8. The actual number of U.S. military personnel and dependents on Guam will increase (possibly due to troop pull-backs from Okinawa and Korea) during the forecast period.
9. Opportunities for transshipment through Guam to the U.S. Mainland, Micronesia, and Asia will not be realized.	9. Opportunities for transshipment through Guam to the U.S. Mainland, Micronesia, and Asia will be realized.	9. Opportunities for transshipment through Guam to the U.S. Mainland, Micronesia, and Asia will be realized early in the forecast period.
a. Surrounding Pacific Island nations develop ability to accept freight direct from major suppliers.	a. Surrounding Pacific Island nations achieve limited ability to create ports capable of handling large ocean-going vessels.	a. Surrounding Pacific Island nations remain unable to create ports capable of handling large ocean-going vessels.
b. Kaohsiung develops into Singapore-sized port to handle majority of feeder traffic coming from China coast (non-Hong Kong traffic), Inchon/Pusan/K obe facilities develop capacity to service growing flow of China coastal feeders.	b. Kaohsiung is not able to immediately and rapidly expand to become a Singapore-sized harbor.	b. Kaohsiung is not able to expand to become a Singapore-sized harbor.

Constrained Case	Base Case	Optimum Case
c. East coast China's production and exports to North America are adequately handled by Kaohsiung, Hong Kong, Pusan, and Kobe.	c. East coast China production and exports to North American develop beyond the capacities of Hong Kong, Pusan, and Kobe ports.	c. East coast China production and exports to North America become massive. The poor harbor prospects along that coast remain unalterable and the ports of Pusan, Inchon, and Kobe are unable to go beyond their already crowded conditions to transship from feeder to international vessels.
d. Guam is unable to offer special customs or value-added advantage to Asian shippers.	d. U.S. shippers continue to find value in extending line through Guam onto ports in Asia.	d. Guam is able to develop a value-added industrial activity that attracts transshipment. This development assumes a weak implementation of GATT, long-term & substantial duties on imports from China, Guam's ability to acquire inexpensive labor, and reliable energy production.
e. The retention of the Jones Act prevents the development of shipping alliances necessary for transshipment of goods.	e. Retention of the Jones Act results in inconsequential impacts.	e. Continuation of the Jones Act facilitates alliances of U.S. large vessels and Asian feeder carriers to meet in Guam.
10. The growth of domestic economies in Asian markets (Taiwan and Korea) will slow in the coming years.	10. The domestic economies of growing Asian markets (particularly Taiwan and Korea) will remain steady, growing into the early 2000s.	10. The domestic economies of growing Asian markets (particularly Taiwan and Korea) will continue to grow on a steady pace throughout the forecast period without major recession.

Constrained Case	Base Case	Optimum Case
11. Tourism growth will slow markedly either because of unfavorable economic developments in client countries or because of delays in the development of Guam's infrastructure.	11. Guam will remain a desirable destination for foreign tourists and will retain its current percentage share of total Pacific and Mariana Island visitors.	11. Guam will become a more desirable destination for foreign tourists and will expand its current percentage share of total Pacific and Mariana Island visitors.
12. Airline deregulation does not occur sufficiently to allow increased flights from Taiwan and Korea to Guam.	12. Airline deregulation allows airline competition in both Taiwan and Korea, encouraging the scheduling of new flights from these areas to Pacific destinations such as Guam.	12. Airline deregulation allows airline competition in all Asian markets, encouraging the scheduling of new flights from these areas to Pacific destinations such as Guam.
13. New air and sea services to Guam are stymied because of the lack of new hotel room accommodations.	13. Major new air and sea services will occur with the construction of new hotel rooms.	13. Major new air and sea services will be provided in anticipation of new hotel room construction and expansion of ancillary commercial services.

outcomes could vary quite drastically, altering expected demands upon the Commercial Port.

The economic climate in Japan could change and affect overseas travel and the demand for fresh tuna, federal subsidies could be eliminated, the U.S. Defense Department may call for a major realignment of its Pacific forces, including those personnel stationed in Guam, or another earthquake could cause further damages to the Port. Fewer visitors would mean less hotel construction, fewer employment opportunities, and a decline in retailing. Military reductions would cause layoffs, a reduction in capital improvements, and the loss of income spent by military personnel and their dependents.

Thus, altering any of the above assumptions will obviously have a significant impact upon the expected levels of traffic through the Port. A discussion of these assumptions, and how they will affect the various categories of port traffic in the future is discussed in Section 4.2. A forecast summary of cargo activity is presented following the discussion of these assumptions.

Before discussing the demand forecasts, however, two of the assumptions of Table 4.1 call for additional discussions. These are presented in the following paragraphs.

4.1.1 The Jones Act. Under U.S. law, trade between the U.S. mainland and the Territory of Guam is classified as domestic, not foreign commerce. The cabotage laws, as spelled out in the Merchant Marine Act of 1920 (commonly referred to as the Jones Act) restricts the carriage of domestic coastal and inter-coastal trade, including trade with Hawaii, Alaska, and with territories and possessions, to U.S. flag vessels. The vessels must be built in the United States, documented under United States law, and owned by United States citizens. The law effectively prevents foreign shippers from moving goods between the U.S. and Guam, even as an intermediate stop between the U.S. mainland and, say, Asia. Foreign carriers, however, may provide shipping services between foreign ports and Guam. Some U.S. jurisdictions, including the Commonwealth of the Northern Marianas (Saipan), the U.S. Virgin Islands, and the Territory of American Samoa, are exempted from the Jones Act. As a result, GovGuam is actively seeking either a similar exemption, improved rate controls, or an outright repeal of the Act's provisions.

The text of Governor T.C. Gutierrez's testimony to Congress on June 12, 1996, outlining GovGuam's concerns and positions, is reproduced at Appendix A.

4.1.2 Development of the Harbor at Kaohsiung. Section 1 alluded to the dramatic market evolution that is about to occur as a consequence of the surging Chinese economy. Its immediate impacts include the recognition that the east China coast lacks the large harbor facilities to support the growth in exports. Moreover, because the east China coast has no locations where natural physical features can be readily exploited to construct a major deep-draft harbor, China will almost certainly use smaller ships to export goods to a major transshipment center(s) for the longer voyages across the Pacific on large-capacity freighters.

Existing transshipment ports include Pusan, Kobe, Yokohama, Hong Kong, and Singapore. All are at or near capacity, although each has varying plans for expansion. Guam's Apra Harbor could serve as a new transshipment center for China. In that event, its greatest competitor will be Kaohsiung in Taiwan. Kaohsiung envisions to become the next Singapore, matching Singapore's 12 million TEU capacity. It is a great natural harbor like Apra, is closer to the source of trade, lies on the great Pacific circle route, and almost certainly will enjoy more favorable labor rates. Needless to say, Guam has a significant challenge in its quest.

The great uncertainty with Kaohsiung, however, is the outcome of the ideological differences and political relationships between Taiwan and China. Pending a stable political climate, private and public efforts to expand Kaohsiung

Harbor is likely to remain modest, to Guam's great advantage. Moreover, political uncertainties will deter the creation of shipping alliances necessary for an efficient transshipment operation. Hence, to the extent that the relationship between Taiwan and China remains unstable or uncertain, it will enhance Guam's development as a potential transshipment center for the east China trade.

4.2 Short-Term Demand Forecast

4.2.1 Imports and Exports.

4.2.1.1 Imports. As discussed in earlier master plans, imports are the single most important cargo flow through the Commercial Port. Historically, this traffic has accounted for over 70 percent of the total port traffic.

Goods are imported primarily for local consumption, to support Guam's construction industry, and to supply Guam's continually growing tourism industry. As will be shown later in this report, local consumption accounts for nearly half of all goods passing through the Port. In Section 1, we reported that local consumption is expected to grow in direct relation to the increase in local population. Tourism traffic will also increase. However, the assumption is that future growth will be constrained by the carrying capacity of the Island. Strong double digit increases like that exhibited earlier in the decade will decline to more manageable levels. It should be noted that for the purposes of the discussions of this master plan, only goods consumed in Guam are classified as imports; goods re-exported to Micronesia are classified as transshipments.

4.2.1.2 Exports. As noted earlier in this plan, nearly all of the export traffic out of Guam consists of military goods (personal vehicles, household goods and equipment) being sent back to the U.S. mainland. A very small portion is made up of garments processed locally and a range of miscellaneous items including scrap metals, frozen fish (by-catch and tuna rejected from sashimi shipments), and other goods. As the base case assumptions indicate, exports are not expected to grow significantly in the future. Although the Japanese market for sashimi will continue to exist, the growth of tuna transshipment is expected to be essentially flat. The BRAC action is also not expected to result in a major decline or increase in the number of military personnel that are stationed in Guam. Exports of scrap and other items may grow with the economy, but these make up a very small fraction of total exports. In the long run, the Commonwealth status for Guam (if successfully achieved) and the general rise in the prosperity of the region may encourage the local manufacture of exportable goods. However, for the forecast period, these factors are not expected to have a significant impact.

4.2.1.3 Local Consumption. Importation of goods for local consumption is the single most important cargo flow at the Commercial Port of Guam, accounting for nearly half the total 1994 port traffic. As discussed in

Section 1 of this report, local consumption should rise in direct relation to the island s per capita income and population growth.

According to the demographic data presented earlier, Guam s population is projected to rise 2 percent annually. This level of growth is expected through the year 2020.

It is more difficult to project real per capita income growth. As we have seen, the real per capita income of individuals has grown moderately in recent years. Much of this growth can be explained by the rise in employment and income generated by the tourism industry, offset only in part by the lagging growth of civilian employment and income from the military installations on the island. It is also reasonable to assume that future development in those two sectors will bracket the growth of individual per capita income. If one accepts this approach, real per capita income should grow at slightly decreasing rates during the forecast period. Combined with the projected population growth, the effective demand for local consumption imports is expected to rise 4.25 percent annually over the forecast period. As noted earlier, local consumption figures comprise only the commodities that are consumed in Guam. Items imported into Guam for subsequent re-export to Micronesia are accounted for under transshipment.

Figure 4.1 Diving in Outer Apra Harbor

Figure 4.2 Jet Skiing in Outer Apra Harbor

4.2.1.4 Tourist Industry. Tourist related activity is purely a function of the number of tourists visiting Guam and their level of expenditures. Guam is a favorite destination of the younger, lower-income Japanese tourists and these travelers are the main reason for the rapid rise of tourism through the first half of this decade. One of the major assumptions of this report is that Guam will remain a desirable destination for these visitors. This trend is expected to continue, particularly if Guam is successful in opening up its attractions to new Asian countries. Should that occur, future tourist expenditures and the corresponding growth in port traffic will primarily reflect 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 tour facilities. As a result, there has been substantial pent-up demand in Japan for Guam vacations. Tourism is likely to grow quite healthily, albeit slowing to about 10 percent annually over the forecast period as previously stated.

4.2.1.5 Military Installations. The United States is continuing to reassess its military presence throughout the world. Rapidly changing geopolitical events, base realignments, and on-going fiscal constraints make it extremely difficult to determine just how the military presence in Guam will be affected. Recent incidents in Okinawa, elevations of tensions between China and Taiwan, reported famines in North Korea, and other incidents could have a direct effect upon U.S. military presence in Guam. Unfortunately, prediction of events, and its direct and indirect impacts on Guam are extremely difficult. Even the military strategic planning experts stationed on-island have little insight into likely and probable outcomes. The only statement that can be made with some degree of certainty is that unless Guam can develop a new exportable product, the shipping of military household goods will continue to dominate outgoing tonnage.

In view of past trends and future uncertainties, it is reasonable to assume the status quo in the level of military use of commercial port facilities for the foreseeable future. This nominal "no-growth" scenario represents our best judgment of the military component of the future commercial port traffic. For purposes of forecasting tonnages, we assume that military traffic will grow at a rate of 1.0 percent per year.

4.2.1.6 Construction. The boom in the construction sector in recent years has been fueled by the sharp rise in tourism. In peak years, construction imports has experienced double digit growth, with as much as 50 percent of the traffic being attributable to the development of tourism infrastructures. New hotel developments, retail space construction, and the creation of entertainment centers all contributed to one of the biggest growth spurts in Guam's economic history. To a lesser extent, building materials imported for military construction, residential development, and public works improvements, made up the balance of this sector.

Table 4.2
Import and Export Forecasts
(Revenue Tons)

Year	Local Consumption	Tourist Industry	Military Installation	Construction Activity	Total
1996	918,352	302,500	216,261	428,400	1,865,513
1997	957,382	332,750	218,424	436,968	1,945,524
1998	998,071	366,025	220,608	445,707	2,030,411
1999	1,040,489	402,628	222,814	454,621	2,120,552
2000	1,084,710	442,891	225,042	463,713	2,216,356

Imports for construction is expected to continue to rise, but at a much slower rate than in the mid 1980s and early 1990s. Like tourism, the double digit growth should slow and it is expected that over the forecast period, construction traffic will increase to about 2 percent.

4.2.1.7 Forecast Summary. Table 4.2 summarizes the short-term forecasts for import and export traffic for the Commercial Port. As the table indicates, traffic into and out of the Port is expected to rise from 1,865,513 revenue tons in 1996 to 2,216,356 tons by the year 2000.

4.2.2 Transshipments. Transshipment traffic through the Commercial Port can be separated into two parts: (1) the transshipment of goods to other areas in Micronesia, particularly the CNMI, the FSM, and Palau, and (2) the receiving processing, assembling, and/or re-exportation of goods received from various destinations and destined for areas outside Micronesia.

4.2.2.1 Transshipments to/from Other Micronesian Islands. Like Guam, the three main economic sectors of other Micronesian islands are tourism, construction, and general consumption. In addition, there is the manufacture of garments in Saipan and a small military presence in Tinian.

In the previous decade, transshipment demand was relatively strong which is reflected in the increase in traffic from 65,000 revenue tons in 1984 to 225,000 in 1994. The development of new facilities, increased manufacture of garments in Saipan, and the ensuing population growth and per capita income, all contributed to this sharp rise.

However, like Guam, the economic growth is expected to slow, and this fact coupled with more direct shipments into these areas, is expected to reduce the amount of transshipments through Guam. Over the forecast period, transshipment traffic through the Commercial Port is expected to grow around 1.5 percent.

4.2.2.2 Guam's Potential 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 previous master plans for the Commercial port and also in Section 1 of this plan. Geographic factors such as voyage distances, sailing times, and costs were considered and it was concluded that it would cost more to transship through Guam. The overall geopolitical situation was also discussed, as was the size and structure of Guam's economy.

The changes to Guam's economy in recent years serve to further reduce its potential as a transshipment center. Guam has evolved primarily into a service-oriented economy with generally higher costs than surrounding countries and territories. Unemployment is very low and there is no large pool of semi-skilled or skilled workers. The fact that Guam's manufacturing sector is very small is testimony to the fact that prospects are poor for significant processing of raw or intermediate materials into finished goods. Such processing would be a necessary adjunct to large-scale transshipment, inasmuch as geographic factors mitigate against the use of Guam as a western Pacific transshipment center.

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. Unless Guam takes a very aggressive marketing stance and establishes a very competitive pricing structure, there will be very little opportunity for Guam to establish itself as a major transshipment center.

4.2.2.3 Forecast Summary. Table 4.3 summarizes the short-term forecasts for transshipment traffic through the Commercial Port.

Table 4.3
Transshipment Forecasts
(Revenue Tons)

Year	Tonnage
1996	231,801
1997	235,278
1998	238,807
1999	242,389
2000	246,025

4.2.3 Tuna Shipments. Guam's existing port infrastructure, network of agents, and frequent flights to Japan has made it a major transshipment point for chilled

fresh tuna destined for Japan. Its cheap fuel, good rest and recreation (R&R) facilities, excellent communications, and frequency of flights to the orient, all make it a prime candidate for continued growth.

Presently, a large fleet of longliners uses Guam for air shipment of their tuna catches and some operators and their agents are quite optimistic about further growth. However, as stated in previous master plans and in Section 1 of this plan, this industry is governed much more by the relative costs at Guam, air freight limitations, and licensing policies of other countries, than by such variables as the growth of the market or the overall harvests versus potential yields. In addition, some have cited other restraints upon growth which threaten Guam's position. These include limits on the number of Japanese vessels allowed to land fish outside of Japan, investments by Taiwanese entrepreneurs in alternative transshipment facilities, and technology changes, such as blast freezing to super cold temperatures that would remove the time constraint on getting the fish to market. Because of these continued competing factors, it is not impossible to envision the departure of chilled tuna transshipment as quickly as it arrived.

Consequently, it is extremely difficult to forecast the future transshipment levels of chilled tuna. As Table 4.4 shows, the metric tonnage of tuna shipped has been very unpredictable. In 1990, the volume of fish transshipped through the port of Guam totaled 12,584 metric tons (mt) and monthly volumes ranged from a low of 400 mt in October to a high of about 1,100 and 1,400 mt in April and May respectively. During that year, airlines reported that about 95% of the fish transshipped in Guam came through the sea port with the remainder coming in on chartered jet freighters. In 1992, the total volume of fish coming out of Apra Harbor declined to about 5,390 mt but by 1993 had increased to 7,104 mt. However, of more interest is the fact that by 1993, fish landed at Apra Harbor constituted less than 65% of the total fish being flown to Japan. In 1995, a new company began flying tuna into Guam from Indonesia which has reportedly displaced 20% to 30% of the air cargo space to Japan from Guam. These facts illustrate the extreme difficulty in attempting to predict how the tuna industry will react in the coming years.

Table 4.4
Tuna Shipments
(Metric Tons)

Year	Tonnage
1989[1]	15,000
1990	12,584
1991	9,837
1992	5,390
1993	7,104
1994	11,170

[1] Estimated

A recent development is that in March 1995, Casamar, a Guam purse seiner vessel maintenance company, began

shipping frozen seiner tuna to Bangkok using American President Line (APL) refrigerated containers. During 1995, the Casamar/APL operation shipped over 28,000 tons of tuna to Thai packers. Reportedly, Casamar/APL have the capacity to eventually transship up to 100,000 tons a year of frozen tuna.

This new refrigerated container operation is attractive for many reasons. First, it is considerably cheaper than shipping by reefer vessel. Current price quotes suggest that container shipment is almost 35% cheaper than transport by conventional reefer vessels. Second, from the packers' viewpoint, the 25-ton containers are much more easily managed and integrated with locally procured fish than an entire reefer vessel of frozen tuna. Third, from the APL perspective the back haul of refrigerated containers to prime Asian shipping markets is a windfall since these containers might otherwise have to be transported empty.

A second Guam transshipment operation that started in March 1995, removes heads and guts from longline caught fish that do not meet Japanese sashimi market standards, then air freighting them to Europe via Korea. While the potential contribution of this operation to the Guam economy is uncertain, and could be small, it may serve to further diversify the tuna transshipment industry and provide additional inducements for longliners to call at Apra Harbor.

Guam does, however, have several distinct advantages. It provides an excellent port for reprovisioning, bunkering, and vessel repair as providing a rest and recreation site for crews. These attractions have gained additional significance inasmuch as owners of eastern Pacific tuna fleets are beginning to move their fleets to the western Pacific. These attributes should be highlighted in Guam's efforts to attract continued tuna transshipment opportunities. For this report, we assume that tuna transshipments will continue through Guam, but that transshipment volumes will remain constant.

Tuna Shipment Forecasts. Table 4.5 summarizes the short-term forecasts for transshipment traffic through the Commercial Port. The figures shown reflect no additional growth over the forecast period.

Table 4.5
Tuna Shipment Forecasts
(Metric Tons)

Year	Tonnage
1996	10,000
1997	10,000
1998	10,000
1999	10,000
2000	10,000

4.2.4 Cruise and Excursion Traffic. Passenger vessels using the Commercial Port fall into two separate categories. The first are cruise ships, with overnight accommodations, that offer cruises that last from several days to two months or more. These vessels range in size from about 300 feet long with accommodations for 120 to 150 passengers, to ships that are over 800 feet long with about 2,000 passengers.

The second category costs of day excursions and evening dinner cruises for tourists staying at hotels. Vessels servicing this industry may range from big yachts carrying up to 150 passengers, to large multihull-design vessels with capacities in the neighborhood of 750 passengers.

4.2.4.1 Extended Cruise Traffic. During fiscal year 1995, twenty passenger vessels arrived in Guam carrying slightly over 8,000 passengers.These vessels originated in Japan, Europe, or in the U.S. In previous years, both the number of vessels visiting Guam and the total passenger count has varied widely. In 1989, approximately 9,150 cruise boat passengers visited the island, and in 1992 a record high was achieved with 13,668 passengers. Since then, the number of passengers has fluctuated between 9,000 and 10,000.

Past forecasts have predicted that cruise vessel passenger counts would grow roughly in proportion to the total number of visitors. This has not occurred, however. While visitor counts has climbed significantly over the long term, cruise vessel traffic has been flat, and has even declined during some periods. For the short-term, therefore, cruise vessel traffic is predicted to grow only slightly as shown in Table 4.6.

Table 4.6
Cruise Vessel Projections

Year	Port Calls	Passenger Count
1996	20	8,000
1997	20	8,400
1998	21	8,800
1999	21	9,250
2000	22	9,700

4.2.4.2 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. The industry is very robust and is growing in proportion to tourism counts.

At the present time, a few larger boats, each with a capacity of 149 passengers, and several smaller boats (excluding dive boats, charter fishing boats, and the submarine) with an average capacity of 49 passengers are engaged in this market. This fleet has a total capacity of almost 1,000

passengers and these vessels may sail once or twice each daily. Although no accurate statistics appear available with respect to this industry, the sheer numbers of passengers carried dwarfs those figures for the cruise vessel industry. It has been reported that close to 25 percent of all visitors enjoys one of these excursions.

If this traffic grows at the same rate as tourism (10 percent annually) as expected, then nearly half a million visitors would be sailing annually on one of the day excursions by the year 2000. Unfortunately, accurate statistics are not available to track what has become the fastest growing activity in the Commercial Port. And, unlike the tuna industry which could decline quite rapidly, day excursions exhibits good stability, and should remain a major player in the Commercial Port for the foreseeable future. Plans should be made over the long haul to accommodate what has obviously become a very popular tourist activity in Guam.

4.3 Intermediate to Long Range Forecast

As established previously in this report, Guam is not expected to evolve easily into a major transshipment center for destinations outside of Micronesia. Therefore, transshipment activity will increase only slightly for the foreseeable future. In addition, military presence on the Island should remain stable, and construction activity will probably slow further as tourism's growth rate declines. Local consumption will continue to rise in direct relationship to population and per capita income growth, with the only significant increase in activity being generated by tourism. Predicting what will occur with the fishing and passenger vessel industry is much more difficult because past activity has been erratic. The best approach to addressing these two sectors would be to expect growth to be flat to slightly rising, with careful monitoring of its actual change rate.

Table 4.7 summarizes the intermediate and long range forecasts for the Commercial Port.

4.4 Demand Capacity Analysis.

4.4.1 Wharf Capacity. In estimating the current capacity of the Commercial Port, only Berths F-4, F-5, and F-6 will be considered as, for all practical purposes, Berth F-3 is fully utilized by fishing vessels. The berth is frequently tied-up with four and five fishing boats abreast. Consequently, the number of cargo vessels using this berth is severely limited. Another factor to consider is that it is extremely important to recognize that the earthquake damage must be repaired to return full functionality to the entire F(oxtrot) Wharf area.

Since H(otel) 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.

Table 4.7
Intermediate to Long-Range Forecast

Year	Tourism Industry (Rev Tons)	Military Traffic (Rev Tons)	Construction Activity (Rev Tons)	Local Consumption (Rev Tons)	Trans-Shipments (Rev Tons)	Tuna Shipments (Metric Tons)	Vessel Calls	Passenger Count
2000	442,891	225,042	463,713	1,084,710	246,025	10,000	30	15,000
2010	648,437	234,180	501,938	1,281,202	285,522	12,000	35	17,500
2025	863,070	241,276	532,661	1,451,596	356,969	15,000	38	19,000

Following the example of the 1990 Master Plan, cargo vessels can be divided into four basic types as shown in Table 4.8.

Table 4.8
Cargo Vessel Types

Vessel Type		Percent of Cargo
A	Containerships	65%
B	Container/Break Bulk Ships	20%
C	Ro-Ro Carriers	5%
D	Inter-Island Barges/Vessels	10%

The Port's container cranes are used to work Type A and C vessels. Type B vessels are generally worked with the ship's gear, either because the container cranes are unavailable, 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. Type E vessels are unloaded by side and stern ramps.

Using the same methodology as used in previous master plans and historical data, the following theoretical handling rates can be achieved:

Type A: 19.65 containers or 345 rev tons/crane hr
38.40 containers or 675 rev tons/ship hr (average of 1.95 cranes)
Average time at berth: 16.1 hrs or 1.3 times working time

Type B: 6.1 containers or 78 rev tons/gang hr
9.4 containers or 120 rev tons/ship hr (average of 1.54 gangs)
Plus breakbulk: 35 rev tons/gang hr
Plus breakbulk: 53 rev tons/ship hr
Combined handling rates:
54 rev tons/gang hr
82.5 rev tons/ship hr

Average time at berth: 38.6 hrs or 1.15 times working time

Type E: 650 rev tons/ship hr
Average time at berth: 6.6 hrs or 1.75 times working time

Type C: (5.9 containers + 9.0 rev tons of breakbulk) or 85 rev tons/vessel hr
Average time at berth: 26 hrs or 3.83 times working time

The productivity rates of Type A vessels 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 for 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 athwart ship, thus requiring that they be turned 90 degrees. Frequently, 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.

Practical Operating Capacity. Assuming that: (1) larger containerships will occupy Berth F-4 and that a large portion of Berth F-5 is unusable since it sustained severe earthquake damage in August 1993; (2) containerships are provided priority at Berth F-4; and (3) the relative proportions of total cargo type given current trade patterns remain constant, the practical operating capacity of the Commercial Port can be estimated as follows:

A berth occupancy factor of 0.4 is used for Type A vessels (full containerships), an appropriate assumption for vessels of this nature that arrive on a semi-scheduled basis (at the same time it allows enough time for other vessels to use the berth). Based on a factor of 0.4, the following amounts of cargo might be discharged from, or loaded aboard Type A vessels if cargo volumes were uniform throughout the year:

$$0.4 \times (675 \div 1.3) \times 8{,}760 = 1{,}819{,}385 \text{ rev tons/year}$$

If a berth occupancy factor of 0.4 is used for Type B (combination container & breakbulk vessel) and Type E vessels (car carriers), while recognizing that container ships already occupy Berth F-4 for 35 percent of the time, the following volumes might be handled by the Type B and Type E vessels:

Type B:
$(0.40 + 0.15 + 0.15) \times (82.5 \div 1.15) \times 8{,}760 \times 0.91 =$ 400,000 rev tons/year

Type E:
$(0.40 + 0.15 + 0.15) \times 650 \times 8{,}760 \times 0.09 =$ 250,000 rev tons/year

Berths F-4 and F-6, however, are also used by fishing vessels when they are not used by the containerships. Therefore the berths are available for cargo vessels only about 83 percent of the time. Thus, the volumes that can be handled by Type B and E vessels would be less than the above figures, or:

Type B:	330,000 rev tons/year
Type E:	170,000 rev tons/year

These volumes are consistent with the ratios of cargo carried by Type B and Type E vessels to that carried by Type A vessels.

With respect to the number of Type C vessels (inter island) 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. However, 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:

Type C:	(0.50 - 0.25) X 2 X 40 X 8,760 =	175,000 rev tons/year

This figure is 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, the total port capacity would then be:

1,819,385 + 330,000 + 170,000 + 175,000 = 2,494,385 rev tons /year

The ratio of the average month to the peak month has been shown in the past to be 0.825, so the annual capacity figure should be reduced accordingly to allow for some peaking:

0.825 X 2,494,385 = 2,057,868 rev tons/year

This figure is close the 1994 cargo volume of 1,940,000 revenue tons (includes transshipments in and out). This leads to the conclusion that F(oxtrot) wharves are operating at near capacity levels.

4.4.2 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. However, it requires 30 to 40 percent more land area than a stacked operation. The stacked operation requires a greater degree of organization, but is more frugal in its use of land. At the Port of Guam, a mixture of both of these storage methods is being used. The analysis

first addresses the yard area that would be required to accommodate existing containerized cargo movement 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 will be in a 1:2:1:2:1 pattern to minimize the moves required and thus the cost of retrievals.

2. Each day, 20 percent of the inbound containers are mounted on chassis ahead of time to expedite delivery. Space is provided for these containers.

3. Outbound empties will 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 percent additional allowance for stacking containers by vessel.

5. The average dwell times for containers are:

Inbound containers	7 days
Outbound containers	5 days
Outbound full containers (export and transshipment)	9 days

In 1995, an estimated 1,700 containers were handled each week, with approximately equal numbers being inbound and outbound. If the peaking factor (peak month to average month) that was used above for wharf capacity is also applied here, then the Commercial Port may have handled as many as 2,060 containers in some weeks (824 twenty-foot containers and 1,236 forty-foot containers) with half being inbound and half outbound. The following calculations shows how much container yard space is required to adequately handle this number of containers.

Inbound ground storage:

20' containers 412 ÷ 7 = 59 blocks @ 1,650 sf	97,350
40' containers 618 ÷ 7 = 88 blocks @ 3,150 sf	277,200

Chassis Storage:

20% of ground storage:	20' - 412
	40' - 618
	1,030 X 0.2=206
	@ 872 sf 179,632

Outbound empties, 75% of outbound containers X 5/7

0.75 X 5 ÷ 7 X 412 ÷ 2.5 X 8 X 20 (40' X 320') =	14,855
Aisle 35' X 320'	11,200

0.75 X 5 ÷ 7 X 618 ÷ 2.5 X 8 X 40 (40' X 920') =	43,240
Aisle 35' X 920'	32,200

Outbound full, 25% of outbound containers X 9/7 X 1.25 diversity factory

0.25 X 9 ÷ 7 X 412 = 132 ÷ 7 X 1.25 = 24 blocks @ 1,650 sf	39,600
0.25 X 9 ÷ 7 X 618 = 199 ÷ 7 X 1.25 = 36 blocks @ 3,150 sf	113,400
Aisle space in ground storage area (2 aisles, 60' X 650' traversing container area)	78,000
Total (Square Feet):	886,677
Total (Acres):	20.4

As the calculations indicate, approximately 20 acres of space are needed to handle the estimated number of containers that moved through the Port in 1995, given the operating parameters noted above. If two vessels should arrive on successive days, there is further peaking, as additional containers are coming in before the containers from the preceding vessel can be delivered from the yard. The effect of this peaking from closely-spaced vessels is to require an increase in the area required.

Section 5

Recommendations

GMP
ASSOCIATES, INC.
Engineers/Architects

Section 5

Recommendations

5.1 Port Expansion Requirements

In the last fifteen years, at least five planning documents have assessed existing operations, estimated future port demands, and identified an array of capital improvements for Apra Harbor to meet anticipated future demands. These planning documents include: *Commercial Port of Guam Master Plan* (1981); *Apra Harbor Interim Survey Report and Environmental Statement* (1983); *Evaluation of Commercial Port Docking Facility* (1988); *New Master Plan for the Commercial Port of Guam* (1990); and *Cabras Island Industrial Park Master Plan* (1992).

The Port Authority of Guam (PAG) first reviewed its master planning requirements in 1981. In February of that year Maruyama & Associates, Ltd., working with Dravo Van Houten, Inc., completed the *Commercial Port of Guam Master Plan*. The 1981 master plan forecasted port activity for a 19 year period—through the year 2000. Its recommendations for facility expansions, land requirements, and equipment procurements were based on the realization of those forecasts.

In May 1983, the U.S. Army Corps of Engineers, Honolulu District, studied the feasibility of providing navigation improvements for the Commercial Port at Apra Harbor. The study, titled *Apra Harbor Interim Survey Report and Environmental Statement*, presented four alternate plans to improve the navigability and accessibility of Apra Harbor.

A comprehensive inspection of the commercial port docking facility and the structural system which supports the rail mounted gantry cranes at the Commercial Port was performed in 1988 by CMH/TNH Consulting Engineers. Results of the inspection were presented in April 1988 in the *Evaluation of Commercial Port Docking Facility*. The study identified items needing repair and also assessed the existing crane rail system's ability to accommodate a second crane.

In September 1990, TAMS Consultants, Inc., working with J. Agi & Associates Inc., completed the *New Master Plan for the Commercial Port of Guam* that updated forecasts provided in the 1981 *Commercial Port of Guam Master Plan*. The 1990 master plan provided forecasts for port activity for a 20 year period—through the year 2010—and associated recommendations for capital improvements. The 1990 Master Plan predicted much higher growth than that which was anticipated in the 1981 study. This was largely attributed to the rapid double digit growth and construction experienced in the late 1980s resulting from Guam's growing tourist industry.

Table 5.1
Comparison of Aggregate Cargo Forecasts
(000 Revenue Tons)

	Tourist Industry			Military Installations			Local Consumption			Construction Activity			Exports			Trans-Shipments			Fishing			Totals		
Year	'90	'92	'96	'90	'92	'96	'90	'92	'96	'90	'92	'96	'90	'92	'96	'90	'92	'96	'90	'92	'96	'90	'92	'96
1995	372	299	303	166	225	216	733	733	918	251	138	428	125	125	N/A	241	241	232	9.5	9.5	10	1897	1771	2107
2000	572	402	443	166	170	225	1027	1027	1085	349	192	464	132	132	N/A	214	214	246	9.5	9.5	10	2467	2145	2472
2005	765	540	---	166	170	---	1348	1348	---	445	245	---	145	145	N/A	257	257	---	9.5	9.5	---	3135	2714	---
2010	887	691	648	166	170	234	1641	1641	1281	516	284	502	168	168	N/A	310	310	286	9.5	9.5	12	3695	3272	2963
2025	---	---	863	---	---	241	---	---	1452	---	---	533	---	---	N/A	---	---	357	---	---	15	---	---	3461

Notes:
1. Column headings refer to the year of the forecast, i.e., 1990 Master Plan, 1992 Duenas Revision, 1996 GMP Plan
2. For the GMP Plan, the figures shown for 1995 are forecasts for 1996
3. Export figures for the GMP Plan are included in other categories. See the discussion in Section 4 of this report
4. Figures for fishing are in thousands of metric tons

The 1990 forecasts were refined once again in July 1992 by Duenas & Associates, Inc., as they prepared the *Cabras Island Industrial Park Master Plan*. Citing the experience gained in the period between 1990 and 1992, Duenas revised the TAMS figures, principally to account for the following factors:

- Using figures from the Territorial Planning Council (TPC), Duenas lowered visitor projections in the year 2010 from 3.1 million visitors to 2.4 million visitors.

- The construction boom of the 1989 era had ended. Noting that many major hotel projects had either been completed, scaled back, temporarily halted, postponed, or declared bankrupt, and that no new starts had been initiated in more than a year, Duenas concluded that the construction industry would not return to its former robustness for at least a decade.

- Cargo tonnage due to military presence was expected to surge due to the closure of U.S. Navy facilities at Subic Bay and U.S. Air Force functions at Clark Air Force Base, both in the Philippines, then hold steady in future years.

Four years later in 1996, we have followed these earlier works with a further revision of the forecasts and recommendations for capital improvements. Sections 1 and 4 explained our adjustments and forecasts in depth. As we prepare to discuss the requirements and recommendations for the port, it would be instructive to compare the forecasts of this report with those forecasted earlier. Table 5.1 details the data and Figure 5.1 graphically portrays the variances.

The comparison clearly shows that our forecast for cargo tonnage is in line with the two more recent forecasts made by TAMS and Duenas in 1990 and 1992, respectively. Although there are some specific differences, the aggregate tonnages are not substantially different. The 1981 forecasts vary significantly from the other three forecasts since they did not account for Guam's rapid growth of tourism experienced in the late 1980s, after the report was written.

- While the tonnages we forecast in the near term, i.e., 1995/96, is higher than was forecasted in 1990 and 1992, our forecasts are more conservative in the intermediate and longer term.

- Our forecast for the year 2010, 14 years from now —about the theoretical limit for an economic forecast in practical terms—is about 730,000 revenue tons less than that forecasted in 1990 and about 310,000 revenue tons less than that forecasted in 1992.

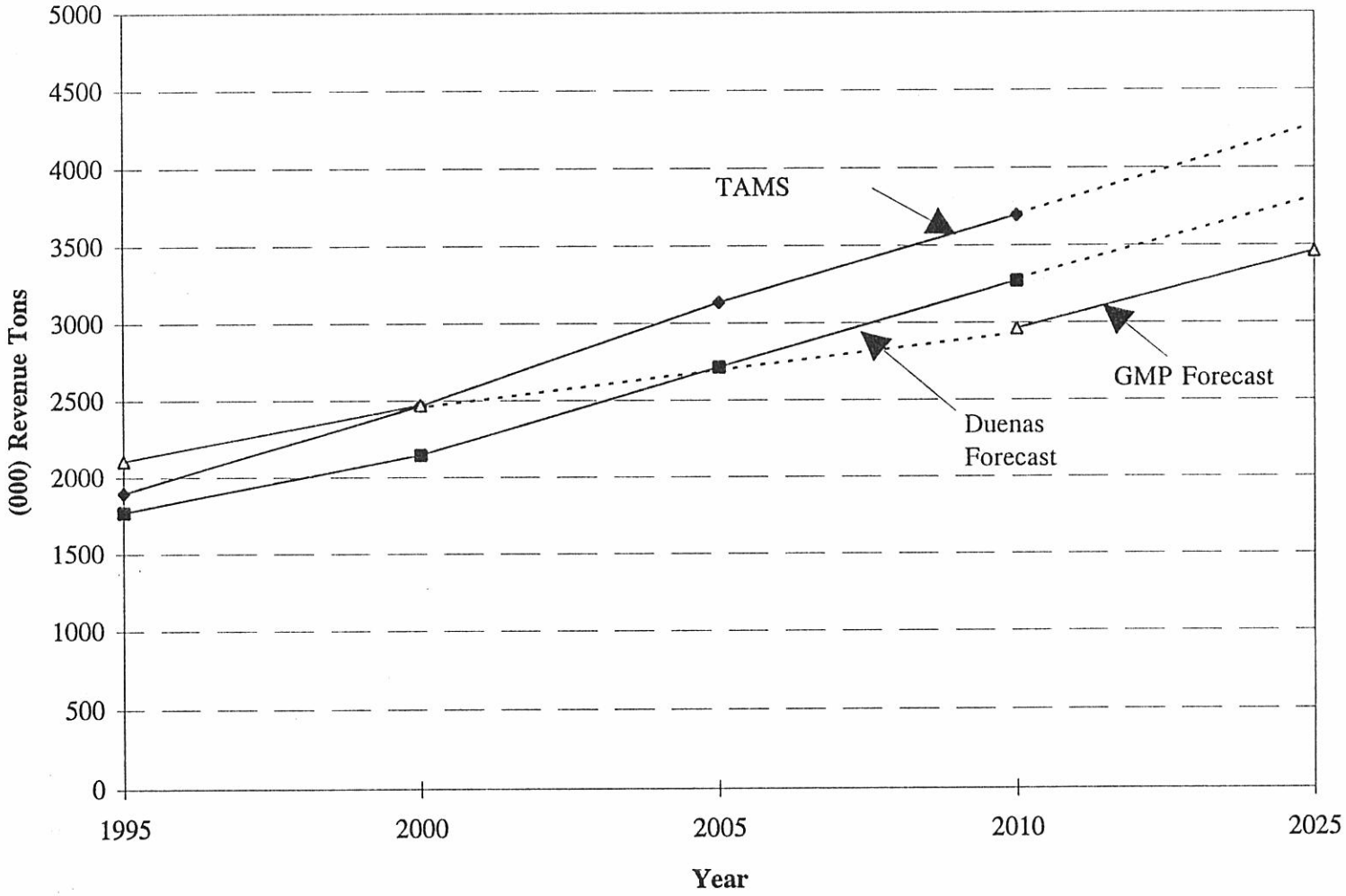
- Our forecast for the year 2025, a period approximately 30 years from now, falls between the forecasts for the year 2010 that was made in 1990 and 1992.

Thus, the forecasted demand that served as the fundamental basis for the recommendations of the 1990 Master Plan is essentially unchanged. Because our forecasts in the intermediate to longer term are lower than that which were envisioned in 1990, the facilities, land, and equipment recommendations that were made in 1990 are in fact more conservative from a demand-capacity point of view. One can conclude then, that the recommendations of the 1990 Master Plan remain valid from a demand-capacity viewpoint.

Notwithstanding the fact that the demand-capacity basis for the 1990 recommendations remain fundamentally unchanged, port expansion needs call for reassessment for the following three reasons:

- The impending closure/disestablishment/realignment of selected U.S. Navy facilities within the Inner

Figure 5.1
Forecasts of Total Cargo Tonnages, Apra Harbor, Guam



Apra Harbor. Under the terms of the Base Realignment and Closure (BRAC) Commission recommendations of 1995, the Ship Repair Facility (SRF), Fleet Industrial Supply Center (FISC), Naval Activities (NAVACTS), and Public Works Center (PWC) are specifically and variously due for closure or reorganization. These pending actions provide an opportunity for the Port Authority and the Government of Guam to capitalize on existing wharfage and facilities within the U.S. Navy-controlled Inner Apra Harbor to augment Guam's own facilities in the Commercial Port area.

- Potential for gains in productivity and efficiency should selected port - related functions be performed by private entrepreneurial enterprises rather than by a government sponsored agency. The Port Authority and the Government of Guam have already taken steps in this direction by the leases they have signed for the Cabras Island Industrial Park and for parts of the Harbor of Refuge. Other areas and activities could be similarly structured.

- Although the economic forecasts and resulting demand - capacity analyses present a less than optimistic vision for Apra Harbor becoming a Singapore - or Hong Kong-like regional transshipment center, the conclusions do not consider the potential and probable effects of optional and intense marketing efforts to entice industry, shippers, fishers, and others to use Apra Harbor. By developing a marketing plan and undertaking an intensive marketing effort, Apra Harbor development need not necessarily be held hostage to passively responding to the natural forces of external economics.

In the remainder of this section we first discuss the needs of PAG. We then discuss the implications of various factors and conditions, such as BRAC '95, existing leases, and physical limitations, on the Commercial Port layout and their influence on the uses of each area. Suggested options include the relocation or expansion of existing operations, introduction of new industries, and alternative layouts are then described with discussions on the various components of the layouts. An analysis of PAG's Capital Improvement Program (CIP) and how our recommended layouts can be integrated with the CIP follows this discussion.

5.2 Commercial Port Needs

The availability of selected Navy-held lands and facilities within the Inner Apra Harbor area provides the Port Authority with development and expansion options that were not available when the previous master plan was completed in 1990. With more available space, existing industries will have more flexibility and options for long range planning. At the same time, to remain competitive with other Pacific nations, Guam must develop an aggressive marketing program. The availability of Inner Harbor properties provides an opportunity to re-think Guam's port planning and marketing strategies. PAG and the Government of Guam must

actively expand the existing industries and open up new industries at the Commercial Port to keep Guam economically competitive. Guam has a unique opportunity to plan its future port operations. The functions that must be accommodated (and hence, sited) by the Port Authority are listed below:

- Container/Breakbulk Terminal. The heart of the Commercial Port at Apra Harbor, as is the case for all of the world's major ports, is its container yard. As presently configured, the PAG's yard covers approximately 26 acres. Given future increases in Guam's population as well as the expected continuance of tourism demands on the local economy, increases in demand for consumer goods can be anticipated. The Port Authority must anticipate and plan or these future needs.

- Transshipment Center. Notwithstanding the fact that Apra Harbor's cargo tonnages for transshipment to other Pacific destinations has not increased significantly in the recent past, it remains entirely plausible that effective marketing can alter the seemingly natural course of future events. For Apra Harbor to develop into a new major port, it will be fundamentally dependent upon the emergence of sizable and sustainable regional transshipment traffic destined to and from major international ports not presently served by Guam. While neither the 1981 nor 1990 Port Master Plans saw hope for such a development, we take the view that innovative thinking and aggressive marketing could create a win-win situation for both Guam and the potential investor/developer. The availability of naval properties in the Inner Harbor certainly adds a new dimension to strategic thinking.

- Fishing Industry Facilities. As discussed in Section 1, the port's services to longliners and purse seiners have steadily increased. Guam fully anticipates the continuance of fisheries as one of its basic industries. By providing modern, state-of-the-art facilities and infrastructures, Guam expects to increase the already considerable fleet that calls Apra Harbor home.

- Fuel Supply and Storage. Guam depends heavily on imported oil to sustain its economy. Because all petroleum products must be imported, adequate fueling areas, distribution systems, and storage capacities must be provided. Although present fueling operations by Mobil Oil and Shell Oil are technically under the purview of GEDA (Guam Economic Development Agency) leases, the PAG nevertheless plays a key role in that the fuel on- and off-loading operations occur within the port.

- Port Headquarters/Administration Offices. Every port requires administrative areas to manage, control, and operate its functions. Ideally, these com-

mand and control facilities should be centrally located, offer clear visibility of port activities, be easily accessible, and provide adequate security.

- Commercial/Passenger Cruise Travel. Although Guam cannot yet consider itself to be a principal destination for international cruise ship travel, increases in tourist traffic makes its prospect realistic. Certainly, the almost total lack of cruise travel facilities within the port must be viewed as having a negative impact. Because tourism is expected to continue as Guam's number one industry, the Port Authority needs to take positive action to promote Guam as an international cruise ship destination.

- Dinner Cruises and Day Trips. Local excursion cruises, including dinner and dance cruises and local day time cruises, is a popular tourist activity with great growth potential. The development and construction of new, consolidated and expanded facilities would likely provide a further stimulus to boost the industry.

- Recreational Boating Facilities. Surrounded by the Pacific Ocean, many recreational boaters call Guam home. The demand for boat slips are greater than its supply, with demand steadily increasing. Moreover, when threatened annually by one or more of the typhoons that approach the island, small boat owners require suitable safe havens for their boats. While the responsibility for recreational boating is sometimes assigned to other than Transportation/ Port Departments in many government jurisdictions (most commonly to "Parks and Recreation Departments"), in Guam the PAG remains accountable. The Port Authority, therefore, must consider the needs of small boat owners in considering the future development of its harbors.

- Water Recreation Areas. Although the maintenance and operation of water-related recreation facilities is not ordinarily a port/harbor function, past practices and existing customs require that the Port Authority provide for such uses provided they are compatible with its principal mission. Accordingly, water recreation facilities are currently provided at several locations within the outer harbor area. For example, Family Beach, an open, sandy beach primarily used by local residents for picnics, jet skiing, and swimming, is located immediately west of Pier Dog. In planning for recreation facilities, one prime consideration is analyzing the feasibility of consolidating these functions to a single location.

- Retail Center. As in the case with water-related recreation facilities, retail facilities are not strictly Commercial Port entities. Nevertheless, their relationship with other port facilities and functions make them natural neighbors. For example, development of fisheries facilities and passenger cruise travel ser-

vices could be enhanced through their proximity to a commercial retail center. Such a center would be aimed principally—though not solely—towards inbound and outbound passengers. Conceptually, a complex similar, but tailored to meet Guam's needs, to the *Aloha Tower Market Place* in Honolulu, *Seaport Village* in San Diego, and the *Fisherman's Wharf* in San Francisco, are possible. By locating the facility adjacent to passenger embarking and debarking areas and/or fishing industry's wharves, the development could prove attractive for private development.

- Warehousing. Due to the nature of shipping operations, warehouse space will always be needed at Apra Harbor. Warehouses in the proximity of the ships will provide more efficient operations within the harbor. With the steady increase in cargo handling additional storage areas will be required.

5.3 Constraints/Conditions/Planning Factors

The previous section described the various needs of Apra Harbor. It covered all needs for the harbor, giving a broad picture of the direction harbor development is heading. This section discusses planning factors, economic, and other considerations that affect the planning process.

5.3.1 BRAC Reuse Plan. Although Guam's naval facilities were spared from closure in previous base realignment decisions, portions of the U.S. Navy facilities within the Inner Apra Harbor were included in the wave of BRAC (Base Realignment and Closure) '95 (BRAC IV) closure and realignment recommendations. While the decision results in a host of negative economic impacts for the territory, it also gives the Port Authority an unprecedented opportunity to reinvent itself and to transform Apra Harbor into a premier port in the Pacific.

Among the facilities affected by the BRAC action with potentially direct beneficial impact are the FISC (Fleet Industrial Supply Center) and portions of the NAVACTS (Naval Activities). Other entities such as the SRF (Ship Repair Facility) and the PWC (Public Works Center) certainly will affect the Commercial Port, but in a more indirect manner. The return of a significant amount of enclosed as well as open storage areas that now belong to the FISC, could have vast implications with respect to the Commercial Port's ability to support and improve container, breakbulk, fishing, and/or dinner cruise travel services. Similarly, the probable release - whether in fee simple or as a long-term lease - of wharfage that currently fall within the purview of NAVACTS could have a dramatic effect on Guam's entire economic base. Although the market driven demand analysis of existing assets has shown that it would be a significant challenge for Guam to become a regional transshipment center, the availability of vast amounts of prime

wharfage and proximate real estate makes that vision not nearly as far-fetched as it superficially appears.

The availability of naval properties presents new challenges in completing the master plan. Because negotiations between the Government of Guam and the U.S. Navy are ongoing and remain inconclusive as of this writing, an alternative that assumes the availability of specific facilities within the navy-controlled Inner Apra Harbor has its risks. However, it is a virtual certainty that at least some of the naval facilities will be returned to the Government of Guam. Whether such properties will be those that the Government of Guam specifically seeks, or whether it will be less desirable assets, remain to be determined.

In expressing its fundamental position with respect to the BRAC '95 negotiations, on April 19, 1996, the Government of Guam's BRAC Steering Committee approved the following vision statement for the future of Apra Harbor:

> "Redevelop portions of the naval base for best and highest use, integrating its facilities and functions with those of the Commercial Port and Guam's business community. Revitalize these assets to diversify products and services; stimulate the economy to generate new capital, retain critical skills, and promote the creation of a variety of new employment opportunities; provide for the homeless; increase recreational and leisure opportunities; and advance tourism."

The vision clearly articulates the need for an effective integration of facilities in the outer and inner harbors to make the Commercial Port as competitive and attractive as possible to the market.

The area within the inner harbor that will likely be available for PAG use by the BRAC '95 program is Victor Wharf. This wharf is located at the innermost point of the inner harbor. Victor Wharf is currently used by the Navy and little or no modifications to the wharves are required to accommodate other ships. However, as stated above, the Inner Apra Harbor cannot accommodate ships with deep drafts without first dredging the area. Therefore, the most logical uses for the Victor Wharf area are activities involving ships that can make full use of the existing wharfage but yet do not require a deep draft harbor. These uses include fishing industry facilities, breakbulk handling, and commercial cruise travel. Fishing boats, breakbulk ships, and commercial cruise ships all do not have deep drafts and can be accommodated by Inner Apra Harbor.

In the fall of 1996, the Government of Guam completed a *Draft Business Reuse Plan* for the Navy-held properties that are to be released under BRAC. The plan calls for some of the functions currently being carried out in the existing Commercial Port area to be relocated to the Inner Harbor. The recommendations described later in this section incorporates the recommendations and provisions of the Draft BRAC Business Reuse Plan. Accordingly, this plan is in full compliance and agreement with the BRAC Plan.

5.3.2 Growth Scenario with Active Marketing.

Section 5.1 concluded that since the demand forecasts of this report were essentially unchanged from the demand forecasts that had been made as part of the 1990 master plan, the demand-driven facility, land, and equipment recommendations of the 1990 remain valid. We stated, however, that the forecast makes no presumption on the role of marketing. The bottom line is that in the absence of a concerted, organized, and intensive marketing effort by the Port Authority, the facility requirements would be essentially as stated in the 1990 plan.

The availability of the Navy's Inner Harbor facilities provides a unique opportunity for the Port Authority and Guam to actively and aggressively attempt to influence the outcome of regional and world economic forces.

Over the past five decades, Apra Harbor's role in the Pacific evolved largely in response to meet post-war defense needs, growth of surrounding island economies, and the opening of the fresh fish market in Japan. These forces alone, however, are not likely to raise the harbor's current activity levels over the foreseeable future.

If Apra Harbor is to experience substantial growth beyond what rising local incomes and visitor demands (including cruise ships) cause, it will have to come through a well-designed promotion by the Port Authority rather than a passive reaction to evolving regional and national needs.

Active marketing means competing in the global market, an extremely competitive arena where large national ports aggressively pursue all the business it can garner. To be effective, Guam must choose to develop a sophisticated marketing program to entice business its way, with the full knowledge that it does not lie along any of the major shipping lanes. It must compete on equivalent terms with for example, Singapore, which is strategically positioned directly along one of the busiest sea lanes in the world.

In electing to market Apra Harbor, it is critical for the Port Authority to determine how it can best package its assets. Because the Authority is unlikely to provide the funding for large-scale development, the marketing plan must clearly articulate the freedoms and advantages that clients will gain by investing their capital in Guam. It will require evidence of speed and efficiency that can be achieved by using Apra Harbor. In the case of fresh fish, these efficiencies are well established. In the case of processed fish (should it be pursued), the case is yet to be made. Nor is it clear that greater efficiencies can be achieved in container transshipments should shippers elect to use Apra Harbor, or that a ship repair facility in Apra Harbor is economically viable and will have sufficient patronage. Even the commercial development of a small fishing boat repair yard will demand evidence of its advantages by way of a market analysis.

It is a foregone conclusion that to spur development, the Port Authority must reinvent its role. Much, perhaps most,

of the harbor functions that currently fall under government ownership and/or control must be turned over to private enterprises, both for development and operation. For example, a capacity to even approach the more than 200 container moves per ship hour that shippers are assuming of the efficient ports of Asia is likely to require an investment and operating ability that cannot be expected of the Port Authority. Similarly, the as yet unclear fishing future should compel Guam to move as great a sensitivity to shifting market forces as can possibly be arranged. This requires the leadership of industry participants and their ability to design, invest, own, and operate their facilities within the commercial port area.

5.3.3 Vision to become a Transshipment Center. Notwithstanding the fact that Apra Harbor's cargo tonnages for transshipment to other Pacific destinations has not increased significantly in the recent past, it remains entirely plausible that effective marketing can alter the seemingly natural course of future events. For Apra Harbor to develop into a new major port, it will be fundamentally dependent upon the emergence of sizable and sustainable regional transshipment traffic destined to and from major international ports not presently served by Guam. While neither the 1981 nor 1990 Port Master Plans saw hope for such a development, we take the view that innovative thinking and aggressive marketing could create a win-win situation for both Guam and the potential investor/developer.

The availability of naval properties in the Inner Harbor certainly adds a new dimension to strategic thinking.

The task of getting out to attract the world to Guam is critical—conventional demand forecasts show that the world is unlikely to move toward Guam without some very creative marketing. In particular, efforts will have to focus intensely on inducing massive private investment. In light of the extremely high capital requirements, it is likely that Guam may have to reinvent the management and operating style of the port. Such a philosophical shift may perhaps be a greater challenge than the marketing effort itself, but it will certainly be a prerequisite to attaining the vision.

The authors of the 1981 and 1990 studies forecasted limited growth potential for transshipment for a good reason—though possible, it will take a Herculean effort. Among other considerations, the marketing strategy must acknowledge and effectively counter/capitalize upon:

- Operating conditions of the major competing harbors in the Pacific
- Current and unfolding trade patterns in the Pacific region
- Logistical considerations for altering shipping routes
- Political instability of Asian nations/communities

- Facilities required to meet or effect changes to trade patterns

5.3.3.1 Operating Conditions. Ports throughout Asia are under considerable stress, and reasonable projections for the next half century indicate an increase in that pressure despite extensive on-going harbor developments. For Asia, growth in cargo volume over the next 20 years is likely to average nearly 20 percent per annum, assuming there are no political disruptions in the region. This will result in a doubling of volume in well under 10 years, and a 300 percent increase shortly after the year 2010. Port expansions will not keep up with that growth, although improvements in handling facilities are certain to raise some of the capacity. This trend presents a window of opportunity for Apra Harbor to move into and participate in the greater Asian market. Currently a minor player, congestion and resulting operating inefficiencies at competing ports in Singapore, Hong Kong, Kaohsiung, Keelung, Pusan, Kobe, and Yokohama, can effectively make Guam an attractive alternative.

5.3.3.2 Changing Trade Patterns. There are strong indications that the traditional trade patterns and routes will grow in unusually varying rates over the next two decades. Among those routes, the trade volume from Southeast Asia to North America is likely to rise while that between North Asia and North America may actually decline. The rise of the former, along a route for which Guam could lie, may present an opportunity for a variety of new trans-Pacific transit issues, much of it of direct benefit to Guam and Apra Harbor. Great changes are also in store for trade between South America and Asia. While this market is not currently well-defined, a marked rise in the flows would certainly add new traffic patterns to the Pacific. The implications for Guam and Apra Harbor are limited only by the resourcefulness of the Guam leadership.

5.3.3.3 Logistical Considerations. The most compelling determinant of an intercontinental shipping route is the great circle route—a route that offers the shortest time between two ports. Conditions in respective ports, e.g., dockage delays, cargo operation inefficiencies, political instability, etc., could affect routing, particularly if the conditions border on the extreme.

There is little reason to touch a freighter's cargo at a port of call unless a perpendicular or subsidiary line passes through the port and transshipment is required. Well over half of the cargo costs relate to the amount of handling required. Thus, it is difficult to conceive a condition under which cargo would be rehandled once on board, unless it is being divided, changing direction, or off-loaded for the performance of a value-added function.

While Guam today has little to offer in terms of a value-added industry, development of such an industry can have major implications toward enticing shippers and developers to transform Apra Harbor into a major transshipment cen-

ter. Guam is in the advantageous position of having relatively free access to the considerable labor force of Micronesia. Centrally located with easy access from CNMI, Palau, FSM, and even the Marshall Islands, Guam has already taken a leadership role in providing skill training for the region. By expanding that role, and integrating the skilled labor force of Micronesia with a new value-added industry(s), Guam and Apra Harbor could offer a significant incentive for the shipping and manufacturing industries of Asia.

Another sound reason for stopping at Guam, might be if the harbor were able to offer superior customs clearance services than that available on the west coast of the U.S. mainland. Convenience and proximity to the source could easily persuade otherwise neutral shippers to process customs clearances through Guam, rather than through congested ports on the west coast.

5.3.3.4 Political Instabilities. The great risk in investing capital in foreign nations lies in their relative instability and unpredictability as compared to conditions in established first and second world countries. Within Asia, Hong Kong is scheduled to revert back to Chinese control shortly. While China has assures the world that the status quo will continue, it remains to be seen. As for Kaohsiung and Keelung on Taiwan, continued friction between that government and the People's Republic of China make investments at risk. Similarly, Korea and its ports are constantly under the thoroughly unpredictable and unknown intentions of North Korea. Regional political uncertainties such as these should only serve to make Guam, a stable and important political unit of the United States, a much more attractive port of operations than the Asian ports.

5.3.3.5 Facility Requirements. In light of the levels of uncertainty, as well as the incremental nature of what will unfold over the next quarter century in the region's shipping market, and the fact that the infrastructure developments are likely to be largely financed by private capital, more thought should be given to the process of development rather than the extent of development itself. Rather than focusing on how large a facility or how the port should be laid out, it is more important to concentrate on how infrastructures are to be planned, financed, operated, and managed. Because private capital will form the backbone of the expansion, the developer/investor will necessarily have a large role in facility development—its schedule, costs, size, etc. In fact, other than broad-based land-use planning, financing initiatives, special tax considerations, and the like, the Government may have little to do with actual facility planning. The traditional structured planning, design, and construction oversight by the Government may not produce the desired outcome. Future expansions and developments are likely to be carried out as a full partnership between the public and private sectors. In such a scenario, the private sector is likely to be given the latitude to develop the facilities in conformance with their specific investment needs and analysis of acceptable levels of risk and internal rates of return required. Thus, whether a ware-

house of "x" square feet would be constructed or whether it will be "y" square feet, or whether there will 20 or 30 cranes and of what type and size, is a decision that the investor providing the capital would make, not the port.

5.3.4 Leases. PAG leases several areas to various tenants. Section 3 of this report describes in detail the various existing leases within Commercial Port lands. Although leases provide income for PAG, they also take away valuable real estate within the Commercial Port. These areas will not be available for long term PAG use. However, increased productivity and efficiency may result if private enterprises perform functions previously provided by Government sponsored agencies. The following areas within the Commercial Port property contain long term leases:

- Cabras Island Developers is leasing 42.2 acres of property within Cabras Island Industrial Park through the year 2043.

- A 4,000 square meter site adjacent to Drydock Island is being leased to Marianas Yacht Club. Their lease expires in the year 2024.

- Mobil Oil of Guam leases Golf Pier to the year 2020.

There are also many leases under the Guam Economic Development Agency (GEDA). These leases are mentioned since they dissect PAG lands. Some of the longer running leases are as follows:

- Cabras Industrial Park is also leased to various companies through GEDA. These lessees include CASAMAR Guam, ESSO, Guam United Warehouse Corp., Kaiser Center, and Mobil Oil Guam and their leases extend for 70 years from 1989 through 1992. Shell Oil is lessee through the year 2009.

- Shell Oil and Mobil Oil currently lease the area on Cabras Island between Wharf F-1 and the Seaplane Ramp. The Shell Oil lease expires on several dates with the latest being June 1, 2006. The latest Mobil Oil lease expires March 4, 2001.

- Most of the other leases expire by the year 2000 and are not considered to be a constraint since these lands will become available in the near future.

5.3.5 Explosive Safety Quantity Distance (ESQD). To safeguard against development in dangerous areas, hazard zones have been established by the Department of Defense for various quantities and types of stored explosives. This zone is designated as the Explosive Safety Quantity Distance (ESQD). The distance of the zone is relative to the quantity and type of ammunition stored at the specific location and radiates from the origin of the ammu-

nition. Generally, the following guidelines should be followed within the ESQD arc:

- Inhabited buildings are not allowed.
- Other structures with the potential of collapsing onto people or otherwise endangering human life are not allowed. The blast itself do not generally pose a threat to human life but damage to proximate structures do.
- At the outer 40 percent of the ESQD arc, recreational facilities (except structures such as grandstands) are allowed.
- Ships are not allowed to moor within the ESQD arc.
- Wharves are generally not allowed since their purpose is to moor ships.

Since Apra Harbor is shared by both the PAG and the U.S. Navy, there is the potential of Navy explosive activities affecting civilian activities within the Apra Harbor area. The existing ESQD arcs within the Apra Harbor area are shown in Figure 5.2. The only ESQD encumbrance that affects any PAG property is the MPS Ammo Anchorage ESQD arc of 5,270 feet located in the open waters of the Outer Harbor area. This encumbrance affects most of Glass Breakwater, including Hotel Wharf, Pier Dog, Family Beach, and surrounding areas. The ESQD origin is a mooring for a ship storing ammunition. The ship is not moored 100 percent of the time and it is to our understanding that the ESQD requirements apply only when the ship is at the mooring. Although not recommended, activities could be allowed within the arc when the area is vacant of explosive storing ships, only to vacate when the ships are moored. These activities could include water recreational activities such as jet skiing, swimming, diving, and picnics. No permanent structures, however, may be erected within the ESQD arc.

The Ammunition Wharf (Kilo) ESQD arc of 7,210 feet (emanating from Orote Point) affects the western-most end of Glass Breakwater as well as the mouth of Apra Harbor. No Commercial Port lands are located within this ESQD arc.

5.3.6 Dredging, Filling and Physical Land Limitations.

Guam's cargo traffic will continue to grow as its population increases and as other cargo producing markets are developed. The need for wharfage space and storage area will increase with this growth in cargo. One alternative to meet this need is to create more usable wharfage and storage area by increasing the land area, converting more waterfront area to docks, or free up more inland area for storage. Challenges confronting these options are described below.

5.3.6.1 Dredging. Much of the waterfront areas usable for docking are already in use. Additional areas, such as the area fronting Golf Pier and the inner harbor, are in shallow waters with ocean depths in some areas less than 30 feet. To accommodate ships that currently use Apra Harbor, the ocean depth must be at least 35 feet. For Guam to develop into a transshipment center, Apra Harbor must be able to accommodate larger ships with drafts from 40 to 46 feet. Currently, ocean depths are 36 to 39 feet at the F Wharves and 26 to 35 feet at the inner harbor.

In May 1983, the U.S. Army Corps of Engineers completed their *Final Interim Survey Report and Environmental Statement, Apra Harbor, Guam*. The study considered four alternatives widen and deepen the access channel to the F-Wharves. These alternatives were:

Plan 1: Dredge the existing channel

Plan 2: Deepen the channel

Plan 3: Lengthen the channel

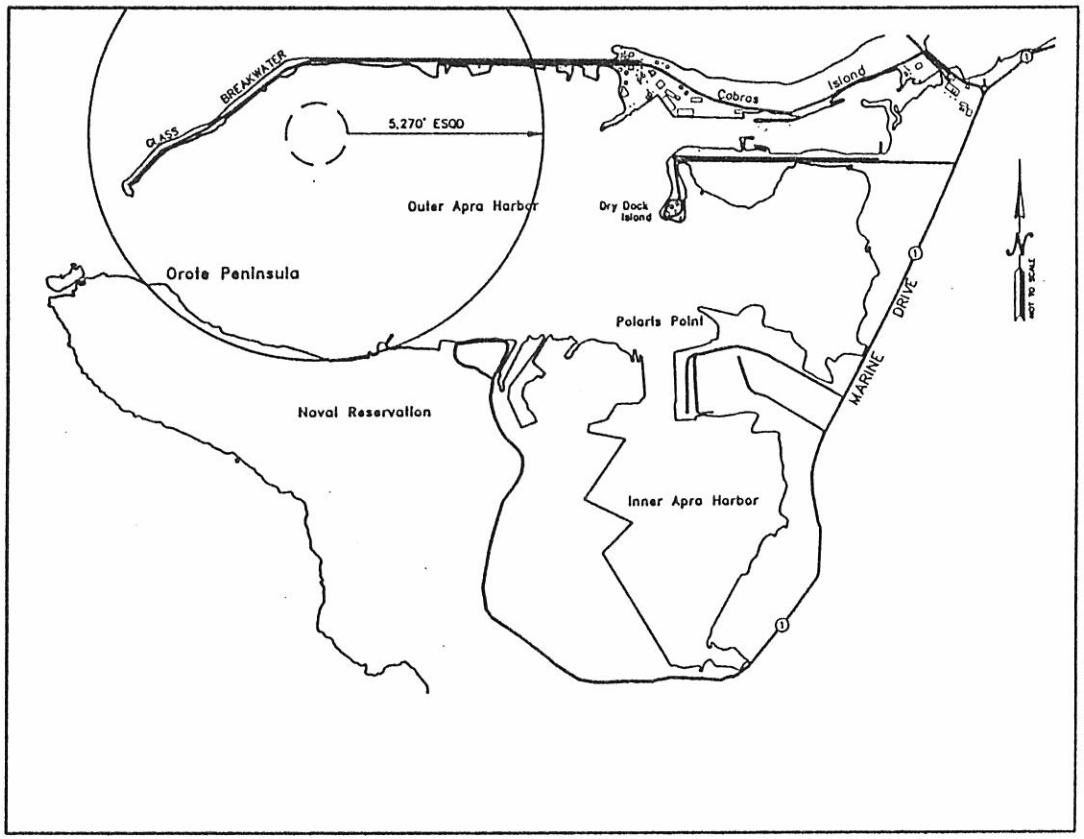


Figure 5.2 ESQD Arc Generated by Maritime Prepositions Ships in Outer Apra Harbor

Plan 4: Partially deepen the channel

Plan 1 did not change the existing depth. The rationale was that under the most probable future conditions, larger than 35-foot draft vessels would continue to bypass Guam because Guam-bound containers would constitute only 10 to 15 percent of the total load. The plan proposed to perform minor dredging off of Wharf F-6, removing approximately 44,900 cubic yards of material to a depth of 36 feet below MLLW. Additionally, the plan proposed to reconstruct the existing bulkhead system and remove Transit Shed 2.

Plan 2 proposed to dredge the entire 2,950-foot channel and the existing F-Wharf area to a new depth of 40 feet below MLLW. Approximately 135,700 cubic yards of dredging was estimated. In addition, the entire length of the existing bulkhead of 1,950 feet would require reconstruction to preserve the stability. As in plan 1, Transit Shed 2 was to be removed.

Plan 3 proposed to dredge the existing channel to a depth of 36 feet (as in Plan 1), but also to extend the wharf beyond F-6 a distance of 400 feet eastward. The additional 400 feet would provide an effective total wharfage (F-5 to the new wharf) of about 1,700 feet, equal to the average length of two 700-foot container ships. A total of approximately 118,700 cubic yards would be dredged. Under this plan Transit Shed 2 was to remain in place.

Plan 4 proposed to dredge the existing channel to two separate depths. The initial 2,000 feet (west end) would be dredged to a minimum depth of -40 feet and the final 950 feet (east end from the middle of Wharf F-5 to the end of Wharf F-6) would be dredged to a minimum depth of -36 feet. A total of 78,300 cubic yards of material was estimated for removal. The initial 1,000 feet of the existing bulkhead along Wharves F-4 and F-5 would require reconstruction and Transit Shed 2 would be relocated.

The Corps recommended the adoption of Plan 4. A channel and berthing area with a minimum depth of -40 feet would accommodate the so-called C-9 class of container ships which has drafts between 32 and 35 feet, is 860 to 950 feet in length, and carries between 2,500 and 3,500 containers is a 13-wide configuration. The C-9 class of vessel is the largest of the Panamax vessels (it can negotiate the Panama Canal).

5.3.6.2 Deep Water. As cargo traffic increases, additional wharfage areas will be required. Inevitably, areas of usable water frontage will become exhausted. To increase docking capacities, one option is to expand the docks by creating additional wharves. Unfortunately, the logical areas to expand the docks are within deep waters and will require large amounts of fill or lengthy piles. These areas include Hotel Wharf, Golf Pier, and the area between these two docks where the ocean bottom ranges from 60 to 100 feet below sea level.

5.3.6.3 Narrow Lands. Although areas near the Glass Breakwater are ideal for docking of ships, the narrow area behind the wharfage limits the type of activity that can be accommodated in this area. Maneuverability and storage space will be limited due to the narrow land. Filling of this area to increase the storage area will also be costly due to the deep waters

5.3.7 Environmental Issues. Due to environmental concerns, not all of the land within the Commercial Port is available for development. A wetlands is located at the area east of Drydock Island. Furthermore, using the land under the oil tank farms for uses other than fuel storage will more than likely require clean-up measures. Other areas of environmental concern include possible soil contamination both under existing property and off-shore.

5.4 Layout Alternatives

The previous sections have listed the various needs of the Commercial Port as well as the limitations, constraints, and key planning considerations, both internal and external. To meet both short and long term goals of PAG and Guam as a whole, the individual needs of the Commercial Port must be integrated into a cohesive plan. This section discusses alternative plans for the Commercial Port that will meet both long and short term PAG needs.

It is clear that locating and sizing the port's prime functions—container cargo operations, including the need for a deep draft berth(s)—is the single most critical planning variable. All other port functions are either dependent upon the container yard, or are clearly secondary in terms of priority. Therefore, as a first step, four alternatives were analyzed for the container yard/deep draft berth. Once the container operation needs were assessed, the resulting recommendation was used as basis for the second planning step of laying-out all other port functions. Finally, this plan assumes the availability of BRAC lands in Inner Apra Harbor and fully incorporates the recommendations of the Draft BRAC Business Reuse Plan dated October 1996.

5.4.1 Container Operations/Deep Draft Berths. Container cargo operations are currently supported at wharves F-3 through F-6, which share space with the sometimes conflicting requirements of the fishing fleet, cruise ships, and break bulk cargo. A number of warehouses and other support structures are interspersed within the 26-acre container yard immediately adjacent to the wharves.

To accommodate the projected increases in cargo to Guam in the coming years, it is prudent to plan for an orderly expansion of the storage capability of Commercial Port. The availability of lands within Inner Apra Harbor is likely to provide Guam the opportunity to actively market those facilities, and along with it, the potential for Apra Harbor to become a major ship repair and/or transshipment center.

Success in attracting private investors and shipping companies could in turn lead to the need to support post-Panamax vessels—those too large to traverse the Panama Canal.

However, from an economic and market-demand perspective, the need to expand cargo handling capabilities to accommodate post-Panamax class of vessels is not immediate. An aggressive and innovate marketing effort, coupled with improved and expanded facilities could, at some point in the future, cause Guam to become a desirable transshipment point for the Asia-North America trade. Until then, it does not make economic sense for the PAG to invest scarce resources in developing berths and facilities to support a class of vessels that have yet to show interest in Guam. The prudent action is for Guam to improve operations at its existing container port, selectively expanding it to accommodate near to mid-term demands. Guam should have an on-the-shelf plan, however, that can be implemented once its marketing efforts bear fruit and generates real interest in deep-berth post-Panamax transshipment activities.

The remainder of this section discusses first, improvements and expansions to the existing container yard; and second, planning alternatives for a deep draft, post-Panamax container transshipment operations that could be finalized when marketing proves successful.

5.4.1.1 Short- to Mid-Term Improvements to Existing Container Operations. With cargo handling facilities already available at the F-Wharves, expansion of the area remains the most logical plan. A centralized area for handling both containers and breakbulk saves both time and cost since handling of material will be minimized and savings due to resource sharing can also be realized. The expanded area would be able to accommodate all cargo. The area near Wharf F-1 will remain as the liquid bulk wharf as Mobil and Shell Oil hold long term leases in this area and petroleum storage facilities already exist.

Expansion of the container yard's capacity can be accomplished in stages. The recommended sequence consists of the following phases:

1. Relocate the fishing fleet and cruise ship functions to Victor Wharf in Inner Apra Harbor.

2. Install two new cranes, relocate the electrical substation from behind Wharf F-5 to the rear of the container yard.

3. Demolish the container freight station and Storage Shed 2 to new facilities in the Cabras Island Industrial Park.

4. Dredge Wharf F-3 to 30 feet.

5. Relocate the port headquarters to Cabras Island Industrial Park.

6. Relocate the parking lot at the main gate.

7. Extend Wharf F-6 by 900 feet to accommodate two, 700 feet long ships, add an additional container crane, and expand the container yard to the western boundary of Cabras Island Industrial Park.

Relocating the fishing fleet and cruise ship functions to Victor Wharf will free up the already congested F-Wharves for container and breakbulk handling and give these functions opportunities for growth. These industries are logical candidates to be relocated since fishing boats and passenger cruise ships do not require very deep drafts like container ships and the amount of space available for shore-side facilities at Victor Wharf are clearly adequate for their needs. With over 3,000 feet of wharf frontage, the Victor Wharves can easily accommodate these industries.

The area near Wharf F-1 currently receives breakbulk with the breakbulk material being stored in existing storage sheds. This area can continue to function in this way while the remainder of Wharf F is being used to receive containers with the container storage yard to remain in this area. The extension of Wharf F and expansion of the storage yard inland will create more usable container storage and handling space. The extension of the wharf will involve the construction of new wharf structures and some dredging of the harbor. Expansion of the storage yard will involve extending the Commercial Port boundaries to Cabras Island Industrial Park.

Locating the Port Headquarters near the cargo handling facilities, while preferable, is not essential to maintain its operations. Moving the headquarters to Cabras Island Industrial Park will free up valuable cargo space yet still be in the proximity of the harbor.

As mentioned above, liquid bulk, or petroleum products, are stored in an area west of Wharf F-1. Keeping the same function in this area is the most feasible alternative since storage and handling facilities already exist here. However, there is no room for expansion in this area due to the container and breakbulk storage to the east and narrow lands to the west. But Shell and Mobil Oil personnel have indicated that there is ample storage space to accommodate the near future and Shell Oil also pipes petroleum to off-site storage facilities.

5.4.1.2 Alternatives for Providing a Deep Draft Vessel Terminal. For Guam to effectively market itself as a transshipment center, it must, as a minimum, have the capability to accommodate today's and tomorrow's large container ships. Most of the world's shipping lines use large post-Panamax vessels that typically have a laden draft of between 40 and 46 feet. The depths at the F-Wharf area are about 34 feet, while the depth within Inner Apra Harbor draft is between 26 to 35 feet. Hence, substantial work will be required at the existing facilities if Apra Harbor is to prove attractive to these classes of vessels.

While these large, modern container ships have yet to traverse the Asia-Pacific route through Guam, world-wide, the total number of post-Panamax class vessels is increasing due to their ability to maximize the economies of scale and transshipment logistics. The significance of a harbor to accommodate these large, deep draft vessels cannot be overstated. The future of world shipping rests with these vessels. Even though smaller vessels are still the norm, the ever-increasing numbers of post-Panamax class vessels means that larger and larger percentages of the world's container cargo is being shipped via these vessels. It is important to keep in mind that the whole point of using these larger ships is to maximize the economics of scale and transshipment logistics. Currently, the larger vessels carry over 6,000 TEU's, with 7,500 TEU vessels expected in the near future. Simply speaking, it is far more economical to move cargo by a 6,000 TEU vessel than to use multiple 2,000 TEU vessels.

The principal reason why Guam is not on any major Trans-Pacific shipping route today is the higher cost of the voyage—it is more economical to transport 2,000 to 3,000 TEU's of container via the shorter northern great circle route than by the longer equatorial route through Guam. But, should Guam offer a harbor capable of handling the large 6,000 and 7,500 TEU ships just coming into service today, it may present the economic advantage necessary for causing a shift in the shipping pattern.

Three alternatives to accommodate post-Panamax class vessels were considered as follows:

1. Construction of a floating pier between Wharves G and H.

2. Construction of a pier and container yard on new fill located between Wharves G and H.

3. Conversion of the Ship Repair Facility (SRF) area into a deep draft wharf.

As an objective, each of the three alternatives aims to off-load/dock a minimum of one C11 (5GVC) class container vessel which requires approximately 1,200 feet of wharf frontage, a draft of approximately 46 feet, and about 50 acres of container yard per berth.

Alternative No. 1—Floating Pier. A floating pier will allow the area between Wharves G and H to be used for the berthing of deep draft ships. A floating pier and support facilities for Apra Harbor would consist of a 1,350 foot floating pier, 1 container crane, 2 access bridges, a container conveyance system, and approximately 42 acres of container storage yard. The floating pier would be located between Wharf G and Wharf H as shown in Figure 5.3. The location is most suitable since it minimizes the length of the required access bridges. A wharf length of 1,350 feet was selected to allow additional shortening of the access bridge lengths while providing desired maneuvering space

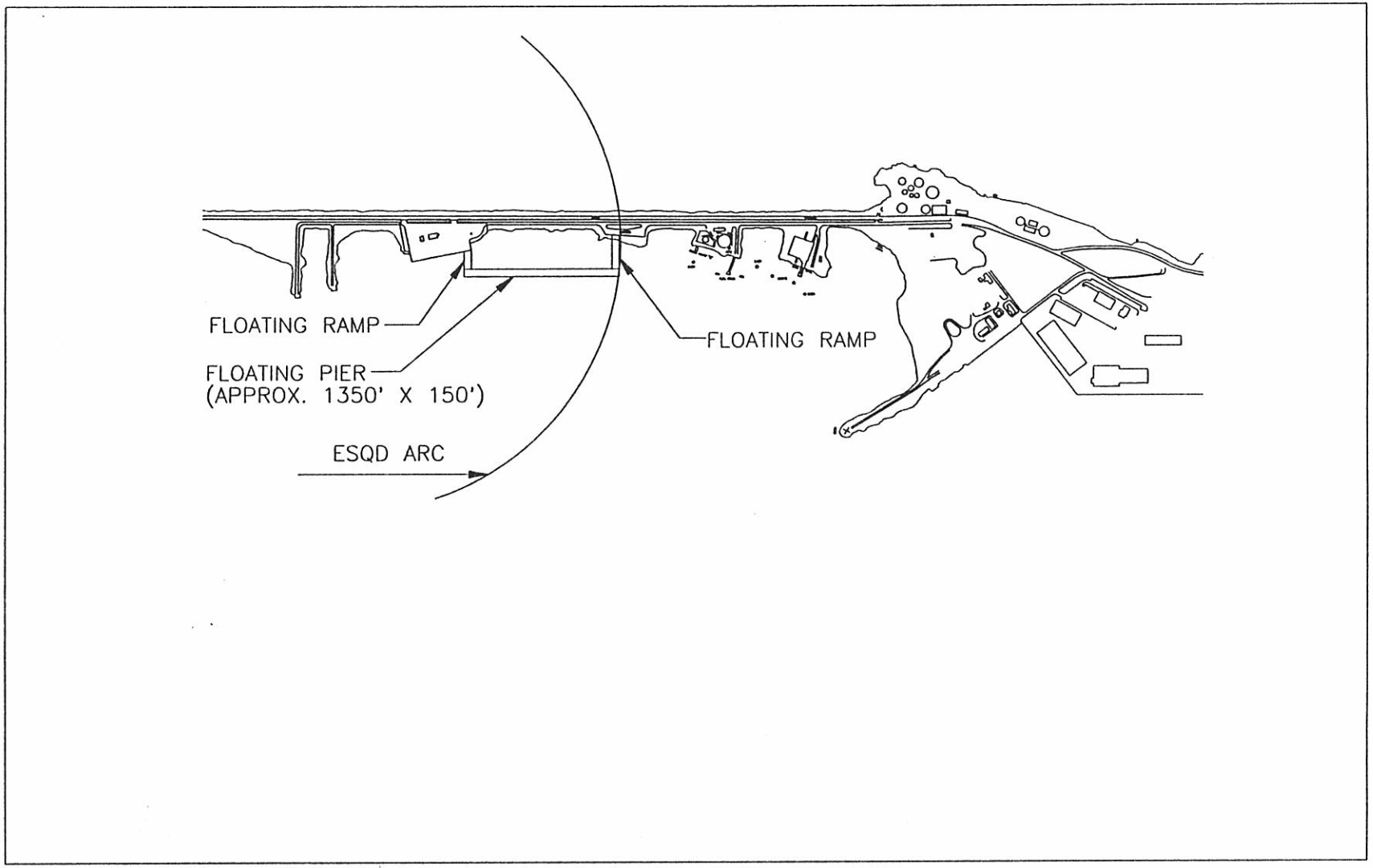


Figure 5.3 Location for a Possible Floating Pier

for trucks and other support vehicles entering and exiting the east and west access ramps from Route 11.

A floating dock, conceptually similar to the proposed facility for Apra Harbor, was constructed at the Port of Valdez in Alaska as a container terminal. At Valdez, a fixed pier was originally envisioned, but was found to be impractical due to potential failure during earthquakes. Hence a floating pier, anchor system, and two articulated access bridges were designed, fabricated, towed to the site, and installed. As designed the pier accommodates ocean carriers up to 50,000 gross registered tons and barges with capacities up to 15,000 tons. The pier was originally designed to accommodate a 40-ton container crane with a maximum outreach of 32 meters. However, the crane was deleted due to unspecified design difficulties. Hence ship cranes or mobile cranes are being used. Therein lies a potential Achilles heel for a floating crane. Efficiently offloading a post-Panamax vessel without high-capacity cranes is not likely to be possible.

There are at least three distinct advantages of siting a floating pier at Apra Harbor to accommodate post-Panamax vessels. The primary advantage of a floating pier is that it minimizes impacts to the underwater flora and fauna in Apra Harbor by eliminating the need for large fills. Second, floating piers are resistant to seismic activity since they are supported by buoyant forces as opposed to rigid supports. A third advantage of a floating pier is that existing port operations need not be significantly impacted during construction since the pier can be constructed elsewhere and towed to its final location. In addition, under a floating pier scenario, no port operations will have to be relocated or eliminated.

There are, however, major disadvantages to locating a floating pier between Wharves G and H for the berthing of post-Panamax ships. Of particular significance is that the area between Wharf G and Wharf H lacks sufficient backland area which can be utilized as a container storage yard. Consequently, the nearest area which is suitable for a container storage yard is the 42 acres currently designated for Lot 1 and Lot 2 of the Cabras Island Industrial Park.

In addition to being approximately sixteen percent smaller than the optimal 50 acres of container yard, the Industrial Park site would be located almost two miles away from the proposed floating pier. To convey containers from the floating pier to the container yard would require improvements to the breakwater to accommodate an additional lane of traffic, or alternatively, to accommodate a tracked container delivery system (e.g., railroad tracks). Both container delivery alternatives will require large capital expenditures which may make such a proposal cost prohibitive. In addition, Apra Harbor will lose much, if not all, of the price competitiveness offered by accommodating post Panamax vessels. Typically, an efficient rail transport system requires a minimum distance of 250 to 750 miles to offset the additional handling costs. The inefficiencies associated with other than a direct offloading and storage operation would

result in significant conveyance time, maintenance, and labor costs.

Moreover, maintenance costs of floating piers are generally greater than that for fixed piers. If Guam is to remain cost competitive with other ports, a floating pier located between Wharves G and H cannot be considered as an economically viable alternative. The limited area available for container yard space makes expansion of service for deep draft vessels difficult should the need be identified.

Alternative No. 2 - Fixed Pier between Wharf G and Wharf H. A fixed pier will allow the area between Wharves G and H to be used for the berthing of deep draft ships. This alternative provides a deep draft facility which is operationally sound while leaving the Ship Repair Facility unaltered. This alternative entails filling approximately 350,000 cubic yards to construct 1,200 ft of deep draft wharfage and 29 acres of container yard as shown in Figure 5.4. Facilities and operations located at Wharf G and the Seaplane ramp will need to be relocated along with fuel tanks to the north of Route 11 to provide a total of 48 acres of container yard space. Two post-Panamax class container cranes would be located at the pier to expedite loading and unloading post-Panamax vessels. In addition, a minimum of 1,200 feet of road between the Seaplane ramp and the existing north fuel tank farm will have to be improved to accommodate two lanes of truck traffic to ease access to the 11 acre portion of the container yard to be located at the existing tank farm located north of Route 11.

The proposed layout of the deep draft wharf and container yard facilitates efficient operations. The proximity of the proposed container yard to the proposed wharf allows use of much of the traditional container handling equipment, e.g., front loaders. In addition the layout eliminates much of the double handling of containers since containers will generally not have to be moved excessive distances to be stored. Minimization of this double handling of containers will aid in keeping operational costs down to maintain cost competitive advantages gained by accommodating post-Panamax vessels. In addition, fixed wharves generally have lower maintenance costs than do floating piers which will also aid in controlling operational costs.

There are, however, disadvantages. The primary disadvantage is the large amounts of fill required to construct the required wharf frontage and container yard space. Such a project is subject to opposition since some coral and other marine life habitat are likely to be eliminated or affected during construction. In addition, the fuel tank farm located north of Route 11 will have to be relocated and new fuel lines will have to be installed to service the relocated fuel tanks. There will also be considerable cleanup and certification costs associated with the relocation of the fuel tank farm.

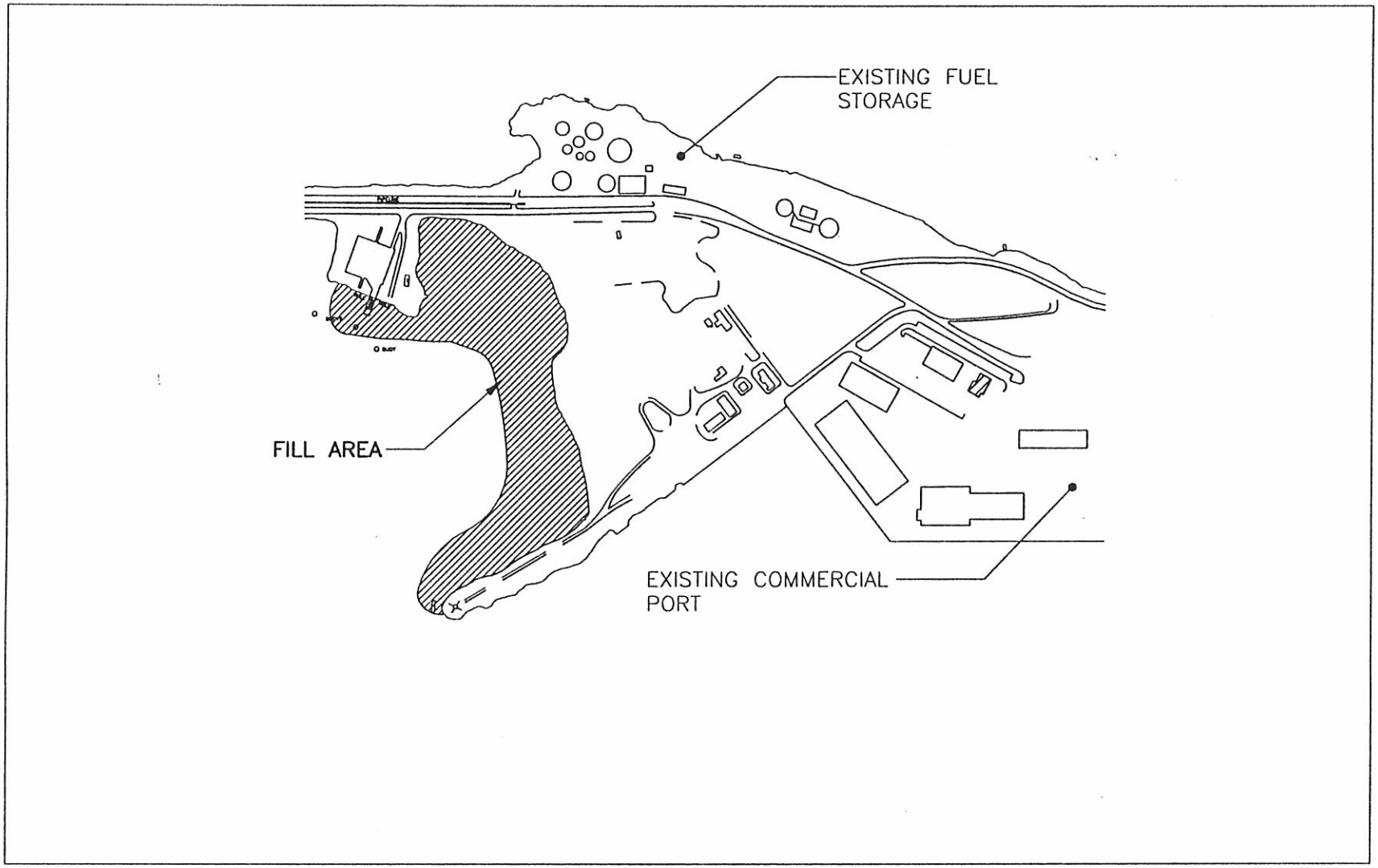


Figure 5.4 Fill Area for Container Yard Expansion

The proposed pier would also be located within the ESQD arc generated by the anchorage of the Maritime Prepositioned Ship(s) in Outer Apra Harbor. As discussed in an earlier section, no permanent construction within the ESQD arc is permitted without a waiver. Obtaining a waiver from the Department of Defense may not be trivial.

The construction of a fixed wharf and container yard between Wharf H and Southwest Point will be able to provide a moderately efficient wharf operation able to accommodate deep draft vessels. However, the high front end capital expenditures required may not be economically feasible since there is an alternate location which provides many of the same advantages with less effort.

Alternative No. 3—Fixed Wharf at SRF Area. The Navy has announced its intention to close its Ship Repair Facility (SRF) at the juncture of Inner and Outer Apra Harbors. As detailed in the Draft Business Reuse Plan for Apra Harbor, non-ship repair functions for the SRF area have become plausible due to the recent reversal by the Navy in regard to the requirement for Guam to maintain at least a minimal ship repair capability. The SRF site offers distinct advantages which include over 3,000 feet of existing Wharf G space in good condition, potential for an additional 2,500 feet of wharf with 50 to 60 foot depths, central location, 100 to 150 acres of backland, and good road access. Although construction would require capital expenditure in the millions of dollars, it would be more economical than the effort that would be required either on Cabras Island (present Commercial Port area) or anywhere else in Inner Apra Harbor.

Figure 5.5 is a schematic that outlines how, in the long term, the northern edge of the SRF area could be developed into a very deep wharf area. The figure shows the development of a two-berth transshipment terminal in two phases. The alignment is intended to take advantage of the naturally occurring 60-foot deep basin in the area.

Phase I. Conceptually, Phase I provides a 1,200 foot wharf at the east end and a backland area of approximately 50 acres. The drydock, AFDM-8, could remain in place and operational during the construction period by this phasing sequence. Such a configuration would allow a privatized SRF to operate as well-the SRF's main buildings, 20 and 21, remain intact.

To minimize capital expenditures, Phase I could be further divided into a Phase IA and Phase IB.

- During Phase IA, a free standing container wharf with access ramps at both ends for container hostlers-yard tractor and chassis units which shuttle the containers to the backlands storage yard-would be constructed. In addition, one or more relatively economical mobile cranes-on crawlers or rubber tires-could be utilized to load/unload the vessels. This would not

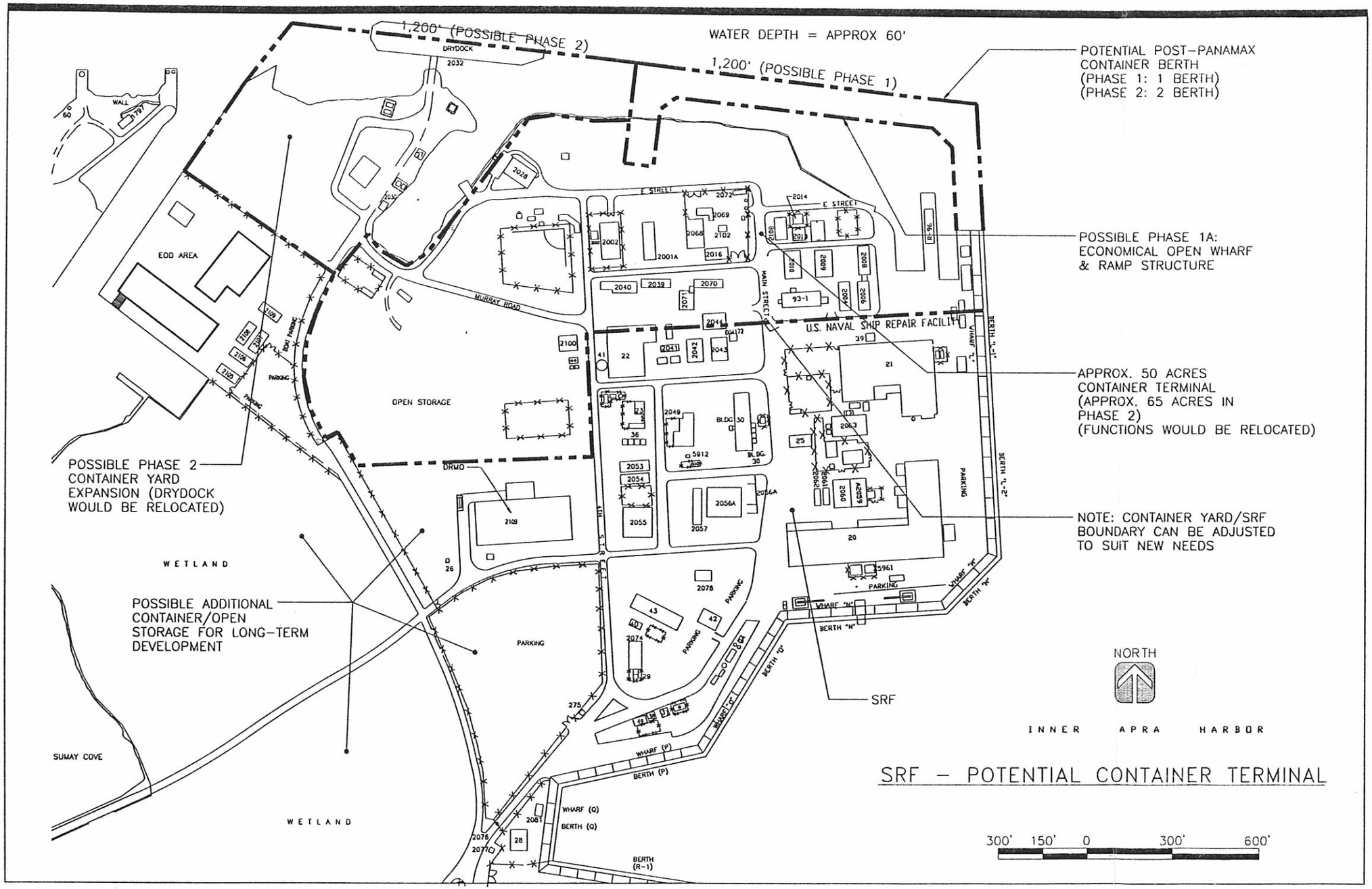

1,200' (POSSIBLE PHASE 2)
1,200' (POSSIBLE PHASE 1)
WATER DEPTH = APPROX 60'
POTENTIAL POST-PANAMAX CONTAINER BERTH (PHASE 1: 1 BERTH) (PHASE 2: 2 BERTH)
POSSIBLE PHASE 1A: ECONOMICAL OPEN WHARF & RAMP STRUCTURE
APPROX. 50 ACRES CONTAINER TERMINAL (APPROX. 65 ACRES IN PHASE 2) (FUNCTIONS WOULD BE RELOCATED)
NOTE: CONTAINER YARD/SRF BOUNDARY CAN BE ADJUSTED TO SUIT NEW NEEDS
POSSIBLE PHASE 2 CONTAINER YARD EXPANSION (DRYDOCK WOULD BE RELOCATED)
POSSIBLE ADDITIONAL CONTAINER/OPEN STORAGE FOR LONG-TERM DEVELOPMENT
SRF
DRYDOCK
EOD AREA
OPEN STORAGE
MURRAY ROAD
E STREET
MAIN STREET
U.S. NAVAL SHIP REPAIR FACILITY
DRMO
BLDG 30
PARKING
WETLAND
SUMAY COVE
WHARF "L"
WHARF "N"
WHARF "O"
WHARF (P)
WHARF (Q)
BERTH "L-1"
BERTH "L-2"
BERTH "N"
BERTH "O"
BERTH (P)
BERTH (Q)
BERTH (R-1)
NORTH
INNER APRA HARBOR
SRF - POTENTIAL CONTAINER TERMINAL
300' 150' 0 300' 600'

FIGURE 5.5

be a state-of-the-art approach, but it would initiate the use of Apra Harbor by large, post-Panamax ships.

- In Phase IB, the area behind the wharf would be filled and paved, rail-mounted post-Panamax container cranes could be added on rails that are planned during Phase IA, but built during Phase IB. On completion of Phase IB, Apra Harbor would own a state-of-the-art post-Panamax capable container terminal.

Phase II would add a second 1,200 foot wharf at the western end. The dry dock could be moved to Papa Wharf and the backlands could be expanded to 65 acres, still permitting a full-scale SRF. Moreover, should development be allowed in the wetlands area, then some or all of that 50 acres could be used as container backlands. Hence, Apra could develop a two berth state-of-the art container terminal of 100 or more acres.

The advantages of utilizing the SRF area include:

- Ability to provide an efficient operating deep draft container ship terminal.
- Minimal capital expenditures (when compared to other alternatives)
- Flexibility to expand from a one berth terminal to a two berth terminal.
- Easy accessibility to the site by trucks and other container handling vehicles.
- Minimize impacts to existing Apra Harbor Port operations.

A disadvantage of locating a deep draft vessel terminal at the existing SRF facility is that some SRF activities may require consolidation or relocation. However, even with the completion of Phase II, Apra Harbor will still be able to accommodate a full-scale SRF.

Conclusion. Converting a portion of the SRF area to accommodate deep draft vessels is preferable to construction of a floating pier between Wharves G and H for the following reasons:

- A port located at the SRF area will be able to operate more efficiently since fourth-generation post-Panamax cranes can be utilized at the site.
- There is sufficient room to locate a container yard adjacent to the wharf.
- Fixed ports generally have lower maintenance costs than floating ports.

- There is sufficient room for expansion of wharf frontage and associated container yard space if the need arises.

- Operation of a wharf located at the SRF area will be less labor intensive.

- A port located at the SRF area may allow Apra Harbor to be more cost competitive with ports located along the northern great circle route.

5.4.2 Fishing Facilities. As discussed in earlier sections, the port's service to longliners and purse seiners has steadily increased. Currently, wharves F-2, F-3, and F-4, are used by both types of fishing vessels in competition with break bulk carriers, container ships, and even passenger cruise vessels from time to time. Facilities at these wharves are generally inadequate to meet current demands. The alternatives are for either a significant improvement to the existing area or relocating the function elsewhere within the harbor.

While improvements can be made to the present site, such an investment makes little sense particularly when far better and suitable facilities will soon become available as the Navy returns significant portions of piers and backlands to the Government of Guam. Moreover, continued shared use of the area with break bulk ships and container ships—operations that will remain in place as discussed in Section 5.4.1—will result in continued congestion and inefficient operations.

The alternative—relocating the fishing industry requirements to Victor Wharf in the Inner Harbor—allows for future growth and could encourage private development of much of the infrastructures by the industry itself. Victor wharf offers an excellent long-term location for fisheries activities. The existing channel criteria and basin geometry (dredged depths) are adequate to support most of the known shallow draft type of fishing vessels. The berths are more than capable of supporting fishery related activities such as loading and unloading operations. Such a facility should provide adequate mooring, fuel, ice, storage, and fish processing areas. Adequate high pressure water at the dock should also be provided for vessel and equipment washdown. A wharf length of approximately 700 to 800 feet is generally required to support four 120-foot trawlers.

For the long-term, a fisheries support building (or buildings) should be planned. This would include storage bays and support areas. The existing Victor Wharf does offer some existing structures that could serve for use as storage facilities, but they are not immediately adjacent to the existing wharf. Additional amenities such as a small office area, showers, and laundry, as well as a lounge area, should be included in the design of these facilities.

One consideration that is currently under active review by Government of Guam planners is the exchange/transfer/

conversion of certain lease provisions pertaining to the Cabras Island Industrial Park with Victor Wharf. Specifically, GovGuam may want to negotiate a change to the lease terms so that instead of developing all of the Cabras Island Industrial Park, the developer would be asked to develop only a portion of it and a portion of Victor Wharf.

As the plan discussed in Section 3, Cabras Island Developers is currently authorized to develop the approximate 42-acre site into a light industrial area. Exchanging some of the Cabras development requirements for Victor Wharf development would give GovGuam a means to privately develop infrastructures to support the relocation of the fisheries [and passenger terminal facilities discussed later].

The relinquishment of some of the land earmarked for industrial development on Cabras Island back to GovGuam opens opportunities for alternative land uses. Specifically, since the Port's container yard is already adjacent to the Cabras Island Industrial Park, one logical option is to extend the container yard further eastward into a portion of what is now designated as the Cabras Island Industrial park. Additionally, the area will facilitate the relocation of functions that are non-essential to container and breakbulk operations to areas relinquished by the Cabras Island Industrial Park. For example, the port headquarters and other administrative offices of various import/export and shipping agents, as well as covered storage and maintenance shops, can be relocated to the eastern portion of Cabras Island providing contiguous open-space for container storage, handling, and transshipment operations.

5.4.3 Fuel Supply and Storage. Commercial fueling activities presently take place at Wharves F-1 and F-2, Golf Pier, and in waters in their immediate vicinity. The 1990 Master Plan stated that in 1989, 1,050,000 barrels of petroleum were handled. The Plan projected 15,500,000 barrels to be required by the year 2010.

Two companies currently distribute POL products on Guam—Shell Oil and Mobil Oil. Within the last year, Mobil Oil purchased the operations of BHP Petroleum on Guam. Shell Oil is in the final stages of acquiring all of the Exxon facilities. These mergers have reduced the number of competing POL distributers from four to two.

In acquiring BHP Petroleum, Mobil was able to expand its bulk storage capacity at its Cabras Island terminal from 329 million barrels (MB) to 495 MB. Mobil Oil, Guam, serves as a transshipment hub for the company. Oil is shipped to Guam via large-capacity tankers from Singapore and transshipped in smaller vessels to the various islands in Micronesia. According to Mobil officials, current utilization rates of their existing storage is high, but its storage capacity should be adequate to meet its needs at least for the next 5 to 7 years.

Shell Oil Guam owns the former GORCO terminal located in Agat, off Route 2. Shell also owns all the former GORCO POL lines that connect the Apra Harbor fueling point to the Agat terminal. At Wharf F-1, Shell offloads fuel from their tanker vessels vial POL lines into their storage tanks at Agat. Shell is also able to distribute fuel to fishing vessels at several fueling pumps located along the F-1, F-2, and F-3 wharves. The acquisition of Exxon's fuel facilities increased Shell's storage capacity by 177,000 barrels. Shell plans to continue using the existing storage tanks at Cabras Island and has no need or plans to develop and construct additional storage facilities.

Officials of both Mobil and Shell Oil agreed that the existing fuel facilities at Cabras Island are satisfactory and will remain adequate to meet all their needs for the short- to mid-term. Neither company has any expansion plans.

For the long-run, GovGuam should pursue joint use of the Navy's fueling facilities and distribution pipelines on Drydock Island. Because land for the construction of additional storage tanks on Cabras Island is not available, off-site storage—as Shell Oil and the Navy performs—is the logical long term solution to meet increased fuel-oil needs.

5.4.4 Port Headquarters/Administrative Offices.

The Port Authority headquarters is presently housed in a single building in the backlands of Wharf F-3. As the need for contiguous open container space becomes a priority item, existing structures within the current container yard should be relocated. There is no compelling and critical reason to site the Port headquarters adjacent to the wharf and container area.

Three alternatives were considered for an alternate location:

1. Cabras Island Industrial Park
2. Drydock Island
3. Ship Repair Facility Area

Locating the administrative headquarters in the to-be-developed Cabras Island Industrial Park has the advantages of general proximity to primary port functions, adjacency to the container yard and its operations, a location that can serve as a physical gateway to the Commercial Port area, and easy road access.

Drydock Island offers the advantage of a central location between the Outer and Inner Harbors, and a commanding view of the Outer Harbor, the entryway to the Inner Harbor, and the main entrance to the Outer Harbor.

The SRF area is intriguing in that because it is located at the centroid of both the Inner and Outer Apra Harbors, it has tremendous appeal as a command, control, and administrative area. Using the area as a Port Headquarters with an accompanying control tower for the Harbor Master to

control traffic is an attractive consideration. The view from a tower located in the vicinity of the present SRF would offer 360 degree surveillance of the environment.

We recommend that the Port Headquarters and general administrative service facilities be relocated to the Cabras Island Industrial Park. While both Drydock Island and the SRF area offer attractive advantages, higher and better use can be made

5.4.5 Commercial/Passenger Cruise Travel. The availability of Victor Wharf in the Inner Harbor areas through BRAC presents new options to service cruise travel needs. Presently, cruise ships dock at Hotel Wharf and Wharves F-3 and F-4, where competition with fishing boats, container ships, and breakbulk carriers exist. Hotel Wharf is an open concrete dock with no permanent structures to accommodate travellers. Several trailers serve as temporary facilities for small businesses. These trailers, however, do not service the international cruise industry and there are no other facilities available at the docks.

Although the market indicates that these present facilities could continue to meet the current and anticipated cruise ship traffic for the next decade, there are dissenting opinions that the very lack of these facilities is constraining a greater growth rate. Guam is a popular destination for large groups of Japanese tourists and the potential exists for a sizable increase in the number of tourists from East Asia, Europe, and the U.S. Through creative marketing and proper incentives, private developers could be encourage to create facilities that would serve to draw increased visits. The potential for an increase in private sector jobs is just one of the possible benefits associated with this proposed expansion. Together with developing recreational water facilities, marketing Apra Harbor as the "Port of Entry" for Micronesia and the Western Pacific should be the focus of cruise travel development.

The Draft BRAC Business Reuse Plan recommends that portions of Uniform and Victor Wharves be revitalized as an international passenger cruise terminal area. We concur. Moreover, as discussed earlier under Fisheries, negotiations with the Cabras Island Industrial Park developers should be pursued to exchange development areas between the Inner Harbor and a portion of the proposed development at the eastern end of Cabras Island. Should these negotiations be successful, private capital could be used to transform the Inner Harbor areas. Once the facilities are completed, present operations at Hotel Wharf, Wharf F-3 and Wharf F-4 could cease, making the latter areas more efficient and effective for breakbulk and containerized cargo operations.

5.4.6 Dinner Cruises and Day Trips. Local excursion cruises, including dinner and dance cruises and local day time cruises, is a market with great potential on Guam. Already a popular service in Guam, the development of new, consolidated facilities would help to expand

this market. Dinner cruises currently operate out of several locations—Hotel Wharf, Seaplane Ramp, and the Harbor of Refuge—none of them ideal. Using vessels with capacities between 20 and 150 passengers, it is one of the most popular of tourist venues. All anticipation is for a continued explosive growth in demand for these services. Even the most pessimistic estimate is that the demand will grow at the rate of tourism in general, 10 percent. Others expect a growth rate somewhat higher than the growth in tourism. Local Excursion Facilities typically require a small office structure of say, 1,000 square feet for passenger processing and direct access to a gangway for access to the vessels. While this type of facility may be preferred in most areas of the world, the local practice of performing much of these administrative functions at tour offices located in hotels will dictate the extent of facility support that would actually be required.

Two alternate locations are available—Victor Wharf in the Inner Harbor and Drydock Island. The Draft BRAC Business Reuse Plan proposes that the northern part of the Victor Wharf area be reused as a dinner cruise terminal. We concur with the recommendation.

The projected return of Drydock Island to the Government of Guam, will offer a second, supplemental site for basing dinner and day cruises ships. Adding the Dinner Cruise operations to Drydock Island would further enhance the attractiveness of Drydock Island as a recreational destination. Combining a central dinner cruise facility with the planned development of an adjacent tourist theme park at Drydock Island could prove an unbeatable tourist destination for Guam.

Relocating the existing dinner/day cruise operations from scattered locations in the Outer Harbor/Harbor of Refuge areas, will consolidate related activities of competing vendors and promote efficiency and customer service, as well as easing their management, control, and operations.

5.4.7 Recreational Boating Facilities. Surrounded by the Pacific Ocean and Philippine Sea, many recreational boaters call Guam their home. The demand for boat slips are greater than its supply, and rising steadily. The Harbor of Refuge, Agana Marina, and Agat Marina provide slips for these small boat owners, with waiting lists the norm at each location. Current slip demand is primarily for boats in the 30 to 60-foot range. Additionally, when threatened annually by one or more of the typhoons that invariably approach the island, small boat owners at Agana and Agat Marinas are at the mercy of the full fury of mother nature.

Presently, at the eastern end of Piti Channel, Aqua World and Umidori Cruises (Harbor of Refuge) together manage about 84 boat slips and landside leases for dive tours, fishing charters, dinner cruises, and an *Atlantis* submarine venue. If the commercial dinner/day cruise businesses (including the *Atlantis* submarine) and the fishing charters are relocated to the Inner Harbor and Drydock Island as

recommended elsewhere in this plan, more privately-owned boats can be accommodated in this area. Additionally, the return, or alternatively, joint-use, of Sumay Cove that lies next to the closing Ship Repair Facility (SRF) will provide additional boat slips for the general population.

5.4.8 Water Recreation Areas. Water recreation facilities are currently located at various locations throughout the outer harbor. Family Beach, an open, sandy beach primarily used by local residents for picnics and swimming, is located immediately west of Pier Dog; Hotel Wharf is used in part for cruise vessel docking; Golf Pier and the old Seaplane Ramp is used by diving and jet ski operators; and the Marianas Yacht Club operates out of Drydock Island. Consolidation of all public recreation functions at Apra harbor at a single location can provide an attractive alternative for these types of recreational activities beyond Tumon Bay.

As in most locations throughout the world, public recreational facilities are at a premium as there is never enough to satisfy everyone. With tourist arrivals expected to rise to nearly 2 million by the year 2000, Guam will need to expand is entertainment and activities for tourists beyond Tumon Bay. One concept with great potential is the construction of a tourist-oriented theme park that would capitalize on Guam's water recreation opportunities.

In reviewing the draft Port Authority Master Plan (June 1996), the PAG expressed a strong desire for consolidating public recreation functions at a single location or proximity. Drydock Island, an area soon to be released by the Navy to GovGuam, is the preferred location for such a venue. The presence of limited existing recreation facilities in the immediate vicinity of the releasable portion of Drydock Island offers an opportunity to consolidate, expand, and improve the level of service being provided. The area could be developed into a combined theme park, recreation area, and as stated earlier, a cruise/day travel terminal. Concurrent preservation of adjacent wetlands and marine sanctuaries would add to the overall attractiveness of the proposal.

5.4.9 Retail Centers. While retail facilities are not a responsibility nor function of a Commercial Port, in Guam's case their close proximity and integration with port-related facilities make joint planning essential. Two areas are recommended for consideration as retail developments:

- Victor Wharf in the Inner Harbor
- Drydock Island

The relocation and development of the fishing industry and passenger cruise travel services to areas vacated by the U.S. Navy along Victor Wharf in Inner Apra harbor will allow Guam to further promote these activities through the development of an adjacent commercial retial center. Such a

center would be aimed principally—though not solely—towards inbound and outbound passengers. Conceptually, a complex similar, but tailored to meet Guam's needs, to the *Aloha Tower Market Place* in Honolulu, *Seaport Village* in San Diego, and the *Fisherman's Wharf* in San Francisco, are possible. In proximity to passenger embarking and debarking areas, and the fishing industry's wharves and transshipment centers, private financing could be a natural fit for such a development concept.

For the Drydock Island area, to date at least one definitive proposal for a privately-financed commercial development has been made to the Guam Economic Development Authority (GEDA). The developer proposes a comprehensive attraction including a 2,000 seat amphitheater, a first class aquarium, botanical gardens, cruise ship terminal, cultural facilities, and aviary. The expressed private developer interest is evidence of the concept's financial feasibility.

5.4.10 Warehousing. Shipping, the business of the port, by its nature will always require supporting warehousing. While dockside warehouses are neither required nor in fact, desirable, warehouses that are located in relative proximity and easily accessible by land transport means, is critical for efficient port operations. Steady increases in cargo handling capabilities of the port will require a corresponding increase in warehousing space. Moreover, the relocation and demolition of structures adjacent to wharves F-3, F-4, F-5, and F-6 for breakbulk and container operations will in turn increase the demand for warehousing. Cabras Island Developers is currently tasked to develop Cabras Island Industrial Park. Notwithstanding that GovGuam may negotiate a swap of areas to develop (Cabras Island for portions of Victor Wharf), the lessee and the PAG should move forward with plans for developing the industrial park, including the construction of new warehouse space.

5.4.11 Hazardous Waste Facilities. As the discussion at Section 2.9 pointed out, the Port does not currently have a RCRA-licensed facility for storing hazardous wastes until they can be processed for shipment and permanent disposal in the Continental U.S. The existing facility fails to meet a number of RCRA mandated standards, not the least of which is siting outside the 100-year flood plain.

Two alternatives are available to Guam: (1) Obtain a waiver to the requirement to be outside the 100-year flood plain, or (2) Enter into a cooperative agreement with the U.S. Navy for the storage/disposal of hazardous wastes through existing Navy facilities.

5.4.11.1 Obtaining a Waiver. The Resource Conservation Recovery Act (RCRA) and its corresponding GEPA regulations establish strict standards for hazardous waste management. GEPA's Hazardous Waste Management Regu-

lations states that its objective is "to establish a program which identifies hazardous waste, regulates hazardous waste storage, treatment, handling, transport and disposal, and establishes capabilities of inspection and enforcement to ensure that hazardous waste management activities shall not jeopardize human health and are carried out in an environmentally sound manner."

Although there is some rationale to consider re-evaluation of the 100-year flood plain—a new seawall has been constructed along Route 11, for example—there is little substantive evidence for optimism. Neither is there optimism that a waiver can be easily obtained. Moreover, there have been informal comments that the constructed facility is too small to meet PAG's needs. The available storage volume reportedly cannot fill a 40-foot container. Even if the flood plain update is successful, or a waiver to the requirement is obtained, the facility itself may require extension.

5.4.11.2 Joint Operations with the U.S. Navy.

Two different cooperative agreements with the Navy are possible. In the first case, PAG/GovGuam could reach agreement whereby their hazardous wastes, used batteries, and waste oil products would be accepted by the Defense Reutilization and Marketing Office (DRMO) for disposal. Since the DRMO already operates facilities that comply with RCRA standards, a cooperative agreement/contract would relive GovGuam and PAG of duplicating these specialized facilities.

Alternatively, GovGuam can take advantage of the on-going efforts by the U.S. Navy to privatize many of their functions. Among the operations under consideration is that being carried out in Building 2002 for the "HAZMIN program." Located within the SRF compound, building 2002 is a large, relatively new concrete warehouse with roll-up doors, floor berms, separate acid storage room, steel racks, fire protection systems, and a small office. The Navy conducts its HAZMIN program out of this building and building 23, a smaller facility. The purpose of the HAZMIN program is to store hazardous materials that are considered "excess" or with an expired shelf life.

Under BRAC, the Navy is considering releasing the facility to GovGuam for privatization. Upon return of the facility to Guam, it would be operated by a private concern. The Navy, along with other customers such as GovGuam (including PAG) and private businesses and individuals, would become a paying customer. The newly privatized operation would not only continue serving DoD customers, but would also provide a much-needed service to the island community.

At least one local business has expressed an interest to assume the operations of the HAZMIN operations being carried out in Building 2002. The company believes the facility would be ideal as a hazardous waste management facility as well as its present purpose as a hazardous materials storage facility.

In addition to hazardous wastes, either alternative—DRMO or a privatized HAZMIN operation—could easily be structured to accept PAG's waste (used) oil and used batteries. Waste oils are regulated as to disposal methods, allowable contaminant levels, and spill containment measures. Used batteries are not regulated per se. So long as the battery acid remains contained within the shell, the used battery is not considered a hazardous waste. However, the contents are considered hazardous waste.

In considering the two primary alternatives available to the PAG—request a waiver of the RCRA requirements, or secure a joint agreement with the U.S. Navy/DoD—it appears prudent to take maximum advantage of existing Navy operations and its initiative to privatize them.

5.5 Summary of Recommendations

Figure 5.6 (Apra Harbor—Layout Alternatives) summarizes the possible layout alternatives discussed in the preceding paragraphs of Section 5.4. Figures 5.7 (Apra Harbor—Recommended Layout) and 5.8 (Recommended Layout Details) graphically portrays the recommendations summarized in the following paragraphs.

- Relocate the fishing fleet from the F-Wharf area to Victor Wharf in the Inner Harbor.
  - ▸ Consider the private development of fisheries support facilities at Victor Wharf by the Cabras Island Developers in exchange for a reduction in development requirements at the Cabras Island Industrial Park. Open negotiations with Cabras Island Developers to explore such an exchange.
  - ▸ Upon successful negotiation of an exchange of development sites, dedicate the released portion of the Cabras Island Industrial Park for further expansion of the container yard.
- Relocate cruise vessel docking from F-Wharf area to Victor Wharf in the Inner Harbor. Consider negotiating with the Cabras Island Developers for private capital development of a new terminal/arrival facility in the Victor Wharf area.
- Dedicate Wharves F-2 and F-3 to break bulk operations. Dedicate Transit Shed 1 as a covered break bulk storage facility.
- Demolish Transit Shed Number 2, Maintenance and Repair Shop, Rig/Welding Shop, Security Office, and Container Freight Station. Work with the Cabras Island Developers to construct replacement facilities in the Cabras Island Industrial Park.
- Relocate the Port Headquarters and shipping agency offices to a new facility at the Cabras Island

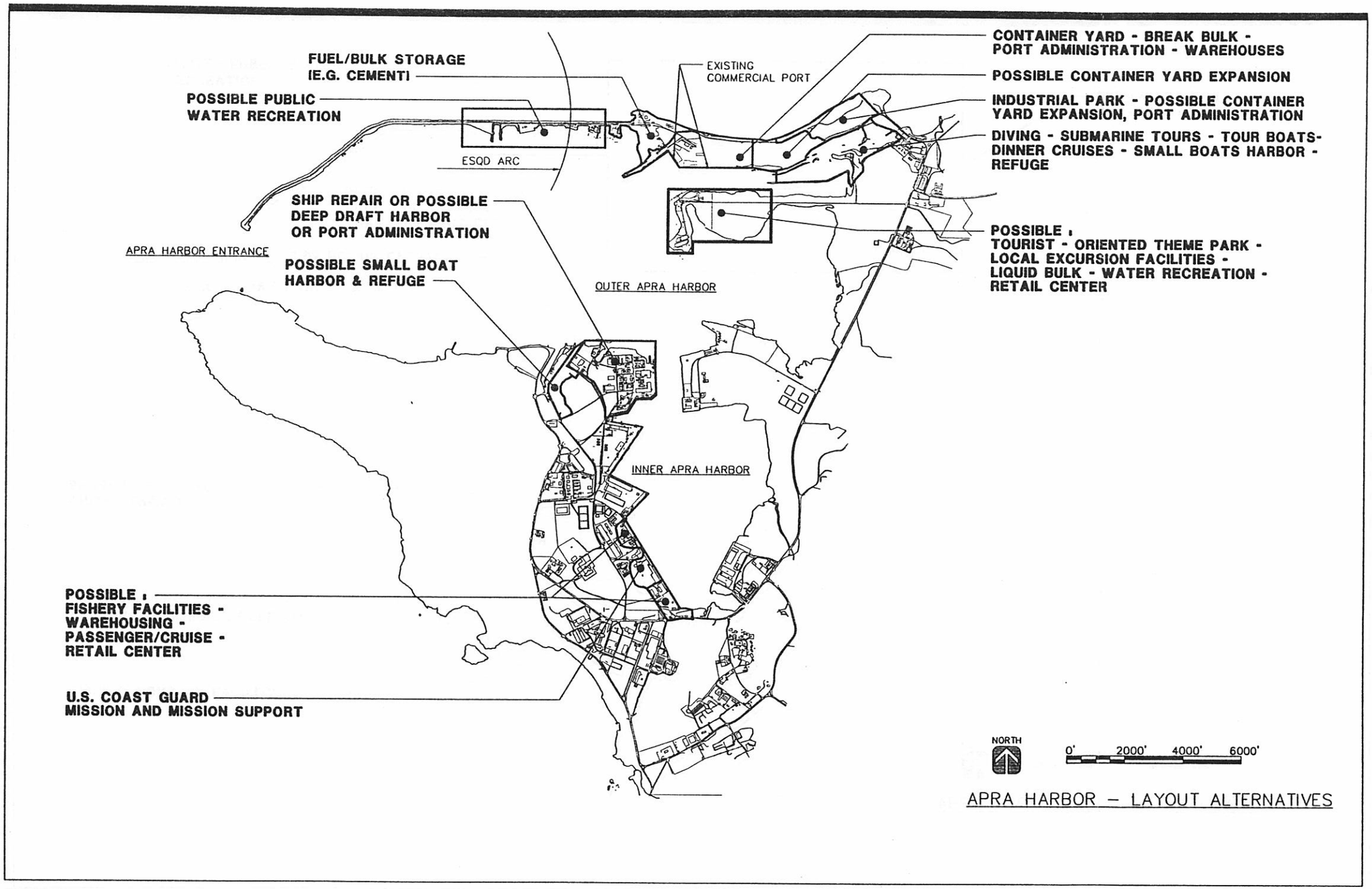
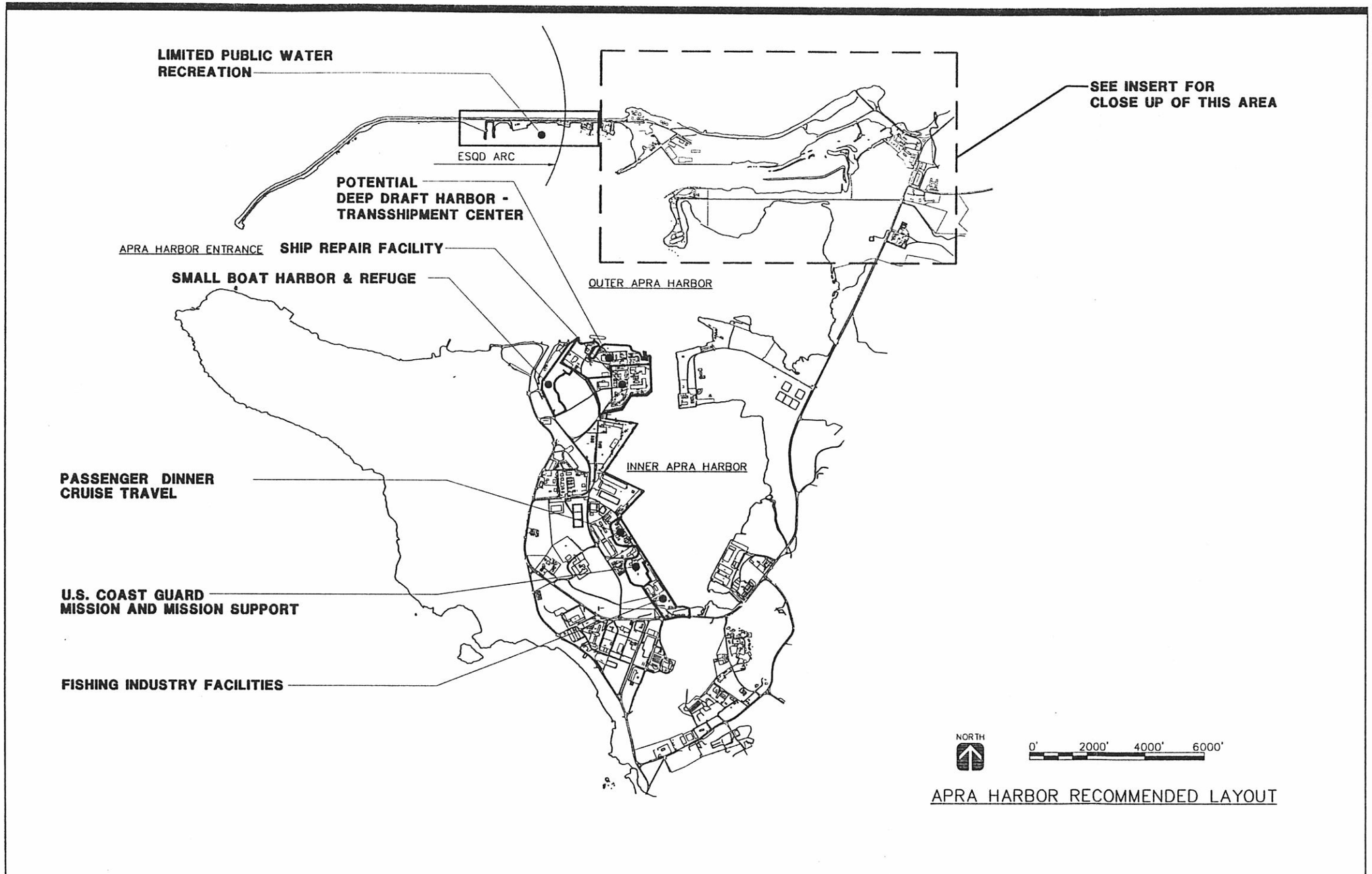

FUEL/BULK STORAGE
(E.G. CEMENT)
POSSIBLE PUBLIC
WATER RECREATION
EXISTING
COMMERCIAL PORT
CONTAINER YARD - BREAK BULK -
PORT ADMINISTRATION - WAREHOUSES
POSSIBLE CONTAINER YARD EXPANSION
INDUSTRIAL PARK - POSSIBLE CONTAINER
YARD EXPANSION, PORT ADMINISTRATION
DIVING - SUBMARINE TOURS - TOUR BOATS-
DINNER CRUISES - SMALL BOATS HARBOR -
REFUGE
ESQD ARC
SHIP REPAIR OR POSSIBLE
DEEP DRAFT HARBOR
OR PORT ADMINISTRATION
APRA HARBOR ENTRANCE
POSSIBLE SMALL BOAT
HARBOR & REFUGE
OUTER APRA HARBOR
POSSIBLE :
TOURIST - ORIENTED THEME PARK -
LOCAL EXCURSION FACILITIES -
LIQUID BULK - WATER RECREATION -
RETAIL CENTER
INNER APRA HARBOR
POSSIBLE :
FISHERY FACILITIES -
WAREHOUSING -
PASSENGER/CRUISE -
RETAIL CENTER
U.S. COAST GUARD
MISSION AND MISSION SUPPORT
NORTH
0'
2000'
4000'
6000'
APRA HARBOR – LAYOUT ALTERNATIVES

FIGURE 5.6



APRA HARBOR RECOMMENDED LAYOUT

FIGURE 5.7

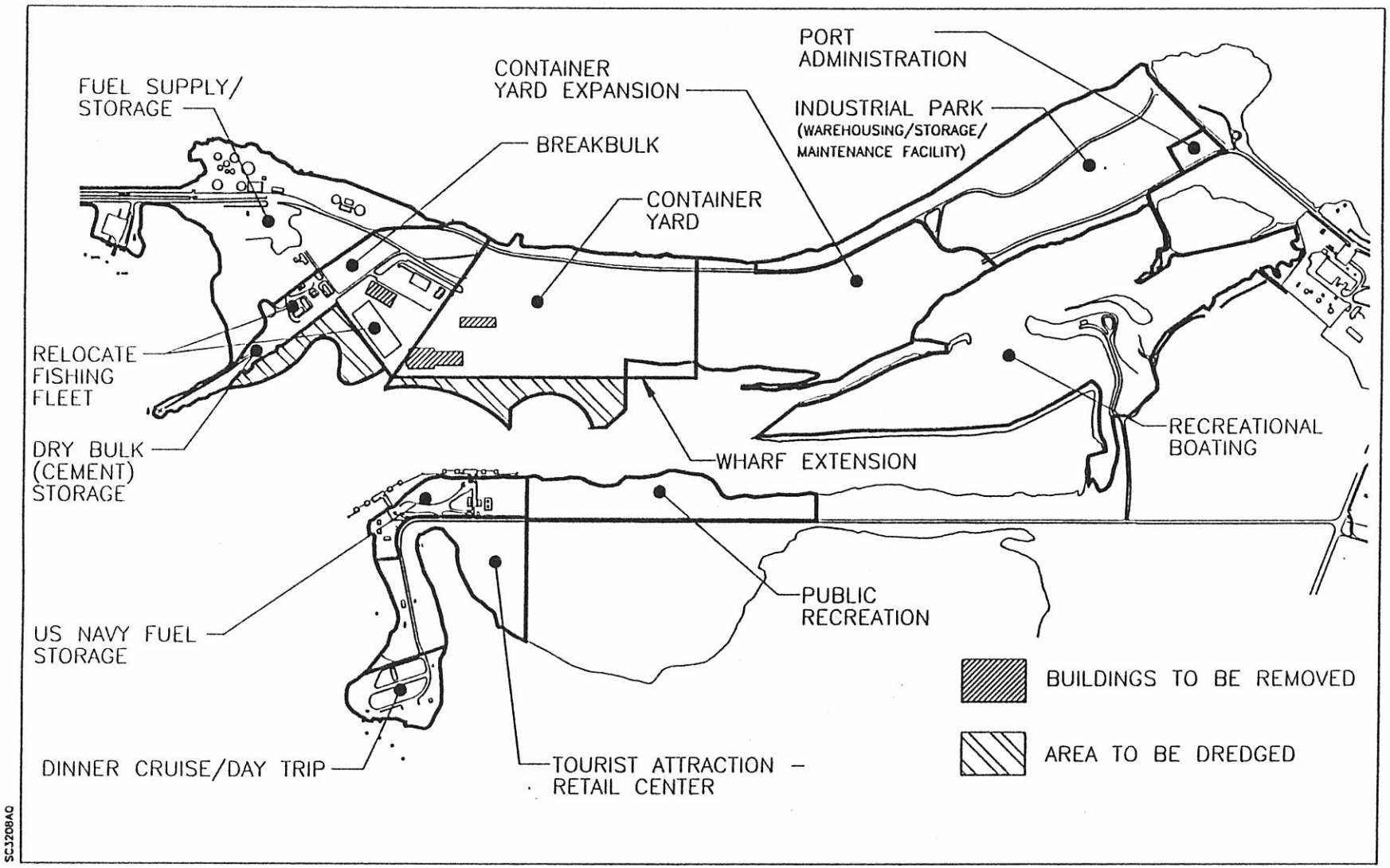


Figure 5.8 Recommended Layout Details

Industrial Park. Site the new Port Headquarters such that it serves as a visible "gate" to the Port and its facilities.

- Consider demolishing the Port Administration and SeaLand Offices to create additional open space for break bulk storage.

- Install two new cranes, and relocate the electrical substation from behind Wharf F-5 to the rear of the container yard.

- Dredge Wharf F-3, F-4, F-5, F-6 to -40-feet at the western end and to -36 feet at the eastern end. Reconstruct 1,000 feet of bulkhead at the western end of the F-Wharves.

- Extend Wharf F-6 by 900 feet to accommodate two, 700-foot long ships. Add a sixth container crane.

- Expand the Container yard to the western boundary of the Cabras Island Industrial Park.

- Upon progress toward the establishment of a regional transshipment center, develop a deep-draft transshipment facility to accommodate post-Panamax class of vessels at the SRF area as described in the Draft Business Reuse Plan.

- Relocate commercial dinner cruise, day cruises, diving/scuba operations from the Harbor of Refuge, Piti Channel, Hotel Wharf, and other Outer Harbor areas to Victor Wharf and Drydock Island.

- Dedicate the Harbor of Refuge to the recreational needs of private vessel owners. Negotiate with the Navy for joint use of Sumay Cove adjacent to the SRF area for additional use by private boat owners.

- Develop the area west of Fuel Dock D on Drydock Island as a public water recreation area.

- Limit areas within the MPS ESQD to public water recreation activities (eliminate commercial diving/jet skiing operations). Prohibit the construction of permanent facilities within the ESQD arc.

- Encourage the development of privately-financed retail/tourist centers on Drydock Island and in the vicinity of the proposed cruise ship terminal on Victor Wharf.

- Store hazardous wastes awaiting shipment for disposal at the Navy's FISC in the Inner Harbor. Conclude appropriate support agreements/contracts either with the Navy. Demolish existing, unlicensed hazardous waste facility on Cabras Island.

- Store used batteries and used oil through Navy facilities in the Inner Harbor. Complete support/contractual arrangements with the Navy for

them to accept and dispose of these materials at a mutually agreed upon cost.

- Retain fueling facilities at its present location. In the long-term, if additional storage capacity is required, use off-site storage terminals.

- Maintain existing navigation markers and aids. Continue working with the U.S. Coast Guard to ensure continued compliance with maritime standards.

5.6 Capital Improvement Program (CIP)

5.6.1 Financing Considerations. The previous portions of this section focused on the needs of PAG and layout alternatives identifying potential locations for the various PAG functions. The cost of completed these requirements are not insignificant, their ultimate viability being restricted by limited financial resources. Regardless of the nature of the CIP to be undertaken, private financing of expansions and developments will be necessary.

The markets into which the Port Authority is hoping to expand are either sufficiently tenuous at the moment (as in the case of the fishing industry) or large (as in container transshipment) to require fairly creative financing. One guiding principle of any future harbor development is that nothing should be financed that private groups would not themselves risk to fund or underwrite. The preferred action, of course, is to have the private sector finance all developments.

That said, it is reasonable for some funding of improvements where clientele are known and committed to be provided through Port Authority bonds that are retired by the client. Moving beyond these areas of proposed harbor development, however, will require financing that is more sensitive to, and linked to real market revenue prospects, than conventional public financing tends to be.

The development of greatly expanded container facilities, fishing services, and perhaps even passenger wharves is likely to encounter difficulties in finding receptive municipal and industrial bond markets given the challenge in conclusively determining the long term market demand for these projects. Developments in these areas will require private risk capital that even then will, in some areas, have to be offered incentives to be forthcoming. An element of that inducement will need to be high levels of private control and operation of any such harbor improvements.

Relinquishing facilities control and management may in fact be the central issue confronting the Port Authority in financing and inducing the harbor's future development. And, it is likely to be extremely controversial and difficult to accept, for a turn to port privatization along the lines seen in Hong Kong will certainly need evaluation. In Hong

Kong, for example, the government sells and deeds the waterfront and laydown for a market price, with the private sector then developing and operating the improvements solely at its discretion.

If fee simple deed transfers are politically and/or culturally unacceptable to the Port Authority, and long term leases are the best that can be offered to potential developers, then private financing is likely to be restricted to movable, relocatable, portable, or transferable improvements such as rolling stock. While this may not be workable for developing a fishing industry, it could be sufficient to develop the major portion of a large cargo transshipment system if the needed fixed improvements are financed by the Government. If the Government is to use public financing to improve fixed assets, it must do so in a fashion that overcomes lingering industry perceptions of the adequacy of the development and unnecessary constraints on the follow-on privately financed effort.

Looking beyond acquiescence of control and facility operation as an investment incentive, there are a variety of ways in which Guam may market and induce the very large private investment that would be needed to develop a major port at Apra Harbor. A combination of industrial revenue bonds and special economic zone bond financing may provide the right impetus provided the restrictive covenants that are commonly attached to these instruments are severely limited. Bond guarantees and special tax treatments could be structured in a manner that would provide sufficient incentive and reduction in risk to cause international shipping group(s) to construct the necessary transshipment facilities once the restraints of the Jones Act were lifted from Guam. With the prospects of changes to the Jones Act closer to realization, Guam, more than ever, must aggressively market itself and obtain large scale investor commitment to international transshipment.

5.6.2 Port Operations & Management Considerations. As discussed in the previous section, one of the critical factors that will determine the financing, and therefore development of expanded facilities and activity at Apra Harbor, will be the extent to which participants control their investment. In light of the fact that it will be difficult for public debt to totally—or even partially—finance the massive scale of development needed to become a major transshipment center, large quantities of private investment will be required. And, as we stated, that investment is not likely to be attracted to facilities that it cannot control.

More important than mere control, however, is the issue of rapid response and flexibility to market changes that private investors will both demand and—coincidentally—alone be capable of giving. Even independent public authorities are ultimately responsible to the taxpayer. Their reliance on government guarantees are such that it prevents changes in operations, policies, and business strategies that are frequently needed, and needed quickly by the market. Additionally, hiring practices and personnel policies of such

autonomous government agencies are subject to public and political pressures that preclude rapid upsizing and downsizing as the economy and market changes.

The harsh reality is that even if the system is emplaced to accept private participants, because the Port is publicly administered, it is not truly free of the pressures discussed above. Consequently, the port will likely find it difficult to meet the efficiency standards required for competing for private risk capital with other regional ports. For example, at present, the highly independent Singapore Port Authority is capable of operating just under 40 container movements per crane hour (and as high as 200 movements per ship hour). Hong Kong and Kaohsiung are capable of movements exceeding 30 container movements per crane hour. In comparison, Guam moves about 20 movements per crane hour (40 movements per ship hour with two cranes). Private investors are likely to find this disparity difficult to reconcile in risking their capital.

While some of this imparity is the consequence of low levels of investment possible under current conditions, some of it is also due to management policy. It is doubtful that the Port Authority could finance or manage a doubling of the current movements. The recent 10 to 20 percent rise in productivity announced at the port is no doubt the result of a growing awareness of the inequality, and could be sustained by the PAG management. However, this activity is only one of many aspects of harbor operations that would register considerable change if turned entirely over to private ownership and management.

Finally, in light of the immense and rapid move from current levels to where Guam needs to go in the near future as a regional transshipment center, it will be critical that managers who have been vitally involved in the operation of large market ports be pulled in to shape the changes at Apra. To do otherwise would be to impose a lengthy learning exercise on the process and no certainty of confidence from private sector for the capacity of the public management to do a job it has never been asked to do before.

Privatization of public activities has clearly demonstrated significant increases in efficiency and savings to the public served in various parts of the U.S. and the world. This has often been possible where no change in service other than efficiency has been desired. However, in the case of Apra Harbor, the opportunity to privatize is uniquely offered by the community's intention to go beyond efficiency, and radically alter the harbor's role in the Pacific.

Such an offering presents a litmus test of Guam's aspirations. If private investment will not or cannot risk the capital to create the major transshipment center that Guam envisions, then it will be a fairly certain indication that the Port Authority should not risk public funds in attempting to force its development. The challenge is to formulate the right balance of financial, managerial, and operational

incentives such that it makes the risks of the venture worthwhile.

5.6.3 Regulatory Considerations. In addition to financial and operational incentives, it is probable that special regulatory courtesies will be necessary to attract greater levels of private investment that currently exists. Despite the possibly lower entry price for doing business in Apra Harbor than at some competing ports in Asia, investors and shippers are not likely to effect a detour to Guam without a corresponding offsetting benefit. The port, for example, needs to establish and provide complete U.S. customs services at Apra Harbor that is more convenient to the shipper than comparable services provided at other ports of entry. Such a service could exploit the relative speed of services, proximity of the services, and integration with any value-added industry that Guam offers, relative to, say, Los Angeles, Long Beach, Oakland, or Seattle. Similarly, it may be possible for Guam to negotiate for preferential labor conditions to lower overall port operational costs as part of its on-going negotiations in Washington, DC, with respect to self-sufficiency and permanent political relationships with the U.S.

5.6.4 Project Priorities. Table 5.2 lists our recommended priorities for PAG capital improvements for the short-, mid-, and long-terms. The recommended priority is based on a number of factors including: facility needs as described earlier in this report, existing conditions and shortcomings, estimated cost of improvements, phasing considerations, relative ease of upgrades/improvements, minimizing impacts to on-going operations, and engineering judgment.

5.7 Concluding Remarks

Throughout the planning process, we found the leadership of Guam to be remarkably thoughtful, possessing an uncommon degree of foresight, and dedicated to their vision. Having an innate drive for success, we believe that by concentrating those energies on an innovative marketing effort, the community could realize positive economic consequences that are simply not predictable using conventional and traditional economic analysis techniques. As we stated earlier, Guam's ultimate future will be dictated by its willingness or aversion to undertake the marketing task, and by the degree to which the community would be willing to reinvent the role of Government and the Port Authority in achieving economic partnerships with the private sector.

Table 5.2
Recommended Priorities, Capital Improvement Program

No.	Description	Ten Year Implementation Schedule ($ Mil)										($ Mil)	Notes
		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total	
1	Develop fishing facilities at Victor Wharf and relocate from F- Wharf.	← Privately Developed →										$0.5	1
2	Develop cruise vessel facilities at Victor Wharf and relocate from F-Wharves.	← Privately Developed →										$0.5	1
3	Develop facilities at Victor Wharf and Drydock Island and relocate dinner cruise, day cruise, diving operations from the Harbor of Refuge, Piti Channel, Hotel Wharf and Outer Harbor.	← Privately Developed →										$0.7	1
4	Resurface existing container facilties	$1.5										$1.5	2
5	F-1 Fuel Pier Repairs	$1.7										$1.7	2
6	Demolish existing hazardous waste facility on Cabras Island and enter agreement with Navy for new facility at Navy's FISC.	$0.1										$0.1	
7	Negotiate with Navy for the joint use of Sumay Cove for private use owners and develop area for such use.	$0.1										$0.1	
8	Construct new port facilities at Cabras Island Industrial Park and demolish existing structures at F-Wharves (demo cost only).		$0.2	← Privately Developed →								$0.2	3
9	Install two new cranes at F-Wharves and relocate/upgrade electrical substation.		$2.0	$2.5	$1.5							$6.0	
10	Expand container yard to the western boundary of Cabras Island Industrial Park		$1.5	$1.5	$1.5							$4.5	2

No.	Description	Ten Year Implementation Schedule ($ Mil)										($ Mil)	
		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total	Notes
11	Sea Wall Protection @ Route 11B (Federal Funds not included)			$0.1	$0.1	$0.1						$0.3	2
12	Dredge areas fronting F-Wharves and reconstruct bulkhead.				$1.0	$3.0	$3.0	$3.0				$10.0	
13	Upgrade facilities at Wharves F-2 and F-3 for breakbulk operations.					$1.0	$1.0					$2.0	
14	Develop area west of Fuel Dock D on Drydock Island for water recreation							$1.0	$1.0			$2.0	
15	Expand container yard into Cabras Island Industrial Park by exchanging development sites with developer.								$2.0	$2.0	$1.5	$5.5	
16	Extend Wharf F-6 by 900 feet (New Wharf F-7)								$0.5	$2.0	$2.5	$5.0	
		$4.4	$4.4	$4.1	$4.1	$4.1	$4.0	$4.0	$3.5	$4.0	$4.0	$40.6	4

Long-Term (when market conditions support need)

No.	Description	Implementation Schedule ($ Mil)										($ Mil)	
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	
17	Deep-draft transshipment facility at SRF area (Phase I).											$15.0	
18	Deep-draft transshipment facility at SRF area (Phase II).											$15.0	
19	Expand off-site fueling facilities (Privately Developed)											$2.0	
												$32.0	

Notes:

1 Capital Improvements funded privately, PAG funds infrastructure support
2 Part of current CIP
3 Capital Improvements funded privately, PAG funds demolition work
4 PAG funded infrastructure work for items 1 and 2 included in 1997; for item 3, in 1998

Appendix A

Testimony of Governor Carl T.C. Gutierrez

Appendix A

Testimony of Governor Carl T.C. Gutierrez of Guam
Presented to
The House Subcommittee on Coast Guard and Maritime Transportation
on the Effects of the U.S. Coastwise Trade Laws
Presented by
Captain Eulogio C. Bermudes, USN, Ret.
General Manager, The Port Authority of Guam
June 12, 1996

Hafa Adai and greetings from Guam.

I appreciate the opportunity to present Guam's views on the U.S. coastwise trade laws and the effect that legislation has on Guam. Though this hearing was called to conduct an inquiry into the overall effect of the U.S. coastwise trade laws on the transportation system in the United States, the Jones Act has had a significant and direct effect on Guam's domestic offshore trades.

The issues to be addressed today include the adverse effects of the Jones Act on the economics of ocean transportation services between the U.S. mainland and Guam, whether there exists a valid basis for maintaining the Jones Act restrictions on Guam, and whether there are reasonable measures that can be taken to ameliorate, at least partially, the undesirable effects of the Jones Act on Guam. These issues were addressed in the comments of the Government of Guam, pursuant to section 407 of the ICC Termination Act, and submitted to the Department of Transportation on April 15, 1996, in DOT Docket No. OST-96-1066—*Request for Public Comment On Competition in the Noncontiguous Domestic Maritime Trades*. Because Guam believes that the issues of the effects of the Jones Act and regulation of ocean common carriers in the domestic offshore trades are interdependent, it is appropriate that those comments are also discussed.

Introduction

As a brief introduction for the Committee, I wish to note that Guam has the distinction of being the most remote destination of the domestic offshore jurisdictions subject to the cabotage laws of the United States. Guam is the largest and southernmost island in the Mariana Archipelago and is located over 6,000 miles from the west coast of the continental United States and 3,700 miles west southwest of Honolulu. Guam has a total of 217 square miles of land and is the home of over 130,000 United States citizens. Guam has been a territory of the United States since the Spanish-American War of 1898. The Organic Act of 1950 created the current government system, which established a governor and a twenty-one member unicameral legislature. The per capita income in 1986 was $7,116. I would like to extend an invitation to the members of the Committee to visit our beautiful island to become more familiar with us.

Guam, as an island economy, is heavily dependent upon ocean transportation. The vast majority of all goods are brought to Guam by ocean carrier. The service to Guam is provided by two such

carriers–Sea-Land Service, Inc. and Matson Navigation Company, Inc. (which recently bought out the Guam service of American President Lines, Ltd.). For many years Guam has been served by two major carriers which, until 1989, operated under an anticompetitive agreement exempted from the antitrust laws under section 15 of the Shipping Act, 1916. Although this rate agreement was discontinued in 1989, the carriers continue to engage in the practice of parallel pricing at rate levels Guam believes are excessive and unjustified. Unfortunately, entry in the Guam trade by new competitors is extremely difficult due to the economics of the Pacific domestic offshore trades, primarily influenced by the effects of the Jones Act. Thus, as a result of Federal legislative intervention, Guam's domestic offshore commerce is controlled by an anticompetitive duopoly of ocean carriers.

The Jones Act Represents a Substantial Barrier to Entry

The Jones Act prohibits foreign flag carriers from serving the trade between Guam and any other U.S. port, including both Hawaii and the U.S. West Coast. While a number of non-protectionist governmental intervention actions in the noncontiguous domestic trades can be readily identified, including adverse tax policy, unduly stringent vessel manning requirements relating to number, classification and citizenship, unduly restrictive citizenship requirements for the ownership of U.S. flag vessels and duplicative and unnecessarily burdensome vessel inspection procedures, it is the governmental actions associated with the Jones Act that are most easily identified as having the most significant limiting effects on the entry of ocean carrier competitors into the noncontiguous domestic trades.

The core of the Jones Act is the dual limitation of mandatory U.S. flagging of vessels serving those trades and the requirement that those U.S. flagged vessels be built in domestic U.S. shipyards. Of course, these limitations carry with them most of what is here defined as the non-protectionist interventions that also serve to restrict entry into the noncontinuous domestic trades. However, it is the U.S. flag vessel documentation requirements, particularly those applicable to the coastwise trades, that carry with them the U.S. citizen ownership restrictions, thereby largely precluding foreign investment in the domestic trades. This restriction on foreign investment in the domestic Jones Act fleet, coupled with the Jones Act's requirement that vessels in the coastwise trades by built in U.S. shipyards, results in the most significant cost impact on vessel operators contemplating entry into the noncontiguous domestic trades. These statutory restrictions on operators in the domestic trades create the greatest part of the Jones Act's barrier to entry into the domestic shipping market.

The importance of reducing or eliminating such interventions to increase the number of potential entrants into the noncontinuous domestic trades and the pivotal role that the Jones Act requirements play in limiting entry into those trades has been universally recognized by affected shipper interests and the offshore governments whose economies are affected. Thus, almost without exception, those interest have consistently sought to have the protectionist governmental intervention inherent in the Jones Act eliminated through either specific trade or commodity exemptions. These efforts have been strenuously resisted by interests that are protected by the Jones Act, including the U.S. flag vessel operators in the trades, the domestic

U.S. shipbuilding industry, and the maritime labor unions. It is important to remember, however that the resistance of these latter interests is not based upon arguments that the overall economic welfare of the United States is best served by a continuation of the Jones Act protectionist market interventions. Rather, those interest have chiefly relied upon tenuous arguments that the Jones Act operates as an essential element in maintaining a viable national defense.

The Barrier to Entry Caused by the Jones Act Should be Eliminated

We believe that the elimination of the barriers to entry created by the Jones Act would result in more carrier competitors entering the noncontiguous domestic maritime trades. Increased carrier competition in those trades would prevent carriers from engaging in the practice on non-competitive "parallel pricing", a practice of particular concern to Congress, as stated in Section 407 of the ICC Termination Act, which ultimately results in excessively high shipping rates.

Setting aside the issue of a total elimination of all Jones Act restrictions, there is the possibility of a more fine tuned method of reducing barriers to entry into the noncontiguous domestic trades to create more competition in those trades and eliminate the effects of parallel pricing. Consideration should be given to ameliorating the adverse effects of the Jones Act by eliminating that aspect which creates the greatest part of the entry barrier. The requirement that Jones Act vessels be U.S. built creates the most significant cost barrier to entry in the noncontiguous domestic trades. If this restriction were eliminated for the noncontiguous domestic maritime trades, foreign built vessels could be reflagged to U.S. registry with relatively small capital investment to create significant opportunities for new entrants into those domestic trades. While this modest action will undoubtedly be heard to effect adversely the U.S. shipbuilding industry, a matter discussed later in my testimony, it would certainly increase the number of vessels in the U.S. flag fleet and fulfill the national security interests underlying the Jones Act.

The Guam trade enjoys an exemption from the Jones Act requirement that U.S. flag vessels serving the trade be built in U.S. shipyards. Theoretically, this exemption should allow more entrants into the Guam trade and increase competition, eliminating the concern over parallel pricing. However, as analyzed in Guam's comments submitted to DOT, U.S. flag ocean carriers in the Pacific can serve Guam economically only with a combined "pass-by" service that calls at both Guam and Hawaii on the way to Far East destinations. To create new entry opportunities in the Guam trade, identical actions must be taken to open up the Hawaii trade. Thus, in the absence of extending this exemption to Hawaii, Guam will remain captive to the existing carriers who have combined Hawaii, Guam, and the transpacific foreign trades to profitably operate in this trade.

The National Defense Costs of the Jones Act Should be Shared by the Entire Nation

Ultimately if it is determined that the Jones Act is completely inviolate and must be retained in all domestic trades, then the issue shifts focus from the necessity and costs of the Jones

Act fleet to the issue of who should bear the burden of these costs. The Government of Guam calculates that the additional costs of the Jones Act restrictions on the economy of Guam is approximately $40 million annually. That means that each family on Guam pays about $1,139 per year to the carriers as a result of the Federally mandated "Jones Act Tax."

It is the position of the Government of Guam that it is inherently unfair to impose the full costs of the domestic Jones Act fleet on the ratepayers in the domestic trades when the benefit of the fleet inures to the entire nation. Just as the "peacetime" ratepayers in the Defense Transportation System, the Army-Air Force Exchange Service and the Navy Exchange Service, have resisted U.S. Transportation Command efforts to include a cost of war time "readiness" in their shipping costs, and are attempting to exit the Defense Transportation System for that reason, so do the Guam ratepayers object to paying a premium for the general defense of the nation in their peacetime commercial shipping costs that is not equally borne by the nation as a whole.

Even the proponents of the Jones Act, who cite the military benefits of the Jones Act, explicitly admit that there is a cost to the shippers and consignees in the captive Jones Act trades for this alleged benefit. As discussed below, that benefit is open to dispute. However, the cost is not, and it has been admitted. Thus, the ratepayers of Guam prefer that the Jones Act fleet be supported by other means than protectionist legislation, the full cost burden of which falls on only a very small segment of the country's population.

Eliminating the Barriers to Entry Created by the Jones Act will not Unduly Harm the National Defense

An option available to Congress to address the noncompetitive conditions in the Guam trade, which undoubtedly provides the shipping public with the most meaningful protection against abuse of market power, is that protection accorded transportation services consumers by the free market system unencumbered by artificial trade barriers. As has been analyzed above, the perceived problems in the domestic trades with pricing and competition are not the product of tariff filing or rate regulation per se. The noncompetitive nature of the Guam trade is primarily a function of the limited number of competitors, which has obviously been artificially restricted by the Jones Act. The entry of more competitors into the trades would undoubtedly produce lower rates and possibly more service options for shippers. It is the first preference of the Government of Guam that the barriers to entry created by the Jones Act be eliminated for the Pacific domestic offshore trades.

Proposals to grant more trade exemptions from the Jones Act have been attacked because allowing foreign flag carriers, which enjoy an unfair cost advantage over U.S. flag carriers, into domestic trades would result in putting the U.S. flag carriers out of the business or force them to reflag to foreign open registry. This assumption may have had some validity in the past but outside of the basic costs of building or repairing a vessel in U.S. domestic shipyards, and, possibly to a lesser degree, crew costs, the most current information indicates that there is really no objective basis for assuming a large operating cost differential between U.S. flag and foreign flag ships. Certainly, with

manned by civilian merchant mariners, thus creating an "in-house" capability that is not dependent on the commercial sector, and certainly not dependent on the continued protection of the Jones Act fleet. In light of this "in-house" capability of the Navy, it does not seem that employment of merchant mariners on Jones Act ships serving the domestic offshore trades is a major national defense issue. Similarly, it does not appear that the national defense hinges on maintaining a Jones Act fleet for the benefit of and the continued existence of the U.S. domestic shipbuilding industry, which for many years has had little large vessel construction business other than Navy contracts and, as far as the commercial fleet is concerned is almost nonexistent at this time. Indeed, no dry cargo container ships have been built in domestic shipbuilding yards in recent years and that situation is not likely to change much if the domestic offshore trades were opened to foreign flag vessels. Thus, it appears that a partial reduction the Jones Act fleet would not have a significant national defense implication, and that an exemption for Guam trade would have the dire consequences alleged by the defenders of the Jones Act.

If the Jones Act is Maintained, then Shippers Must be protected through Effective Rate Regulation

Until such time as there is meaningful competition in the Guam trade, which by definition can not exist as long as there are only two major carriers serving the trade, it is incumbent upon the Congress to ensure meaningful regulation is tailored to the specific conditions of the trade. Reduced regulation as is often espoused by the very carriers enjoying a duopoly in the Guam trade, i.e. repeal of tariff filing and rate regulation, is not appropriate or proper for a market that lacks sufficient competition. The marine transportation industry is very different from the motor carrier industry where capitalization costs are low and new entry is relatively easy. Nor is the marine transportation industry similar to the rail industry which requires significant capitalization costs, but where rates are restrained by easy substitution with motor carriage. The unhappy and controversial experience of the former ICC with captive shippers in the rail industry is perhaps a good example of how deregulation theory does not produce acceptable results when put into practice when competition is lacking.

Thus, it is absolutely necessary that there continue to be some form of enlightened and flexible tariff filing requirements coupled with fair—but meaningful—rate regulation. The defects in the tariff filing and rate regulation system applicable to the noncontiguous domestic trades before the enactment of the ICC Termination Act, especially in the Guam trade, have been well documented in the public records of the Federal Maritime Commission in the comprehensive rate case prosecuted by the Government of Guam (FMC Docket No. 89-26). The ability of the carriers to shift from the FMC to the ICC jurisdiction by artificially changing the contractual basis for cargo pick up and delivery services in the port area, effectively prevented either agency from exercising any meaningful regulatory authority over either carriers' rates or their tariff filing practices.

Even worse, however, over the long history of regulation in the domestic offshore trades, the FMC appeared to be interested in regulating only those carriers serving the larger domestic off-

shore trades, Alaska, Hawaii and Puerto Rico, and the ICC appeared to be totally uninterested in engaging in any form of regulation of water carriers in the domestic trades. The political trends of the 1980s and 1990s seemed to result in a competition between the two agencies to determine which could regulate less. Discrimination and rate reasonableness complaints were generally buried by imposing a morass of artificially high and overly technical burdens of proof on shippers, even when they were brought on the basis of statutes that imposed affirmative duties on the regulatory agencies involved. General revenue rate regulation was not undertaken by the ICC at all and the FMC did not undertake any general revenue investigations against any carrier other than Matson after 1980. While much of this regulatory inactivity can be excused on the basis of the perceived competitiveness of the Alaska and Puerto Rico trades, no such justification exists for the Guam trade. We believe Guam stands out as the single example of a domestic trade that has been totally neglected by agencies disregarding their fundamental statutory mandates and ignoring their own regulations.

Indeed, the recent Initial Decision issued by the presiding Administrative Law Judge in FMC Docket No. 89-26 specifically finds that the Commission's regulations that establish the methodology and standards for determining the reasonableness of rates in the domestic offshore trades will not be applied to the Guam trade. Those regulation were specifically intended by congress in P.L. 95-475 to establish clear and universally applicable guidelines for determining rate reasonableness issues. After more than 15 years of application of those regulations to all other domestic offshore trades, Guam finds that it stands alone in having no meaningful regulatory protection under them. We believe that this result is unconscionable and we will pursue our legal remedies to the fullest extent of the law. However, Guam's hope for the future lies in the new regulatory regime of DOT's Surface Transportation Board, established by the recently enacted ICC Termination Act.

Rate Regulation Needs to Be Improved

The ICC Termination Act has unified jurisdiction over the noncontiguous domestic trades in the STB, finally resolving the most problematical limit to effective regulation of the trades and curbing the abuse of market power by the carriers. By eliminating the artificial incentive for carriers to construct "joint through tariffs" with motor carriers that amount to little more than enhanced pick up and delivery services, cargo movements can probably return to the predominantly port-to-port movement pattern historically experienced before the 1989 cancellation of tariffs by Sea-Land and APL. The statute also continues basic tariff filing requirements and imposes a statutory standard of rate reasonableness. While these provisions are certainly the fundamental building blocks of effective regulation and meaningful protection of captive shippers in the noncontiguous domestic trades, there are aspects of the ICC Termination Act that must be amended by Congress if the goals of the statute are to be fulfilled.

First, there are major gaps in the coverage of the tariff filing and rate reasonableness provisions of the ICC Termination Act that must be closed if effective regulation is to be accomplished. Exemptions for major descriptions of traffic, shipper contracts and rail-water carriage produce avenues of evasion of regulatory

standards that could very well defeat the purpose of unifying regulatory jurisdiction with the STB. Ultimately, it is imperative that the STB's authority under the Act be crafted by Congress in a manner that produces effective regulatory oversight of the total movement of cargo in the noncontiguous domestic trades and forever shuts the artificial "loophole" that the bifurcated jurisdiction between the ICC and the FMC produced.

The statutory provision in the ICC Termination Act that must be repealed is the so-called "Zone of Reasonableness" (ZOR) provision set forth at section 13701(d) of the Act. In addition to this provision's inherent inequity, it was included in the ICC Termination Act on the basis of misrepresentations of law and fact during Congressional deliberations on the Act. Essentially, a group of four carriers serving the domestic offshore trades borrowed a provision of the Interstate Commerce Act that had heretofore only been applied to motor carriers in the contiguous United States and used "creative" legal arguments, to argue that this provision had been applied to domestic offshore water carriers "for the past 15 years". The Government of Guam, learning of the application of the provision on the eve of enactment of the Act, informed Congress that the ZOR of the Interstate Commerce Act applied only to motor carriers and that the theory of the carriers was an untested theory that had never been applied by the ICC. Indeed, in very recent rate increase orders issued by the ICC, no reference to the applicability of a ZOR is even mentioned. To date, the carriers have failed to respond the Government of Guam's analysis and have yet to cite a single instance where the ZOR was even applied to a domestic offshore water carrier rate increase. In light of this background, Congress should immediately repeal the ZOR.

In addition, the inherent inequity of the ZOR should lead to reexamination and ultimate repeal by Congress. The fundamental inequity in the ZOR as it now appears in the ICC Termination Act is that it vastly exceeds the annual rate of inflation now being experienced in the United States economy. This standard would allow the carriers to continue to escalate their rates in excess of the current rate of inflation notwithstanding the fact that the base rates going into the initial period under the ZOR are set at excessive and unreasonably high levels. Thus, the carriers would always be able to keep their rates far higher than reasonable levels with no ability for the ratepayers to challenge them as they are increased. Rather, the ratepayers would be forced to constantly challenge the "current" level of rates that would constantly be superseded by new annual rate increases. The legal circularity of such a system was experienced by the FMC under the Intercoastal Shipping Act of 1933, leading to interminable rate proceedings and significant legal issues as to whether the rate proceedings were moot before they were completed. Ultimately, this never ending rate inquiry system served to create regulatory paralysis and prevented shippers in the domestic offshore trades from ever obtaining any meaningful relief or even fundamental due process in having their complaints over rate levels being given timely and substantive consideration by the FMC. It was for this reason that P.L. 95-475 was enacted and it is for this same reason that the basic framework of that statute must be carried forward into the STB's regulatory system under the ICC Termination Act.

It may be argued by carrier interests that the ZOR as presently enacted allows for adjustments to the zone congruent with changes in the rate of inflation as expressed in the Producer Price Index. However, a reasonably careful reading of the statutory provision in question, 49 U.S.C. § 13701(d)(2), indicates that it is an unartfully drafted provision designed solely to provide a one-way device to increase the ZOR beyond any reasonable measure of the rate of inflation and increasing carrier costs. As drafted the 7.5% ZOR may only be changed by the same percentage change in the PPI for the preceding one year period after a rate has taken effect. That is, if the PPI increases by an annual rate of 2% to 3%, under a literal interpretation of the ZOR adjustment language, the ZOR range will increase to 9.5% to 10.5%, thus aggravating the gross inequity of this statutory provision in terms of providing any meaningful avenue of redress to shippers burdened with unreasonable rates. To bring the ZOR down to the rate of inflation now being experienced in the U.S. economy, the PPI would have to decline by approximately 4% over a one-year period, a deflationary trend in prices that is extremely unlikely to occur under current economic conditions. Thus, the legislation created a perpetual "cushion" for ever increasing rates, designed to expand over time. This is utterly inequitable to provide carriers in the noncontiguous domestic trades the statutory ability to automatically increase rates at an annual rate that is several times the rate of inflation. It is also inequitable to preclude totally shipper interests any meaningful avenue of legal redress against such rate increases, which are added to rates already established at unjustifiably high levels by almost any objective economic measure.

The ZOR, as now enacted, completely eviscerates the substance of the reasonableness standard of section 13701(a) and the ability of the STB to provide any meaningful regulatory protection to shippers against the abuse of market power by the carriers serving the noncontiguous domestic trades. This is especially true in trades where competition is lacking and a government sanctioned oligopolistic duopoly exists, as is the case in the Guam trade. The justification for this one-sided regulatory system during the deliberations over the ICC Termination Act was that the limiting factor on rate increases in the noncontiguous trades will not be the ZOR, but inter-carrier competition. In support of this argument the recent history of few rate increases in the Pacific domestic trades has been cited. This argument is wrong for two reasons. First, if competition is the real limiting factor on rates in the noncontiguous domestic trades, the ZOR provisions become meaningless and unnecessary immediately upon their enactment. Alternatively, if the ZOR does have a real effect on the rates in the Guam trade, it is clearly not in the public interest to implement provisions that substantively nullify the fundamental concept of rate reasonableness, as set forth in both the substantive rate reasonableness provision at section 13701(a) and in the Federal Government's Transportation Policy at section 13101(a)(1)(D) of the ICC Termination Act.

Ultimately, if these statutory provisions will have no operative effect in practice, then they should be removed. Obviously, this argument of the carrier interests in the domestic offshore trades is specious on its face and only serves as camouflage for the real reason why they support these provisions and the second reason why the competition argument supporting the ZOR

fails. It is clear that the ZOR related provisions effectively preclude legal challenges to increases in rate levels by establishing an irrebuttable presumption of reasonableness for rate increases far above the inflation rate. However, the provision also effectively precludes challenges to existing rate levels. When a complaint is filed carriers can easily overtake such actions by filing a never ending spiral of unchallengeable rate escalations. The desultory regulatory history of the Intercoastal Shipping Act of 1933 prior to the enactment of P.L. 95-475 should not be repeated under the ICC Termination Act and the ZOR provisions must be amended to reflect the lessons learned by predecessor agencies under previous statutes. The shippers in the noncontiguous domestic trades should not be condemned to repeating this painful and unjust regulatory history.

Obviously, the ZOR as presently described in § 13701 must be substantially revised and made to parallel the more evenhanded procedural and burden shifting relief accorded to carriers implementing general rate increases of 5% or less under the Intercoastal Shipping Act of 1933. Under this latter concept, General Rate Increases of less than 5% would not be subject to suspension and the carriers would not have to file any financial justification with less than a 3% GRI, figured in an annual basis. Although shippers could file complaints against GRIs of less than 3%, the carrier is further provided with not having the burden of proof that GRIs of 3% or less are reasonable.

Finally, a critical aspect of ensuring that the shortcomings of the FMC's administration of the Intercoastal Shipping Act of 1933 are not repeated is to undertake a process of implementation that better addresses the specific needs of both shippers and carriers in each affected domestic offshore trade. An investment in enlightened regulation at the outset of administering a new statute is to be vastly preferred to forging ahead without a sense of direction and constantly attempting to "catch up" to the experience gained in formal proceedings under specific but untested statutory provisions. This was indeed the basic concept underlying the 1978 amendments to the Intercoastal Shipping Act of 1933, P.L. 95-475, requiring that standards be promulgated in advance and reviewed every year by the FMC. That the FMC failed to adhere to this stringent requirement is a matter of history. The root cause of this failure is the FMC's concept of "one standard fits all" trades and its complete reliance upon the traditional notice and comment rulemaking process. These dual shortfalls in vision doomed the success of the substantial efforts made under P.L. 95-475 from the beginning. These processes only served to facilitate administrative convenience and maximize agency discretion and regulatory power by administrative fiat.

Enlightened regulation requires a process whereby the particular needs of affected interests under specific economic conditions are considered and those interests are allowed full participatory rights in the promulgation of the regulatory standards to which they must adhere. Thus, the process known as "negotiated rulemaking" should be undertaken by the STB in promulgating general revenue standards under section 13701(a) in the framework provided by the Federal Advisory Committee Act. Under this process all affected interests must be fairly represented on an advisory board presided over by a designated STB official and the advisory board could break down the task of an overall regulatory general revenue standard into its component

parts by breaking into subcommittees focused on each particular trade. A cooperative effort of this type will also dispel the notion of "winners and losers" in the promulgation of regulatory standards and instill in all participants a willingness to fulfill the spirit of the statute and imbue all resulting STB decision with an enhanced measure of legitimacy.

Conclusion

It is the position of the Government of Guam that there is an unavoidable connection between two fundamental issues concerning Federal legislation affecting the economics of the domestic offshore trade to Guam. First, the Federal government has created significant restrictions on free and open competition in the domestic offshore trades of the United States, largely caused by the application of the trading restrictions contained in the Jones Act. Second, in light of these restrictions it is incumbent on the Federal government to establish a system of effective regulation of rates charged by carriers in those trades to prevent the abuse of the market power those carriers enjoy as a result of the effects of the Jones Act. These two fundamental truths go hand-in-hand. If the restrictions of the Jones Act are lifted and the benefits of free and open competition are allowed to develop in the domestic offshore trade to Guam, the necessity for regulation diminishes and could even disappear. The one outcome that the Government of Guam will resist at all costs is a system that both creates the existence of market power by the carrier duopoly that controls our trade to the mainland U.S. and yet fails to provide meaningful protection against the abuse of that power to the severe detriment of the people of Guam. We trust that the Congress will perceive the justness of our position.