COMMERCIAL PORT of GUAM MASTER PLAN

Prepared for the
Port Authority of Guam
February 1981

By
MARUYAMA & ASSOCIATES, LTD., GUAM/
DRAVO VAN HOUTEN, INC., NEW YORK

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1.0 INTRODUCTION

1.0 INTRODUCTION

Guam is the largest and southernmost island in the Mariana chain. With a 1980 population of 105,800, it is by far the most populous island in Micronesia. It is approximately thirty miles long and ranges in width from four to eight and one-half miles and has a land area of about 209 square miles. The island is approximately 3300 nautical miles west of Honolulu, 1500 miles east of Manila and 1350 miles south of Yokohama. (See Plate 1, Commercial Port Master Plan)

Following the landing of Magellan in 1521, Guam was claimed by Spain. At the end of the Spanish-American War in 1898 the island was ceded to the United States and was administered by the U.S. Navy. The Japanese occupied Guam from the end of 1941 until mid-1944. Passage of the Organic Act in 1950 removed the island from the jurisdiction of the U.S. Navy and placed it under a civilian administration. The first governors were appointed by the President of the United States. It was not until 1971 that the first elected governor was inaugurated. Guam has a unicameral legislature consisting of 21 senators elected at-large for a two year term. Guam is represented in the U.S. Congress by an elected, non-voting delegate to the U.S. House of Representatives.

Although the political status of Guam was altered in 1950, free access to Guam was not permitted until August 1962. This initiated the modern era for the island. Guam is now an unincorporated territory of the United States. Although Guamanians are U.S. citizens, they do not vote in U.S. national elections. The original inhabitants were Chamorros, but today the population is an admixture of many cultures including Spanish, American, Filipino, Japanese and Polynesian.

The Mariana Islands are situated on submarine ridges formed by volcanic activity. The northern half of Guam is primarily a high plateau of permeable limestone which is underlaid by a fresh water lens. The southern half is the product of volcanic activity and consists of many ridges and valleys.

The climate of Guam is warm and humid. Daily high temperatures are generally in the middle or high eighties with lows in the low seventies to high sixties. Relative humidity commonly ranges between 65 and 75 percent in the afternoon and from 85 to over 90 percent at night.

Prevailing winds on Guam are the tradewinds which blow from the easterly direction. These winds are strongest and most constant during January through April when wind speeds of 15 to 25 miles per hour are common. Guam is located in the portion of the Pacific affected by Typhoons. These occur most frequently during July through October. From 1946 to 1976, Guam was affected by 14 typhoons which brought torrential rains and violent winds. The two most damaging were Typhoon Karen on November 11, 1962, and Typhoon Pamela on May 21, 1976.

With easterly trade winds predominating, Apra Harbor, with its entrance on the west side of Guam, is relatively well protected from the predominant waves. The Port of Guam, at the eastern end of Apra Harbor, is well protected from deepwater waves, generated by the prevailing winds however storm waves generated from the northwest through southwest are the most critical affecting the harbor entrance and outer Apra Harbor. Due to the size and openness of the outer harbour the Coast Guard does not consider it to be a harbor of refuge.

Apra Harbor is a natural deep lagoon enclosed by a submarine coral bank, and a barrier reef. The Glass Breakwater has been constructed along the north and west sides of the lagoon. Much of Apra Harbor's shoreline is land reclaimed during dredging. This includes most of the flat portions at Cabras Island, the islets of Piti Channel, Drydock Island and Polaris Point.

The Port of Guam at Apra Harbor is the only commercial seaport on Guam and is the principal seaport in Micronesia. The initial plan for the commercial port was prepared in 1964. Construction of the port, following this plan, was completed in 1969. As a result of Guam's rapid development in the late 1960's and a rapid change from breakbulk to containerized shipments the planned facility was rapidly outdated. See Plate 2 for a plan of the existing facilities at the Port.

Prior to construction of the Commercial Port all general cargo was handled by the Civilian Government at the Naval Supply Depot, under a license agreement with the Navy. The Port of Guam commenced operation with a port intended primarily for breakbulk cargo with a commensurately large staff. Present management and staff have made significant progress in adjusting from a breakbulk type of operation to almost completely containerized shipments. Equipment acquisition and rationalization of the labor force reflect this shift toward containerization. Moreover current management has attempted to put the Port on a more sound fiscal basis. This study is largely the result of the Port's efforts to aid the economy of Guam by utilizing its over-all talents and potential fiscal strength to develop a marine oriented industrial center at Apra Harbor.

Performed under contract with the Port Authority of Guam, this study had the following main objectives:

- Estimate future waterborne commerce through the port of Guam and analyze the ability of the existing facilities to handle it;

- Determine the feasibility of expanding the Port of Guam;

- Analyze the potential for establishing a fisheries center and fish processing facility on Guam;

Update the Land-Use Plan for Cabras Island and Surrounding Area including the 927 acres of fast land and submerged land recently authorized by congress to be transferred from the Navy to the Government at Guam.

The study, funded in part through a grant from the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, Department of Commerce was prepared under the joint venture of Maruyama Associates, Ltd. and Dravo Van Houten, Inc. The principal personnel assigned were Donald S. Hill, Project Manager; Vinay K. Sood, Principal Civil Engineer; David L. Glickman, Economist; and William F. Pinckard, Fisheries Consultant. An Environmental Impact Assessment of the proposed container yard expansion was prepared by Pacific Basin Environmental Consultants. This is appended to this report.

2.0 SUMMARY AND CONCLUSIONS

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2.1 Port of Guam

The Port of Guam, also referred to as Commercial Port and Port, consists of the following physical facilities:

- 32 acres of total land area (plus 11 acres of undeveloped land area);
- 12 acres of container yard;
- 750 feet of wharf with 30 feet dredged depth;
- 1,950 feet of wharf with 35 feet dredged depth;
- two 43,000 square foot transit sheds;
- 24,000 square foot maintenance and repair building;
- 24,000 square foot container freight station;
- 25,412 square foot administration building;
- 3,600 square foot equipment shed;
- 3,482 square foot leased office building;
- 2,458 square feet in six miscellaneous buildings and structures.

In addition, the Port recently leased 11 acres of land on the north side of Route 11 from the Navy. This was done in support of Guam's need to expand its Port Container Yard and handling facilities.

In fiscal year 1980, the Port handled 720,000 revenue tons of cargo with a total of 752 vessel calls.

2.2 Shipping Services

Under United States law, trade between the United States and Guam is classified as domestic commerce. The cabotage laws as spelled out in the Merchant Marine Act of 1920, and related legislation, generally 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 United States flag carriers. The vessels must be built in the United States, documented

under United States law and owned by United States citizens.[1/] This effectively prevents foreign flag vessels from moving goods and merchandise between the United States and Guam. No restrictions are imposed for foreign shipments.

At the present time, Guam is served by eleven regularly scheduled steamship lines, two U.S. flag carriers in the United States-Guam trade, seven in inter-regional trade with foreign areas, and three in intra-regional trade including transshipment with the Trust Territory. One line provides both inter and intra-regional services. The estimated calls by these scheduled steamship lines, types of services provided and

TABLE 2.1
PORT OF GUAM
ESTIMATED CALLS BY SCHEDULED CARGO CARRIERS BY AREA OF SERVICE, 1980

	Number of Calls	Frequency of Calls	Type of Services	Area Served
Domestic Carriers				
1. American President Lines	26	14 days	Containers Only	U.S., Far East, So. Asia, Mid-East
2. United States Lines	50	Weekly	Containers Only	U.S., Europe, Cent. Am., Far East
Inter-regional Carriers				
1. Asiatic Intermodal Seabridge S/A	13	28 days	Containers, Breakbulk, Scrap	Manila, Hong Kong, Taiwan
2. Aurelio 3	12	33 days	Containers, breakbulk lumber	Manila, Hong Kong, Taiwan, Guam
3. Daiwa Line 1/	12 2/	30 days	(Primarily containers) (roll-on/roll-roll-off autos, limited breakbulk)	Japan So. Pacific, Australia
	13 3/	28 days		Japan, Taiwan, Saipan
4. Kyowa Shipping Co.	30 4/	10 days 3/	Breakbulk, autos, limited container capacity	Japan, Korea, Taiwan, Hong Kong
5. Nauru Pacific Line	6	60 days	Containers, some breakbulk	U.S. West Coast, Trust Territory, So. Pacific
6. Saipan Shipping Co.	12 5/	Monthly	Breakbulk, limited container capacity	Japan, Saipan Eastern Trust Territory
7. Tiger Line Inc.	6+ 6/	60 days	Breakbulk	Japan, Taiwan Hong Kong, Trust Territory
Intra-regional Services				
1. Oceania Line	52	Weekly	Containers, 10,000 barrels POL, limited breakbulk capacity	Saipan, Tinian
2. Palau Shipping	17	21 days	Primarily containers, some breakbulk	Yap, Palau
3. Saipan Shipping Co.	36 285+	10 days	Primarily containers, some breakbulk	Saipan, Tinian

1/ Daiwa discontinued service in February 1981. A replacement service will be established.

2/ Two vessels each on 60 day round-trip service.

3/ One vessel on 28-29 day round-trip service.

4/ Three vessels making total of 2-3 calls per month.

5/ Two vessels making 60 day round trips.

6/ One vessel making 60 day round trips, second on inducement.

1/ Title 46, Section 11, U.S. Code allows foreign-built vessels to engage in trade between the United States and Guam.

2.2.1 Domestic Carriers

The U.S. flag carriers, American President Lines (APL) and United States Lines, both operate fully containerized services. They both have preferential berth assignment agreements which provide for use of either berth F-5 or F-6 depending on which berth is available at time of docking and the availability of at least one of the two gantry cranes for movement of the containers between ship and dock.

United States Lines currently is scheduled for berth occupancy approximately every Wednesday and American President Lines every other Tuesday. These days of call have been varying as route schedules are adjusted. After calling at Guam, both carriers continue westbound to Taiwan, Hong Kong and Japan and return directly to the U.S. west coast via the modified great circle route. All cargo from Guam to the U.S. mainland is thus initially carried westward to the Far East. Westbound cargo from the mainland to Guam greatly exceeds cargo to the mainland and Eastbound cargo from the Far East to the U.S. West Coast greatly exceeds cargo in the reverse direction..

2.2.2 Inter-regional Carriers

Both container and breakbulk cargo are carried, the latter including motor vehicles from Japan. As with the Guam-U.S. mainland trade, imports by these carriers are greater than exports. Container movements are in total greater than conventional breakbulk movements, excluding motor vehicles.

2.2.3 Intra-regional Services

Intra-regional carriers provide both direct services between Guam and the other islands of the Trust Territory and transshipment services for the inter-regional carriers. They do not, however, provide transshipment services for frozen tuna fish movements. As a rule, outbound cargo movements from Guam exceed inbound movements.

2.2.4 Vessel Calls

In fiscal year 1980 there were a total of 752 vessel calls recorded by the Harbor Master's Office. The largest single category was fishing vessels with 313 calls. Most of these called primarily for bunkers. There were 97 calls by container vessels and 89 calls by breakbulk cargo services. Tankers made 99 calls and tugs and barges 96. There were 12 calls by passenger vessels and 6 by bulk cement carriers.

2.3 Guam's Oceanborne Trade

2.3.1 Imports, Exports and Transshipments

Table 2.2 presents data on imports, exports, and transshipments through the Port of Guam for the years 1968-1980.

TABLE 2.2

CARGO REVENUE TONS BY IMPORTS, EXPORTS AND TRANSSHIPMENT
FISCAL YEARS 1968-1980

Fiscal Year	Import	Export	Transshipment 1/	Total
	A. Revenue Tons (000)			
1968	229	60	25	314
1969	266	54	20	340
1970	407	70	9	486
1971	616	85	18	719
1972	596	117	26	739
1973	668	79	139	886
1974	670	84	104	858
1975	534	115	31	681
1976	441	121	128	690
1977	549	108	177	834
1978	513	75	227	815
1979	543	131	143	817
1980	516	140	64	720
	B. Percentage of Total			
1968	73	19	8	100
1969	78	16	6	100
1970	84	14	2	100
1971	86	12	2	100
1972	81	16	3	100
1973	76	9	15	100
1974	78	10	12	100
1975	79	17	4	100
1976	64	18	18	100
1977	66	13	21	100
1978	63	9	27	100
1979	67	16	17	100
1980	72	19	9	100

1/ Primarily to and from Trust Territory; also includes frozen fish, pineapples originating in Philippine Islands, etc. in some years. These tonnages reflect the fact they cross the wharf twice.

Source: Annual Economic Review and Port Authority of Guam.

The long term trend in total trade was distinctly upward between 1968 and 1980. Fiscal year 1980 volume is down from the preceding three years primarily because of the sharp fall-off in transshipment of canned pineapples from the Philippines. In every year during the entire period, imports were much larger than exports and transshipments combined. Domestic imports represent approximately three-quarters of the total.

Exports never exceeded more than 19 percent of the total volume. Approximately two-thirds of these are domestic and one-third foreign. As for transshipment cargo, the overall trend was sharply upward through 1978 despite some rather unusual annual fluctuations, which were magnified because the actual volumes involved are double counted in the statistics. The volumes shown in Table 2.2 for the years 1968-1972 are of

an entirely different order of magnitude from those shown for the years 1973-1978. Since 1978, the volume has declined precipitously primarily due to loss of the pineapple trade. As for Guam traffic, the transshipment traffic through Guam to the Trust Territories is much greater than in the reverse direction. In 1978, the Northern Marianas, principally Saipan, imported 36,083 revenue tons of cargo from Guam. The other districts in the Trust Territory imported 27,372 tons. Palau accounted for more than half of this volume. Exports from the Northern Marianas and the other Trust Territory areas amounted to 4,856 tons.

2.3.2 Breakbulk and Container Cargo

Beginning with 1975, containerized cargo has steadily accounted for 84 to 88 percent of the total volume annually, breakbulk for the balance. It is anticipated that the proportion of container cargo will increase slightly over time.

In recent years, just about all of the trade between Guam and the United States has consisted of containerized cargo, all carried by scheduled cargo liner services. Such small volumes of breakbulk cargo as are carried in this trade are generally by inducement and consist of non-containerizable cargo, primarily motor vehicles, construction equipment and construction components.

Inter-regional trade with foreign areas and intra-regional trade with the Trust Territories now account for all breakbulk cargo, plus additional volumes of containerized cargo. In 1979, breakbulk inter-regional trade was larger than containerized movements, 90,527 tons and 76,886 tons, respectively. In this context it may be noted that motor vehicles which are generally carried on roll-on/roll-off vessels are classified as breakbulk cargo and constitute the majority of the breakbulk cargo.

All regularly scheduled steamship operators serving Guam now use 20 and 40 foot containers. In 1980 the proportions were approximately 40 percent 20-footers and 60 percent 40-footers.

2.3.3 Commodity Composition

Guam's imports from the United States consisted primarily of what is sometimes referred to as "grocery store" trade for personal consumption and "office supply" trade for commercial consumption and use.

All goods imported for the personal use of U.S. Armed Forces stationed in Guam are included in the various commodity totals, as are also some cargoes shipped in Department of Defense controlled vessels and military components carried on non-Department of Defense vessels. About 85 percent of Navy controlled cargo was shipped through the Port of Guam.

Frozen tuna fish, presently the largest volume commodity classification exported to the United States mainland, is unloaded

directly from fishing vessels and carrier vessels to refrigerated containers on dock. As noted earlier canned pineapple movement has terminated. Household effects and personally owned vehicles belonging to Armed Forces personnel are significant export items.

Japan is probably the largest "foreign" source of imports to Guam. It is probably also one of the largest "foreign" markets for Guam's exports. The principal Japanese exports to Guam also consisted of goods and merchandise primarily for personal and commercial consumption and use. Automobiles and other motor vehicles account for over half the value of imports from Japan. The largest single commodity export from Japan to Guam in terms of tonnage was cement for the account of Kaiser Cement and Gypsum Company. In 1978 total cement shipments came to 71,185 metric tons and in 1979 to 48,165 metric tons.

Japanese imports from Guam were much smaller in volume and also much more limited in commodity composition than were exports to Guam. The single largest commodity classification consisted of scrap iron and steel, followed by some fresh fish.

2.3.4 Other Apra Harbor Trade Movements

Guam imports bulk volumes of crude oil and refined petroleum products and cement through privately maintained facilities in the Cabras Island Industrial Park. Crude oil and refined products imports were 11,018,000 barrels in 1979. This was mainly crude oil, much of which was refined and then re-exported.

Passenger vessels in the cruise trade accounted for 16 calls in 1977, 18 in 1978, 10 in 1979 and 12 in 1980.

2.4 Economic Base

2.4.1 Gross Business Receipts

The gross business receipts in current prices increased from $227 million in 1970 to $786 million in 1978. This is equivalent to an annual growth rate of 16.8 percent, well in excess of the rate of inflation which is also reflected in the growth rate. Gross business receipts include only the private sector. They do not include the government sector on which Guam has been heavily dependent.

One very encouraging aspect of the gross business receipts statistics is the growth of the agricultural sector from $0.5 million dollars in 1973 to $2.9 million in 1978. This represents an annual growth rate of almost 40 percent. Guam was agriculturally self-sufficient until after the end of World War II. Once again farmers are beginning to take advantage of the excellent growing climate. They are benefitting from the high cost of imported produce.

2.4.2 Employment

Total employment on Guam in November 1979 was 33,000. The largest concentrations of employment were in public administration, 28 percent; services, 26 percent; and trade, 21 percent. Cumulatively, this results in 75 percent of the total, a clear indication that the economy is service oriented.

Private enterprise provided 54 percent of all civilian jobs in November 1979, the Government of Guam, 26 percent and the Federal Government 20 percent. Federal employment is primarily with the military establishment and to a much lesser degree by various agencies such as the Internal Revenue Service, Federal Aviation Administration, Immigration and Naturalization Service and the Departments of Agriculture and Commerce. At the present time, the continuation of such employment is considered essential and non-replaceable for the stability of the economy.

2.4.3 Tourism

Tourism started on Guam in 1967 with 6,600 estimated visitors. This increased to 241,146 visitors in 1973, an annual growth rate of 82 percent. Since then arrivals have fluctuated between 201,344 in 1976 and 264,326 in 1979. The low in 1976 resulted largely from the effects of Typhoon Pamela. The most recent statistics show 74 percent of arrivals are from Japan. The United States follows with 13 percent.

Tourist arrivals by cruise ship amount to less than three percent of the total. Visitors arriving by sea remain only part of one day whereas those arriving by air remain an average of four days.

It has been estimated that visitors in 1977 generated $123 million in direct income to the business community, and that this direct income generated $104 million in indirect income and $123 in induced income.

The tourist industry is considered second only to the military in its importance to Guam in terms of total money income.

2.4.4 Balance of Trade

Guam's foreign trade has been and will continue to be heavily negative. This is characteristic of developing island economics. From 1970 through 1979, imports increased from $96 million to $230 million (reaching a high of $269 million in 1978) whereas exports increased from $6 million to $42 million. The peak annual deficit occurred in 1976, $242 million.

Guam depends largely on Federal Government loans and grants to both the public and private sectors and on expenditures on Guam of various

U.S. Government departments and agencies, notably the Department of Defense. Without such assistance and expenditures it would not be possible for Guam to pay for its imports or to balance its current account international transactions.

2.5 Economic Development

The heavy relative dependence of the economy on Federal Government programs and activities should be reduced progressively as other economic activity increases. This should not be interpreted as advocating a reduction in Federal expenditures but a relative increase in other aspects of the economy.

Considerable effort should be devoted by the Territorial and Federal Governments and by private enterprise to expand and diversify Guam's production industries. The present incentive program to locate industries on Guam should be extended.

2.5.1 Population Forecast

A high, medium and low forecast of civilian population was made. These forecasts were increased by an assumed constant 20,000 military and dependents and 2,500 non-immigrant aliens admitted under special programs. These forecasts result in an increase from 105,800 population in 1980 to 135,700 for the low forecast, 136,200 for the medium and 163,100 for the high in the year 2000.

2.5.2 Civilian Labor Force Forecast

The Department of Commerce developed a series of low, medium and high projections of the civilian labor force for the period 1980-1990. This forecast was adjusted for the 1980 census and then extrapolated to the year 2000. On this basis the civilian labor will be 61,400 for the low forecast, 70,200 for the medium and 76,500 for the high. These forecasts equate to 3.5 percent, 4.0 percent and 4.25 percent growth rates. These large percentage increases will come about primarily as the result of the large number of young people in the present population who will reach working age by 2000.

Gainful employment must be provided for this large work force or the island will suffer a large out-migration.

2.5.3 Business Forecast

It is expected that the long term trend in gross business receipts will continue upward. This will reflect both real growth and increased costs. Real growth, on a constant price basis, of three percent appears reasonable. A three percent annual increase in gross business receipts is fractionally within the range of many forecasts of

gross national product of the United States. Although gross business receipts and gross national product are not directly comparable, the comparison is suggested because the United States is now and will continue to be Guam's largest source of supply for its import requirements and the largest market for its exports, as well as the largest source of funds from abroad.

2.6 Traffic Forecast

The general cargo traffic forecast for long range planning purposes was made separately for imports, exports and transshipments. In the case of imports and exports a base year volume was taken as the average for the three year period 1977-1979. It is considered that the drop in traffic in 1980 is largely a result of worldwide economic conditions but should be viewed as a short term abberation. For transshipment traffic, a special tabulation of unduplicated cargo movements for the period March 1979-February 1980 was used as the base.

It is considered that a three percent average increase in traffic will be a very reasonable expectation. To permit evaluation of a reduction or an increase in traffic from that expected, a projection was made at two percent and also four percent. These are shown on Table 2.3.

TABLE 2.3

PROJECTIONS OF CARGO REVENUE TONS BY IMPORTS, EXPORTS AND TRANSSHIPMENT
FISCAL YEARS 1985-2000
(000 REVENUE TONS)

Year	Low (2%)	Medium (3%)	High (4%)
	A. Imports		
Base	535	535	535
1985	588	615	642
1990	642	695	749
1995	695	776	856
2000	749	856	963
	B. Exports		
Base	105	105	105
1985	115	120	125
1990	125	136	146
1995	136	152	167
2000	146	167	188
	C. Transshipment		
Base	89	89	89
1985	98	103	107
1990	107	116	125
1995	116	130	143
2000	125	143	161
	D. Total		
Base	729	729	729
1985	802	838	875
1990	875	948	1021
1995	948	1057	1166
2000	1021	1166	1312

It is expected that the United States will continue to be the major source of supply for Guam's imports and the major market for its exports. Essentially, Guam is expected to continue to be an import for consumption economy through the projection period. In this sense the commodity composition of imports should consist primarily of goods and merchandise for personal and business consumption and use, modified over time to reflect changing consumer preferences, plus construction equipment and components and motor vehicles for both personal and business use.

Exports would consist primarily of shipments of refined petroleum products, some machinery including re-exports of construction equipment, personal effects and motor vehicles for account of Armed Forces personnel and some domestically produced food products.

Guam is ideally situated to serve as a transshipment center for islands in the western portion of Micronesia. (See Plate 5, Western Pacific Political Subdivisions).

Transshipment trade with the other islands of Micronesia is expected to increase as their population increases and as their economies develop and expand. Information provided by the Office of the High Commissioner of the Trust Territory of the Pacific Islands projects total population to increase from 117,000 in 1979 to 242,000 in year 2000. Population in the Northern Marianas, and the Truk, Yap and Palau Districts, those which account for the bulk of the transshipment trade via Guam, is projected to increase from 76,000 to 158,000 in year 2000. Both of tnese projections reflect a growth rate of 3.5 percent.

This assumes that transshipment services via Guam continue to provide competitive advantages vis-a-vis direct services to/from the islands for cargo originating/terminating in both the United States and various foreign countries, notably in the Far East, Southeast Asia and Australia and New Zealand. Frequency and reliability of service and total comparative costs are the principal elements in this competition.

Transshipment of frozen tuna is not expected to continue its rapid growth of the first five years. It is considered more reasonable to expect an increase at the same rate as general cargo transshipment traffic for the other islands of Micronesia. Transshipment of fresh tuna is considered to be a real possibility which could amount to 20,000 to 30,000 tons per year but this is too uncertain to be reflected in port traffic projections at this time The transshipment of frozen tuna can continue at the Commercial Port. Initial transshipments of fresh tuna could be accommodated at the Commercial Port but at the 20,000 to 30,000 ton level facilities should be provided on Drydock Point. Small scale local fisheries can continue to be accommodated at the Agana Marina, Merizo Pier and Agat Marina. Expansion at these locations is limited. Expansion beyond the capacity of the existing facilities can be provided on Drydock Point with a good harbor of refuge in Piti Channel.

2.6.1 Forecast of Mode of General Cargo Shipment

In the period 1975-1980 containerized movements accounted for 84 to 87 percent of total annual volumes. All of the trade with the United States is now containerized except for small volumes of non-containerizable construction equipment and other oversized cargo. This pattern of operations in Guam-United States trade is projected to continue into the future.

In fiscal year 1979 inter-regional trade with foreign areas and intra-regional trade with the Trust Territory were divided 46 percent breakbulk and 54 percent containerized. The breakbulk category, however, included motor vehicles which are generally carried on specialized roll-on/roll-off vessels from Japan. This specialized movement is projected to continue. There is relatively little margin for a substantial increase in containerized movements of this trade.

Over time, the share of containerized movements is expected to increase to the 88-90 percent range of total cargo movements.

As the volume of containerized movements increases, there will be a tendency towards proportionately greater use of 40 foot containers.

2.6.2 Forecast of Container Traffic

The containerized proportion is presently 85 percent of total. It is expected that this will gradually increase to 90 percent in the year 2000.

The split between 20 foot and 40 foot containers is expected to shift from 32 percent 20's and 68 percent 40's in the base year to 26:74 split in 2000. Foreign containers are predicted to handle a gradually increasing proportion of container port traffic, increasing from 11 percent to 18 percent in 2000.

It was assumed that inbound refrigerated containers would remain constant at 13 percent by number over the period of analysis.

Transshipment traffic is identified separately due to its effect on berth occupancy. Each container used for transshipment cargo crosses the wharf up to four times. With two of these crossings the productivity is substantially lower. From the aspect of the container yard, transshipment containers are similar to Guam destined containers in that they are only in the container yard twice.

Only inbound container movements were analyzed to obtain total number of containers. Outbound movements were assumed equal in number whether empty or full. To convert revenue tons to number of containers, an average of 26 and 15 revenue tons was used for each 40 foot and 20

foot container, respectively. Frozen tuna was assumed at 20 tons per 40 foot container. The container forecast in terms of numbers and twenty foot equivalent units (TEU's) is shown on Table 2.4.

TABLE 2.4

CONTAINER FORECAST
INBOUND AND OUTBOUND[1/]

Year	Low	Medium	High
Base No.	45188	45188	45188
TEU	73205	73205	73205
1985 No.	49288	51602	53914
TEU	82804	86691	90576
1990 No.	53922	58414	62996
TEU	91667	99304	107093
1995 No.	58464	65270	72076
TEU	100558	112264	123971
2000 No.	63180	72170	81158
TEU	109933	125576	141215

1/ These numbers do not double count transshipment containers. These are only counted once when discharged from the long haul liner vessel and once when loaded onto the long haul liner vessel.

2.7 Future Port Requirements

An evaluation was made of the requirements for wharf, container yard, buildings, equipment and manning of the Port to accommodate projected traffic. These are summarized individually.

2.7.1 Wharf Capacity

In the period May 1979-April 1980, approximately 85 percent of the Port's cargo was handled with a Port occupancy of 6.2 percent. Using the anticipated domestic, inter-regional, intra-regional and frozen tuna transshipment traffic, it is estimated that the existing wharves have a capacity of 1,300,000 to 1,700,000 revenue tons per year without incurring excessive ship delay time awaiting berth. This is adequate to handle the anticipated traffic through the year 2000.

2.7.2 Container Yard

With the present container yard operating practices with containers stored on the ground and on-chassis, the existing container yard has a capacity of approximately 1,660 twenty-foot equivalent units (TEU's) grounded plus 174 on chassis for a total of 1,834 TEU's. For an all-chassis type operation the capacity is approximately 700 TEU's.

U.S. Lines currently has an all-chassis operation utilizing six acres of land leased from the Navy. It is indicated that APL will convert from a combination grounded-chassis operation to an all-chassis operation if the facilities would permit. This would be done in order to be in a better competitive position. Guam is currently the only port at which APL does not have an all-chassis operation.

The container yard capacity necessary to accommodate the traffic forecast is shown on Table 2.5. This is based on domestic traffic being all-chassis and inter-regional traffic continuing as a grounded operation. Construction of a container yard on a portion of the 11 acres leased from the Navy would provide adequate container capacity through the year 2000. It is estimated that the expansion of the container yard, relocation of Route 11 and construction of a protective seawall will cost $4,500,000. (See Plate 6, Proposed Expansion of Container Yard).

TABLE 2.5

REQUIRED CONTAINER YARD CAPACITY
TOTAL REQUIRED CONTAINER YARD CAPACITY

Base	1247	1247	1247
1985	1427	1493	1559
1990	1609	1740	1874
1995	1795	2001	2206
2000	1978	2255	2533

2.7.3 Port Buildings

There is currently a surplus of transit shed and container freight station space. Transit Shed 2, adjacent to Berth F-4, occupies a prime area in the Port. This area would be better utilized as open back-up for the container wharf. A duty free shop currently occupies the western end of Shed 2. This shop should not be located in the heart of a general cargo area. The shop should be relocated and the shed demolished. It is estimated that the cost of the shop relocation and shed demolition will cost $250,000.

2.7.4 Port Equipment

Port equipment is adequate for traffic anticipated in the near future. If the container yard is expanded and APL converts to an all-chassis operation then one straddle crane and the one Hystainer will be adequate for handling containers in the grounded portion of the yard.

There are an excess of small forklift trucks which should be sold or scrapped. As Port traffic increases it may be desirable to add a third gantry crane but this is something which should not have to be evaluated for several years. One leased mobile crane has been returned to lessor. The other leased mobile crane is considered surplus to requirements and could be released.

2.7.5 Manning

The Port presently has a surplus of labor. This situation is partly being rectified by terminating "casual" employees presently assigned to permanent stevedoring gangs and as tractor drivers.

The Port should continue its efforts to further rationalize its staffing.

2.8 Fisheries Development

Transshipment of frozen tuna fish at the Commercial Port commenced in 1974. Within five years the traffic had grown to nearly 15,000 tons. This represented almost eight percent of total outbound cargoes. Although this traffic is not expected to continue its very rapid growth, development of a transshipment trade in fresh tuna appears to be a strong possibility. In addition development of small scale local fisheries is emerging and is expected to outgrow the existing Agana Marina facilities. All three of these fisheries trades should be encouraged.

Provisions for development and expansion of these fisheries trades should be made on Dry Dock Point along Piti Channel. A harbor of refuge should be developed at the eastern end of Piti Channel.

2.9 Marine Oriented Industrial Park

Guam has a very narrow industrial base. Presently, manufacturing is almost non-existent and the processing industry is essentially limited to the GORCO oil refinery. Development of both forms of industry should be encouraged. As has been done in many European and Asian countries and at several ports in the United States, the Port Authority should undertake to develop the land adjacent to Apra Harbor for use by private industry. The inducements of tax abatements currently offered by the Guam Economic Development Authority should be made available to industries locating in this industrial park as well as low cost small business loans and subsidized rents.

2.10 Ecological Preserves

Much of the surplus area transferred from the Navy to the Government of Guam is marginal or actually submerged. It is unlikely that these areas could be reclaimed through dredging, as was done with much of Cabras Island and Dry Dock Point. These areas, however, are one of the few most biologically productive areas on the island. They provide a nursery ground for many juvenile species of animals and for a diversity of plant life. The area is a critical link in the fragile Sasa Bay ecological-system and should therefore be preserved and protected.

2.11 Economic Impact of Improvements

2.11.1 Container Yard Expansion

An analysis was made of savings which would result from expansion of the container yard. Savings which were quantified, are those resulting from a reduction in vessel port-time, improvement in container yard efficiency, reduction in required number of straddle cranes, tractors and dray drivers and value of goods in-transit. These potential savings were conservatively estimated. The internal rate of return for the container yard expansion is 13.6 percent for the low traffic forecast, 14.6 for the medium and 15.5 percent for the high. This is obviously an economically justifiable investment.

2.11.2 Demolition of Transit Shed 2

It is estimated that Transit Shed 2 occupies a space equivalent to 1.9 acres of container yard. The Port's costs for providing utilities to the duty free shop exceed the rental income. The expansion portion of the container yard is estimated to cost $409,091 per acre. On this basis the area occupied by Transit Shed 2 is worth $786,000. The estimated cost for relocating the duty free shop and demolishing the shed is $250,000. This yields a benefit-cost ratio of 3.1 excluding savings in utility costs. This ratio would be significantly increased if the annual savings resulting from increased efficiency at Berth F-4 were added. It is recommended that the shop be relocated and the shed demolished.

2.11.3 Fisheries

The large scale fishing interests involved in transshipment of frozen tuna plus those which wish to resume transshipment of fresh tuna to Japan will likewise provide substantial income for the local service industries such as bunkering, ship chandlering, ship repair and entertainment.

Support for small scale local fisheries will assist the local entrepreneurs involved in this activity as well as the supporting services industries.

2.11.4 Marine Oriented Industries

Development of a marine oriented industrial park by the Port Authority will result in the following benefits:

- Employment will increase;
- Vacant land can become revenue producing;
- New port-oriented industrial development will increase cargo throughput, value of cargo handled and use of port's capital equipment;

- Industrial development will require and justify development of infrastructure which will encourage further development;

- Increase in number and proximity of port-related service industries will benefit vessels calling at the port;

- Value of private and public investment in the port will increase substantially, improving the port and the community's financial rating;

- A port industrial development program for land on or near the channel will save the navigable waterfront for port users.

Illustrative of the magnitude of potential benefits which could result from development of an industrial park at Apra Harbor are the following summaries of developments undertaken by four port bodies in the continental U.S.

The Port of Portland in Oregon developed two large industrial parks. Of the 3,600 acres available, approximately 1,500 acres are occupied by over 100 firms which employ over 8,800 workers.

Presidents Island operated by the Memphis and Shelby County Port Commission provides employment for a total of 10,000 workers who received a total of $147 million in wages in 1979. The City and County also received an indirect employment benefit from an additional 9,000 jobs in local port dependent industries.

The Board of Commissioners of the Port of New Orleans and the City officials, business leaders and major landowners supported creation of the Almonaster-Michaud Industrial District by the Louisiana Legislature in 1979. This district covers approximately 7,500 acres of which 2,500 are currently occupied. New Orleans is pioneering a route toward large-scale industrial development along navigable waters.

The Port of Oakland in California administers both the seaport and the airport. The 300 acre Oakland Airport Business Park has some 400 firms with a total employment of 8,000.

Similar accomplishments to the above can be realized by the Port Authority of Guam.

2.12 Financial Feasibility

The financial viability or commercial profitability of a project is the expected net profit after all pertinent costs are deducted. However, care must be exercised so as not to place too great an emphasis on financial viability. The return on investment is set through administrative prices (port tariffs), and while the proposed improvement and future operation can be shown to be financially viable and attractive, that is sufficient revenues will be produced to cover annual operating costs and repay loans, such profitability is not necessarily indicative of economic feasibility or true benefits to the local economy from the investment.

Port tariffs have recently been increased for the first time in three years. This was essential in order to cover increased labor, fuel, utilities and costs of loans tied to the prime rate. The financial viability was analyzed by evaluating the financial costs of the container yard expansion in terms of annual costs and determining the tariff increase required to cover these costs. The potential reduction in labor and equipment operating and maintenance costs were evaluated and compared with the financial costs resulting from the project. This financial analysis is largely based on financial data assembled for the Terminal Tariff Study by Peat, Marwick, Mitchell & Co., and the cost estimates prepared under the contract for detailed design of the container yard expansion.

The Economic Development Administration (EDA) has been approached for assistance in funding part of the Port improvements under Title I, Public Works Program. It is also possible to obtain funds from the Department of Interior. This requires approval of the Federal Congress for the appropriation. Both of the federal sources would provide grants.

Loans from local banks or sale of revenue bonds are other possibilities. The loans might be guaranteed by the two U.S. flag carriers in a similar fashion to the loan for the gantry crane guaranteed by U.S. Lines. It is expected that the revenue bonds would qualify for tax free status.

The estimated cost of the container yard expansion is $4,500,000. EDA Title I money requires matching funds from local sources. The value of the land dedicated to the expansion of the container yard is

100,000. An additional $400,000, representing value of land in the sting container yard which will be improved, yields a total of ,500,000 from local sources. This could be used to offset an equal ım of EDA grant money. The balance of $3,000,000 could be obtained alf through EDA grant and half through local financing. The Port Authority expressed the opinion that the terms for this local funding might approximate ten percent for 25 years. The annual cost of the $1,500,000 local funding would be $165,255.

The total annual financial cost for the expanded container yard is $203,255.

Local funding $1,500,000 at 10% for 25 years	$165,255
Average Annual Maintenance	38,000
Total	$203,255

The Port improvements can be completed in 1982. The traffic estimated for 1982 is 46,544 containers. This is the total for inbound and outbound containers, not double counting the transshipment containers. The weighted average of $85 per container as the port tariff for the various container trades would have to be increased 5.1 percent to offset the annual costs of the project. This amounts to approximately one half of one percent of the cost of the delivered commodity.

The savings in straddle crane costs permitted by conversion of the APL operation from a combination chassis-grounded, to an all-chassis operation is almost sufficient to offset the annual capital and maintenance costs. It is expected that these savings can be obtained through job transfers within the Guam civil service system, normal labor attrition and sale of the surplus straddle cranes. By reducing the Port's operating costs the capital and maintenance costs of the project could be covered without an increase in tariff.

Small business loans can be utilized for improvements for port related industries. A current impediment to the ability to offer subsidized rents is the requirement in the transfer legislation that market rates be charged for lease or sale of the land. It is understood that efforts are being made to have this amended.

2.13 Proposed Land-Use Plan

The preparation of this recommended land-use plan was greatly simplified by the Economic and Land-Use Plan for Cabras Island and Surrounding Area, July 1979, prepared jointly by the Port Authority of Guam and the Cabras Island Task Force, a committee organized at the direction of Governor Paul M. Calvo. The committee members consisted

of the following public and private agencies: Bureau of Planning, Department of Commerce, Guam Economic Development Authority, The Guam Growth Council, and members of The Port Authority of Guam Advisory Council.

It is emphasized that the Port Authority's Plan is compatible with the Government of Guam's land-use standards from the Land-Use Plan, Guam prepared by the Bureau of Planning in that the ecological concerns of that plan were adhered to.

The assumptions made by the Port Authority to simplify the planning process were adopted with only minor modifications in the development of this proposed land-use plan. The modifications are bracketed.

1. Port facilities must be developed sufficiently to accommodate current traffic and the expected increases in future years.

2. The Port Authority will coordinate the planning and prioritization of water-oriented activities to be located around Apra Harbor in order to minimize any adverse impact upon port operations.

3. The multiple use of Apra Harbor for shipping, industry, recreation, conservation [and defense] is beneficial for all concerned.

4. Waivers on the explosive safety quantity distance (ESQD) zone requirements can be obtained from the Navy for lands which fall between the existing 7,210-foot zone and the preferred 10,400-foot zone for the ammunition wharf. No immediate relocation of the ammunition wharf is expected.

5. Military lands [not released in 1980 but which are included in this Plan] will [ultimately] be acquired by the Government of Guam.

6. [The Navy's Hotel Wharf will be available for use by the Commercial Port for use by passenger ships and fishing vessels when it will not interfere with Navy's use of the facility.]

2.13.1 Coordination of Planning

The input of various agencies in planning is very desirable. This is evident in the Economic and Land-Use Plan for Cabras Island and Surrounding Area prepared by the Port Authority with the assistance of several other agencies. However, administration of specific functions is another matter. The following is suggested by the present survey team as a possible approach to the division of function and responsibility: the Guam Economic Development Authority retains its current responsibility for the incentive program, the Port Authority be

given responsibility for actual development and administration of industrial parks on Cabras Island and elsewhere around Apra Harbor. It is essential for these agencies to cooperate with each other and with other agencies in implementation of their respective functions and responsibilities.

Activities at all government owned industrial parks should be coordinated. Those industries which have a greater dependence on air transport could be located at Harmon and those with a greater dependence on water transport could be located at the Port. Industries at both parks could be offered similar tax incentives.

2.13.2 Development Constraints

The Hotel Wharf currently functions under a safety waiver of three million pounds net explosive weight (NEW). Construction of habitable buildings on Navy lands within 7,210 feet of Hotel Wharf is prohibited unless waived by the Department of Defense Explosive Safety Board.

The Commercial Port (30 acres), the GEDA Industrial Park (32 acres) and several private companies leasing military land are all within the 7,210-foot ESQD. These entities function under a disclaimer of liability for damages from an explosion.

A report to the Committee on Appropriations, U.S. House of Representatives, completed in March 1979, reveals the unlikelihood that an alternative to Hotel Wharf will be forthcoming in the near future, due to high costs and unconvincing economic justification. According to the report, the location of the current ammunition wharf near the Commercial Port is not unique to Guam. "Only one of 24 ammunition ports outside the continental United States operates without a waiver and only three of eight ports in the contiguous U.S. can accommodate nine million pounds NEW without waiver."

The release of 927 acres by the Navy was conditioned that it be used for port related industry. There are on-going discussions between representatives of the Navy and the Port for the orderly transfer of the surplus land.

Drydock Point is fringed by lowlying land which is covered by mangrove. This is a natural habitat for certain crustacea and a crucial link in the Sasa Bay ecological system. The area should be retained in the natural state and should not be dredged or filled for industrial development.

2.13.3 Port Development Requirements

Immediate and anticipated future port and land-use requirements were evaluated in order to permit establishment of priorities for planning purposes. The future requirements of the Commercial Port and the existing power plants received top priority.

There are substantial investments in the tank farms, bulk cement plant, machine shop, chassis and container repair shops, warehouses and cold storage facilities currently situated in the Cabras Island Industrial Park to the west of the Commercial Port. These are all considered port related industries. With open land available eastward from the existing Commercial Port, it is considered better over-all utilization of resources to plan for expansion of the existing container yard toward the north and ultimately toward the east. (See Plate 7, Land-Use Plan Exhibit.) The wharf face is shown with a straight line extension 1,400 feet long. This would provide a straight wharf 3,350 feet long. This length of wharf should be adequate to satisfy port requirements well into the 21st century.

A further eastward prolongation of the container wharf is shown angled. This is shown for future container use or as a coal wharf for power plant fuel. This wharf extension would be better as a straight extension if environmental constraints would permit. This location would be good for a coal wharf only because of its nearness to the power plants however a 45 feet deep channel would be desirable for a coal wharf. At this location considerable dredging would be required. If the OTEC power plant proves feasible this area could be used for other dry or liquid cargoes.

Expansion of the Port to serve as a fishing base for frozen and/or fresh tuna fish is very tenuous, but is a real possibility, therefore, land has been allocated for accommodating the requirements of such an industry. If, in several years time, the fishing industry has not developed on Guam to the point where all of the area is required for fishing and there is a need for this land for other purposes, then it should be released.

A prime requirement in the vicinity of the Port is land for industrial development. Manufacturing industries are catered for where the nature of the land permits and aquaculture where it is expected that environmental constraints will prevail.

GORCO has made plans for accommodating an increase in ship bunkering. These involve transferring some of their product loading operations for fuels loaded into military vessels to the Navy fuel wharves to free their pier for bunkering.

2.13.4 Details of Proposed Land-Use Plan

The proposed land-use plan is considered to be long range. It is intended to be flexible as the status of projected port developments is too tentative to allow for specific siting of actual facilities.

The recommended land allocation is as follows, progressing from west to east along the northern perimeter of Apra Harbor, across Cabras Island, then southward along Marine Drive and out onto Drydock Point and Drydock Island. A more detailed description of the proposed land-use is included in Section 14.0.

The two old piers and Williams Beach should be reserved for recreation and recreational boating.

Wharf "H", commonly referred to as Hotel Wharf, currently the Navy Ammunition Wharf, should be reserved for use as an auxiliary passenger terminal on a "not to interfere with Navy use" basis.

The area immediately east of Hotel Wharf should be considered as a tentative site for a bulk coal berth for supplying fuel to the power plants. This site would not require the extensive dredging as the one in Piti Channel but would require reclamation for the surge pile and a 1.8 mile long conveyor.

Wharf "G" (Golf), presently used by Mobil for Petroleum products tankers, should remain in that service

The old seaplane ramp owned by the U.S. Coast Guard and not part of the 927 acres authorized for transfer, is presently used as a launching ramp for recreational boating. It is recommended that the Government of Guam acquire this property in addition to the 927 acres and continue its current use until alternate facilities in Apra Harbor are available.

The Marianas Yacht Club is presently utilizing the cove and shoreline west of Cabras Island Industrial Park. The Yacht Club has expressed an interest in relocating to a more sheltered area. Until they can relocate to new facilities, it is recommended that continued use of the present site be permitted. After relocation of the Yacht Club, this location could be reserved for future fisheries requirements.

The GORCO oil pier, F-1, should continue in its present use.

The Kaiser bulk cement terminal should continue in its present use.

The Dillingham Ship Repair facility, F-2, should be permitted to continue in its present use. If Dillingham chooses to vacate the site then it should be annexed to the Port for use by fishing and intra-regional general cargo vessels.

Berth F-3 should continue as a berth for fish transshipment and breakbulk general cargo traffic. The Coast Guard should be permitted continued occupancy of the west end of this berth until their own facilities are available.

Berth F-4 should be continued in its current use for container ships, combination and breakbulk general cargo ships and fishing vessels. This should also continue as the principal berth for passenger ships until other arrangements can be made.

Berths F-5 and F-6 should continue in present service as container wharves.

The Feed Mill, adjacent to the east end of Berth F-6, interferes with full utilization of this berth by container ships. It should be planned to relocate this feed mill as the need for additional container handling capacity dictates. It is expected that this relocation may be justified when container throughput approaches 100,000 TEU.

The area east of the existing Port area should be reserved for one additional container berth and associated back-up area. Further eastward, should tentatively be reserved for a coal berth with an adjacent coal surge pile for the power plants.

Northwest of the Cabras Power Plant should be reserved for the OTEC Plant or for a coal storage yard.

The intervening area between the future container yard expansion and the area reserved for OTEC or coal storage should be reserved for industrial development.

The channel between the two power plants should be reserved for recreational boating.

The land south of the fuel tank farm and west of Marine Drive which can be developed for industrial and commercial use should be subdivided and adequate infrastructure constructed for industrial and commercial use. The marginal and submerged lands in this area, are not recommended for development and should be preserved to protect the crucial balance of the Sasa Bay ecological system.

The narrow strip of land leading to Drydock Point, between the roadway and the south side of Piti Channel, should be reserved for open space.

Drydock Point is designated primarily as an area for development of a support area for fisheries, with an adjacent area for repair of small craft and fishing vessels. Full utilization of this area requires relocation of the road to the south of the point.

Two Navy fuel docks are located at the northwest corner of Drydock Island. These are presently under-utilized but GORCO is discussing using one of these docks for shipment of petroleum products on military tankers. This is to relieve pressure on the GORCO pier. These docks are expected to remain under Navy control for the foreseeable future.

Two Navy fuel docks are located at the northwest corner of Drydock Island. These are presently utilized by Navy, Navy ships serviced by GORCO and civilian tankers supplying oil to the Guam Power Authority. These docks are expected to remain under Navy control.

The Navy has stated that they intend to retain portions of Drydock Island in order to have access to and to support a floating-drydock operation at Dry Dock Point should the need arise. This reservation will be provided until a proposed graving dock is constructed on the south side of Apra Harbor.

3.0 ECONOMIC BACKGROUND

3.0 ECONOMIC BACKGROUND

3.1 General

This Section reviews the present structure of Guam's economy and the growth trends of its major components. This is followed by an examination of a series of potential developments and factors and the impact these may have on future volumes of commerce. An evaluation of future prospects, with all its fallibility and potential for error, is indispensable to the formulation of a long-range plan for the development of Guam's non-military marine terminal facilities.

Two different sets of factors are broadly responsible for and affect the volumes of commerce handled at sea ports. One set consists of those factors of national and international character which are of controlling importance in determining the magnitude and composition of trade. Ports have little or no influence over the course of events in this area. The other set of factors is related to inter-port competition. These determine the ability of individual ports to participate in the waterborne commerce of the region. By their programs and policies, public agencies responsible for port planning, development and operations, and private enterprise performing similar functions, influence the individual port's competitive role in the handling of waterborne commerce.

As an island with only one port, Guam's oceanborne commerce is affected almost entirely by the first set of factors, those over which the Port Authority of Guam has no control. While the policies, programs and operations of the Port Authority do affect the costs of this trade, they have no real impact on the total volumes and composition. The private enterprise bulk cargo handlers do, because they also control the actual volumes of their imports and exports. Theoretically, they could relocate their facilities elsewhere but they are not expected to do so. It is expected that they will expand their operations as the total economy of Guam continues to grow and as their markets served from Guam develop.

There is one exception to the general statement that the Port Authority's activites have no impact on trade volume. This has reference to Guam's transshipment trade with other islands of Micronesia. This component is influenced by direct and, therefore, competitive carrier services between the islands and various import sources of supply and export markets. To the degree that the Port Authority's pricing practices affect total costs of transshipment and contribute to substitution of direct carrier services for transshipment, they will affect Guam's total oceanborne trade and utilization of its cargo handling facilities.

3.2 Basic Trends

The major factors that will affect the basic trends in oceanborne commerce are those associated with the structure of economic activity. These include:

- the role of the Federal military establishment and of other Federal Government programs;
- tourism and the visitor industry;
- socio-economic trends such as for population and labor force;
- gross business receipts;
- employment;
- the balance of trade and the balance of payments.

In the discussion that follows, the impact of the military and of other Federal Government programs on the economy will not be treated as a separate entity, as is tourism. These activities are pervasive in their scope and importance for both the public and private sectors of the economy. The various aspects of Federal Government activity are discussed in relation to population, the levels of activity of various industry classifications, civilian employment and the balance of trade and balance of payments.

It is important to note that long-term trends will be interrupted and affected by short-term developments and by occurrences which cannot be projected. Fluctuations in economic conditions are examples of the former; typhoons, wars and strategic military considerations of the latter. Depending on the time, duration, severity and frequency of such occurances, the long-term trends may be affected both positively and negatively. It is therefore recommended that a complete reappraisal be undertaken periodically, at intervals of five years.

For our present purposes, it is assumed that peace-time conditions will prevail, that strategic considerations will dictate the continuation of the military presence on Guam and that the current level of about 20,000 in military personnel and dependents will remain constant. Typhoons and other natural disasters cannot be forecast, however, many marginal structures destroyed during Super-Typhoon Pamela in May 1976 were replaced with typhoon-resistant construction. A comparable typhoon will not result in similar destruction and extensive reconstruction.

It is further assumed that any possible change that may take place in the political relationship of Guam with the United States will be such as to promote rather than impede the growth and development of

Guam's economy. Any possible impact on the future volumes of oceanborne commerce should, therefore, be positive rather than negative. Questions related to the desirability of a change in the existing relationship and the direction a change might take are beyond the scope of this report.

3.3 Population and Labor Force

The recently completed 1980 census of population estimated that Guam's total population early this year was 105,800. This preliminary estimate includes the civilian population, military personnel and their dependents and non-immigrant aliens admitted under special programs. It represents an increase of 24.4 percent over the 1970 census count of 84,996, an annual growth rate of 2.2 percent. This provides a new base for projecting future population and labor force.

Various projections have been prepared of Guam's future population. These include three prepared within the last three years: by the U.S. Army Corps of Engineers to the year 2030; by Professor Benjamin F. Bast of the University of Guam to the year 2000; and the third by Dr. Shuiliang Tung of the Guam Department of Commerce to 1990. The Corps of Engineers' interim projection for year 2000 is 187,000, Dr. Bast's, 200,000. The projections by Dr. Bast and the Corps of Engineers were developed before the results of the 1980 census became available. As a consequence they are both based on assumed growth trends which were substantially higher than those revealed by the census.

For our present purposes, we have therefore decided to use the Department of Commerce projections for the period 1980-1990 and to extrapolate them to the year 2000. These projections have been revised to incorporate both the new data base for 1980 and the growth trends revealed in the census enumeration for the period 1970-1980. It is recognized that this approach accepts that the underlying assumptions that will shape population growth in the period 1980-1990 will also apply in 1990-2000 and that this may produce an inherent margin of error.

Using 1980 as the base year, a range of low, medium, and high projections were developed for the civilian population by means of the cohort survival method for each sex under varying assumptions as to fertility and mortality. This excludes non-immigrant aliens admitted under special programs[1/] and members of the U.S. Armed Forces and their dependents living on military reservations. To the totals thus derived for the civilian population were added the projected levels of future military related population and non-immigrant aliens. It was assumed that the former would remain constant at 20,000 and the latter at 2,500, and that there would be zero net migration. The total projected increase in population under these assumptions would therefore come entirely from the natural increase in the civilian population.

1/ Non-immigrant aliens increased rapidly to about 11,000 in the early 1970's, particularly for employment in the construction industry, and then declined to about 5,000 in 1977 and to 3,000 in early 1980.

These projections are presented in Table 3.1. They range from an increase to 117,300 for the low projection to 118,700 for the medium to 130,400 for the high projection. Extrapolated to the year 2000, the low projection comes to 135,700, the medium projection to 136,200 and the high projection to 163,100. The year 2000 projections are equivalent to increases of 31 percent, 29 percent and 52 percent respectively over the 1980 data base.

TABLE 3.1
PROJECTIONS OF THE TOTAL POPULATION OF GUAM

Year	Low Projection	Medium Projection	High Projection
1980	103,800	105,800	106,900
1981	104,300	107,000	108,300
1982	105,300	108,700	110,300
1983	106,500	110,000	112,700
1984	107,700	111,200	115,200
1985	108,900	112,300	117,600
1986	110,200	113,500	120,000
1987	111,400	114,700	122,400
1988	113,300	116,100	125,200
1989	115,300	117,400	127,800
1990	117,300	118,700	130,400
2000[1/]	135,700	136,200	163,100

1/ Extrapolated to year 2000

Source: Guam Department of Commerce

The future population will provide the future labor force. Using certain assumptions with respect to the labor force participation rate, the Department of Commerce developed a series of low, medium and high projections of the civilian labor force for the period 1980-1990. Under the medium projection the civilian labor force would increase from 32,000 in 1980 to 47,400 in 1990, an increase of 48 percent. This excludes non-immigrant labor which totalled about 3000 at the time the census was taken and which is projected at a constant of 2500 from 1981 to year 2000. Extrapolated to year 2000, the medium labor force projection comes to 70,200; under the low and high projections, the labor force would increase to 61,400 and 76,500 respectively. These projections equate to increases of 99 percent, 119 percent and 130

percent for the low, medium and high civilian labor force projections respectively.

These very large percentage increases in the civilian labor force - far greater than in total or civilian population - would come about primarily as the result of the large number of young people in the present population who will reach working age by 1990[2/], the higher participation rate of young males than in the past and the continued high rate of entry into the labor force of young females.

The projections of the civilian labor force under all three levels of increase are presented in Table 3.2. The assumed constant of 2500 non-immigrant alien workers should be added to the totals shown in order to arrive at the total labor force. It will be the task of the expanding economy to provide opportunities for gainful and productive employment for this expanding labor force, otherwise there will be an out-migration to more attractive labor markets.

TABLE 3.2

PROJECTIONS OF THE CIVILIAN LABOR FORCE OF GUAM

Year	Low Projection	Medium Projection	High Projection
1980	30,800	32,000	33,200
1981	31,900	33,500	34,900
1982	33,000	35,100	36,800
1983	34,200	36,700	38,500
1984	35,500	38,300	40,400
1985	36,800	39,800	42,100
1986	38,100	41,400	43,900
1987	39,400	43,100	45,600
1988	40,800	44,500	47,100
1989	42,100	55,200	48,800
1990	43,500	47,400	50,400
2000[1/]	61,400	70,200	76,500

1/ Extrapolated to year 2000

Excludes non-immigrant aliens and members of the U.S. Armed Forces and their dependents living on post.

Source: Guam Department of Commerce

2/ The age distribution of the population in 1977 was quite different from that in the United States. For example, more than half the population of Guam was under 19 years of age, as compared with 38 percent in the United States. Conversely, those over 65 comprised only 3 percent and 10 percent respectively.

3.4 Gross Business Receipts

Table 3.3 presents data on consolidated gross business receipts of the private sector of the economy by major industry classification for the years 1970-1978. These data are not comparable to and should not be compared directly with gross national product statistics for the United States. The former include only the private sector, the latter also include the government sector. Further, the Guam data are concerned with gross business receipts rather than the value added of each industry classification and are therefore duplicative in character. For example, the volume of gross receipts of wholesale trade is in large measure an input component of the retail trade industry and is therefore incorporated in the gross receipts of retail trade. The data as published do not, however, distinguish between the gross receipts and the value added by the two stages of the distribution process. This may be compared with gross national product in the United States which represents the total sales value for final consumption in the economy and is based on the value added at each stage in the production and distribution cycle.

A project to develop the conceptual approach and structure of the gross island (national) product of Guam for the period 1972-1976 was undertaken and completed by Russell C. Krueger as a Consultant to the Economic Research Center of the Department of Commerce of Guam. Despite its limitations, which were recognized by the author, it provided a valuable conceptual frame of reference and methodology for a continuing program. Unfortunately, it has not been carried forward.

Table 3.3 does, nevertheless, provide important information on the structure of the economy of Guam. Though the data are presented only in current prices rather than also in constant prices, thus making it extremely difficult to measure both long-term trends and annual fluctuations adjusted for inflation as can be done in the United States, it does reveal significant changes in the levels and distribution of economic activity.

Overall, gross business receipts in current prices increased from $226,854,000 in 1970 to $786,423,000 in the eight-year period 1970-1978. These are presented in current dollars and therefore reflect both inflation and growth. The increase over the period 1970-1978 is equivalent to a total increase of 247 percent, and a compound annual rate of increase of 17 percent. This is the broadest available measure of the growth trend in the private sector of the economy and, in a sense, of the total economy. Other measures of this trend are to be found in services provided by the government sector, including increases in consumption of electricity from 259 million KWH in 1971 to 490 million KWH in 1978, in water consumption from 2.9 billion gallons to 4.0 billion gallons and in telephone usage from 7,745 installed units to 14,056 units, excluding extensions.

TABLE 3.3

GROSS BUSINESS RECEIPTS
($ Thousands, Current)

Year	Agriculture	Construction	Manufacturing	Transportation	Wholesale	Retail	Insurance Real Estate Finance	Service	Total 2/
1970	1/	53,131	6,307	135	29,800	91,092	19,694	26,695	226,854
1971	1/	69,458	39,833	148	40,232	107,885	24,607	41,228	323,391
1972	1/	86,269	41,390	213	46,514	162,375	34,568	51,764	423,093
1973	543	127,847	62,990	11,009	48,569	180,316	66,726	64,939	562,940
1974	726	108,911	113,370	15,209	43,147	200,598	66,726	73,381	626,598
1975	1,171	92,794	139,422	13,640	46,903	189,010	58,056	68,940	600,549
1976	1,204	63,966	152,223	14,292	46,536	221,837	63,997	70,494	634,549
1977	1,686	85,467	172,617	15,246	77,775	215,201	65,581	80,209	713,782
1978	2,832	111,194	187,496	16,670	54,121	259,194	69,167	85,697	786,371
1979	4,918	110,992	215,100	23,881	94,288	320,549	77,226	130,894	977,848

P Preliminary estimates.

1/ Prior to 1973, Agriculture was not included in total gross receipts.

2/ Totals may not add up due to rounding.

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

All nine industry classifications experienced growth during the decade of the seventies, though by different rates. The largest absolute increases were in manufacturing and in retail trade. The increase in manufacturing is deceptive in its relative importance because it is very narrowly based rather than broadly diversified. The GORCO refinery which came on line in 1970 is estimated to account for 90 percent of total manufacturing gross business receipts, but for only about 10 percent of total manufacturing employment. The remaining 10 percent of the gross business receipts of the manufacturing classification and 90 percent of manufacturing employment are accounted for by food processing, printing and some other production activities. Watch and garment production increased rapidly in the first half of the decade. Subsequently, garment manufacturing declined sharply as a result of negative rulings and interpretations by U.S. Customs officials of Headnote 3(a) of the U.S. Tariff Code, and watch assembly fell off because of changes in consumer preferences and import quotas.

The composite transportation, public utility and communications classification had the highest percentage increase but a relatively small absolute volume increase in comparison with the other industries. This was probably due to increased usage of motor vehicles, the growth of international communications, and the growth of private port and airport-related activities. Government receipts from power, communications and port and airport activities are not included in Table 3.3. Also notable are the very low levels of gross receipts of the agricultural sector, making it necessary to import most food requirements; the very low level of commercial fishing; the absence of mining activities, due to lack of indigenous natural resources; and the steady increases of the wholesale, service, and insurance, real estate and finance industries. The tourist industry is not separately classified.

The relatively low percentage increase and the erratic fluctuation of the construction industry deserve special note because of the industry's importance to the basic infra-structure. While such fluctuations are characteristic of any free enterprise system, those on Guam appear to have been affected by special circumstances. These include the hotel construction boom in the early 1970's, the slowdown in military construction following the termination of the Viet Nam conflict, the low level of military construction through most of the 1970's, and Super-Typhoon Pamela in 1976. With respect to military construction it may be noted that the total volume increased from $21.3 - 29.3 million annually in 1974-1977 to $70.3 million in 1978. Also, that the application of minimum wage regulations to non-immigrant labor in the construction industry beginning in 1977 inflates the total cost of construction since then.

For the future, it is expected that the long-term trend as measured by gross business receipts will continue upward, though not necessarily at the same rate as in the past decade. As in the past, the upward trend will reflect both real growth and expansion of the economy and increased

costs and prices. Lacking both appropriate price and value added data, it is not possible to determine real growth trends of the past or to project them into the future. It is suggested, however, that real growth, on a constant price basis, of three percent per year appears to be reasonable. Such a rate of increase would double the size of Guam's economy in about 24 years. Some component industry classifications would increase at a faster rate, some at a slower rate.

A three percent annual rate of increase in gross business receipts is fractionally within the range of many forecasts of the gross national product of the United States. Although it was noted earlier that Guam's gross business receipts are not directly comparable to the gross national product of the United States, the comparison is suggested here because the United States is now and will continue to be Guam's largest source of supply for its import requirements and the largest market for its exports, as well as the largest source of funds from abroad.

3.5 Employment by Industry

Recent employment by industry clasification is shown in Table 3.4. Total employment in November 1979 was 33,300, approximately the same as a year earlier, including non-immigrant aliens.

The largest concentrations of employment were in public administration, services and trade. These accounted for 28 percent, 26 percent and 21 percent of total employment. Cumulatively, this came to 75 percent of the total, a clear indication that the economy is service oriented. Employment in finance, insurance and real estate is similarly oriented.

In striking contrast were the low levels of employment in the production sectors, primarily manufacturing and agriculture, with 4 percent and less than one percent, respectively of the total. These are extremely low even by comparison with other developing island economies. Construction, with 9 percent of employment was down from a year earlier when it provided 16 percent of all jobs.

Table 3.4 also reveals that private enterprise provided 54 percent of all civilian jobs in November 1979, the Government of Guam 26 percent and the Federal Government 20 percent. For a free enterprise economy, even one in the developing stage of growth, this public sector employment is unusually large.

Federal Government employment of civilians is primarily by the military establishment and to a much lesser degree by various agencies, such as the Internal Revenue Service, Immigration and Naturalization Service, Federal Aviation Administration, and the Departments of Agriculture and Commerce. At the present time, the continuation of such employment is considered as essential and non-replaceable for the stability of the economy.

TABLE 3.4

EMPLOYEES ON PAYROLLS ON GUAM BY INDUSTRY

SIC Code[1]	Industry	Nov 1978	Oct 1979	Nov 1979
	All Industries	33,800	33,600	33,300
	Agriculture	100	100	100
	Construction	5,300	3,200	3,000
15	General building contractors[2]	4,100	2,000	1,800
16	Construction other than building construction-general contractors	400	600	600
17	Special trade contractors	800	600	600
	Manufacturing	1,200	1,200	1,200
20	Food and kindred products	500	500	500
27	Printing and publishing	200	200	200
--	All other manufacturing	500	500	500
	Transportation and public utilities	2,600	2,700	2,700
	Trade	7,000	7,000	7,000
	Wholesale	600	500	500
	Retail	6,400	6,500	6,500
	Finance, insurance and real estate	1,300	1,200	1,200
	Service	7,800	8,800	8,700
70	Hotels and other lodging places	1,300	1,500	1,500
--	All other services	6,500	7,300	7,200
	Public administration	8,500	9,400	9,400
*	Federal government	6,600	6,700	6,700
*	Territorial government	9,300	8,900	8,800
*	Private employment	17,900	18,000	17,800

Total does not add up due to rounding

[1]Standard Industrial Classification Manual, 1972 edition.

[2]Includes operative builders.

* The employees in this category are included within the above industries breakdown.

NOTE: Data includes full-time and part-time employees who worked during or received pay for any part of the pay period which includes the 12th day of the survey month. Proprietors, self-employed, unpaid family workers and domestic servants are excluded.

SOURCE: Bureau of Labor Statistics, Department of Labor.

As regards employment by the Government of Guam, the study team received some statements from officials and from the business community that the public service is too large for the society and that it is "highly overstaffed" and "self-perpetuating". We have no comment on such statements. The point we would make in this context is that as the economy expands, future employment opportunities should be created primarily in the private sector.

It is desirable and necessary that many Government programs are directed toward the basic infrastructure, for example, the provision of health and educational services, construction and maintenance of a highway network, water, sewer, power and communication systems but greater growth in the private sector, particularly in production activities is considered essential for the long-term growth and viability of the economy. This would increase the tax base and yield additional revenue for the continuing functions of government. It would probably also lead to reduction in the persistently unfavorable balance of trade and to reduced pressures on Guam's limited financial resources.

3.6 Tourism and the Visitor Industry

Beginning with 1967, tourism and the visitor industry have become increasingly important to Guam's economy. All of these visitors arrive and depart by air, except for the very small number of cruise ship passengers. Whereas the visitors who use the air mode average four days on Guam, the cruise passengers generally remain only part of one day.

The total number of air visitors and the dollars they spend have had strong, long-term upward trends and now make a significant contribution - some say the most significant next to the military - to total money income. Further, the income derived from tourists and other visitors is estimated to be the largest single favorable component of the current account balance of payments.

Statistically, visitor expenditures are recorded as part of gross business receipts of the service, transportation and retail trade classifications of industry. Dr. Don C. Warner of the University of Guam has estimated that in 1977 they generated $123.4 million in direct income to the business community. This was equivalent to 18 percent of total gross business receipts in that year. Dr. Warner also estimated that that direct income generated an additional volume of $104.1 million in indirect income and $122.9 million in induced income.

Data on visitor arrivals for the period 1967-1980 are presented in Table 3.5 together with the percentages from Japan, North America/Hawaii and other areas. The long-term upward trend ran unabated from 1967 to 1974, when more than 260,000 visitors came to Guam. Construction of hotel space to accommodate this influx kept pace with the increasing

numbers of visitors. The decline in 1975 and 1976 is attributed to the depressed levels of economic activity in Japan and the United States, the two major visitor markets, and to Typhoon Pamela, which hit Guam in May 1976. The upward trend was re-established in 1977 and reached an all time peak in 1979 when 264,326 visitors came to Guam. Based on data for the first three months of calendar year 1980, it is possible that this year will exceed 1979.

TABLE 3.5

VISITORS ARRIVALS
Calendar Years 1967-1980

Year	Total	Percent of Total		
		Japan	North America Hawaii	Other Areas
1967	6,600 (est)	66	na	na
1968	18,000	35	38	27
1969	58,265	50	32	18
1970	73,723	60	24	16
1971	119,124	71	17	12
1972	185,399	75	16	9
1973	241,146	70	15	15
1974	260,568	66	11	23
1975	239,695	67	9	24
1976	201,344	69	9	22
1977	240,467*	63	13	24
1978	231,975	69	13	18
1979	264,326	72	14	14
1980[1/]	141,642	74	13	13
	EXCURSION ARRIVALS BY CRUISE SHIP			
1976	3,752			
1977	5,361	(Japan 2,416; Australia 2,945)		
1978	6,843	(Japan 1,543; Australia 4,922; United States 423)		

1/ January-June

Source: Guam Visitors Bureau

* - Includes overnighting air crews not counted in previous years.

More recently, the U.S. Corps of Engineers made a preliminary projection of about 500,000 for the year 2000. These may be compared with less structured estimates by officials of Guam Visitors Bureau and by several people associated with the tourist industry and the business community that the number of visitors will increase at rates of 10 to 15 percent annually for the next decade, and may even double the 1979 total of 264,326 within the next five years. Such estimates are generally accompanied by the qualifications that they are contingent on the

availability of hotel rooms and on sufficient air services. These are very important qualifications.

The level of air services and the structure of air fares, are all subject to administrative control of the U.S. Civil Aeronautics Board. Currently before the Board are several proposals to institute new services between Guam and various Far East and Southeast Asian countries, and between the U.S. West Coast and Asia via Guam. Pan American has recently been permitted to double its service between Manila, Honolulu and the mainland via Guam from three to six flights weekly in each direction. This was to take advantage of an agreement which was pending approval for 20 years. Braniff, on the other hand, recently discontinued its twice weekly service between Hong Kong and Los Angeles via Guam.

Hotel occupancy in Guam increased from 72 percent in June 1979 to 75 percent in June 1980. This is in contrast to Hawaii where average hotel occupancy in June 1980 was 65 percent compared with 69 percent in the previous June.[3/]

Turning now to the future availability of hotel space, a doubling of the 1979 visitor count in five years would require the construction of the equivalent of at least one new Guam Hotel Hilton annually. Given Guam's limited domestic capital resources and a shortage of required management skills, the financing of such an expansion program would have to come from overseas sources.

It is not possible to state with any degree of certainty that the required expansion program in hotel space will materialize. This will depend on such considerations as the volume of capital investment required, the cost of money, and comparative investment opportunities elsewhere including Micronesia, the South Pacific area and Hawaii, which compete with Guam for the tourist trade. The land requirements for such an expansion program may constitute an additional constraint, unless areas other than along Tumon Bay are determined to be suitable by hotel developers. It is reported that construction of a new hotel on Cocos Island, a very attractive area for water sports and sunning off the south coast of Guam, is imminent. See Table 3.6 for existing hotel units.

To assure the continued expansion of the visitor industry, it will be necessary for the Japanese market to continue to expand and for other markets to be promoted and developed. Table 3.5 reveals a very heavy dependence on the Japanese market, 72 percent in 1979 and 76 percent the first three months of 1980. Supplementary information and visual observation indicate that it is heavily concentrated in the 20-40 year age group and that the prime reason for visiting Guam is for pleasure purposes. This has both positive and negative implications for the tourist industry.

3/ Quarterly Economic Review, April-June 1980, Economic Research Center, Department of Commerce, Government of Guam.

TABLE 3.6
HOTELS ON GUAM 1980

Hotels	Units
Fujita Tumon Beach Hotel	293
Guam Dai Ichi Hotel	202
Guam Dai Ichi Annex	200
Guam Hilton Hotel	383
Guam Horizon Apartment Hotel	105
Guam Hotel Okura	230
Guam Reef Hotel	300
Guam Suehiro Hotel	30
Pacific Islands Hotel and Beach Colony	203
Pacific Islands Club	100
Plumeria Garden Hotel*	78
Hotel World Trade Center*	85
Hotel Joinus	36
Magellan Hotel*	31
Mendiola Apartment Hotel*	78
Micronesia Village Hotel*	175
Terrazo Tumon Villa	22

* Denotes hotels in commercial areas.
All others are in the Tumon Beach resort area.
Source: Guam Visitors Bureau.

Other markets should therefore be extensively cultivated, including other countries in the Far East, Southeast Asia, and Australia and New Zealand, as well as the United States and Canada, particularly on the West Coast of both countries. In this context promotion of tourism for all Micronesia, in which Guam would share, should be considered. Expansion and diversification of tourist attractions, now heavily focused on sightseeing, duty-free shopping and swimming, could be a stimulus to expansion and broadening of the market. These could include additional water-oriented activities such as boating, scuba-diving, deep-sea sport fishing and water-skiing, cultural and other activities which would be shared with local residents.

3.7 Agriculture

It should first be noted that this sector was once capable of producing most of Guam's consumption requirements. Changing consumer preferences, improved standards of living, increased and changing composition of the population and a general preference to take employment in new and emerging sectors of the economy led to declining production in agriculture following World War II. In 1978 and 1979, this sector had only about 100 employees, not counting self-employed proprietor-operators.

Recent trends in the production of primary crops and in the market value of local agricultural products are presented in Table 3.7 and Table 3.8 respectively. The production declines in 1976 and 1977 of several of the crops and of poultry, pork, beef and eggs are traceable primarily to the impact of Typhoon Pamela. Statistics from the 1978 Census of Agriculture, Bureau of Census, U.S. Department of Commerce indicates that the tree crops especially coconuts and avocados were greatly affected by Typhoon Pamela. There were 84 percent fewer coconut trees in 1978 than in 1975 and 64 percent fewer avocado trees. Although vegetables and field crops recovered from the devastation, there was some shift in concentration with a substantial increase in watermelons and cantaloupes but decreases in other crops.

TABLE 3.7
PRODUCTION OF PRIMARY CROPS:
Fiscal Years 1975-1978

Crop	1975 (Pounds)	1976 (Pounds)	1977 (Pounds)	1978 (Pounds)
Watermelon	360,814	63,081	818,000	3,323,326
Cucumber	152,389	102,981	619,200	979,200
Head Cabbage	235,936[1]	46,100	422,000	67,490
Sweet Potato	99,024	44,590	216,200	216,602
Eggplant	388,241	44,721	198,000	206,100
Cantaloupe and Melons	189,020	29,897	192,000	590,400
Chinese Cabbage	[1]	26,083	180,000	36,934
Cooking Banana	458,467	51,537	149,520	97,205
Tomato	299,583	26,558	144,000	207,300
Eating Banana	[2]	142,000	142,200	91,874
Long Beans	N/A	55,539	94,090	198,000

[1]Head and Chinese cabbage total 335,936

[2]Cooking and eating bananas total 412,467

N/A - Not Available

Source: Department of Agriculture, Government of Guam.

the surpluses derived from services such as sea and air transportation, international banking and insurance, and from tourism, personal remittances and earnings on foreign investment. For Guam, all of these items, for which detailed data are unfortunately not available, are generally believed also to result in deficit balances, except for income derived from the visitor industry.

TABLE 3.9

Balance of Trade, 1970-1979

Year	Imports	($ Millions) Exports	Balance
1970	96.4	5.8	- 90.6
1971	115.0	10.5	- 104.5
1972	166.8	16.4	- 150.4
1973	211.1	10.9	- 200.2
1974	259.1	20.0	- 239.1
1975	266.2	28.5	- 237.8
1976	267.6	25.2	- 242.4
1977	255.6	25.3	- 230.3
1978	268.6	35.8	- 232.8
1979	230.0	42.3	- 187.7

Totals may not add up due to rounding

Source: Guam Department of Commerce.

For the remainder, Guam depends largely on Federal Government loans and grants to both the public and private sectors and on expenditures on Guam of various U.S. Government departments and agencies, notably the Department of Defense. Without such assistance and expenditures it would not be possible for Guam to pay for its imports or to balance its current account international transactions.

Long-term private capital investment such as in hotels and oil refining facilities, have both favorable and unfavorable impacts on the current account balance of payments. On the favorable side, the inflow of capital represents a receipt of funds even though some of it is spent for financing imports for construction. Coincidentally, it also provides jobs for and income from both the initial construction activity and from continuing operations of the facilities. On the unfavorable side, the transmission of earnings to the overseas investors is an annual drain on the economy's capacity to pay for imports.

This brief discussion of the balance of trade and the balance of payments highlights the significance to the economic welfare of Guam of

the policies of the Federal Government with respect to loans and grants to and expenditures on Guam and of foreign capital investment in Guam. Increases and decreases in the level of such inflows of funds affect the economy to an extraordinary degree. Major reduction of such inflows would have drastic consequences for the economy; major increases would have the opposite effect and help to ensure its continued growth and development.

In the broader context, the basic conclusion that emerges from the preceding analysis of the structure of the economy is that it is too narrowly structured. The basic production industries are both inadequate in size and too limited in scope to satisfy the society's needs for many essential commodities and manufactured goods.

4.0 POTENTIAL FOR ECONOMIC AND INDUSTRIAL DEVELOPMENT

4.0 POTENTIAL FOR ECONOMIC AND INDUSTRIAL DEVELOPMENT

4.1 General

It is considered essential for the economy's future viability that its production industries not only continue to expand, but that they also diversify their bases. Considerable effort should be devoted by both the Territorial and Federal Governments and by private enterprise to achieve these objectives. With particular reference to the manufacturing industries, the present incentive program to locate on Guam should be extended. Also, it will be necessary for the required labor skills to be developed and to overcome what many in the business community regard as a general reluctance to accept employment in factories.

For the long term, the heavy relative dependence of the economy on Federal Government programs and activities should be reduced progressively as other economic activities increase. This is not to suggest that these programs and activities should be reduced. Quite the contrary. What is suggested is that other economic activities increase even more. The results, if successful, will more than compensate for the effort involved.

Among the potential developments which could be considered are the following:

- foreign trade zones and industrial parks;
- the outlook for fishing-related industries and other industrial activities;
- Guam's load-center role for transshipment trade with the other islands of Micronesia;
- the development of Guam as a regional corporate center for some business functions now performed in the Far East and Southeast Asia.

4.2 Foreign Trade Zone and Industrial Parks

In our discussions with government officials and with members of the business community, the survey team was informed that there is need for the development of a foreign trade zone on Guam, and specially on Cabras Island. The discussions also revealed that there is some confusion as to just what a foreign trade zone represents under U.S. law.

As spelled out in the Foreign Trade Zones Act of 1934 and subsequent legislation, a foreign trade zone is a specifically

designated area into which foreign goods may be imported, within which the imports may be manipulated and processed, or otherwise held, and then re-exported to foreign areas or shipped into the customs territory of the United States. Technically, although the zone is actually located in the United States, it is outside its customs territory. No duties are paid on imports into the zone or on re-exports to foreign destinations. For goods which are shipped into the customs territory of the United States, the appropriate duties are then assessed. Because there are certain advantages derived from such operations, they have increased substantially in recent years.

Guam, however, does not assess duties on either imports or exports. In this sense, the entire Territory is a foreign trade zone. As spelled out in The Economic and Land - Use Plan for Cabras Island and Surrounding Area published by the Port Authority of Guam in 1979, what is really meant by those who advocate the establishment of a foreign trade zone is the creation of a free trade zone within which manufacturing activities would be "exempt from or granted abatement from territorial taxes and licenses requirements on exported items". Further, it is said that this concept "is intended to supplement the government's Qualifying Certificate Program for tax rebates and/or tax abatements for certain business activities newly established on the island."

Based on information provided by the Guam Economic Development Authority (GEDA) and from the Guam Economic Review, 1979, the taxes referred to include:

- abatement of taxes on real property for up to ten years;

- abatement of income taxes for up to ten years when derived from lease of property or equipment;

- abatement of the gross receipts tax of four percent on the manufacture of alcoholic beverages or petroleum products;

- rebates of up to 75 percent of income taxes on dividends for up to five years; and

- rebate of up to 75 percent of corporate income taxes for up to 20 years.

In addition long term loans of up to 25 years at interest rates as low as three percent are also available "to eligible enterprises in agriculture, fishing, tourism and industrial/manufacturing/commercial activities." The principles embodied in these incentives would be extended to all manufacturing companies which would be located in the proposed free trade zone on their production for the export market. Presumably, the next step in the development of incentives would be to

extend various benefits to all manufacturing industries producing for the domestic market and in this manner lead to import substitution.

The survey team strongly supports this concept. Many states and local jurisdictions in the United States employ similar approaches in their efforts to attract industry. So, too, do many developing nations, sometimes with and sometimes without reference to specific locations.

The proposed free trade zone could well be an integral part of such additional industrial parks which may be located on Guam. At present, there are three such parks on Guam: the present Cabras Island Industrial Park, adjacent to the Commercial Port; Harmon Industrial Park, near the airport, is ideally situated for activities dependent on or related to air transportation; and the E.T. Calvo Memorial Park which is located in a prime commercial development area and which is currently commercially oriented. Government officials and members of the business community who were interviewed by the survey team were in general agreement that future industrial parks for manufacturing activities related to waterborne imports of raw materials and semi-finished products should be located on Cabras Island.

Within this frame of reference, it is recommended that consideration be given to coordination of planning, development and administration of Apra Harbor's non-military cargo handling facilities and to similar coordination with respect to the present Cabras Island Industrial Park and such new industrial parks as may be located on Cabras Island and adjacent to Apra Harbor.

Several agencies of the Government of Guam are concerned with planning for industrial expansion and/or administration of various aspects of existing programs. These include the Port Authority of Guam, the Guam Economic Development Authority, the Department of Commerce and the Planning Bureau of the Office of the Governor. For example, Guam Economic Development Authority administers the incentive program for the establishment of new industrial pursuits and also the present Cabras Island Industrial Park. The latter responsibility antedates the establishment of the Port Authority of Guam. The leases of the present occupants vary considerably in time span and in other substantive provisions. Further, the leases do not provide for the Port Authority to collect dockage and wharfage fees from vessels and cargo handled at the various facilities in the Industrial Park.

There is urgent need to coordinate the planning, development and administration of Apra Harbor's non-military cargo handling facilities and the development of industrial parks.

Given the inherent nature of government agencies everywhere to attempt to maximize their functions and responsibilities, it is probably unrealistic to expect all planning and development, and administrative responsibilities on Guam to be consolidated in one agency. Nor is it necessarily desirable. The input of various agencies in the planning

stage, each from a different perspective, is considered to be desirable. These activities should be coordinated, including those concerned with land and water use planning and development. Administration of specific functions, however, is another matter. Generally, these tend to be best implemented when they are consolidated in individual agencies.

At this level, the division of function and responsibility could take the following form: the Guam Economic Development Authority to retain its current responsibility for the incentive program and the Port Authority to be given responsibility for actual development and administration of industrial parks on Cabras Island and elsewhere around Apra Harbor. It would be essential for these agencies to cooperate with each other and with other agencies in the implementation of their respective functions and responsibilities.

The above suggestions should be viewed as one possible approach to the problem. They are not written in concrete. It is only in this sense that they are submitted by the present survey team for consideration by the appropriate authorities.

4.3 Headnote 3(a) and the Generalized System of Preference

Headnote 3(a) of the U.S. Tariff Code permits duty free entry into the United States of articles which are grown, produced or manufactured on Guam and other insular possessions when at least 50 percent (30 percent for watches) of the import price is value added in the territory or possession. Imports of watches are also subject to quota allocation. It was under these provisions that garment and watch manufacturing in Guam expanded rapidly in the early 1970's. Garment manufacturing subsequently declined as a result of unfavorable rulings and interpretations by U.S. customs authoritites; watch assembly declined primarily because of changing consumer preferences from traditional to digital watches.

The Generalized System of Preferences was established by the United Nations Conference on Trade and Development in 1964, as part of a broad effort to assist developing nations to improve their economies by expanding their export markets. Import barriers were reduced by the developed nations to permit easier access to their markets for the goods and merchandise exported by the developing nations and territories. The specific provisions of the eased barriers vary from country to country as do also the beneficiaries among the developing nations.

Guam is now included as a beneficiary territory of Australia, New Zealand, Japan and the European Common Market. The United States is also an adherent of the Generalized System of Preferences. For Guam, however, there are potentially greater benefits to be derived from increased exports to the United States under Headnote 3(a), provided rulings and interpretations by U.S. customs officials are more timely, consistent and liberal than they have been in the past. It is our

understanding that negotiations to this end are currently underway. It might be necessary for the value added to be reduced to 20 or 25 percent in order to offset the high labor costs on Guam relative to other countries in the Western Pacific.

4.4 Other Industrial Activities

It was not possible within the time frame and budgetary limitations of the present study to undertake extensive market surveys of potential users of a free trade zone. However, based on broad experience of the team members and on their knowledge of trends and developments in other developing countries, following are some of the types of production activities which may be considered as potential for Guam. It must be stressed that the list should not be viewed as being all inclusive in coverage of future potentialities; rather, it is presented for the purpose of suggesting the kinds and types of activities that have been undertaken in other developing economies that may also be appropriate for Guam:

- Clothing, apparel and other textile products;
- Leather products, such as purses, handbags, wallets, some footwear, briefcases and luggage;
- watches and other time-pieces;
- Various electronic components and devices;
- Glass, pottery and china;
- Packaging of certain agricultural products and development of a slaughterhouse (this would be primarily for local consumption, but would also include small volumes of some commodities for export);
- Aquaculture and mariculture;
- Fish processing;
- Veneers and plywood;
- Some drugs and chemicals, particularly those which are petroleum based or use products of the sea as their source materials;
- Photographic and optical goods;
- Radios and television sets;

- Commercial production and/or home handicraft industries based on local resources of coral and hardwood.

It is recommended that these are among the types of production activities that should be subjected to intensive market analysis in the United States, Canada, Australia and New Zealand.

In developing the list of potential activities, the survey team recognized that because of Guam's limited natural resources, it would be necessary in most instances to import either the raw materials or semi-finished products. For example, there are no natural resources on Guam of metallic ores, most minerals, fibers or timber. Generally, the emphasis should be on assembly operations and light manufacturing rather than on heavy manufacturing.

As GORCO has demonstrated, however, it is possible to develop a complex heavy industrial activity based on imports of the raw material. While the production of the refinery is in large measure for use by the military establishment, some portions of its production do go to the civilian market, and to Guam Power Authority, and also are exported to other islands. In the same manner, production from other activities that may be established could, in part, be for domestic consumption on Guam and lead to substitution for products now imported in finished form. Guam would also benefit from the jobs and income created by the activities.

Guam is located in an area which possesses a very good growing climate. As indicated on Tables 3.7 and 3.8, there has been significant increase in agricultural production from 1969 through 1978. Pork and egg production almost doubled over this period. Guam has a good growing climate, fertile soils, and judging from prices for produce from the mainland, the possibility for a substantial profit margin. Vegetable crops which are not susceptible to long term damage from typhoons should be encouraged.

By taking advantage of recent and continuing research in aquaculture and mariculture, it is possible that sufficient volumes of various products could be harvested to provide live bait needed for a pole-and-line type tuna fishing operation. This in turn might provide sufficient inducement for private industry to establish a fish processing and canning industry on Guam (See Section 8.0). In addition prawn, eels and softshell turtles are possible commercially viable aquaculture species.

As was noted in the earlier analysis of the structure of the economy, the development of additional industrial pursuits will require extensive training programs to develop the required labor skills. Many of these programs would probably be undertaken by the private interests who would be involved, as is generally the case in other developing nations, and as was done by GORCO on Guam, with the cooperation of the

Government of Guam. It will also be necessary to overcome what many in the business community regard as a general reluctance on the part of Guamanian labor to seek employment in factory enterprises. Finally, it will be necessary that the total costs of production on Guam and the costs of transportation to export markets be competitive with total delivered costs from other sources of supply.

4.5 Guam as a Regional Corporate Center

The survey team is of the opinion that there is positive long-term potential for Guam to develop as a regional administrative center and base of operations for both U.S. and foreign corporations doing business in the Western Pacific. It is believed that Guam could become a regional center for various corporate functions and activities now based in Hong Kong, Singapore, Manila, Taipei and other Far East and Southeast Asia locations. These would include such functions as marketing, purchasing, banking, insurance, communications, training and, under certain circumstances which will be noted, distribution functions. They would complement but not necessarily be dependent on the establishment of manufacturing or other production facilities.

It is appropriate to note that success in achieving this potential may not lead immediately to increased volumes of cargo movements through the Port of Guam. It would rather contribute to expanding and strengthening the base and scope of the Island's economy. This would provide additional dimensions to employment opportunities, corporate and personal income and foreign exchange resources which would be reflected over time in increased demand and higher volumes of trade.

Further, it is important that achievement of this potential be recognized and accepted as a long term rather than short run objective, and that short run expectations not lead to unwarranted frustrations and discouragement. Within this context, efforts directed towards fulfillment should be accorded a high priority by both government agencies and the private business community, requiring extensive and coordinated promotion and planning by both sectors.

As a corollary of the above, it may be noted that historical experience in other areas suggests that successful performance as a regional administrative center at the individual corporate level would attract additional corporate presence and activity. This would enhance Guam's role as a general entrepot center in the region, and as a viable alternative base of operations competitive with Hong Kong, Singapore, Manila and other regional locations.

Comparative costs of doing business on Guam and in other countries in the Far East and Southeast Asia are currently in a state of transition. The decline in dollar exchange rates in recent years, coupled with higher rates of inflation have substantially affected cost

comparisons, generally to the advantage of Guam. According to the Guam Growth Council "many business costs on Guam are much lower than (in) the major Asian cities of Tokyo, Hong Kong, Seoul, Taipei, Singapore and Manila". For example, office rent in Tokyo is priced at $4.73 per square foot compared with prime space as low as $.80 per square foot on Guam. Construction, residential, food and other household and personal consumption costs are also said to be lower in Guam. While these cost relationships will change over time, it is expected that Guam will become increasingly cost competitive with other Far Eastern and South Asian centers.

Establishment of regional administrative offices in conjunction with the development of manufacturing and other production activities, would make the entire enterprise eligible for various tax rebates and other benefits under the GEDA incentive program. In addition, the resultant exports from Guam would become eligible for tariff preferences under Headnote 3(a) of the U.S. Tariff Code and under the Generalized System of Preferences. This could lead to development of Guam as an export distribution center for goods and merchandise "produced in the United States". In effect, the joint and simultaneous establishment of regional corporate and manufacturing facilities would yield reciprocal benefits to both the companies involved and the economy of Guam.

As a territory of the United States, Guam offers corporate enterprise political stability, military protection and security and the advantages and benefits of the American legal and judicial systems. This political-military-legal-judicial frame of reference has no counterpart elsewhere in the Far East and Southeast Asia. It may, for example, be compared with the present - and possibly future - political and military instability in a number of areas along the western rim of the Pacific. As was noted earlier, it is assumed that any change that may take place in the political relationship of Guam with the United States will be such as to promote rather than impede the growth and development of Guam's economy.

Guam already has a basic structure of business services and facilities required for an expanding role as a regional corporate center and base of operations. Without going into extensive detail, the following may be noted.

4.5.1 Air Transportation

Guam is centrally located with respect to air transportation within the Far East, Southeast Asia and the South Pacific. Most major Asiatic destinations can be reached within three to five hours flight time. Existing passenger and cargo services provided by six carriers link the Territory directly with the continental United States and Hawaii, the islands of Micronesia, Japan, Korea, Taiwan, the Philippines, Hong Kong, Singapore, Thailand, Indonesia, Australia, New

Zealand, and other South Pacific Islands, and via connecting carriers with China, India and the rest of Asia. As noted in the earlier section on tourism, eight additional carriers have proposals before the Civil Aeronautics Board to institute new services between Guam and various Far East and Southeast Asia countries and between the U.S. West Coast and Asia via Guam.

4.5.2 Postal and Telecommunications Service

With respect to communications, the U.S. Postal Service is responsible for all mail handling on Guam with the same rate and service schedules as in the United States. Telex and overseas telephone services are provided by RCA Global Communications. Additionally, direct courier services are available on a door to door basis between Guam and the United States and most Pacific rim countries at relatively low rates and two to three day delivery schedules. These services are described by members of the business community as "efficient" and "excellent".

4.5.3 Banking Services

There are eight full service U.S. commercial banks and three full service foreign banks which provide the wide range of banking services required for multi-national operations, including the three largest U.S. banking institutions, viz, Bank of America, Citibank and Chase Manhattan Bank. Almost 100 insurance companies, both U.S. and foreign, offer similiarly wide ranging services and coverages. Additional business oriented services and resources already available on Guam include accounting, advertising, computer, foreign exchange, legal services, office equipment, printing, stock brokerage and specialized secretarial and office personnel services for established companies or for established companies with particular short term needs.

5.0 GUAM'S OCEANBORNE TRADE

5.0 GUAM'S OCEANBORNE TRADE

5.1 General

This section presents a review and analysis of Guam's oceanborne trade during the period 1968 - 1980. It examines trends and developments in imports, exports, and transshipment trade; the origins and destinations of this trade in terms of trade with the United States - this is recorded as domestic trade - and with foreign areas including the Trust Territory; the commodity composition; and the division between breakbulk and container movements. The terms Port Authority of Guam, Commercial Port and Port of Guam are used synonymously.

Transshipment trade is recorded by the Port Authority first as transshipment in and then as transshipment out. The volumes shown in the following discussion are therefore duplicated volumes. They represent revenue control totals rather than unduplicated cargo volumes which actually moved through the Commercial Port. The reason for this is explained below.

Guam's waterborne trade statistics are recorded solely in terms of cargo revenue tons, not in weight tons. In shipping industry terminology, a revenue ton represents a unit of cargo occupying either 40 cubic feet of space aboard a vessel or weighing one short ton (2,000 pounds), with the shipping operator having the option of assessing freight charges on either basis in order to maximize revenue. Revenue ton charges vary considerably as between different commodities. For example, the charges for carrying machinery are quite different from those for carrying fish or canned fruits and vegetables. In the case of inbound military cargo the contract between the shipping operator and the military is actually a box rate and the revenue tons reported are on the basis of total cubage.

Except where specifically noted, the following review and analysis of Guam's waterborne commerce is in terms of revenue tons. Also, because the data have historically been collated on a fiscal year basis and are so published in available source material, they are so presented in this report, except where specifically noted.

5.2 Overall Trends

Table 5.1 presents data on imports, exports, and transshipments through the Commercial Port for the years 1968-1980.

Analysis of Table 5.1 and of related data reveals the following basic trends and developments.

- The long term trend in total trade was distinctly upward between 1968 and 1980. Total trade increased from 313,000-340,000 tons in 1968-1969 to 486,000 tons in 1970 to a range of

815,000-834,000 tons in 1977-1979. The overall trend was punctuated by peak years in 1973 and 1974 when volumes of 886,000 tons and 858,000 tons respectively, were handled followed by two years of depressed volumes of 690,000 tons in 1975 and 681,000 tons in 1976. Fiscal year 1980 volume is down from the preceding three years primarily because of the sharp fall off in transshipment trade.

TABLE 5.1

CARGO REVENUE TONS BY IMPORTS, EXPORTS AND TRANSSHIPMENT
FISCAL YEARS 1968-1980

Fiscal Year	Import	Export	Transshipment 1/	Total
	A. Revenue Tons (000)			
1968	229	60	25	314
1969	266	54	20	340
1970	407	70	9	486
1971	616	85	18	719
1972	596	117	26	739
1973	668	79	139	886
1974	670	84	104	858
1975	534	115	31	681
1976	441	121	128	690
1977	549	108	177	834
1978	513	75	227	815
1979	543	131	143	817
1980	516	140	64	720
	B. Percentage of Total			
1968	73	19	8	100
1969	78	16	6	100
1970	84	14	2	100
1971	86	12	2	100
1972	81	16	3	100
1973	76	9	15	100
1974	78	10	12	100
1975	79	17	4	100
1976	64	18	18	100
1977	66	13	21	100
1978	63	9	27	100
1979	67	16	17	100
1980	72	19	9	100

1 / Primarily to and from Trust Territory; also includes frozen fish, pineapples originating in Philippine Islands, etc. in some years.
Source: Annual Economic Review and Port Authority of Guam

In every year during the entire period, imports were much larger than exports and transshipments combined, and accounted for the largest share of total movements ranging from highs of 81 to 86 percent in the early seventies, to 76 to 79 percent in the middle seventies to 63 to 67 percent in more recent years. For the first eleven months of fiscal year 1980, the relative share of imports increased to 72 percent. The import volume peaks were established in 1973-1974 when about 669,000 tons were handled annually. Since then the volumes have tended to

stabilize in 513,000-549,000 ton range, except for 1976 when imports declined sharply.

- By contrast, exports never exceeded 131,000 tons and never accounted for more than 19 percent of the total volume. The long-term trend was upward from 60,000 tons in 1968 to 134,000 tons in 1979, with relatively moderate annual fluctuations for most of the period.

- As for transshipment cargo, the overall trend was sharply upward through 1978 despite some rather unusual annual fluctuations, which were magnified because the actual volumes involved are double counted in the statistics. The volumes shown in Table 5.1 for the years 1968-1972 are of an entirely different order of magnitude from those shown for the years 1973-1978. Since 1978, the volume has declined precipitously. As is set forth later in this report, the transshipment volume is expected to stabilize and then increase moderately over time.

- Analysis of the factors which influenced Guam's foreign trade during this period suggests that it is important to differentiate between long-term trends and short-term fluctuations and developments. In the long run, the major factors which influenced the overall trend of increase in imports were population increase, growth in the economy, the continued presence of the United States military establishment, the continuing inflow of United States government funds, and the growth in the tourist industry.

- The most significant short-term factors were fluctuations in the levels of economic activity in Guam, and in the United States, Japan and other important trading areas for Guam; the construction boom of the early and mid-seventies, notably in hotel construction, which contributed to the long-term growth of the tourist industry; fluctuations in the inflow of private capital investment funds; the growth and then the decline of transshipment movements of canned pineapples from the Philippine Islands to the United States, and Typhoon Pamela in May 1976.

- The above analysis is indicative of the fact that Guam's economy is essentially an import consumption rather than an export production economy. It imports far more of its consumption requirements than it exports of its domestic production. The production sectors of the economy are both inadequate in size and too limited in scope to satisfy the society's needs for many essential commodities, let alone provide surpluses for export. Guam must therefore look to overseas sources of supply for most of its consumption requirements. Analysis of the commodity

composition of imports and exports later in this Section supports this basic conclusion. Transshipment trade, which is really a pass-through operation, does not affect this analysis.

5.3 Trade Area Distribution

The direction of Guam's trade through the Commercial Port is heavily weighted by trade with the United States and the Far East. Data on the sources of imports and the destination of exports in revenue tons are available for the period 1976-1980. These are presented in Table 5.2.

TABLE 5.2
CARGO REVENUE TONS BY IMPORTS AND EXPORTS BY TRADE AREA
Fiscal Years 1976-1980

	Imports 1/			Exports 1/		
Fiscal Year	Domestic	Foreign	Total	Domestic	Foreign	Total
A. Revenue Tons (000)						
1976	356	85	441	83	38	121
1977	397	152	549	73	35	108
1978	391	122	513	40	35	75
1979	426	117	543	81	50	131
1980	390	125	515	91	49	140
B. Percent of Total						
1976	81	19	100	69	31	100
1977	72	28	100	68	32	100
1978	76	24	100	53	47	100
1979	78	22	100	61	39	100
1980	76	24	100	65	35	100

Totals may not add up due to rounding

1/ Excludes transshipment

Source: Port Authority of Guam

Table 5.2 indicates that the United States is generally the source of more than three-quarters of the total import volume; foreign sources for the balance. Other data suggest that the Far East, particularly Japan, Taiwan, Philippine Islands and Hong Kong, account for most of the imports from foreign areas. On a lesser scale, there is some import trade with Australia and New Zealand, the Northern Marianas (meat and dairy products from Tinian) and various South Pacific and Southeast Asia sources of supply.

As is the case with imports, the United States is also the most important export trading partner, generally accounting for about two-thirds of the total revenue tons annually. The export markets are in large measure comparable to the import sources of supply, except that the Trust Territory is proportionately more important as an export market than as a source for imports. This is for exports from domestic Guam production and imports for Guam consumption, not transshipment traffic.

It will be noted that Table 5.2 does not include transshipment cargo. Available statistics do not provide information on where inbound transshipments into Guam originate or where outbound movements from Guam are destined. Such statistics as are available indicate that on a combined inbound and outbound basis, in fiscal years 1976-1979, foreign areas, including the Trust Territory, had somewhat larger annual volumes of transshipment traffic than did the United States.

From other sources, including steamship agents and several carriers and the Guam Department of Commerce, information was derived that most of the transshipment cargo originates in the United States and the Far East and is then forwarded to Saipan and to the Truk, Yap and Palau Districts of the Trust Territory. These movements are known to be considerably larger than movements in the reverse direction. There is much less transshipment trade with the Eastern District of the Trust Territory. Additionally, the United States is ultimately the destination of frozen tuna fish transshipments brought in by carrier vessels from tuna fishing bases and by fishing vessels from the various fishing grounds, including those in Trust Territory waters. In fiscal years 1975-1979, there were also substantial transshipments of canned pineapple originating in the Philippines and consigned to the United States. This movement, which was carried by Matson Navigation from Guam to the United States, was completely terminated when the line stopped serving the Guam trade in 1979.

Supplementary data on Guam's total trade with the United States were made available by the U.S. Corps of Engineers. (See Appendix Table A-1). These indicate that Guam's imports from the United States increased progressively from 133,156 short tons in calendar year 1975 to 175,215 tons in 1976, 197,273 tons in 1977 and 215,107 tons in 1978; exports from Guam to the United States were 48,380 short tons in 1975, 149,855 tons in 1976, 88,535 tons in 1977 and 115,380 tons in 1978. In both cases, transshipment volumes are included in the totals.

Additional supplementary data published by the Office of the High Commissioner of the Trust Territory of the Pacific Islands provide the following information on trade with the Trust Territory. Again transshipments are included in the totals. In fiscal year 1978, the Northern Marianas, principally Saipan, imported 36,083 revenue tons of cargo from Guam and the other districts in the Trust Territory 27,372 tons, with Palau accounting for more than half of this latter volume. Exports to Guam were much smaller, 2,233 tons and 2,623 tons from the Northern Marianas and the other Trust Territory areas, respectively.

5.4 Breakbulk and Container Cargo

Table 5.3 presents data on the Port of Guam's breakbulk and container revenue tons for the period 1970-1980. It indicates clearly that the shift from breakbulk to container movement which began in the

sixties - but for which statistics are not available - continued through the decade of the seventies. Beginning with 1975, containerized cargo has steadily accounted for 84 to 88 percent of the total volume annually, breakbulk for the balance. It is anticipated that the proportion of container cargo will increase slightly over time.

TABLE 5.3

CARGO REVENUE TONS, BREAKBULK AND CONTAINER CARGO[1/]
FISCAL YEARS 1970-1980

Fiscal Year	Breakbulk	Container	Total
	A.	Revenue Tons (000)	
1970	293	193	486
1971	306	414	720
1972	NA	NA	739
1973	321	564	885
1974	243	615	858
1975	109	571	681
1976	93	597	690
1977	133	702	835
1978	113	701	814
1979	108	709	817
1980	95	625	720
	B.	Percentage of Total	
1970	60	40	100
1971	42	58	100
1972	NA	NA	100
1973	36	64	100
1974	29	71	100
1975	16	84	100
1976	13	87	100
1977	16	84	100
1978	14	86	100
1979	13	87	100
1980	13	87	100

1 / Includes transshipment cargo
Source: Port Authority of Guam and Annual Economic Review, 1979.

In recent years, just about all of the trade between Guam and the United States has consisted of containerized cargo, all carried by scheduled cargo liner services. Such small volumes of breakbulk cargo as are carried in this trade are generally by inducement and consist of non-containerizable cargo, primarily motor vehicles, construction equipment and construction components.

Interregional trade with foreign areas and intraregional trade with the Trust Territories now account for all breakbulk cargo, plus additional volumes of containerized cargo. In 1979, breakbulk interregional trade was larger than containerized movements, 90,527 tons and 76,886 tons, respectively. In this context it may be noted that motor vehicles which are generally carried on roll-on/roll-off vessels are classified as

breakbulk cargo and constitute the majority of the breakbulk cargo.

All regularly scheduled steamship operators serving Guam now use 20 and 40 foot containers. During the period 1976-1979, while Matson Navigation was still operating on the United States-Guam route, this line used 27 foot containers. Table 5.4 shows the split in container size of inbound cargo during this period and for the first nine months of fiscal year 1980.

Table 5.4, shows clearly that with the withdrawal of Matson Navigation, the use of 27 foot containers has, for all practical purposes, ceased. In March 1980, only two such containers were used. They have been replaced primarily by increased use of 40 foot containers by the two American flag carriers now serving Guam, viz., United States Lines and American President Lines. Foreign flag carriers serving Guam also use both 20 and 40 foot boxes, but primarily the former. For all carriers combined, the division in March 1980, was 636 twenty-footers, two twenty-seven footers and 868 forty-footers. This was equivalent to 42 percent and 58 percent for the twenties and forties, respectively.

TABLE 5.4

CONTAINERS BY SIZE, DISCHARGING CARGO
FISCAL YEARS 1976-1980

Fiscal Year	20'	27'	40'	Total
A.		Number of Containers		
1976	6,957	7,200	7,115	21,272
1977	8,597	9,311	7,785	25,693
1978	8,557	9,455	8,247	26,259
1979	7,905	6,704	9,932	24,541
1980	8,220	475	13,030	21,725
B.		Percent of Total		
1976	33	34	33	100
1977	34	36	30	100
1978	32	27	41	100
1979	33	36	31	100
1980	38	2	60	100

Source: Port Authority of Guam

5.5 Commodity Composition

Detailed information on the commodity composition of Guam's trade is available from the Guam Department of Commerce only for the first two quarters of 1977. For purposes of analysis, this has been supplemented by data on Guam-United States trade, including transshipment trade, for calendar years 1975-1978 made available by the U.S. Corps of Engineers and on Japan-Guam trade derived from official statistics published by the Japan Tariff Association for the years 1978 and 1979.

As noted earlier, Guam imports of general cargo from the United States accounted for more than three-quarters of total revenue ton imports. Exports to the United States accounted for about 65 percent of total revenue ton exports. Although the Corps of Engineers' data are in short tons and include transshipments, the commodity composition of the trade with the United States may nevertheless be accepted as representative of Guam's total general cargo foreign trade, except for commodities such as coffee and tea which are not produced in the United States, but which are available from other import sources.

Guam's imports from the United States are essentially consumer and commercially rather than industrially oriented. In the period under discussion, imports consisted primarily of goods and merchandise for personal and commercial consumption and use. The largest volume commodity classifications were food products,including rice, fresh and canned fruits, vegetables and nuts, meat, dairy products, groceries, and miscellaneous food products; animal feeds; lumber, furniture, and other wood and paper products; stone, clay and glass; soaps, detergents, paints and varnishes; chemicals; some primary metal products; machinery and other fabricated metal products; motor vehicles; and miscellaneous goods, not elsewhere classified (N. E. C.), the largest single classification. For the balance, the commodity composition runs the gamut of what is sometimes referred to as "grocery store" trade for personal and "office supply" trade for commercial consumption and use.

All goods imported for the personal use of U.S. Armed Forces stationed in Guam are included in the various commodity totals, as are also some cargoes shipped in Department of Defense controlled vessels and military components carried on non-Department of Defense vessels. We were informed that about 85 percent of Navy controlled cargo was through the Commercial Port and that no change is anticipated in this relative balance.

As regards exports to the United States, two of the largest volume commodity classifications were actually transshipments of tuna fish and canned pineapples, the former unloaded directly from fishing vessels and carrier vessels to refrigerated containers on dock and the latter originating in the Philippine Islands. The fish movement and the prospects for the future are discussed in a later section of this report; the pineapple movement, as noted earlier, has terminated.

Additionally, there were some shipments of jet fuels and residual fuel oils from the GORCO refinery; some machinery, probably construction equipment re-exported back to the United States; motor vehicles probably personal vehicles belonging to Armed Forces personnel and miscellaneous goods, N. E. C. It is our understanding that recent exports also include substantial movements of scrap iron.

Turning now to the commodity composition of Japan-Guam Trade, it should be noted that it is the general consensus of both government

officials and of the shipping industry that Japan is the largest "foreign" source of imports to Guam. It is probably also one of the largest "foreign" markets for Guam's exports. The Japanese data as published by the Japan Tariff Association use different commodity nomenclature than the Corps of Engineers, and are also in terms of commodity units and metric weights, for example, kilograms and metric tons and meters. They are sufficiently descriptive, however, to confirm the preceding analysis of the commodity composition of Guam's oceanborne trade.

In 1978 and 1979, the principal Japanese exports to Guam also consisted of goods and merchandise primarily for personal and commercial consumption and use. The principal general cargo commodity classifications consisted of fresh and frozen and canned fish, fresh and frozen fruits and vegetables and prepared foodstuffs; fats and oils; paints, plastics and rubber and products; textiles, leather and products; base metals and products, particularly iron and steel products and structural forms and shapes; machinery and fabricated metal products including office machinery and equipment; electrical equipment; motor vehicles; and optical and photographic goods, including televisions and radios. As in the case of imports from the United States the balance consisted of a wide variety of other goods and merchandise entering essentially into personal and commercial consumption and use. The largest single commodity export from Japan to Guam was cement. It is our understanding that this was for the account of Kaiser Cement and Gypsum Company. In 1978 total shipments came to 71,185 metric tons and in 1979 to 48,165 metric tons.

Japanese imports from Guam were much smaller in volume and also much more limited in commodity composition than were exports to Guam. The single largest commodity classification consisted of scrap iron and steel, followed by some fresh fish, some gas oil and fuel oil, paper wastes and scrap and miscellaneous products.

5.6 Other Apra Harbor Trade Movements

It was noted earlier that Guam imports bulk volumes of crude oil and refined petroleum products and cement through privately maintained facilities in the Cabras Island Industrial Park. Data provided by the Economic Research Center of the Guam Department of Commerce indicate that crude oil and refined products, primarily the former, were 11,429,000 barrels and 11,018,000 barrels in 1978 and 1979 respectively. Also, that cement imports fluctuated from 52,255 metric tons (2,205 pounds) in 1977 to 26,352 metric tons in 1978 to 47,200 tons in 1979. This latter may be compared with data provided by the Kaiser Cement and Gypsum Company that sales averaged almost 50,000 metric tons annually in calendar years 1976-1979. Most of these imports were from foreign sources of supply.

It is anticipated that crude oil imports for the GORCO refinery and refined product imports by Esso Standard Eastern and Mobil Oil will continue to expand moderately as total consumption for civilian, power, aviation and the military establishment increases. Cement imports will follow the trend in construction activity which is relatively flat at present but which is also expected to increase over time as population increases and the economy continues to expand. These factors are developed more extensively later in this report.

There is one additional component of the commerce of the Commercial Port that should be noted here. This consists of occasional movements of passenger vessels in the cruise trade. In 1977, there were 16 visits, 18 in 1978, 10 in 1979 and 12 in 1980.

6.0 SHIPPING SERVICES

6.0 SHIPPING SERVICES

6.1 General

From the turn of the century until August, 1962, Guam was a restricted military area. As such, its oceanborne trade during this period was served only by United States flag carriers. After World War II, however, an exception was made for a carrier which had been organized under the laws of the Trust Territory of the Pacific Islands. Technically, the latter was a foreign flag carrier even though the Trust Territory was under the trusteeship of the United States. The American flag carriers were engaged primarily in the trade between the United States and Guam; Saipan Shipping Company, the Trust Territory flag carrier, in intra-regional trade, including transshipment between Guam and the other islands in Micronesia.

Since the lifting of the restriction, Guam's waterborne commerce has expanded to include other trading partners, notably in the Far East, Southeast Asia, Australia and New Zealand. As the trade expanded, additional shipping lines, both U.S. and foreign flag carriers, established scheduled services to and from Guam and broadened the range of trade origins and destinations.

It is important in this context to note two factors which affect Guam's shipping service and, in turn, the development and utilization of the Commercial Port. The first is that under United States law, trade between the United States and Guam is classified as domestic rather than foreign commerce. Under the cabotage laws as spelled out in the Merchant Marine Act of 1920, generally referred to as the Jones Act, and related legislation the carriage of domestic coastal and intercoastal trade, including trade with Hawaii and Alaska and with territories and possessions, is reserved to United States flag carriers. The vessels must be built in the United States, documented under United States law and owned by United States citizens.[1/] As applied to Guam, this effectively prevents foreign flag vessels from moving goods and merchandise between the United States and Guam, even as part of longer trade route movements to and from the Far East and other foreign areas. Therefore, although United States flag carriers may serve both Guam and foreign origins and destinations on the same shipping route movements, foreign carriers may provide shipping services only between Guam and foreign origins and destinations.

In recent years some sentiment has developed on Guam for an exemption from the Jones Act and related legislation in order to permit foreign flag carriers to serve United States-Guam trade. The Virgin Islands and American Samoa have long been exempt from the Jones Act by specific legislation; more recently, the Northern Marianas were exempt under the provisions of the covenant which established the Northern

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1/ Title 46, Section 11, U.S. Code allows foreign-built vessels to engage in trade between the United States and Guam.

Marianas as a Commonwealth. The possible benefits to Guam of being granted a similar exemption, particularly as it might affect transshipment traffic, are discussed in Section 7.0.

The second factor has reference to shipping rates to and from Guam. Rates of domestic carriers in the United States-Guam trade are subject to regulatory control by the Federal Maritime Commission. However, should exemption from the Jones Act be granted, the rates would presumably be free from such controls. Further, while domestic carriers serving Guam are not eligible for either construction differential or operating differential subsidies on their Guam services, they are eligible for such subsidies on their services to foreign areas beyond Guam. When subsidy payments are received by the carriers, this may influence the structure of shipping rates between the United States and Guam.

For their services beyond Guam, whether via Guam or served directly from the mainland, for example, with the Philippine Islands or Japan, domestic carriers are members of steamship conferences which determine the applicable rates. As regards foreign flag carriers who serve Guam's inter-regional trade with foreign areas, it is our understanding that the rates for such services are not determined by conferences but are rather set individually by the carriers.

During the course of our investigation, we received a number of conflicting comments as to the reasonableness of shipping rates to and from Guam. Predictably, non-shipping interests maintained that the rates are "too high"; conversely, shipping related interests stated that the rates are generally reasonable and in some cases "too low".

Within the constraints of time and the limited availability of data, it was not possible to evaluate the validity of these contentions. Granted that ocean freight rates may be a significant component of total CIF import costs and of ultimate consumption prices, it is nevertheless extremely difficult to conclude whether the rates to and from Guam are high or low in comparison with other ocean carrier services of comparable distance, commodity composition, volume and service characteristics.

6.2 Steamship Services and Routes Served

At the present time, Guam is served by eleven regularly scheduled steamship lines, two in the United States-Guam trade, seven in inter-regional trade with foreign areas, and three in intra-regional trade including transshipment with the Trust Territory. One line provides both inter-and intra-regional services. These are set forth below by area of service in alphabetical order of carrier.

6.2.1 United States-Guam Services

A. American President Lines

American President Lines (APL), which had been in the Guam trade in the 1950's and 1960's, withdrew in 1969. In 1979, it reinstituted service to Guam when Matson Navigation (Company) withdrew. It provides a fortnightly service direct from the West Coast as part of its Straits Express Service route, with scheduled arrivals and departures from Guam every other Tuesday. Scheduled service is provided by four Seamaster full container ships; all cargo being containerized prior to loading. After calling at Guam, the vessels proceed to Hong Kong and then to Kaohsiung, Taiwan, where the containers lifted in Guam are transferred for carriage back to the mainland via the line's California Service route. These vessels had been calling first at Kaohsiung and then Hong Kong but found that they had to reverse the calls to be more competitive to Hong Kong. Transshipment cargo, including frozen tuna fish for delivery to the United States, and outbound and inbound cargo to and from Saipan, Tinian and Rota is handled at Guam with the latter service provided by intra-regional carrier (see below). Both 20 and 40 foot containers are used; data for the first five months of 1980 show 62 percent 40 foot container usage, 38 percent 20 foot boxes. Refrigerated containers are available for both direct and transshipment movements.

B. United States Lines

United States Lines (U.S. Lines) has been in the Guam trade continuously since 1972. Currently fifty sailings per year are scheduled for Guam by nine full container ships, including reefer containers, of the Lancer and Leader classes on the line's U.S. East and West Coast-Hawaii-Guam Far East service. After departing Guam, the vessels proceed to Kaohsiung, Hong Kong, Kobe and Yokohama and thence back to the United States. As in the case of American President Lines, no break-bulk cargo is carried as such; transshipment cargo, including frozen fish and cargo to and from the other islands, is handled at Guam in the same manner as by APL. Although both 20 and 40 foot boxes are used, 84 percent were 40 footers in March 1980.

In calendar year 1979, United States Lines had 45 scheduled liner calls at Guam plus 25 calls under military charter; Matson Navigation and American President Lines had a combined total of 21 scheduled liner calls.

Some comparative comments are appropriate here with respect to the domestic carrier services. In both cases, inbound cargo far exceeds

outbound cargo, often by a ratio of 4:1 or more; containers, however, are necessarily balanced, with a generally one ship time lag for outbound movements.

Both lines have preferential berth assignment agreements which provide for use of either berth F-5 or F-6 depending on which berth is available at time of docking and the availability of at least one of the two gantry cranes for movement of the containers between ship and dock. Both lines prefer to operate from berth F-6 and to have both gantry cranes available.

United States Lines is scheduled for berth occupancy approximately every Wednesday and American President Lines every other Tuesday. These days of call have been varying as route schedules are adjusted. Both lines operate under tight voyage schedules; the latter line is also under tight scheduling pressure for interconnecting service at Kaohsiung. Delays in the former's calls at Guam create potential for overlapping in berth occupancy and crane utilization. This did, in fact, occur on May 1, 1980 when the vessels American Lancer and President Van Buren were both in port while the survey team was on Guam. On that occasion, each ship used one of the two container berths and one of the gantry cranes and divided the use of the truck crane with the American Lancer having its use in the morning and the President Van Buren in the afternoon. The results appeared to be satisfactory with each vessel completing its call within the one day.

As of early 1980 neither line has an exclusive container or marshalling yard for its containers within the Commercial Port area. For this reason, U.S. Lines, which uses a chassis operation moves all incoming containers out of the Port area to the "boonie" yard behind the Port which it leases from the Navy, except for refrigerated containers and containers carrying automobiles. By contrast, APL uses a grounded, stacked operation and, therefore, requires relatively less space per container. It grounds its containers within the confines of the Port, using the Port's straddle cranes for this operation. Both, however, do use the Port's existing container yard for pre-loading operations of outbound containers. Although both lines indicate where they would prefer the containers to be spotted, the specific locations are determined by the Port's operating personnel.

When less than container shipments (LCL) are involved, both lines have the stripping or stuffing performed outside the Commercial Port. However, whereas APL permits forwarding of containers consigned for transshipment to all islands in the Northern Marianas, U.S. Lines permits only containers destined for Saipan but not to the other islands to be forwarded without prior stripping.

During interviews with the survey team, officials of both lines indicated recent improvement in container handling productivity between ship and dock, but they also noted several operating constraints and

increased operating costs due to limited container yard capacity in the Commercial Port and their lack of control of port labor. They also commented on what they perceived to be a need to improve the overall efficiency of port labor. Finally, they questioned whether port cargo handling equipment is adequate and most efficiently and economically utilized and maintained. These observations were supported by the steamship agents for the other scheduled carriers.

6.2.2 Inter-regional Carriers

Regularly scheduled services are primarily with Japan, Taiwan, Korea, Philippines, and to a lesser degree, with Australia and New Zealand. These services are believed to be adequate to carry the present volumes in this trade and capable of absorbing moderate increases in volume.

Both container and breakbulk cargo are carried, the latter including motor vehicles from Japan. As with the Guam-U.S. mainland trade, imports by these carriers are greater than exports. Container movements are in total greater than conventional breakbulk movements, excluding motor vehicles; however, the ratios may vary by individual carrier and vessel. Some transshipment cargo to and from the Trust Territory is generally carried on all vessel movements. Berth assignment is determined by the Harbor Master's Office on an availability basis, container location in the yard by the Port's operating personnel. The survey team received comments from steamship line agents and also observed that far more shed space is available than is required for breakbulk movements.

A. Asiatic Inter-modal Seabridge S.A.

This line initiated service between Guam and Manila, Hong Kong and Taiwan in 1976. It operates one ship, the MV Timmar Fortune, of Panamanian registration and 5,400 gross registered tons. The ship is a former bulk carrier adapted to carry the equivalent of 200 TEU containers plus scrap iron and small volumes of breakbulk cargo. The vessel operates on two alternating routes, each on a 28-day round-trip schedule and each including a call at Guam; on one of the routes, the ship calls at Truk and Ponape in the Trust Territory after departing Guam. Transshipment service to Saipan, Tinian, Yap and Palau is provided by intra-regional carriers.

The vessel generally docks at Berth F-3 or F-4 and generally handles its cargo and containers with its own gear. Cargo is primarily inbound. On its March 4, 1980 call, it handled 2,871 revenue tons, 2,280 tons inbound, 371 tons outbound and 220 tons of transshipped cargo; all but 260 tons were containerized. The line's agent on Guam is Ambyth Shipping and Trading, Inc.

B. Daiwa Line

Guam service by Daiwa Line terminated in February 1981. There is an obvious need for a similar service therefore it is expected that a substitute carrier will provide the service. The following describes the services which were provided by Daiwa. Daiwa Line, of Japanese ownership, served Guam with three separate route services, with three partial container ships which have roll-on/roll-off capability for motor vehicles and limited space for breakbulk cargo. The Pacific Princess and Fiji Maru each served Guam on one of the line's two Japan-South Pacific-Australian routes on a 60-day turnaround basis; the third service was provided by the Ponape Maru as part of the line's Japan-Taiwan-Guam-Saipan service on a 28-29 day schedule. These ships are of 7,716-8,444 gross tonnage, carry their own deck cranes for handling containers and do not, therefore, require the use of either the Port's gantry or truckcranes.

In March 1980, each ship made one call at Guam. The Ponape Maru handled 4,707 revenue tons of cargo, consisting primarily of motor vehicles and 31 containers almost all inbound, including transshipment cargo; the Fiji Maru 1,817 revenue tons, also almost all inbound and also consisting primarily of autos plus 39 containers; the Pacific Princess 601 revenue tons, almost all containerized, but with an inbound-outbound split of 61 percent and 39 percent respectively.

Subject to the preferential berth assignments of both American President Lines and United States Lines, the Daiwa Line ships docked at berths F-5 or F-6; when these were not available, they berthed at F-3 or F-4. Generally, they arrived and departed within one day. Inbound containers, including transshipment were grounded within the Port area with locations determined by Port personnel. When necessary, inbound less-than container-load (LCL) movements were delivered to Suzue Guam Company outside the Commercial Port for stripping and stuffing. Both 20 and 40 foot containers, primarily the former, were handled. The line's agent was Atkins-Kroll (Guam) Ltd.

C. Aurelio 3

Edwards Shipping and Mercantile Ltd. provided regularly scheduled service between Guam, Manila and Kaohsiung through 1980. This service has now been taken over by Aurelio 3 which plans to call every 33 days. They will serve Manila, Hong Kong, Taiwan and Guam primarily with containerized shipments and breakbulk lumber. The ships are expected to use Berths F-3 or F-4. Ambyth Shipping and Trading, Inc. is agent for the line.

D. Kyowa Shipping Company, Ltd.

Kyowa Shipping Company, Ltd., currently provides service with three vessels of either Japanese or Panamanian registry between Japan, Korea (transshipped in Japan), Kaohsiung, Hong Kong and Guam. These are the Asian Palm, Asian Rose and Big Glory. The vessels are of 4,000 - 6,000 gross tons and are essentially conventional breakbulk general cargo carriers with limited container capacity. Two also have roll-on/roll-off capability for automobiles. After departing Guam, the vessels proceed to South Pacific islands on varying routes and then back to Japan. Berth assignment is by the Harbor Master's Office depending on availability and estimated length of occupancy. Maritime Agencies of the Pacific Ltd. is the agent.

E. Nauru Pacific Line

Nauru Pacific Line, which had served the Australia-Guam trade in 1971-1976, recently reestablished service with the Fentress via Trust Territory ports. It is an old CMAV-1 vessel of 3,805 gross tonnage converted to carry containers and some break-bulk cargo and is of Trust Territory registry. Berthing is generally at Berth F-3 or F-4, and is limited to one day. Nauru Air and Shipping Agency is the agent.

In this context, it may be noted that Nauru Pacific Line also provides a direct service from San Francisco via Honolulu to Majuro, Ponape, Truk and Saipan in the Trust Territory, and that this service competes with the transshipment services provided to some of these islands by APL and U.S. Lines via Guam.

F. Saipan Shipping Company, Inc.

Saipan Shipping Company, Inc. provides both inter-and intra-regional shipping services at Guam. The former is detailed here, the latter below. Service is currently provided by two vessels chartered from Kyowa Shipping, the Sunbird and Great Ocean, of 2,490 and 1,997 gross tonnage respectively. Both vessels are conventional breakbulk carriers with limited container capacity. They call at Guam on a monthly frequency. Vessel itineraries include Kobe and Yokohama in Japan, Saipan, Guam and the Eastern Trust Territory. Berth occupancy is generally for a two-day stay at Berth F-3 or F-4. Cargo movements tend to be fairly well balanced; the March 17-19 call of the Sunbird carried 516 revenue tons inbound, 529 tons outbound plus 60 tons of transshipment cargo. These latter

movements are coordinated with the line's intra-regional barge service to the Northern Marianas.

G. Tiger Line (United Micronesia Development Association)

Tiger Line operates two ships in the Japan-Kaohsiung-Hong Kong-Guam-Trust Territory trade, the Herkimer on regularly scheduled 60-day round-trip service, and the Catherine Maru on an inducement basis. These and other vessels that may be used are chartered from the Trust Territory or Kyowa Line, They are conventional breakbulk vessels. Berth F-3 or F-4 is generally used, depending on berth availability. The MV Herkimer called at the Commercial Port in March 1980 and handled 750 revenue tons of cargo, of which 609 tons were exports. Maritime Agencies of the Pacific Ltd. is the agent.

6.2.3 Intra-regional Services

Intra-regional carriers provide both direct services between Guam and the other islands of the Trust Territory and transshipment services for the inter-regional carriers. They do not, however, provide transshipment services for frozen tuna fish movements. As a rule, outbound cargo movements from Guam exceed inbound movements. As is the case with other berth assignments, these are determined by the Harbor Master's Office on an availability basis, frequently at Berths F-5 and F-6 for vessels carrying primarily containers and at Berths F-3 and F-4 for vessels handling primarily breakbulk cargo. At times, this involves shifting vessels between berths.

A. Oceania Line Inc.

Since 1976, Oceania Lines has provided service between Guam and Saipan and Tinian, currently on a weekly frequency by a tug-barge operation, the latter identified as TM 644. The tug is provided by Cabras Marine Service and flies the Panamanian flag; the barge is chartered from a Singapore firm. The barge has a capacity of 58 TEU's plus hold capacity of 10,000 barrels of petroleum, oil and lubricants (POL), and some breakbulk capacity. A roll-on/roll-off ramp is used for the container movements. In March 1980, there were four calls at Guam. Total revenue tons carried per voyage fluctuated between a low of 322 tons and a high of 813 tons. In each case, there was more outbound than inbound cargo, plus transshipment cargo, mostly containerized. Ambyth Shipping and Trading, Inc. is the agent.

B. Palau Shipping Company

Palau Shipping Company has provided service between Guam and Yap and Palau since 1974, at present with a sailing every 21

days by Micronesia Princess. This is a self-sustaining 2,100 gross registered ton vessel of Trust Territory registry. Cargo is carried primarily in containers. Recent movements have been largely outbound from Guam, in the 800 revenue ton range, with 225 tons inbound. Ambyth Shipping and Trading, Inc. is the agent for the line.

C. Saipan Shipping Company, Inc.

This service to and from Saipan and Tinian is provided by tug-barge operation on a three-sailing per month schedule. The tug and the barge are chartered from Dillingham Corporation. The barge, the DG-5, is of 811 gross registered tons and flies the United States flag. Both container and breakbulk cargo are carried, primarily the former. Cargo movements per call are in the 500-750 revenue ton range with substantially larger proportionate shares of transshipment cargo than is true of the other intra-regional carriers.

Table 6.1 summarizes the above information in terms of estimated scheduled calls at the Commercial Port for all of calendar year 1980.

6.3 Additional Vessel Calls at Apra Harbor

In addition to the regularly scheduled carrier service calls, many other types of vessels call at the Commercial Port where berthing space is provided. These include fishing vessels, tugs and barges, occasional passenger ships in the cruise trade, research and survey vessels, tankers, cement carriers, vessels taking on stores and bunkers, ships requiring repair, and various miscellaneous vessels. With specific reference to fishing vessels, both those bringing in frozen tuna fish for transshipment or in port for other purposes, it is not uncommon for these to outnumber scheduled cargo vessels on any given day. At times, this may also be true of the cumulative total of tugs, barges and other vessels.

Fishing vessels bringing in frozen fish for transshipment are generally accommodated at the bend between Berths F-3 and F-4. Tugs and barges, loading or unloading cargo are often docked at berth F-4 while those laying over are moored at the far end of Berth F-6 when space is available. This sometimes requires that the tugs and barges be shifted to other berths. Passenger vessels dock at Berth F-4, basically because the transit shed behind the berth has some modest passenger amenities. This is also true of research, survey and training ships.

Independent of the vessel calls at the Commercial Port, vessel calls are made at other non-military facilities in Apra Harbor. At the Cabras Island Industrial Park, adjacent to the Commercial Port, GORCO maintains a deep-draft tanker berth, F-1, for receipt of crude oil. This facility is also used by GORCO for outbound shipments of refined

products and by Esso Standard Eastern for receipt and shipment of refined products.

TABLE 6.1

PORT OF GUAM
ESTIMATED CALLS BY SCHEDULED CARGO CARRIERS BY AREA OF SERVICE, 1980

	Number of Calls	Frequency of Calls	Type of Services	Area Served
Domestic Carriers				
1. American President Lines	26	14 days	Containers Only	U.S., Far East, So. Asia, Mid-East
2. United States Lines	50	Weekly	Containers Only	U.S., Europe, Cent. Am., Far East
Inter-regional Carriers				
1. Asiatic Intermodal Seabridge S/A	13	28 days	Containers, Breakbulk, Scrap	Manila, Hong Kong, Taiwan
2. Aurelio 3	12	33 days	Containers, breakbulk lumber	Manila, Hong Kong, Taiwan, Guam
3. Daiwa Line 1/	12 2/	30 days	(Primarily containers) (roll-on/roll-roll-)	Japan So. Pacific, Australia
	13 3/	28 days	(off autos, limited) (breakbulk)	Japan, Taiwan, Saipan
4. Kyowa Shipping Co.	30 4/	10 days 3/	Breakbulk, autos, limited container capacity	Japan, Korea, Taiwan, Hong Kong
5. Nauru Pacific Line	6	60 days	Containers, some breakbulk	U.S. West Coast, Trust Territory, So. Pacific
6. Saipan Shipping Co.	12 5/	Monthly	Breakbulk, limited container capacity	Japan, Saipan Eastern Trust Territory
7. Tiger Line Inc.	6+ 6/	60 days	Breakbulk	Japan, Taiwan Hong Kong, Trust Territory
Intra-regional Services				
1. Oceania Line	52	Weekly	Containers, 10,000 barrels POL, limited breakbulk capacity	Saipan, Tinian
2. Palau Shipping	17	21 days	Primarily containers, some breakbulk	Yap, Palau
3. Saipan Shipping Co.	36 285+	10 days	Primarily containers, some breakbulk	Saipan, Tinian

1/ Daiwa discontinued service in February 1981. A replacement service will be established.

2/ Two vessels each on 60 day round-trip service.

3/ One vessel on 28-29 day round-trip service.

4/ Three vessels making total of 2-3 calls per month.

5/ Two vessels making 60 day round trips.

6/ One vessel making 60 day round trips, second on inducement.

Also in the Industrial Park is Berth F-2 used by Dillingham Maritime Services to moor its tugs and barges and for ship repair; a recently constructed wharf between the GORCO and Dillingham facilities used by Kaiser Cement and Gypsum Company for receipt of cement; and water frontage occupied by Cabras Marine Service on the west side of the Industrial Park. The Marianas Yacht Club currently operates from a beachfront area situated between the former seaplane ramp and the Cabras Island Industrial Estate under a temporary joint-use agreement. To the east along the Glass Breakwater is located Wharf G, used by Mobil Oil Company for receipt and shipment of refined products. Straddling Wharf

G is an old wharf presently used for parking and fishing and a former seaplane ramp now used as a launching ramp for small boats.

Further to the west along the breakwater is Wharf H, commonly referred to as Hotel Wharf, maintained by the Navy for handling ammunition.

Additionally, the Navy maintains two wharves, identified as Wharf D and Wharf E for bunkering purposes, both located on the northwestern end of Drydock Island. The Navy also has a substantial number of facilities in Inner Apra Harbor; these are outside the scope of this report.

Table 6.2 presents a statistical detail of all vessel calls at Apra Harbor for each month in calendar year 1979. In total, 778 vessels were recorded by the Harbor Master's Office. The largest single category consisted of fishing vessels with 313 calls. There were 66 calls by U.S. container vessels and 120 calls by scheduled foreign flag carriers operating container, roll-on/roll-off and breakbulk cargo services, Tankers of both United States and foreign registry, primarily the latter, and tugs and barges made 120 calls and 111 calls, respectively. The remaining calls were made by passenger ships, bulk cement carriers, and miscellaneous vessels, 9, 11 and 31 respectively.

Table 6.3 also shows the monthly distribution of these ship calls. The highest frequencies were in April, and June, July and August, when from 71 to 76 calls were made; 51, the lowest in October and 55 in December. All other months registered 61 to 65 calls.

For comparative purposes, Table 6.2 presents a summary of all vessel calls in fiscal years 1977-1979.

TABLE 6.2
APRA HARBOR
Vessel Calls*/
Fiscal Years 1977-1979

Type of Vessel	1977	1978	1979	1980
Container Ship	101	110	99	97
Breakbulk	105	106	89	89
Bulk Carrier	19	11	11	6
Tankers	86	91	116	99
Passengers	16	18	10	12
Fishing Vessels	189	221	267	313
Barge & Tugs	130	143	125	96
Miscellaneous	10	12	39	40
TOTAL	656	712	756	, 2

Source: Harbor Master's Office, Port Authority of Guam

*/ Excludes vessels at military facilities

TABLE 6.3

NUMBER OF VESSELS BY TYPES HANDLED AT APRA HARBOR - CALENDAR 1979*/

TYPE OF VESSEL	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
U.S. Container vsl	6	6	4	6	5	6	5	6	5	6	6	5	66
Jap. Cont/Roro vsl	4	3	3	4	1	3	2	2	1	2	3	2	30
Other Container vsl	-	-	-	-	-	-	1	1	1	-	1	1	5
Breakbulk cargo	8	7	10	7	4	7	10	7	5	8	6	6	85
U.S. Tankers	2	1	3	2	4	6	1	1	5	3	3	2	33
Other Tankers	8	5	8	13	11	4	6	9	5	6	3	9	87
U.S. Fishing vsls	1	2	-	-	1	2	2	1	5	1	1	-	16
Japanese " "	8	17	20	24	19	25	30	31	21	15	23	13	246
Other " "	6	9	4	6	4	3	3	3	1	2	5	5	51
Passenger ship	3	-	1	-	1	-	1	1	-	-	-	1	8
Bulk cement	1	1	1	1	1	1	-	1	1	-	1	-	9
Tugs & Barges	11	7	9	11	12	12	9	10	10	5	7	8	111
Miscellaneous vsls	2	3	2	2	2	2	4	3	2	3	3	3	31
Total Monthly	60	61	65	76	65	71	74	76	62	51	62	55	778

Source: Harbor Master's Office, Port Authority of Guam

*/ Excludes vessels at military facilities.

7.0 GUAM'S POTENTIAL AS TRANSSHIPMENT CENTER

7.0 GUAM'S POTENTIAL AS TRANSSHIPMENT CENTER

7.1 Transshipment Trade Between the United States and Western Pacific

The thought that Guam has the potential for becoming such a transshipment center for cargo moving between the U.S. mainland and various countries in the Far East, Southeast Asia, Australia and New Zealand is based on the assumption that both U.S. and foreign flag carriers would derive substantial economic and operational benefits by using Guam as a load-center for consolidating/segregating different segments of both eastbound and westbound traffic. Conceptually, this is similar to the present structure of transshipment trade with the islands of Micronesia. For example, westbound movements from the United States would be carried in very large vessels to Guam where the cargo would be offloaded and segregated by different destinations, and then carried forward to the various destinations by smaller vessels. For eastbound cargo, the order of movement would be reversed.

It is seriously open to question whether the carriers would derive the benefits suggested. In fact, it is much more probable that transshipment via Guam would result in additional costs.

The voyage distances between the U.S. West Coast and the Far East and Southeast Asia are shorter by great circle routes than they are via Guam. For example, the direct voyage distance between San Francisco and Yokohama is 4,536 nautical miles compared with 6,405 miles via Guam; between Los Angeles and Kaohsiung on Taiwan, the direct distance is 6,046 miles versus 6,912 miles via Guam; between Seattle and Hong Kong, 5,768 miles direct versus 6,770 miles via Guam. See Plate 4 for map of Northern Pacific with typical sailing distances.

The reason for these differences in voyage distance are due to the curvature of the earth. The shortest sailing route between the United States West Coast and the Far East and Southeast Asia is the modified great circle route along the northern rim of the Pacific and thence along the Asiatic coastline, rather than directly across the ocean to Guam and transshipment from there. This is true even though Guam is relatively close to the western rim of the Pacific basin and also on a relatively dires-ocean route from the West Coast to Manila, Hong Kong, Djakarta, Singapore and Bangkok. Generally, the further north the origin/destination points, for example, Seattle/Yokohama, the greater the difference between the northern circle route and the one via Guam; the further south the origin/destination points, say Los Angeles/Hong Kong, the smaller the difference between the two routes. Transshipment via Guam would thus require detours from the shortest voyage routes, more sailing time and increased operational costs.

Table 7.1 presents a representative list of comparative sailing distances between the West Coast and the Far East and Southeast Asia, direct and via Guam.

TABLE 7.1
SAILING DISTANCES FOR PACIFIC PORTS - NAUTICAL MILES[1]

A.

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

B.

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

C.

	Guam	Honolulu		San Francisco	
		Direct	Via Guam	Direct	Via Guam
Koror	712	3,988	4,030	5,720	5,765
Truk	590	3,028	3,908	4,931	5,643
Ponape	906	2,685	4,224	4,641	5,959
Majuro	1,554	1,895	4,872	3,892	6,607
Pago Pago	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] Generally over routes that afford the quickest passage.

With respect to Australia and New Zealand, the direct trans-ocean routes between the West Coast and these areas, and between the East Coast via the Panama Canal are considerably shorter than the routes involving transshipment through Guam. Sydney to San Francisco is 1,611 miles less going direct than going by way of Guam. From Sydney to the Panama Canal the difference is 3,320 miles. Again, and limited for the moment to comparative sailing distances, there would be longer distances, more sailing time and increased operational costs.

There would also be increased costs resulting from the handling of the transshipment movements on Guam. For example, incoming containers would have to be offloaded, sorted by destinations, probably held in the yard awaiting loading and then loaded aboard outbound vessel. These costs would not be incurred on direct service routes. In addition to the increased handling costs, the interest costs of the goods in transit would be higher as a result of the increased time involved in shipping via Guam.

U.S. flag carriers serving the Guam trade are already positioned to take advantage of the suggested transshipment service. Both serve Southeast Asia and the Far East, U.S. Lines on its basic USA-Hawaii-Guam-Far East service, American President Lines with three different routes from the West Coast, only one of which touches on Guam. The Guam traffic is heavily westbound, the Far East and Southeast Asia traffic is proportionately heavier eastbound. The empty containers taken from Guam on the continuation of their westbound voyages are used by both carriers for eastbound shipments from the Far East.

The fact that they do not use Guam as a load-center for Far East-Southeast Asia traffic would appear to be presumptive evidence that they do not regard such an operation as either economically or operationally feasible. One of the U.S. carriers considered serving Guam via feeder service covering Busan, Kobe and Kaohsiung. The westbound and eastbound traffic between the U.S. and Guam would then have been transshipped at Kobe. The U.S. carrier would have been at a disadvantage relative to its U.S. flag competition because of increased transit time, but would have been competing directly with foreign flag carriers for the traffic from Korea, Japan and Taiwan.

In order for foreign flag carriers to participate in the suggested transshipment activity, it would first be necessary for Guam to be granted an exemption from the Jones Act and related legislation. U.S. shipping interests would strongly oppose enactment of such an exemption. Even if it is assumed that an exemption would be granted and that foreign flag carriers would enter the U.S. Guam trade, it is very questionable that they would find it any more feasible, operationally and economically, to use Guam as the load-center for their U.S.-Far East-Southeast Asia or U.S.-Australia-New Zealand services. They would be subject to the same constraints of voyage distances, sailing time and costs. These trade routes generate sufficient traffic, particularly eastbound, to warrant direct services. Intrusion of a transshipment stage on Guam into the present pattern of direct services would distort rather than maximize the present efficiencies.

Shippers, as distinct from shipping operators, would not benefit from the transshipment services contemplated. Generally, the rate structure in the shipping industry provides for per mile costs to decrease as distance increases. Therefore, the longer the direct hauls, the lower the total rates as compared with the combined costs for two separate segments of a transshipment route.

Internationalization of the U.S.-Guam shipping market by the granting of an exemption from the cabotage laws would not lead to an overall increase in this trade. More carriers would compete for the available traffic. In this context, it should be noted that a recent study by the Maritime Administration shows that "roughly one-half of the

outbound cargo (from the U.S. mainland) and one-third of the inbound cargo carried on U.S. flag commercial vessels between the U.S. and Guam is military cargo, which must be carried on U.S. flag vessels regardless of cabotage requirements".

Should Guam be exempt from the provisions of the Jones Act and related legislation, and the U.S.-Guam trade opened up to foreign flag competition, the ocean freight rates would presumably no longer be subject to Federal Maritime Commission jurisdiction. This could conceivably result in a situation where the U.S. carriers would demand "protection" in the form of various direct and indirect types of assistance.

In summary, it is not believed that there is reasonable prospect for the development of Guam as a transshipment load-center for trade between the United States and the countries on the western rim of the Pacific basin. Guam is simply not strategically located to serve as a load center for traffic in the western Pacific or between this region and the west coast U.S. It is not a question of physical facilities but one of geographic location.

7.2 Transshipment Trade with Micronesia

Part C of Table 7.1 lists sailing distances from various principal centers in Micronesia and South Pacific to Honolulu and San Francisco. These distances are given for direct sailings and via Guam. Guam is on the direct route from Palau, Koror and Yap, therefore, there is almost no difference in distances direct or via Guam. However, for Truk and Ponape in the Federated States of Micronesia and in the Marshall Islands, shipment to and from Honolulu and the west coast via Guam adds significantly to total mileage. Pago Pago in American Samoa and Nauru are indicated in the table merely to show the significance of their geographic location.

Based on data published by the Office of the High Commissioner, Trust Territory of the Pacific Island, Table 7-2 presents data on the trade of the Trust Territory by country of origin/destination in fiscal year 1978. It will be noted that most of the traffic was inbound, and that Japan and the U.S. West Coast and Hawaii were the major sources of supply served by direct carrier services.

Table 7.3 indicates the estimated 1980 population for various areas in the Western and Southern Pacific. This is done to serve as an indication of the traffic potential for these areas. For general cargo, traffic is primarily a function of population, however, the other islands do not have the same propensity toward consumption that Guam does so the traffic would not be proportional. The populous areas, Western Samoa, Gilbert Island, Solomon Islands and New Hebrides are not on the same trade route to Honolulu and the West Coast.

TABLE 7.2
CARGO MOVEMENTS AT PORTS IN THE TRUST TERRITORY AND NORTHERN MARIANAS BY PORTS OF ORIGIN AND DESTINATION, 1978
(Revenue tons)

TT Ports / Foreign ports	US West Coast		US Hawaii		Guam a)		Japan		Other Far East		Australia		Trust Territory		Other		TOTAL	
	unload	load	unload	load	unload	load	unload	load	unload	load	unload	load	unload	load	unload	load	unload	load
Kosrae[s]	b)	b)	b)	b)	-	-	1,221	-	288	-	149	-	1,175	1,659	-	-	2,833	1,659
Majuro	1,087	1,283	15,624	-	648	-	4,957	8	2,393	-	475	-	189	664	203	13	25,576	1,968
Ebeye	-	-	2,004	-	142	-	287	-	54	-	-	-	50	5	12	-	2,549	5
Total Marshalls	1,087	1,283	17,628	-	790	-	5,244	8	2,447	-	475	-	239	669	215	13	28,125	1,973
Palau	c)	4,559	c)	4	14,616	2,324	4,608	350	1,988	1,935	-	-	1,614	1,870	10,770	6,190	33,596	17,232
Ponape	4,786	103	617	11	2,577	48	4,550	330	1,270	-	1,491	-	1,299	995	-	2	16,590	1,489
Truk	7,851	51	484	12	5,131	-	9,680	264	1,383	-	1,275	-	477	2,448	10	-	26,273	2,775
Yap	211	7	c)	19	4,258	251	2,456	24	795	-	-	-	400	848	3	1	8,123	1,150
Trust Territory TOTAL	13,935	6,003	18,729	46	27,372	2,623	27,759	976	8,171	1,935	3,372	-	5,204	8,489	10,998	6,206	115,540	26,278
Rota[e]	c)	c)	c)	c)	873	-	126	-	94	-	-	-	539	123	-	-	1,632	123
Tinian[e]	c)	c)	c)	c)	783	194	-	-	-	-	-	-	335	348	-	-	1,118	542
Saipan	1,531	78	183	23	34,427	2,039	9,650	53	4,010	-	230	-	834	5,805	25	5	50,890	8,004
Northern Marianas[e] TOTAL	1,531	78	183	23	36,083	2,233	9,776	53	4,104	-	230	-	1,708	6,276	25	6	53,640	8,669

Unload: Cargo from foreign port to Trust Territory port load: Cargo from Trust Territory port to foreign port

a) Guam includes local cargo and transshipment
b) Transshipment at Ponape
c) Transshipment at Guam
d) Not including Kosraa for October through December
e) Rota for January through June only. Tinian January through September only. Saipan full year.

Source: Bulletin of Statistics. 1978, published by Office of the High Commissioner, Trust Territory of the Pacific Islands.

TABLE 7.3

ESTIMATED POPULATION - 1980

Guam	105,800
Northern Marianas	15,970
Koror	14,800
Yap	9,320
Truk	38,650
Ponape	23,140
Kosrae	4,940
Marshall Islands	29,670
American Samoa	32,000
Western Samoa	200,000
Gilbert Islands & Tubalu	80,000
Nauru	9,000
Solomon Islands	210,000
New Hebrides	110,000

Source: U.S. Dept. of Interior, Office of Territorial Affairs and Estimates based on published 1970 population.

Transshipment via Guam competes with direct carrier services to the islands from the U.S. West Coast and Hawaii, and also from several foreign origins, notably Japan, Taiwan, the Philippines and Australia. Three carriers provide direct service between the West Coast and various islands via Honolulu: Matson Navigation, to the Marshall Islands; Nauru Pacific Lines to Majuro, Ponape, Kosrae, Truk and Saipan; and Philippines, Micronesia and Orient Navigation Company (PM&O Lines) westbound only to Majuro, Kosrae, Ponape, Truk, Saipan, Yap and Koror. PM&O's eastbound service is currently dedicated to carriage of pineapples from the Philippines to the U.S. West Coast. Direct services from various foreign origins to individual islands are provided by Asiatic Inter-modal Seabridge (Truk and Ponape), Saipan Shipping (Saipan, Truk and Eastern Trust Territory) and Tiger Line (Yap and Koror). Daiwa Line also provided direct service to Saipan from Japan and Taiwan. It is expected that the replacement carrier will resume this service.

The principal elements in the competition between transshipment and direct services are frequency and reliability of service and total comparative costs. The fact that the Port of Guam handled 44,693 revenue tons of transshipment cargo in the twelve month period March 1979 - February 1980 is indicative that transshipment can compete with the direct services mentioned above. To the degree that transshipment services continue to provide competitive advantages, they will increase their volume as the total market in Micronesia grows.

8.0 APRA HARBOR AS A FISHERY CENTER

8.0 APRA HARBOR AS A FISHERY CENTER

8.1 General

In recent years the Commercial Port at Apra Harbor has been utilized for transshipment of frozen tuna for onward shipment as seafreight to the United States mainland, transshipment of fresh tuna for airfreighting to Japan, and as a site for refueling of fishing vessels. The principal traffic in terms of cargo has been for transshipment of frozen tuna, and in terms of number of vessel calls, refueling predominates.

This Section includes a brief description of world and local tuna resources, methods of catching, a description of the existing operation of transshipping frozen tuna at Guam, potentials for the transshipment of frozen and fresh tuna and possibilities for development of facilities for local fisheries at Apra Harbor.

8.2 The Tuna Fishing Industry

8.2.1 Tuna Species

Tuna is a highly migratory, pelagic fish which inhabits both temperate and tropical waters. Tuna tend to collect or school around the boundaries of ocean systems where food is most abundant.

The most common marketable species of tuna, which comprise just over 70 percent of international landings and almost 100 percent of the worldwide tuna trade, include yellowfin, bluefin, albacore and skipjack. Of these species, skipjack account for close to 40 percent of the principal species landed, with yellowfin accounting for approximately 32 percent of the total. See Table 8.1 for 1975 world catches of tuna by ocean. Note the increase in percentage of tuna harvested in the Pacific in 1975 as compared with 1971.

8.2.2 Harvesting Techniques

Tuna are harvested by a variety of techniques. The most successful being the long-line, purse-seine and live bait pole-and-line methods. The long-line is more effective for deeper swimming species while the purse-seine and live bait pole-and-line methods are only effective for surface fishing, i.e., tuna that are schooling at or near the surface.

The long-line technique is used to catch all marketable species of tuna with the exception of skipjack and is the only practical and proven method of harvesting the deeper swimming species. This gear is simply what the name implies, a long line to which floats are attached, with each end of the main line having a floating marker. Attached to, and

suspended from the main line, are gangeons or branch lines (often as many as 2,000) to which are attached baited hooks. A long line can, when stretched, exceed 40 miles in length and the set may take up to three hours with retrieval taking 12 hours or more.

TABLE 8.1

WORLD CATCHES OF TUNA BY OCEAN
1975
(Metric tons)

	Atlantic	Pacific	Indian
Albacore	61,249	112,867	10,832
Bigeye	49,748	107,719	31,611
Northern Bluefin	24,539	16,154	- 0 -
Southern Bluefin	1,695	9,813	22,798
Skipjack	61,277	464,291	47,446
Yellowfin	118,300	326,846	38,742
TOTAL	316,808	1,037,701	151,429
Percent total 1975:	21.0	68.9	10.1
Percent total 1971	24.3	62.3	13.4

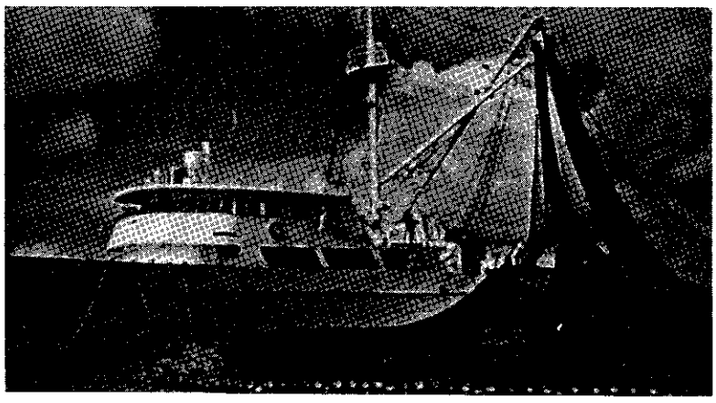
Source: International Tropical Tuna Commission, La Jolla, Calif. 1978.

Purse-seine fishing is usually associated with larger vessels harvesting skipjack and yellowfin tuna. (Figure 8-A). The net, when stretched out, resembles a fence with a float line on top and a lead line and purse rings attached to the bottom. The net is set around a school of tuna with a power skiff towing one end to eventually encircle the school alongside the seiner vessel. The bottom of the net is immediately closed by pursing (hauling in the purse line), capturing and containing the fish. Brailing or scooping the fish out of the net with a large scoop commences, using a winch to lift these nets full of tuna aboard. They are than placed into refrigerated holds. (Figure 8-B).

Seine fishing for tuna has met with more success in areas where the sea tends to be turbid or murky, where the thermocline is shallow and the demarcation line between warm and cold currents is distinct. These conditions are more common in the Eastern Pacific than in the Western Pacific where the waters are very clear and the thermocline is deeper.

The Pacific Tuna Development Foundation has sponsored various trial charters for fishing boats working out of Guam. Two of these underway at the time of this study involved the purse seiner Island Princess and the fishing boat Typhoon. The Island Princess was using a

net similar to those used successfully by the Japanese in the Western Pacific. It is nearly double the depth, 50% longer, with a finer mesh and lighter web than the nets typically used in the Eastern Pacific. It is understood that the Typhoon is experimenting with various trolling and jigging techniques.



PURSE SEINER

FIGURE 8-A

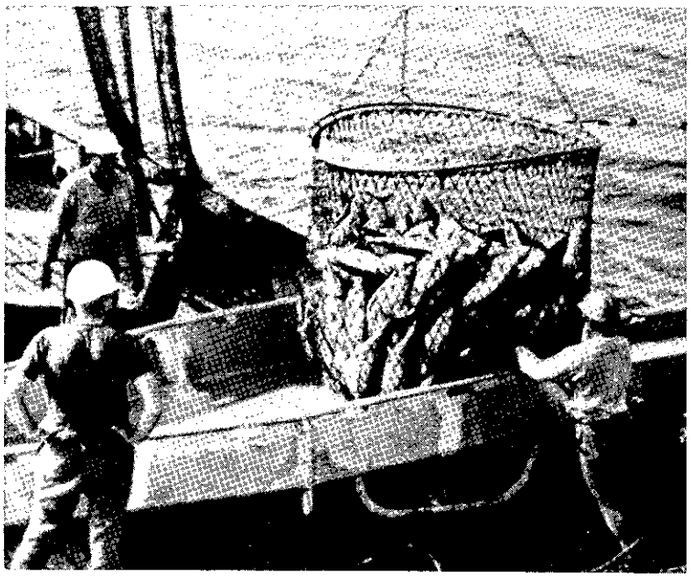


FIGURE 8-B
Brailing Tuna from a Pursed Net

The three American purse seiners active in the area are at a disadvantage relative to the large Japanese fleet within which, vessels in communication with one another by code to advise other vessels when a large school of tuna is encountered. The greater the number of vessels in a code group, the better for all the boats. Although Van Camp and Star-Kist are competitors, it is understood that their boats assist one another for their mutual benefit.

The live bait pole-and-line method (Figure 8-C) is used to harvest surface schools of skipjack and yellowfin. The procedure is uncomplicated and extremely effective. Upon sighting a school of tuna the vessel takes up a position in the immediate area and commences to discharge live bait carried within sea water tanks in the vessel, attracting and exciting the tuna. The crew standing on platforms along the sides of the boat use poles with short lines to which are attached feathered lures with barbless hooks. The tuna, in their feeding frenzy, are quickly and easily caught, and when hooked, are lifted out of the water onto the deck in one motion, the barbless hooks coming free. The crewman immediately flips the lure back into the feeding school of tuna and the procedure is repeated. The success of this method depends not only on the abundance of surface swimming tuna but also on the availability of live bait-fish at a reasonable cost.

LIVE-BAIT FISHING

FIGURE 8-C
Pole-and-line Fishing Using Live Bait

There is concern as to the supply of live bait in certain areas, as this is the key to success of pole-and-line fishery. At present, the Hawaiian Islands, American Samoa, Guam and many other islands in the Pacific do not have amounts of live bait capable of sustaining even a small scale commercial fishery. Species of bait fish often utilized in pole-and-line fishery are:

- Square Tails;
- Juvenile Snappers;
- Round Herring;
- Herrings and Sardines;
- Anchovies;
- Cardinal Fish;
- Juvenile Jacks;
- Silver Sides.

Because of the limitations on the supply of live bait, there has been considerable interest in the culturing of bait fish in order to supplement natural supplies. Programs and experiments designed to supply cultured bait to the tuna fishery in the Central and Western Pacific have been underway since the latter 1950's beginning with the culture of tilapea in Hawaii, and more recently, in American Samoa.

From all reports it appears that cultured bait for tuna is indeed feasible at least from a biological and technical standpoint, however, from an economical point of view further development work is necessary.

In light of the importance of the tuna live bait pole-and-line fishery and the limitations of supply of bait-fish, emphasis is being placed on developing Guam as a source of bait supply for fishing vessels. It is possible, therefore, that the aquaculture research presently being carried out in Hawaii and American Samoa could benefit Guam. This should be closely monitored.

8.2.3 The Resource

The maximum sustainable yield (MSY) of a species is the catch which can be maintained over a long period of time. The MSY of sedentary demersal fish can be estimated with considerable accuracy but it is very difficult to do this with a migrating fish such as tuna. The MSY of a migratory fish may not be well known until it is approached or has been exceeded.

Table 8.2, reproduced in part from Callaghan and Simmons[1/] shows the estimated MSY for principal tuna species in the Pacific and the landings reported in 1977. Note the significant disparity in estimated MSY.

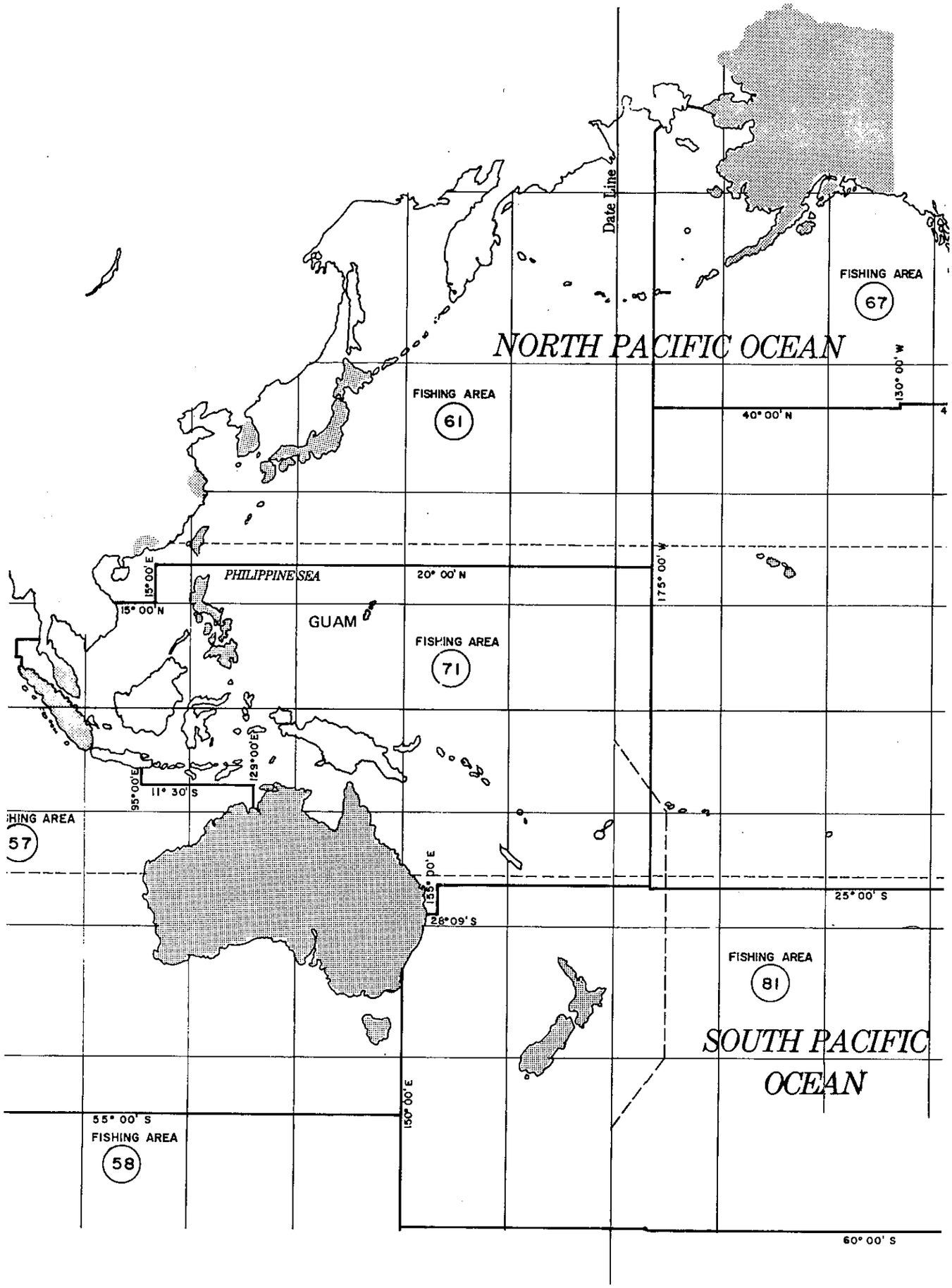
Gulland's total estimated MSY was exceeded by the reported 1977 catches. This was especially true for the yellowfin. It is possible that the MSY has been reached or exceeded as the tuna catch per unit of effort is declining throughout the entire South Pacific Commission area. Callaghan and Simmons[1/] report that the catch per unit of effort declined by one percent for long-line fishing within the 200 mile zone of Guam and the Trust Territory from 1972 through 1976.

It is understood that platform fishing has been expanded off the Philippines and that this may have interfered with the normal migratory pattern of tuna. Furthermore, immature tuna are being landed at these platform fishing operations. There is concern that this could significantly affect tuna fishing in the Western Pacific.

Guam is located in the north central part of FAO Area 71. This area extends generally from the western end of Sumatra to 175° West and from 25° South to 20° North. (See Figure 8-D).

Table 8.3 lists catches of major species of tuna in Area 71 from 1974 through 1977. In 1975 the catches in Area 71 amounted to one-third of all Pacific Ocean catches. The principal species caught were the skipjack and yellowfin, approximately 65 and 25 percent respectively of the total.

1/ An Analysis of Tuna Transshipment at the Commercial Port of Guam, Paul Callaghan and Barbara Simmons, University of Guam Marine Laboratory, Technical Report No. 65, May 1980.



FISHING AREAS IN THE PACIFIC

COMMERCIAL PORT MASTERPLAN

PORT AUTHORITY OF GUAM

FIG. 8-D

MARUYAMA & ASSOCIATES, LTD. • DRAVO VAN HOUTEN, INC.

GUAM NEW YORK

TABLE 8.2

ESTIMATES OF MAXIMUM SUSTAINABLE YIELD AND 1977 CATCHES

OF PRINCIPAL TUNA SPECIES IN PACIFIC

(Thousand Metric Tons)

	Estimated MSY		1977
	Fullenbaum[1/]	Gulland[2/]	Catches[3/]
Albacore	133	110	89
Bigeye	109	100	136
Bluefin	73	45	22
Skipjack	1080	650	508
Yellowfin	205	145	350
Total	1600	1050	1105

1/ Saul B. Salia and Virgil J. Norton, Tuna : Status, trends, and Alternative management arrangements, RFF/PISFA Paper No. 6 (Wash., D.C.:Resources for the Future, Inc., 1974):32.

2/ U.S. Dept. Commerce, NOAA, NMFS, Tuna 1947 to 1972, Current Fisheries Statistics No. 6130, Basic Economic Indicators (Wash., D.C.,:1973):34.

3/ United Nations, Food and Agriculture Organization, Yearbook of Fishery Statistics, 1977, Volume 44 (Rome:FAO, 1978):102-106, Table B-36.

TABLE 8.3

CATCHES OF TUNA

FAO AREA 71

1947-1977

(thousand metric tons)

Species	1974	1975	1976	1977
Albacore	27	17	12	7
Bigeye	22	27	27	32
Skipjack	303	205	252	272
Yellowfin	89	92	97	118
Total Area Catch	441	341	388	429

Note: Only principal species of tuna shown.

Source: United Nations, Food and Agriculture Organization, Yearbook of Fishery Statistics, 1977, Volume 44 (Rome:FAO, 1978):102-106, Table B-36.

Area 71 supplied approximately 26 percent of the total world catch of major market tuna, including 42 percent of the world's skipjack, 37 percent of the bigeye and 21 percent of the global yellowfin landings.[1/]

8.2.4 Tuna Bases in Southwest Pacific

Tuna bases serve fishing fleets by way of canning, cold storage and/or transshipment. Table 8.4 indicates the estimated annual landings at principal tuna bases in the Southwest Pacific in 1977-1979. Not indicated in the table is the substantial use of mother ships for transshipment.

TABLE 8.4

ESTIMATED ANNUAL
TUNA LANDINGS (MT)

PALAU	15,000
SOLOMONS	15,000-20,000
PAPUA NEW GUINEA	25,000-50,000
NEW HEBRIDES	10,000
FIJI	2,000-5,000
AMERICAN SAMOA	20,000-45,000

Source: National Marine Fisheries Service

By comparison, Guam handled from 13,000 to 15,000 metric tons during the same period. More than half of the fish handled at Guam was originally landed at Palau or Papua New Guinea and was transported to Guam by carrier vessel.

The Solomons and American Samoa have tuna canneries. Fiji had a small cannery but this has recently been closed.[2/] Star-Kist is building a tuna processing operation a t Mano, Papua New Guinea.[3/] Bumble Bee is reportedly building a new cannery in the south of the Philippines. All of these are low cost areas relative to Guam.

1/ Callaghan and Simmons, Ibid, from Klawe, W.L. World Catches of Tunas and Tuna-like Fishes in 1975. Internal report No. 11. La Jolla : Z.A.T.T.C.

2/ John Eads, Perspectives of Guam Fisheries, October 15, 1978.

3/ Callaghan and Simmons, Ibid.

Guam has served as a tuna base primarily for fueling of vessels and transshipment of tuna into refrigerated containers.

8.3 Transshipment of Frozen Tuna at Guam

The tuna transshipment trade from Guam to Honolulu and mainland U.S. was developed by Matson Lines to utilize the refrigerated containers which would otherwise have been returned empty to Honolulu or the West Coast. U.S. Lines and APL are presently both carrying containers of frozen tuna from Guam to the West Coast. The containers utilized in this trade carry refrigerated products from the West Coast to Guam. The refrigerated containers can help satisfy the need for containers for non-refrigerated dry cargo from the Far East to the West Coast but if they can attract frozen tuna at Guam they command a higher rate. Table 8.5 shows the amount of tuna transshipped through Guam annually from 1974 through 1979. The vessel types presently discharging at Guam include refrigerated carriers, purse-seine vessels and infrequently, long-line vessels. While an occasional U.S. flag vessel will discharge at Guam, the majority of vessels to use Guam as a transshipment center are under foreign flag. In 1979 a total of 46 vessels (carriers and catchers) discharged frozen tuna at Guam.

TABLE 8.5

TUNA TRANSSHIPPED THROUGH GUAM

Year	Tonnage (metric tons)
1974	4,533
1975	7,627
1976	10,443
1977	13,630
1971	16,058
1914	14,763

Source: Port Authority of Guam

8.3.1 Transshipment Operation

Several groups of personnel are involved in the discharge process from vessel to the refrigerated containers. These include vessel crew, dockside stevedores, supervisors and equipment operators. The vessel crew, supplemented as necessary by contract stevedores, are responsible for removing the fish from the holds and placing it into buckets and net slings, which are then lifted by either the vessel's winch or a dockside crane onto an inclined ramp at the rear of a container.

The discharge operation of the Japanese flag carrier vessel Mononok with 200 tons of primarily skipjack tuna from Palau was carefully monitored by the Consultant in April 1980. It is understood from discussions with Port's personnel that this was a typical discharge operation. The following is a description of that operation. The vessel's crew supplemented by contract stevedores take turns or shifts working in the ship's hold, separating and loading the frozen tuna into the cargo net or false bottom canvas bucket, often working two hatches at a time. (Figures 8-E and 8-F). When filled, the cargo net or bucket, is lifted either by the vessel's winch or a dockside crane onto the stuffing ramp (Figure 8-G). The fish then slide down the inclined ramp into the refrigerated containers. Occasionally the tuna will jam up on this ramp and are then stuffed down the ramp with a wooden pusher or broom (Figure 8-H).

The stevedores inside each container assure that the tuna are evenly loaded (Figure 8-J). These men are relieved about every 30 or 45 minutes. Supervision of the gangs is the responsibility of the stevedores longshoremen leadingman who works with the stevedores during the discharge operation. The area surrounding a ramp and containers is policed by a custodian who retrieves any fish which fall off the ramp and chute during the container loading process (Figure 8-K). Usually two containers are loaded simultaneously (Figure 8-L). All personnel employed in the transshipping operation are under the supervision of the cargo handling supervisor. This man's responsibilities include making sure that the cargo is properly handled, that safety procedures are observed and the gangs work harmoniously.

8.3.2 Problems and Constraints

The small hatch openings on nearly all the carriers and fishing vessels discharging fish at the Port of Guam are the principal bottleneck in the discharge of tuna from the vessels. The hatch openings are not large enough to permit the lowering of a cargo net into the hold, so that the smaller canvas, false-bottomed bucket must be used. This can be seen in Figure 8-6. This canvas bucket, when filled by the crew in the hold, is lifted out by the vessel's winch and emptied onto a cargo net on the deck which when full (usually taking three full canvas buckets or about 900 to 1,000 pounds) is lifted from the vessel to the loading ramp placed at the rear of the containers. This double handling is inefficient.

The containers are placed directly on the pavement to reduce the required lift from the vessel to the ramp. The Mononok's gear was incapable of hoisting loaded nets or buckets onto the stuffing ramp, therefore, a 35-ton mobile crane was used for this purpose. This crane can hoist and swing quickly but cannot luff or boom up and down quickly. This inability to luff quickly forces the stevedores to use the crane for lifting loads from one arc across the deck of the vessel. The vessel's gear is, therefore, used to move the fish from the several hatches to the cargo net placed along the arc.

FIGURE 8-E
Discharging Skipjack from Frish Well To Cargo Net on Deck

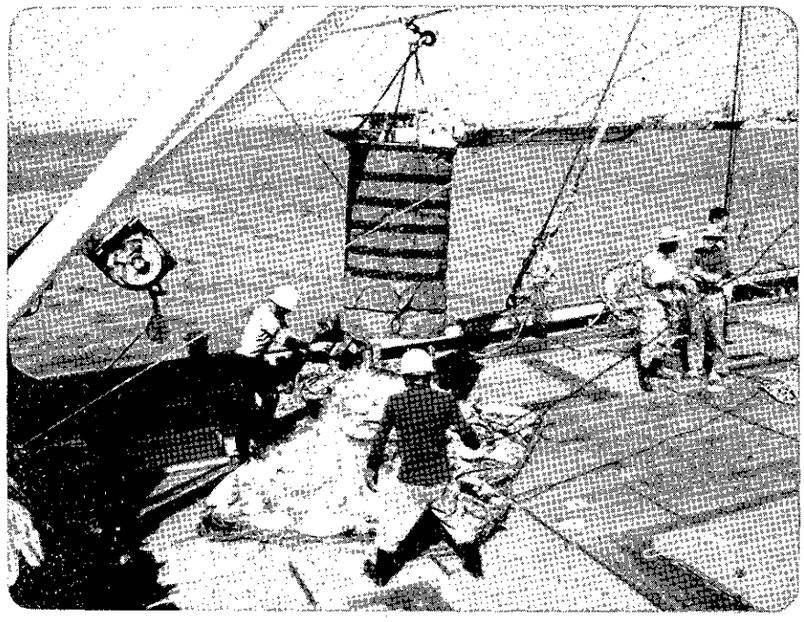


FIGURE 8-F
Emptying False Bottom Canvas Bucket Onto Cargo Net on Deck

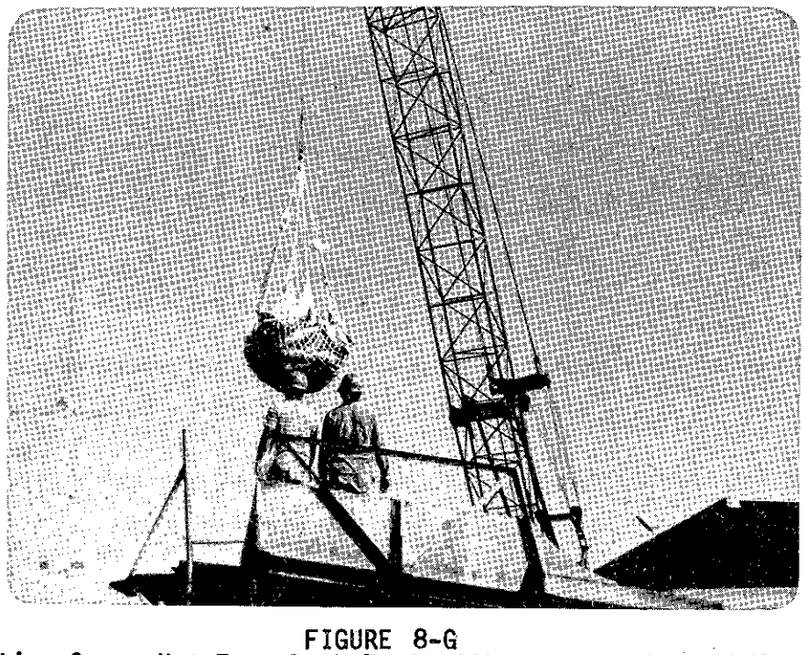


FIGURE 8-G
Hoisting Cargo Net From Deck To Stuffing Ramp Using Mobile Crane

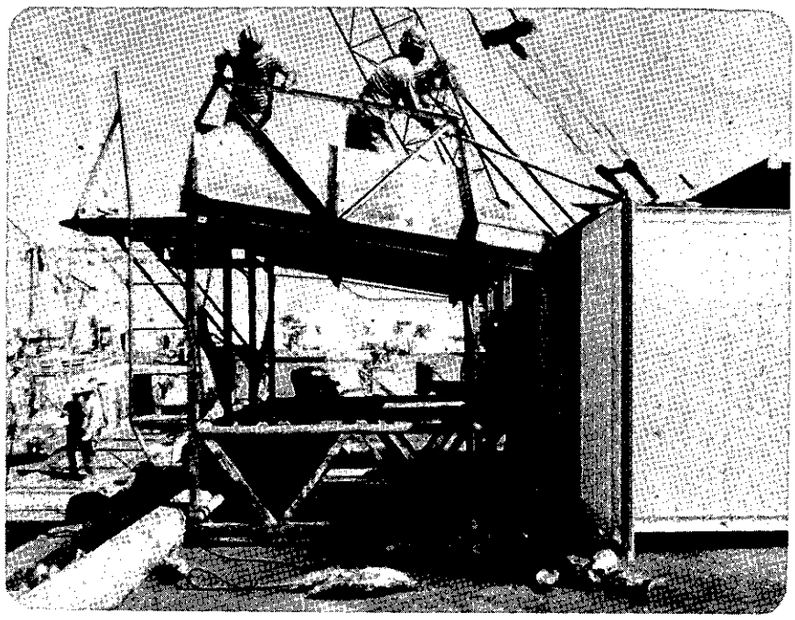


FIGURE 8-H
Fish Being Pushed Down
Stuffing Ramp into Containers

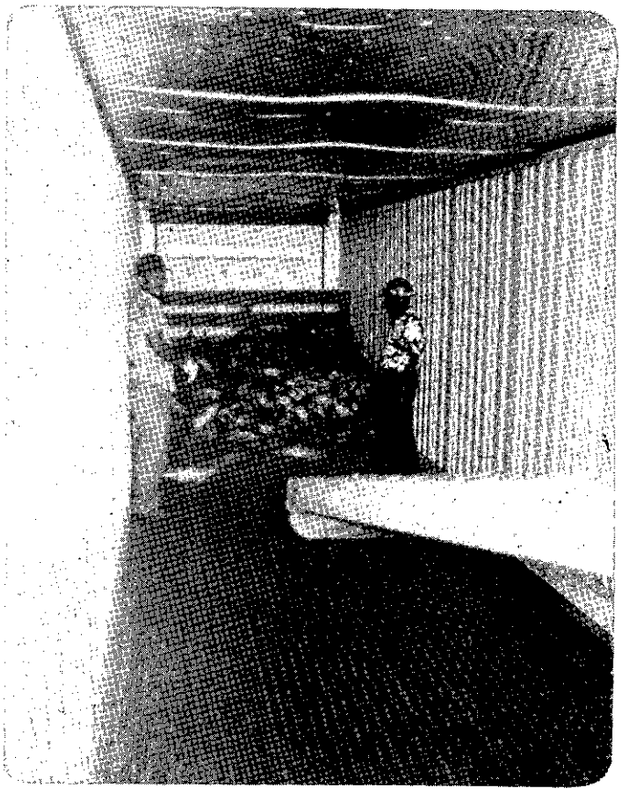


FIGURE 8-J
Interior View of Container.
Telescopic Chute of Stuffing Ramp on Right

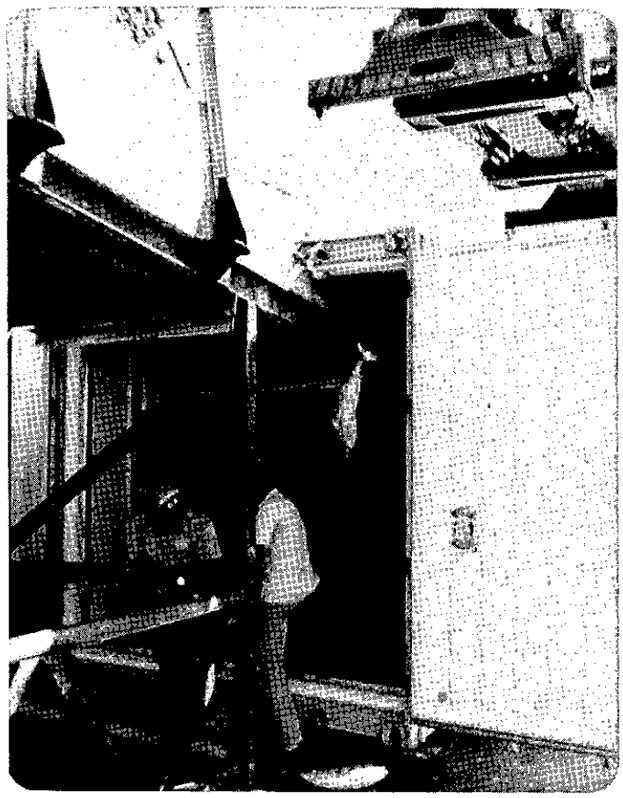


FIGURE 8-K
Fish Dropping Off Stuffing Ramp

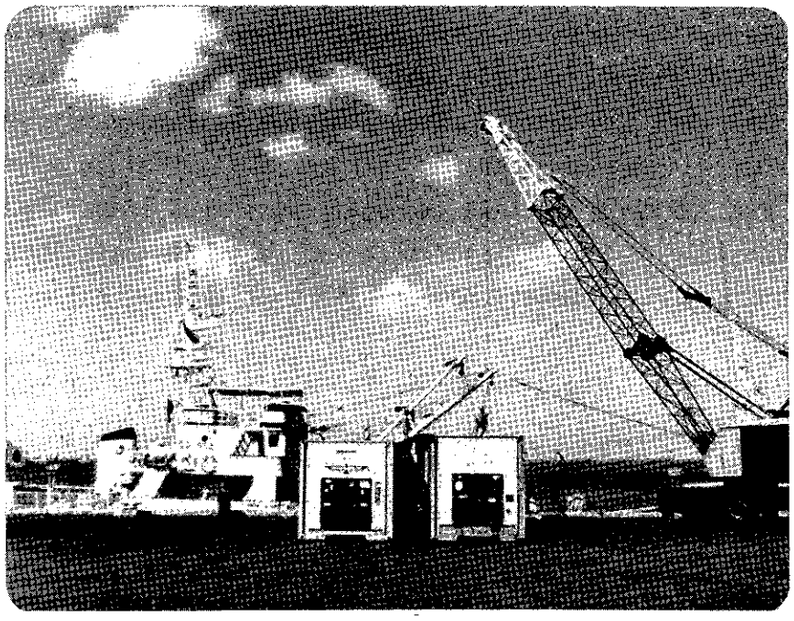


FIGURE 8-L
Two Containers Being Stuffed with Fish from Carrier Vessel
Port's Mobile Crane on Right

A knuckle boom type hydraulic crane could quickly reach any of several hatches on the vessel and hoist a canvas bucket up to the stuffing ramp. Since the small hatch opening is the primary bottleneck in the discharging operation, the ability to work multiple hatches would increase the vessel discharging rate.

If it is planned to continue the use of the mobile crane for discharge of the tuna or to replace it with a knuckle boom crane, then it is recommended that the ramps be modified to permit their use with containers on chassis. With containers grounded on the wharf apron, it is necessary to use the Port's only Hystainer for moving the loaded containers. If the containers were loaded while on chassis, any one of the Port's 20 yard tractors could be used for replacing a full container with an empty one.

Use of a pocket conveyor, scaled down from the type which have been used for handling stems and boxes of bananas could be developed and fabricated for this service. Such a conveyor could match the current productivity with one-third to one-half the current number of stevedores but the estimated cost of such a conveyor is $350,000.

Van Camp has recently procured a drag flight conveyor with wood cleats for elevating fish from the underside of a hopper at Palau. A combination of two of these conveyors could also permit a reduction in the number of stevedores employed in the transshipment operation. The bottleneck would still be the hatch openings.

An alternative to the use of carrier vessels from Papua New Guinea or Palau to Guam would be loading of refrigerated containers at these base ports and then transporting these to Guam by feeder vessels. There is a reluctance on the part of APL and U.S. Lines to release their containers for shipment to those two outlying ports. If this alternative were adopted, Guam would lose most of the economic benefit from transshipment of frozen tuna, the employment of the stevedores.

Although there has been criticism about the rate at which frozen tuna is discharged at Guam, the handling and throughput charges at Guam only add 10 percent to the cost of shipping fish from Palau. The potential reduction in vessel turnaround time does not appear to warrant payment of the 10 percent pay differential for night work which translates to only a four percent surcharge on the charge-out rate. The 14 tons per hour discharge rate experienced from February through August 1979 compares favorably for handling frozen round fish at other commercial ports. At canneries where fish will be processed, as received, then the fish can be floated out with a warmed brine solution. This is not possible where the fish is to be maintained in its frozen state. Large purse seiners can afford to transport the fish from Guam waters to the canneries in American Samoa to obtain the higher price for

the fish at the cannery and benefit from the less restrictive discharge conditions and thus a much faster discharge rate.

Containerized shipment of frozen tuna from Guam to the West Coast is to satisfy the demand for fish at canneries at Long Beach and San Diego. These containerized shipments compete with refrigerated tramp vessels which require accumulation of sufficient cargo to justify the call of the reefer vessel. These reefer vessels load at the base port of the fishing fleet, from mother ships, or directly from large purse seiners. The significant growth in tuna transshipments in refrigerated containers at Guam is indicative that this service is competitive.

Title 46 USCA 251a, the second sentence of which is commonly referred to as the Nicholson Act, prohibits the discharge of fish by a foreign flag vessel at a United States port if that fish were caught by the vessel on the high seas or transferred to the vessel on the high seas. If the fish were caught in foreign waters by a foreign flag vessel or if the fish were loaded or transferred to a foreign flag carrier vessel in foreign waters, then the vessel can discharge the fish at a United States port.

Guam, however, is exempt from the provisions of the Nicholson Act, therefore, Guam can be used by foreign flag vessels for discharge of fish caught or transferred on the high seas. Foreign flag reefer vessels cannot be used for shipping frozen tuna from Guam to the canneries at American Samoa, Long Beach or San Diego. Foreign flag vessels are presently permitted to transport cargo from Saipan or Palau to the U.S. West Coast, however, because of port costs, it is cheaper to discharge in Ensenada, Mexico and truck the fish to San Diego rather than discharge the ship at the cannery in San Diego.

This shipment has been stopped since July 1980 due to a dispute between U.S. and Mexico. The Mexican government has included tuna within their 200 mile "exclusive economic zone". This dispute is under active negotiation.

8.3.3 Transfers of Tuna

This operation involves the direct transfer of tuna from a catcher vessel or a carrier to a mother ship or a reefer ship and often does not involve any port labor or equipment. Such transfers are infrequent, but they have been known to occur without any fees being levied with the exception of dockage. Dockside transfer of tuna to a mother ship should be permitted only when there is no other demand for the berth.

8.3.4 Forecast of Transshipment of Frozen Tuna at Guam

A total of 64,242 metric tons of tuna have been transshipped through Guam from May 1974 through December 1979. This traffic showed a

35 percent annual growth rate over the first four years, 22 percent over the full five years, reflecting the two percent reduction in throughput in 1979 relative to 1978. Despite this very substantial increase in transshipment of frozen tuna over the past six years it was concluded that there will not be any significant increase in the traffic in the near future. The new tuna processing facilities at Papua New Guinea and the Philippines will affect the continued increase in shipment of frozen tuna to California. However, it is expected that tuna will continue to be transshipped via Guam to supply the needs of canneries in Long Beach and San Diego. APL and U.S. Lines provide regular, frequent service at a price sufficiently competitive for shippers to continue to use it.

In April 1980, one of the U.S. flag carriers was considering a 30 percent increase in tariff for frozen tuna from Guam to California. After further evaluation and local pressure the increase was scaled back to maintain the competitive tariff. Provided the tariff is continued at a reasonable rate, the shipper is expected to continue to use the service to keep his options open and maintain competition, containers versus tramp refrigerated ships.

If development of local bait supply through aquaculture proves economical and further experience indicates that the maximum sustainable yield of the tuna species has not been reached, then Guam's transshipment of frozen tuna could increase but not to the point where it would overtax the existing physical facilities.

It is not considered justified for the Port to make any further investment for improved physical facilities for transshipment of frozen tuna unless such investments are underwritten or guaranteed by Port users.

8.4 Transshipment of Fresh Tuna at Guam

A Japanese trading company has engaged in some preliminary discussions concerning using Guam as the base for a fleet of long-line vessels to supply the sashimi market in Japan. This would be a seasonal type fishery. Initially 20 to 30 boats would be used but it is said that the fleet could ultimately contain up to 200 vessels. The vessels would range in length from 70 to 80 feet with a beam of 20 feet, and would hold from 5 to 10 tons of fish and 10 to 15 tons of crushed ice. Refrigeration could be used to supplement the ice. These vessels carry a crew of up to eight men and would remain on the fishing grounds not longer than 10 days after the first fish is caught in order to be able to land the fish in excellent condition.

Time in port is expected to be two to three days with actual discharge of catch requiring two hours. Discharge of the catch is commonly done at night to reduce risk of deterioration of the catch

which is placed in specially designed insulated containers suitable for air transport. The filled containers are kept in a cold storage room until shortly before flight time when they are loaded aboard the aircraft, flown to Japan and delivered to the fresh fish market.

With 200 vessels in the fleet, 10 days at sea and 2 days in port, an average of 33 vessels would be in port at one time with an average of 17 vessels discharging during one night. With 14 hours available per night for vessel discharge, it would be necessary to be able to accommodate a minimum of 3 vessels simultaneously or 4 allowing for some peaking of vessel arrivals. Loading of ice, bunkering and re-provisioning could be done during daylight hours. Approximately 370 feet of wharf length would be required to accommodate four 80 feet long vessels with 10 feet space at each end of vessel. If berth F-3 were utilized for this operation, 380 feet remains for the Coast Guard launch and a frozen tuna transshipment vessel. Sashimi vessels awaiting discharge could double berth or they could wait in Piti channel east of Berth F-6.

Initially it would be satisfactory for the early contingent of boats to "raft" at anchor at the east end of the Port.

Guam Cold Storage, near the commerical air terminal, has previously been used for sashimi air freight movements to Japan. They claim to have enough spare capacity to accommodate the full scale sashimi operation which has been discussed. Pedro's ice plant has enough spare ice making capacity to serve the early contingent of boats. A crusher would be required to produce satisfactory crushed ice from the 300 pound blocks which Pedro's produces. Flake ice is superior to crushed ice. This would require a new plant. Such a plant would be justified for the full 200 boat operation.

If the resource and the market prove adequate to sustain the full fleet of 200 vessels, then it would be desirable to provide a separate area for discharging and servicing the fishing fleet. This could be provided on Drydock Island with the wharf along the south side of Piti channel. It is understood that the earlier discussions between the Port and the Japanese trading company were terminated when the Port declined to share the financing costs of the project. It is the Consultant's opinion that the Port's action was proper. The apparent intent is to bring in foreign flag vessels with low cost crews from Korea and Taiwan, take the catch from waters in the vicinity of Guam and market it in Japan. Very little benefit would accrue to the economy of Guam. If the potential benefits are such that the trading company considered that it had to share the financial risks, even with the low paid foreign crews, then it is unlikely that they would have been willing to enter into a joint venture arrangement utilizing an increasing percentage of Guamanian crews. However, the Port should continue to consider all approaches for use of its facilities which are consistent with the

objectives of the Port and on which increased revenue would be realized without adversely affecting other operations in the Port or on Guam. The sashimi operation is one which should be considered as it can produce revenue from under-utilized facilities.

8.5 Development of a Local Fishery

The Fishery Conservation and Management Act of 1976 (FCMA), Public Law 94-265, provides for the conservation and management of all fishery resources within the U.S. Fishery Conservation Zone (FCZ). The FCZ around Guam extends from the seaward boundaries of the territorial sea (3 nautical miles from shore) to 200 nautical miles seaward. Tuna are excluded from regulation under FCMA as they are considered to be a highly migratory species.

A draft copy of the Fisheries Development and Management Plan by Steven S. Amesbury and Paul Callaghan was made available prior to finalization of this study. This Fisheries Development and Management Plan (FDMP) was prepared for the Guam Marine Fisheries Council which was established by Governor Paul M. Calvo under Executive Order 79-6. The FDMP will be integrated into the Comprehensive Economic Development Plan under preparation by the Guam Department of Commerce and also the Pacific Basin Development Council's Overall Pacific Fishery Development Plan.

The Amesbury and Callaghan FDMP presents an excellent historical and current analysis of subsistence, recreational, and commercial fishing on Guam. The FDMP includes an estimate by John Eads, a local commercial fisherman that 30 boats with an average length of 24 feet are in use on Guam for full-time commercial fishing. The estimate does not include boats used for part-time commercial, subsistence or recreational fishing. Surface trolling and bottom fishing with electric or hydraulic reels are the primary techniques used by the commercial boats.

Under the FCMA, vessels larger than five net tons are allowed to fish in the FCZ only if they are documented under the laws of the United States, or registered under the laws of any state of the U.S. This requires that the vessels be built in the U.S. This creates a hardship for local fisherman because of the high freight costs for transporting a boat to Guam from the U.S. mainland or Hawaii.

The FDMP presents an estimate of 212 tons of local fish landings at Guam in 1979. Offshore trolling, bottom fishing and diving accounted for 68 percent of the landings. The balance resulted from inshore netting, diving and hook-and-line fishing. This amounts to nine percent of the estimated 1979 fishery product imports into Guam. This indicates a substantial margin for further import substitution by local fisheries.

The FDMP points out the following deterrents to development of a local fishery:

- Lack of scientific and technical information on the resource base;

- Federal law limiting use of vessels over five tons to those of U.S. construction;

- Insufficient shoreside facilities;

- Poorly developed market and distribution systems for locally caught fish;

- Insufficient sources of local private risk capital;

- Relatively high labor costs;

- Insufficient coordination on a technical level with the Commonwealth of Northern Marianas;

- Lack of coordination and the absence of a firm commitment toward fisheries development and management by the Government of Guam.

The FDMP establishes the development and management objectives for reef fisheries, small-boat fisheries, large-scale harvesting, and, transshipment and processing. For each, there is a description of the constraints, recommendations and program for implementation.

The plan is considered to be very soundly based. Discussions on Guam indicated general agreement with the opinions formed by this study team that development of local small-scale fisheries is very desirable and more readily achieved than large-scale harvesting. Development of fueling, ice making, freezing and marketing facilities at the Agana Marina would greatly assist local commercial fishermen. Improvement at Merizo Pier in the south of Guam, the proposed marina in Agat Bay, development of a harbor of refuge at the eastern end of Piti Channel and establishment of small boat repair facilities would encourage development of local small-boat fisheries. It is then possible that large-scale fisheries could be an outgrowth from successful small-scale fisheries.

Further development of local fisheries beyond that which can be accommodated at the Agana Marina, Merizo Pier and Agat Marina and including the potential for large scale harvesting can best be accommodated in Apra Harbor, the only deep water harbor on Guam.

One of the deterrents to development of a local fishery is competition of imported fish from the Philippines and Palau and fish landed by foreign fishing vessels. Fresh fish is being flown into Guam from the Philippines. The delivered price of this fish in Guam is

reported to be 75 cents per pound, well below the price which local fishermen must obtain to make their efforts worthwhile. Foreign long-line tuna boats catch a substantial amount of non-tuna species. If these are taken outside Guam's FCZ, they may legally be discharged on Guam. Much of this fish finds its way into the local market at prices which are not profitable for local fishermen. The local fishermen are attempting to counter this competition by emphasizing the high quality of their fresh fish. The local fishermen should be assisted in these efforts and aided in their endeavors to obtain greater productivity and better marketing of their catch.

If joint ventures between U.S. and foreign fishing interests are permitted in the Guam FCZ, this should be done only with assurance of maximum participation by Guam fishermen.

8.5.1 Fish Cannery

Many arguments have been posed for and against the construction of a tuna cannery within the Port of Guam. Some development plans have indicated that the resources are such that an investment would be feasible.

While it is recognized that a tuna cannery is the best way to maximize the income from a tuna fishery, also recognized are the associated problems, such as high cost of supplies and equipment, questionable logistics, the risk should the supply of fish become inadequate to justify continued operation and price competition from such low labor cost countries as Papua New Guinea and the Philippines. In conjunction with close proximity to proven fishing grounds and available stocks of bait fish, low labor cost is a strong inducement to investors. Such advantages offset the duties levied on processed and frozen products emanating from these nations.

Guam is a high labor cost area when compared to other Western Pacific tuna centers. It appears unlikely that Guam can expect any near term benefits from large-scale tuna fishing such as establishment of a cannery. There is a significant economy of scale in a tuna cannery. The U.S. West Coast has seen the recent demise of several small and medium sized canneries. The canneries now operating in Long Beach and San Diego are large and efficient. These canneries obtain their supplies directly from purse seiners and motherships working the Eastern, Central and Northern Pacific. They supplement tuna from these sources with tuna shipped directly from Palau and Papua New Guinea, and transshipped via Guam.

The FDMP does recommend a study of the possibility of "loining" tuna and then shipping the frozen loins to a cannery for packing. Fish meat and oil are a by-product of the loining process. Fish meal is very valuable as a supplement in poultry feed. It is currently not being

used as such on Guam because of its cost. The local poultry industry could benefit from use of this by-product from a tuna loining operation on Guam.

8.6 Facilities for Support of Fishing Vessels

8.6.1 Ice Plants

Guam has two commerical ice making plants:

- Pedro's at Asan with a capacity of approximately 30 ton per day of 300 pound blocks;

- Foremost Dairies near Harmon Industrial Park, which makes small quantities of tube ice.

Pedro's has two cube cutting machines and one crusher, neither of which make a good ice for fish, although the existing crusher is used for crushing the block ice used in the distribution of fresh fish airfreighted in from the Philippines. The reported surplus capacity of 20 to 25 tons of block ice per day is adequate to satisfy the ice requirements of an advance contingent of 20 to 30 sashimi boats but a new crusher would be desirable. For the full 200 boat fleet of sashimi boats, a new ice plant, preferably at wharfside, would be necessary. The full fleet could require an ice plant with a capacity of 200 tons per day.

8.6.2 Cold Storage Plants

Guam has three commercial cold storage plants:

- Suzue Guam, Ltd. in the Cabras Island Industrial Park adjacent to the Port;

- Pedro's at Asan;

- Guam Cold Storage at Harmon Industrial Park.

Suzue Guam has one 10,000 square foot dehumidified room currently leased for produce, one chill room of 3,500 square feet with a temperature of 40-45^{o}F, and one room of 3,500 square feet which is held at - 10^{o}F. This plant is reportedly approximately 70 percent utilized for storage of frozen beef, chicken, ice cream, etc. Occasionally some incidental catch from the tuna vessels is stored here prior to local sale. At last report there were serious doubts about the physical condition of the refrigeration machinery at this plant.

Pedro's cold storage plant is mainly for support of the adjacent supermarket and as a wholesale butcher operation.

Guam Cold Storage has one chill room and two freezer rooms. One freezer room of approximately 3,500 square feet is now idle. This plant is used occasionally for storage of incidental catch acquired from the tuna vessels by a fish wholesaler and was used to support a sashimi operation in which the sashimi was airfreighted to Japan. There is currently more than enough spare cold storage capacity to support a moderate scale sashimi operation.

U.S. Lines provides approximately weekly service and APL a bi-weekly container service to the west coast. The refrigerated containers provided by these lines for the transshipment of frozen tuna are a form of cold storage but not a freezer plant.

An average of 1,340 tons per month of tuna were discharged at the port, in 1978. This did not create any need for long-term cold storage. As the volume of tuna passing through the port is not expected to increase significantly in the future and the availability of refrigerated containers appears to be established, a wharfside cold storage facility for transshipment of frozen tuna is not considered necessary at this time.

Should there be an increase in the number of fishing vessels calling at the Port of Guam, in particular long-line vessels whose catch comprise other fish species as well as tuna, and if this by-catch proves to be significant, then wharfside cold storage facilities might be justified.

It has been suggested that Star-Kist and Van Camp would utilize a wharfside cold storage facility if the costs were justified and should the situation arise where refrigerated containers were in short supply or unavailable when required. While this must be considered as a possibility, there is no clear or positive indication that the volume of tuna will increase in the near future to the point where such a situation would develop.

8.6.3 Repair Facilities

Complete machine shop facilities for the maintenance and repair of marine craft including fishing vessels are provided by the Dillingham Corporation of Guam at a site leased from GEDA, immediately adjacent to berth F-2. Included is a 1,000 ton floating drydock on 5 year lease from the Navy. This drydock is capable of accommodating vessels up to 200' long, 40' wide and 18' feet deep. All major repairs can be accomplished. These facilities are adequate for the present tuna vessel traffic but the drydock is excessive for the boats currently in use and anticipated for the small-scale fishery. These boats currently are hauled using launching ramps or mobile cranes. There has been considerable discussion about the installation of a small marine railway or boat lift but so far no one has been willing to risk the capital.

Should traffic in small or medium size fishing vessels increase significantly, additional repair facilities primarily for use by the fishing industry would be desirable and could be accommodated on Drydock Point.

8.6.4 Fuel, Stores and Water

The Guam Oil and Refining Company (GORCO) has a lease with the Port providing for two fuel tanks west of Shed 1 and a piping system along the wharf for fueling vessels. Fresh water is available to vessels at the wharves through the Port's water system. Stores are available through local chandlers.

8.7 Benefits from Tuna Transshipment

Transshipment of frozen tuna is projected to increase at approximately three percent. The current rate of transshipment is approximately 15,000 tons per year. Callaghan and Simmons determined that total disbursements from tuna transshipped at Guam Commercial Port from January 31 to August 31, 1979 was $193 per ton. This produces $2.9 million of disbursements per year for 15,000 tons of frozen tuna. The following summarizes the distribution of these disbursements:

Public Sector

Stevedoring	4%
Equipment Rental	1%
Others	4%

Private Sector

Freight	48%
Crew Cash Advances	7%
Supplies	3%
Fuel	28%
Repairs & Deck Supplies	2%
Tug & Pilot	1%
Others	2%

Transshipment of fresh tuna which could achieve 20,000 to 30,000 tons per year would be expected to produce similar benefits. The freight costs for air shipment of the iced fish would be significantly higher than seafreight of frozen fish thus a higher percentage of the disbursements would be allocated to freight. In addition the costs for ice would add to the disbursements. It is conceivable that the total disbursements on Guam could approach $1,000 per ton or $20 to $30 million per year. As with the frozen tuna the largest portions of the disbursements would go off-island to the freight carriers, for crude oil, vessel owners and crew.

The greatest effect on Guam from both trades would probably be the low cost incidental catch marketed on Guam. This low cost incidental catch could significantly affect development of local fisheries, however, it is possible that the total direct, indirect and induced benefits from local fisheries would be greater than the economic benefits to Guam from the low cost incidental catch. This is something that could be evaluated by a team such as Amesbury and Callaghan as on extension to the work they have done on the Guam Fisheries Development and Management Plan.

9.0 TRAFFIC FORECAST

9.0 TRAFFIC FORECAST

9.1 Combined General Cargo Forecast

There are a number of methods and techniques available which can be used to develop projections of future cargo movements through ports. Similarly, there are numerous uses for the cargo projections which are developed. The methods and techniques range from those which are purely mathematical-statistical in derivation to those which are essentially judgmental in character. The uses for the projections include those concerned with facility requirements to accommodate future cargo movements, economic and financial analysis of facility expansion or proposed new facilities, marketing of ports and port facilities and services and, development of a master plan for the entire port and harbor area.

A primary purpose of this study is to assess future port requirements and develop a land-use plan for the Navy land being turned over to the Government of Guam. This requires a long range traffic forecast rather than a near term forecast which would be required for immediate cash flow projections.

It is expected that the United States will continue to be the major source of supply for Guam's imports and the major market for its exports. There may, however, be some shifts in the proportionate distribution of both imports and exports.

In the recent past, the United States has generally accounted for upwards of 75 percent of total imports and more than 60 percent of total exports; foreign areas, notably Japan, Taiwan, the Philippines, Hong Kong, and to a lesser degree, Australia, New Zealand and the Trust Territory of the Pacific for most of the balance. As the total volumes of Guam's trade expand, it is possible that the direction of future trade may undergo some modification.

This would be particularly the case should efforts to broaden the base and scope of the production sectors of the economy be successfull. In this event, Guam may look increasingly to foreign sources of supply for some of its expanding import requirments, especially for raw materials and semi-finished products for further manufacture or fabrication or for assembly, and for more diversified foreign markets to absorb some portion of its expanding exports. The former would be comparable to the experiences of GORCO and Kaiser Cement and Gypsum Company, both of which now import their supply requirements from foreign sources, the latter would be similar to experiences in other developing island economies notably those in the Caribbean.

As indicated, there may also be some changes in the commodity composition of future imports and exports. Depending on the degree of

success achieved in establishing manufacturing plants and assembly operations, there may be some imports of raw materials and semi-finished products. Conceivably, some portions of the resultant production could become available for domestic consumption, and substitute for goods and merchandise currently imported. This could also be the case should agricultural, livestock and fishery production develop substantially beyond their present levels.

Essentially, however, Guam is expected to continue to be an import-for-consumption economy through the projection period. In this sense the commodity composition of imports should consist primarily of goods and merchandise for personal and business consumption and use, modified over time to reflect changing consumer preferences, plus construction equipment and components and motor vehicles for both personal and business use. In volume terms, the major commodity classifications should continue to be food products; animal feeds; lumber, furniture and other wood and paper products; stone, glass and clay products; chemicals; primary metal products; machinery and some other fabricated metal products; and, as indicated, motor vehicles and construction equipment and components.

Exports, again depending on the degree of success in establishing manufacturing plants and assembly operations, and on expansion of agricultural, livestock and fishery production, would consist primarily of shipments of refined petroleum products, cement, some machinery including re-exports of construction equipment, motor vehicles including those belonging to Armed Forces personnel and some domestically produced food products.

The volumes of transshipment trade recorded by the Port Authority represent duplicated revenue tons rather than unduplicated cargo volumes which actually move through the Commercial Port. This recording in duplicated terms is perfectly valid for purposes of the wharf portion of the port as transshipment cargo crosses the wharf twice. For the purposes of transit shed or open transit areas there is no distinction as all cargo comes into the port once and goes out once. A special tabulation of unduplicated revenue ton movements was prepared by Port Authority staff for the period March 1978 - February 1980. A total volume of transshipment of 44,693 revenue tons is shown for the twelve months March 1979 - February 1980. This total includes approximately 15,000 tons of frozen tuna. The balance of approximately 30,000 tons consists of vehicles, construction materials, animal feeds, foodstuff and goods and merchandise for personal and business consumption and use.

Transshipment trade with the other islands of Micronesia is expected to increase moderately over time as their population increases and as their economies develop and expand. Information provided by the Office of the High Commissioner of the Trust Territory of the Pacific Islands projects total population to increase from 117,000 in 1979 to 242,000 in year 2000. Population in the Northern Marianas, and the

Truk, Yap and Palau Districts, those which account for the bulk of the transshipment trade via Guam, is projected to increase from 76,000 to 158,000 an increase of 107 percent.

As set forth in Section 8.0 transshipment of frozen tuna is not expected to continue its rapid growth of the first five years. It is considered more reasonable to expect an increase at the same rate as general cargo transshipment traffic for the other islands of Micronesia.

Transshipment of fresh tuna is considered to be a real possibility which could amount to 20,000 to 30,000 tons per year but this is too uncertain to be reflected in port traffic projections at this time.

Projection of future revenue ton cargo movements through the Port of Guam involved a two-stage process. First, separate regression analysis based projections were developed for imports, exports, transshipments and total trade for the historical period 1968-1979 (1980 was incomplete). After analysis and testing of the results of this methodology, a series of low, medium and high projections were developed separately for imports, exports and transshipments. In each case, the low level projections represent a simple growth rate of two percent per year over the base year volume, the medium level projections a three percent rate of increase and the high projections a four percent rate of growth. Projections were developed for each five year time interval to year 2000.

The survey team views such a range of growth rates as appropriate and realistic based on our analysis and evaluation of the factors which will affect Guam's future oceanborne commerce. It is considered that the sharp drop in traffic in 1980 is largely a result of worldwide economic conditions which should be viewed as a short term aberration.

In the case of imports and exports, the base year volume is the average of revenue ton movements for the three year period 1977-1979. In the case of transshipment traffic, the special tabulation of unduplicated movements for the period March 1979 - February 1980 is accepted as the base year volume, adjusted to conform to the historical data. The projections are set forth in Table 9-1.

Imports are projected to increase from a base volume of 535,000 revenue tons to a range of 642,000-749,000 tons in 1990 and to 749,000-963,000 tons in year 2000. The medium level growth projections are for volumes of 696,000 tons in 1990 and 856,000 tons in year 2000. These latter volumes would be equivalent to increases of 30 percent and 60 percent respectively over the recent base year volume.

For exports, the volumes are projected to grow from a base of 104,600 tons to a low-high range of 126,000-146,000 tons in 1990 and 146,000-188,000 tons in year 2000. The medium growth rate projections

come to 136,000 tons and 167,000 tons in 1990 and year 2000 respectively.

TABLE 9.1

Projections of Cargo Revenue Tons by Imports, Exports and Transshipment
Fiscal Years 1985-2000
(000 Revenue Tons)

Year	Low (2%)	Medium (3%)	High (4%)
	A. Imports		
Base	535	535	535
1985	588	615	642
1990	642	695	749
1995	695	776	856
2000	749	856	963
	B. Exports		
Base	105	105	105
1985	115	120	125
1990	125	136	146
1995	136	152	167
2000	146	167	188
	C. Transshipment		
Base	89	89	89
1985	98	103	107
1990	107	116	125
1995	116	130	143
2000	125	143	161
	D. Total		
Base	729	729	729
1985	802	838	875
1990	875	948	1021
1995	948	1057	1166
2000	1021	1166	1312

On the same basis, transshipment trade with the other islands of Micronesia, including frozen tuna transshipment, would increase to 49,000-53,600 revenue tons by 1985, 53,600-62,600 tons by 1990, 58,100-71,500 tons by 1995, and to 62,600-80,400 tons in year 2000. To make these unduplicated volumes comparable with the volumes presented earlier in Section 5 and also in Table 9.1 they should be doubled.

This assumes that transshipment services via Guam continue to provide competitive advantages vis-a-vis direct services to/from the islands for cargo originating/terminating in both the United States and various foreign countries, notably in the Far East, Southeast Asia and Australia and New Zealand. Frequency and reliability of service and total comparative costs are the principal elements in this competition.

Summing up the separate projections for imports, exports and transshipments, total revenue ton volumes are anticipated to increase from a base of 729,000 tons to a range of 875,000-1,021,000 tons in 1990 and to a year 2000 range of 1,021,000-1,312,000 tons. The medium range growth rate projections are for volumes of 948,000 tons in 1990 and 1,166,000 tons in year 2000.

9.2 Forecast of Mode of General Cargo Shipment

Containerized movements already account for the overwhelming share of total annual volumes. In the period 1975-1979 this share ranged between 84 and 87 percent annually.

All of the trade with the United States is now containerized, except for small volumes of non-containerizable construction equipment and other oversized cargo. This pattern of operations in Guam-United States trade is projected to continue into the future.

As regards inter-regional trade with foreign areas and intra-regional trade with the Trust Territory, in fiscal year 1979 these were divided 46 percent breakbulk and 54 percent containerized. The breakbulk category, however, included motor vehicles which are generally carried on specialized roll-on/roll-off vessels from Japan. This specialized movement is projected to continue. Given the extensive geographic distribution and the diverse commodity composition of the remaining trade with foreign areas and the Trust Territory, there is relatively little margin for a substantial increase in containerized movements of this trade.

In the overall, therefore, it is projected that the present distribution of Guam's oceanborne trade as between containerized and breakbulk movements will continue into the near future. Over time, the share of containerized movements may increase to the 88-90 percent range of total cargo movements. The absolute volume of containerized movements should therefore increase as both the total volume of trade expands and the share of the total moves up moderately.

As the volume of containerized movements increase, there will be a tendency towards proportionately greater use of 40 foot containers. It will be recalled that with the withdrawal of Matson Navigation, the use of 27 foot units was discontinued, to be replaced primarily by increased use of 40 foot boxes by both American President Lines and United States Lines.

In fiscal year 1979, while Matson was still in operation, their 27 foot containers comprised 36 percent of all containers discharging cargo, compared with 33 percent and 31 percent for the twenty and forty foot sizes respectively. During the nine month period following Matson's withdrawal, July 1979-March 1980, the distribution shifted to 60 percent for the 40 foot containers, 37 percent for the 20 foot boxes and the remaining 3 percent accounted for by tag-end movements of twenty-seven footers. In March 1980 when there were 1,506 containers discharged, only two were twenty-seven footers; the 40 foot units accounted for 58 percent of the total and twenty footers for the remaining 42 percent.

9.3 Forecast of Container Traffic

Projection of cargo revenue tons by imports, exports and transshipments are shown on Table 9-1. The containerized proportion is presently 85 percent of total. It is expected that this will gradually increase to 90 percent in the year 2000.

The split between 20 foot and 40 foot containers is expected to shift from 32 percent 20's and 68 percent 40's in the base year to 26:74 split in 2000. The 27 foot containers are ignored as they currently play an insignificant part in the Port's traffic. U.S. Lines are forecasting 8 percent 20 foot containers for their near term operation. It is expected that this will be reduced only marginally and that APL and the foreign flag carriers will account for most of the shift toward 40 foot units. Foreign containers are predicted to handle a gradually increasing proportion of container port traffic, increasing from 11 percent to 18 percent in 2000.

It was assumed that inbound refrigerated containers would remain constant at 13 percent by number over the period of analysis.

Transshipment traffic is identified separately due to its effect on berth occupancy. Each container used for transshipment cargo crosses the wharf up to four times. With two of these crossings the productivity is substantially lower. From the aspect of the container yard, transshipment containers are similar to Guam destined containers in that they are only in the container yard twice, however, with a grounded operation care must be exercised in stacking containers for transshipment as one mis-placed container delays an entire barge or shipload of containers, not just one truck and driver.

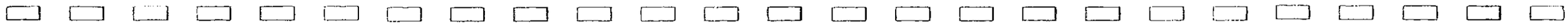
Only inbound container movements were analyzed to obtain the total number of containers. Outbound movements were assumed equal in number whether empty or full. To convert revenue tons to number of containers an average of 26 and 15 revenue tons was used for each 40 foot and 20 foot container, respectively. Frozen tuna was assumed at 20 tons per 40 foot container. The container forecast in terms of numbers and twenty foot equivalent units (TEU's) is shown on Table 9-2.

TABLE 9.2

CONTAINER FORECAST

	Inbound and Outbound[1/]		
Year	Low	Medium	High
Base No.	45188	45188	45188
TEU	73205	73205	73205
1985 No.	49288	51602	53914
TEU	82804	86691	90576
1990 No.	53922	58414	62996
TEU	91667	99304	107093
1995 No.	58464	65270	72076
TEU	100558	112264	123971
2000 No.	63180	72170	81158
TEU	109933	125576	141215

1/ These numbers do not double count transshipment containers. These are only counted once when discharged from the long haul liner vessel and once when loaded onto the long haul liner vessel.



10.0 FUTURE PORT REQUIREMENTS

10.0 FUTURE PORT REQUIREMENTS

This Section presents a brief description of the physical facilities of the present Commercial Port, the present utilization of these facilities and an analysis of improvements necessary to accommodate the additional container and break-bulk general cargo traffic, forecast in Section 9.0.

10.1 Physical Facilities of Commercial Port

The Commercial Port currently consists of:

- 32 acres of total land area;
- 12 acres of container yard;
- 750 foot of wharf with 30 feet dredged depth;
- 1,950 foot of wharf with 35 feet dredged depth;
- two 43,000 square foot transit sheds;
- 24,000 square foot maintenance and repair building;
- 24,000 square foot container freight station;
- 25,412 square foot administration building;
- 3,600 square foot equipment shed;
- 3,482 square foot leased office building;
- 2,458 square foot in six miscellaneous buildings and structures.

In addition the Port had recently leased 11 acres of land on the north side of Route 11 from the Navy. This is in support of the Port's need to expand its container storage and handling yard.

The 750 feet of wharf is designated as Berth F-3. The 1,950 feet of wharf is nominally designated as Berths F-4, F-5 and F-6 although use of approximately 350 feet at the eastern end is restricted due to a shoal with approximately 22 feet of water within 200 feet of the wharf. The wharf structure consists of an anchored steel sheet pile bulkhead. The construction drawings contain the cautionary note: "To maintain stability of bulkhead, no overdredging shall be permitted in this area". The designed dredge depths are shown as 30 feet for the 750 feet length of wharf and 35 feet for the 1,950 feet length of wharf. The datum for

water depths is mean lower low water. Mean higher high water is 2.4 feet and extreme low water -2.0 feet.

The wharf structure appears to be in very good condition. The timber gravity type fender system is in poor condition and should be replaced.

All of the port buildings are of reinforced concrete or concrete block construction.

Transit Shed 1, adjacent to Berth F-3, is used as a garage for fork lift trucks and yard tractors. Three bays at the western end of the shed are occupied by parts from cannibalized fork lift trucks.

Transit Shed 2, adjacent to Berth F-4, is largely unused except at the western end where a lessee has established a duty free shop. This shop has 10,044 square feet of space under lease.

The Container Freight Station is largely unused except for 1,331 square feet of space at the eastern end under lease to Cabras Marine.

Other buildings in the port are fully utilized with the exception of some office space in the Administration Building.

All buildings appear to be in very good condition, however, a small patch of concrete spalled off the underside of the roof of the U.S. Lines office building in July 1980. This exposed some corroded reinforcing steel. This indicates that a close inspection of all buildings is warranted.

The existing container yard was designed for straddle carriers to transport containers between the wharf and the container yard. Typhoon tie-downs were installed on a grid which provides for 576 TEU's on one level or 1152 TEU's with containers stacked two high. The straddle carriers are no longer used. They were replaced by straddle cranes, two purchased in 1973 and a third in 1975.

One straddle crane is presently out of commission. It has been cannibalized to a certain degree to obtain parts for the other two cranes. These straddle cranes can stack containers four high and five wide, leaving room for a truck lane on one side of the stack. The cranes are supported on four large rubber tired wheels. The wheels can be turned through 90^{o} to move the cranes laterally to adjacent stacks. Utilizing straddle cranes, the container yard can accommodate approximately 830 TEU's per level. For a workable container storage density, an average stacking height of two containers gives a capacity of 1,660 TEU's. In addition the container yard can accommodate approximately 174 TEU's on chassis. Paving in the Port is generally in good condition but the container yard paving has been destroyed where the straddle crane wheels have been turned.

One container gantry with a lifting capacity of 30 long tons was installed in 1971. A second container gantry with a lifting capacity of 40 long tons was installed in 1979.

The Port leases a 140 ton capacity Manitowac truck crane which is used for wharfside container handling. In addition, the Port has the following items of equipment on its inventory; a 40 ton capacity truck crane acquired in 1977, a 40 ton capacity Hystainer with an adjustable spreader for lifting and stacking containers, two 20 ton, two 10 ton, six 3.5 ton, 30 three ton and five two ton fork lift trucks, all acquired in 1973, 20 yard hustler tractors acquired in 1973, 1975 and 1977, two warehouse towing tractors with flatbed steel dollies acquired in 1973, five yard chassis acquired in 1973, two small straddle carriers acquired in 1969 and 1971, and miscellaneous cars, trucks, buses, welding machines and generators acquired between 1970 and 1978.

Many of the smaller forklift trucks have been cannibalized or are out of order awaiting parts and repair. The two small straddle carriers are also out of order and are no longer compatible with the present method of handling containers at the Port.

APL, as a part of an agreement with the Port, contracted with Crane Maintenance and Engineering Company to maintain the two container gantries and two of the three straddle cranes and train a staff of mechanics in proper maintenance procedures. The maintenance contract has been very effective. The four pieces of equipment have had very little down-time during the contract period and it is understood that the local mechanics have received very good training. The maintenance contract has been extended through at least April 1981.

10.2 Working Hours

The Commercial Port works ships round-the-clock using two 11-hour shifts. The day shift works from 7:00 AM to Noon and 1:00 PM to 7:00 PM. The night shift works from 7:00 PM to Midnight and 1:00 AM to 7:00 AM. Overtime is paid at 1.5 times straight time wage rates for more than 8-hours per day. This amounts to approximately a 22 percent increase in the charge-out rates. A night differential amounting to 10 percent of wage rate is paid for night work. This differential amounts to approximately four percent of the charge-out rate. The holiday differential adds approximately 45 percent to the charge out rates.

Ships are also worked on weekends.

The container yard is generally open from 8:00 AM to 7:00 PM Monday through Friday unless special service requests are made.

10.3 Berth Occupancy

Berth occupancy at the four nominal berths at the Port was analyzed for the 12 month period May 1979 - April 1980.

The Port was analyzed in two parts, F-3 as one part and F-4, F-5 and F-6 combined, as the second part. Tabulation of the data was made in terms of feet-hours of occupancy because of the wide range in lengths of vessels. The conversion to percentage occupancy was made by dividing by the product of length of wharf and number of hours per year.

It was not possible to determine from the available logs when the vessels were actually working cargo and when they were merely at berth. The berth occupancy analysis merely considers the total elapsed time at berth.

Tug boats often berth abreast one another. The same occasionally holds true for fishing boats that are berthed but not working cargo. In tabulating berth occupancy, all vessels were considered as occupying a length of wharf equal to the vessels length-over-all plus ten percent to allow for clearance between vessels.

The Normar II came into Guam for repairs and then was shown as restrained by the Coast Guard. This vessel was berthed at the return wharf at the east end of F-6. This return wharf is at right-angles to F-6 and did not restrict utilization of F-6 but since the report showed this vessel occupying F-6, this is the way it was tabulated. Table 10.1 shows the results of this analysis.

TABLE 10.1

BERTH OCCUPANCY
During Period May 1979-April 1980

Vessel Classification	Berth F-3 %	Berth F-4 F-5 & F-6 %	All Four Berths %
Extra-Regional Container or Combination Vessels 1/	-	8.5	6.2
Intra-Regional Container, Combination, Breakbulk Vessels and Barges	12.5	11.6	11.8
Fishing Vessels and Carriers	24.9	8.4	13.0
Tugs	0.2	3.1	2.3
Passenger Ships	-	1.4	1.0
Layups and Repairs	5.2	8.0	7.2
Total	42.8	41.0	41.5

1/ Includes Matson, U.S. Lines, APL and Daiwa Vessels.

It is interesting to note that over 85 percent of the Port's cargo is handled with a Port occupancy of 6.2 percent. This was done in approximately 2400 hours at berth in the 12 month period. This was substantially less than the combined occupancy by tugs, layups and repairs. The intra-regional vessels had a high occupancy largely because of slack time in scheduling which could actually be considered as layup but was not tabulated as such. The analysis shows the minor roll played by passenger vessels in terms of berth occupancy.

Although fishing vessels have a high occupancy rate, much of this was primarily for bunkering and rest and recreation for the crew.

10.4 Wharf Capacity

Many factors influence the cargo handling capacity of a wharf. Among these are the type of cargo, bulk or general cargo; breakbulk or unitized; type and size of ship; size of shipment; cargo handling equipment; working hours; weather; private or public terminal; and amount of congestion and resulting ship delay time. Within the Commercial Port there is no bulk cargo. It is primarily a general cargo port handling largely unitized cargo in standard 20 and 40 foot containers. The ships are generally medium to large. Shipments are small to medium. Cargo handling equipment is generally good. Working hours are suited to the trade. Weather delays are not significant. It is a publicly owned and operated port open to all fishing, general cargo and passenger vessels. At the current level of traffic the congestion and concomitant delay time for a ship awaiting berth is negligible.

The analysis of existing wharf capacity was based on a separate capacity for each of the three principal classes of service: fully containerized ships, combination container-Ro/Ro-breakbulk ships and breakbulk and intra-regional vessels. Containerized traffic, tuna transshipment and Ro/Ro traffic handled concurrently with containers account for over 90 percent of Port traffic. Average current throughput figures were used for these classes of traffic and conservative average berth occupancy figures were assumed for each class of traffic. For breakbulk cargo other than the Ro/Ro and frozen tuna discharge an average berth occupancy and throughput per unit length of wharf were assumed. These separate capacities for the different services were then combined to obtain a wharf capacity for the entire Commercial Port.

10.4.1 Fully Containerized Ships

Liner container ships serving Guam vary from the 820 feet long, 1068 TEU capacity American Trader to the 510 feet long, 432 TEU capacity Fiji Maru. The length of the four vessels APL has in the Service is 574 feet. The American Trader is one of the nine vessels used by U.S. Lines for Guam service, six are 700 feet long, 1258 TEU capacity vessels and two are 709 feet long. Restricted depth at the eastern end

of Berth F-6 limits the 1,950 ft of wharf to two of these large container ships and one shallow draft inter-island ship or barge, or one large container ship, one small container ship plus two or three intra-regional barges or ships. There is enough water depth at the eastern end of the channel to safely maneuver the intra-regional vessels.

The two U.S. flag carriers currently serving Guam handle approximately 425 revenue tons of containerized cargo plus empties per hour at berth. This productivity is for two gantry cranes serving one ship. Although some analyses of wharf capacity use completely random arrival of vessels, container ships work very closely to a fixed schedule. Increased fuel costs have resulted in a reduction in cruising speed. This normal reduction gives the vessel added speed margin if it is necessary to make-up for delays enroute. Container ships will deviate slightly from the schedule but inter-arrival times are not random. Although APL is able to adhere very closely to its schedule of a vessel every other Tuesday, U.S. Lines with its scheduled 50 calls per year has produced some conflicts with APL ships. These conflicts have occurred with approximately 15 percent of the APL calls. For the U.S. flag container vessels, where each has a priority agreement for a berth and a crane, it is reasonable to consider a low berth occupancy factor for evaluation of berth capacity. For a berth occupancy factor of 30 percent based upon 250 working days per year, 24 hours per day at 425 revenue tons per hour that the berth is occupied, the berth will have a capacity of 766,800 revenue tons per year. The average length of the container ships serving Guam for APL and U.S. Lines is 658 feet. Allowing 10 percent of length-over-all for total clearance at ends of vessel, the average berth length requirement is 723 feet. The 766,800 revenue tons per year berth capacity over 723 feet of berth yields a capacity of 1,060 revenue tons per foot of berth per year. This is less than world norms for comparably equipped berths and vessels, therefore, it is considered reasonable to use this value for evaluation purposes.

10.4.2 Combination Containers - Ro/Ro - Break-bulk Ships

The inter-regional foreign flag combination self-geared container Ro/Ro ships account for approximately 11 percent of containerized import revenue tonnage, 25 percent of containerized export revenue tonnage and most of the break-bulk cargo which passes through the Port. The normal practice of these vessels is to carry containers on deck and vehicles below deck. The liner vessels which account for most of the trade, have ramps on the stern quarter to permit rapid loading and discharging of vehicles and other cargo carried below decks. The majority of the 6,179 vehicles imported from Japan in 1979 were simply driven off the ship. This operation is conducted while containers are discharged and loaded using ship's cranes.

These vessels handle approximately 80 revenue tons of containerized cargo per hour at berth. Assuming that these liner vessels, currently representing approximately 38 calls per year, handle one-half of the breakbulk cargo or approximately 1,100 revenue tons per call then the total productivity of these vessels is approximately 140 revenue tons per hour. These vessels are generally worked continuously while in port oftentimes including weekends. Using a 250 day workable year for evaluation purposes, 24 hours per day and a berth occupancy of 40 percent yields a capacity of 336,000 revenue tons per year. The average length of these vessels is approximately 500 feet. Allowing 10 percent for clearance results in a 550 feet long berth, and a unit capacity of 611 revenue tons per foot of berth per year. The higher berth occupancy utilized for this service allows for the fact that no priority use agreement applies. The unit capacity for this service again is less than world norms for similar service, therefore, the figure is considered reasonable for use in port capacity evaluation.

10.4.3 Break-bulk and Intra-Regional Vessels

The breakbulk general cargo ships handling the balance of inter-regional breakbulk cargo and the barges and ships involved in the intra-regional trade could work under a higher allowable berth occupancy than the liner vessels. This is due to their shorter length so that they can more easily be accommodated at available berths. The daily costs of the vessel and cargo are lower, therefore, an occasional delay awaiting berth is acceptable. For purposes of this evaluation an average berth occupancy for this class of service of 65 percent is considered reasonable. At this occupancy and for the nature of this service a unit capacity of 220 revenue tons per foot of berth per year is considered reasonable.

If Berth F-3 is used exclusively for transshipment of frozen tuna under current cargo handling practices (80 tons/8 hr. day) and a berth occupancy of 70 percent is assumed, the capacity of this berth is approximately 48,000 tons per year. This makes allowance for continued use by the U.S. Coast Guard of 100 feet of the westerly end of the berth. If the working day were increased to 11 hours the capacity would be 59,000 tons per year or approximately 112,000 tons per year for two 11-hour shifts. These figures are based on a 250-day year and a 10 percent reduction in productivity for a second 11-hour shift.

Alternately if the 650 feet of available berth were used for inter-regional and intra-regional break-bulk ships and barges at a unit capacity of 220 revenue tons per foot of berth then the capacity would be 143,000 revenue tons per year. For the current evaluation it is considered reasonable to use the 59,000-ton figure for frozen tuna transshipment.

10.4.4 Summary of Wharf Capacity

Combining the above unit capacities:

Berths F-4, 5 & 6

550 ft @	611 RT/ft/yr	=	336,050 RT/yr
723 ft @	1060 RT/ft/yr	=	766,380 RT/yr
677 ft @	220 RT/ft/yr	=	148,940 RT/yr
			1,251,370 RT/yr

or:

2 X 723 ft. @	1060 RT/ft/yr	=	1,532,760 RT/yr
504 ft. @	220 RT/ft/yr	=	110,880 RT/yr
			1,643,640 RT/yr

Including the frozen tuna fish, at a 1:1 ratio of revenue tons to weight tons gives the port a wharf capacity of approximately 1,300,000 to 1,700,000 revenue tons per year. In order to achieve the 1,700,000 revenue tons per year capacity it would probably be necessary to install one additional gantry crane. These figures are considered reasonable for wharf operation in basically the same manner as present. As the Port approaches these throughputs it would probably be necessary to find alternative moorings for the Cabras Marine tugs and also the barges and fishing boats when not involved in cargo operations or bunkering.

The transshipment cargo actually crosses the wharf twice so the total cargo projections must be increased by approximately 12.5 percent to analyze wharf requirements. The wharf capacities of 1,300,000 to 1,700,000 revenue tons per year have a 12 percent spare capacity over the low and high cargo projections for the year 2000, increased to reflect the effects of the transshipment cargo therefore no further evaluation need be made of wharf capacity and utilization at this time.

10.5 Capacity of Existing Container Yard

It is usually not practical to deliver containers from the vessel to the next move in the intermodal chain, or to recover containers from the street directly to the vessel. The container yard permits the large surge in containers discharged from the vessel and the gradual delivery to the street. On outbound movements the container yard permits the gradual accumulation of containers from the street, the orderly marshalling of the containers prior to arrival of the vessel and rapid loading of the vessel. The marshalling of containers is preferably done adjacent to the berth. The time lag between vessel discharge and container delivery or between container receipt and vessel loading is the container yard storage time.

The number of containers stored in a container yard at any one time is a function of the container yard storage time, vessel inter-arrival

time, number of shipping lines and number of containers discharged and loaded per ship.

The existing container yard was initially planned for straddle carriers to transport containers between the wharf and the yard. Typhoon tiedowns have been installed on a grid suitable for these straddle carriers. This grid provides for 576 TEU's in one layer. The theoretical capacity if the containers were stacked two high is 1152 TEU's however to permit flexibility for working the yard it is reasonable to assume a factor of 1.5 which results in a capacity of 864 TEU's.

The method of operating the container yard was changed in 1973 when the Port acquired two straddle cranes. A third was acquired in 1975. These straddle cranes permit stacking containers four high and five wide. The existing yard with straddle cranes can accommodate approximately 830 TEU's per level, plus approximately 174 TEU's on chassis. To permit flexibility in operation of the stacks it is reasonable to assume an average of two high giving a capacity of 1660 TEU's in the stacks plus 174 on chassis for a total of 1834 TEU's.

For an all-chassis type operation the capacity of the existing container yard is approximately 700 TEU's.

The capacity of the existing container yard can be spoken of as ranging from 700 TEU's for an all chassis operation to 1834 TEU's for a combined chassis and straddle crane operation.

The principal carriers serving Guam are U.S. Lines with approximately weekly service and APL with fortnightly service. These two lines account for almost 85 percent of container traffic. Although the trade is considerably unbalanced in favor of imports, the empty containers from Guam are required to satisfy the demand in the eastward direction from the Far East to the U.S. West Coast. Generally a vessel from these lines will load the same number of containers as it discharges at Guam.

A small percentage of the containers discharged by the U.S. flag carriers contain personally owned vehicles (POV's). These containers are discharged early in the operation, are devanned when discharged and are shipped out on the same vessel.

In addition it is understood that some containers are delivered out of the yard almost when discharged from the vessel, taken to the consignee, unloaded, returned to the container yard and loaded onto the same vessel. Most containers are delivered on a demand basis with most of them returned to the port prior the line's next vessel call.

The most efficient operation occurs when containers are simultaneously being discharged and loaded. The crane lifts a container

off the vessel, places it on a chassis, then picks up an outbound container and places it on the ship. The yard tractors with chassis deliver an outbound container to the crane and then wait to receive an inbound container. This is efficient in terms of equipment time and moves and also in terms of space requirements in the container yard. Approximately half of the containers on a vessel are carried on deck with the balance in the holds below deck. Containers below deck are stowed in cells with steel corner guides. In order to double-cycle, one on and one off, it is necessary to remove all the containers over a hatch, remove the hatch cover, and remove all containers from one cell. It is then possible to double-cycle for the balance of the containers below deck until the last cell. After the hatch cover is replaced the containers on deck are again handled one per crane cycle.

The vessel operation is pre-planned by the Port and the carriers. At the time of this study, U.S. Lines regularly double-cycled but APL did not. It is expected that APL will start double-cycling. U.S. Lines had an inventory of approximately 384 40 foot chassis and 129 20 foot chassis. Their operation was entirely on-chassis. APL had a combination chassis and grounded operation. Their chassis inventory was 110 40 foot and 51 20 foot. Considering that APL was handling roughly half the cargo volume that U.S. Lines was, they had a high chassis inventory. APL has recently converted three of their terminals from grounded to chassis operation. Guam is the only APL terminal which is not all-chassis. The indication is that their Guam operation will also be converted to an all-chassis operation in order to be better able to meet the competitive advantage which U.S. Lines possesses with their frequent service and all-chassis operation. Most consignees want the cargo delivered within a few days of vessel discharge so, in effect, APL needs almost the same number of chassis as containers. Under these circumstances they need a full chassis operation. It is expected that if the physical facilities were provided to permit APL to adopt an all-chassis operation that they would do so.

The Japanese shipping lines do not have the same competition as the U.S. carriers, therefore, it is expected they will continue their grounded operation.

Approximately 40 containers must be removed from a vessel before double-cycling can commence. With an all-chassis operation 40 empty chassis must be available to receive these containers before additional chassis can be made available by loading containers onto the vessel. Both APL and U.S. Lines load approximately the same number of containers that are discharged from a vessel. The container yard must be able to accommodate the containers discharged plus the empty chassis needed to start working the next vessel.

U.S. Lines have 50 scheduled calls per year, APL 26, for a total of 76 calls. Their share of the market is roughly in proportion to their scheduled calls. Generally APL holds strictly to schedule, arriving every other Tuesday. The U.S. Lines vessel generally arrives on Wednesday but sometimes on Thursday and occasionally on Friday. The two lines have had vessels in port simultaneously about 15 percent of the time. One of the occurrences of simultaneous arrival was on May 1, 1980. The study team was very favorably impressed by the simultaneous working of the American Lancer and the President Van Buren. One criticism which was heard was that Port personnel were so busy working the ships that very few containers were delivered from the yard on that day. This is very understandable when a port normally handles one large container vessel at a time and suddenly two must be handled. Despite this criticism the most important thing is to turn the vessels around expeditiously and this was done.

10.6 Required Container Yard Capacity

The traffic forecast in Section 9.0 utilized the three year period 1977-1979 as the base year for general cargo imports and exports and the period March 1979-February 1980 as the base year for transshipments. In converting the traffic forecast in revenue tons to a container forecast the base year for traffic has been taken as applicable to calendar year 1980. The basis for container forecast is the situation since August 1979 when APL replaced Matson. The following are the other assumptions and conditions for the container forecast.

- Foreign flag carriers account for 11 percent of base year traffic with 38 calls in Base year increasing to 18 percent in 2000;

- Foreign flag container operations are grounded;

- U.S. flag container operation with Honolulu and mainland is all-chassis;

- U.S. flag carrier's cargo is proportional to scheduled sailings of each;

- Average cargo on U.S. vessels is proportional to actual sailings of each, use 26 for APL and 45 for U.S. Lines for base year;

- Peaking factor of 1.2 is applied to average cargo load to account for seasonal variations in shipment;

- Distribution of container deliveries and receipts, five day work week;

Day	1	2	3	4	5	6	7
Deliveries - %	10	30	35	20	5		
Receipts - %	5	10	20	30	20	10	5

- Deliveries out of yard during simultaneous discharge of two vessels at 50 percent of normal rate.

Requirements were determined for the base year with requirements for future years being proportional to traffic. In reality, the frequency of vessel calls would increase with a substantial increase in traffic thus reducing the required container capacity of the container yard as a function of traffic. For the purposes of this study it is considered satisfactory to maintain capacity as a constant proportion of traffic as this is well within the accuracy of the traffic forecast. Table 10.2 shows the required container yard capacity in terms of TEU's.

The existing container yard can only accommodate approximately 700 containers on-chassis, therefore, for an all chassis operation by both U.S. carriers it is necessary to expand the container yard. With the currently proposed expansion of the container yard into the 11 acres leased from the Navy, the Port could accommodate the forecasted all-chassis and grounded container traffic for the next ten to twenty years. The economic justification for the container yard expansion is analyzed in Section 11.0.

TABLE 10.2

REQUIRED CONTAINER YARD CAPACITY - TEU

Chassis Operation Year	Low	Medium	High
Base	981	981	981
1985	1087	1137	1187
1990	1174	1269	1366
2000	1353	1541	1730
Grounded Operation			
Base	266	266	266
1985	340	356	372
1990	435	471	508
2000	625	714	803
Total Required Container Yard Capacity			
Base	1247	1247	1247
1985	1427	1493	1559
1990	1609	1740	1874
1995	1795	2001	2206
2000	1978	2255	2533

11.0 ECONOMIC IMPACT AND JUSTIFICATION FOR EXPANSION

11.0 ECONOMIC IMPACT AND JUSTIFICATION FOR EXPANSION

11.1 Economic Impact of Port Activities

In order to develop a full assessment of the economic impact of port activities, including both the Commercial Port and the Industrial Park, on the economy of Guam, it would be necessary first to develop comprehensive data on direct impact measured in terms of revenue, employment and payrolls. The information would then be used, in conjunction with an input-output matrix of the inter-relationships of the various sectors of the economy of Guam, to develop the value-added indirect and induced levels of impact. The sum of all three levels of impact - direct, indirect and induced - would represent the total economic impact on the economy of Guam.

In the present context, direct economic impact is defined as the gross revenue or income accruing to employees and proprietors derived from the servicing of non-military vessels and expediting the movement of cargo through Apra Harbor. Indirect economic impact represents the "value added" by those who create the demands for port facilities and port services. They may be either manufacturers and processors of raw materials or semi-finished goods, or non-manufacturers, primarily wholesalers and distributors of goods and merchandise.

The "value added" is the difference between the sales value of the goods and services and the acquisition cost of their input materials. It represents the wages, interest, rent and profits added at each stage of the production and distribution process. Though defined here in relation to indirect economic impact, the value added concept is equally applicable to direct economic impact, and is the basis for calculating induced impact.

Induced income consists of the secondary, tertiary and subsequent rounds of consumption expenditures resulting from the value added income generated at the direct and indirect levels of impact.

Within the constraints of the time frame of the present study and of the limited availability of comprehensive data at all three levels of impact, it was not possible to develop a full assessment of the economic impact of port activities. It was, however, possible to develop a limited assessment of employment related to some aspects of port activity and services.

By means of a telephone survey of private companies and public agencies known to be engaged in the servicing of commercial vessels and expediting the movement of cargo into and out of the Commercial Port and the Industrial Park, and in some processing of raw materials and semi-finished imports, the following employment information was developed. For reasons of confidentiality, these data are presented cumulatively for various types of activities in Table 11.1.

TABLE 11.1

PORT-RELATED EMPLOYMENT

Type of Activity	Number of Firms	Employment
1. Port of Authority of Guam		288 regulars 66 casuals 364
2. Tugboats & Pilots	2	40
3. Shipping Agents & Companies	6	97
4. Trucking, Warehousing & Distribution	7	200
5. Ship Construction & Repair (included in 2 above)		
6. Container stuffing & Stripping, (included in 4 above)		
7. Importers, Processors & Distributors of Petroleum, Cement & Animal Feed	4	280
8. Ship Chandlery Services	4	12
9. Federal & Territorial Government		66 1,059

It will be noted that the listing does not include many types of activity that are related to either servicing of the vessels or expediting the movement of cargo at the direct impact level, or in the processing of imports. The data exclude exporters and importers, freight forwarders and customs brokers, foreign banking, marine and cargo insurance, crew expenditures, vehicle handling and services, various professional services, and other processors of imports, for example, of dairy and other food products, bottling plants, and printing establishments.

On the basis of Table 11.1, a total of 1,059 employees were employed in port-related activity. This was equivalent to 3.3 percent of total civilian employment in September 1979. The three largest types of activity employers are the Port Authority with 364 employees; importers, processors and distributors of petroleum and products, cement and animal feed, 280 employees; and trucking, warehousing and distribution, 200 employees. Shipping agents and companies had 97 employees. Sixty persons were employed by Federal and Territorial Governments, 40 by tugboat, pilot and ship construction and repair companies; and 12 by ship chandlers.

It must be stressed that the above information on employment is a minimum first order of magnitude approximation of the impact of shipping and cargo movement activities on the economy of Guam. It is incomplete even for the direct level of employment impact and is totally lacking in

terms of gross revenue for all levels of impact. Similarly, indirect employment data are incomplete and are not available at all for the induced level of impact.

In the broadest sense, it may be said that because Guam is so heavily dependent on foreign trade for its economic welfare, it is equally dependent on port-related activity. This is tantamount to saying that Guam cannot live or have a viable economy without Apra Harbor and its non-military cargo-handling facilities. Nevertheless, it is rather suggested that more limited parameters should be established for a comprehensive study of port impact.

The development of an input-output matrix is extremely complex and time consuming. It requires a massive amount of basic source material on inter-industry relationships and on the multiplier effects at each level of impact. Such information is not at present available on Guam.

It is therefore recommended that consideration be given to development of a less complex methodology for evaluating the economic impact of port activities in Guam, perhaps similar to that used by Dr. Don C. Warner in his 1978 study of the tourist industry.

11.2 Justification for Expansion of the Port of Guam

Existing wharf capacity is adequate for traffic with a reasonably good certainty of developing over the next twenty years. Wharf capacity is also adequate to handle the anticipated traffic in transshipment of frozen tuna fish over the next twenty years. If the long considered traffic in transshipment of fresh tuna develops this can be handled initially at Berth F-3. If magnitude of this traffic warrants, a new area can be developed on Drydock Point for exclusive use by the fishing fleet.

The container yard is currently inadequate to accommodate the existing traffic, especially with the all-chassis method of operation desired by U.S. Lines which is also the method of operation chosen by APL for all of its terminals except Guam. As stated previously it is indicated that APL will go to an all-chassis operation on Guam if the container yard is expanded. The following section identifies and estimates the benefits which would result from an expansion of the container yard.

11.3 Benefits Resulting from Expansion of Container Yard

The economic impact of port activities referred to above are difficult to identify and quantify. In other studies it has been indicated that the impact of a port is on the order of four to seven times the direct earnings at the port. This reflects the "ripple" effect of the direct activities at the port. The benefits identified for the

economic justification resulting from expansion of the container yard are direct benefits which would accrue from a change in method of operation by APL and the direct access between wharf and container yard for U.S. Lines. As previously stated, it is indicated that APL will adopt an all-chassis operation if the container yard could accommodate this manner of operation. The cost of the additional chassis is not reflected in the benefit-cost analysis since this cost has been justified on competitive grounds.

The following are the direct benefits identified for the container yard expansion and the basis of quantification:

A. Value of Goods in Transit

APL with fortnightly sailings have tried to spread their operations out over a longer period of time to take advantage of their vessel scheduling. Their customers are applying some pressure to obtain earlier delivery of consignments. In order to accommodate this pressure APL must increase its chassis inventory and arrange earlier delivery of containers after discharge from the vessel. With the expanded container yard and conversion to an all-chassis operation it is estimated that an average of four days could be saved on APL cargo in-transit. It is conservatively estimated that this cargo has an average CIF value of $250 per revenue ton. The benefits from the reduction of in-transit time have been calculated only for the estimated APL cargo, using an annual interest rate of 12 percent.

B. Dray Drivers

Currently three dray drivers are used to shuttle U.S. Lines' containers and chassis between the Port's container yard and the leased "Boonie" yard on the north side of Route 11. If U.S. Lines were able to utilize a container yard adjacent to the wharf for their all-chassis operation then the drivers serving the gantry cranes would move the chassis between the parking place in the container yard and the gantry crane. The magnitude of this benefit for the Base Year was calculated on the basis of three drivers for 14-hours per ship plus two days at 8-hours per day for two days for mobilizing outbound containers prior to ship arrival, at $13.50 per man-hour for 50 sailings per year. For subsequent years these benefits were assumed proportional to estimated cargo traffic.

C. Tractors

The savings in tractor time is estimated only for the three tractors used in the U.S. Lines' draying operation. The savings in the Base year were determined on the basis of

$35,000 original purchase cost at 12 percent interest, 10-year life, $800 fuel cost per year, maintenance at $1,200 per year including parts and labor and 1,200 hours operation in base year. As with the Dray Drivers, benefits for future years were assumed proportional to traffic.

D. Straddle Cranes

Conversion to a grounded operation by APL could permit the release of two straddle cranes. The benefit resulting from this is determined as the avoidance of the cost of future operation with the straddle cranes. No re-sale value has been included as a potential benefit although the cranes do have a potential re-sale value. The magnitude of this benefit was determined on the basis of original purchase cost of $380,000, 12 percent interest, 10-year life, $4,000 fuel cost per year, operator for 2,090-hours per year at $14.70 per hour, maintenance of 235 man hours per year at $15.20 per man-hour and parts and materials at same cost as maintenance labor. These are the estimated savings for one crane. The total benefits were determined on the basis of two straddle cranes. Benefits for future years were assumed proportional to estimated domestic and transshipment container traffic.

E. Improvement in Container Yard Efficiency

There is considerable congestion in the present container yard especially during the 15 percent of the time when the two U.S. flag carriers are in port simultaneously. It is conservatively estimated that the expansion of the container yard and a conversion to an all-chassis operation by APL would result in at least 10 percent improvement in the operation of the container yard. This benefit will accrue to both domestic and foreign cargo. This benefit has been calculated only in terms of savings in labor costs at straight time rates. For the Base year these benefits were taken as 10 percent of the labor cost from the Port's Container Section, Transportation Section and one-half the Crane Operation Section at an hourly rate of $13.50 The benefits for future years were assumed proportional to traffic. It is considered that this benefit is under-stated. The 10 percent improvement in efficiency is considered to be very conservative, no overtime costs are included and more importantly no equipment costs are included.

F. Reduction in Vessel Port Time

With an orderly arrangement of containers parked adjacent to the wharf it is expected that a reduction in ship turnaround time of at least 10 percent would be realized. As with

improvements in port efficiency it is considered that this benefit is understated. It is only taken on the U.S. flag carriers, although all vessels will benefit from the improvement and it is considered to be a very modest degree of improvement. The savings are based on current practices and current costs of operating and maintaining 1200 TEU U.S. flag container ships, approximately $39,000 per day.

Table 11-2 shows the benefits calculated for the base year and at five-year increments through the year 2000. The construction costs are shown as being incurred in 1981. The benefits would then start accruing in 1982.

All of the benefits assuming a savings in labor costs presume that there is alternative employment within the Port or within the civil service system on Guam at the same rates of pay otherwise the benefits would have to be reduced by the difference between the rates of pay used in the analysis and the next highest rate of pay available for alternative employment.

11.4 Costs for Expansion of Container Yard

The costs to be included in the benefit-cost analysis of the container yard expansion are the cost of the relocation of Route 11 and the construction and annual maintenance of the addition to the container yard. The estimated construction cost is $4,500,000. This is assumed to be spent in 1981 with 1982 being the first year in which benefits accrue. In reality, the maintenance will be low in the early years and will gradually increase with time but they have been assumed uniform at 1 1/2 percent of the construction costs per year. This is an overstatement of costs. The substantial reduction in pavement maintenance costs through limiting the operation of straddle cranes to the western portion of the existing container yard has not been quantified. This results in an understatement of benefits.

11.5 Internal Rate of Return

Table 11.3 shows the estimated revenue tons, benefits and construction and maintenance costs for the expanded container yard and relocated Route 11. The internal rate of return (IRR) for each of the three cargo forecasts is shown at the bottom of this table. The internal rate of return is the interest rate at which a stream of future benefits is equal to a stream of future costs. Considering that even the low cargo projection results in an IRR of 13.6 percent, with conservative estimates of benefits, the expansion of the container yard is an economically justified investment.

TABLE 11.2

BENEFITS IN THOUSAND 1980 DOLLARS
FOR MEDIUM TRAFFIC PROTECTION

Year	Domestic Inbound Rev. Tons x1000 (1)	Value of Goods in-transit (2)	Dray Drivers (3)	Tractors (4)	Straddle Cranes (5)	Improvement in Container yard Efficiency (6)	Reduction in Vessel Port time (7)	Total Benefits
Base	516	60	61	31	216	146	234	748
1981(8)								767
1982(8)								785
1983								803
1984								822
1985	580	67	69	35	243	164	263	841
1986								859
1987								875
1988								893
1989								910
1990	640	74	75	38	268	181	290	926
1991								944
1992								960
1993								978
1994								994
1995	698	81	82	42	293	198	317	1013
1996								1032
1997								1049
1998								1068
1999								1086
2000	761	88	90	46	319	216	345	1104

(1) For medium cargo projection. Includes domestic inbound and transshipments.

(2) Applied only for APL cargo assuming average of 4 days reduction in cargo transit time at 12% interest rate on 35% of cargo at $250 cargo value per revenue ton.

(3) Applied for US Lines cargo. Current practice is to use three dray drivers to shuttle between Port's container yard and US Lines' leased "Boonie" yard. Three drivers @ $13.50-hr. for 14 hrs while ship is working plus two 8 hr. shifts for mobilizing outbound containers, 50 ships per yr. in base year.

(4) Tractors used in the U.S. Lines draying operation. $35.000 new cost, 10 yr. life, 12% interest, $800 fuel per yr., maintenance @ $1200 per yr. labor and parts, 1,200 hrs/yr. operation in base year.

(5) Two straddle cranes made rebundant by APL shift to all-chassis operation, @ $380,000 new cost, 10yr. life, 12% interest, $4,000 fuel/yr., operator 2,090 hrs./yr., @ $14.70, maintenance 235 man hrs./yr. at 15.20 parts at same cost as maintenance labor.

(6) Assume 10% improvement in efficiency of container yard. This will accrue to foreign as well as domestic cargo. This benefit calculated only on labor of Container Section, Transportation Section and one-half of Crane Operation Section. The man-hrs. for these three sections in 1979 were 27,000, 56,000 and 25,000 respectively. Hourly rate of 13.50 per hr. for 10% x (27,000 + 56,000 + 1/2 x 25,000). All hourly wage rates include benefits and unassigned time costs.

(7) Assume 10% improvement in vessel turnaround time for US flag container vessels for 76 vessels per yr. (base year) at $1,619 per hr.

(8) Construction in 1981, first year of benefits 1982.

TABLE 11.3

ESTIMATED BENEFITS AND COSTS
REVENUE TONS, BENEFITS AND COSTS IN THOUSANDS

	Benefits						Costs
Year	Rev. Tons	Low Benefits	Rev. Tons	Medium Benefits	Rev. Tons	High Benefits	Capital & Maintenance Costs (1)
Base	516		516		516		
1981							4,500
1982		769		785		800	67.5
1983		781		803		826	67.5
1984		791		822		852	67.5
1985	554	803	580	841	606	878	67.5
1986		814		859		902	67.5
1987		824		875		927	67.5
1988		836		893		951	67.5
1989		846		910		976	67.5
1990	592	858	640	926	690	1000	67.5
1991		867		944		1022	67.5
1992		876		960		1046	67.5
1993		887		978		1069	67.5
1994		896		994		1093	67.5
1995	625	905	698	1013	770	1116	67.5
1996		918		1032		1141	67.5
1997		929		1049		1166	67.5
1998		942		1068		1189	67.5
1999		953		1086		1214	67.5
2000	666	965	761	1104	855	1239	67.5
Internal Rate of Return		13.6%		14.6%		15.5%	

(1) Annual maintenance costs of yard and relocated road @ 1-1/2% construction costs.

11.6 Benefit Cost Ratio

The internal rate of return analysis does not require prior determination of a discount rate and therefore is considered more applicable for evaluation of projects, however a preliminary study by the Corps of Engineers on feasibility of providing navigational improvements at the Port utilized an interest rate of 6-5/8 percent for a 50-year period of analysis. Applying the 50-years, 6-5/8 percent interest as the terms for repayment of the construction costs and discounting the 19 years of benefits shown on Table 11-3 for the medium projection of cargo back to 1981 yields a benefit cost ratio of 2.3. This is a high benefit cost ratio considering that benefits were only taken over 19 years and no salvage value was assigned to the expanded yard. This analysis is largely for comparison purposes.

11.7 Modifications at Berth F-4

As stated previously 85 percent of current cargo at the Port is containerized. This percentage is expected to increase slightly with time. Of the breakbulk cargo a substantial percentage are vehicles. This leaves only a small percentage of break-bulk cargo.

The transit sheds adjacent to Berths F-3 and F-4 were constructed when the cargo was primarily breakbulk. Transit Shed 1, adjacent to Berth F-3, is presently used as a garage for some of the Port's equipment. Suzue Guam are currently (December 1980) negotiating to lease this shed for use as a container freight station (CFS) and possibly for cold storage. Transit Shed 2, adjacent to Berth F-4 is still largely designated for transit breakbulk cargo. A duty free shop occupies 10,044 square feet of this 43,000 square feet shed.

This shop was constructed to serve tourists on passenger ships which tie-up at Berth F-4. It is on a percentage lease arrangement. Two years income to the Port from this lease averages out at approximately $0.25 per square foot[1/] however the Port provides free utilities to this shop. It is estimated that the cost of the utilities exceeds the rental income.

The expansion of the container yard is estimated to cost $4,500,000 or $409,091 per acre. The floor area of Transit Shed 2 is 43,000 square feet. If this shed were demolished the contribution to the Port would be on the order of 62,000 square feet considering the limitations on vehicular traffic close to the perimeter of the shed. Conservatively, this area, adjacent to Berth F-4 is worth approximately 35 percent more than equivalent area at the rear of the container yard. This then makes the area of the shed equal to 1.35 x 62,000 = 83,700 square feet (1.9 acres) or $786,000 worth of container yard.

Demolition of the shed is estimated to cost $150,000. The cost of providing comparable accommodations for the Duty Free Shop is estimated at $100,000.

The benefit-cost ratio on a current basis is 3.1. If the benefits for increased efficiency of Berth F-4 were added, the benefit-cost ratio would be substantially higher.

Furthermore the Port is primarily a general cargo port and a shop such as the one in Transit Shed 2 should not be permitted in such a prime cargo handling area of the Port. It is recommended that the shop be relocated and the shed demolished.

1/ Charles D. Griffin and Philip W. Won, Real Estate Appraisal of Port July 1980.

12.0 FINANCIAL FEASIBILITY

12.0 FINANCIAL FEASIBILITY

The financial viability or commercial profitability of a project is the expected net profit after all pertinent costs are deducted. However, in evaluating this particular investment, care must be exercised so as not to place too great an emphasis on financial viability. The return on investment is set through administrative prices (port tariffs), and while the proposed improvement and future operation can be shown to be financially viable and attractive, that is sufficient revenues will be produced to cover annual operating costs and repay loans, such profitability is not necessarily indicative of economic feasibility or true benefits to the local economy from the investment.

Port tariffs have recently been increased for the first time in three years. This was essential in order to cover increased cost of labor, fuel, utility and of loans tied to the prime rate. The financial viability will be analyzed by evaluating the financial costs of the container yard expansion in terms of annual costs and determining the tariff increase required to cover these costs. The potential reduction in labor and equipment operating and maintenance costs are evaluated and compared with the financial costs resulting from the project. This financial analysis is largely based on financial data assembled for the Terminal Tariff Study by Peat, Marwick, Mitchell & Co., and the cost estimates prepared under the contract for detailed design of the container yard expansion.

12.1 Land Acquisition

The federal Government will transfer to the Government of Guam the land necessary for the container yard expansion. This is a part of a 927 acre transfer of surplus land at no cost to the Government of Guam. One of the provisions of the transfer is that if the land is leased or sold to private interests, this must be done at current market rates. The value of the land portion of the transaction, not including improvements or development, must be paid to the Federal Government.

U.S. Lines leases six acres of land in the old quarry on Cabras Island, across Route 11 from the Port. The rate for this unimproved land is $48,000 per year, or $8,000 per acre per year, $0.18 per square foot per year.

Griffin[1/] reports current rentals for buildings comparable to the Port's transit sheds at $2.75 to $3.60 per square foot per year at Harmon Field Industrial Park. Relative to these rates for buildings the $0.18 rate looks reasonable for unimproved land. For the area on which the expanded container yard will be constructed, the lease rate for the unimproved land would be $88,000 per year. The market value of the 11 acres determined from this lease rate is approximately $1,100,000.

1/ Charles D. Griff and Philip W. Won, Port of Guam Real Estate Appraisal, July 1980.

12.2 Construction Costs

The construction costs consist of the relocation of Route 11, protection of a portion of this road by a seawall, construction of the container yard with associated utilities, fencing and structures and demolition of Transit Shed 2. The total estimated cost is $4,500,000.

12.2.1 Route 11 Relocation

It is inconceivable to consider an expanded container yard with a public highway running right through the middle of the yard. The road must be relocated. Existing ground elevation along the north of Cabras Island is approximately seven feet above mean lower low water. In order to minimize problems of vertical alignment of the road and minimize the risk of inundation during high tides created by typhoons, the road must be elevated to approximately eleven feet above datum. The estimated cost of the road relocation is $1,270,000.

The seawall required to reduce overtopping of the road by waves during storms is estimated to cost $720,000. It is assumed that the maintenance cost of the relocated road will be the same as the maintenance cost on the existing road.

12.2.2 Container Yard Expansion

The estimated cost of the container yard paving, fencing, utilities, lighting and security and dispatch building is $2,510,000.

The estimated maintenance cost of the container yard is $38,000 per year. This is assumed as a uniform annual cost although in reality it will initially be lower and then increase gradually with time.

12.2.3 Demolition of Transit Shed 2

The estimated cost of relocating the Duty Free Shop and demolition of Transit Shed 2 is $250,000.

12.3 Source of Funding

The Economic Development Administration (EDA) has been approached for assistance in funding part of the Port improvements under Title I, Public Works Program. It is also possible to obtain funds from the Department of Interior. This latter source requires approval of the Federal Congress for the appropriation. Both of the federal sources would provide grants.

Loans from local banks or sale of revenue bonds are other possibilities. The loans might be guaranteed by the two U.S. flag carriers in a similar fashion to the loan for the gantry crane

guaranteed by U.S. Lines. It is expected that the revenue bonds would qualify for tax free status.

The estimated cost of the container yard expansion is $4,500,000. EDA Title I money requires matching funds from local sources. The value of the land dedicated to the expansion of the container yard is $1,100,000. An additional $400,000, representing value of land in the existing container yard which will be improved, yields a total a $1,500,000 from local sources. This could be used to offset an equal sum of EDA grant money. The balance of $3,000,000 could be obtained half through EDA grant and half through local financing. The Port Authority expressed the opinion that the terms for this local funding might approximate ten percent for 25 years. The annual cost of the $1,500,000 local funding would be $165,255.

12.4 Annual Financial Costs

The total annual financial costs for the expanded container yard are:

Local funding $1,500,000 at 10% for 25 years	$165,255
Maintenance	38,000
Total	$203,255

12.5 Effect on Tariffs

The Port improvements can be completed in 1981. The traffic estimated for 1982 is 46,544 containers. This is the total for inbound and outbound containers, not double counting the transshipment containers. The recommended single movement container throughput rate in the Peat, Marwick, Mitchell tariff study[1/] is $72 for standard container vessels. In addition there is a $25 charge for receiving or delivering containers at the container yard and a $7 charge for draying. For domestic containers, assuming two-thirds are subject to drayage and one-third to the receiving/delivering charge, the average rate for the container in and out of Guam is $170. Using this rate as a weighted average for the various container trades requires an increase in rate of 5.1 percent to offset the annual costs of the project. This amounts to approximately 2.1 percent of the ocean freight cost or approximately 0.5 percent of the cost of the commodity.

12.6 Offsetting Efficiencies

Section 11.0 presents the economic analysis of the Port

1/ Peat, Marwick, Mitchell & Co., Terminal Tariff Study, December 19, 1980.

improvements project. Table 11.2 summarizes the economic benefits for the container yard expansion and Section 11.7 outlines the benefits for Transit Shed 2 demolition. The savings in straddle crane costs permitted by conversion of the APL operation from a combination chassis-grounded, to an all-chassis operation is almost sufficient to offset the annual capital and maintenance costs. It is expected that these savings can be obtained through job transfers within the Guam civil service system, normal labor attrition and sale of the surplus straddle cranes. By reducing the Port's operating costs the capital and maintenance costs of the project could be covered without an increase in tariff.

13.0 PORT OPERATION ANALYSIS

13.0 PORT OPERATION ANALYSIS

This Section deals with current practices at the port with respect to manning and equipment utilization. It was not possible under the terms of this study to make a detailed evaluation of labor and equipment requirements however it is possible to make some general comments based upon statistical data, interviews and personal observations.

Port management must be complemented on its efforts to rationalize employment at the Port. It is understood that several years back the Port employed over 1,000 workers. This has been reduced to 298 salaried employees with an additional 66 hourly employees, most of whom are casual, hired only as the work demands.

Table 13.1 shows the roster at the Port for FY1981. Note that there are 19 positions vacant. This is further evidence of management's desire to have an efficient, properly staffed port.

13.1 Manning

The Terminal Tariff Study by Peat, Marwick, Mitchell & Co. contains data which indicate that only 59 percent of port labor was assigned to billable work only 59 percent of the time. This is a very low percentage. For comparison purposes the Port of New York which has a very high surplus of port labor reports something on the order of 25 percent idle time. At the other end of the scale the Pacific Maritime Association covering U.S. west coast ports has a pay guarantee plan in effect which in 1979 paid out 2.8 percent of gross shoreside payroll under the provisions of the plan.

The port talks in terms of having eight nine-man stevedoring gangs and two casual gangs. The staffing patterns show that the eight full-time gangs consist of one stevedore leader, two winch operators, three salaried stevedores and three casual stevedores. It is hoped that some of the recommendations made by Marine-International Joint Venture in their management study of the Port in the fall of 1978 will be implemented. One of their specific recommendations about which nothing appears to have been done concerns the layering of supervisory personnel. There are eight stevedoring supervisors and eight stevedoring leaders for will be forty salaried winch operators and stevedores. The supervisor, leader and winch operator designations are not a problem provided they can be called-out and be productive in handling cargo. Call-outs should be for individuals required for specific tasks not as gangs. Five stevedores should be adequate to work with one container gantry crane.

TABLE 13.1

PORT AUTHORITY OF GUAM
STAFFING PATTERN
FY 1981

Classification	Position	Employed Annual	Employed Hourly	Vacancies
Management	13	9	1	3
Administration & Finance Personnel, Accounting, Procurement & Claims	33	33	-	-
Harbor Master Safety & Security	30	28	-	2
Operations				
Management & Coordination	3	2	1	-
Tariffs & Documentation	13	12	1	-
Maintenance				
Supervisory	5	5	-	-
Control	6	4	-	2
Automotive	10	10	-	-
Diesel	5	5	-	-
Cranes	11	11	-	-
Welding	3	3	-	-
Automotive Bodies, & Coatings	9	7	1	1
Facilities, Buildings & Grounds, Janitorial	16	16	-	-
Transportation				
Supervision & Dispatching	3	2	-	1
Tractor Trailers	41	29	11*	1
Cranes	23	22	-	1
Terminal				
Supervisor & Dispatching	2	2	-	-
Cargo Checkers - Autos	9	8	-	1
Cargo Checkers - Containers	14	13	-	1
Cargo Checkers - Breakbulk	19	13	-	6
Cargo Handling - Stevedoring				
Supervisory	8	8	-	-
Stevedore Leaders	9	8	1*	-
Winch Operator	16	16	-	-
Stevedore	73	24	49*	-
Rigging				
Leader	1	1	-	-
Rigger	4	4	-	-
Stevedore	4	3	1*	-
Total	383	298	66	19

* Most of the hourly employees are casual, hired as needed for work in the Port.

It is understood that the one rigger leader, four riggers and three stevedores assigned to the rigging loft only make and maintain the slings and rigging gear. For the amount of rigging work at the Port it is considered adequate to have one rigger full-time at the rigging shop, assisted as required, by stevedores not assigned to cargo handling work.

There is no apparent justification for nineteen positions shown for breakbulk checkers. It is recognized that six of these positions are vacant but even thirteen appears to be high for the amount of breakbulk cargo handled at the Port. It would be desirable to eliminate the qualification of auto, containers or breakbulk from the checker classification so that the checkers could be easily assigned to different types of ships in Port. This would permit a substantial reduction in the total number of checkers.

There are two container gantry cranes, two straddle cranes and two truck cranes, a total of six cranes and twenty two crane operators. For the nature of the traffic, when container ships are completed in twelve to fourteen hours, this number of operators appears excessive.

Marine-International discuss late billing by the Port to the ships agents. This was still a complaint made by the agents during discussions at the Port in 1980. It is understood that the Port is modifying its procedures so as to permit more rapid billing to the agents.

13.2 Equipment

Another Marine-International recommendation which has not been implemented concerns the forklifts. The junk and the surplus forklifts in poor condition should have been disposed of. The three westerly bays of Shed 1 are still filled with parts from cannibalized forklifts. It is understood that a survey board has been established to review disposal of surplus equipment. A more detailed record-keeping system has been talked about for the equipment so that proper controls over use, maintenance and disposition of uneconomic equipment can be implemented. So far this has not been done. It is understood that proper record-keeping of maintenance costs has been started but the only data this study team was given are records of manhours and costs of fuel charged against the individual items of equipment.

In evaluating the justification for replacement of existing equipment it was assumed that the maintenance and repair (M & R) costs were equal to the product of the average of the tabulated manhours for M & R and the hourly rate determined by the Peat, Marwick, Mitchell & Co. Tariff study applicable for FY1981. This product was then doubled to reflect parts, materials and equipment utilized in the maintenance and repairs.

For the straddle cranes the maintenance and repair costs on the above basis amount to $20,214 per crane per year. This is 6 percent of the cost of the straddle crane procured in 1973. This is a reasonable annual M & R cost for a diesel powered crane. For analysis purposes this has approximately the same as would be assumed as annual M & R for a new Hystainer. For comparison purposes the existing seven year old Hystainer has had an average of 692 manhours of M & R charges. At $16.70 per manhour this represents $11,556 of labor charges or an estimated $23,113 of parts and labor.

A new Hystainer would have an annual capital cost of approximately $85,000 per year based on a 10 years 15% chattel mortgage. The straddle cranes will be completely paid for in three years time. The annual payments on the current mortagage are approximately $47,000 per crane. The port's manager of operations considers a Hystainer to have the same productivity as a straddle crane. Discounting the fact that a straddle crane permits a much higher storage density of containers than a Hystainer the current level of M & R cost on the straddle cranes does not justify replacement by a new Hystainer with comparable productivity.

With expansion of the container yard it is recommended that one straddle crane and the one Hystainer be retained for handling loaded and empty 40-foot containers in the portion of the yard where the grounded operation will continue. The 20-ton forklifts can be used to assist the other equipment in handling most loaded and all empty 20-foot containers. The practice of using forklifts for handling containers not fitted with fork pockets should be terminated.

There has been some talk about replacing container gantry No.1 because of its age. Provided that container gantries are maintained at the standards utilized by the crane maintenance contractor employed under the APL lease agreement, these container gantries should have a life of 20 to 25 years. Overhaul and possibly replacement of the diesel engines will be required during that time but the economic life of these cranes should be substantially more than ten years.

The port had two large truck cranes on lease. One, a 300 ton capacity P & H crane is being rehabilitated prior to return to lessor. The other, a 140 ton crane, was available at the port when gantry crane No. 1 was damaged in September however, if the two gantries were to be maintained properly and different procedures were utilized to repair damage following an accident then the port could also dispense with this crane.

A recommendation is made in Section 8 concerning purchase of a hydraulic knuckle - boom crane for aiding in transshipment of frozen tuna. There has been talk of purchasing a hydraulic crane with a telescopic boom for this purpose. Normal cranes with telescopic booms are not intended for cyclic operation of the telescopic feature of the boom. Such a crane could be utilized to replace the truck crane presently employed in this service but would not have the luffing speed considered desirable for discharging fishing vessels or carriers.

14.0 LAND-USE PLAN

14.0 LAND-USE PLAN

The preparation of this recommended land-use plan was greatly simplified by the Economic and Land-Use Plan for Cabras Island and Surrounding Area, July 1979, prepared jointly by the Port Authority of Guam and the Cabras Island Task Force, a committee organized at the direction of Governor Paul M. Calvo. The committee members consisted of the following public and private agencies: Bureau of Planning, Department of Commerce, Guam Economic Development Authority, The Guam Growth Council, and members of The Port Authority of Guam Advisory Council.

The initial plan for the Commercial Port was prepared in 1964 by the Tudor Engineering Company. It was a very commendable study and plan. This was followed by a plan prepared by Greenleaf/Telesca-Ahn in 1972 which was basically an extension of the Tudor Plan. Overseas Bechtel prepared a very ambitious plan in October 1977 which lacked economic and financial analyses and had potential adverse environmental impact upon Piti Channel and Sasa Bay areas. It is emphasized that the Port Authorities Plan is compatible with the Government of Guam's land-use standards from the Land-Use Plan, Guam prepared by the Bureau of Planning in that the ecological concerns of this plan were adhered to.

14.1 Assumptions Made for Land-Use Plan

The assumptions made by the Port Authority to simplify the planning process are adopted with only minor modifications in the development of this recommended plan. The modifications are bracketed.

1. Port facilities must be developed sufficiently to accommodate current traffic and the expected increases in future years.

2. The Port Authority will coordinate the planning and prioritization of water-oriented activities to be located around Apra Harbor in order to minimize any adverse impact upon port operations.

3. The multiple use of Apra Harbor for shipping, industry, recreation, conservation [and defense] is beneficial for all concerned.

4. Waivers on the explosive safety quantity distance (ESQD) zone requirements are required from the Navy for any action on Navy lands falling within 7,210-foot from Hotel Wharf. No immediate relocation of the ammunition wharf is expected.

5. [The Navy's Hotel Wharf will be available for use by the Port of Guam for use by passenger ships and fishing vessels on a "not-to-interfere with Navy use" basis.]

14.2 Development Constraints

The Hotel Wharf currently functions under a safety waiver of three million pounds net explosive weight (NEW). Construction of habitable structures and operation not related to ammunition handling on Navy land within 7,210 feet from Hotel Wharf require waivers from the Department of Defense explains Safety Board.

The Commercial Port, the GEDA Industrial Park, and several private companies leasing military land are all within the 7,210-foot ESQD. These entities function under a disclaimer of liability for damages from an explosion.

A report to the Committee on Appropriations, U.S. House of Representatives, on the Guam Explosive Handling Dock by the Committee's Survey and Investigations Staff was highly critical of the Navy's request to build a new ammunition pier at Orote Point. The report, completed in March 1979, reveals the unlikelihood that an alternative to Hotel Wharf will be forthcoming in the near future, due to high costs and unconvincing economic justification. According to the report, the location of the current ammunition wharf near the Commercial Port is not unique to Guam. "Only one of 24 ammunition ports outside the continental United States operates without a waiver and only three of eight ports in the contiguous U.S. can accommodate nine million pounds NEW without waiver."

A consultant's team was making a field survey in November 1980 for an environmental impact assessment of a combined ammunition wharf-combatant wharf near Gab Gab Beach at Adogan Point the south side of Apra Harbor. This would be substantially less costly than the separated combatant wharf and ammunition wharf in the Navy's initial plans. This would have a better chance of being funded.

The Navy has given permission to the Port Authority to use Hotel Wharf for passenger ships when the Commercial Port is fully occupied. It is understood that fishing boats may also use Hotel Wharf when the Commercial Port is full. It is considered much more reasonable to normally berth passenger ships at Hotel Wharf than to mix these ships with cargo and fishing vessels.

The eastern edge of Sasa Bay, south of the causeway to Drydock Point, is fringed with mangrove. This is a natural habitat for certain crustacea therefore it is unlikely that permits could be obtained for filling this area to the elevation necessary for commercial or industrial buildings.

A similar potential environmental constraint exists in Piti Channel. The Guam Coastal Management Program surveyed and found that four mangrove species are represented along the shoreline and on islets in the channel. These four species are considered threatened or endangered on Guam and are primary candidates for inclusion on official listings.

14.3 Port Development Requirements

Immediate and anticipated future port and land-use requirements were evaluated in order to permit establishment of priorities for planning purposes. The future requirements of the Commercial Port and the existing power plants received top priority followed by fisheries related projects and port related industries as permitted by environmental constraints.

There are substantial investments in the tank farms, bulk cement plant, machine shop, chassis and container repair shops, warehouses and cold storage facilities currently situated in the Cabras Island Industrial Park to the west of the Commercial Port. These are all port related industries. With open land available eastward from the existing Commercial Port, it is considered better over-all utilization of resources to plan for expansion of the existing container yard toward the north and ultimately toward the east. The wharf face is shown with a straight line extension 1,400 feet long. This would provide a straight wharf 3,350 feet long. The straight wharf extension is very desirable for flexibility in berthing varied sizes of vessels and for utilization of container gantries.

It is possible to provide for shifting container gantries around corners or bends in wharfs as was done in Port Elizabeth and the Port of Oakland, but it is much less costly in shifting time and construction costs to provide for a long, straight container wharf. A prolongation of the wharf is shown angled. This is shown for future container or coal wharfs. This wharf extension would be better as a straight extension if environmental constraints would permit. This location would be good for a coal wharf only because of its nearness to the power

plants. The most common vessel for transport of coal has a 42 foot draft requiring a minimum channel depth of 45 feet. A coal wharf at the eastern end of the commercial port would thus require extensive dredging.

Two alternatives to the coal wharf located in Piti channel were considered. One, an offshore berth directly north of the power plants, with a high level trestle back to coal storage piles immediately adjacent to the power plants. The other was a reclaimed area between Hotel Wharf and Mobil's Wharf "G". This area is better from a dredging standpoint and distance from installations which could be affected by coal dust transported by the prevailing winds, but it would necessitate a 1.8 mile long conveyer and reclamation for the transit coal storage adjacent to the berth. This reclamation would extend out over the coral reef. Until more detailed evaluations are made of the justification for conversion of the power plants to coal and best location for a coal wharf it is considered that the area shown east of the container wharf extension should be reserved for coal. If the OTEC power plant proves feasible this area could be designated for port related industry or could be used for other dry or liquid cargoes.

Expansion of the Port to serve as a fishing base for frozen and/or fresh tuna fish is very tenuous, but is a real possibility, therefore, land has been allocated for accommodating the requirements of such an industry. If, in several years time, the fishing industry has not developed on Guam to the point where all of the area is required for fishing and there is a need for this land for other purposes, then it should be released.

A prime requirement in the vicinity of the port is land for industrial development. Manufacturing and commercial enterprises are catered for where the nature of the land permits and aquaculture where it is expected that environmental constraints will not permit this use.

GORCO has made plans for accommodating an increase in ship bunkering. These involve transferring some of their product loading operations for fuels loaded into military vessels to the Navy fuel wharves on Drydock Point to free their pier for bunkering.

14.4 Marine Oriented Industrial Park

During the post World War II reconstruction in Europe port reconstruction was coordinated with regional planning and industrial development. This resulted from a joint planning effort of port agencies and private industries, with government cooperation. Several European ports expanded their port area by thousands of acres to provide for energy production, heavy manufacturing and processing industries with their demands for marine transportation of raw materials and finished products, and smaller factories linked either to the large manufacturers or to the maritime transport system.

Since the early 1960's several American port authorities have developed large marine oriented industrial parks. The ports have utilized the planning, administrative and financial abilities of their staffs plus their contacts with representatives of commerce and industry to develop idle land.

The Port of Portland in Oregon developed two large industrial parks. Swan Island on the Willamette River was the site of a shipyard during World War II. It was subsequently developed into a planned industrial district with corporate offices, manufacturing and distribution. There are over 80 firms employing 6,700 workers on the 415 acres developed.

Rivergate at the confluence of the Columbia and Willamette Rivers the Port of Portland acquired a large contiguous estate. With nearly 3,000 acres, Rivergate is the largest marine industrial park in the United States. Approximately half of the site has been prepared. Of this 570 acres have been sold or leased and are occupied by private industry or private marine terminals. Over 2,100 employees work in the 24 private industries in Rivergate. When land is sold by the Port of Portland, the land and structures are put on the City's tax rolls. If land is leased, there is a City tax on the lease. There is no tax on vacant land.

Presidents Island, operated by the Memphis and Shelby County Port Commission was opened in 1951. The 1,000 acre site is now occupied by 186 tenants. The Port Commission leases the property from the local government. The commission pays the equivalent of the land property tax to the City and County for land in use. The industrial occupant pays taxes on buildings and personal property. It is estimated that in addition to the 10,000 employees working on the island there are 9,000 jobs in local port dependent industries. Plans have been made to develop an additional 2,000 acres at Presidents Island.

The Port of Oakland administers both the seaport and the airport. The containerport at Oakland is the nation's second largest and the seventh largest in the world. Several city blocks of waterfront near Jack London Square and hundreds of unimproved acres at the Port of Oakland Distribution Center and Embarcadero Cove have been renovated by the Port of Oakland into a thriving community of shops and restaurants, parks and marinas, offices, light industrial plants and distributing centers. Developing and leasing these properties is one of the Port's prime responsibilities and a vital source of income. In 1980 these commercial and industrial properties generated 13 percent of the Port's total 1980 operating revenues. At the 300 acre Oakland Airport Business Park some 8,000 people are employed by 400 firms. This park was developed by the Port of Oakland with some parcels being sold and others leased to private commercial and industrial tenants. Much of the construction has been financed by tax free revenue sold by the Port.

In contrast to the acquisition and ownership of large tracts of land by a port body, the City of New Orleans has established an industrial tax district encompassing 7,500 acres of which 2,500 acres are occupied. Only a very small percentage of the vacant land will ever be in public ownership. The City, the Port of New Orleans, owners of large tracts of land and private industries have joined together to establish this Almonaster Michoud Industrial District.

Advantages attributed to this industrial tax District include:

- Ability as a separate entity to receive Federal Financial assistance for planning and infrastructure;

- Power of District to grant tax abatement for industries settling in the District;

- Authority to prepare a District development plan which would direct the location of extensive drainage, water, sewer, roads, and power feeders;

- Authority to regulate private land development by establishing the planned location, types and probable development standards for future industries in the District.

The District plan will be the principal instrument to protect unique land to meet the needs of water transport-oriented industries.

These four examples of industrial parks illustrate alternative forms of ownership but they each benefit from an integrated plan coordinated by a Port agency.

14.5 Recommended Land-Use Plan

The recommended land-use plan is shown on Plate 7.

The plan is considered to be long range, possibly extending beyond the Navy's Apra Harbor strategic requirements. It is intended to be flexible as the status of projected port developments is too tentative to allow for specific siting of actual facilities at this time.

The recommended land allocation is as follows, progressing from west to east along the northern perimeter of Apra Harbor, across Cabras Island, then southward along Marine Drive and out onto Drydock Point and Drydock Island.

The two piers and Williams Beach should be reserved for recreation and recreational boating.

Wharf "H", commonly referred to as Hotel Wharf, currently the Navy Ammunition Wharf, should be reserved on a "not-to-interfere with Navy use basis" for use as an auxiliary passenger terminal when Berth F-4, where the existing passenger terminal is located, is required for cargo vessels. If possible this wharf should be considered the regular berth for passenger ships and Berth F-4 as the auxiliary passenger berth when Hotel Wharf is not required for ammunition ships.

The area immediately east of Hotel Wharf should be considered as a tentative site for a bulk coal for supplying fuel to the power plants. This site has immediate access to deep water required for bulk carriers but, as mentioned earlier, would require reclamation of an area out over the coral reef for a coal surge pile.

Wharf "G" (Golf), presently used by Mobil for petroleum products tankers, should remain in that service.

The old seaplane ramp presently owned by the U.S. Coast Guard and not part of the transfer, is used as a launching ramp for recreational boating. It is recommended that the Government of Guam acquire this property and continue its use until alternate facilities in Apra Harbor are available.

The Marianas Yacht Club is presently utilizing the cove and shoreline west of Cabras Island Industrial Park. Until they can relocate to new facilities, it is recommended that continued use of the present site be permitted. After relocation of the Yacht Club, this location could be reserved for future fisheries requirements. This cove has extensive shoreline but it is completely open to waves generated within Apra Harbor and to ocean waves and swells penetrating through the harbor entrance.

A 45 knot wind acting across the 2.4 mile fetch of Apra Harbor for 30 minutes would generate five foot high waves. Several pleasure boats anchored in the cove have suffered severe damage due to beaching during such storms. Even large fishing boats would be unable to remain safely berthed at this site during such conditions unless additional protection were provided by breakwaters.

It is unlikely that these breakwaters could be justified for many years therefore if fisheries facilities were constructed at this location they would only be considered as fair weather berths.

The GORCO oil pier, F-1, should continue in its present use. GORCO are considering expanding their refinery and bunkering operation. This might require an additional berth. Tentative provision could be made

for an additional berth on the opposite side of the point from their existing berth. This is somewhat at conflict with the construction of a breakwater for protection of the cove but both are considered to be very long range possibilities which should be reevaluated when the need for one or the other arises.

The Dillingham Ship Repair facility, F-2, should be permitted to continue in its present use. If Dillingham chooses to locate the site and another leasee cannot be found to continue to operate it as a marine repair facility then it should be annexed to the Port for use by fishing and intra-regional cargo vessels. There is a possibility for use of this berth for receipt of petroleum products and for bunkering. This use should be permitted provided it does not conflict with its use by fishing vessels or intra-regional cargo vessels or adequate compensation is obtained for priority of use.

Berth F-3 should continue as a berth for fish transshipment and breakbulk general cargo traffic. The Coast Guard should be permitted continued occupancy of the west end of this berth until their own facilities are available. Shed 1, adjacent to Berth F-3 is presently under-utilized. It is serving as a garage for fork lift trucks and tractors. If a leasee will take over this shed at market rates, with or without all or a portion of the adjacent wharf, this should be permitted. If the lessee desires to operate this installation as a general cargo terminal then Dillingham should be permitted to resume offering general cargo handling services at Berth F-2.

Berth F-4 should be continued in its current use for container-Ro/Ro- combination and breakbulk general cargo ships and fishing vessels. This should also continue as the principal berth for passenger ships until other arrangements can be made. The majority of the breakbulk general cargo handled at the port is in the form of vehicles which are driven off the ships and do not require protection by transit sheds. Shed 2, adjacent to Berth F-4, should be demolished to permit more effective use of this berth for handling containers and Ro/Ro traffic.

Berths F-5 and F-6 should continue in present service as container wharves and adequate infrastructure constructed for industrial and commercial use. The marginal and submerged lands in this area, exclusive of that designated for other uses, are recommended for development of aquaculture and mariculture. This could ultimately utilize output of high nutrient content water from the OTEC plant and could serve as the basis for a live bait type fishery.

The narrow strip of land leading to Drydock Point, between the pipeline right-of-way adjacent to the roadway and the south side of Piti Channel should be reserved for a utility corridor. This strip of land is too narrow for industrial development and would

require extensive dredging of coral if it were to be developed for marine purposes.

Drydock Point is designated primarily as an area for development of berths along the south side of Piti channel and an adjacent support area for fisheries. Full utilization of this area for receipt and processing of fish and for repair of fishing vessels and gear requires relocation of the road to the south of the point. Details of the development of this area cannot be given as the need is too uncertain at present.

A small yacht repair facility is desirable to support small scale fisheries. The drydock at Dillingham's is too large to be used by one small fishing vessel. A small ship lift could be conveniently installed on Dry Dock Point. An interim solution would be to relocate the disabled straddle crane to Drydock Point. The hoist and traverse features of this crane could be utilized without requiring travel of the crane.

Two Navy fuel docks are located at the northwest corner of Drydock Island. These are presently under-utilized but are essential to the Navy's strategic requirements. GORCO is discussing using one of these docks for shipment of petroleum products on military tankers to relieve pressure on the GORCO pier. These docks are expected to remain under Navy control for the foreseeable future.

The Feed Mill, adjacent to the east end of Berth F-6, interfers with full utilization of this berth by container ships. It should be planned to relocate this feed mill as the need for additional container handling capacity dictates. It is expected that this relocation may be justified when annual container throughput approaches 100,000 TEU.

The area east of the existing Port area should be reserved for one additional container berth and associated back-up area. Further eastward, should tentatively be reserved for coal berth with an adjacent coal surge pile for the power plants.

Northwest of the Cabras Power Plant should be reserved for the OTEC Plant or for a coal storage yard. It is understood that the OTEC plant will require approximately five acres. The site preferred by the consultants currently studying the OTEC plant lies between the seawater canal, the existing high ground and Route II.

The intervening area between the future container yard expansion and the area reserved for OTEC or coal storage should be reserved for port related industries.

The Seaman's Club has a current lease with the Navy for a site approximately 450 yards east of the Feed Mill. This lease is at no-cost through 1991. It is recommended that the club be permitted to continue at its present location until the site is required as back-up for the second easterly wharf extension along Piti Channel. At such time, the club could be relocated to the overlook north of the Port's Administration Building where it would be more conveniently located for seamen from ships at the Port.

The channel between the two power plants should be reserved for a harbor of refuge for recreational boats.

The land south of the fuel tank farm and west of Marine Drive which can be developed for industrial and commercial use should be subdivided.

The Navy used to anchor a floating drydock just south of Drydock Island. The Navy has stated that they intend to retain Drydock Island in order to have access to and to support a floating drydock operation at this site should the need arise. This reservation will be provided until a proposed graving dock is constructed on the south side of Apra Harbor or until the need no longer exists.

Development of the abandoned quarry along the North Shore of Cabras Island for manufacturing and production industries will probably require an increase in ground elevation or construction of a protective seawall. The details of the development are too uncertain at this time to permit a detailed evaluation of requirements.

14.6 Utilities Requirements

The following is an estimate of the utilities requirements for the area included in the above recommended land-use. The estimates are based upon full development of the area.

14.6.1 Water

Domestic water for Guam is mainly from the basal groundwater lens in the central and northern portions of the Island. Approximately 70 wells supply this system. Presently water is supplied to the Port through the Navy's water system connected to its Fena Reservoir.

The Navy wishes to discontinue this and to have the service provided by the Public Utilities Agency of Guam.

The Water Facilities Master Plan prepared by consultants to the Guam Environmental Protection Agency (GEPA) and the Public Utilities Agency of Guam (PUAG) consider the needs of Apra Harbor to be in harmony with recommendations established in the Economic and Land-Use Plan for Cabras Island and Surrounding Area.

PUAG proposes to extend the 16-inch waterline from Adelupe to Asan where it will convert to the 12-inch line connecting Asan and Piti to accommodate the Navy's desires and provide for expanded requirements. The Government of Guam also plans to construct reservoir tanks in Piti to provide sufficient water for Apra Harbor during peak hours. It is anticipated that additional wells in Central Guam and surface water sources will be developed in order to meet the expanded needs of Guam including Cabras Island and the port facility.

The following is an estimate of the average daily water demand:

Commercial Port	0.4 million gallons per day
Port Related Industries	0.6 " " " "
Power production	0.4 " " " "
Aquaculture	0.8 " " " "
Total	2.2 million gallons per day

The above is based upon most of the water demand for aquaculture being obtained from salt water wells on the site.

14.6.2 Sewerage

Presently the Port's waste waters are processed at a small plant on the opposite side of Route II from the Port's Administration Building using an activated sludge process with the effluent being discharged into the Philippine Sea via an outfall pipe extending almost to near the edge of the reef. The effluent is not chlorinated. Although this plant was expected to treat an average daily flow of approximately 20,000 gallons to secondary treatment levels, approximately 50,000 gallons per day is being treated.

The new port area and the industrial area will have to be sewered. The estimated flow is 0.6 million gallons per day. It is recommended that this be collected and pumped through a new force main to a planned extension of the sewer system near the intersection of Routes 1 and 11. The substantial disparity between quantities of domestic water and sewage is attributable to the aquaculture which would produce a negligible amount of sewage.

14.6.3 Power

The following are the estimated power demands for the development area. These are based upon light manufacturing and commercial development of the Port's industrial area. If OTEC power proves to be low cost then it is likely that power intensive industries would locate near the OTEC plant. This possibility cannot be evaluated at this time.

Commercial Port	1,000 kilowatts
Port Related Industries	6,000 "
Aquaculture	100 "
Total	7,100 kilowatts.

APPENDIX A

TRADE STATISTICS
GUAM - UNITED STATES

COMMODITY CLASSIFICATION FOR DOMESTIC WATERBORNE COMMERCE

Note: The commodity descriptions used in the statistical tables in this publication are abbreviated forms--to conserve printing space-of the following commodities.

Code No.	Item Name
	Group 01-Farm Products
0101	Cotton, raw
0102	Barley and rye
0103	Corn
0104	Oats
0105	Rice
0106	Sorghum grains
0107	Wheat
0111	Soybeans
0112	Flaxseed
0119	Oilseeds, not elsewhere classified
0121	Tobacco, leaf
0122	Hay and fodder
0129	Field crops, not elsewhere classified
0131	Fresh fruits and tree nuts, except bananas and plantains
0132	Bananas and plantains
0133	Coffee, green and roasted (including instant)
0134	Cocoa beans
0141	Fresh and frozen vegetables
0151	Live animals (livestock), except zoo animals, cats, dogs, etc.
0161	Animals and animal products, not elsewhere classified
0191	Miscellaneous farm products
	Group 08-Forest Products
0841	Crude rubber and allied gums
0861	Forest products, not elsewhere classified
	Group 09-Fresh Fish and Other Marine Products
0911	Fresh fish, except shellfish
0912	Shellfish, except prepared or preserved
0913	Menhaden
0931	Marine shells, unmanufactured
	Group 10-Metallic Ores
1011	Iron ore and concentrates
1021	Copper ore and concentrates
1051	Bauxite and other aluminum ores and concentrates
1061	Manganese ores and concentrates
1091	Nonferrous metal ores and concentrates, not elsewhere classified
	Group 11-Coal
1121	Coal and lignite
	Group 13-Crude Petroleum
1311	Crude petroleum

Code No.	Item Name
	Group 14-Nonmetallic Minerals, Except Fuels
1411	Limestone flux and calcareous stone
1412	Building stone, unworked
1442	Sand, gravel and crushed rock
1451	Clay, ceramic and refractory materials
1471	Phosphate rock
1479	Natural fertilizer materials, not elsewhere classified
1491	Salt
1492	Sulphur, dry
1493	Sulphur, liquid
1494	Gypsum, crude and plasters
1499	Nonmetallic minerals, except fuels, not elsewhere classified
	Group 19-Ordnance and Accessories
1911	Ordnance and accessories
	Group 20-Food and Kindred Products
2011	Meat, fresh, chilled, or frozen
2012	Meat and meat products prepared or preserved, including canned meat products
2014	Tallow, animal fats and oils
2015	Animal by-products, not elsewhere classified
2021	Dairy products except dried milk and cream
2022	Dried milk and cream
2031	Fish and fish products, including shellfish, prepared or preserved
2034	Vegetables and preparations, canned and otherwise prepared and preserved
2039	Fruits and fruit and vegetable juices, canned and otherwise prepared or preserved
2041	Wheat flour and semolina
2042	Prepared animal feeds
2049	Grain mill products, not elsewhere classified
2061	Sugar
2062	Molasses
2081	Alcoholic beverages
2091	Vegetable oils, all grades; margarine and shortening
2092	Animal oils and fats, not elsewhere classified, including marine
2094	Groceries
2095	Ice
2099	Miscellaneous food products
	Group 21-Tobacco Products
2111	Tobacco Manufactures

COMMODITY CLASSIFICATION FOR DOMESTIC WATERBORNE COMMERCE

Code No.	Item Name
	Group 22-Basic Textiles
2211	Basic textile products, except textile fibers
2212	Textile fibers, not elsewhere classified
	Group 23-Apparel and Other Finished Textile Products, Including Knit
2311	Apparel and other finished textile products, including knit
	Group 24-Lumber and Wood Products Except Furniture
2411	Logs
2412	Rafted logs
2413	Fuel wood, charcoal, and wastes
2414	Timber, posts, poles, piling, and other wood in the rough
2415	Pulpwood, log
2416	Wood chips, staves, moldings, and excelsior
2421	Lumber
2431	Veneer, plywood, and other worked wood
2491	Wood manufactures, not elsewhere classified
	Group 25-Furniture and Fixtures
2511	Furniture and fixtures
	Group 26-Pulp, Paper and Allied Products
2611	Pulp
2621	Standard newsprint paper
2631	Paper and paperboard
2691	Pulp, paper and paperboard products, not elsewhere classified
	Group 27-Printed Matter
2711	Printed matter
	Group 28-Chemicals and Allied Products
2810	Sodium hydroxide (caustic soda)
2811	Crude products from coal tar, petroleum, and natural gas, except benzene and toluene
2812	Dyes, organic pigment, dyeing and tanning materials
2813	Alcohols
2816	Radioactive and associated materials, including wastes
2817	Benzene and toluene, crude and commercially pure
2818	Sulphuric acid
2819	Basic chemicals and basic chemical products, not elsewhere classified
2821	Plastic materials, regenerated cellulose and synthetic resins, including film, sheeting, and laminates
2822	Synthetic rubber
2823	Synthetic (man-made) fiber

Code No.	Item Name
	Group 28-Continued
2831	Drugs (biological products, medicinal chemicals, botanical products and pharmaceutical preparations)
2841	Soap, detergents, and cleaning preparations; perfumes, cosmetics and other toilet preparations
2851	Paints, varnishes, lacquers, enamels, and allied products
2861	Gum and wood chemicals
2871	Nitrogenous chemical fertilizers, except mixtures
2872	Potassic chemical fertilizers, except mixtures
2873	Phosphatic chemical fertilizers, except mixtures
2876	Insecticides, fungicides, pesticides, and disinfectants
2879	Fertilizers and fertilizer materials, not elsewhere classified
2891	Miscellaneous chemical products
	Group 29-Petroleum and Coal Products
2911	Gasoline, including natural gasoline
2912	Jet fuel
2913	Kerosene
2914	Distillate fuel oil
2915	Residual fuel oil
2916	Lubricating oils and greases
2917	Naphtha, mineral spirits, solvents, not elsewhere classified
2918	Asphalt, tar, and pitches
2920	Coke, including petroleum coke
2921	Liquefied petroleum gases, coal gases, natural gas, and natural gas liquids
2951	Asphalt building materials
2991	Petroleum and coal products, not elsewhere classified
	Group 30-Rubber and Miscellaneous Plastic Products
3011	Rubber and miscellaneous plastics products
	Group 31-Leather and Leather Products
3111	Leather and Leather products
	Group 32-Stone, Clay, Glass, and Concrete Products
3211	Glass and glass products
3241	Building cement
3251	Structural clay products, including refractories
3271	Lime
3281	Cut stone and stone products
3291	Miscellaneous nonmetallic mineral products

Code No.	Item Name
	Group 33-Primary Metal Products
3311	Pig iron
3312	Slag
3313	Coke (coal and petroleum), petroleum pitches and asphalts, and naphtha and solvents
3314	Iron and steel ingots, and other primary forms, including blanks for tube and pipe, and sponge iron
3315	Iron and steel bars, rods, angles, shapes and sections, including sheet piling
3316	Iron and steel plates and sheets
3317	Iron and steel pipe and tube
3318	Ferroalloys
3319	Primary iron and steel products, not elsewhere classified, including castings in the rough
3321	Nonferrous metals primary smelter products, basic shapes, wire, castings and forgings, except copper, lead, zinc and aluminum
3322	Copper and copper alloys, whether or not refined, unworked
3323	Lead and zinc including alloys, unworked
3324	Aluminum and aluminum alloys, unworked
	Group 34-Fabricated Metal Products, Except Ordnance, Machinery, and Transportation Equipment
3411	Fabricated metal products, except ordnance, machinery, and transportation equipment
	Group 35-Machinery, Except Electrical
3511	Machinery, except electrical
	Group 36-Electrical Machinery, Equipment and Supplies
3611	Electrical machinery, equipment and supplies
	Group 37-Transportation Equipment
3711	Motor vehicles, parts and equipment
3721	Aircraft and parts
3731	Ships and boats
3791	Miscellaneous transportation equipment
	Group 38-Instruments, Photographic and Optical Goods, Watches and Clocks
3811	Instruments, photographic and optical goods, watches and clocks
	Group 39-Miscellaneous Products Of Manufacturing
3911	Miscellaneous products of manufacturing

Code No.	Item Name
	Group 40-Waste and Scrap Materials
4011	Iron and steel scrap
4012	Nonferrous metal scrap
4022	Textile waste, scrap, and sweepings
4024	Paper waste and scrap
4029	Waste and scrap, not elsewhere classified
	Group 41-Special Items
4111	Water
4112	Miscellaneous shipments not identifiable by commodity
4113	LCL freight
4118	Materials used in waterway improvement, Government materials
9999*	Department of Defense controlled cargo and special category items

* Cargoes exported on Department of Defense controlled vessels (other than goods for the use of U.S. Armed Forces abroad) and non-Department of Defense shipments of military component items (abbreviated SCI) for which commodity detail is not furnished to the Corps of Engineers.

APPENDIX TABLE A.1

APRA HARBOR
COMMODITY TRADE WITH THE UNITED STATES

APRA HARBOR, GUAM (4480) — Coastwise Inbound

Commodity	CY 1978	CY 1977	CY 1976	CY 1975
0101	--	--	--	3
0103	10	12	27	--
0105	9,061	7,649	6,095	3,676
0129	354	90	4	2
0131	2,173	2,176	1,331	1,290
0132	10	--	--	--
0133	--	2	4	--
0141	5,487	4,867	3,866	2,869
0161	686	502	521	567
0191	31	48	93	25
0861	1	1	6	23
0911	53	102	165	39
0912	335	244	163	133
1091	555	2,045	1,772	252
1121	2	1	13	--
1411	22	21	--	--
1442	1,619	6,178	4,093	24
1451	135	5	--	--
1491	1,233	826	1,208	578
1492	--	--	1	--
1494	41	68	100	11
1499	--	4	1	246
1911	4	17	9	34
2011	9,108	8,335	7,461	3,834
2012	110	41	89	42
2014	--	--	17	106
2015	1	--	--	--
2021	2,922	1,920	2,822	1,286
2022	144	38	20	61
2031	10	--	--	--
2034	9,822	9,757	1,463	1,402
2039	372	476	374	552
2041	735	473	329	176
2042	9,951	9,248	7,520	3,854
2049	422	253	188	50
2061	403	233	176	338
2081	18,042	15,885	10,404	2,949
2091	1,350	1,448	867	298
2094	11,821	13,936	31,316	10,514
2099	17,604	15,115	9,628	6,265
2111	881	957	682	554
2211	594	901	665	304
2413	124	92	7	15
2414	--	1,276	9	--
2421	6,568	5,294	3,203	917
2431	742	976	934	139
2491	1,496	1,808	335	81
2511	3,637	2,668	2,919	1,448
2611	1	--	--	--
2621	3	--	--	39
2631	4,586	2,998	2,695	2,586
2691	4,456	2,978	987	489
2711	574	587	589	346
2810	--	2	24	7
2811	--	--	--	1
2812	--	23	--	--
2813	271	109	2,625	1,825
2819	2,650	2,323	1,428	591

APPENDIX TABLE A.1

APRA HARBOR

COMMODITY TRADE WITH THE UNITED STATES

APRA HARBOR, GUAM (4480) — Coastwise Inbound

Commodity	CY 1978	CY 1977	CY 1976	CY 1975
2821	2	80	38	46
2831	49	49	16	49
2841	2,371	1,972	1,011	453
2851	2,477	1,977	1,480	595
2871	234	270	55	76
2876	195	143	98	44
2879	152	133	50	89
2891	399	102	35	89
2911	7	1	--	--
2913	12	--	30	48
2914	--	--	--	21
2916	3	3	272	348
2917	165	83	61	25
2918	467	688	477	330
2920	12	2	--	5
2921	4	--	--	--
2951	789	1,273	2,100	364
2991	2,296	1,590	1,498	612
3011	1.381	1,131	860	1,745
3111	18	11	11	2
3211	865	593	346	216
3241	235	183	143	260
3251	621	324	294	115
3271	37	92	25	--
3281	89	87	--	--
3291	4,486	4,059	1,161	1,054
3312	1,064	45	--	--
3314	3,687	2,656	1,121	380
3315	--	1,401	162	81
3316	557	403	71	4
3317	2,085	2,002	953	1,306
3319	550	15	29	14
3321	21	12	60	24
3322	1,609	28	85	53
3323	5	21	1	13
3324	51	42	5	7
3411	9,690	6,129	5,418	3,776
3511	3,406	2,370	1,515	995
3611	3,784	4,057	3,193	2,371
3711	6,870	6,971	5,184	7,336
3721	23	6	6	2
3731	46	18	52	18
3791	292	259	858	88
3811	20	19	25	6
3911	1,267	1,797	747	760
4022	7	7	6	1
4029	2	--	--	--
4112	31,423	29,161	36,415	58,494
TOTAL	215,107	197,273	175,215	133,156

APPENDIX TABLE A.1

APRA HARBOR

COMMODITY TRADE WITH THE UNITED STATES

APRA HARBOR, GUAM (4480) — Coastwise Inbound

Commodity	CY 1978	CY 1977	CY 1976	CY 1975
0105	--	1	--	--
0131	--	--	499	--
0912	19,158	112,185	11,823	8,070
2011	32	140	464	1
2034	--	12	9,107	9,130
2039	52,725	42,732	56,409	--
2091	--	--	--	8
2094	1	--	401	158
2099	--	--	--	3
2111	--	--	1	--
2211	--	1	9	44
2421	--	1	2	4
2511	1	--	5	3
2631	--	--	1	3
2691	3	--	--	--
2711	3	--	--	2
2819	--	1	2	--
2841	8	6	1	2
2851	--	2	--	2
2891	20	--	--	--
2912	--	--	30,633	20,960
2915	7,184	25,375	17,358	--
2916	17,514	--	--	--
3011	1	--	8	79
3211	--	--	1	--
3241	--	3	--	--
3314	3	95	3	--
3316	13	142	--	--
3317	3	7	1	3
3319	--	--	--	3
3323	--	24	--	--
3411	395	688	278	1,247
3511	130	135	210	131
3611	4,351	2,963	3,875	3,557
3711	1,205	1,090	829	736
3721	17	4	--	2
3731	--	2	--	3
3791	--	2	67	3
3911	885	424	190	42
4011	119	98	216	213
4112	1,609	2,399	17,462	3,969
TOTAL	115,380	88,533	149,855	48,380
Coastwise Inbound and Outbound TOTALS	330,487	285,806	325,070	181,536

Source: U.S. Corps of Engineers

APPENDIX B

TRADE STATISTICS
GUAM - JAPAN

APPENDIX TABLE B.1

COMMODITY CLASSIFICATION FOR TRADE WITH JAPAN

SECTION I LIVE ANIMALS; ANIMAL PRODUCTS

1 Live aimals
2 Meat and edible meat offals
3 Fish, crustaceans and molluscs
4 Dairy produce; bird's eggs; natural honey; edible products of animal origin, not elsewhere specified or included
5 Products of animal origin, not elsewhere specified of included

SECTION II VEGETABLE PRODUCTS

6 Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage
7 Edible vegetables and certain roots and tubers
8 Edible fruit and nuts; peel of melons or citrus frui:
9 Coffee, tea, maté and spices
10 Cereals
11 Products of the milling industry; malt and starches; gluten; inulin
12 Oil seeds and oleaginous fruit; miscellaneous grains, seeds and fruit; industrial and medical plants; straw and fodder
13 Raw vegetable materials of a kind suitable for use in tanning; lacs; gums, resins and other vegetable saps and extracts
14 Vegetable plating and carving materials; vegetable products not elsewhere specified or including

SECTION III ANIMAL AND VEGETABLE FATS AND OILS AND THEIR CLEAVAGE PRODUCTS; PREPARED EDIBLE FATS; ANIMAL AND VEGETABLE WAXES

15 Animal and vegetable fats and oils and their cleavage products; edible fats; animal and vegetable waxes

SECTION IV PREPARED FOODSTUFFS; BEVERAGES, SPIRITS AND VINEGAR; TOBACCO

16 Preparations of meat, of fish, of crustaceans or molluscs
17 Sugars and sugar confectionery
18 Cocoa and cocoa preparations
19 Preparations of cereals, flour or starch; pastrycooks' products
20 Preparations of vegetables, fruit or other parts of plants
21 Miscellaneous edible preparations
22 Beverages, spirits and vinegar
23 Residues and waste from the food industries; prepared animal fodder
24 Tobacco

SECTION V MINERAL PRODUCTS

25 Salt; sulphur; earths and stone; plastering materials, lime and cement
26 Metallic ores, slag and ash
27 Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes

SECTION VI PRODUCTS OF THE CHEMICAL AND ALLIED INDUSTRIES

28 Inorganic chemicals; organic and inorganic compounds of precious metals, of rare earth metals, of radio-active elements and of isotopes
29 Organic chemicals
30 Pharmaceutical products
31 Fertilisers
32 Tanning and dyeing extracts; tannins and their derivatives; dyes, colours, paints and varnishes; putty fillers and stoppings; inks
33 Essential oils and resinoids; perfumery, cosmetics and toilet preparations
34 Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing and scouring preparations, candles and similar articles, modelling pastes and "dental waxes"
35 Albuminoidal substances; glues
36 Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations
37 Photographic and cinematographic goods
38 Miscellaneous chemical products

SECTION VII ARTIFICIAL RESINS AND RLASTIC MATERIALS, CELLULOSE ESTERS AND ETHERS, AND ARTICLES THEREOF; RUBBER, SYNTHETIC RUBBER, FACTICE, AND ARTICLES THEROF

39 Artificial resins and plastic materials, cellulose esters and ethers; articles thereof
40 Rubber, synthetic rubber, factice, and articles thereof

SECTION VIII RAW HIDES AND SKINS, LEATHER, FURSKINS AND ARTICLES THEREOF, SADDLERY AND HARNESS; TRAVEL GOODS, HANDBAS AND SIMILAR CONTAINERS; ARTICLES OF GUT (OTHER THAN SILK-WORM GUT)

41 Raw hides and skins (other than furskins) and leather
42 Articles of leather; saddlery and harness; travel goods; handbags and similar containers; articles of animal gut (other than silk-worm gut)
43 Furskins and artificial fur; manufactures thereof

APPENDIX TABLE B.1 (Continued)

SECTION IX WOOD AND ARTICLES OF WOOD, WOOD CHARCOAL; CORK AND ARTICLES OF CORK; MANUFACTURES OF STRAW, OF ESPARTO AND OF OTHER PLAITING MATERIALS; BASKETWARE AND WICKERWORK

- 44 Wood and articles of wood; wood charcoal
- 45 Cork and articles of cork
- 46 Manufactures of straw, of esparto and of other plaiting materials; basketware and wickerwork

SECTION X PAPER-MAKING MATERIAL; PAPER AND PAPERBOARD AND ARTICLES THEREOF

- 47 Paper-making material
- 48 Paper and paperboard; articles of paperpulp, of paper or of paper or of paperboard
- 49 Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans

SECTION XI TEXTILES AND TEXTILE ARTICLES

- 50 Silk and waste silk
- 51 Man-made fibres (continuous)
- 52 Metallised textiles
- 53 Wool and other animal hair
- 54 Flax and ramie
- 55 Cotton
- 56 Man-made fibres (discontinuous)
- 57 Other vegetable textile materials; paper yarn and woven fabrics of paper yarn
- 58 Carpets, mats, matting and tapestries; pile and chenille fabrics; narrow fabrics; trimmings; tulle and other net fabrics; lace; embroidery
- 59 Wadding and felt; twine, cordage, ropes and cables; special fabrics; impregnated and coated fabrics; textile articles of a kind suitable for industrial use
- 60 Knitted and crocheted goods
- 61 Articles of apparel and clothing accessories of textile fabric, other than knitted or crocheted goods
- 62 Other made up textile articles
- 63 Old clothing and other textile articles; rags

SECTION XII FOOTWEAR, HEADGEAR, UMBRELLAS, SUNSHADES, WHIPS, RIDING-CROPS AND PARTS THEREOF; PREPARED FEATHERS AND ARTICLES MADE THEREWITH; ARTIFICIAL FLOWERS; ARTICLES OF HUMAN HAIR; FANS

- 64 Footwear, gaiters and the like; parts of such articles
- 65 Headgear and parts thereof
- 66 Umbrellas, sunshades, walking-sticks, whips, riding-crops and parts thereof
- 67 Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair; fans.

SECTION XIII ARTICLES OF STONE, OF PLASTER, OF CEMENT, OF ASBESTOS, OF MICA AND OF SIMILAR MATERIALS; CERAMIC PRODUCTS; GLASSWARE

- 68 Articles of stone, of plaster, of cement, of asbestos, of mica and of similar materials
- 69 Ceramic products
- 70 Glass and glassware

SECTION XIV PEARLS, PRECIOUS AND SEMIPRECIOUS STONES, PRECIOUS METALS, ROLLED PRECIOUS METALS, AND ARTICLES THEREOF; IMITATION JEWELLERY; COIN

- 71 Pearls, precious and semi-precious stones, precious metals, rolled precious metals, and articles thereof; imitation jewellery
- 72 Coin

SECTION XV BASE METALS AND ARTICLES OF BASE METAL

- 73 Iron and steel and articles thereof
- 74 Copper and articles thereof
- 75 Nickel and articles thereof
- 76 Aluminium and articles thereof
- 77 Magnesium and beryllium and articles thereof
- 78 Lead and articles thereof
- 79 Zinc and articles thereof
- 80 Tin and articles thereof
- 81 Other base metals employed in metallurgy and articles thereof
- 82 Tools, implements, cutlery, spoons and forks, of base metal; parts thereof
- 83 Miscellaneous articles of base metal

SECTION XVI MACHINERY AND MECHANICAL APPLIANCES; ELECTRICAL EQUIPMNT; PARTS THEREOF

- 84 Boilers, machinery and mechanical appliances; parts thereof
- 85 Electrical machinery and equipment; parts thereof

SECTION XVII VEHICLES, AIRCRAFT, AND PARTS THEREOF; VESSELS AND CERTAIN ASSOCIATED TRANSPORT EQUIPMENT

- 86 Railway and tramway locomotives, rolling-stock and parts thereof; railway and tramway track fixtures and fittings; traffic signalling equipment of all kinds (not electrically powered)
- 87 Vehicles, other than railway or tramway rolling-stock, and parts thereof
- 88 Aircraft and parts thereof; parachutes: catapults and similar aircraft launching gear; ground flying trainers
- 89 Ships, boats and floating structures

SECTION XVIII OPTICAL, PHTOGRAPHIC, CINEMATOGRAPHIC, MEASURING, CHECKING, PRECISION, MEDICAL AND SURGICAL INSTRUMENTS AND APPARATUS; CLOCKS AND WATCHES; MUSICAL INSTRUMENTS; SOUND RECORDERS AND REPRODUCERS; TELEVISION IMAGE AND SOUND RECORDERS AND REPRODUCERS, MAGNETIC; PARTS THEREOF

90 Optical, photographic, cinematographic, measuring, checking, precision, medical and surgical instruments and apparatus; parts thereof

91 Clocks and watches and parts thereof

92 Musical instrument; sound recorders and reproducers; television image and sound recorders and reproducers, magnetic; parts and accessories of such articles

SECTION XIX ARMS AND AMMUNITION; PARTS THEREOF

93 Arms and ammunition; parts thereof

SECTION XX MISCELLANEOUS MANUFACTURED ARTICLES

94 Furniture and parts thereof; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings

95 Articles and manufactures of carving or moulding material

96 Brooms, brushes, feather dusters, powder-puffs and sieves

97 Toys, games and sports requisites; parts thereof

98 Miscellaneous manufactured articles

SECTION XXI WORKS OF ART, COLLECTORS' PIECES, AND ANTIQUES

99 Works of art, collectors' pieces, and antiques

SECTION XXII SPECIAL TRASACTIONS AND COMODITIES NOT CLASSIFIED ACCORDING TO KIND

国名及び品目番号 COUNTRY & COMMODITY	数量 QUANTITY	単位 UNIT	価額(千円) VALUE(1,000yen)
Guam(U.S.A.)			
00.00-090	39750	KG	86505
2-ST			86505
03.01-132	152	KG	114
03.01-139	27	KG	221
03.01-211	3201407	KG	624031
03.01-214	1136191	KG	251011
03.01-222	23666	KG	3588
03.01-223	66000	KG	9420
03.01-224	120	KG	145
03.01-228	1014	KG	366
03.01-229	8093	KG	3686
03.01-311	1346	KG	4812
03.01-319	1597	KG	1583
03.01-411	19	KG	255
03.01-419	6029	KG	3416
03.02-310	189	KG	330
03.02-321	69	KG	130
03.02-323	1500	KG	727
03.02-325	24	KG	453
03.02-329	666	KG	782
03.02-330	25	KG	389
03.02-410	61	KG	491
03.03-012	124	KG	279
03.03-014	139	KG	119
03.03-015	3045	KG	3213
03.03-016	1096	KG	1465
03.03-017	25	KG	114
03.03-022	199	KG	128
03.03-023	34	KG	263
2-ST			911541
07.01-200	47092	KG	12258
07.01-390	3248	KG	2413
07.01-900	144075	KG	37954
07.04-010	1496	KG	1001
07.04-020	1628	KG	435
07.04-030	127	KG	931
07.04-090	1417	KG	102
2-ST			55114
08.02-200	41740	KG	9190
08.02-900	789	KG	239
08.06-100	6185	KG	2705
08.06-200	16131	KG	5199
08.07-000	2768	KG	894
08.08-000	102	KG	194
08.09-000	15090	KG	4578
2-ST			22997
09.04-010	2798	KG	3067
09.04-090	601	KG	603
09.10-910	439	KG	757
09.10-990	312	KG	438
2-ST			4865
11.08-010	2527	KG	628
2-ST			628
12.07-090	12	KG	102
12.08-011	14	TH	764
12.08-019	1407	KG	1023
2-ST			1889
15.07-100	5115	KG	1589
15.07-600	14025	KG	3267
15.07-940	2212	KG	1733
15.07-990	695	KG	634
2-ST			7223
16.03-000	100	KG	128
16.04-025	2142	KG	1544
16.04-031	3907	KG	2825
16.04-042	22528	KG	3855
16.04-043	8860	KG	1893
16.04-062	78245	KG	22298
16.04-099	5380	KG	5429
(620) Guam(U.S.A.)			
16.05-052	700	KG	501
16.05-099	6306	KG	8403
2-ST			46878
17.01-910		MT	153
17.04-010	4551	KG	3866
17.04-020	1747	KG	2090
17.04-090	202	KG	347
2-ST			6456
18.06-010	67	KG	190
2-ST			190
19.02-090	5247	KG	1706
19.03-010	669	KG	224
19.03-020	6501	KG	2024
19.03-090	789	KG	372
19.05-000	255	KG	222
19.07-010	9070	KG	4019
19.07-020	455	KG	329
19.08-011	43450	KG	22075
19.08-019	1514	KG	1075
19.08-020	6421	KG	6424
19.09-090	17971	KG	16140
2-ST			54640
20.01-010	958	KG	1183
20.02-013	47	KG	110
20.02-019	586	KG	419
20.02-091	45741	KG	14816
20.02-092	28072	KG	13521
20.02-099	1778	KG	1385
20.06-019	852	KG	193
20.06-099	1118	KG	461
2-ST			32088
21.01-021	231517	L	51698
21.01-022	32303	L	5875
21.01-029	147	KG	180
21.01-030	2723	KG	1623
21.01-040	14229	KG	4293
21.04-090	3055	KG	4576
21.05-100	1517	KG	1996
21.07-010	4261	KG	12194
21.07-040	104604	KG	54068
21.07-060	332	KG	397
21.07-090	38432	KG	17856
2-ST			154068
22.02-011	5215	L	1095
22.02-019	14503	L	8618
22.03-000	73997	L	8527
22.05-090	207	L	227
22.07-010	11503	L	4633
22.07-090	453	L	466
22.09-920	10332	L	3557
22.10-000	3378	L	535
2-ST			27600
23.07-090	2	MT	1245
2-ST			1245
24.02-200	2150	TH	4474
2-ST			4474
25.03-000	20	MT	1127
25.22-000	12	MT	418
25.23-010	48161	MT	391425
2-ST			392970
27.10-719	2	KL	663
27.16-000	20	MT	1034
2-ST			1697
28.17-100	67770	KG	7151
28.28-092	360	KG	380
2-ST			7531
29.02-900	900	KG	536
29.08-000	271840	KG	41300
29.23-011	2884	KG	4277
2-ST			46113
30.03-999	2296	KG	1834
2-ST			1834
32.05-990	18	KG	110
32.09-110	6184	KG	1983
32.09-241	3600	KG	1375
32.09-245	2447	KG	1707
32.12-000	9160	KG	1727
2-ST			6902
33.06-021	139	KG	1053
33.06-022	1356	KG	1361
33.06-032	122	KG	258
33.06-039	40	KG	117
2-ST			2789
41.01-010	690	KG	623
(620) Guam(U.S.A.)			
34.02-011	3917	KG	624
34.02-019	3818	KG	420
34.05-090	1800	KG	303
2-ST			1970
36.05-020	472	KG	1271
36.06-010	7003	KG	4109
36.06-090	375	KG	313
36.08-090	653	KG	521
2-ST			8214
37.01-090	227	SM	366
37.02-092	838	SM	5552
37.03-010	19764	SM	14695
37.03-020	424	SM	360
37.05-000	1	SM	1140
37.07-091	1208	M	385
37.08-000	3536	KG	2916
2-ST			25414
38.11-230	12413	KG	6324
38.17-000	72	KG	102
38.18-000	216	KG	119
38.19-990	976	KG	873
2-ST			7418
39.01-321	12505	SM	10596
39.01-322	67	SM	160
39.01-600	474	KG	605
39.01-810	431	KG	1257
39.01-920	11600	KG	6062
39.02-211	98000	KG	20157
39.02-239	460	KG	117
39.02-320	692	KG	801
39.02-531	526	KG	473
39.02-539	2078	KG	1195
39.02-540	3063	KG	871
39.02-551	7085	KG	2221
39.02-552	1269	KG	396
39.02-553	262	KG	321
39.02-554	79	KG	103
39.02-739	1535	KG	3179
39.03-119	58	KG	106
39.07-100	11672	KG	10411
39.07-390	338	KG	604
39.07-600	270	KG	1896
39.07-910	4869	KG	5554
39.07-920	55	DZ	632
	676	KG	
39.07-990	25924	KG	30033
2-ST			97530
40.09-010	9	KG	124
40.09-090	32	KG	105
40.10-010	175	M	960
	1261	KG	
40.11-100	656	NO	2572
	5371	KG	
40.11-200	981	NO	14398
	32668	KG	
40.11-410	240	NO	734
	1235	KG	
40.11-490	259	NO	9220
	16234	KG	
40.11-510	10	NO	201
	650	KG	
40.11-610	1340	NO	901
	2107	KG	
40.14-090	563	KG	1039
2-ST			30244
42.02-320	416	DZ	2365
	2800	KG	
42.02-911	39	DZ	177
	39	KG	
42.02-912	50	DZ	201
	34	KG	
42.02-913	550	DZ	671
	266	KG	
42.02-919	250	DZ	351
	84	KG	
42.02-999	639	DZ	2499
	1410	KG	
2-ST			6284
44.15-120	17	SM	149
44.21-090	20612	KG	4421
44.23-010	6	NO	390
	160	KG	
44.23-020	29	SM	974
44.23-090	960	KG	134
44.24-090	7681	KG	8129
44.27-011	140	KG	555
44.27-019	13	KG	104
44.27-099	2236	KG	3580
44.28-000	802	KG	1655
2-ST			20091
46.02-091	1903	KG	1247
46.03-091	440	KG	292

APPENDIX TABLE B.1 (Continued)

輸出国別品別表 EXPORTS, COUNTRY BY COMMODITY (1979)

国名及び品目符号 COUNTRY & COMMODITY	数量 QUANTITY	単位 UNIT	価額(千円) VALUE(1 000yen)
(620) Guam(U.S.A.)			
2-ST			1539
48.05-300	520	KG	141
48.07-140	260	KG	106
48.07-200	420	KG	572
48.07-990	170	KG	250
48.14-010	120	KG	113
48.14-020	968	KG	1471
48.15-100	15739	KG	4332
48.15-200	2355	KG	968
48.15-920	1066	KG	471
48.15-990	2339	KG	2000
48.16-022	3163	KG	3099
48.16-023	41794	KG	8318
48.18-012	874	DZ	5747
	9945	KG	
48.18-019	423	DZ	2929
	6018	KG	
48.18-030	171	KG	522
48.18-040	900	KG	2403
48.18-090	100	KG	311
48.19-300	358	KG	442
48.21-200	1346	KG	846
48.21-300	3612	KG	2791
48.21-900	4088	KG	3154
2-ST			40986
49.01-000	215005	NO	11759
49.02-010	6500	NO	378
49.02-020	52765	NO	11492
49.05-000	326	KG	524
49.09-000	3533	KG	5191
49.10-500	2560	KG	2262
49.11-100	14168	KG	11520
49.11-210	139	KG	463
49.11-220	561	KG	2015
49.11-290	1528	KG	1343
2-ST			52237
51.01-200	480	KG	113
51.02-110	78	KG	175
51.04-214	1295	SM	231
	127	KG	
51.04-219	611	SM	125
	25	KG	
51.04-221	618	SM	224
	47	KG	
51.04-229	49218	SM	12226
	4757	KG	
51.04-350	566	KG	847
51.04-511	595	SM	251
	84	KG	
51.04-522	491	SM	161
	39	KG	
51.04-620	975	SM	225
	102	KG	
2-ST			15146
55.09-215	539	SM	223
	63	KG	
55.09-221	5013	SM	1679
	846	KG	
55.09-228	1043	SM	347
	138	KG	
55.09-229	1757	SM	566
	199	KG	
55.09-231	253	SM	104
	30	KG	
55.09-239	312	SM	120
	38	KG	
55.09-294	517	SM	115
	25	KG	
55.09-420	514	SM	124
	42	KG	
55.09-500	339	KG	417
2-ST			3895
56.07-130	659	SM	257
	95	KG	
56.07-221	10865	SM	2306
	1126	KG	
56.07-422	1207	SM	256
	138	KG	
56.07-511	500	SM	126
	77	KG	
2-ST			2045
58.02-200	69	SM	353
	133	KG	
58.02-500	385	SM	1236
	795	KG	
58.02-600	391	SM	158
	151	KG	
58.04-490	267	SM	401
	72	KG	
58.05-013	5879	KG	10679
58.08-090	55	KG	368
58.10-040	116	KG	372
2-ST			13567

国名及び品目符号 COUNTRY & COMMODITY	数量 QUANTITY	単位 UNIT	価額(千円) VALUE(1 000yen)
(620) Guam(U.S.A.)			
59.04-040	8178	KG	8689
59.04-050	798	KG	756
59.04-080	1103	KG	811
59.05-012	33150	KG	45083
59.05-092	51956	KG	49012
59.08-000	252	KG	349
2-ST			104690
60.01-311	34072	KG	53208
60.01-321	5161	KG	11990
60.01-329	1289	KG	2510
60.01-410	525	KG	1094
60.02-019	900	DZ	552
	405	KG	
60.05-420	44	DZ	137
	93	KG	
60.05-490	18	DZ	183
	64	KG	
60.05-510	1099	DZ	8082
	1934	KG	
60.05-900	40	KG	159
2-ST			78815
61.01-430	12	DZ	381
	58	KG	
61.01-530	5	DZ	184
	24	KG	
61.01-929	40	DZ	678
	139	KG	
61.01-930	89	DZ	1595
	166	KG	
61.02-420	4	DZ	165
	16	KG	
61.02-430	6	DZ	167
	33	KG	
61.02-520	16	DZ	190
	50	KG	
61.02-530	6	DZ	123
	24	KG	
61.02-620	13	DZ	125
	30	KG	
61.02-720	23	DZ	217
	68	KG	
61.02-993	366	DZ	1665
	337	KG	
61.06-040	90	DZ	157
	14	KG	
2-ST			5848
62.02-210	16	DZ	2458
	519	KG	
62.02-310	133	DZ	642
	138	KG	
62.02-390	125	DZ	669
	108	KG	
62.02-510	868	DZ	5787
	1424	KG	
62.02-600	160	DZ	218
	71	KG	
62.02-790	75	KG	419
62.02-819	93	KG	377
62.02-890	60	KG	832
62.04-919	720	KG	420
62.05-091	521	KG	1658
62.05-092	457	KG	2155
2-ST			15685
63.02-000	1134	KG	213
2-ST			213
64.01-921	71	DZ	545
64.01-041	1403	DZ	3991
64.01-049	335	DZ	1821
64.02-023	2	DZ	178
64.02-024	125	DZ	2931
64.02-029	16	DZ	126
64.02-030	76	DZ	983
64.03-000	20	DZ	202
64.04-000	64	DZ	530
2-ST			10413
65.06-010	9	DZ	690
	163	KG	
2-ST			690
66.01-092	6	DZ	161
66.01-099	111	DZ	1152
2-ST			1313
68.04-011	75	KG	178
68.04-019	378	KG	278
68.06-010	18	KG	102
68.06-090	81	KG	600
68.07-010	4200	KG	651
68.14-010	70	KG	297
68.16-090	85	KG	208
2-ST			2317
69.02-011	1	MT	131
69.07-010	713	SM	2071

国名及び品目符号 COUNTRY & COMMODITY	数量 QUANTITY	単位 UNIT	価額(千円) VALUE(1 000yen)
(620) Guam(U.S.A.)			
69.07-090	14070	KG	1410
69.08-010	8368	SM	15362
69.08-020	98	MT	11464
69.10-000	190	KG	118
69.11-011	739	DZ	3080
	1910	KG	
69.11-012	4161	DZ	15303
	14448	KG	
69.11-013	1555	DZ	7734
	5951	KG	
69.11-020	38	DZ	860
	518	KG	
69.12-011	294	DZ	1060
	1122	KG	
69.12-012	1244	DZ	3056
	5183	KG	
69.12-013	1636	DZ	9750
	8218	KG	
69.12-090	66	KG	224
69.13-010	3008	KG	5421
69.13-090	777	KG	969
2-ST			78076
70.07-000	1901	KG	378
70.08-010	212	KG	744
70.09-000	1700	KG	817
70.13-011	1131	KG	2468
70.13-019	1121	KG	769
70.14-011	99	KG	347
70.16-010	3170	KG	560
70.17-000	6	KG	103
70.20-900	8	KG	126
70.21-093	87	KG	247
2-ST			6559
71.12-010		KG	930
71.12-090	62	KG	5325
71.14-090	1	KG	324
71.15-090	5	KG	1049
71.16-013	118	DZ	952
	21	KG	
71.16-024	166	DZ	753
	6	KG	
71.16-029	27	DZ	851
	3	KG	
71.16-030	203	DZ	2518
	21	KG	
71.16-091	19	KG	186
71.16-092	9	KG	1030
2-ST			13920
73.10-231	1	MT	199
73.10-234	2937	MT	226778
73.10-235	36	MT	3838
73.10-236	4	MT	498
73.10-237	5	MT	423
73.10-239	51	MT	5304
73.10-920	18	MT	2811
73.11-311	30	MT	3494
73.11-319	2	MT	250
73.11-321	2	MT	169
73.11-329	2	MT	203
73.11-590	35	MT	4614
73.12-032	4	MT	400
73.12-041	2	MT	285
73.13-110	72	MT	6970
73.13-200	31	MT	3008
73.13-319	1	MT	140
73.13-912	124	MT	15981
73.13-913	260	MT	34262
73.13-930	2	MT	419
73.13-990	5	MT	860
73.14-021	28	MT	5699
73.14-091	1	MT	374
73.15-820		MT	596
73.18-121		MT	140
73.18-133		MT	327
73.18-139		MT	249
73.18-931	175	MT	24180
73.18-932		MT	140
73.18-934	51	MT	6690
73.18-990	1	MT	116
73.20-090		MT	1196
73.21-019		MT	354
73.21-040		MT	859
73.22-000	240	MT	57523
73.23-010	120	NO	256
	240	KG	
73.24-000	213	NO	4060
	11082	KG	
73.25-011		MT	673
73.25-019	70	MT	10349
73.25-090	7	MT	3706
73.26-000	1	MT	218
73.27-090	8	MT	2916
73.29-019	758	KG	320
73.30-900	650	KG	166
73.31-010	92750	KG	18030
73.31-090	1112	KG	1233
73.32-011	3945	KG	1812

国名及び品目符号 COUNTRY & COMMODITY	数量 QUANTITY	単位 UNIT	価額(千円) VALUE(1,000yen)
(620) Guam(U.S.A.)			
73.32-013	174	KG	104
73.32-019	85	KG	354
73.32-029	110	KG	352
73.34-010	200	KG	165
73.36-110	20	NO	154
	110	KG	
73.36-190	176	NO	1476
	1172	KG	
73.36-220	12	NO	108
	64	KG	
73.38-111	130	KG	116
73.39-119	6598	KG	9696
73.38-200	34	KG	107
73.40-990	14238	KG	13929
2-ST			479729
74.19-090	65	KG	877
2-ST			877
76.03-019	240	KG	101
76.08-010		MT	621
76.10-000	259	KG	300
76.15-190	125	KG	108
76.16-090	532	KG	1168
2-ST			2298
78.06-090	564	KG	747
2-ST			747
79.06-090	1502	KG	1098
2-ST			1098
81.04-222	20	KG	690
2-ST			690
82.01-050	30	DZ	290
	78	KG	
82.02-030	72	NO	102
82.03-110	278	NO	884
	506	KG	
82.03-190	1175	NO	813
	199	KG	
82.04-019	1896	KG	3055
82.05-020	5	NO	259
82.06-000	260	KG	989
82.08-010	48	NO	128
82.09-011	160	DZ	720
	144	KG	
82.09-091	50	DZ	435
	135	KG	
82.14-011	617	DZ	820
	358	KG	
82.14-021	1200	DZ	498
	438	KG	
82.14-031	835	DZ	728
	322	KG	
82.14-039	180	DZ	170
	183	KG	
2-ST			10571
83.01-011	2008	KG	3526
83.01-012	568	KG	4378
83.02-010	9955	KG	6000
83.02-090	265	KG	330
83.03-090	7555	KG	5033
83.04-000	720	KG	342
83.05-010	512	KG	300
83.06-019	120	KG	175
83.07-011	1027	NO	4473
	1004	KG	
83.07-019	3	KG	368
83.09-090	4	KG	225
83.13-010	11460	KG	6182
83.15-019	2000	KG	412
2-ST			31744
84.01-290	430	KG	1057
84.06-400	29	NO	2488
	1053	KG	
84.06-611	42	NO	1671
	1047	KG	
84.06-710	17887	KG	39457
84.06-720	2269	KG	6769
84.06-790	110	KG	992
84.07-200	3	NO	1225
	190	KG	
84.09-011	1	NO	2300
	8500	KG	
84.09-019	1	NO	4300
	11000	KG	
84.10-290	1	NO	120
	18	KG	
84.10-310	7	NO	1314
	455	KG	
84.10-491	1	NO	130
	15	KG	
84.10-492	16	NO	259
	262	KG	
84.10-499	10	NO	1699
	301	KG	
(620) Guam(U.S.A.)			
84.10-511	1	NO	331
	20	KG	
84.10.519	4	NO	358
	181	KG	
84.10.610	244	KG	2825
84.11-131	162	NO	2042
	1110	KG	
84.11-200	251	KG	1726
84.11-400	267	KG	1386
84.12-019	104	NO	1530
84.12-020	1391	KG	2350
84.13.010	35	KG	442
84.15.111	170	NO	3037
	4145	KG	
84.15-129	8	NO	683
	622	KG	
84.15.310	2	NO	1423
	152	KG	
84.15-330	2	NO	843
	809	KG	
84.15.340	1	NO	133
	25	KG	
84.15.360	11	NO	2627
	1457	KG	
84.15.490	720	KG	1414
84.17.990	4034	KG	9272
84.18.380	405	KG	1369
84.21.015	2	NO	700
	126	KG	
84.22.400	1	NO	2000
	2859	KG	
84.22.610	6	NO	892
	900	KG	
84.22.690	1	NO	5306
	7546	KG	
84.22.720	570	KG	780
84.22.790	1610	KG	5158
84.23.650	5	NO	879
	532	KG	
84.23.790	926	KG	3168
84.24.490	2	NO	357
	460	KG	
84.24.500	133	KG	144
84.25.390	40	NO	1671
	585	KG	
84.25.500	78	KG	828
84.30.150	2	NO	764
	187	KG	
84.30.200	18	KG	265
84.41.111	126	NO	3540
	1108	KG	
84.41.129	48	NO	1829
	502	KG	
84.41.131	3	NO	413
	194	KG	
84.41.134	4	NO	378
	108	KG	
84.46.010	1	NO	279
	95	KG	
84.46.020	2	NO	281
	89	KG	
84.47.019	1	NO	273
	12	KG	
84.48.320	11	KG	146
84.49.119	4	NO	120
	7	KG	
84.49.190	275	NO	8695
	2716	KG	
84.50.000	64	KG	194
84.51.100	44	NO	1675
84.51.200	10	NO	190
84.52.111	7579	NO	38112
84.52.310	172	NO	12342
84.52.390	2	NO	150
84.53.200	1	NO	2000
	110	KG	
84.53.520	3	NO	3400
	91	KG	
84.54.900	457	NO	504
	285	KG	
84.55.219	45	KG	1014
84.55.220	1	KG	128
84.59.200	2	NO	15300
	13600	KG	
84.59.890	31	NO	1345
	564	KG	
84.59.990	100	KG	747
84.60.010	500	KG	4322
84.60.090	390	KG	1885
84.61.021	504	KG	961
84.61.022	50	KG	283
84.61.030	9	KG	203
84.62.010	31	KG	1099
84.63.010	1062	KG	8210
84.63.020	97	KG	843
84.63.030	202	KG	2150
84.63.050	1365	KG	2107
84.63.081	744	KG	1125
84.64.000	15	KG	116
84.65.090	16	KG	1201
(620) Guam(U.S.A.)			
2-ST			238448
85.01-222	136	NO	394
85.01.231	3	NO	259
	114	KG	
85.01.232	1	NO	800
	320	KG	
85.01.400	7	ST	2617
	2050	KG	
85.01.693	1	NO	215
85.01.695	1	NO	130
	58	KG	
85.01.721	659	NO	1135
	420	KG	
85.01.910	130	KG	264
85.02.050	2	NO	3993
	5007	KG	
85.03.010	370	TH	11428
	24870	KG	
85.03.020	3	TH	303
	134	KG	
85.03.030	6	TH	904
	179	KG	
85.04.110	30762	KG	10053
85.04.190	47	KG	312
85.05.020	2	NO	167
85.05.040	37	NO	626
85.06.111	98	NO	270
85.06.119	146	NO	1483
85.06.222	1726	NO	8917
85.06.229	294	NO	2212
85.06.310	95	NO	1428
85.06.500	67	KG	148
85.07.011	322	NO	621
85.07.019	30	NO	156
85.08.010	15397	KG	26654
85.08.090	5	KG	152
85.09.011	80	ST	101
85.09.020	2114	KG	6321
85.10.010	3628	NO	3653
	1783	KG	
85.11-100	16	KG	185
85.12.310	226	NO	624
85.12.400	200	NO	577
85.12.510	4796	NO	21098
85.12.540	379	NO	21989
85.12.600	12	KG	250
85.13-127	226	NO	869
	170	KG	
85.14-110	135	KG	1742
85.14-131	8811	NO	145733
85.14-132	1173	NO	6046
85.14-139	3711	NO	8062
	3805	KG	
85.14-141	2811	NO	77708
	24118	KG	
85.14-149	347	NO	5703
	1312	KG	
85.14-200	210	KG	317
85.15-120	64	NO	586
85.15-131	400	NO	259
85.15-132	141	NO	3364
85.15-191	35	NO	3609
	305	KG	
85.15-192	10	NO	388
	19	KG	
85.15-212	3133	NO	237876
85.15-219	674	NO	19090
85.15-221	5	NO	975
85.15-229	2	NO	335
85.15-311	1292	NO	23598
85.15-319	34	NO	568
85.15-390	415	NO	3919
85.15-413	6298	NO	141267
85.15-414	446	NO	4202
85.15-419	192	NO	1437
85.15-511	1049	NO	92221
85.15-512	800	NO	35992
85.15-521	414	NO	3779
85.15-530	65	NO	1837
85.15-541	2613	NO	141698
85.15-542	905	NO	23105
85.15-543	7	NO	381
85.15-600	28	NO	801
	47	KG	
85.15 700	98	NO	15865
	737	KG	
85.15 890	12	NO	1919
	215	KG	
85 15-910	209	NO	791
85 15-920	150	NO	405
85 15 930	12	NO	101
	30	KG	
85.15 940	4	NO	184
	18	KG	
85.15-960	92	NO	1661
	2824	KG	
85 15 980	893	KG	2236
85 17 090	30	KG	208
85 19 131	98	KG	1911

APPENDIX TABLE B.1 (Continued)

輸出国別品別表 EXPORTS, COUNTRY BY COMMODITY (1979)

国名及び品目符号 COUNTRY & COMMODITY	数量 QUANTITY	単位 UNIT	価額(千円) VALUE(1,000yen)
(620) Guam(U.S.A.)			
85.19-133	4	KG	107
85.19-134	665	NO	199
	20	KG	
85.19-135	148	KG	893
85.19-136	8	NO	1778
	300	KG	
85.19-200	1	KG	124
85.20-110	1610	NO	514
	65	KG	
85.20-199	3500	NO	797
	62	KG	
85.20-210	114	NO	186
	25	KG	
85.20-290	75	NO	284
	16	KG	
85.21-110	41	NO	1174
	685	KG	
85.21-395	839	NO	504
	3	KG	
85.22-910	501	NO	10602
	2252	KG	
85.23-019	2689	KG	1666
85.23-054	142	KG	133
85.23-095	686	KG	2016
85.25-210	4000	KG	1064
2-ST			1171435
87.01-919	3	NO	2482
	2175	KG	
87.02-122	3312	NO	266081
87.02-193	240	NO	327911
87.02-292	1	NO	2950
87.02-922	1126	NO	756132
87.02-923	637	NO	496697
87.03-095	63401	KG	83710
87.07-110	105	NO	171285
	346295	KG	
87.07-200	508	KG	1061
97.09-012	179	NO	11507
87.09-013	352	NO	47157
87.09-014	124	NO	37852
87.10-090	42	NO	849
87.12-010	994	KG	2075
87.12-021	37	NO	286
87.12-039	161	KG	314
87.14-200	17	NO	10514
	49810	KG	
87.14-300	2	NO	182
	140	KG	
87.14-400	350	KG	245
2-ST			4842706
89.01-220	7	NO	315
	126	KG	
89.01-290	8	NO	9687
	5905	KG	
2-ST			10002
90.01-010	293	DZ	2562
90.01-020	820	DZ	3311
90.02-010	1054	NO	20779
90.02-020	214	NO	682
90.02-040	110	DZ	996
90.03-010	21	KG	241
90.04-000	45	DZ	842
90.05-021	4	DZ	482
	82	KG	
90.07-191	371	NO	3950
90.07-192	1241	NO	51563
90.07-193	88	NO	939
90.07-194	233	NO	4152
90.07-195	7	NO	583
90.07-199	10	NO	283
90.07-210	1012	NO	8128
90.07-310	410	NO	1303
90.07-320	226	KG	2945
90.08-110	55	NO	2191
	66	KG	
90.08-120	27	NO	1275
	253	KG	
90.09-020	1	NO	479
	88	KG	
90.10-920	43	NO	4901
	2287	KG	
90.13-010	96	NO	373
	70	KG	
90.16-110	19164	NO	742
	408	KG	
90.16-136	4288	NO	498
	218	KG	
90.17-110	46	NO	7390
	89	KG	
90.18-000	516	KG	1541
90.19-110	12	NO	366
		KG	
90.20-091	92	KG	281
90.22-010	5	NO	907
	68	KG	
90.24-020	200	NO	236
	75	KG	
(620) Guam(U.S.A.)			
90.28-310	4	NO	330
	12	KG	
90.28-320	150	NO	597
	87	KG	
90.28-330	3	NO	1335
	26	KG	
90.28-370	50	NO	324
	10	KG	
90.28-399	30	NO	2840
	206	KG	
90.28-420	4	NO	149
	2	KG	
90.29-000	55	KG	1359
2-ST			131845
91.01-010	18258	NO	172720
91.01-090	25	NO	188
91.03-000	47	NO	457
	12	KG	
91.04-010	2491	NO	9957
	2362	KG	
91.04-091	172	NO	334
	22	KG	
91.04-099	12	NO	139
	45	KG	
91.06-000	340	NO	3003
	509	KG	
91.11-090	5	KG	467
2-ST			187265
92.01-010	54	NO	13966
	10883	KG	
92.02-090	12	NO	140
	30	KG	
92.04-010	90	NO	150
	22	KG	
92.06-010	8	NO	121
	60	KG	
92.07-010	55	NO	12254
	3653	KG	
92.07-020	67	NO	1481
	305	KG	
92.07-090	10	NO	2565
	235	KG	
92.10-030	10	KG	143
92.11-210	45	NO	1397
92.11-220	2964	NO	76058
92.11-300	546	NO	79010
	9032	KG	
92.11-911	34	NO	361
92.11-919	1368	NO	13624
92.11-922	970	NO	12075
92.11-931	963	NO	78066
92.11-932	3945	NO	154505
92.11-933	78	NO	1570
92.11-990	4	NO	849
92.12-110	10533	KG	35031
92.12-190	1857	KG	15657
92.12-211	90	NO	119
92.13-010	226	KG	2965
92.13-090	3098	KG	5573
2-ST			507689
94.01-110	92	NO	2230
	656	KG	
94.01-190	2144	NO	22959
	19709	KG	
94.02-010	4	NO	878
	616	KG	
94.03-110	77125	KG	46896
94.03-190	360	KG	228
94.03-200	36399	KG	28235
94.03-310	110	KG	151
94.03-320	831	KG	2158
94.03-330	12134	KG	7033
94.04-000	144	NO	1330
	307	KG	
2-ST			112098
95.05-050	12	KG	1410
2-ST			1410
96.01-022	12	DZ	172
	22	KG	
96.01-025	5	DZ	112
	20	KG	
96.01-028	258	DZ	1511
	1492	KG	
2-ST			1795
97.01-000	1395	KG	1363
97.02-010	91	DZ	791
	253	KG	
97.02-020	60	DZ	441
	269	KG	
97.02-030	27	DZ	261
	97	KG	
97.03-030	5	DZ	106
	118	KG	
97.03-053	95	DZ	1103
(620) Guam(U.S.A.)			
	379	KG	
97.03-057	106	DZ	291
	186	KG	
97.03-058	221	DZ	1122
	433	KG	
97.03-061	233	DZ	3333
	1476	KG	
97.03-062	1219	DZ	979
	713	KG	
97.03-064	126	DZ	511
	202	KG	
97.03-065	1861	DZ	10240
	4885	KG	
97.04-090	20681	KG	59064
97.05-090	167	KG	774
97.06-019	873	KG	1640
97.07-011	3	DZ	104
97.07-020	29033	DZ	629
97.07-030	1295	DZ	433
97.07-040	18	DZ	379
97.07-090	119	KG	412
2-ST			83976
98.01-010	139	DZ	1984
	22	KG	
98.03-020	7739	DZ	6230
98.03-030	339	DZ	1080
98.03-041	1959	DZ	857
98.03-049	358	DZ	295
98.03-060	41	KG	352
98.05-011	145	GS	738
98.05-020	25	KG	428
98.06-000	495	KG	649
98.10-011	308	DZ	5747
98.10-012	206	DZ	2870
98.10-019	1920	DZ	4551
98.10-021	2	DZ	166
98.10-029	13	DZ	196
98.12-010	80	DZ	292
	27	KG	
98.15-010	58	DZ	1987
	1488	KG	
98.16-000	109	KG	275
2-ST			28607
99.06-000	23	KG	280
2-ST			280
TOTAL			10168234
(620) Guam(U.S.A.)			
97.03-062	20	DZ	174
	130	KG	
97.03-064	22	DZ	308
	118	KG	
97.03-065	711	DZ	5222
	2757	KG	
97.04-020	96	KG	129
97.04-090	15285	KG	6133
97.05-020	18	DZ	340
	104	KG	
97.05-090	312	KG	1554
97.06-019	344	KG	611
97.06-070	3	DZ	397
97.06-090	2100	KG	523
97.07-020	21124	DZ	606
97.07-030	516	DZ	150
97.07-040	12	DZ	197
97.07-090	254	KG	1194
97.08-000	367	KG	1609
2-ST			25990
98.01-010	87	DZ	1322
	10	KG	
98.03-020	1944	DZ	1794
98.03-030	146	DZ	408
98.03-041	2054	DZ	1011
98.03-049	172	DZ	157
98.03-060	53	KG	371
98.05-011	49	GS	313
98.05-020	7	KG	116
98.06-000	165	KG	156
98.08-010	30	DZ	101
98.10-011	82	DZ	1977
98.10-012	90	DZ	1043
98.10-019	1852	DZ	1677
98.10-029	5	DZ	128
98.12-010	79	DZ	119
	19	KG	
98.15-010	97	DZ	2978
	2232	KG	
2-ST			13671
TOTAL			9187850

IMPORTS, COUNTRY BY COMMODITY (1978)

EXPORTS, COUNTRY BY COMMODITY (1978)

国名及び品目符号 COUNTRY & COMMODITY	数量 QUANTITY	単位 UNIT	価額 (千円) VALUE(1,000yen)
Guam(U.S.A.)			
00.00-019	215	KG	348
00.00-029	335377	KG	71495
2-ST			71843
01.06-100	2	NO	159
	2	KG	
2-ST			159
27.10-130	114	KL	1293
27.10-147	31	KL	1111
27.10-175		KL	121
2-ST			4515
47.02-010	14	MT	638
47.02-020	108	MT	6069
2-ST			6707
49.11-210	315	KG	503
2-ST			503
61.06-224	8	DZ	315
	3	KG	
2-ST			345
73.03-200	12	MT	1857
73.03-910	353	MT	5126
73.29-029	500 00	KG	773
73.30-000	16000	KG	260
2-ST			7156
76.01-210	4	MT	597
76.01-220	234	MT	32029
2-ST			32626
78.01-200	5	MT	216
2-ST			216
95.05-100	1	PG	250
2-ST			250
TOTAL			124320

(1979)

Guam(U.S.A.)			
00.00-029	38597	KG	29356
2-ST			29356
03.01-211	250	KG	2509
03.01-241	14036	KG	22504
03.01-244	1064	KG	1128
03.01-245	5613	KG	5615
03.01-246	531	KG	507
03.01-247	1359	KG	1331
03.01-251	2787	KG	2794
03.03-219	1765	KG	1150
2-ST			37538
26.03-290	7	MT	656
2-ST			656
27.10-130	35	KL	1427
27.10-147	86	KL	2517
2-ST			3944
44.05-591	1132	CM	43760
44.05-599	22	CM	886
2-ST			44646
47.02-010	29	MT	1343
2-ST			1343
49.11-210	23	KG	187
2-ST			187
61.02-275	12	DZ	129
	88	KG	
2-ST			129
73.03-100	114	MT	2837
73.03-200	11	MT	1561
73.03-910	3056	MT	63435
73.11-200	9	MT	169
2-ST			68002
74.01-310	68	MT	21984
74.01-321	57	MT	12544
2-ST			34528
76.01-120	15	MT	3013
76.01-215	13	MT	2209
76.01-220	505	MT	86148
2-ST			91400
78.01-200	24	MT	1626
2-ST			1626
84.12-220	5	KG	154
2-ST			154
95.05-239	7	KG	255
2-ST			255
TOTAL			313784

国名及び品目符号 COUNTRY & COMMODITY	数量 QUANTITY	単位 UNIT	価額 (千円) VALUE(1,000yen)
Guam(U.S.A.)			
00.00-090	63320	KG	127897
2-ST			127897
03.01-111	14	KG	104
03.01-119	160	KG	926
03.01-126	42	KG	145
03.01-128	347	KG	985
03.01-132	1812	KG	876
03.01-134	289	KG	1303
03.01-139	589	KG	843
03.01-211	1915151	KG	340015
03.01-214	447662	KG	91642
03.01-222	16533	KG	3805
03.01-223	224	KG	233
03.01-228	1500	KG	535
03.01-229	5876	KG	2983
03.01-312	1104	KG	2702
03.01-319	1174	KG	1245
03.01-412	102	KG	269
03.01-419	1800	KG	818
03.02-206	431	KG	752
03.02-319	642	KG	1046
03.02-323	1397	KG	745
03.02-325	20	KG	348
03.02-329	42	KG	128
03.02-33.	16	KG	120
03.02-410	27	KG	140
03.03-011	28	KG	130
03.03-014	149	KG	111
03.03-015	1300	KG	1458
03.03-016	1407	KG	1644
2-ST			456049
04.04-000	488	KG	481
04.05-110	131	KG	135
2-ST			616
06.02-000	137	NO	235
06.03-000	65	KG	408
2-ST			643
07.01-200	61731	KG	14287
07.01-390	2640	KG	2197
07.01-900	168514	KG	44102
07.04-030	51	KG	301
07.04-090	44	KG	279
2-ST			61166
08.02-210	19487	KG	3438
08.02-290	5163	KG	944
08.06-100	5325	KG	1699
08.06-200	12419	KG	3090
08.07-000	5258	KG	1573
08.08-000	238	KG	243
08.09-000	14741	KG	4285
2-ST			15272
09.02-010	73	KG	232
09.04-010	1901	KG	2082
09.10-910	920	KG	1484
09.10-990	570	KG	734
2-ST			4532
11.08-010	2292	KG	550
11.08-020	1026	KG	246
2-ST			796
12.08-011	280	TH	1326
12.08-019	782	KG	586
2-ST			1912
15.07-100	3300	KG	890
15.07-600	16500	KG	3299
15.07-940	4839	KG	3452
15.07-990	784	KG	421
2-ST			8062
16.02-010	72	KG	102
16.04-025	1507	KG	1094
16.04-051	5457	KG	3434
16.04-052	3393	KG	1748
16.04-042	8184	KG	1710
16.04-043	2946	KG	601
16.04-062	55555	KG	14438
16.04-069	504	KG	105
16.04-099	1989	KG	1742
16.05-030	186	KG	133

国名及び品目符号 COUNTRY & COMMODITY	数量 QUANTITY	単位 UNIT	価額 (千円) VALUE(1,000yen)
(620) Guam(U.S.A.)			
16.05-099	5866	KG	6257
2-ST			31364
17.01-910		MT	873
17.04-010	1540	KG	1203
17.04-020	3233	KG	4733
17.04-090	575	KG	773
2-ST			7582
19.02-000	6377	KG	1580
19.03-010	360	KG	128
19.03-020	4585	KG	1174
19.03-090	1597	KG	767
19.05-000	589	KG	340
19.07-000	43728	KG	21614
19.08-011	14828	KG	8104
19.08-020	5904	KG	6236
19.08-090	13046	KG	11546
2-ST			51489
20.01-010	169	KG	208
20.01-090	182	KG	110
20.02-019	867	KG	636
20.02-091	53694	KG	15556
20.02-092	12190	KG	6477
20.02-099	976	KG	686
20.06-999	684	KG	1803
20.07-300	800	L	318
2-ST			25794
21.03-000	48	KG	125
21.04-021	293963	L	59587
21.04-022	16188	L	2910
21.04-030	3673	KG	1332
21.04-040	13545	KG	3736
21.04-090	2735	KG	3264
21.05-100	1272	KG	1442
21.07-010	2335	KG	6956
21.07-040	135518	KG	72667
21.07-050	64	KG	625
21.07-060	88	KG	141
21.07-090	22082	KG	11085
2-ST			163873
22.02-011	5020	L	890
22.02-019	12604	L	6107
22.02-090	550	L	597
22.03-000	48238	L	4947
22.07-010	12037	L	4306
22.07-090	180	L	172
22.09-920	5490	L	1895
22.10-000	1662	L	371
2-ST			19285
25.03-000	15	MT	948
25.22-000	27	MT	2147
25.23-610	71185	MT	520643
2-ST			523738
27.10-719	8	KL	2349
27.16-000	58	MT	2710
2-ST			5059
28.08-000	1150	KG	124
28.17-100	115950	KG	13134
2-ST			13258
29.02-500	250	KG	413
29.08-000	767200	KG	111341
29.23-011	8074	KG	11794
2-ST			123548
30.03-999	700	KG	1181
30.04-010	111	KG	326
2-ST			1507
31.02-200	34	MT	2513
2-ST			2513
32.09-241	16744	KG	5909
32.12-000	810	KG	257
2-ST			6166
33.06-021	60	KG	529
33.06-022	1603	KG	1731
33.06-032	129	KG	198
33.06-039	95	KG	387
2-ST			2845
34.01-010	320	KG	274
34.01-029	150	KG	126
34.02-011	7194	KG	1020
2-ST			1420
35.06-010	400	KG	137
35.06-090	4224	KG	1182
2-ST			1319
36.05-020	366	KG	717
36.06-010	9562	KG	5483

国名及び品目符号	数量	単位	価額 (千円)
(620) Guam(U.S.A.)			
36.06-090	150	KG	130
2-ST			6330
37.01-010	2831	SM	3953
37.01-090	364	SM	585
37.02-019	2651	M	240
37.02-091	54	SM	130
37.02-092	1452	SM	10143
37.03-020	16702	SM	13867
37.07-091	1352	M	151
37.07-092	3482	M	424
37.08-000	1688	KG	2399
2-ST			32102
38.11-230	8923	KG	4922
38.16-000	2600	KG	429
38.19-990	15311	KG	1434
2-ST			9785
39.01-321	4256	SM	5732
39.01-322	3298	SM	3013
39.01-610	1359	KG	1257
39.01-690	156	KG	1172
39.01-810	195	KG	438
39.01-820	80	KG	234
39.01-910	4609	KG	1623
39.02-211	42909	KG	5068
39.02-231	270	KG	141
39.02-310	15240	KG	5252
39.02-320	156	KG	805
39.02-410	963	KG	1278
39.02-511	6015	KG	2192
39.02-539	3834	KG	1204
39.02-540	124903	KG	14039
39.02-552	1560	KG	652
39.02-553	282	KG	341
39.02-710	540	KG	390
39.02-731	1503	KG	865
39.02-739	677	KG	576
39.02-811	178	KG	118
39.02-100	16041	KG	8793
39.07-260	55	KG	118
39.07-290	40	KG	178
39.07-400	262	KG	137
39.07-650	645	KG	1119
39.07-910	46511	DZ	5242
	4803	KG	
39.07-920	52	DZ	572
	471	KG	
39.07-990	16313	KG	16951
2-ST			81499
40.09-010	1393	KG	1648
40.10-010	370	M	2101
	1921	KG	
40.10-021	16	M	661
	69	KG	
40.11-100	2464	NO	8514
	19384	KG	
40.11-200	1151	NO	17544
	42736	KG	
40.11-410	155	NO	451
	811	KG	
40.11-510	1642	NO	1760
	3954	KG	
40.11-590	25	NO	191
	341	KG	
40.11-920	425	NO	20766
	42118	KG	
40.11-990	11	NO	530
	1600	KG	
40.14-090	393	KG	1696
2-ST			55862
42.01-000	378	KG	899
42.02-230	200	DZ	1434
	1032	KG	
42.02-290	18	DZ	170
	13	KG	
42.02-320	67	DZ	407
	445	KG	
42.02-330	416	DZ	1521
	650	KG	
42.02-911	39	DZ	170
	81	KG	
42.02-912	75	DZ	115
	43	KG	
42.02-991	55	DZ	1455
	164	KG	
42.02-999	22	DZ	743
	347	KG	
42.03-031	12	DZ	448
	84	KG	
42.03-050	32	DZ	451
	2	KG	
2-ST			7813
44.21-000	17925	KG	2901
44.23-010	1	NO	164
	27	KG	

国名及び品目符号	数量	単位	価額 (千円)
(620) Guam(U.S.A.)			
44.24-090	4516	KG	4185
44.27-011	234	KG	387
44.27-099	6195	KG	4772
44.28-000	1075	KG	1497
2-ST			13906
46.02-010	200	SM	164
	126	KG	
2-ST			164
48.01-210	435	KG	161
48.01-990	6480	KG	598
48.14-020	95	KG	447
48.15-100	7900	KG	2443
48.15-200	2221	KG	572
48.15-920	3222	KG	1061
48.15-990	330	KG	136
48.16-020	2624	KG	2946
48.16-030	49717	KG	8413
48.18-012	599	DZ	3258
	6968	KG	
48.18-019	185	DZ	1320
	1882	KG	
48.18-030	266	KG	1156
48.18-040	1268	KG	2352
48.19-000	953	KG	2392
48.21-200	840	KG	522
48.21-300	1742	KG	1424
48.21-900	4121	KG	4066
2-ST			33267
49.01-000	26398	NO	13263
49.02-010	120000	NO	5277
49.02-020	60577	NO	15341
49.06-000	28	KG	516
49.09-000	2937	KG	2419
49.10-000	1393	KG	804
49.11-100	20655	KG	13474
49.11-210	34	KG	182
49.11-220	589	KG	837
49.11-290	1265	KG	1843
2-ST			53956
51.02-110	102	KG	264
51.04-211	836	SM	107
	53	KG	
51.04-229	16226	SM	3585
	2291	KG	
51.04-511	1277	SM	272
	173	KG	
2-ST			4228
55.09-216	1033	SM	109
	83	KG	
55.09-221	15980	SM	5209
	2853	KG	
55.09-224	510	SM	138
	60	KG	
55.09-225	418	SM	101
	42	KG	
55.09-228	6056	SM	1799
	942	KG	
55.09-295	903	SM	261
	112	KG	
55.09-500	316	KG	464
2-ST			8081
56.07-120	459	SM	113
	75	KG	
56.07-130	1628	SM	407
	130	KG	
56.07-221	4122	SM	863
	398	KG	
56.07-223	1840	SM	282
	223	KG	
56.07-599	1021	SM	173
	62	KG	
2-ST			1836
58.02-600	1334	SM	427
	676	KG	
58.04-490	250	SM	251
	72	KG	
58.05-013	991	KG	1710
2-ST			2388
59.03-010	34	KG	136
59.04-040	3032	KG	2709
59.04-050	562	KG	542
59.04-080	570	KG	330
59.05-011	63	KG	179
59.05-012	363	KG	733
59.05-092	4469	KG	5354
59.08-000	3406	KG	1909
59.11-091	190	KG	106
2-ST			11998
60.01-311	36746	KG	34500
60.01-321	2952	KG	6492
60.01-329	1766	KG	2148

国名及び品目符号	数量	単位	価額 (千円)
(620) Guam(U.S.A.)			
60.01-410	216	KG	112
60.04-210	25	DZ	113
	49	KG	
60.05-420	310	DZ	1557
	989	KG	
60.05-520	65	DZ	273
	100	KG	
60.05-530	43	DZ	251
	66	KG	
60.05-630	40	DZ	133
	60	KG	
60.05-730	9	DZ	111
	9	KG	
2-ST			45990
61.01-430	7	DZ	183
	30	KG	
61.01-921	10	DZ	435
	281	KG	
61.01-929	178	DZ	2694
	543	KG	
61.01-930	25	DZ	253
	18	KG	
61.02-720	12	DZ	214
	60	KG	
61.02-730	126	DZ	1501
	595	KG	
61.03-100	46	DZ	168
	86	KG	
2-ST			5445
62.02-510	226	DZ	2223
	727	KG	
62.02-600	200	DZ	262
	75	KG	
62.02-819	20	KG	136
62.02-890	13	KG	117
62.03-020	2000	NO	133
	95	KG	
62.04-100	54	KG	132
62.04-919	375	KG	444
62.05-091	70	KG	475
62.05-092	317	KG	720
2-ST			4644
63.02-020	2267	KG	414
2-ST			414
64.01-021	27	DZ	309
64.01-041	1302	DZ	2797
64.01-049	184	DZ	754
64.02-022	35	DZ	531
64.02-030	119	DZ	1101
64.04-000	24	DZ	162
2-ST			5645
65.06-010	30	DZ	1761
	494	KG	
2-ST			1761
66.01-010	105	KG	309
66.01-092	51	DZ	645
66.01-099	187	DZ	1330
2-ST			2284
68.02-000	2	MT	1890
68.04-010	6	KG	287
68.07-090	14018	KG	5675
68.12-000	3	MT	321
68.13-090	462	KG	144
68.14-010	10934	KG	3739
2-ST			12056
69.07-010	601	SM	957
69.07-090	2376	KG	271
69.08-010	6095	SM	9573
69.08-020	130	MT	14143
69.10-000	80	KG	137
69.11-012	1906	DZ	9070
	6845	KG	
69.11-013	1151	DZ	6620
	4599	KG	
69.11-019	1641	DZ	6964
	4693	KG	
69.12-011	500	DZ	2868
	2380	KG	
69.12-012	826	DZ	2359
	3656	KG	
69.12-012	128	DZ	741
	522	KG	
69.12-019	331	DZ	1604
	1455	KG	
69.13-010	1785	KG	3653
69.13-090	484	KG	530
69.14-000	6135	KG	1478
2-ST			60968
70.08-010	102	KG	142
70.09-000	125	KG	157
70.13-011	1844	KG	1877

輸出国別品別表 EXPORTS, COUNTRY BY COMMODITY (1978) 671

国名及び品目符号 COUNTRY & COMMODITY	数量 QUANTITY	単位 UNIT	価額 (千円) VALUE(1,000yen)
(620) Guam(U.S.A.)			
70.13-019	160	KG	262
70.13-020	346	KG	1136
70.14-011	3	NO	379
	55	KG	
70.16-090	3170	KG	569
2-ST			4516
71.01-029	28000	GR	293
71.12-010		KG	3613
71.12-090	8	KG	1000
71.15-090	194	KG	2113
71.16-019	11	DZ	125
	1	KG	
71.16-024	183	DZ	758
	37	KG	
71.16-029	19	DZ	490
	3	KG	
71.16-030	270	DZ	2299
	19	KG	
71.16-061	256	DZ	4036
	96	KG	
71.16-091	364	KG	1280
71.16-092	3	KG	385
71.16-093		KG	217
71.16-099	8	KG	2257
2-ST			18866
73.03-900	101	MT	4360
73.10-231	36	MT	2267
73.10-234	481	MT	27159
73.10-235	38	MT	3647
73.10-236	3	MT	346
73.10-237	19	MT	1821
73.10-239	87	MT	7631
73.10-920	15	MT	2300
73.11-211	2	MT	323
73.11-212	2	MT	285
73.11-213	6	MT	630
73.11-311	27	MT	3026
73.11-319	3	MT	339
73.11-321	15	MT	625
73.11-329	9	MT	353
73.11-500	24	MT	3055
73.11-600	77	MT	6652
73.12-021	4	MT	807
73.12-041	4	MT	571
73.13-110	518	MT	47945
73.13-120	320	MT	27857
73.13-200	13	MT	1332
73.13-319	1	MT	120
73.13-912	23	MT	3076
73.13-913	252	MT	25484
73.14-021	33	MT	4586
73.14-091	42	MT	2804
73.15-330		MT	613
73.15-612		MT	473
73.15-642		MT	558
73.15-720		MT	332
73.18-139	12	MT	2722
73.18-931	164	MT	16432
73.18-932		MT	103
73.18-934	81	MT	8589
73.18-936	16	MT	2255
73.20-010	3	MT	1880
73.20-090	5	MT	4237
73.21-040	38	MT	12616
73.21-090	1886	MT	318698
73.22-000	2	MT	250
73.23-090	60	KG	112
73.25-019	22	MT	2908
73.27-020	7	MT	960
73.27-090	3	MT	983
73.31-010	104652	KG	16919
73.31-090	10295	KG	2618
73.32-011	1215	KG	459
73.32-021	130	KG	136
73.32-029	199	KG	275
73.36-190	61	NO	3194
	1533	KG	
73.38-110	154	KG	106
73.38-190	7783	KG	5820
73.38-200	200	KG	437
73.40-990	43415	KG	15196
2-ST			599885
74.03-021		MT	115
74.07-010		MT	304
74.19-000	12	KG	127
2-ST			546
76.03-019	8269	KG	3526
76.15-120	166	DZ	329
	347	KG	
76.16-090	479	KG	617
2-ST			4472
82.01-010	36	DZ	326
	290	KG	
82.01-030	8	DZ	103
	69	KG	
(620) Guam(U.S.A.)			
82.01-040	36	DZ	326
	216	KG	
82.01-050	32	DZ	280
	90	KG	
82.02-021	1033	NO	1502
82.02-030	432	NO	534
82.03-100	1022	NO	714
	623	KG	
82.03-940	37	NO	2666
82.04-011	84	NO	126
82.04-019	479	KG	1092
82.04-020	2220	NO	396
82.05-020	23	NO	571
82.05-040	44	NO	125
82.06-000	220	KG	559
82.08-010	84	NO	125
82.09-011	135	DZ	558
	98	KG	
82.09-091	33	DZ	436
	126	KG	
82.09-099	8	DZ	104
	55	KG	
82.14-011	386	DZ	976
	287	KG	
82.14-012	80	DZ	127
	39	KG	
82.14-021	140	DZ	271
	79	KG	
82.14-031	387	DZ	565
	148	KG	
2-ST			12482
83.01-011	3270	KG	4465
83.02-010	7806	KG	3882
83.02-090	276	KG	342
83.03-090	2426	KG	2788
83.05-010	368	KG	209
83.06-090	13	KG	130
83.07-011	92	NO	241
	126	KG	
83.07-012	65	NO	1146
	554	KG	
83.07-019	454	KG	1159
83.08-010	206	KG	444
83.09-019	3	KG	342
83.09-090	1	KG	124
83.13-010	9291	KG	4844
83.15-012	80	KG	192
83.15-019	2520	KG	510
2-ST			20818
84.05-210	110	KG	590
84.06-390	2	NO	461
	740	KG	
84.06-400	16	NO	1749
	740	KG	
84.06-591	2	NO	3208
	829	KG	
84.06-611	10	NO	427
	135	KG	
84.06-710	20614	KG	41730
84.06-720	957	KG	4808
84.06-790	172	KG	1235
84.09-012	2	NO	3367
	3370	KG	
84.09-020	32	KG	144
84.10-100	1	NO	273
	180	KG	
84.10-210	4	NO	763
	143	KG	
84.10-310	724	NO	4074
	1892	KG	
84.10-491	2	NO	309
	27	KG	
84.10-499	16	NO	956
	148	KG	
84.10-511	5	NO	434
	54	KG	
84.10-610	378	KG	2995
84.11-120	2	NO	1199
	350	KG	
84.11-131	28	NO	1757
	828	KG	
84.11-132	1	NO	2143
	4600	KG	
84.11-200	278	KG	1031
84.11-400	479	KG	3734
84.12-011	7	NO	355
84.12-019	34	NO	2988
84.12-020	90	KG	154
84.15-111	163	NO	3470
	2750	KG	
84.15-310	2	NO	1264
	620	KG	
84.15-330	2	NO	969
	162	KG	
84.15-390	7	NO	3935
	1940	KG	
84.15-410	26	KG	247
84.15-490	9256	KG	11221
(620) Guam(U.S.A.)			
84.17-990	11597	KG	15968
84.18-200	2381	NO	1533
	1187	KG	
84.18-390	96	KG	515
84.20-110	18	NO	3839
	252	KG	
84.21-012	10	NO	484
	160	KG	
84.22-219	3	NO	3601
	2945	KG	
84.22-621	4	NO	341
	540	KG	
84.22-710	630	KG	753
84.22-790	90	KG	450
84.23-220	1	NO	2450
	11290	KG	
84.23-300	3	NO	39054
	51424	KG	
84.23-490	2	NO	4601
	17250	KG	
84.23-690	2	NO	337
	134	KG	
84.23-790	6574	KG	9309
84.24-310	1	NO	197
	90	KG	
84.24-490	1	NO	153
	190	KG	
84.25-100	20	NO	657
	230	KG	
84.25-390	103	NO	3471
	1179	KG	
84.25-500	23	KG	235
84.28-100	18	NO	506
	189	KG	
84.30-190	1	NO	606
	396	KG	
84.40-490	1	NO	11035
	7730	KG	
84.41-111	165	NO	4064
	1476	KG	
84.45-290	5	NO	993
	450	KG	
84.46-010	1	NO	749
	270	KG	
84.48-110	28	KG	149
84.49-111	4	NO	214
	79	KG	
84.49-119	4	NO	529
	197	KG	
84.49-190	307	NO	13296
	5448	KG	
84.49-200	16	KG	106
84.51-100	25	NO	834
84.51-200	44	NO	485
84.52-111	6212	NO	31770
84.52-112	12	NO	194
	26	KG	
84.52-310	75	NO	6638
84.52-390	11	NO	1175
84.53-530	1	NO	300
	5	KG	
84.54-900	236	NO	2337
	1090	KG	
84.55-219	25	KG	444
84.56-310	1	NO	212
	140	KG	
84.56-390	1	NO	195
	60	KG	
84.59-430	5	NO	30122
	19700	KG	
84.59-490	5	NO	441
	850	KG	
84.59-890	5	NO	2512
	371	KG	
84.59-990	98	KG	662
84.60-010	300	KG	2251
84.61-021	15875	KG	20488
84.61-030	87	KG	344
84.62-010	84	KG	274
84.63-010	725	KG	1781
84.63-020	26	KG	391
84.63-030	110	KG	1251
84.63-050	15	KG	133
84.63-060	2	NO	392
	199	KG	
84.63-081	50	KG	127
84.65-090	18	KG	428
2-ST			328366
85.01-222	41	NO	153
85.01-223	21	NO	728
85.01-224	1	NO	230
	17	KG	
85.01-231	3	NO	363
	101	KG	
85.01-400	7	ST	6129
	4222	KG	
85.01-721	140	NO	675
	224	KG	
85.01-722	220	NO	150

国名及び品目符号	数量 QUANTITY	単位 UNIT	価額 (千円) VALUE(1,000yen)
(620) Guam(U.S.A.)			
	38	KG	
85.01-729	90	NO	163
	34	KG	
85.01-910	8	KG	108
85.02-040	15	KG	395
85.03-010	305	TH	8581
	20844	KG	
85.03-030	4	TH	840
	59	KG	
85.04-110	12577	KG	5109
85.04-190	317	KG	774
85.05-020	30	NO	294
85.05-040	58	NO	1529
85.05-050	152	KG	473
85.06-111	50	NO	162
85.06-119	54	NO	650
85.06-222	3567	NO	20173
85.06-229	108	NO	1316
85.06-490	100	NO	155
85.06-500	91	KG	185
85.07-011	80	NO	204
85.08-010	32978	KG	31351
85.08-090	57	KG	622
85.09-020	4181	KG	8660
85.16-010	2579	NO	2806
	1162	KG	
85.11-211	2	NO	189
	192	KG	
85.11-212	2	NO	460
	135	KG	
85.12-310	510	NO	1651
85.12-490	36	NO	118
85.12-510	5671	NO	24123
85.12-540	334	NO	23989
85.12-550	159	NO	566
	515	KG	
85.12-600	22	KG	350
85.13-125	2	NO	291
	16	KG	
85.13-127	98	NO	347
	60	KG	
85.13-131	1	NO	2280
	144	KG	
85.13-220	18	KG	138
85.14-110	261	KG	3277
85.14-131	10143	NO	195711
85.14-132	1705	NO	7413
85.14-139	2451	NO	5145
	2441	KG	
85.14-141	2456	NO	80238
	24943	KG	
85.14-149	145	NO	1452
	401	KG	
85.14-200	208	KG	338
85.15-120	202	NO	803
85.15-131	52	NO	329
85.15-132	60	NO	896
85.15-191	16	NO	2184
	254	KG	
85.15-192	13	NO	666
	28	KG	
85.15-212	3035	NO	209702
85.15-219	1031	NO	28263
85.15-221	10	NO	1183
85.15-311	1117	NO	20036
85.15-319	64	NO	798
85.15-390	122	NO	875
85.15-411	94	NO	2257
85.15-412	132	NO	944
85.15-413	6024	NO	119787
85.15-414	504	NO	4857
85.15-511	24	NO	2290
85.15-512	1122	NO	70893
85.15-521	691	NO	6732
85.15-530	102	NO	2287
85.15-541	3075	NO	196881
85.15-542	771	NO	21795
85.15-600	6	NO	156
	36	KG	
85.15-700	17	NO	3957
	124	KG	
85.15-830	1	NO	221
	20	KG	
85.15-890	6	NO	705
	105	KG	
85.15-910	200	NO	346
85.15-920	110	NO	217
85.15-930	37	NO	493
	307	KG	
85.15-990	617	KG	2155
85.16-000	374	KG	605
85.19-129	11	NO	228
	27	KG	
85.19-131	19	KG	356
85.19-134	832	NO	154
	45	KG	
85.19-135	223	KG	947
85.19-136	12	NO	1962
	445	KG	
85.19-200	18	KG	337
85.19-310	105	NO	389
	13	KG	
85.20-110	2648	NO	874
	198	KG	
85.20-120	4000	NO	182
	46	KG	
85.20-210	535	NO	330
	124	KG	
85.20-290	4	NO	150
	95	KG	
85.20-500	399	KG	555
85.21-110	6	NO	156
	82	KG	
85.21-212	3	NO	174
	2	KG	
85.21-395	730	NO	321
	1	KG	
85.22-910	930	NO	17351
	3391	KG	
85.23-021	121	KG	260
85.23-091	604	KG	328
85.23-095	1187	KG	1127
85.28-000	2	KG	347
2-ST			1171109
86.08-000	1	NO	1130
	2560	KG	
2-ST			1130
87.01-990	1	NO	48120
	41350	KG	
87.02-191	1	NO	141
87.02-192	3117	NO	2098481
87.02-193	371	NO	477571
87.02-922	869	NO	612717
87.02-923	548	NO	382350
87.02-993	1	NO	167
87.06-010	4220	KG	2170
87.06-090	91805	KG	83779
87.07-110	14	NO	21432
	45670	KG	
87.07-200	48	KG	289
87.09-012	67	NO	4515
87.09-013	467	NO	63644
87.09-014	263	NO	75617
87.10-000	168	NO	2776
87.12-010	2893	KG	4049
87.12-021	4	NO	169
87.14-200	4	NO	4038
	6645	KG	
87.14-300	79	NO	396
	1308	KG	
2-ST			3882421
89.01-290	1	NO	740
	421	KG	
89.03-010	1	NO	26867
	454	GT	
2-ST			27607
90.02-010	1510	NO	35554
90.02-020	247	NO	994
90.02-040	294	DZ	3038
90.02-090		KG	149
90.05-011		DZ	160
	54	KG	
90.05-021	24	DZ	2037
	330	KG	
90.07-191	200	NO	2294
90.07-192	1158	NO	47165
90.07-193	4	NO	227
90.07-194	282	NO	3982
90.07-195	3	NO	245
90.07-210	1346	NO	10423
90.07-310	476	NO	1697
90.07-320	614	KG	5947
90.08-110	59	NO	2764
	98	KG	
90.08-120	42	NO	1205
	305	KG	
90.09-030	1	NO	224
	35	KG	
90.10-920	5	NO	1186
	144	KG	
90.13-010	539	NO	435
	322	KG	
90.14-990	4	KG	187
90.16-110	3	NO	166
	90	KG	
90.16-139	1	NO	117
	6	KG	
90.17-210	1	ST	558
	62	KG	
90.18-000	295	KG	405
90.20-091	37	KG	197
90.24-020	12	NO	341
	44	KG	
90.24-090	2	NO	385
	20	KG	
90.28-190	3	NO	375
90.28-330	7	KG	
	2	NO	116
	16	KG	
90.28-370	23	NO	146
	4	KG	
90.28-399	28	NO	5078
	192	KG	
90.28-520	85	NO	334
	41	KG	
90.28-590	2	NO	398
	20	KG	
90.29-000	14	KG	265
2-ST			129794
91.01-010	16950	NO	190723
91.01-090	1557	NO	10566
91.04-010	277	NO	1665
	409	KG	
91.04-091	143	NO	847
	253	KG	
91.04-099	15	NO	186
	55	KG	
91.06-000	220	NO	1310
	228	KG	
91.07-000	62	NO	228
2-ST			205530
92.01-010	84	NO	20701
	18560	KG	
92.02-010	648	NO	4833
	1787	KG	
92.02-090	106	NO	314
	96	KG	
92.06-010	10	NO	147
	70	KG	
92.07-010	30	NO	6571
	3044	KG	
92.07-020	16	NO	248
	66	KG	
92.10-090	86	KG	270
92.11-210	20	NO	170
92.11-220	4415	NO	127151
92.11-300	194	NO	31495
	3425	KG	
92.11-911	254	NO	1257
92.11-919	892	NO	6573
92.11-921	63	NO	2884
92.11-922	1148	NO	13711
92.11-923	20	NO	150
92.11-931	1039	NO	84719
92.11-932	4153	NO	176777
92.11-933	315	NO	7220
92.11-990	20	NO	483
92.12-110	8633	KG	31473
92.12-190	420	KG	4136
92.13-010	247	KG	4380
92.13-090	227	KG	1073
2-ST			526736
94.01-110	21	NO	3277
	746	KG	
94.01-190	954	NO	12291
	11513	KG	
94.01-200	55	KG	112
94.02-010	1	NO	227
	154	KG	
94.02-020	13	NO	1017
	656	KG	
94.02-090	396	KG	524
94.03-110	42099	KG	26240
94.03-190	2663	KG	2494
94.03-200	21139	KG	20238
94.03-310	60	KG	260
94.03-320	1391	KG	2687
94.03-330	15905	KG	10217
2-ST			79584
95.05-010	67	KG	12707
2-ST			12707
96.01-000	20	DZ	141
	120	KG	
96.02-092	178	DZ	1125
	926	KG	
96.02-099	54	KG	222
2-ST			1488
97.01-000	1065	KG	1108
97.02-020	67	DZ	681
	409	KG	
97.03-010	35	DZ	513
	185	KG	
97.03-053	28	DZ	535
	213	KG	
97.03-057	40	DZ	130
	77	KG	
97.03-058	30	DZ	306
	135	KG	
97.03-061	264	DZ	3570
	1900	KG	

APPENDIX C

ENVIRONMENTAL IMPACT ASSESSMENT

ENVIRONMENTAL IMPACT ASSESSMENT

for the

PROPOSED EXPANSION OF THE

COMMERCIAL PORT CONTAINER YARD

Prepared for

Maruyama & Associates, Ltd. (Guam)

and

Dravo Van Houten (New York)

JOINT VENTURE

by

PACIFIC BASIN ENVIRONMENTAL CONSULTANTS

August 1980

I. INTRODUCTION

The preparation of this Environmental Impact Assessment (EIA) is required in order to meet the standards established under the National Environmental Policy Act of 1969 (NEPA). At the present time expansion of port facilities meets at least two major criteria of this act: acquisition of federal funds and utilization of federal land. This EIA is being prepared to satisfy the NEPA requirements and because of the Port's general environmental conscientiousness.

The objective of this EIA is mainly to assess the impact of the proposed container yard expansion. This expansion will entail grading and paving of an 11 acre site north of the existing yard, relocation of Route 11, construction of a seawall to protect the roadway from storm waves, installation of storm drainage system, lighting and fencing. "(See Plate 6 of Commercial Port Master Plan)". Further expansion of the container yard, beyond that proposed at this time, would probably entail additional wharf construction and dredging. Impacts associated with this construction would have to be evaluated at that time.

The second most important land use anticipated for Cabras Island is for the future requirements of the power plants. Replacement of the present oil fired plants by OTEC would produce positive environmental impacts however if the plants are converted to coal there are several potential negative impacts. These will all have to be evaluated at the time that conversion is seriously considered.

Fisheries related projects such as canneries, etc., can result in environmental damage. However, it is generally accepted that all discharge from such units would be cleared before discharge into the island sewer system.

The extent of environmental degradation that can result from port related industries will depend entirely upon the extent and the type of these industries.

A ship building and repair industry would need extensive mitigating effort. Other manufacturing and assembling industries that need mass importation of material for use as raw material would also impact the environment depending on the kind of materials and processes involved. Environmental assessment on these must be deferred to the time when there is a prospect for such an industry being established at Apra Harbor.

Where the present land use is continued it is expected that expansion, if any, will be along the existing lines with built-in adequate controls to mitigate possibilities of environmental problems.

II. STATEMENT OF NEGATIVE DECLARATION

After careful evaluation of all relevant information relating to the proposed Commercial Port container yard expansion project, it seems reasonable that a statement of Negative Declaration be prepared.

Negative impact on the environment is expected to be greatest on the land since a section of coastline must be cleared in order to build the facility. Other aspects of environmental concern are those impacts associated with primary construction activities, i.e., displacement of wildlife, fugitive dust, noise, and congestion. In the case of this project, disturbance to wildlife is not expected since species diversity and actual numbers are exceedingly limited. Construction related primary impacts are short-term and will create only minimal environmental impact. Some of the potental impacts due to construction can be minimized by using sound construction practices.

The proposed container yard expansion project has been demonstrated to be an essential element in the future development of the Commercial Port complex and the island's economy. Previous plans and policies by local and federal government agencies have identified this need and have given it top priority. Furthermore, sufficient land adjacent to the existing container yard has been secured from the U.S. Navy. This parcel of land has been used as a container/storage yard for several years. Any further work on this parcel will only benefit the Commercial Port complex.

Although the proposed container yard expansion project will not significantly affect the environment adversely, and although the project conforms to government plans and policies, it is suggested that the following recommendations be followed:

1. Provide a storm water drainage system to handle additional runoff and connect to existing system, which may require additional outlets to Apra Harbor.

2. New container yard must be paved, fenced, striped and lighted adequately.

3. Adequate number of fire hydrants must be provided.

4. The existing natural "scenic overlook" should be maintained and be made accessible from the realigned road.

We urge that the preceding recommendations be carefully evaluated by inclusion in the expansion of the container yard at Cabras Island. Based on this EIA, it is suggested that this Statement of Negative Declaration be accepted and that an EIS not be required.

III PROJECT DESCRIPTION

A. Purpose of Action

The Port Authority of Guam plans to renovate, upgrade, and expand the entire port facility to handle the increasing demand for port related activities of the future. Since the Commercial Port was designed and constructed in 1968, major breakthroughs have occurred regarding the methods employed in moving shipboard cargo. The majority of cargo brought to Guam is containerized--an innovation which drastically improved shipping in the early 1970's.

At the present time the Guam Port Authority operates under a combination grounded storage-straddle crane operation and a container on chassis method, having progressed from the straddle carrier method as the annual number of containers increased significantly.

This method of container handling has the advantage of high density storage. The straddle cranes employed at Guam permit stacking containers five wide and four high. However, herein lies the major disadvantage: extremely poor accessibility to containers. There are other distinct drawbacks to this method of handling containers. These include the cost of equipment and high maintenance and operating expenses. Furthermore, high density storage is usually associated with some form of automatic yard control system requiring a degree of sophistication beyond the capabilities of small and medium sized container terminals. For these reasons, such a container handling system is not recommended unless terminal through-put reaches a high level and yard space is limited.

United States Lines, the carrier with the largest amount of general cargo traffic at the Port, currently leases six acres of unimproved land on the North side of Route 11. This is part of the Navy land which will be turned over to the Government of Guam. This lease was necessary to provide room for storage of chassis units used by United States Lines. As a matter of corporate policy the United States Lines utilizes an all-chassis operation in its worldwide operation. With approximately weekly service the containers which arrive on one ship are generally stripped of contents and shipped out on the next vessel. Retaining these containers on chassis greatly simplifies the operation of receipt, delivery to the consignee, receipt back into the container yard and loading onto the ship. This requires a chassis inventory greater than the number of containers discharged per ship.

The second domestic carrier, American President Lines (APL) utilizes a combined chassis and grounded operation at Guam. This is partly due to the restricted area in the existing container yard and partly to APL's fortnightly service. The longer inter-arrival time of ships permits APL to obtain multiple uses from the chassis and thus

operate with fewer chassis units than the number of containers discharged per ship. Guam is the only terminal in the APL system which is operated in a partly grounded fashion. There is considerable competition between APL and United States Line. It is indicated that APL would convert to an all-chassis operation if the terminal area would permit. This would allow APL to offer quicker delivery of containers after ship arrival. There is also the attraction of a reduction in operating costs via a shift to an all-chassis operation.

The advantages of the all-chassis method of operation are:

1. Containers are very accessible.

2. Once containers reach the yard, either from the street or the wharf, no additional lifting is necessary.

3. Increased health/safety for workers since most containers will not be stacked.

4. Improved ship loading and unloading time.

5. Less time required to secure for a typhoon.

The disadvantages are:

1. Requires a substantial investment in chassis.

2. Requires more yard space than grounded operation with close stacking..

Under this system there is no additional labor cost associated with the sorting, rehandling and storage of containers in the yard. This system is usually employed when accessibility is of utmost importance, where labor rates are high, or when a shipping line desires to provide maximum service. The economics and financial justification of the project have been established in the Maruyama and Associates, Ltd. - Dravo Van Houten, study.

B. Description of the Project

The Port Authority of Guam proposes to expand the container yard into an 11 acre site directly north of the existing yard "(See Plate 6 of Commercial Port Master Plan)". The basic scope-of-work encompasses the following tasks:

1. Level and compact the area in conformity with the existing container yard.

2. Realign the existing highway (Route 11) and utilities, on the northeast boundary.

3. Construct a seawall along the northern side of the realigned highway to prevent damage as a result of heavy wave run-up.

4. Provide adequate storm water drainage and connect to the existing disposal system.

5. Provide an underground electrical system for the proposed reefer plugs and floodlights.

6. Provide lighting and security fencing around the perimeter of the expanded yard.

7. Pave the expanded container yard and various areas associated with the new construction.

C. Environmental Setting as it Exists

1. Geology and Topography of Cabras Island

Apra Harbor is a deep lagoon enclosed by a submarine coral bank and a barrier reef on which a breakwater has been constructed, Cabras Island, and Orote Point, the latter two being raised limestone plateaus of reef origin. Cabras Island is a narrow limestone ridge with abrupt scarps and cliffs ranging up to 65 feet in elevation and an interior characterized by small hills covered with vegetation; the seaward side of Cabras Island was greatly altered by quarrying for the original construction of the Glass Breakwater. Additional quarrying was done on Cabras Island for reconstruction of the breakwater following the damage sustained during Typhoon Pamela in 1976. Much of Apra Harbor's shoreline is artificially filled land as is much of the existing container yard. Randall (1974) defines the majority of Cabras Island adjacent to the Commercial Port facility as:

> Limestone rock land, steep . . . largely of steep ridges, scarps and cliffs, prevailing surface gradient 25 to more than 100 percent, with many scarps or cliffs nearly vertical.

2. Flora and Fauna

Vegetation within the project site is primarily restricted to low rises or higher limestone knolls, and is mainly comprised of low shrub-like plants, small trees, or weeds and grass. Only a few larger trees exist here.

This area was highly modified as a result of the earlier quarrying. Most all natural vegetation was removed long ago when the breakwater was first constructed and subsequently when the Port was constructed and

then expanded. Since the project site is currently being used as a container yard facility, vegetation is non-existent except in isolated spots.

Tangan Tangan (Leucaena leucocephala) is the dominant form of vegetation within the project site and is found in isolated low spots as well as on the higher limestone knolls. A number of smaller forms are commonly found in the same areas, such as the Inkberry vine (Cestrum pallidum), False poinsettia (Euphorbia sp.) and Sensitive plant (Mimosa sp.).

Two dominant weeds, Bidens pilosa and Stachytarpheta indica, are found scattered about along with at least two types of grasses of the genus Pennisetum which are usually found along easements or bordering the container yard.

The Beach Morning Glory (Ipomoea pes-caprae), a vine-like plant, is commonly found on the fringes of the project site bordering the ocean. Within this same area a small band of the beach strand shrub Scaevola taccada was also observed. Although this shrub is commonly found nearest the ocean, it is also well established in isolated areas of the higher limestone knolls where a larger species of Scaevola is found represented by two or three well formed trees.

A number of larger trees were observed within the project site; however, they are considered rare and isolated. The moderately high sea-Hibiscus tree (Hibiscus tiliaceus) and the Sour-sop tree (Annona muricata) were observed in isolated low spots as well as on the limestone knolls.

Only a few isolated individuals of the Australian Iron Wood tree (Casuarina equisetifolia) and the common coconut tree (Cocos nucifera) were observed.

Refer to Appendix I for a check list of the flora found in the project site.

Regarding fauna, the area for the proposed container yard expansion is depauperate of most wildlife species common to Guam. This is primarily due to the area's high noise level and frequent use by trucks transferring and storing containers, and to the lack of suitable vegetation. During two site visits only a few black drongo (Dicrurus macrocercus), two erusasian tree sparrows (Passer montanus saturatus), and one white tern (Gygis alba candida) were observed. The white tern could possibly nest in the few large Casurina trees found within the site, but it is unlikely that many birds frequent the area due to high noise levels and the general lack of vegetation and cover.

No mammals or other larger wildlife would be found in this area. It is possible that the marine toad (Buro marinus), the Philippine rat

snake (Boiga irregularis), and the giant African land snail (Achatina fulica) are found in the area, although none were seen during the site inspections. There are several stray dogs in the area utilized by United States Lines but no rare or endangered species were observed or are known to exist in the area.

3. Archaeology and History

The history and culture of Guam is characterized by variation and tremendous change. The original inhabitants of Guam were the Chamorros; but today the population is a mixture of many cultures including Chamorro, Filipino, Japanese, Asian, Caucasian, Polynesian, Micronesian, and European.

Early maps indicate that Apra Harbor was a major population center with the main settlement located at Sumay Cove, an area currently nestled within the U.S. Naval Station Complex across the harbor from Cabras Island. A cultural reconnaissance survey of Cabras Island in 1977 did not find any prehistoric remains; however, it was reported that some foundations associated with the American occupation were located.

The Department of Parks and Recreation was contacted to confirm that the project site is not found on the National Register of Historic Places and that there are no archaeological sites within the area.

4. Utilities and Infrastructure

Domestic water for Guam is obtained primarily from approximately 70 wells located in the central portion of northern Guam. Presently potable water for all of Apra Harbor is supplied by the U.S. Navy from their Fena Reservoir. The Public Utility Agency of Guam (PUAG) confirms that there are no wells located on or near the project site.

The Water Facilities Master Plan prepared by consultants of GEPA and PUAG considers the needs of Apra Harbor to be in harmony with recommendations established in the Economic and Land-Use Plan for Cabras Island and Surrounding Area. Because of the Navy's desire to decrease the amount of water sold for civilian use, PUAG is proposing to extend the 16 inch waterline from Adelupe to Asan where it will convert to the 12 inch line connecting Asan and Piti. The Government of Guam also plans to construct reservoir tanks in Piti to provide sufficient water for Apra Harbor during peak hours. It is anticipated that in order to meet the expected needs of Guam as well as Cabras Island and the port facility, additional wells in central Guam will be installed and surface water sources will be developed.

Power and water are provided along Route 11. Domestic sewage generated by Cabras Island is treated by the Commercial Port Sewage Treatment Plant using an activated sludge process without chlorination,

the effluent being discharged into the Philippine Sea. Although this plant was expected to treat an average daily flow of approximately 20,000 gallons to secondary treatment levels, because of an increased demand from industrial firms within Cabras Island Industrial Park approximately 50,000 gallons per day is being treated. This plant was permitted under NPDES # GU0020109.

5. Air Quality

Air quality on Guam is considered to be pristine in most areas since the prevailing northeast tradewinds generally disperse any noxious pollutants toward the ocean. Because of the industrial nature of Cabras Island, air quality over the project area is variable but considered to be quite good.

On Cabras Island, exposed northerly surfaces are subject to salt spray which when coupled with high winds, heavy surf, and high humidity can cause severe corrosive low level atmospheric conditions. In the past, high sulphur dioxide (SO_2) emissions from Cabras and Piti Power Plants (located east of the port facility) have caused damage to fish, vegetation, workers, and swimmers during adverse wind conditions. This problem has been minimized somewhat through the installation of a tall stack on the Piti Power Plant which, although the SO_2 emissions remain the same, allow them to be carried further out into Apra Harbor.

Both the Piti and Cabras Power Plants burn low-grade, high sulphur fuel oil which creates sulphur emissions higher than allowable under federal EPA regulations; however, Guam receives a waiver from the U.S. EPA since the emissions are generally blown out to sea. The Guam Power Authority (GPA) is currently required by a U.S. EPA compliance schedule to have either stack gas scrubbers in operation by July 31, 1981, or to use low sulphur fuel oil. Efforts are underway to solve this problem and studies have been initiated regarding seawater scrubber units. As the Navy's tall stack on the Piti Power Plant is for two of its five boilers, the Navy is attempting to resolve with the U.S. EPA the need for a second stack for the remaining boilers.

Another form of air pollution is generated by heavy tractor trailer traffic stirring up coral dust on the existing unpaved container yard, particularly during the dry season. The only other air pollutant in the area is related to automobile and truck exhaust emissions from the rather heavy vehicular traffic on Route 11 directly adjacent to the project site.

6. Noise

Noise characteristics at the project site are quite high and primarily related to heavy vehicular traffic along Route 11 and to the ingress and egress of numerous tractor trailer rigs. The noise level is

generally constant, but interrupted by periods of high noise when container rigs are being moved throughout the yard.

Since Apra Harbor is located directly beneath approach patterns to Guam International Air Terminal, occasional noise from aircraft can be heard. However, these noise levels are minimal and sporadic.

7. Population

The project site is located within the municipality of Piti/Asan which currently has a population of approximately 2,570. The nearest residential dwellings are located near the junction of Route 1 and Route 11 approximately 1.3 miles from the project site.

IV LAND-USE RELATIONSHIPS

A. Federal Government Plans and Policies

The United States Navy, in conjunction with the U.S. Air Force, recently completed a study of the Department of Defense (DOD) utilization of real estate in Guam. Among the primary reasons for this study was the Government of Guam's desire to determine which land holdings could be released by the DOD in conjunction with Federal Executive Order 11954 (EO 11954) to meet the development needs of the island.

Congressman Won Pat, Guam's representative in the House of Representatives, introduced a bill for release of lands in the vicinity of Apra Harbor. This bill, P.L. 96-418. Sec. 818, has been passed and an orderly transfer of these surplus Navy lands to the Government of Guam is now underway.

One of the major restrictions placed on any future economic development of the Commercial Port is the Navy's Explosive Safety Quantity Distance (ESQD). This is a circular zone established by the Department of Defense around its ammunition pier, Hotel Wharf on the Glass Breakwater. Originally the ESQD arc was established at 10,400 feet from the eastern edge of Hotel Wharf. However, in 1977 the Navy decreased the ESQD arc to 7,210 feet. It currently extends to approximately 100 feet beyond the eastern edge of the Commercial Port boundary. It is the policy of the U.S. Navy to discourage construction of any permanent habitable facilities on Navy owned lands within this arc until the ammunition pier is relocated or unless other arrangements are made with the U.S. Navy.

B. Local Government Plans and Policies

The government of Guam realizes the need for improved facilities in the Commercial Port complex in order to meet the increasing demand for economic growth. To facilitate this growth they have taken steps to secure federal land on Cabras Island on which to expand.

The land use plan developed by Maruyama & Associates, Ltd., Dravo Van Houten, Joint Venture, while retaining some of the existing uses such as the Mobil and GORCO oil piers, ship repair facilities, and some recreational use, foresees development of port-related industries, fish transshipment, and fisheries support facilities. The plan also envisions expansion of the container yard and berthing facilities. If the OTEC plant is developed near the existing power plant, it may be possible to use the nutrient rich effluent for live-bait fisheries in the lowland areas south of Piti Channel.

Due to the location of the Commercial Port, the entire Asan/Piti area is the logical location for expansion of port-related industrial facilities to serve Guam.

C. Conformity and Confilct

The importance of the Commercial Port facility to the future economic growth of Guam is apparent. All previous economic plans (federal and local government) identify the need for improved facilities and expansion of the port. They call for an orderly development with long-range planning in mind. The Government of Guam has been working particularly hard to strengthen its economic base in the western Pacific and focuses on the Commercial Port as a central element in the success of such an effort.

Major conflict arises as a result of the ESQD arc from the Navy's ammunition wharf and the restrictions in the Federal legislation authorizing transfer of surplus land. These two factors play a major role in any further development of the Commercial Port facility. The ESQD arc establishes a zone which is unsafe for present port facilities let alone any new structures. However, the Navy has demonstrated its desire to improve on present ESQD restrictions by relocating the ammunition wharf elsewhere in Apra Harbor. The Navy has identified several sites for relocation of the ammunition wharf, one of which was Orote Point. However, this site met strong criticism from the local government and the private sector for environmental reasons. Because of strong criticism and budgetary constraints, the proposed ammunition wharf project at Orote Point was set aside. Presently, the Navy is in the process of identifying and carrying out environmental studies on new sites within Apra Harbor for the wharf's relocation. If these studies present a suitable site for relocating the ammunition wharf, development within the Commercial Port complex may begin to expand significantly by the mid-1980's.

V. PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

A. Positive Aspects

Expansion of the container yard into an adjacent 11 acre parcel of land will improve conditions within the Commercial Port complex in numerous ways. Most importantly it will ameliorate terminal congestion and permit more rapid delivery and receipt of containers. As it is now, containers are often stacked four high which necessitates considerable movement before containers can be loaded. Furthermore, there are no designated areas where particular shipping lines can unload and store their own containers. This complicates and confuses the entire port unloading and loading process which in turn wastes considerable time and money.

The chassis operation solves some of these problems, particularly the time in handling the containers, as well as increased health/safety standards. Other primary advantages of the chassis operation include a more efficient ship turn-around time since it is considerably more efficient to retrieve containers on a chassis.

While the Commercial Port is switching its major emphasis from a grounded operation to a chassis operation, it is possible that specific areas will be designated where the two major cargo lines can off-load and store grounded containers. American President Lines and United States Lines would be designated an area where only their containers would be stored. Other smaller lines handling inter-regional and intra-regional trade would not have separately designated storage areas and would continue to store theirs together. The major advantage of segregating stored containers of the two major lines is the increased efficiency in locating and loading containers after storage.

Plans for the expansion of the container yard include paving the new site as well as repaving some of the old yard. Right now the proposed site is unpaved causing a considerable fugitive dust problem since it is being used for containers storage on chassis. Paving the expanded site will eliminate the fugitive dust problem.

Container yard expansion plans also call for realignment of a portion of Route 11 to the northern edge of Cabras Island. Existing blacktop along the Commercial Port complex is in terrible condition because of the extensive use it receives from numerous large tractor trailer rigs traveling on it each day. New and improved road surfaces capable of handling heavy loads will replace the old surface. This improvement will ease the wear and tear associated with daily use. Along with the realignment of Route 11 a seawall will be constructed to protect port facilities and improved infrastructure from storm generated wave run-up. This seawall will rise to an elevation of $\pm$ 15 ft. or $\pm$ 18 ft. MLLW.

After careful examination of the existing environment, there will be minimal damage and loss of habitat/vegetation from the proposed expansion project. This area is presently being used for container storage and has already been highly modified from natural conditions by initial quarrying operations and subsequently by port expansion. Because of these modifications and the lack of space to the east and west, this site is the most logical place to expand for additional container storage. Paving the expanded container yard will stabilize the entire area and there will be considerably less damage and loss due to storms as a result of the seawall. The project also calls for increased security with all chassis and containers stored within the fenced port area. Consolidation of all containers from the various steamship companies into this area should deter theft and vandalism.

B. Negative Aspects

There are a number of adverse environmental impacts which stem from expanding the container yard. However, only one of these impacts is considered significant. For the most part, the adverse impacts are either felt as increased loads on existing facilities or new impacts of a minor nature.

The expansion project proposes to increase the container yard by 100 percent or from 11 to 22 acres. The addition of these 11 acres will add approximately 50 $feet^3$/second of storm water runoff to the present load or a total of 100 $feet^3$/second. These figures represent maximum storm water runoff calculations based on a 20 year storm. Normal storm water runoff will not approach these figures. Presently, storm water runoff is carried off the Commercial Port complex by a series of storm drains. The expansion project proposes to connect to this existing system in such a way that storm water will continue to run into Apra Harbor rather than into the Philippine Sea. However, it is expected that one additional storm water discharge point will be added to carry runoff water from the northern sector of the additional 11 acre site. Storm water quality is not expected to be any different than what presently exists in the Commercial Port complex even though loading will increase 100 percent given a 20 year storm. It is not likely that leaks or spillage in the container yard will add significantly to the pollutant loading problem already existing at the port facility because of the equipment used in transporting containers. Low level hydraulic and oil leaks from the tractor-trailer rigs, and possibly leakage from containers can be expected.

Storm water quality will improve slightly over existing conditions since the area will be paved. Because of paving, the existing sediment transport of coral silt and dirt will be significantly reduced in storm water runoff into Apra Harbor.

Preparation of the site for expansion will necessitate the removal of existing limestone outcroppings and the destruction of all remaining vegetation on the 11 acre site. For the most part, the vegetation is comprised of Tangan-tangan. However, a few larger trees will have to be removed. This is not considered a significant adverse environmental problem since the majority of the area is already cleared and modified.

Since the container yard is to be expanded to the northern edge of Cabras Island, damage from storm generated waves constitutes a potential hazard. Although the likelihood of such an event is minor, the impact of storm generated waves inundating the container yard should not be taken lightly. Project engineers have evaluated reports on the size and frequency of storm generated waves which can be expected along this shoreline in the event of a typhoon. Two alternate designs have been prepared for the seawall. One consists of a rock rubble mound type resembling the construction used for the Glass Breakwater. This would have a top elevation of $\pm$ 18 ft. MLLW. The other alternate is a recurved concrete seawall with a top elevation of $\pm$ 15 ft. MLLW. Both seawalls would offer comparable protection against wave run-up. The choice between the two alternates would be made after bid opening. Highway elevation is presently designed at $\pm$ 12 ft. MLLW. From a visual/aesthetic point of view the creation of this seawall will effectively reduce any view to the north due to the difference in heights between the roadway and the top of seawall.

VI. ALTERNATIVES TO THE PROPOSED ACTION

A. No Action

The alternative of "No Action" would leave the capacity of the container yard as it is now. Without expansion, all existing problems, i.e., lack of space, terminal congestion increased vehicle and driver waiting time increased in-port time and associated increased costs and safety and health hazards would remain as they are.

The existing container yard was designed to handle approximately 864 twenty foot equivalent units (TEU) with containers stacked up to two high. However, figures show that the number of containers handled over the past six years averages 46,381. This is significantly greater than design criteria.

The boom in containerized shipping of the sixties and seventies suggests that future containerized shipping will be even greater. Presently, 85 percent of all cargo is containerized. The expected increase in containerization coupled with the lack of adequate container storage space at the Port strongly suggest that increased container storage space is necessary in order to meet future needs. Because of limited space at the Commercial Port the cumbersome stacking system of container storage has been employed. This is very inefficient. Although grounded operations require less space, more time is spent retrieving containers stacked 2 to 4 high. A chassis operation eliminates re-handling of containers and allows easy access when retrieving the containers.

A portion of the existing container yard will remain as a grounded operation to accommodate the considerably smaller number of containers of the inter-regional carriers. In addition it is expected that the two major carriers may ground some containers during peak periods when there are insufficient chassis.

The recent addition of a second gantry crane at the Commercial Port acknowledges the increase in containers handled. Development of support facilities is essential to keep up with port projections. Because of these facts and projects, "No Action" is not a viable alternative.

B. Alternate Site Location

Areas within the vicinity of the Commercial Port at Cabras Island presently occupied by organizations other than the Port Authority include the following: Bulk cement plant; Mobil Oil tank farm; U.S. Coast Guard Depot; Exxon tank farm; United Seamen's Service, Inc.; Hunt and Behren's Feed Mill; Guam Oil and Refining Company pier and ballast tanks; Dillingham Maritime Services; Navy Ammunition Wharf; Silverado (Suzue Guam Co., Ltd.) and various smaller industries. Negotiations are

currently underway for the orderly transfer of land from the Navy to the Government of Guam.

Two previous port studies outlined areas on Cabras Island where commercial development might take place. Essentially, Cabras Island in its entirety is valued as a commercial port complex. Any expansion of the container yard facility must be adjacent to the existing facility for economic reasons as well as convenience. Handling containers efficiently is closely related to proximity to wharfs. Any distance from the wharf further than a few hundred feet alters the economics and creates a considerable logistics problem.

There is no available land on the west side of the existing container yard since present port facilities are already located there. To the east is a parcel of land on which the Feed Mill stands. This facility stands in the way of Commercial Port development to the east and has been slated for relocation at the appropriate time. However, present relocation is not necessary since additional container wharfage is not essential at this time and additional container storage space can be adequately obtained at lower cost on the northern side of Cabras Island.

There is no doubt that additional container storage space will be necessary when additional wharfage is built. Such expansion will ultimately take place to the east of the existing container yard concurrent with the relocation of the Feed Mill.

C. Plan Modification

Essentially this proposed project is a modification of existing container yard storage capability and the increase in area will allow for economics in container handling cost and will accommodate expected increases in actual numbers of containers in the future. A complete listing and discussion of the project description is found in Section III B. Other than these proposed plans, no further modifications are anticipated at this time.

VII PROBABLE ADVERSE IMPACTS WHICH CANNOT BE AVOIDED

A. Disruption of Flora and Fauna by Site Clearing and Construction Activities

Adverse environmental impact caused by the construction phase of the project, including clearing of low limestone outcrops and all flora, are unavoidable. Existing flora is confined to a few limestone outcrops and to scattered and isolated pockets on the site. Numbers of species is minimal for both flora and fauna, with practically no fauna found on the site due to present industrial use. Because of the disturbed nature of the site, environmental damage, although unavoidable, will be minimal.

VIII RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

A. Short-Term Gains versus Long-Term Losses

The most direct short-term gain of the proposed container yard expansion will reflect the port's ability to quickly load, unload, and store a greater number of containers more efficiently. The impact of such a gain will be felt economically by cutting time and labor needed to handle the containers. At the same time, health/safety conditions will be improved since the majority of containers will be stored on individual chassis.

These short-term gains will be continued until the point where Commercial Port activities again strain with the increased traffic. At that time the long-term losses will begin to outweigh the short-term gains, and, of course, further expansion will be justified.

B. Long-Term Gains versus Short-Term Losses

Long-term gains of the proposed project rely on the same rationale as that given above. The expected increase in the efficiency of container handling will extend into the foreseeable future. The removal and disruption of flora and fauna are adverse short-term environmental considerations which are weighed against these long-term benefits. At the present time, it is safe to assume that the disruption of flora and fauna is insignificant, particularly in view of the type, condition, and scarcity of both in the area.

Although no amount of removal or disruption of flora and fauna is considered beneficial, this project must be evaluated in terms of beneficial uses of the proposed site. There is no doubt that Cabras Island will eventually become a commercial port/industrial complex in its entirety. Because of this, a realistic viewpoint is that removal and disruption of flora and fauna is essential to the progressive development of the port. In this sense such action can be considered beneficial. Construction of a seawall, although expensive and aesthetically unappealing, is viewed as a benefit in the long-term since protection of the new facility will be insured.

IX IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The irreversible and irretrievable commitments of resources which will be involved in the expansion of the container yard will be felt primarily on the coastline. Since this facility is to be built near the coast, all other possible coast related projects will be precluded.

A. Coastal Land

The container yard expansion project is situated from the middle to the north edge of Cabras Island. Although the facility will be completely visible to the passing motorist, the improved facilities will not detract from visual aesthetics any more than existing facilities. The realignment of Route 11 will take place on the extreme north edge of Cabras Island along the shoreline which offers a rather good utilization from a visual point of view.

Since the site has been used for port related facilities, only slight changes in scenic-vista are expected. Over a period of time, disfiguration of the land will be reduced by natural growth of vegetation on exposed faces. Seeding and landscaping will also reduce impact from a visual point of view.

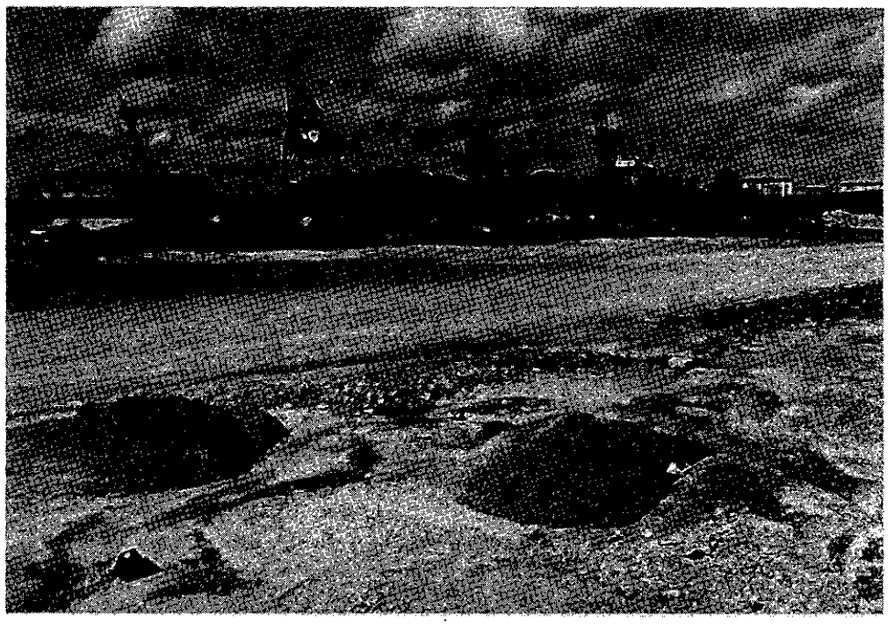


FIGURE C-1

Existing container yard expansion. View is to the southwest toward the Commercial Port and gantry crane unloading area.

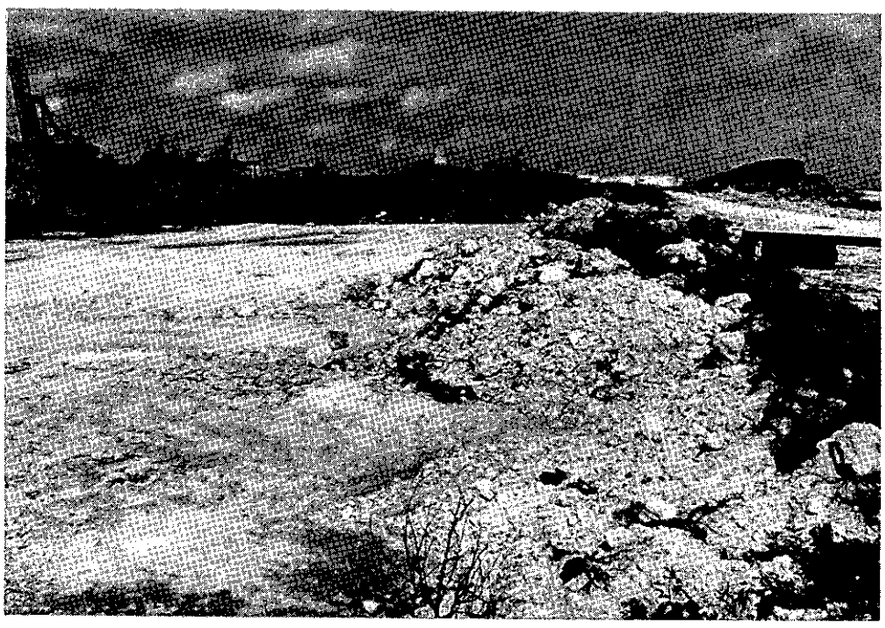


FIGURE C-2

Typical ground level view of the proposed site for container yard expansion. View is to the west.

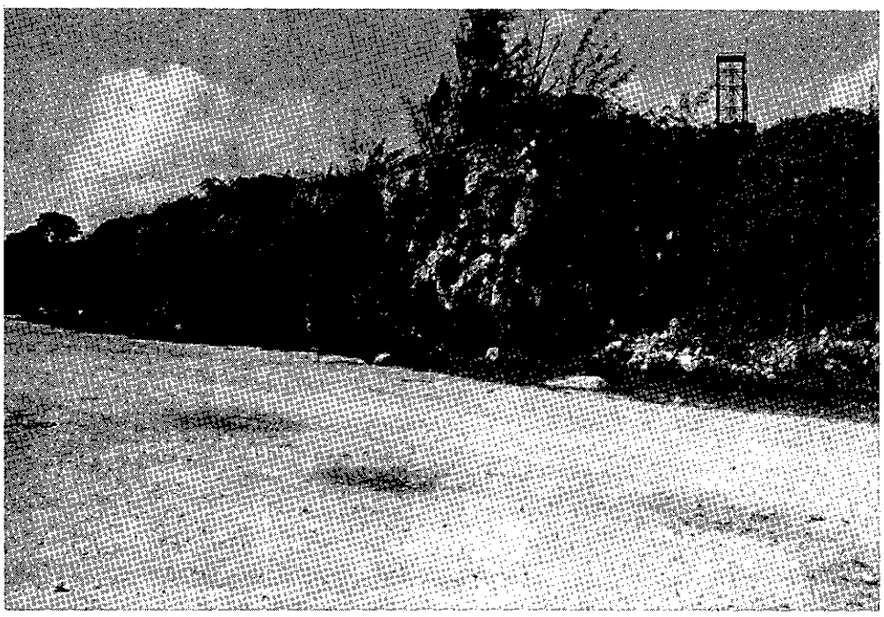


FIGURE C-3

One of the larger limestone outcroppings and associated vegetation. View is to the south.

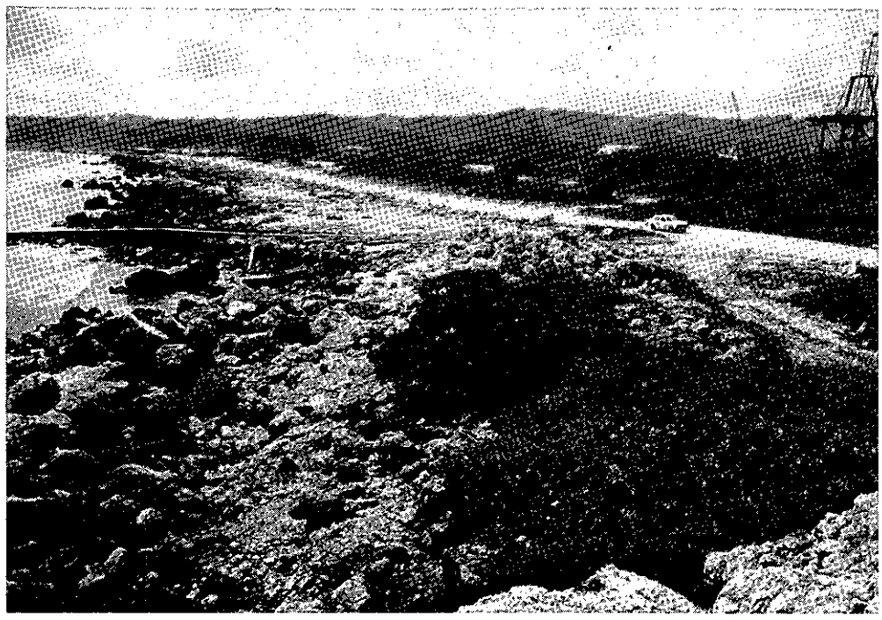


FIGURE C-4

Oceanside development of proposed site for container yard expansion. Note how rubble has been piled along the high water mark to prevent wave inundation. View is to the east.

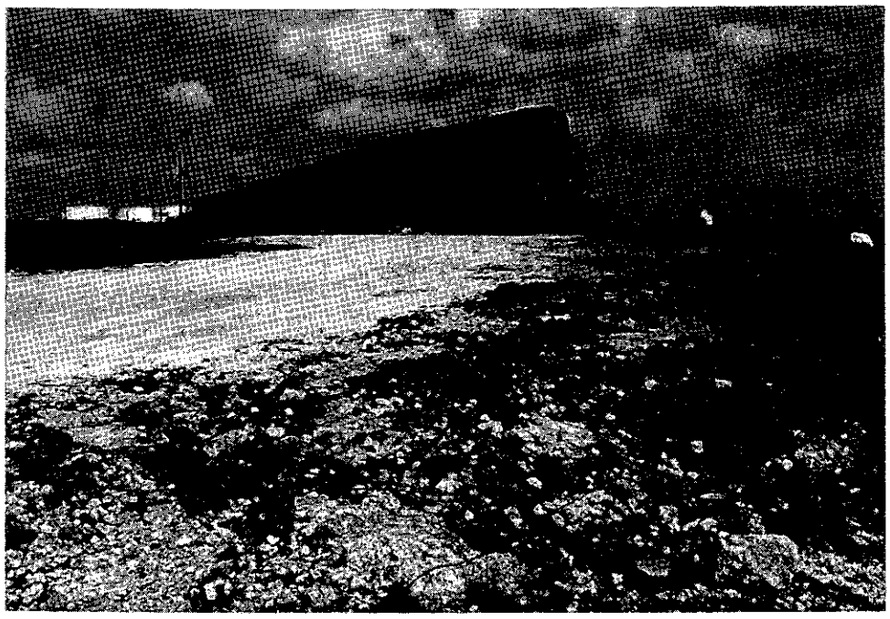


FIGURE C-5

Uplifted limestone ridge to the northwest. Approximate elevation is ± feet.

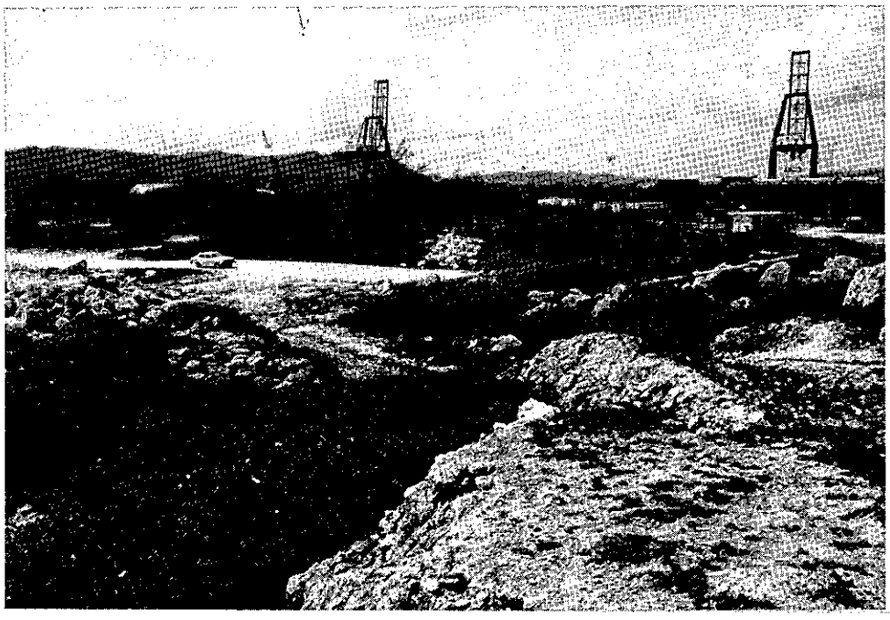


FIGURE C-6

General overview of western sector of proposed site. Note piles of rocks and scrap.

APPENDIX D

FLORA CHECKLIST

PLANT NAME	COMMON NAME	OCCURRENCE*
Annona muricata	Sour Sop	R
Bidens pilosa	Beggers Tick	C
Casuarina equisetifolia	Australian Iron Wood	R
Cestrum pallidum	--	C
Cocos nucifera	Coconut Palm	R
Euphorbia sp.	Poinsettia	C
Hibiscus tiliaceus	Sea Hibiscus	R
Ipomoea pes-caprae	Beach Morning Glory	C
Leucaena leucocephala	Tangan Tangan	D
Mimosa sp.	Sensitive Weed	C
Pennisetum sp.	Common Grass	C
Scaevola taccada	--	C
Stachytarpheta indica	False Verbena	C

*D = Dominant

C = Common

R = Rare

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