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FISHING BASE CONSTRUCTION PROGRAM FOR PAPUA NEW GUINEA SURVEY REPORT

Tokyo, March 1978

Japan International Cooperation Agency

PREFACE

The Government of Papua New Guinea has planned, as a part of the economic development program of that country, to develop the rich fishery resources of its offshore waters, and requested Japan to prepare a plan for the construction of fishery bases at Rabaul and Kavieng.

In compliance with the request, this Agency carried out a preliminary survey from June 7 to June 27, 1976, also a feasibility survey from September 24 to October 10 of the same year. Subsequently, a planning survey team, headed by Mr. Kiyohide Nemoto, Chief of the Division of Construction, Department of Fishing Ports, Fisheries Agency, was sent to Papua New Guinea from November 8 to December 10 to prepare a construction paln for the two districts.

The survey team's findings are now available for reference. In compiling the report a great deal of relevant information was collected and analysed, and visits were exchanged between specialists of both countries for consultation.

The Agency hopes that the construction of fishery bases based on the report will proceed smoothly and that this project will contribute to both the development of fishery in Papua New Guinea and closer friendly relations between the two countries.

Finally, the Agency wishes to record its thanks to the members of the survey team for the work they have done and also to those who have helped the Agency in connection with this project.

Shinsaku Hogen,
President

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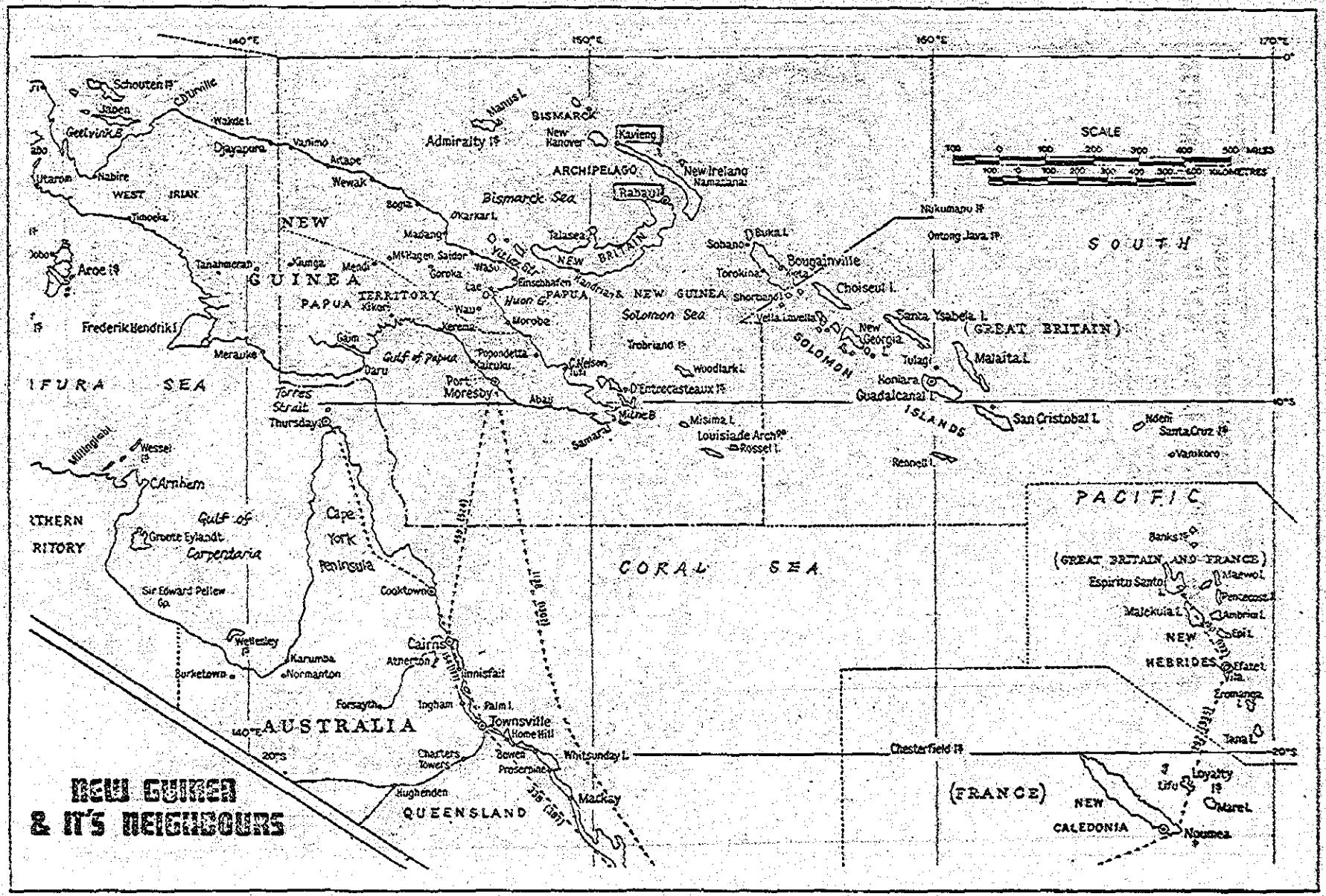
NEW GUINEA
& IT'S NEIGHBOURS
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MILES
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AUSTRALIA
QUEENSLAND
NEW GUINEA
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Loyalty Is
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CORAL SEA
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170°E
10°S
20°S

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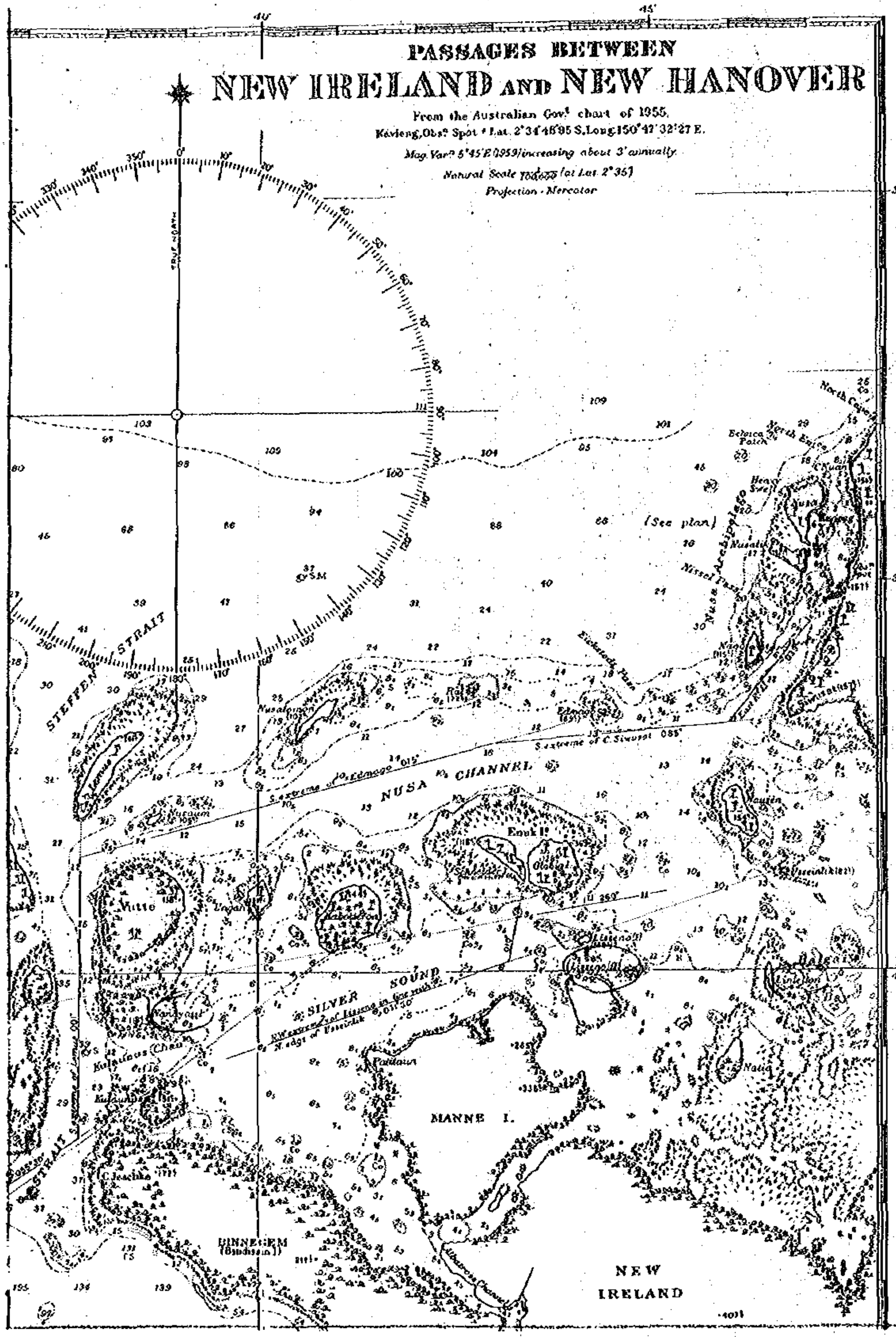
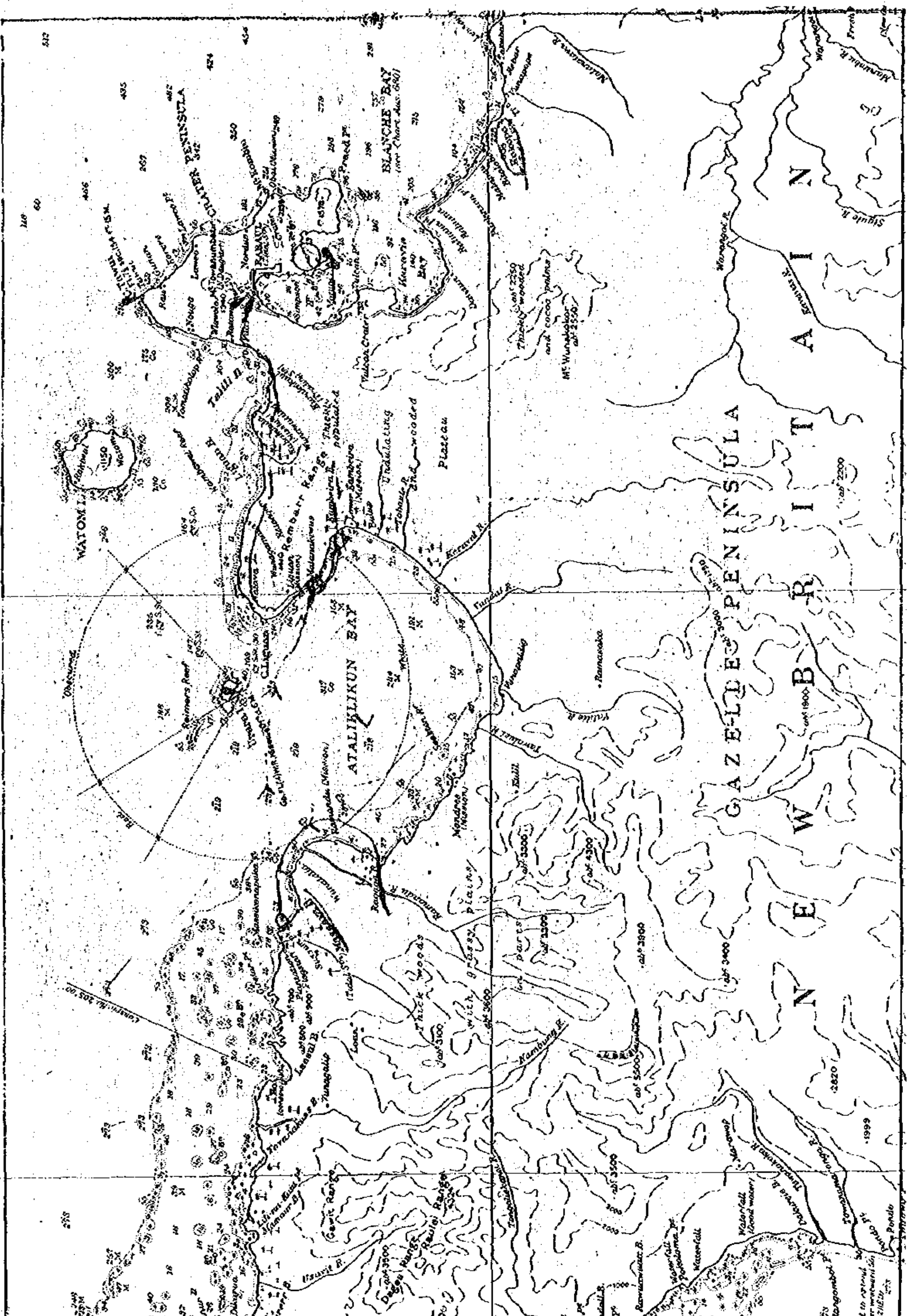
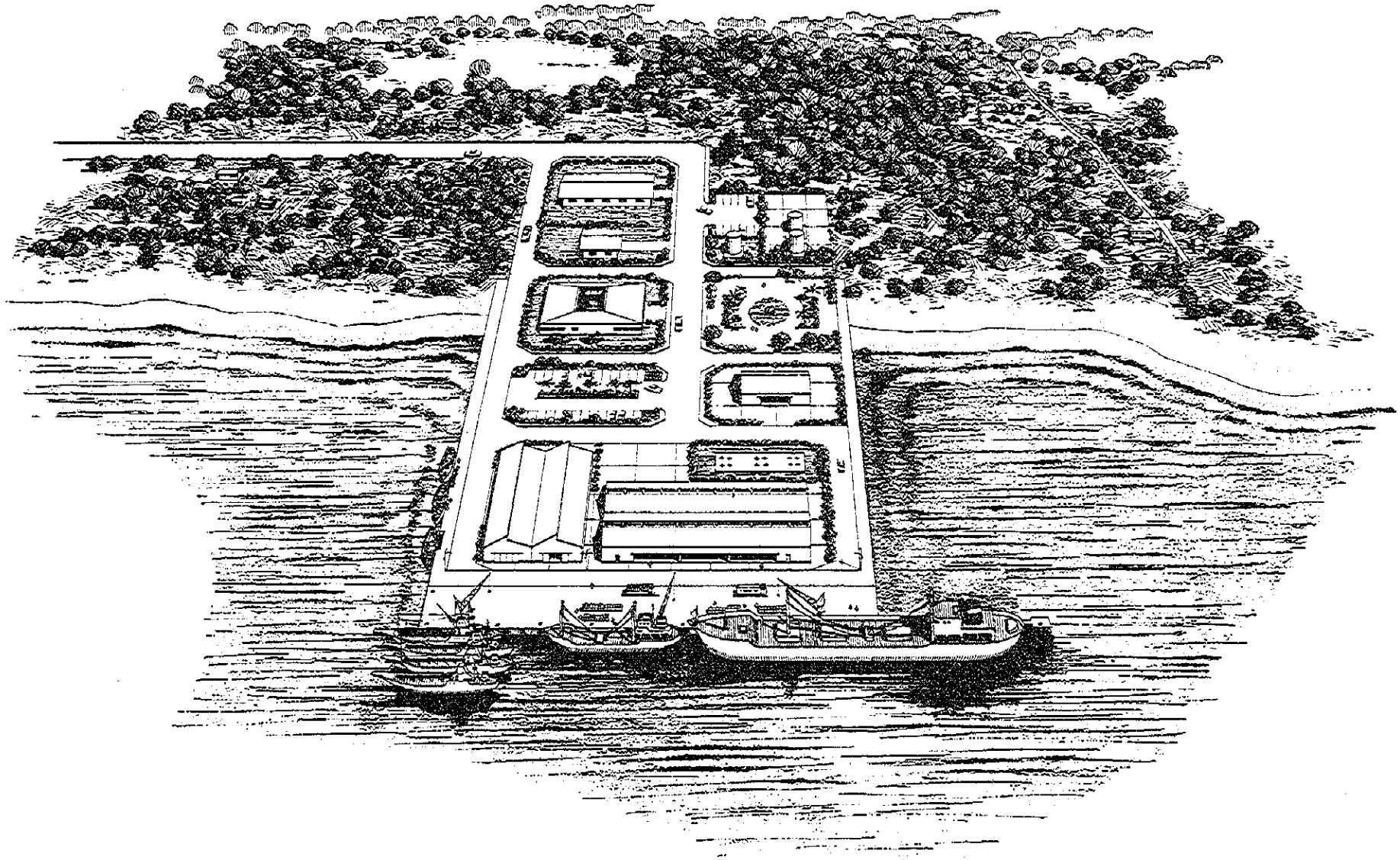
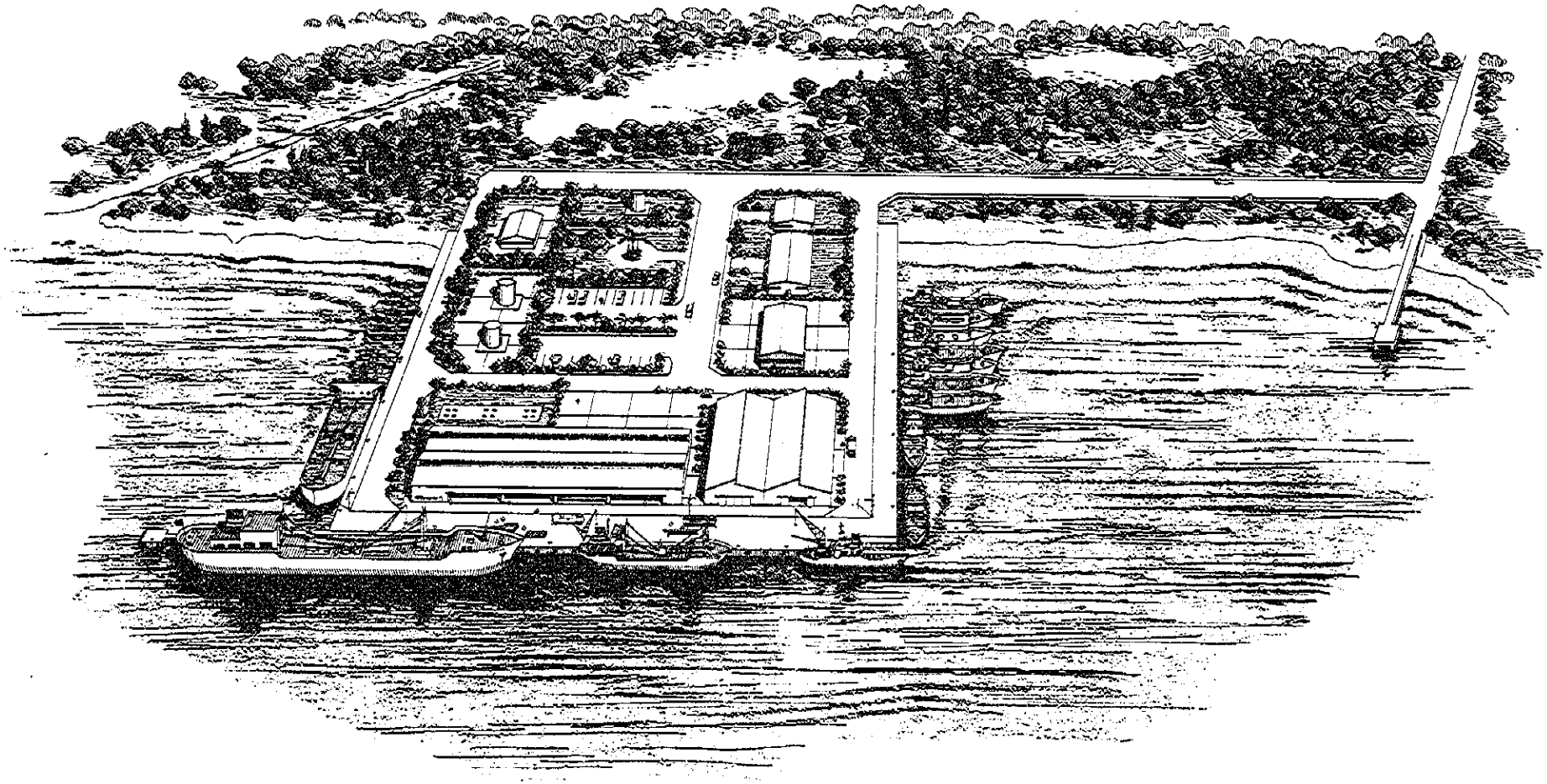

PASSAGES BETWEEN
NEW IRELAND AND NEW HANOVER
From the Australian Govt. chart of 1955.
Kavieng, Obsd. Spot • Lat. 2°34'46.95 S. Long. 150°47'32.27 E.
Mag. Var.n 5°45'E (1959) increasing about 3' annually.
Projection - Mercator
STEFFEN STRAIT
NUSA CHANNEL
SILVER SOUND
Nusa Archipelago
Nissel Pass
Vutto
Enuk I.
Lin Lon
MANNE I.
NEW IRELAND
North Cape


NEW BRITAIN
GAZELLE PENINSULA
ATALIKLIKUN BAY
BLANCHE BAY
CRATER PENINSULA
WATOM I.

Bird's–Eye View of Kavieng Fishing Base



Bird's–Eye View of Rabaul Fishing Base



Introduction

1. Historical Background

As a result of the fishery talks held in Tokyo on August 2-4, 1976, it was decided that the Japan International Cooperation Agency, the institution for the implementation of the Japanese Government's technical cooperation projects, would carry out a survey in conjunction with a program for the construction of fishing bases both in Kavieng and Rabaul in October, to which the Government of Papua New Guinea was giving top priority.

The construction program will be put into force under the close cooperation of the Japanese Government with the Government of Papua New Guinea.

2. Purpose of Survey

The purpose of this survey is to carry out a survey in conjunction with a program for the construction of fishing bases both in Rabaul and Kavieng and to prepare a report on the preliminary design of structures, computation of the construction cost, fund program and recommendations for transmittal to the Government of the Republic of Papua New Guinea so as to pave the way for the preparation of necessary detailed designs.

3. Composition of the Survey Team

Leader	Mr. Kiyohide Nemoto	Head, Fishing Port Construction Division, Fisheries Agency, Ministry of Agriculture and Forestry
Planning	Mr. Takao Hirano	Assistant Head, Disaster and Prevention and Coastal Protection Division, Fisheries Agency
Construction	Mr. Masayoshi Tanaka	Chief, Disaster and Prevention and Coastal Protection Division, Fisheries Agency
Economic analysis	Mr. Katsushi Kamishikiryo	Head, Second Operation Division, Fukuoka Branch Office, Agriculture, Forestry and Finance Corporation
Marketing facility	Mr. Hideo Nakamura	Chief, Fish Marketing Division, Fisheries Agency
Fisheries Administration	Mr. Satoru Koakutsu	Technical Official, International Affairs Division, Fisheries Agency
Coordination	Mr. Eiji Hashimoto	Technical staff member, Agricultural Cooperation Division, Japan International Cooperation Agency

4. Itinerary of, Actions Taken by, the Survey Team

See the attached table

5. Acknowledgment

The Survey Team expresses its deepest appreciation to all parties concerned for their cooperation and advice -- particularly to those whose names are listed below:

Name	Position
(1) Japanese Embassy	
Ambassador Yamaguchi	Japanese Ambassador in Papua New Guinea
Counselor Nagai	Counselor, Japanese Embassy in Papua New Guinea
Secretary Minami	Secretary, Japanese Embassy in Papua New Guinea
(2) Port Moresby	
Mr. A. Farapo	Assistant Secretary, Department of Foreign Affairs and Trade
Mr. John Natera	Secretary, Department of Primary Industry (D.P.I.)
Mr. Peter Wilson	Director, Fisheries Department (D.P.I.)
(3) Rabaul	
Mr. John Tovue	Provincial Planner
Mr. Sinai Brown	Provincial Policy Secretariat
Mr. Eliakin Bolton	Provincial Research Officer
Mr. Simon Lupale	Provincial Legal Officer

Name	Position
Mr. R. A. Coase	Fisheries Inspector, Rabaul
Mr. F. Enbi	Provicial Rural Development Officer
(4) Kavieng	
Mr. R. Tovue	Provincial Commissioner
Mr. Peter Robert Jones	Acting Area Fisheries Development Officer
Mr. John Day	Fisheries Inspector, Kavieng

Itinerary of PNG Survey Team

			Lv.	Ar.	Action
1.	Nov. 8	Mon.	Tokyo		
2.	9	Tues.		Sydney	
3.	10	Wed.	Sydney	Port Moresby	
4.	11	Thu.		Port Moresby	Courtesy calls and talks on the survey (Japanese Embassy and P.N.G. Government)
5.	12	Fri.		Port Moresby	
6.	13	Sat.	Port Moresby	Madang	
7.	14	Sun.		Madang	Fact-finding tour (Japanese side)
8.	15	Mon.	Madang	Kavieng	
9.	16	Tue.		Kavieng	(Accompanied by staff officials of the PNG Government from this date)
10.	17	Wed.		Kavieng	Talks with the local side
11.	18	Thu.		Kavieng	Fact-finding tour of the construction site
12.	19	Fri.		Kavieng	Ditto
13.	20	Sat.	Kavieng	Rabaul	Collection of data
14.	21	Sun.		Rabaul	Ditto
15.	22	Mon.		Kilin Watta	Talks with the local side
16.	23	Tue.		Kilin Watta	Fact-finding survey (land)
17.	24	Wed.		Kilin Watta	Ditto

			Lv.	Ar.	Action
18.	Nov. 25	Thu.		Kilin Watta	Fact-finding survey (sea) aboard chartered ship
19.	26.	Fri.		Kilin Watta	Sorting of data
20.	27	Sat.		Rabaul	Ditto
21.	28	Sun.		Rabaul	Ditto
22.	29	Mon.		New Massa	Fact-finding survey (aerial) aboard chartered aircraft
23.	30	Tue.		New Massa	Fact-finding survey (land)
24.	Dec. 1	Wed.		New Massa	Fact-finding survey (sea) aboard chartered ship
25.	2	Thu.	Rabaul	Port Moresby	
26.	3	Fri.		Port Moresby	Consolidation of survey results
27.	4	Sat.		Port Moresby	Ditto
28.	5	Sun.		Port Moresby	Consolidation of survey results
29.	6	Mon.		Port Moresby	Briefing and report (Japanese Embassy in the morning and the PNG Government in the afternoon)
30.	7	Tue.	Port Moresby	Sydney	
31.	8	Wed.	Sydney		
32.	9	Thu.		Tokyo	

FISHING BASE CONSTRUCTION PROGRAM

FOR

PAPUA NEW GUINEA SURVEY REPORT

(SUMMARY)

1977

JAPAN INTERNATIONAL COOPERATION AGENCY

1. Fisheries of Papua New Guinea

Sea fisheries in Papua New Guinea chiefly consists of skipjack pole and line fishing in the Bismarck Sea and Shrimp Trawl fishing in the Papua Gulf district, both of which are large in scale, being already established as commercial fishery.

The major part of the skipjacks and tunas, and shrimps caught by these two types of fisheries are frozen and exported to overseas markets.

Meanwhile, in the coastal waters, such forms of fisheries are practiced as angling, gill net, haul seine, dart, beach seine by canoes, or by the equipped with out board engine. The cathes consist of reef fish and a small amount of migratory fish.

Regarding local fisheries, because the fisherman engaged solely in fishery is practically nil, stave production can not be expected at present, so that supply system of marine products is being left vertually unconsolidated.

However, all the marine products distributed in the domestic market are producted by local fisheries.

An increasing atendency of the consumption of canned fish in recent year suggest an appreciable amount of potencial demand. Therefore, the need of consolidation of the supply system has become pressing.

Since skipjack is important among the fish species caught in the Papua New Guineanwaters, the major protion of the processed products of Papua New Guinea also consists of skipjack products of frozen and smoked ("arabushi").

The rest is comprising small-scale home-processed smoked fish of local taste.

Regarding the processing and use of tilapia which is caught in great quantities from the Sepik River, various researches are now carried out by

the Central Research Laboraty, Kanudy. It is hoped that systematic studies on all the catches will be continued and the future and that various processing facilities to be consolidated, together with the development of fisheries.

2. Prospect of Skipjack Fisheries

The target for 1981 onward regarding skipjack catches has been set as shown below.

Total Catches	75,000 ton
Kavieng	25,000 ton
Rabaul	28,800 ton
Manus	21,200 ton

The target for 1981 onward regarding catches of local fish has been set shown below.

Kavieng	900 ton
Rabaul	900 ton

3. Kavieng Fishing Base Construction Program

3-1. Basic concept

Kaving Fishing Base Construction Program was planned on the basis of the basic concept described below.

(i) Resting on the basis of the basic policy of the Government of Papua New Guinea to convert the skipjack pole and line fishing which presently adoptes the mother ship system into one adopting the base fisheries system starting from the target year, the base will be consolidated in a way to make it capable of functioning as a base of operation for the

skipjack pole and line fishing operated in the Bismarck Seas as the fishing ground.

(ii) Since the promotion of local fisheries constitute and extremely important subject from the standpoint of securing animal protein for the people of Papua New Guinea, the base will be consolidated in such a way as to serve also as a foundation upon which local fisheries in the Kavieng area could be promoted.

(iii) With a view toward promoting export through the positive utilization of affluent marine resources, the base will be provided with such functions as to allow production and export of frozen skipjack in large quantities at and from the base.

(iv) The scale and arrangement of facilities to be established on the base shall be such that will enable the base to comply with demand for the target year.

(v) The target year for the program shall be set to 1981.

(vi) The construction period for the base shall be 3 years.

3-2. Planned Site

As the planned site, the survey team selected the "Burns Phillip Plantation" that had been indicated in the "Scope of Work"

3-3. Facilities Plan

The facilities plan was so composed as to permit safe and rational handling of the planned handling amount at the planned site, as Fig. 2-4-1, Fig. 2-4-2.

3-4. Amount of Investment

The work stage plan was so compiled as to allow start of service of the base in April, 1981, and the investment amount with regard to the base managerial facilities was intergrated on the basis of the presupposed condition given below.

(i) Machinery and materials that are unprocurable on the domestic market will be imported from Japan.

(ii) Land compensation and moving cost of buildings attendant on construction shall not be appropriated.

(iii) Labor unit cost and the unit costs for materials etc. will adopt as the standard the prices in Nov. 1976, and will also take into consideration the prices rise rate.

	The annual rise rate for the plan
Labor unit cost for skilled workers	3 %
Labor unit cost for unskilled workers	5
Unit cost for steel member	0
Unit cost for building stone	0

Further, items to be covered by foreign currency is as follows:

(i) Of the purchasing costs for construction materials, those for materials such as a cement and steel members whose domestic procurrement is not possible.

(ii) Of the labor cost, those salaries and wages to be paid to skilled workers.

(iii) Of the consultant charges, the expenses expect the on-the-spots staying costs and the hire of a office at the local site.

(iv) Of the contingencies, 10 % for foreign currency of the facilities cost.

Table 3-4. Breakdown of Investment into Amounts in Foreign and Domestic Currencies by Fiscal Year

Unit: Kina

Fiscal Year	Item	Amount
1978		1,204,011
	Facilities costs	833,385
	Consultant fee	287,287
	Contingencies	83,339
1979		1,672,567
	Facilities costs	1,355,944
	Consultant fee	181,029
	Contingencies	135,594
Total		2,876,578
	Facilities costs	2,189,329
	Consultant fee	418,316
	Contingencies	218,933

Remarks: Contingencies consist of 10 % each of the facilities costs both in foreign and domestic currencies.

4. Rabaul Fishing Base Construction Program

4-1. Basic Concept

(i) Resting on the basis of the basic policy of the Government of Papua New Guinea, the base will be consolidated in way to make it capable of functioning as a base of operation for the skipjack pole and line fishing operated in the Bismarck Sea and Solomon Sea as the fishing ground.

(ii) The base will be consolidated in such a way as to serve also as a foundation upon which local fisheries in the Rabaul area could be promoted.

(iii) Further, the base will be provided with such functions as to allow refrigeration and processing of skipjack, and export of these marine products.

(iv) The scale and arrangement of facilities to be established on the base shall be such that will enable the base to comply with demand for the target year.

(v) The target year for the program shall be set to 1981.

(vi) The construction period for the base shall be 3 years.

4-2. Planned Site

In selecting the site for the Rabaul Fishing Base, the land conditions of the two candidate lands, i.e., Kilinwata and New Massava, were compared and studied.

Because of enjoying more favorable land conditions and being more favorably located to the fishing grounds, New Massava was chosen as the site.

4-3. Facilities Plan

The facilities plan was so composed as to permit safe and rational handling of the planned handling amount at the planned site, as Fig. 3-4-1, Fig. 3-4-2.

4-4. Amount of Investment

The work stage plan was so compiled as to allow start of service of the base in April, 1981, and then the investment amount was integrated on the basis of the same presupposed condition as to the Kavieng fishing base construction program.

Table 4-4. Breakdown of Investment into Amounts in Foreign and Domestic Currencies by Fiscal Year.

Unit : Kina

Fiscal Year	Item	Amount
1978		1,549,879
	Facilities costs	1,122,822
	Consultant fee	314,775
	Contingencies	112,282
1979		2,361,762
	Facilities costs	1,982,484
	Consultant fee	181,030
	Contingencies	198,248
Total		3,911,641
	Facilities costs	3,105,306
	Consultant fee	495,804
	Contingencies	310,531

Remarks : Contingencies consist of 10 % each of the facilities costs both in foreign and domestic currencies.

5. Management and Operation of Fishing Base

In order to give full play to the functions of the constructed base, the various facilities, of which the base is composed, must be managed and operated in an adequate manner.

Therefore, for the fishing base and the superstructure it is both possible and necessary to establish without delay a new management and operation system that complies with the national situation of Papua New Guinea.

6. Analysis of Economy and Finance

6-1. Analysis of Economy

The result of metric analysis based on the calculation of cost and benefit relative to below two effects (examination period of 30 years).

a) Increase of catch due to increased degree of operation of fishing boats.

b) Increased employment

	The internal rate of return (I.R.R.)	The cost and benefit ratio when the discount rate is 11 %
Kavieng	16.6 %	1.48
Rabaul	19.5 %	1.77

When the direct benefits, the indirect benefits and the associated benefits that were unable to measure are considered in addition to the above, the present project must be highly evaluated for its of contribution to regional economy.

Furthermore, from its public nature, its evaluation from the standpoint of national economy is judged as being satisfactory.

6-2. Analysis of Finance

Finance analysis was done in the way that loaned investment amount will be repaid by the profits of the base.

Its results is followings:

(The examination period has been set at 30 years)

Deferment term (year)	Loan interest rate	
	Kavieng	Rabaul
10	2.6 %	1.4 %
7	2.8	1.5
5	2.9	1.6

As may be seen from the above, fund employment is possible by the sole appropriation of the profit gained from the base.

The funds employment program presupposes the income to be fixed.

The burden charges for use of the base which represent the major portion of income must be fully collected.

Viewed from the standpoint of promoting the sound growth of associated enterprises, the less the burden charges, the greater an effect can be expected. Also, considering the public nature of the Base, it is desired that the Government extend aid for the construction of the Base.

7. Advice, and Matters Requiring Future Study

7-1. Advice

(i) To consolidate the management and operation system of fishing base as soon as possible.

(ii) To establish the management and operation system of super structure on the base.

(iii) To carry out training in connection with the management and operation of the base.

(iv) To establish as soon as possible a stable supply system of live bait.

7-2. Matters Requiring Future Study

(i) To replete statistical data relating to the base construction program.

(ii) To rear a specialist for the fishing base construction.

CONTENTS

Chapter 1 Fisheries of Papua New Guinea

Chapter 1 Fisheries of Papua New Guinea

1-1 Present Situation of Fisheries

1-1-1 *Sea Fisheries*

(1) Outline

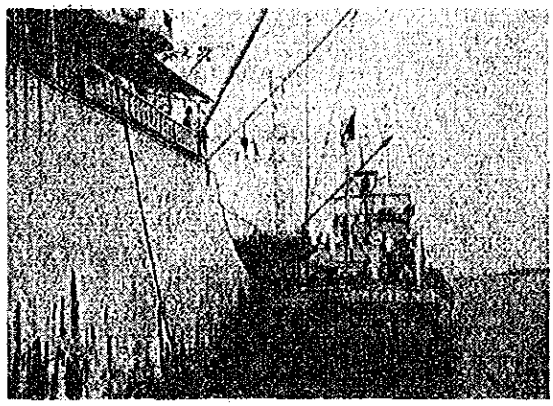
At present, *sea fisheries in Papua New Guinea chiefly CONSISTS* of skipjack pole-and-line fishing in the Bismarck Sea and Shrimp trawl fishing in the Papua GULF district, both of which are large in scale, being already established as commercial fishery. The major part of skipjacks and tunas, and shrimps caught by these two types of fisheries are frozen and exported to overseas markets.

Skipjacks and tunas are frozen on mather ships, while shrimps are on trawl fishing boats. Meanwhile, in the coastal waters, such forms of fisheries are practiced as analing, gill net, haul seine, dart, beach seine by canoes, or by those equipped with out board engine. The cathes consist of reef fish and a small amount of migratory fish.

(2) Fisheries of Kavieng Area

(i) Skipjack Pole-and-Line Fishing

Skipjack pole-and-line, which constitutes the main fishery of the Kavieng area, boasts of the longest history in Papua New Guinea, being



Skipjack pole-and-line fishing vessel

started from March, 1970.

At the inception of operation in 1970, the Kyokuyo Fishing Co., a Japanese firm, conducted experimental fishing, with three skipjack pole-and-line vessels of the 39-G.T. class and one mother ship. During the period from March, 1970 to December of the same year, a catch of roughly 2,400 tons was achieved.

On the basis of the results obtained through this experimental operation, the plan to build the skipjack pole-and-line fishing was pushed forward, leading to the establishment of a Japan-Australia joint venture firm in August, 1971. Later, another firm operating from its base in Kavieng was established, so that now, some 20 skipjack pole-and-line fishing vessels are operated by the two fishing enterprises.

This type of fishing is operated by the mother ship system, chiefly because of the lack of refrigerating and cold storing land facilities for the catch in the vicinity of the fishing grounds, and partly because it would "enhance the operating efficiency of skipjack pole-and-line fishing boats" due to such reasons as 1) easy moving of the mother ship complying with the shift of baiting ground, and 2) the convenience of supply of necessary materials, fuel oil, food and water, when operating in the baiting grounds using the mother ship as a base.

Hence, the mother ship will anchor at a fixed location which, in this case is the vicinity of 3 to 4 nautical miles to the baiting ground of the Patio Island of New Hanover, located at a distance of 15 to 16 nautical miles away from Kavieng.

Regarding the live bait, which were caught at beginning of operations at Silver Sound, has now been shifted to Ysabel Pass of the New Hanover Island, due to the increased demand of live bait, as the operating scale has become larger with the increase in the number of skipjack pole-and-line fishing boats.

(ii) Local Fisheries

The local fisheries catch tunas, mackerel, and reef fish, by such gears as angling, haul seine, gill net and fixed-shore nets practiced by 3 to 4 fishing boats of 16 to 18 ft in length and some 20 to 30 canoes equipped with outboard engine.

In some cases, the fishing grounds are extended as far as to the environs of Silver Sound.

In some other cases, during the agricultural slack season, some 50 farmers, engage in fishing activities. The annual catch of the local fisheries is estimated at 25 tons.

(3) Fisheries of Rabaul Area

(i) Skipjack Pole-and-Line Fishing

The mother-ship-system skipjack pole-and-line fishing using Rabaul as its base, has been practiced since 1971 by the two fishing enterprises, one of which, operates in the skipjack fishing grounds 30 to 40 miles offshore, using the baiting grounds in the vicinity of Cape Lambart, and the other operates around the baiting ground located in the neighborhood of the Pondo district, south of Cape Lambart. Both adopt the mother ship system as the operating form, wherein the skipjack pole-and-line fishing boats operate on a day-trip basis, brailing up their catches onto the company's mother ships which stay in the anchoring ground. The number of fishing vessels operating in these grounds amounts to 18 to 19. The skipjack fishery of the Rabaul area, in its fishing form, is quite similar to that of the Kavieng area, with the annual skipjack catch amounting to somewhere between 15,000 and 20,000 tons, although some changes are observed by the year.

This area is characterized by the baiting grounds scattered into several places. Thus, each company divided its fleet into 4 or 5 boats, in the separate baiting ground. Furthermore, the skipjack fishing grounds cover a vast area extending as far as the Kimbe Bay, fishing operations are not concentrated.

Somewhat later than that of the Kavieng area, the skipjack fishing season in the Rabaul area is usually from March to December, concurring with the appearance of the migrating shoals of fish. The catches reach a peak in the months of June and July, and are the lowest in December. Thus, during the season-off period, January and February, the skipjack pole-and-line fishing boats, mostly Japanese fishing boats, return to home country for repair.

(ii) Local Fisheries

In the environs of Rabaul, the fishing using a bamboo basket has been practiced from very early times. Recently, as gill net fishing, trolling and angling by canoes, or by those equipped with outboard engine have been adopted, but such operations are mostly intended for home consumption. Although there are some catches of large horse mackerel from the Blanche Bay and Karavia Bay, the fish species mostly comprise reef fish, which besides the fish for home consumption, are sold on the road side or in the markets in Rabaul.

In addition to this, in the local fisheries of the Rabaul area fishing by the use of small-scale fishing gears such as simple trap nets, and enclosure nets are observed here and there in the neighborhood of Liguan, but it is difficult to grasp the amount of catch.

1-1-2 Inland Waters Fishery

Inland waters fishery is being operated in the drainage basin of such rivers as the Sepik River, Ramu River and Fly River. Using gill nets, the local people catch tirapia and carp for their own home consumption, in some areas, fresh water fish constitute staple food.

In recent years, endeavors have been made toward converting tirapia into a commercial product, as seen in theprocessing of it into salted dry fish.

Table 1-1-1 (1) Localities of Baiting Grounds

Baiting Grounds	Central Points		Baiting Ground Radius	Remarks
	S	E		
1	02°17'48"	150°28'36"	20 (n.m.)	Environs of New Hanover
2	04°15'13"	151°46'03"	20 "	" Cape Lambart
3	05°10'00"	145°50'00"	10 "	" Karkar Island (not utilized)
4	05°33'30"	149°14'30"	10 "	" Cape Shelton (not utilized)
5	05°25'00"	150°06'00"	10 "	" Kimbe (not utilized)
6	05°21'30"	150°54'00"	10 "	" Bangula Bay (not utilized)

Table 1. - Annual catch, daily catch rates & species composition of the Papua New Guinea fishery, 1970 - 75

	1970		1971		1972		1973		1974		1975	
	Total	Avg/Boat Day	Total	Avg/Boat Day	Total	Avg/Boat Day	Total	Avg/Boat Day	Total	Avg/Boat Day	Total	Avg/Boat Day
Jan	-	-	918	3.54	681	1.75	411	1.13	1,529	5.08	575	1.97
Feb	-	-	992	3.49	744	2.09	294	1.02	1,808	7.69	546	2.22
Mar	307	3.74	1,461	4.40	1,359	2.69	678	1.66	1,625	3.47	769	2.61
Apr	348	4.70	1,512	4.27	966	2.51	839	1.48	3,259	4.59	1,066	4.02
May	370	4.51	1,884	5.51	1,633	2.78	2,906	3.58	5,722	5.56	2,282	3.75
Jun	441	5.44	2,039	6.43	793	1.69	3,011	3.67	5,485	5.80	2,496	3.21
Jul	480	6.40	1,952	5.52	846	2.17	4,038	4.50	5,215	4.80	2,238	2.55
Aug	113	4.03	2,027	4.23	748	2.24	4,373	4.70	4,351	4.29	1,792	2.70
Sep	-	-	1,490	3.55	345	1.36	4,719	5.26	3,367	3.57	1,454	2.64
Oct	-	-	1,065	3.78	1,336	3.42	1,782	2.85	3,833	3.88	1,629	2.20
Nov	145	4.54	962	2.86	2,243	5.11	2,571	4.53	3,373	3.57	964	1.72
Dec	226	3.97	700	2.33	1,430	3.44	2,647	5.14	2,216	2.99	1,509	2.71
Total	2,430	4.76	17,002	4.19	13,124	2.67	28,269	3.68	41,780	4.4	17,322	2.69
Percent skipjack	96.8		99.0		86.5		94.4		96.6		Not available	
Percent yellowfin	3.1		0.8		12.5		4.6		2.9		Estimated 5%	
Percent other species	0.1		0.2		1.0		1.0		0.5		Not available	

1-2 Present Situation of Consumption, Distribution and Processing of Marine Products

1-2-1 Consumption and Distribution of Marine Products

(1) Outline

Regarding the collection of detailed data on the demand of marine products in Papua New Guinea, we had to rely on hearings from governmental institutions and persons concerned with the fishery industry, since it was difficult to collect them locally.

The fisheries of Papua New Guinea, as stated earlier, may be divided into two groups, that operated by joint-ventures with foreign capital and that practiced traditionally by the local peoples. Almost all the marine products distributed in the domestic market are produced by local fisheries.

An increasing atendency of the consumption of canned fish in recent years suggest an appreciable amount of potential demand. Therefor, the need of consolidation of the supply system has become pressing.

Although some amount of local marine products are soled in the markets in urban area of Port Moresby, Madang, Lae and Rabaul, the most part is allotted for home consumption. However, owing to the fact that barramundi and spiny lobsters are accepted as high-class seafood, they are frozen and exported, and domestic consumption of them is quite limited.

Regarding local fisheries, partly owing to the fact that it uses canoes, and partly because the fishermen engaged solely in

fishery is practically nil, stave production can not be expected at present, so that the supply system of marine products is being left virtually unconsolidated.

Despite the fact that dependency on fresh fish as the people's food is extremely low, canned fish composed chiefly of Australian products are sold in large quantities at the supermarkets in the country. In addition, demand for canned mackerel from Japan increases year after year. It is believed therefore that the consumption of marine products including canned fish will expand with the popularization of seafood and consolidation of the distribution systems.

At present, Papua New Guinea positively to promore improvement plans for fishing bases and markets, at same time plans to improve the fisheries educational and research institutions are pushed forward. Thus, the prospect for the development of the fisheries in the country may be promitionaly.

Fish shop at city market

(2) Consumption and Distribution of Marine Products in the Kavieng Area

The annual production of local fisheries in the Kavieng area is estimated to be 25 tons, of which about 12 tons is transported

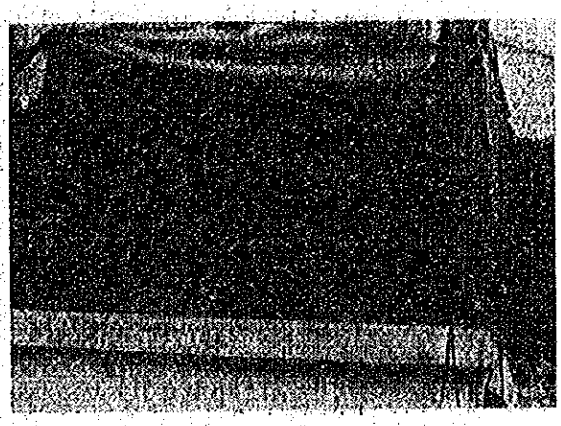
to Rabaul by air. The most of the remainder is consumed independent, and the rest is delivered to the markets. Two types of fish, mainly fresh fish (mainly small fish) and smoked fish (mainly large fish) are soled, however, neither the rates nor the quantity of them could be checkes up precisely.

Distribution of marine products in this area is characterised by the function of supply of frozen fish to Rabaul and active support by the Primary Industry Department to the system.

In other words, the Department purchases the catches (after grading them into Grades 1 through 3, at the three stations, i.e., Limellon Island, Lisseno (II) Island and Nanavaul Island) from the fishermen (20 to 30 ordinary fishermen, plus 40 6o 50 arbitrary land workery) operating along the coasts of the various islands in Silver Sound. Stored fish into ice boxes (large boxes measuring 71 cm x 110 cm x 81 cm, with capacity of 200 kg and small boxes, 60 cm x 120 cm x 60 cm, 100 kg) at the Island are collected periodically to keep them in a 2-ton cold storage (-10°C) provided in the agricultural and marine products stock station, then transport to Rabaul. The ice needed is supplied from the station's ice plant having a daily production capacity of 2-tons.

The purchasing prices of the Primary Industry Department is fixed at 55 toe/kg for first grade products, 40 toe/kg for second grade and 26 toe/kg for third grade.

"Arabushi" factory in Nago island.



"Arabushi" shipjack smoked products.

Fish sales in the markets in Kavieng are performed by persons engaged in fishery and home processors. The sales counter of fish has no clear division from that of vegetables or fruits, moreover, in sufficient consideration is given to keep the quality of products.

As regards the method of sales, in most cases, the smaller fishes are sold in units of a several fish, while the larger ones are sold individually. As the price is not indicated, it is determined by the negociation with a buyer. The market is opened for about 15 hours, from early morning to the evening. The sellers in most cases are women. Unsold fishes are sold the next day at lower prices. Thereafter, they are consumed by the sellers' homesholders, or alloted to the community members.

(3) Consumption and distribution of marine products in the Rabaul Area

Area

For huge-lot demand of fresh fish (including frozen fish), the Rabaul area depends on air-transports from Kavieng. That is,

a monthly average of 1.2 tons is carried into the area by the Primary Industry Department and delivered to the hotels, clubs and schools. When supply is excessive, the products are delivered also to the communities located closely. In the area, not only meat handlers but also large-lot users own cold storing facilities, so that they cook the stored fish as needed. In this area, the price of fish is 65 toe/kg for first grade products, 45 toe/kg for second grade products but no price is set for third grade products.

Similar to the Kavieng area, the most of the local fisheries products are applied to home consumption, and the rest is sent to the market. As regards the fish sales at the markets, the conditions are exactly the same as those in the Kavieng area. The plan is under study to build a fish market adjacent to this market.

1-2-2 Processing of Marine Products

(1) Outline

Since skipjack is important among the fish species caught in the Papua New Guineanwaters, the major portion of the processed products of Papua New Guinea also consists of skipjack products of frozen and smoked ("arabushi"), the rest is comprising small-scale home-processed smoked fish of local taste.

Regarding the processing and use of tilapia which is caught in great quantities from the Sepik River, various researches are now carried out by the Central Research Laboratry, Kanudy. It is hoped that systematic studies on all the catches will be continued and the future and that various processing facilities to be

consolidated, together with the development of fisheries.

Outstanding domestic processing facilities include the freezing factory in Port Moresby and Madang of the New Marine Product Co., a company engaged in shrimp trawl fishing, the smoked shipjack ("arabushi") factory, the largest of its kind, run by the Golling Kyokuyo Fishing Co. located on the Nago Island in the Kavieng area, and the cold storage of the New Britain Fishing Co. in Rabaul. Besides these facilities, in the environs of the Papua Gulf, there is only the small refrigerating facility intended for the purchases and storage of barramundi and spiny lobsters. Thus, in general, it may be said that the domestic processing system is virtually unequipped.

(2) Processing in Kavieng Area

As stated earlier, located on Nago Island is a smoked skipjack ("arabushi") factory having an average daily crude-fish-processing capacity of 12 tons (maximum 15 tons). The factory is provided with a dregs disposal facilities having a daily disposal capacity of 0.2 ton and a waste water treating facility which adopts the sedimentation system. Since the supply of mangrove (the firewood used for smoking) is being secured, there is no factor that may hinder operation of the factory.

In addition to the frozen fish supply business run in Rabaul by the Primary Industry Department, small-scale processing into smoked products is being practiced by the fishermen. Such products are being sold in the market of the Kavieng area along with fresh fish.

(3) Processing in Rabaul Area

In the Rabaul area, the only facility of a processing of marine products is the refrigerating facility (capable of storing approximately 300 tons) built previously by the New Britain Fishing Co. on the coast along the Simpson Bay. Use of this facility is limited to a certain period for the temporary storage of frozen fish from the mother ships belonging to the company, Thus, the other activities are negrectivity. However, the attached ice-plant is being operated, turning out ice for company-use as well as for outside users in small quantities.

Based on the Provincial Government's policy, which takes into account the preservation of the water quality within the bay, control majons are forced on the location of factories and enterprises that may cause that polution. For this reason, that the aforementioned refrigerating facility is restricted from full-fledged operation and being left virtually idling. Hence, any marine products processing facility in the form of enterprise cannot be expected to establish on land having good conditions along the shores of the Gulf of Simpson, or in the environs of Rabaul.

It was for this reason that New Massava was selected as the site for the establishment of the fishing base.

On the completion of fishing base, the establishment of a processing facility of marine products attached to the fishing base will be considered.

1-3 Problems of Fisheries

The fisheries of Papua New Guinea is gradually improving its status in terms of industry and economy, at the same time interest and expectations toward fisheries are being enhanced by the advancement of the skipjack fishery in the Bismarck Sea and the shrimp trawl fishery in the Papua Gulf. Among a number of problems to be solved for continuous development of the fisheries of Papua New Guinea, the following matters are recognized as urgent.

1-3-1 Problems Concerning Fishing

(i) In order to seek stable growth of the skipjack fisheries that is the main-constituent fisheries in the country, it is necessary to establish a supply system for bait fish which is most essential to fishing and to promote the exploitation of new baiting grounds.

(ii) Since fishing conditions are unstable as shown in the considerable fluctuation of annual catch in skipjack fishing, a plan to consolidate the systems of forecast and transmission of information related to the fishing is needed.

(iii) Since the securing of well-trained workers proves to enhance efficiency of fishing, there is need for promotion of giving the knowledge and technics of fishing to the fishermen.

(iv) Promotion, in forms of enforcement of policies, is needed to enable easy procurement, domestically and locally, of various materials for fishing (fuel oil, fishing packle, ropes, fishing nets, spare parts for machinery and instruments of fishing

boats, etc.) that are required for fisheries.

(v) It is necessary to promote the improvement of fisheries as well as the policies by consolidating surveys and data collection associated with fisheries.

I-3-2 Consumption and Distribution of Marine Products

Since the marine product are imporial as a protein source for the people, the utilization of them is development of fisheries is needed, but as the background that facilitates the growth of fisheries, it is required that the value of the marine products be increased by being consumed usefully. Thus, the activity of fisheries depend largery on the consumption of marine products. Furthermore, since the distribution measures taken for the supply of marine products from the producing centers to the consuming areas, or non-producing areas, are realize as an important factor, considerations must be given to the various matters associated with the consumption and distribution of marine products in planning the development of fisheries. Main points to be considered are as follows:

(i) Efforts are needed to expand the volume of consumption of marine products through deploying policies to popularize fish food among the people.

(ii) In order to keep regular consumption of marine products, means of supply and sales that will enable purchase and selection by fish species and by form should be promoted.

(iii) To establish the supply system of marine products from the producing centers to the consuming areas, efforts are needed to foster traders specializing in the collection and handling of marine products.

(iv) In order to ensure speedy and regular supply of marine products, considerations must be given to establishing policies for means of transportation, especially to the inland area.

(v) Efforts should be made to compile the results of survey and statistical data required for executing the various measures relating to demand and consumption of marine products.

(vi) The installment of small refrigerating show cases and the consolidation of preserving and cold-storing facilities that are required for the consumption and distribution of marine products must be promoted at a national level by subsidizing measures.

1-3-3 Processing of Marine Products

The development of processing of marine products generally shows a tendency of complying with such factors as the growth of fisheries, trend of demand for marine products and the changes in the eating habits and the substance of the dietary life of the people. Essentially, processing of marine products has the role of effective utilization of marine products.

In planning the development of processing of marine products, a considerable amount of catch for a single fish species becomes

essential conditions. The methods and scale of processing will also differ according to the destination of the processed marine products. Thus, the following matters must be taken into account in planning the development of processing of marine products. The following matters are applicable both to the Kavieng and Rabaul areas.

(i) Based on the establishment of a comprehensive policy for utilization of marine product, processing items both for the domestic and overseas markets should be properly selected.

(ii) The fish species to serve as raw material for processing are to be selected, and research and guidance on processing methods should be promoted.

(iii) Regarding the location and business of enterprise, preliminary adjustments relating to sanitation and pollution problems should be made.

(iv) With a view toward popularization of processed marine products, measures should be taken to promote the teaching and guidance of simplified techniques in making salted dry and smoked products.

(v) Efforts are needed to improve the quality of processed products by promoting technical training of workers.
(This is particularly necessary when planning shipment of products to international markets.)

(vi) Care should also be taken to such matters relating to the progress of processing of marine products as the supply of packing materials, seasonings and materials, and the establishment of manufacturers of them.

1-4 Measures for the Promotional for Fisheries

Although the Papua New Guinea Government's plan for promoting the fisheries is still in the stage of planning, the vital points of the concept underlying the planning can be largely summarized by the matters described below. The matters have also been considered as the substantial points by the present survey team.

1-4-1 Basic Concept

The role to be played by the fisheries and the merits to be gained by promotion are:

(i) To aim at the supply and securing of marine-products for the people.

(ii) To contribute to progress the national economy through the promotion of export of marine products.

(iii) To promote stable of employment and progress of regional economy through the promotion of the fisheries.

(iv) To promote increase of value of fisheries products through the development of the fisheries processing industry.

1-4-2 Direction of Policies

The followings give the outline of concrete measures to be taken on the basis of the basic concept that is required from a national standpoint.

(i) To promote the construction of fishing bases in the Kavieng and Rabaul areas for the maintenance and development of the skipjack fisheries, which plays the most significant role

in terms of production, and at the same time, to plan to set up associated facilities.

(ii) To endeavor to increase production and enlarge exports of marine products by means of the sound management and operation of the fishing base, furthering stabilization of employment and raising the level of regional economy.

(iii) To make positive efforts toward extension of fish-eating habits and establishing a marine products distribution system that is essential to supply, aiming at increasing demand corresponding to the development of local fisheries.

(v) To push forward education, training and extension of technics of fisheries and to exert efforts to rear skilled laborers.

1-4-3 Urgent Key Policies

(i) Planning of basic plans for consolidating the fishing bases and the positive promotion of the plan,

(ii) Establishment of a live-bait supplying system and development and promotion of new baiting grounds and

(iii) Consolidation of the testing and research systems associated with the industry.

(iv) Promotion and arrangement of facilities relating to fisheries processing industry and others in order to make overall utilization of the fishing base.

1-4-4 Basic Plan for Consolidating Fishing Base

(1) Basic Concept

Based on the stated basic policy, and with a view to converting the skipjack pole-and-line fishing now operated by the mother ship system in the fishing grounds in the Bismarck Sea into base-operated fishing, a key base will be selected and consolidated as the base of operations, aiming at the same time to contribute to the promotion of local fisheries.

(2) Prospect of Skipjack Fisheries

Assuming that the live-bait supplying system will be established by 1980, the target for 1981 onward regarding the skipjack catches has been set as listed below.

Table 1-4-4-(2) Total catches of Skipjack

(Unit: ton)

Fiscal year	Total catches	Remarks
1981	75,000	Fishing boats: 75

Chapter 2 Fishing Base Construction Plan for Kavieng

Chapter 2 Fishing Base Construction Program for Kavieng

2-1 Basic Concept

In setting up the Fishing Base Construction Program for Kavieng, full studies were made of such matters as the natural conditions of the Kavieng area and the trends of fisheries production as well as those associated with distribution, processing and consumption of marine products in Papua New Guinea and in the Kavieng area. Then, taking into full consideration the Papua New Guinea Government's Measures for the promotional for fisheries, the program was planned on the basis of the basic concept described below.

(i) Resting on the basis of the basic policy of the Government of Papua New Guinea to convert the skipjack pole-and-line fishing which presently adopts the mother ship system into one adopting the base fisheries system starting from the target year, the base will be consolidated in a way to make it capable of functioning as a base of operation for the skipjack pole-and-line fishing operated in the Bismarck Sea as the fishing ground.

(ii) Since the promotion of local fisheries constitutes an extremely important subject from the standpoint of securing animal protein for the people of Papua New Guinea, the base will be consolidated in such a way as to serve also as a foundation upon which local fisheries in the Kavieng area can be promoted.

(iii) With a view toward promoting export through the positive utilization of affluent marine reasources, the base will be provided with such functions as to allow production and export of frozen skipjack in large quantities at and from the base.

(iv) The scale and arrangement of the facilities to be established at the base shall be such that will enable the base to comply with demand for the target year.

(v) The target year for the present program shall be set to 1981.

(vi) The construction period for the base shall be 3 years.

2-2 Setting of Planned Handling Amount

To determine the scale of the present base program, the planned handling amount, i.e., landing amount of catch to be handled at this base and assortment for distribution, the shipping amount of marine products from the base and the vessel force for the target year of 1981 were determined as described below.

2-2-1 Landing Amount and Assortment for Distribution

(1) Landing Quantity

Fisheries presently practiced in the waters of the vicity of this area consists of skipjack pole-and-line fishing and local fisheries.

Skipjack pole-and-line fishing is operated by the mother ship system using the Ysabel Pass of New Hanover Island as the baiting ground. The skipjacks captured are landed in an amount of about 2,000 tons yearly to be used as raw material for the smoked

skipjack "Arabushi" factory located on Nago Island in this area. The rest of the catch is shipped directly from the fishing grounds to international markets. At the time the landing quantity on this base was evaluated, by presuming the operating conditions of skipjack pole-and-line fishing, etc. that will be cpnverted to base fisheries as specified below.

(i) The catch landed on the base will be captured by fishing boats fishing in the Kavieng area (the Base and its environs).

(ii) These fishing boats, like in the past, will engage in shipjack pole-and-line fishing and local fisheries.

(iii) Although stable supply of live bait is indispensable to skipjack pole-and-line fishing, difficulties are being experienced in obtaining them at the present stage. However, by future expansion of baiting grounds, stable supply of live bait will be realized by the target year.

(iv) To engage in skipjack pole-and-line fishing converted into the base fisheries system, a total of 25 skipjack pole-and-line fishing boats of the 59-G.T. class will operate at a one-week cycle using the base as the base of operation. In view of the past catch results, the annual catch per fishing boat was evaluated to be 1,000 tons.

(v) With respect to local fisheries that aims at complying with local demand, although sufficient data on the quantity and distribution of game fish are not enough, we place high expectations on the effect of the enforcements of policies in connection

with the promotion of local fisheries. In this area, for which the main fishing grounds is the Silver Sound, an annual catch of some 900 tons is gained.

(vi) The captured skipjacks that will annually total some 23,000 tons will be transported by two carriers and will be landed every day on the base. The remaining 2,000 tons will be unloaded on Nago Island as the raw material for smoked skipjack "Arabushi".

(2) Assortment for Distribution of Landed Products

Based on the stated basic concept and due to the situation of consumption of marine products in the Kavieng area, the skipjack and local fishes landed at the base are to be divided into 3 groups, those for freezing and storage, those for processing and those for fresh consumption. The following describes the specific details.

(i) Processing of the captured skipjacks will be carried out at the smoked skipjack ("Arabushi") factory on the Nago Island alone; the skipjacks unloaded on the base will all be frozen.

(ii) By taking into account the situations of marine products consumption of the Kavieng area, the landed local fishes will be distributed at the base as frozen or process (smoked) product, or as fresh food.

Table 2-2-1 Landed Quantity and Assortment for Distribution for the Target Year

(Unit: ton)

Landing place / Assortment for Distribution / Type of fisheries / Catch	Catch	Base: Assortment for Distribution: For freezing & storage	Base: Assortment for Distribution: For processing	Base: Assortment for Distribution: Use as fresh food	Nago Island: For processing
Skipjack pole-and fishing	25,000	23,000	23,000	-	-	2,000
Local fisheries	900	900	500	100	300	-
Total	25,900	23,900	23,500	100	300	2,000

2-2-2 Shipping Out Amount

The catches that have been landed at the base will be allotted as described earlier into three groups, as those for freezing and storing, those for processing and those for use as fresh food, and in the manner shown below will be shipped out from the base respectively as frozen products, processed products and fresh food. (See Table 2-2-2)

(i) Skipjacks that are frozen at the base will be exported overseas in their entirety.

(ii) All of the local fishes handled at the base will be applied for consumption in the Kavieng area.

Table 2-2-2 Shipping-out Amount for the Target Year
(Calculated as converted into fresh fish)

(Unit: tons)

Marine products	Fish species	For local market	For overseas market	Total	Remarks
Frozen products	Skipjack	-	23,000	23,000	Smoked skipjack "Arabu-shi" produced at Nago Island factory will be shipped overseas direct-ly from Nago Island.
"	Local fishes	500	-	500	
Processed product	"	100	-	100	
Fresh food	"	300	-	300	
Total		900	23,000	23,900	

2-2-3 Vessel Power

In calculating the estimated number of fiahinf boats and carrier that will be utilizing the base for such purposes as landing their catch, shipping out marine products, and supply and rest, the base-utilizing situation of these vessels for the target year was supposed as shown below. (See Fig. 2-2-3)

(i) A 5-G.T. class fishing boat loaded with local fishes intended for storage into the 3 ice boxes provided in the vicinity of the fishing grounds will utilize the base every day for unloading, supply and rest.

(ii) Twenty-five fishing boats of the 59-G.T. class engaged in skip-jack pole-and-line fishing will return to the base for supply and rest at a one-week cycle, divided into 7 groups.

(iii) Two 100-G.T. carriers will be stationed at the base and will load the captured skipjacks and carry them to the base. The carriers will also receive necessary supplies to prepare them for the next voyage.

(iv) To export frozen skipjack, freezing carriers of the 600-G.T. class and the 2,000-G.T. class will enter port, load cargo and receive supply. In this case, the carriers will not enter the port concurrently. The average daily loading capacity at the base will be 120 tons.

(v) Of the total shipping tonnage for overseas shipments of 23,000 tons, 70% will be carried out by the 600-G.T. class carrier and the remaining 30% by the 2,000-G.T. class carrier.

(vi) The 2,000-G.T. carrier will call at the three fishing bases of Kavieng, Rabaul and Manus in regular succession and will load cargo of 1/3 of its maximum loading capacity at each of the ports.

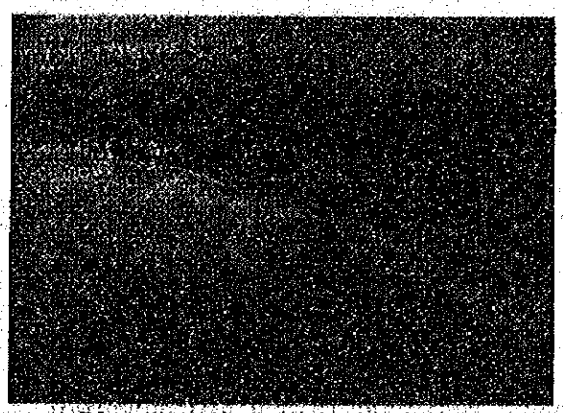
Table 2-2-3 Annual Frequency of Port Entry of Freezing Carriers

G.T. (A)	Carry-out amount (B)	Maximum loading capacity (C=0.8A)	Loading capacity per time (D)	Annual frequency of port entry (E=B/D)	Days required for loading (F=D/120)
	ton	ton	ton		day
600	23,000x0.7=16,100	480	480	34	4
2,000	23,000x0.3= 6,900	1,600	1,600÷3=530	13	5

Fig. 2-2-3 Model Plan for Utilization of Base by Ships

Type of vessel	G.T.	Purpose of Use				Number of Boats	Number of Days
		Landing	Carrier Shiping-out	Supply	Rest		5 10 15 20 25 30 35 40
Local fishery	1			○	○	40	
"	5	○		○	○	1	
Skipjack pole-and-line fishing	59			○	○	3	
"	"			○	○	"	
"	"			○	○	"	
"	"			○	○	4	
"	"			○	○	"	
"	"			○	○	"	
"	"			○	○	"	
Carrier	100	○		○	○	1	
"	"	○		○	○	"	
"	600		○	○	○	"	
"	2000		○	○	○	"	

2-3 Selection of Planned Site



Planned site for Kavieng fishery base

As the "Scope of Work" for the present survey had indicated as the planned site for the base "Burns Phillip Plantation", the survey team, after carrying out thorough investigation of the geographical conditions of the site selected it as the planned site, based on such conditions as stated below.

2-3-1 Water and Electric Power Supplying Conditions

The topography of the Kavieng area being both flat and without any rivers, the base must depend on groundwater for water that is required for operation of the base. Judging from the fact that the area's annual mean precipitation is 3,200 mm, and also from the results of pumping tests (136 tons/hour) carried out at a point located at a distance of approximately 4 km away from the site, groundwater is assumed as being plentiful.

Also, viewed from the fact that groundwater is being pumped up in an amount of 7 tons per hour at a point located in the neighborhood of the planned site and being smoothly supplied to the marine products processing factory on Nago Island, securing of water required for the Base may be considered to be certain. Electric power can be secured as power is being distributed up to an area in the neighborhood of the planned site.

2-3-2 Relationships with Natural Conditions

As may be seen in the Appendix titled "Natural Conditions of Planned Site and Its Environs", in the monsoon season from December through April, the planned site will be affected by waves advancing in the NW direction. However, since the waves intruding from between the Nago Island and Nusariku Island will be deflected by the coral reefs in the vicinity of the two islands and will reach the planned site at heights of no more than 0.5 m, it is considered that functions as a anchorage can be secured even under the present condition.

As regards the tidal streams passing through the Nusa Channel, during ebb tide, those flowing southward are thought to be the fastest due to the topography in the vicinity of the northern harbor entrance of Port Kavieng, but they will not be such that would be of any hindrance to the navigation, or mooring, of vessels.

There is absolutely no concern of the construction of the base causing any change in the coastline in the vicinity of the site.

2-3-3 Land-Building Conditions of Site

The Base requires a vast area of land as its site. Owing to the fact that a coral reef having a largely L.W.L. ground level and measuring about 100 m in width runs from the north to south, land-building of site by sea surface reclamation is extremely easy, while site aquisition on the land area is also viewed as quite easy.

2-3-4 Traffic and Transportation Conditions

Land traffic leading from the main road to the planned site

will be secured by building a access road in a length 320 m.

Further, since the planned site is located closely to the Nago Island, it will be possible to maintain close relations with the Nago processing factory as in the past.

2-4 Planned Policy

2-4-1 Basic Policy

Since the present base program must be planned in a manner to conform with the "Basic Concept" described in "2-1", and to allow smooth operation of skipjack pole-and-line fishing after it has been converted from the mother ship system into the base fisheries system, and at the same time, to fully contribute to promoting local fisheries and the export of marine products, the facilities plan will be so composed as to allow the achieving of the targets shown below, and to permit safe and rational handling of the planned handling amount set in "2-2" at the planned site selected in "2-3".

(i) To secure smooth landing functions for catches

(ii) To secure speedy handling functions and thorough storing functions for the landed catches

(iii) To secure speedy loading and shipping-out functions for the marine products

(iv) To secure smooth supply functions for vessels

(v) To secure adequate management and operation functions for the base

2-4-2 Facilities to be Covered by Program

Regarding the facilities program, in order to achieve the facilities program target as stated earlier, the scale and arrangement of the facilities listed in Table 2-4-2, that are in direct need, will be determined. At the same time, the construction cost of those facilities that will be owned by the Base Management Body will be estimated.

Table 2-4-2 Facilities to be Covered by Program

Owner of Facilities		
Base Management Body	Superstructure Management Body	Others
Mooring facilities	Refrigerating & cold storing facilities	Oil supply facilities
Revetment	Ice making and storing facilities	
Land		
Roads	Fishing gear warehouse	
Parking lots	Waste water disposal facilities	
Illumination facilities	Crew's welfare facilities	
Water supply facilities	Office	
	Handling machineries	
	Water supply facilities	
Green park		
Management Office		

Note) Owing to the fact that the planned site is relatively blessed in terms of marine phenomenon conditions, it was decided that the natural water basin will be utilized as the waterway and anchorage, and that no facility such as breakwaters will be planned for construction.

2-4-3 Policy Concerning Arrangement of Key Facilities

(i) Facilities directly associated with vessels such as anchorage and mooring facilities will be provided at most advantageous positions to ensure safe mooring and ready maintenance of such facilities, by taking into account marine phenomenon conditions especially. In accomplishing this, ample consideration will be given for leaving allowance for future enlargement of the fishing base.

(ii) The face line of the quay wall will be provided at a position that will allow the desired water depth to be secured, by taking into account such matters as the configuration of the coral reef and land building conditions. As a rule, no dreging work will be carried out.

(iii) To allow for speedy managing of landed fish and loading of marine products, the mooring facilities and the site will be located adjacent to each other as far as possible. Since trucks will be employed to carry out the jobs, extra space will be secured for the quay wall.

(iv) Various managing facilities for the landed fish and supply facilities for vessels will be so located as to prevent any confusion in the movement of vessels and fishes. The oil-supply and water-supply tanks, however, will be provided at a place remotely located from the mooring facilities as much as possible. Supply to vessels will be carried out by oily feeding and water-feeding pumps.

2-5 Facilities Plan

The facilities plan for the facilities listed in Table 2-4-2 has been set up as shown below, taking into due consideration the "Natural Conditions of the Planned Site and Its Environs" of the Appendix, and based on the Planned policy" of "2-4".

2-5-1 Dimensions of Vessels

Since the scale and arrangement of facilities directly associated with vessels such as mooring facilities must be determined based on "Fleet Force for Target Years" of "2-2-3", dimensions of the vessels were set as shown in Table 2-5-1. (See Appendix, "Dimensions of Vessel".)

Table 2-5-1 Dimensions of Vessels

Type of vessel	G.T.	Vessel length	Vessel width	Maximum draft
Local fishing boats	5	13	2.5	1.3
Skipjack pole-and-line fishing boats	59	26	4.8	2.3
Carrier	100	31	5.8	3.3
Carrier	600	62	9.0	6.6
Carrier	2,000	77	10.8	7.5

2-5-2 Mooring Facilities

(1) Scale

D.L.-8m quay wall	110 m
D.L.-8m pile	two unit
D.L.-2m wharf	14 m
D.L. 0 "	50 m

(i) The quay wall, as a rule, is to be provided with an extension that is required for landing catches, loading marine products and supplying vessels and letting them rest. Using Fig. 2-2-3 as the basis, we shall calculate the required extension for a case in which the maximum length of quay wall extension is required, that is, for a case in which a 2,000-G.T. carrier, a 100-G.T. carrier and 4 59-G.T. skipjack pole-and-line fishing boats will be using the quay wall on the same day.

2,000-G.T.Class	1 berth alongside quay	Required extension	Quay wall 85 m
100 G.T. "	"	"	34
59-G.T. "	"	"	29
		Total	148

(ii) By taking into consideration the geographical position of the stated calculated extension and the topographical conditions, the planned water depth of the quay shall be set to D.L.-8m uniformly.

(iii) The D.L.-2m wharf is to be provided with an extension of a portion of "1 berth alongside quay" of a 5-G.T. class fishing boat, and the D.L. 0 m wharf with a 50 m extension for a non-powered vessel.

(iv) Although it is assumed here that the captured skipjacks will be transported to the base by means of carriers, it is also conceivable that the operating form will turn into dry-trip operation when the live-bait supply condition further improves. Thus, by assuming the state of day-trip operation, we shall

check to see whether a 150 m quay extension will rationally function with regard to skipjack pole-and-line fishing boats that operate on a day-trip basis.

The skipjack fishing boats will put out from the base for the fishing grounds every day during the hours from 3 a.m. to 4 a.m.

The fishing ground is located at a position from 50 to 60 nautical miles away from the base.

The operating time at the fishing grounds, including the time for fishing-ground scounting, acounting will be from 2 to 3.5 hours.

Landing works will be completed by 8:30 p.m.

The time required for landing per boat will be 24 minutes.

Based on the abovestated conditions (See "Behavior of Day-Trip Operation Skipjack Fishing Boats".), we get

$$\text{Required berth} = \frac{a \times b}{c} = \frac{24 \times 5}{60} = 2$$

where,

a Required landing time per boat: 24 minutes

b Number of boats making simultaneous port entries: 5 boats

c Interval between port entries of fleet: 60 minutes

Hence, the required quay extension will be 143, implying

that the calculated scale of 150 m will be sufficient.

2,000-G.T. Class	One berth alongside quay	Required quay extension:	85 m
59-G.T. Class	2 berths alongside quay	"	58 m
		Total	143 m

(2) Arrangement

The D.L-8 m quay face line, which is used in skipjack pole-and-line fishing and in shipping out marine products, will be provided largely paralle to the edge line of the coral reef and will be positioned so as to ensure a D.L-8 m water depth, while the wharf will be provided on the northern side of the quay where there is a more quite and calm anchorage.

2-5-3 Freezing and Cold Storing Facilities

(1) Capacity

Freezing capacity: 80 ton/D

Cold storing capacity: 720 tons

As will be seen from Tables 2-2-1 and 2-2-2, since the greater part (23,500 tons) of the 23,900 tons of fishes that will be landed on this base in the target year will be stored into these facilities and will be shipped out as frozen products, the scale of the facilities was determined as shown below, by taking into consideration the "Model plan for base utilization by ships" of Fig. 2-2-3.

(i) As the landed fishes intended for frozen products will have to be rapidly frozen in order to ensure quality, the facilities

are required to have a daily mean freezing capacity of 65.3 tons. By giving conserervation to shift in the landing time band and work loss, the daily freezing capacity will be set to 80 tons.

(ii) To ensure smooth service of shipping vessels, the cold storing facilities to store frozen products is required to have a storing capacity of at least a 9 day's portion (65.3 tons x 9 days 588 tons). Thus, by making allowances for a 2 day's p portion (131 tons) to prepare for unpredictable situations, the cold storing capacity shall be set to 720 tons.

(2) Arrangement

A major factor that determines the quality of the catch is how well the degree of freshness is maintained. For this reason, the freezing and cold storing facilities will be provided adjacent to the quay to allow for speedy carrying-in of landed products and loading of marine products. In addition, the facilities will be equipped with such handling machinery as cranes (hoisting capacity: 2 tons) and fork lifts.

2-5-4 Ice Making and Storing Facilities

(1) Capacity

Ice making capacity: 35 tons/D

Ice storing capacity: 175 tons

Because the freshness of skipjacks and local fishes must be maintained by means of ice during the period following capture of them up to the time they are stored into freezing and cold storing

facilities, the ice making and storing capacities were calculated in a manner to allow supply of ice to comply fully with the fluctuation in demand.

(i) The ice making capacity will be able to cover the daily ice supply amount shown below.

For skipjack pole-and-line fishing boats:

25,000 tons x 0.33 tons/300 days ≒ 28 tons/day

For local fishing boats:

900 tons x 1.0 ton/300 days = 3 tons/D

For others (markets, hospitals, etc.) 4 tons/D

(ii) To comply with fluctuation in demand, the ice storing capacity makes allowance for a reserve of a 5 day's portion.

(2) Arrangement

Similar to oil supply and water supply, the supply of ice in a short period of time is one of the vital services required for fishing boats. Thus the ice making and storing facilities will be located behind the D.L-8 m quay adjacent to the freezing and cold storing facilities.

2-5-5 Oil and Water Supply Facilities

(1) Capacity

Oil storing capacity: 800 kℓ (2 units of 400 kℓ tanks)

Water supply capacity: 4.0 ton/hr

(i) As shown in Table 2-5-5 91), the monthly average consumption of fuel oil for vessels in estimately to be 1,500 kℓ. On the assumption that the tanks will be refilled twice a month, the

tanks' oil storing capacity was set to 800 kℓ.

(ii) The water supply capacity shall be set to 4.0 tons/hr, 1.5 times the average daily demand amount of 2.72 tons/hr. (See Appendix "Calculation of Industrial Water Amount".)

(2) Arrangement

The oil-supply and water-supply tanks will be provided at a farthermost point from the mooring facilities. Supply to the ships will be carried out by way of pipes.

Table 2-5-5 (1) Consumption of Fuel Oil for Vessels

Type of vessel	G.T.	(a) Engine output (H.P.)	(b) Consumption of fuel oil (ℓ/HP.hr)	(c) Monthly mean operating time (hr)	(d) Number of ships	(a x b x c x d) Monthly consumption of fuel oil (kℓ)
Skipjack pole-and-line fishing boats	59	420	0.18	15 hr 30 days 450	25	850.5
Carrier	100	700	"	12 30 360	2	90.7
"	600	2,400	"	240 3 round trips 720	1	311.0
"	2,000	4,000	"	360 2 1/3 240	1	172.8
Local fishing boats	not more than 5	20	"	10 30 days 300	50	54.0
Total						1479.0

Note: Calculation for 2,000-G.T. class carrier presupposes that the carrier will receive oil supply in an amount of 1/3 of its total required amount at the three bases of Kavieng, Rabaul and Manus.

2-5-6 Land

1) Area by purpose of use

Name of land	Area (m)	Breakdown					
		Reclaimed land			Existing land		
		Base M.B.	Super-structure M. B.	Others	Base M.B.	Super-structure M. B.	Others
Land for freezing and cold storing facilities	2,550		2,550				
Land for ice making and storing facilities	1,250		1,250				
Land for oil supply facilities	1,080						1,075
Land for water supply facilities	300					300	
Land for fishing gear warehouse	1,040		1,040				
Land for waste water disposing facilities	700		700				
Land for parking lots	1,515	1,170			345		
Land for green park	1,600	1,600					
Land for crew's health and warefare facilities	1,800		1,800				
Land for Superstructure M.B. Office	2,025					2,025	
Land for Base M.B. Office	900				900		
Land for Dock roads	5,373	3,410			4,963		
Land for Access roads	3,840				3,840		
Total	23,968	6,180	7,340		7,048	2,325	1,075

(2) Arrangement

The facilities will be arranged based on the "Policy Concerning Key Facilities Arrangement" of "2-4-3".

Fig. 2-5-6(1) KAVIENG FISHING BASE PLAN (NO.1) S=1/2,000

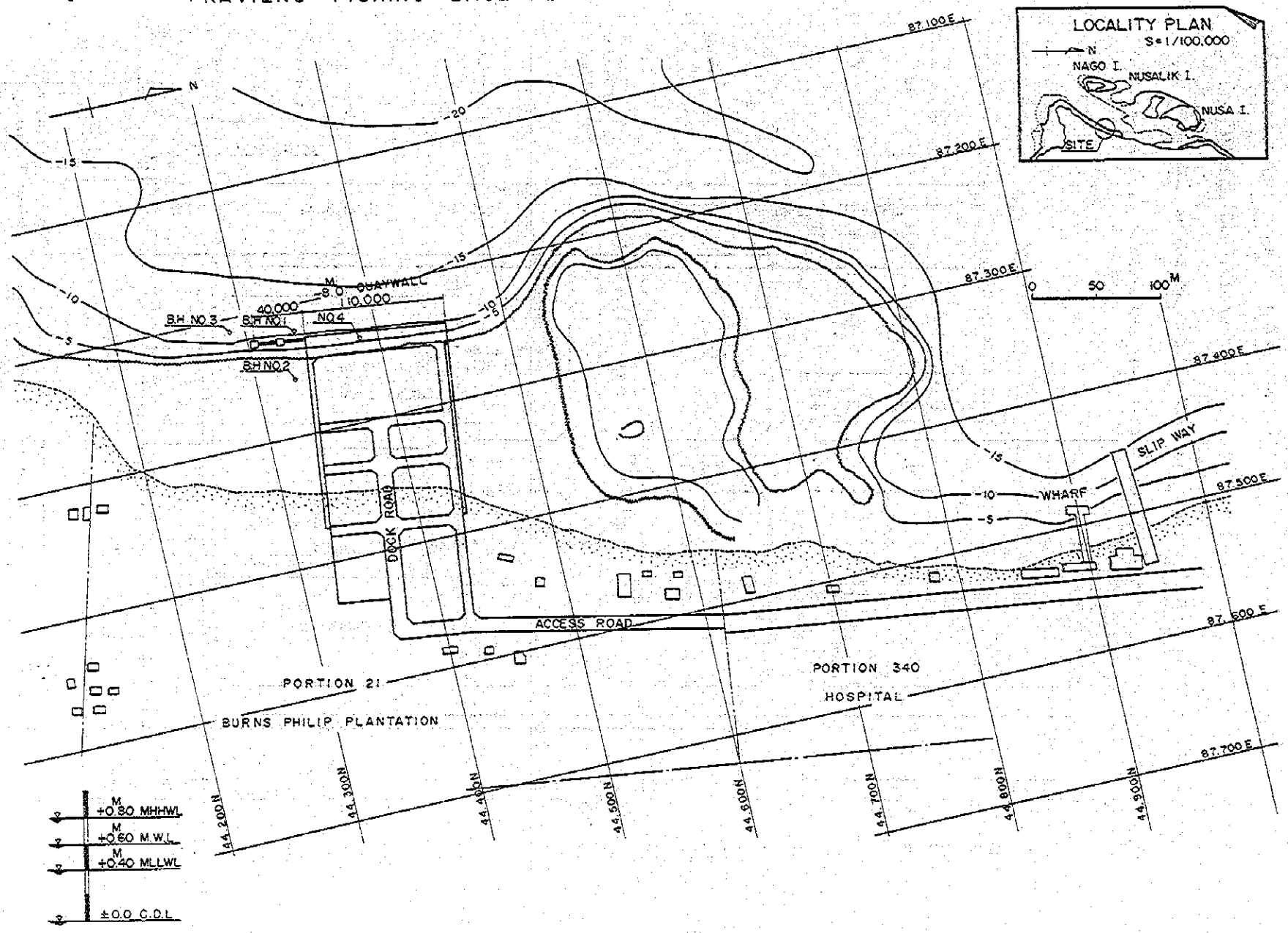
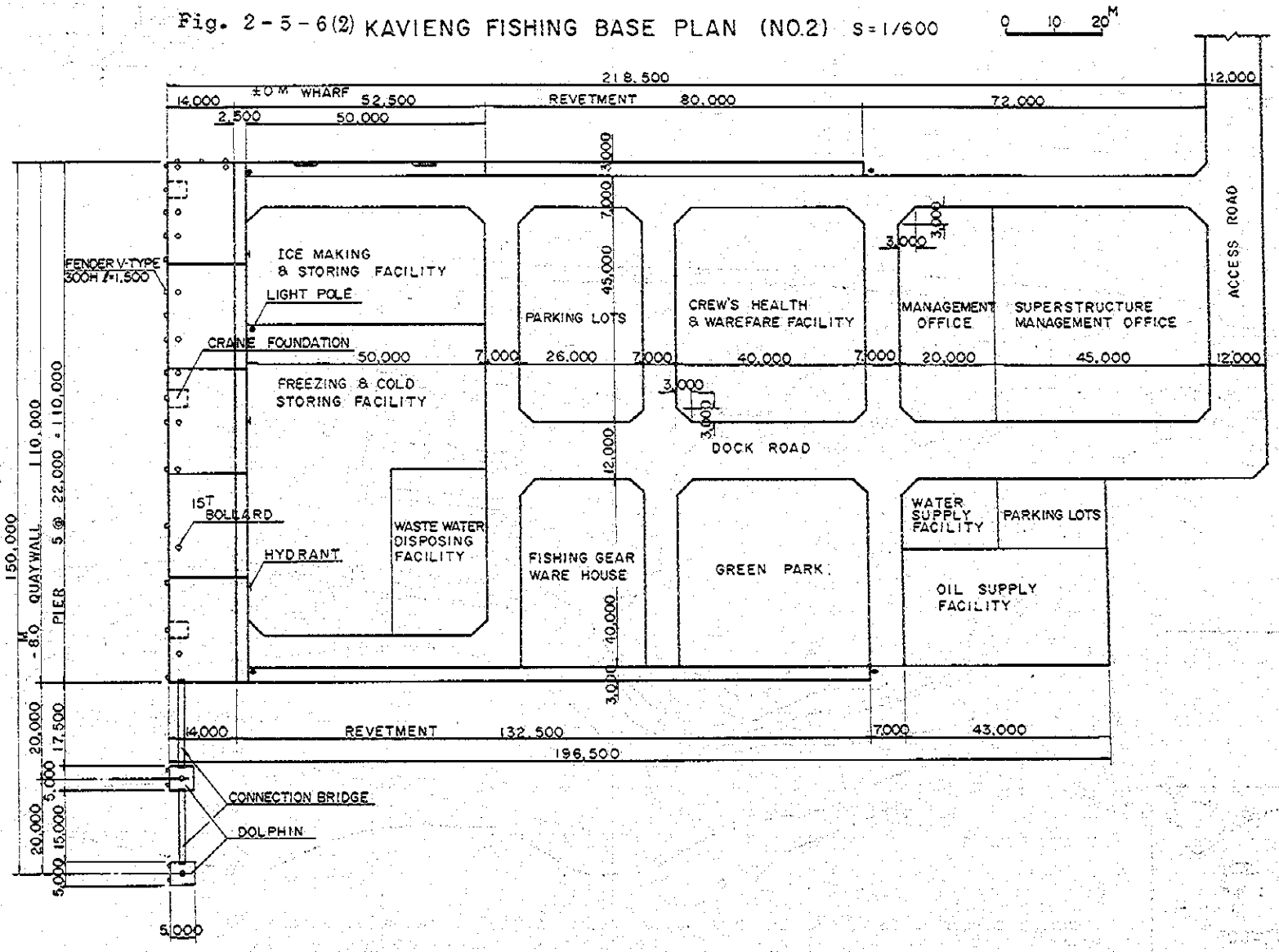


Fig. 2-5-6(2) KAVIENG FISHING BASE PLAN (NO.2) S=1/600



2-6 Structural Design of Key Facilities

2-6-1 Design Conditions

Based on the Appendix entitled "Natural Conditions of Planned Site and Its Environs", the design conditions have been set as listed in Table 2-6-1.

Table 2-6-1 Design Conditions

Item		Quay Wall	Wharf	Revetment
Tidal level	M.H.H.W.L.	+0.8 m	Same as to left	Same as to left
	M.W.L.	+0.6 m	"	"
	M.L.L.W.L.	+0.4 m	"	"
	D.L. (C.D.L.)	±0.0 m	"	"
Wave		Not especially considered	"	"
Seismic coefficient	Horizontal coefficient (Kh)	0.5	0.00	"
	Vertical coefficient (Kv)	0.00		"
Foundation soil		Silty sand N value: 12	Coral reef Bearing capacity: 30 ton/cm^2	"
Vessels of plan (G.T.)		2,000 G.T.	5 G.T.	
Surcharge	Uniform load	1.5 t/m2	0.5 t/m^2	"
	Wheel load	TL 20	-	-
	Crane load	12 t		
Approaching speed of vessel		0.1 m/s	0.4 m/s	-
Pulling force of vessel		15 t	5 t	-
Crown level		+2.3 m	+2.0 m	+2.5 m
Apron width		14 m	1 m	3 m

2-6-2 Selection of Structure of Key Facilities

In selecting the structure of key facilities, studies were made based on the "Design Conditions" of "2-6-1" and the "Law Concerning Fishing Port Structures" enforced in Japan, and with attention paid to the following matters.

(i) That it is possible to complete construction within a limited period.

(ii) That a construction method be adopted that would comply with the foundation structure which is subject to change considerable, the foundation soil being composed of coral reef and silty sand.

(iii) That the facilities be of a construction that would not entail in-water digging as far as possible, in view of the structural characteristics of the coral reef.

(iv) That stable supply of materials is possible.

(v) That execution is easy.

(vi) That construction cost is relatively low.

(vii) That it allows ready and inexpensive maintenance and repair.

The selected standard construction of the key facilities are shown in Figs. 2-6-2-(1) ~ 2-6-2-(4).

Fig. 2-6-2(1) QVAY WALL CROSS SECTION

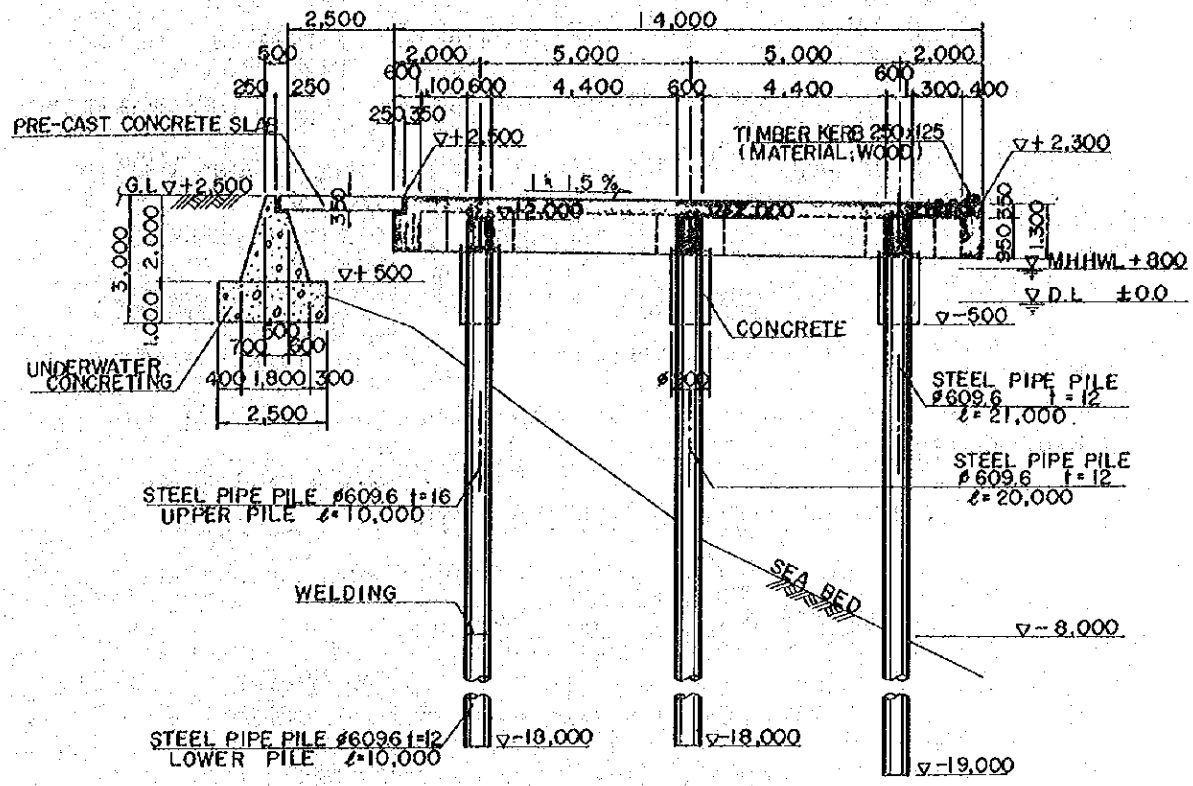
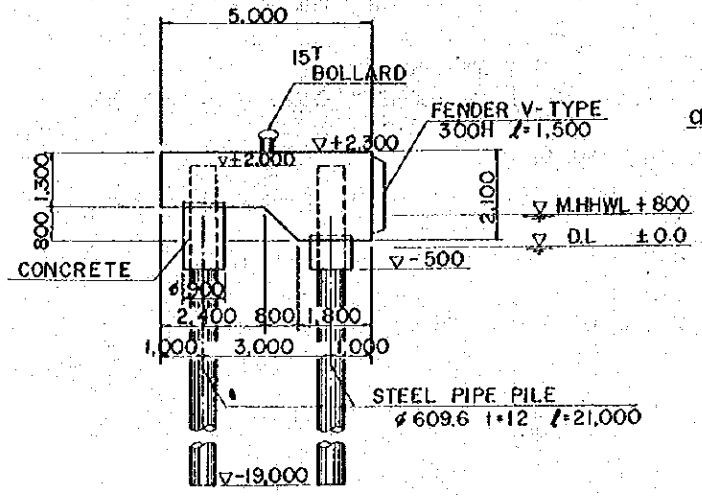


Fig. 2-6-2(2)

MOORING SECTION



CONNECTION BRIDGE SECTION

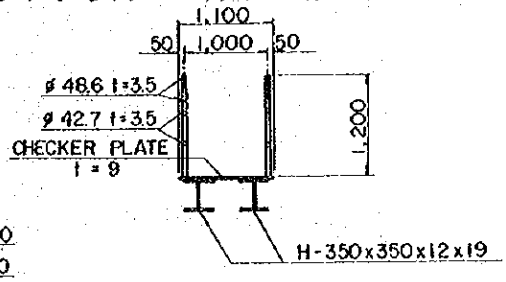
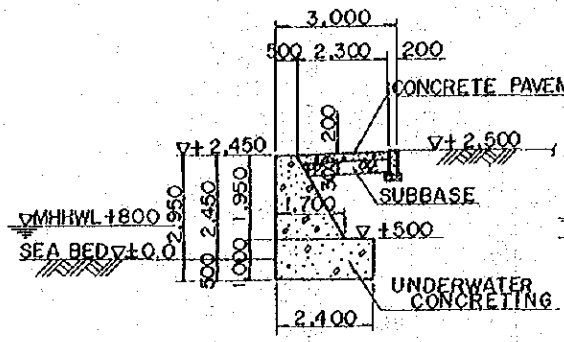


Fig. 2-6-2(3)

WHARF SECTION



REVETMENT SECTION

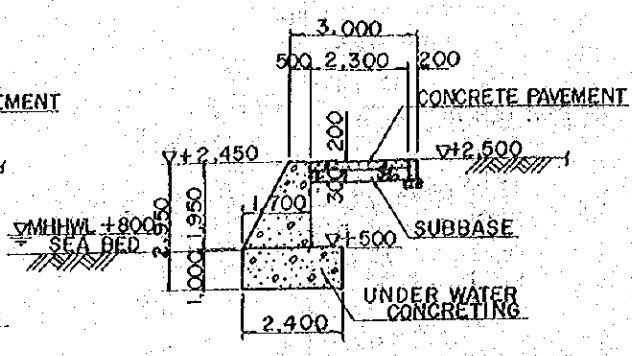
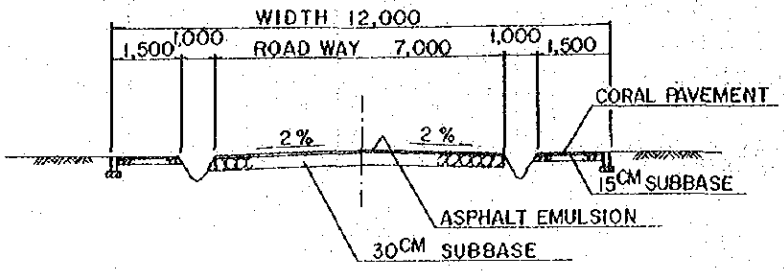
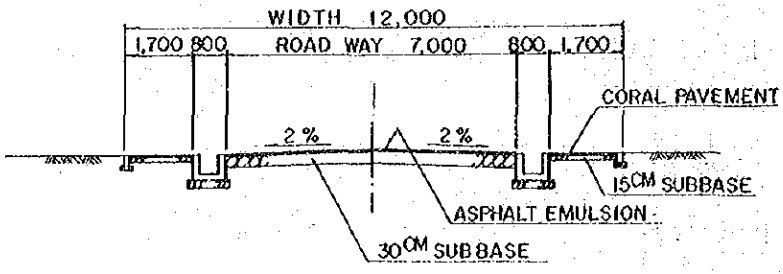


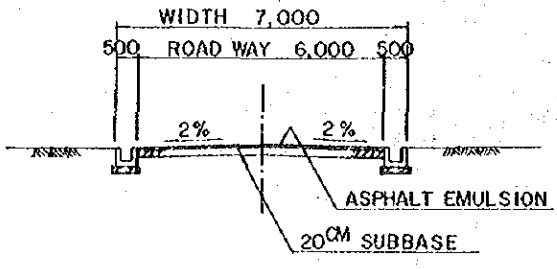
Fig. 2-6-2(4)

ACCESS ROAD SECTION 0 2 4M



DOCK ROAD SECTION





2-7 Construction Plan

2-7-1 Points to be Noted in Executing Work

(1) Securing of Labor Force

Although it is believed that unskilled workers can be procured in the Kavieng area, it will be difficult to procure skilled workers locally. And in view of the particularity of port and harbor works, it will not be easy to obtain locally port technicians having adequate experience who can be engaged in the work, thus necessitating the procuring and bringing-in of a large number of port technicians and skilled workers.

(2) Procurance of Chief Construction Materials

(i) Since it will be hard to procure such materials as steel members (steep pipe piles, deformed bars, etc.), cement, asphalt in Papua New Guinea, it will be necessary to rely on imports.

(ii) Aggregates for concrete will be collected from the state-owned lands in the Kavieng area. For crude aggregates for reinforced concrete, however, aggregates produced in the Rabaul area will be used, as those produced in the Kavieng area are unsuitable in terms of quality.

(iii) Procurement of timber to be used as molds and supports is possible domestically in Papua New Guinea, but that of steel members is not.

(iv) Of the materials required for the illumination facility, supply facility, handling machinery and management Office,

it will be possible to procure aggregates for concrete and timber in Papua New Guinea, but for others it will be difficult to procure them domestically.

Kavieng area for Procuring construction materials.

(3) Construction Machinery, Tools, and Construction Craft

With respect to the machinery, tools and construction craft shown below, it seems possible to utilize those found domestically in Papua New Guinea.

Pile driving boat

Tugboat

Pontoon

Bulldozer

Tractor shovel

Dump truck

Concrete mixer

Vibrator

Asphalt plant

Finisher

Macadam roller

Tire roller

Sprayer

Motor grader

2-7-2 Work Stage Planning

The work stage plan has been compiled as illustrated in Fig. 2-7-2-(2) based on the Basic Yearly Plan for Base Construction given in Fig. 2-7-2-(1). to allow start of service of the base in April, 1981.

Table 2-7-2-(1) Basic Yearly Plan for Base Construction

Item	1978	1979	1980	1981
Preparation of drawings and documents for design to be executed				
Concluding of contract work agreements				
Construction of facilities of Base Management Body				
Construction of facilities of Superstructure Management Body				
Start of service of base				

Fig. 2-7-2-(2) Work Stage Planning by Facility

Name of facility	Q'ty	1978 Oct.	1979 Apr.	1979 Oct.	1980 Apr.	1980 Oct.	1981 Apr.
Base M.B. facilities							
- 8 m quay wall	110 m						
Dolphin	40 m						
10 m wharf	50 m						
North revetment	80 m						
South revetment	130 m						
Land	14,170 m^2						
Access road	320 m						
Dock road	674 m						
Illumination facilities	7 units						
Water supply facilities	1 set						
Office	1 building						
Superstructure M.B. facilities							
Refrigerating and cold storing facility	1 building						
Ice making and storing facility	1 building						
Fishing gear warehouse	1 building						
Waste water disposed facility	1 set						
Crew's health and welfare facility	1 building						
Handling machineries	3 units						
Water supply facilities	1 set						
Office	1 building						
Others							
Oil supply facilities	1 set						

2-8 Amount of Investment

2-8-1 Investment Amount by Facility

On the basis of the presupposed conditions given below, the investment amount with regard to the base supervisory facilities was integrated as shown in Table 2-4-2. (Refer to Table 2-8-1.)

(i) Machinery and materials that are unprocurable on the domestic market will be imported from Japan.

(ii) Land compensation and moving cost of buildings attendant on construction shall not be appropriated.

(iii) Labor unit cost as well as the unit costs for materials to be procured domestically will adopt as the standard the domestic prices obtained through hearings surveys carried out at the local site in Nov., 1976 and will also take into consideration the price rise rate.

(iv) Unit costs of materials to be imported from Japan will adopt as the standard, prices determined by taking into account those prices obtained through local hearings in Nov., 1976 as well as prices prevaling on the Japanese domestic market, and at the same time, will take the price rate into consideration.

(v) The hire for machinery, tool and construction craft will adopt as the standard, values determined by making reference to the hire calculating standard used in Japan, and will also take into consideration the price rise rate.

Breakdown of Investment Amount by Facility (Kabieng)

Table 2 - 8 - 1

Unit - Kina

Name of Facility	Type of Facility	Unit	1978 Q'ty	1978 Unit Price	1978 Foreign Currency	1978 Domestic Currency	1978 Amount	1979 Q'ty	1979 Unit Price	1979 Foreign Currency	1979 Domestic Currency	1979 Amount	Total Q'ty	Total Foreign Currency	Total Domestic Currency	Total Amount
Preliminary & Administration		Unit	1		27,388.9	27,131.6	54,520.5	1		42,701.8	46,004.8	88,706.6	1	70,090.7	73,136.4	143,227.1
Sub-total					27,388.9	27,131.6	54,520.5			42,701.8	46,004.8	88,706.6		70,090.7	73,136.4	143,227.1
Basic Facilities																
Quay wall	-8.0m SP. Pile type	m	59	8,075.9	254,090.4	222,387.7	476.478.1	51	8,181.7	221,756.9	195,509.8	417,266.7	110	475,847.3	417,897.5	893,744.8
Dolphin,	"	Unit	0		0	0	0	1	60,911.6	42,244.9	18,666.7	60,911.6	1	42,244.9	18,666.7	60,911.6
Wharf	±0.0m	m	25	1,293.8	11,525.3	20,819.7	32,345.0	25	1,312.4	11,774.3	21,035.7	32,810.0	50	23,299.6	41,855.4	65,155.0
North revetment	±0.0m	"	40	1,425.5	24,608.0	32,412.0	57,020.0	40	1,447.5	24,145.3	33,754.7	57,900.0	80	48,753.3	66,166.7	114,920.0
South revetment	±0.0m	"	0		0	0	0	130	1,447.6	81,724.1	106,463.9	188,188.0	130	81,724.1	106,463.9	188,188.0
Land	±2.5m	m2	6,930	14.5	80,286.1	20,198.9	100,485.0	7,240	14.7	84,175.6	22,252.4	106,428.0	14,170	164,461.7	42,451.3	206,913.0
Access road	12m width	"	3,840	26.8	11,136.0	91,776.0	102,912.0	0		0	0	0	3,840	11,136.0	91,776.0	102,912.0
Dock road	12m 7m width	"	0		0	0	0	5,373	36.4	26,201.3	169,375.9	195,577.2	5,373	26,201.3	169,375.9	195,577.2
Towage fee		Unit	1	9,624.7	9,624.7	0	9,624.7	1	9,681.9	9,681.9	0	9,681.9	2	19,306.6	0	19,306.6
Sub-total					391,270.5	387,594.3	778,864.8			501,704.3	567,059.1	1,068,763.4		892,974.8	954,653.4	1,847,628.2
Illumination facilities		Unit	0		0	0	0	1		18,051.1	4,622.3	22,673.4	1	18,051.1	4,622.3	22,673.4
Water supply facilities		"	0		0	0	0	1		80,000.0	80,000.0	160,000.0	1	80,000.0	80,000.0	160,000.0
Management facilities office		"	0		0	0	0	1		10,272.0	5,530.0	15,800.0	1	10,270.0	5,530.0	15,800.0
Sub-total					0	0	0			108,321.1	90,152.3	198,473.4		108,321.1	90,152.3	198,473.4
Total					418,659.4	414,725.9	833,385.3			652,727.2	703,216.2	1,355,943.4		1,071,386.6	1,117,942.1	2,189,328.7
Contingencies		Unit	1		41,865.9	41,472.6	83,338.5	1		65,272.8	70,321.6	135,594.4	1	107,138.7	111,794.2	218,932.9
Consultant fee		"	1		208,463.1	78,823.5	287,286.6	1		118,676.5	62,352.9	181,029.4	1	327,139.6	141,176.4	468,316.0
Total					250,329.0	120,296.1	370,625.1			183,949.3	132,674.5	316,623.8		434,278.3	252,970	687,248.9
Grand Total					668,988.4	535,022.0	1,204,010.4			836,676.5	835,890.7	1,672,567.2		1,505,664.9	1,370,912.7	2,876,577.6

(vi) Based on the results of hearing surveys, the rise rate of the labor unit cost for the Papua New Guinean people shall be set to an annual rate of 5%. For materials procured within the country, the rise rate will not be considered as the major portion of them will be collected on state-owned lands.

(vii) Regarding the rise rate of the labor unit costs for port technicians and skilled workers and that for unit costs of materials of Japanese make, based on the past results in Japan, the annual rise rate will be set to 3% for labor unit cost, 2% for cement, whereas, steel member unit costs will be levelled off.

2-8-2 Breakdown of Investment into Amounts in Foreign and Domestic Currencies by Fiscal Year

Of the total investment amount of 2,877,000 Kina, foreign currency will account for 1,506,000 Kina, representing a rate of 52.3% (See Table 2-8-1-(1)).

Items to be covered by foreign currency will be as follows:

(i) Of the purchasing costs for construction materials, those for materials such as cement and steel members whose domestic procurement is not possible.

(ii) Of the labor cost, those salaries and wages to be paid to skilled workers such as the construction craft crew and skilled laborers that will be engaged in special work such as steel pipe driving.

(iii) Of the consultant charges, expenses other than hotel allowance and office lease charges at locality.

(iv) Of reserve funds, 10% of the foreign currency portion of facilities expense.

Table 2-8-2-(1) Breakdown of Investment into Amounts in Foreign and Domestic Currencies by Fiscal Year

Unit: Kina

Fical year	Item	Amount (A)	Breakdown by foreign and domestic currencies	
			Foreign (B)	Domestic
1978		1,204,011	668,988	535,022
	Facilities cost	833,385	418,659	414,726
	Consultant fee	287,287	208,463	78,824
	Contingencies	83,339	41,866	41,473
1979		1,672,567	836,677	835,891
	Facilities cost	1,355,943	652,727	703,216
	Consultant fee	181,030	118,677	62,353
	Contingencies	135,594	65,273	70,322
Total		2,876,578	1,505,665	1,370,913
	Facilities cost	2,189,329	1,071,387	1,117,942
	Consultant fee	468,316	327,140	141,176
	Contingencies	218,933	107,139	111,794

Note:
Note: Contingencies consist of 10% each of the facilities expenses both in foreign and domestic currencies.

Table 2-8-2-(2) Breakdown of Consultant Fee

Unit: Kina

Item	1978			1979			Total			Remarks
	Amount	Foreign currency	Domestic currency	Amount	Foreign currency	Domestic currency	Amount	Foreign currency	Domestic currency	
Grand Total	287,287	208,463	78,824	181,029	118,676	62,353	468,316	327,139	141,177	
1. Facilities design cost	110,084	93,613	16,471	0	0	0	110.084	93,613	16,471	
1) Execution and design cost	65,672	56,672	0	0	0	0	65,672	65,672	0	Construction cost x 0.03
2) Air transportation expense	27,941	27,941	0	0	0	0	27,941	27,941	0	
3) Hotel allowance	16,471	0	16,471	0	0	0	16,471	0	16,471	
2. Construction supervision charge	177,203	114,850	62,353	181,029	118,676	62,353	358,232	233,526	124,706	
1) Personal expense	111,026	111,026	0	111,029	111,029	0	222,055	222,055	0	
2) Hotel allowance	41,177	41,177	41,177	0	41,177	41,177	82,354	0	82,354	
3) Air transportation expense	3,824	3,824	0	7,647	7,647	0	11,471	11,471	0	
4) Indirect expense	21,176	0	21,176	21,176	0	21,176	42,352	0	42,352	

Chapter 3 Fishing Base Construction Program for Rabaul

Chapter 3 Rabaul Fishing Base Construction Program

3-1 Basic Concept

In planning the Rabaul Fishing Base Construction Program, as in the case for Kavieng, the plan was set up based on the baisc concept described below, while taking into account the fisheries industry promotional policy of the Government of Papua New Guinea.

(i) On the basis of the basic policy of the Government of Papua New Guinea, the base will be consolidated in a manner to allow it to function as a base of operation for skipjack pole-and-line fishing carried out in the fishing grounds in the Bismack Sea and Solomon Sea.

(ii) The base shall also be consolidated in a manner to make it become a foundation upon which local fisheries in the Rabaul area can be promoted.

(iii) Furthermore, the base will secure such base functions that will permit freezing, processing and export of shipjack.

(iv) The scale and arrangement of the facilities to be constructed at the base will be such that will allow them to fully comply with the demand directed toward the base in the target year.

(v) The target year for this plan shall be set to 1981.

(vi) The construction period for the base shall be 3 years.

3-2 Setting of Handling Amount of Plan

3-2-1 Landing Amount, Assortment for Distribution

(1) Landing Amount

Similar to the Kavieng area, fisheries practiced in this area and its environs at present comprise skipjack pole-and-line fishing and local fisheries.

Skipjack pole-and-line fishing is being practiced by the mother ship system using the water basins in the vicinity of Caple Lambert located to the west of Rabaul as the live bait fishing grounds. Skipjacks that have been captured are shipped to international markets directly from the fishing grounds.

In the current program, the landing amount was calculated assuming the operating conditions of such fisheries to be the same as those in Kavieng.

(i) Thirty skipjack pole-and-line fishing boats of the 59-G.T. class will engage in shipjack pole-and-line fishing converted into base fisheries.

Of the 30 fishing boats, 25 will operate in the Bismarck Sea on a day-trip basis using carriers as the relay base. The 5 remaining fishing boats will operate in the Solomon Sea on a two-day-trip basis.

The annual catch per fishing boat shall be 1,000 tons for the day-trip-basis operating ships, and 760 tons for the two-day-trip ships. The skipjacks captured shall be all landed on this base.

(ii) Regarding the promotion of local fisheries that has made an extremely belated start, we place high expectations on the effects of future policies carried out by the Government in this direction. Fishing boats putting out from this base and operating in the Ataliklikun Bay and Garerr Bay will catch local fishes in the amount of 900 tons annually, landing them on the base.

(2) Assortment for Distribution of Landed Products

Based on the stated basic concept and due to the situations of marine product consumption in the Rabaul area, shipjacks and local fishes landed at the base shall be assorted as described below.

(i) Ten percent of the skipjacks captured in the Bismark Sea shall be used for processing and the rest for freezing.

(ii) Local fishes, being intended for supply to Rabaul City will be mostly frozen.

Table 3-2- summarizes the foregoing.

Table 3-2-1 Landing Amount and Assortment for Distribution for Target Year

Type of fishery	Catch	Landed amount	Assortment for distribution		
			For freezing and cold storing	For processing	As fresh food
Skipjack pole-and-line	28,000	28,800	26,300	2,500	-
Local fisheries	900	900	700	100	100
Total	29,700	29,700	27,000	2,600	100

3-2-2 Shipping out Amount

(i) The whole amount of frozen shipjack and processed shipjack products produced at the base will be all exported overseas.

(ii) Frozen local fishes will be sent to Rabaul City, while the rest will be appropriated for consumption in the vicinity of the base.

Table 3-2-2 Shipping-out Amount for Target Year (Calculated as Converted into Fresh Fish)

(Unit: ton)

Marine products	Fish species	For local districts	For Rabaul city	For overseas	Total
Frozen products	Skipjack			26,300	26,300
"	Local fishes		700		700
Processed products	Skipjack			2,500	2,500
"	Local fishes	100	-		100
Fresh food	"	100	-		100
Total		200	700	28,800	29,700

3-2-3 Vessel Force

In calculating the force of the vessels that will be utilizing the base, the base utilizing conditions of the vessels for the target year was assumed as shown below (See Fig. 3-2-2).

(i) Three fishing boats of the 3-G.T. class which will carry local fishes captured in the Ataliklikan Bay by stationary net fisheries, will use the base every day for the purpose of landing, supply and rest.

(ii) Ten 3-G.T. class fishing boats that will be engaged in gill-net and extended-rope fishing in the Garerr Bay will utilize the base every day for the purpose of landing, supply and rest.

(iii) Twenty-five skipjack pole-and-line fishing boats of the 59-G.T. class that will operate in the Bismarck Sea using two carriers as the relay bases will return to the base on a one-week cycle, divided into 7 groups, for the purpose of receiving supply and rest.

The two 150-G.T. carriers will alternately load the captured skipjacks and carry them to the base, where they will not only conduct landing operations but will also receive supply in preparation for the next voyage.

(iv) Five 59-G.T. class fishing boats which will be engaged in skipjack pole-and-line fishing on a two-day-trip basis will return to the base in two groups to land the catch, receive supply and rest.

(v) To carry out frozen local fishes to Port Rabaul, a freezing carrier of the 10-G.T. class will perform loading at the base.

(vi) To export the marine products produced at the base, two freezing carriers, one of the 600-G.T. class and the other of the 2,000 G.T., will load products and receive supply at the base. Similar to the case of Kavieng, the mean daily loading capacity will be 120 tons.

(vii) The 600-G.T. carrier will carry out 70% of the total frozen skipjack export amount and processed skipjack, while the 2,000-G.T. carrier will carry out 30% of the frozen skipjack.

(viii) The 2,000 G.T. carrier will visit the fishing bases of Kavieng, Rabaul and Manus in regular succession, loading 1/3 of its maximum carrying load at each of the bases.

(ix) The 10-G.T. carrier described in (v) will unload at the base an annual tonnage of 240 tons of foodstuff carried out from Port Rabaul.

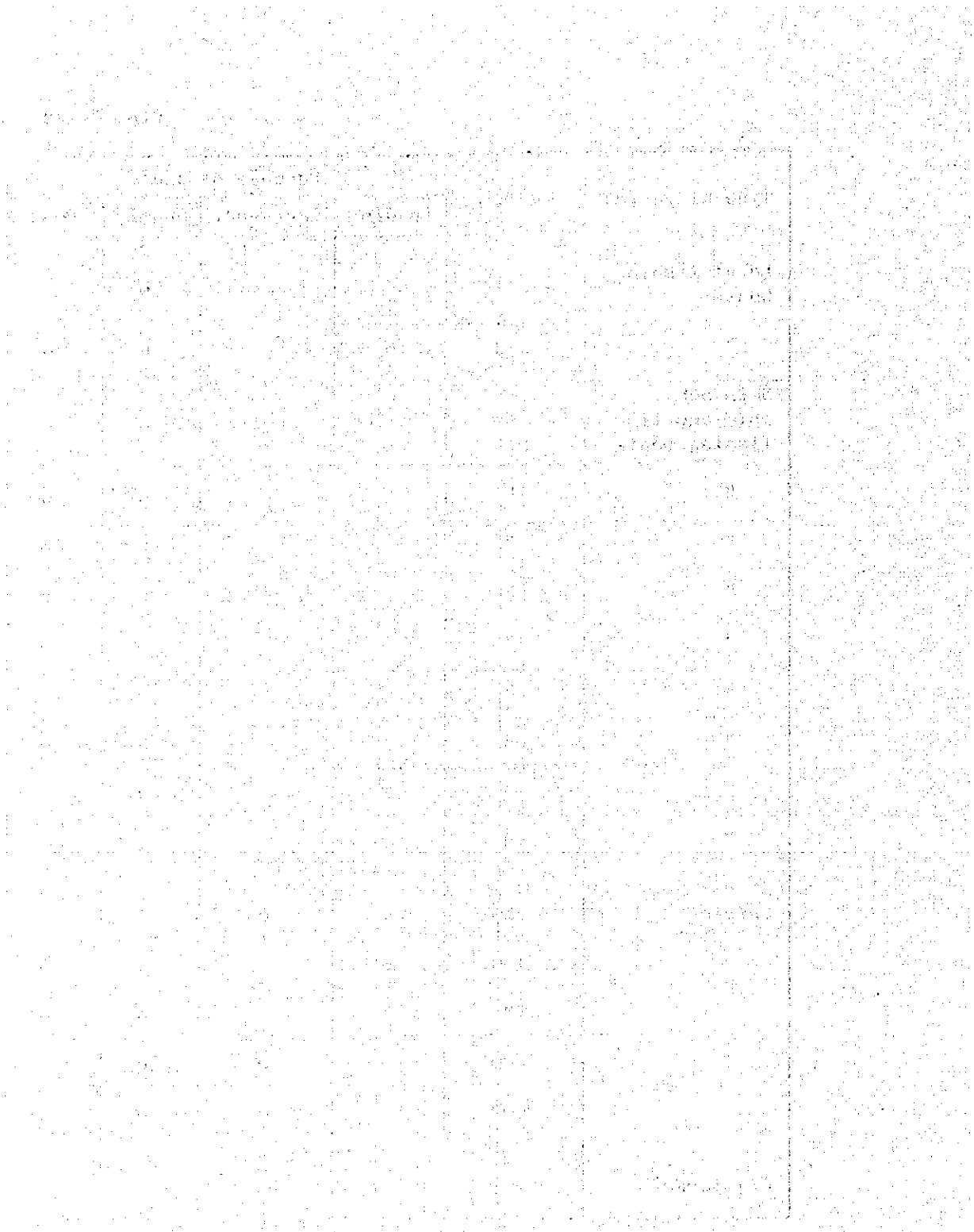
Table 3-2-3 Frequency of Port Entry of Freezing Carriers

G.T. (A)	Carry-out amount (B)	Maximum carrying capacity (C=0.8A)	Burden per voyage (D)	Annual port entry frequency (E=B/D)	Number of days required for loading (F=D/120)
10	700	8	8	88	0.1
600	26,300x0.7=2,500x 0.2 = 18,900	480	480	39	4
2,000	26,300x0.3 = 7,900	1,600	1,600÷3=530	15	5

Note: The weight of processed skipjack was assumed to be equivalent to 20% of that of fresh skipjack.

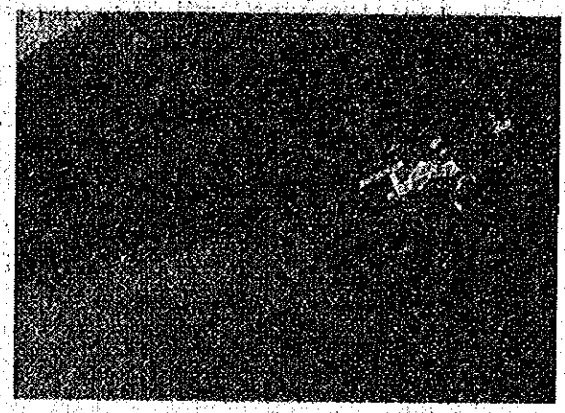
Fig. 3-2-3 Model Plan for Base Utilization of Vessels

Type of vessel	G.T.	Purpose of use				Number of vessels	Number of days
		Landing	Carry-out	Supply	Rest		
Local fishing boats	1			o	o	20	
"	3	o		o	o	13	
Skipjack pole-and-line fishing boats	59			o	o	3	
"	"			o	o		
"	"			o	o		
"	"			o	o	4	
"	"			o	o	"	
"	"			o	o	"	
"	"			o	o	"	
"	"			o	o	"	
"	"	o		o	o	2	
"	"	o		o	o	3	
Carriers	10	o	o			1	
	150	o		o	o	"	
	"	o		o	o	"	
	600		o	o	o	"	
	2000		o	o	o	"	
Oil tankers		o					

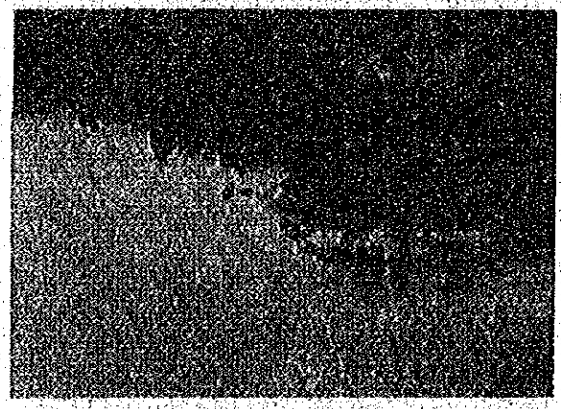


3-3 Selection of Planned Site

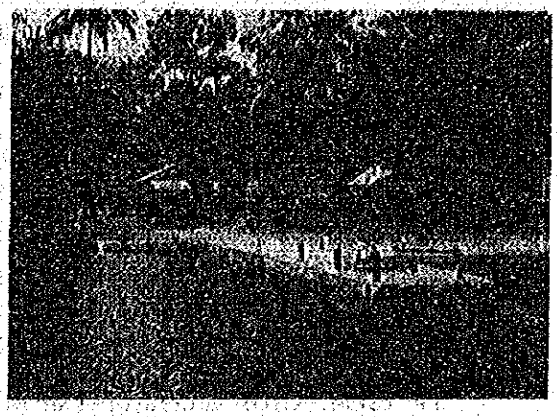
In selecting the site for the Rabaul Fishing Base, the land conditions of the two candidate lands, i.e. Kilinwata and New Massava, were compared and studied. Because of enjoying more favorable land conditions and being more favorably located to the fishing grounds, New Massava was chosen as the site.



Planned site for New Massava fishing base



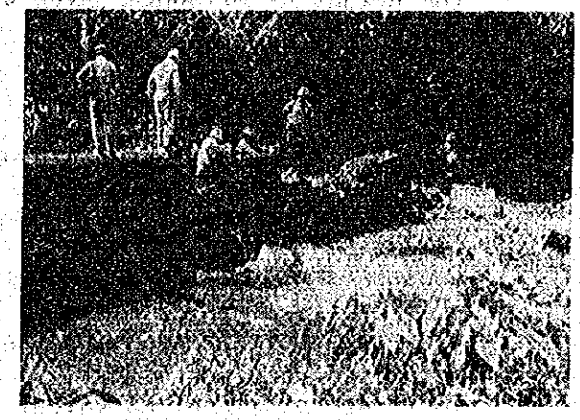
Planned site for Kilinwata fishing base



Jetty in New Massava

3-3-1 Situation of Industrial Water and Electric Power Supply

(i) Both sites have rich river water and groundwater resources, making the securing of sufficient



Source of stream in New Massava

industrial water required for the base certain.

(ii) Both places being presently areas without power-distribution, measures for non-utility generation must be taken.

3-3-2 Relation with Natural Conditions (See Appendix "Natural Conditions of Planned Site and Its Environs")

(1) Marine Conditions

Since data that may be useful regarding meteorological and marine phenomena were not available, studies on marine conditions were carried out based on the meager data that were available as well as on the results of survey hearings carried out in the locality. As a result, no significant difference was found to exist regarding the two sites.

(i) In Kilinwata, during the trade wind season from April through December, there are conspicuous SE winds. But when the fatch is taken into account, the wave height in the SE direction will not be so high. Judging from the configuration of the coral, reef, waves visiting this area will be high in the NE direction: the height of offshore waves will be somewhere between 0.6 to 1.0 m.

(ii) In New Massava, unlike Kilinwata, the area will be fully shielded off from SE winds during normal times, but during the monsoon season, the area will be affected by NW winds and waves. According to the results of hearings carried out in the locality, there are prominent NE waves, rather than NW waves, whose heights in the offshore areas will reach 0.6 to 1.0 m, as in

Kilinwata. But due to the presence of the Massava Island and the reefs surrounding the island, it is assumed that the wave heights at the anchorage will only be a half of those of offshore waves.

(2) Soil Conditions

(i) In Kilinwata, despite the presence of vast coral reefs, the sea bed located in front of it (M.W.L.: -7.5 m) is composed of a extremely soft silty soil stratum, so that it requires a large-scale foundation improvement prior to constructing any structure upon it.

(ii) In New Massava, on the other hand, although no coral reel can be seen, and while the bed slope is comparatively steep, the bed soil is generally sandy. The soil stratum of the sea bed is generally simple, the major portion being composed of tight sandy soil containing volcanic ashes. Compared to Kilinwata the soil conditions are more favorable.

3-3-3 Land Building Conditions

Regarding Kilinwata, because of the existence of coral reefs largely of a height of L.W.L., less soil is required for sea surface reclamation compared to New Massava. Also, site equisition on land is also thought as being easy. However, owing to the complexity of the flat-surface configuration of the coral reef, construction of the reventment to be located behind the piled pier will be difficult.

3-3-4 Relative Position Regarding Local Fishing Grounds and Live-Bait Fishing Grounds

For promoting local fisheries practiced not only in the Ataliklikun Bay, but also in the Garerr Bay, New Massava offers greater advantages, being located largely in the middle of the two bays and being close to the live-bait fishing grounds.

3-3-5 Traffic and Transportation Conditions

Although there are no roads that link the central area of Rabaul City with the two sites, timewise, Kilinwata is at a closer distance than New Massava.

3-4 Planned Policy

3-4-1 Basic Policy

On the basis of the "Basic Concept" of "3-1", since the current base program must be planned in a manner to ensure smooth operation of skipjack pole-and-line fishing that has been converted from the mother ship system into base-operated fishing as well as in a way to fully contribute toward the promotion of local fisheries and export of marine products, the facilities plan will be compiled in a manner to enable achievement of the targets states below, as well as to enable safe and rational handling of the planned handling amounts set in "3-2", and at the site selected in "3-3".

In this case, full considerations will also be given to such points as environmental preservation of the planned site and its vicinity. The targets are:

(i) Smooth landing functions for the catch, will be secured.

(ii) Functions to enable speedy handling of catches as well as those to ensure processing and storing will be secured.

(iii) Functions to enable speedy loading and carry-out of marine products will be secured.

(iv) Function to ensure smooth supply to vessels will be secured.

(v) Functions for preserving and storing daily living necessities will be secured.

(vi) Functions to ensure proper management and operation of the base will be secured.

3-4-2 Facilities Covered by Program

With respect to the facilities plan, in order to achieve the stated planned target regarding the facilities, the scale and arrangement of those listed in Table 3-4-2 which are directly needed will be determined. At the same time, the construction cost will be calculated only for the facilities that will be owned by the Base Management Body.

Table 3-4-2 Facilities to be Covered by Program

Owner of facility		
Base Management Body	Superstructure Management Body	Others
Mooring facilities	Refrigerating and cold storing facilities	Oil supply facilities
Revetment	Ice making and storing facilities	
Land	Fishing gear warehouse	
Roads	Waste water disposal facilities	
Parking lots		
Illumination facilities	Crew's health and welfare facilities	
Water supply facilities	Power generation facilities	
	Handling machineries	
Management Office	Water supply facilities office	
Green park		

3-4-3 Policy Concerning Arrangement of Key Facilities

Same as "2-4-3".

3-5 Facilities Planning

Facilities planning was carried out as described below by taking into consideration the Appendix "Natural Conditions of Planned Site and Its Environs" and resting on the basis of the "Planned Policy" of "3-4".

3-5-1 Dimensions of Vessels

Since the scale and arrangement of the facilities directly associated to vessels such as mooring facilities must be determined on the basis of the "Vessel Force for Target Year" described in "3-3-3", the dimensions of the vessels were determined as shown in Table 3-5-1.

Table 3-5-1 Dimensions of Vessels

Type of vessels	G.T.	Vessel length	Vessel breadth	Maximum draft
Local fishing boat	Less than 1	5 m	1.5 m	0.5 m
"	3	10	2.5	1.1
Skipjack pole-line fishing boat	59	26	4.8	2.3
Carrier	10	16	3.5	1.6
"	150	35	6.5	2.6
"	600	62	9.0	6.6
"	2000	77	10.8	7.5
Oil tanker	500	43	7.8	3.5

3-5-2 Mooring Facilities

(i) Scale

DL -8 m quay = 170 m (Mooring pils: 2 unit)

DL -4 m quay = 60 m

DL -3 m quay = 100 m

DL -1.5m wharf = 50 m

DL ±0.0 wharf = 40 m

(i) Based on Fig. 3-2-3, we shall calculate the extension of the -8 m quay for a case in which one carrier each of the 2,000-G.T. class and 150-G.T. class and 3 fishing boats of the 59-G.T. class will be using the quay on the same day.

2,000-G.T. class	1 alongside berth	Required quay extension	85 m
150-G.T. class	"	"	40 m
59-G.T. class	"	"	29 m
		Total	154 m

(ii) The quay extension just stated is required for landing the catch of the Bismarck Sea by the 150-G.T. class carrier and that of the Solomon Sea by the 59-G.T. carrier. However, when fishing in the Bismarck Sea is carried out on a day-trip basis, then, as calculated in 2-5-2-(1)-(v), the 150-G.T. class carrier will no longer be needed but a quay extension for a two-berth's portion for the 59-G.T. fishing boats will be required.

Thus, the required quay extension, as shown below, will be 170 m..

150m - 40m + 29m x 2 = 170m

(iii) The -3 m quay will be provided with a berth width that will permit supply and rest of the 59-G.T. fishing boats.

For supply:	2 alongside berths	Required extension	58 m
For rest:	7 vertical berths	"	42 m
		Total	100 m

(iv) The -1.5 m wharf will be provided with an extension that will allow the approaching of a 3-G.T. fishing boat, while the ±0 m wharf will be provided with a 40 m extension for the outboard-motor-equipped fishing boats.

-5 m quay	13 vertical berths	Required extension	50 m

(v) The -4 m quay will be provided with a berth width that will permit the approaching of a 500-G.T. class oil tanker that will carry heavy oil for power generation and fuel oil for vessels to the base.

(2) Arrangement

(i) The face line of the -8m way will be provided largely parallel to the contour line.

(ii) The -4 m quay will be provided eastward of the -8 m quay and the -3 m quay westward.

3-5-3 Refrigerating and Cold Storing Facilities

(1) Capacity

Freezing capacity: 90 ton/day

Cold storing capacity: 800 ton

(i) Since the fishes to be frozen calls for rapid freezing in order to ensure quality, a daily mean freezing capacity of 75 is required. However, with an allowance made for the shift in the landing time bands and the work loss, the daily freezing capacity was set to 90 tons.

(ii) As may be seen from Fig. 3-2-3, the facilities are required to have a storing capacity of at least a 6 day's portion. Thus, with an allowance of a 2 day's portion taken into account, the cold storing capacity will be set to 800 tons.

(2) Arrangement

Same as 2-5-3-(2).

3-5-4 Ice Making and Storing Facilities

(1) Capacity

Ice making capacity: 40 ton/day

Ice storing capacity: 200 tons

The ice making capacity shall be such that will cover the daily water supply amount. The ice making capacity shall be 5 times the daily water supply amount.

For skipjack pole-and-line fishing boats:

28,800 ton x 0.33 ton/300 days = 32 ton/day

For local fishing boats:

900 ton x 1.0 ton/300 days = 3 ton/day

For others: 5 "

(2) Arrangement

In view of the daily water supply amount, the ice making and storing facilities will be located adjacent to the freezing and cold storing facilities.

3-5-5 Oil-supply and Water-Supply Facilities

(1) Capacity

Oil storing capacity: 900 k (450 k tank: 2 units)

Water supply capacity: 4.7 ton/hr

(i) As listed in Table 3-5-5-(1), since monthly fuel oil consumption is estimated to be 1,800 k , tank oil storing capacity shall be set to 900 k , assuming the tanks to be refilled twice a month.

Table 3-5-5-(1) Fuel Oil Consumption

Type of vessel	GT	(a) Engine output HP	(b) Oil consumption /HP.hr	(c) Monthly means operating hours (hr)	(d) No. of boats	(axbxcxd) Oil consumption k
Local fishing boats	Not more than 3	33	0.18	10hrx30days = 300	33	58.8
Skipjack pole-and-line fishing boats	59	420	"	15 x 30 = 450	30	1,020.6
Carriers	150	1,000	"	12 x 30 = 360 round-trips	2	129.6
"	600	2,400	"	240 x 3 = 720	1	311.0
"	2,000	4,000	"	360x2x1/3=240	1	172.8
Non-utility		1,140	0.2	24 x 30 = 720	1	164.1
Total						1,856.9

(ii) The water supply capacity shall be 4.7 ton/hr, 1.5 times the daily mean demand of 3.13 ton/hr.

(2) Arrangement

Same as 2-5-5-(2).

3-5-6 Land

(1) Area by purpose of land

Unit: m^2

Name of land	Area	Breakdown					
		Reclaimed land			Existing land		
		Base M.B.	Super-structure M.B.	Others	Base M.B.	Super-structure M.B.	thers
Land for refrigerating and cold storing facilities	2,850		2,850				
Land for ice making and storing facilities	1,750		1,750				
Land for waste water disposal facilities	700		700				
Land for fishing gear warehouse	1,225		1,225				
Land for water supply facilities	680					680	
Land for power generation facilities	1,125		600			525	
Land for superstructure management office	1,050		1,050				
Land for parking lots	1,190	1,190					
Land for green park	1,190	1,156			34		
Land for base M.B. office	750	120			630		
Land for oil supply facilities	1,125			1,125			
Land for dock road	3,854	3,308			546		
Land for access road	3,000				3,000		
Grand Total	20,489	5,774	8,175	1,125	4,210	1,205	

(2) Arrangement

On the basis of the "Policies Concerning Arrangement of Koy facilities" of "2-4-3", the facilities were arranged as illustrated in Figs. 3-5-6-(1) and 3-5-6-(2).

Fig. 3-5-6-(1) RABAUL FISHING BASE PLAN (NO. 1) S = 1/2,000
(NEW MASSAVA)

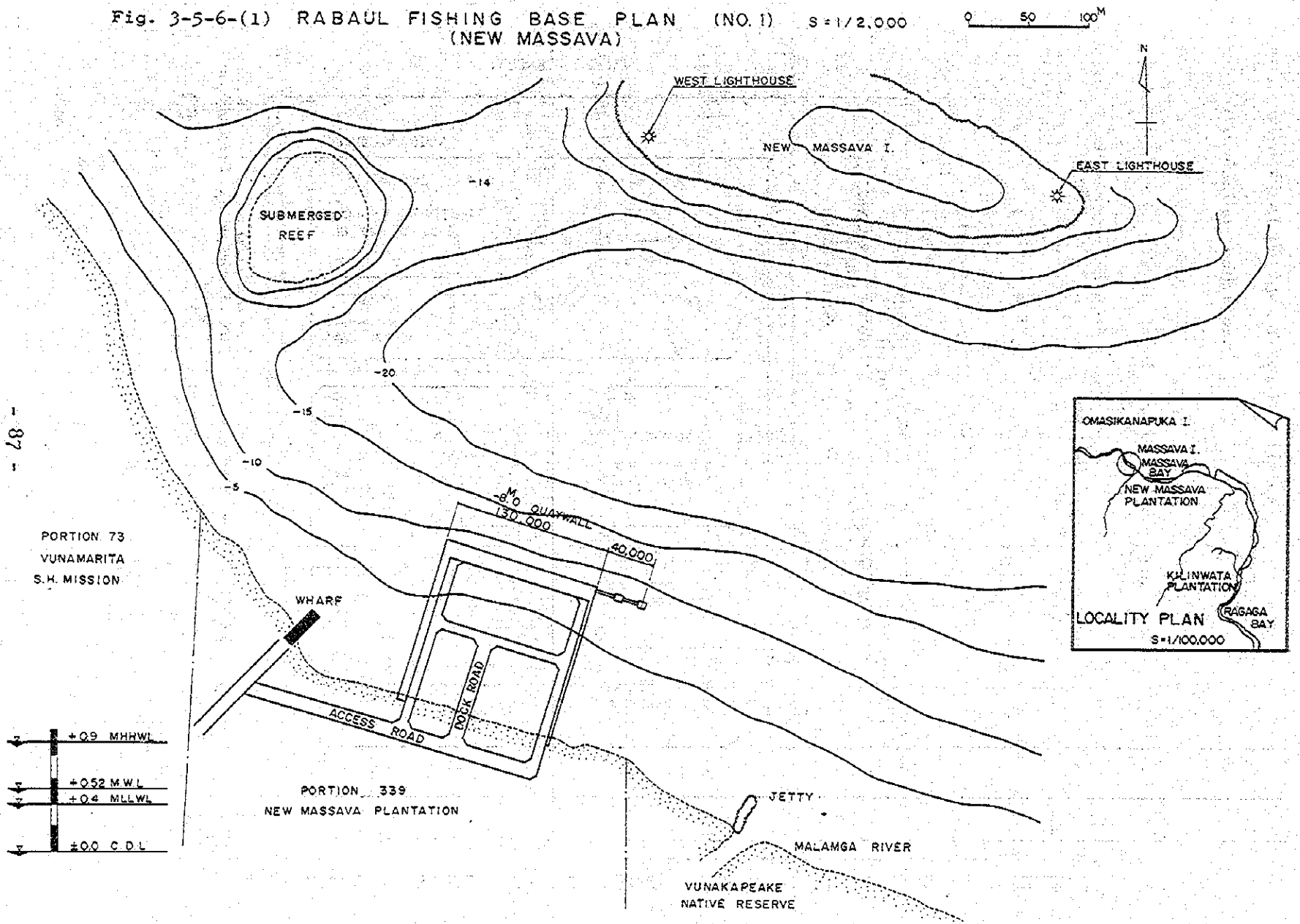
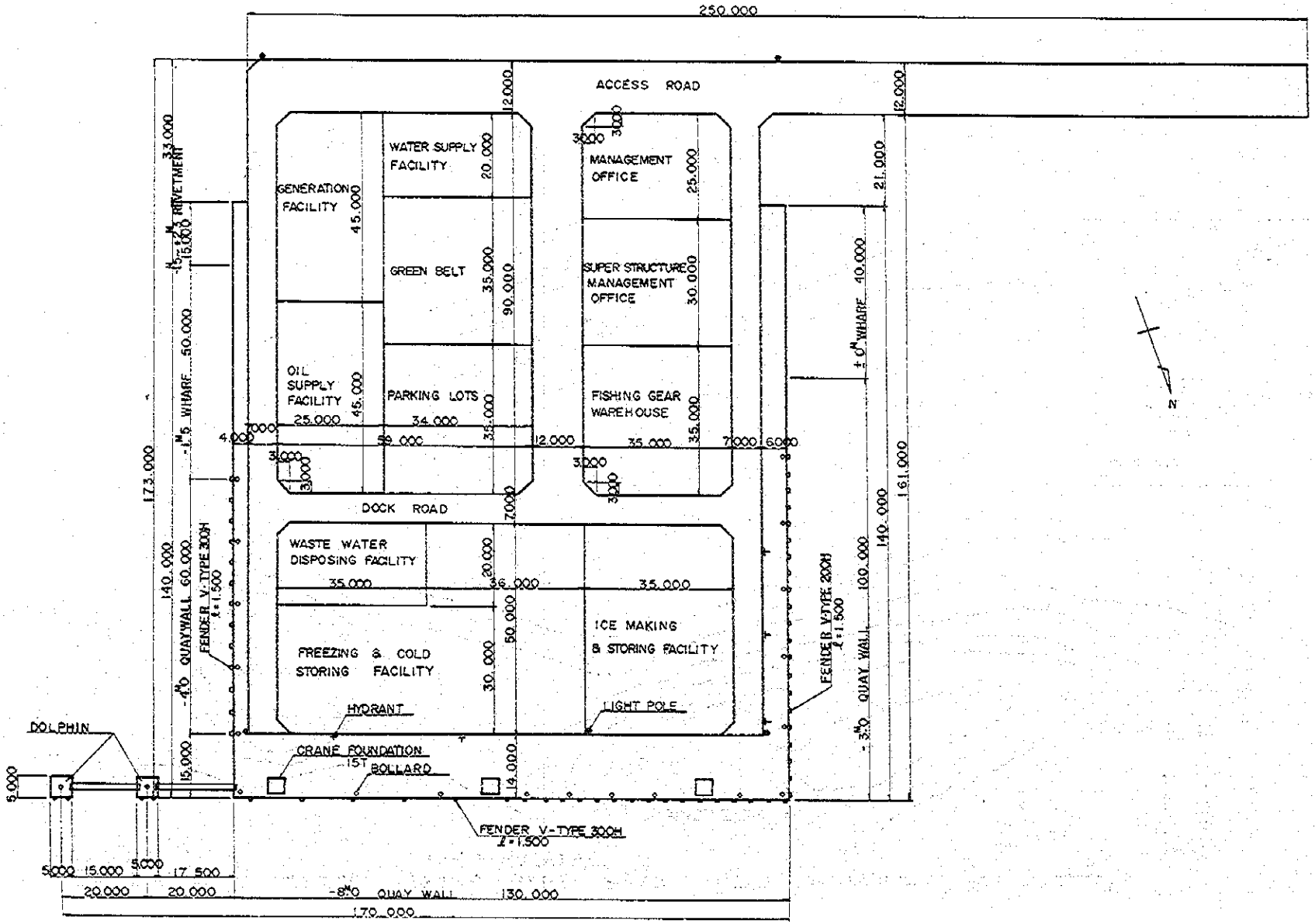


Fig. 3-5-6-(2) RABAUL FISHING BASE PLAN (NO.2) S = 1/600 0 10 20M



3-6 Structural Design of Key Facilities

3-6-1 Design Conditions

Table 3-6-1 Design Conditions

Item		-8m quay	-4 quay	-3m quay
Tidal level	M.H.H.W.L	+0.90	Same as to left	Same as to left
	M.W.L.	+0.52	"	"
	M.L.L.W.L	+0.40	"	"
	D.L. (C.D.L)	±0.00	"	"
Wave	Height Direction	Not especially condisdered	"	"
Seismic coefficient	Horizontal coefficient (k_h)	0.15	"	"
	Vertical coefficient (k_v)	0.00	"	"
Foundation soil		Silty sand, N value: 12	"	"
Vessils concerned (G.T.)		2.000	500	59
Carrying load	Uniform load	1.5 ton/M	0.5 ton/M	0.5 ton/M
	Wheel load	TL 20	Same as to left	"
	Crane load	12 ton	-	-
Approaching speed of vessel		0.1 M/SEC	0.3 M/S	0.4 M/S
Pulling force of vessel		15 ton	10 ton	10 ton
Crown level		+2.3 M	+2.3 M	Same as to left
Apron width		1.4 M	3 M	6 M

Fig. 3 - 6 - 2(1) SECTION

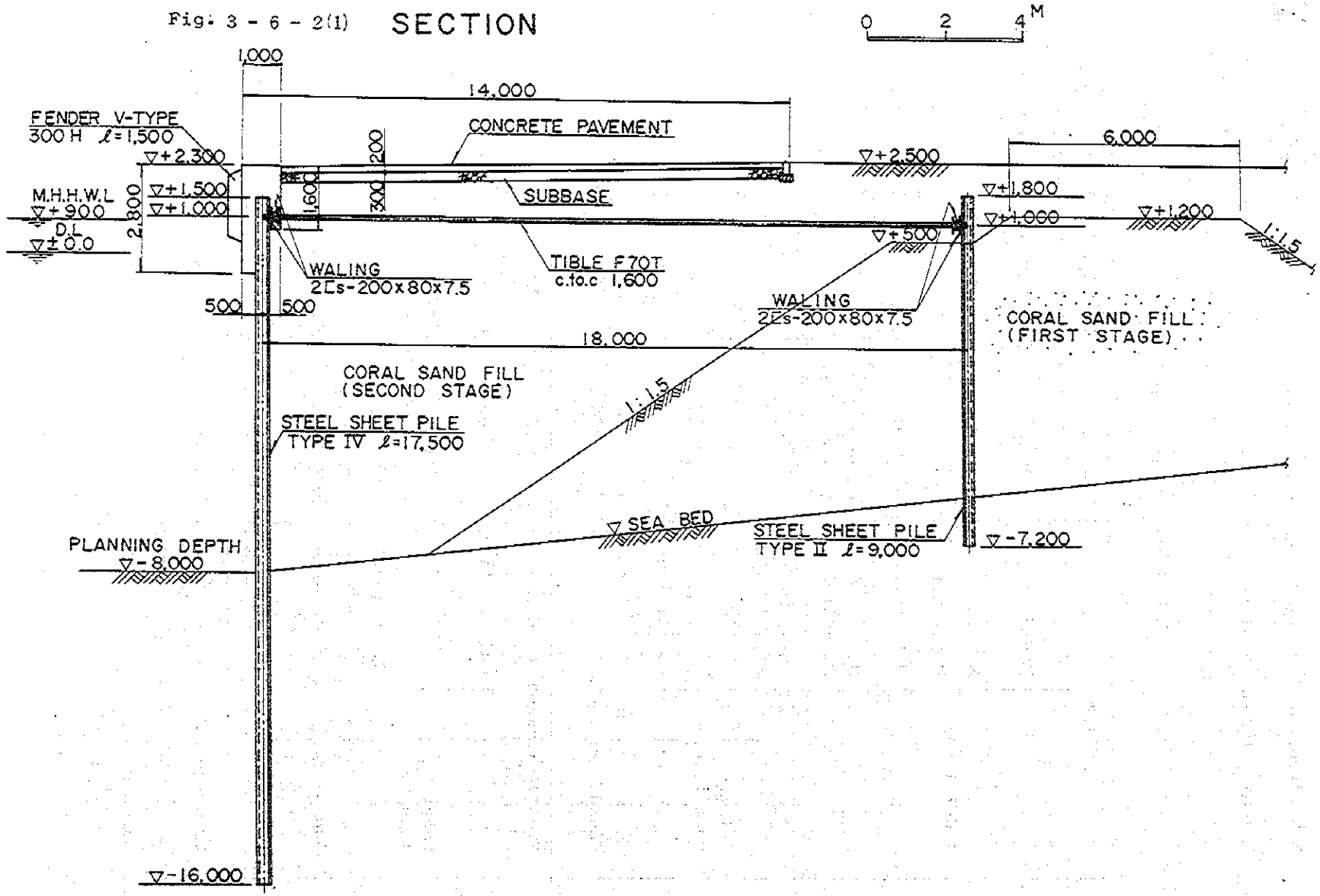


Fig. 3 - 6 - 2 - (2)

STANDARD CROSS SECTION OF -4.0M QUAYWALL

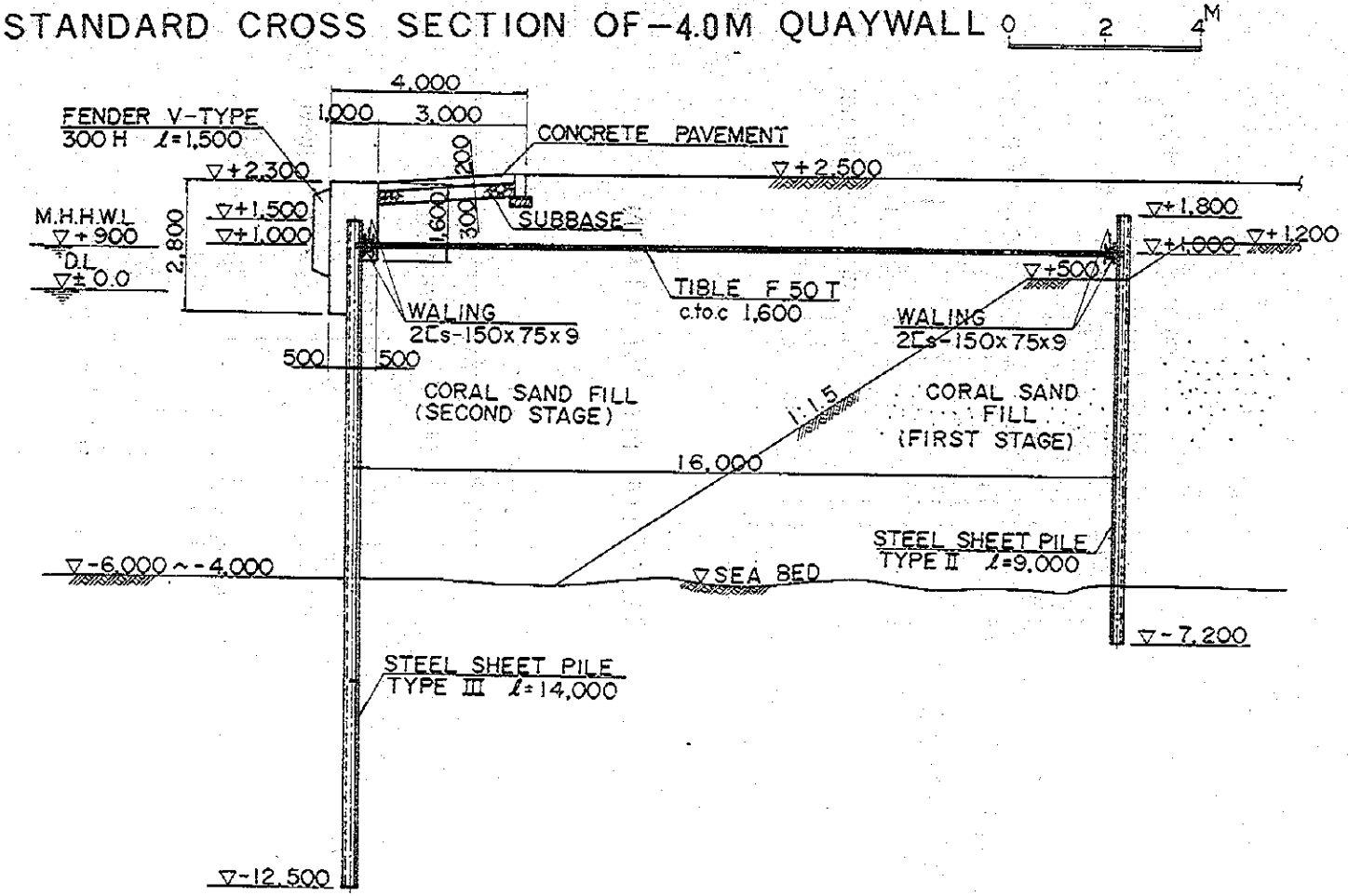
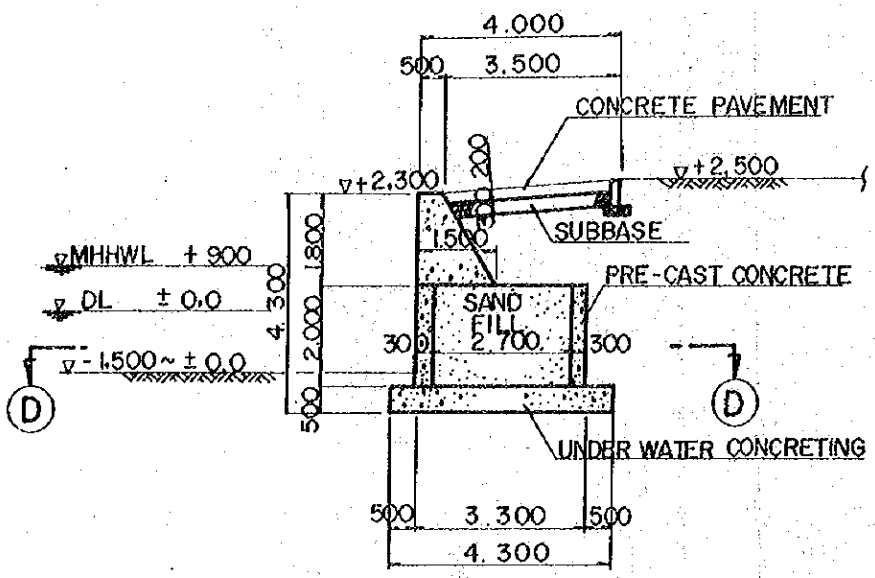


Fig. 3 - 6 - 2 -(3). FAST WHARF SECTION



WEST REVETMENT SECTION

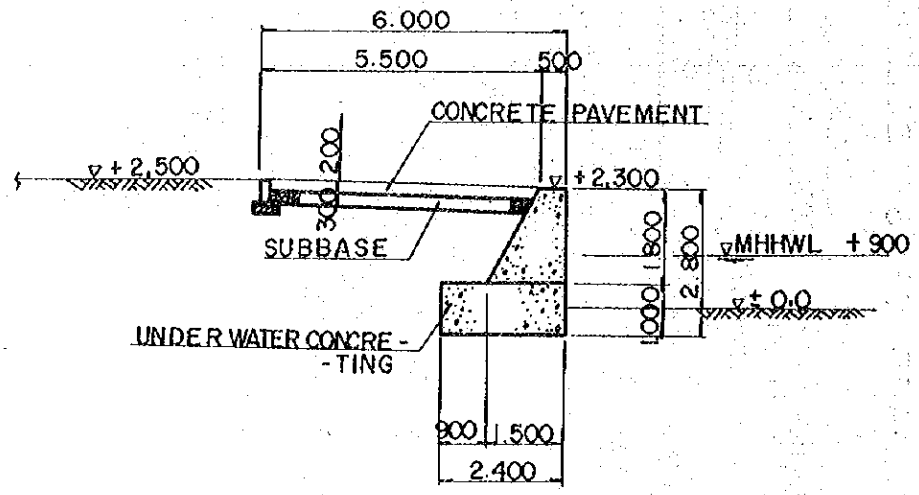
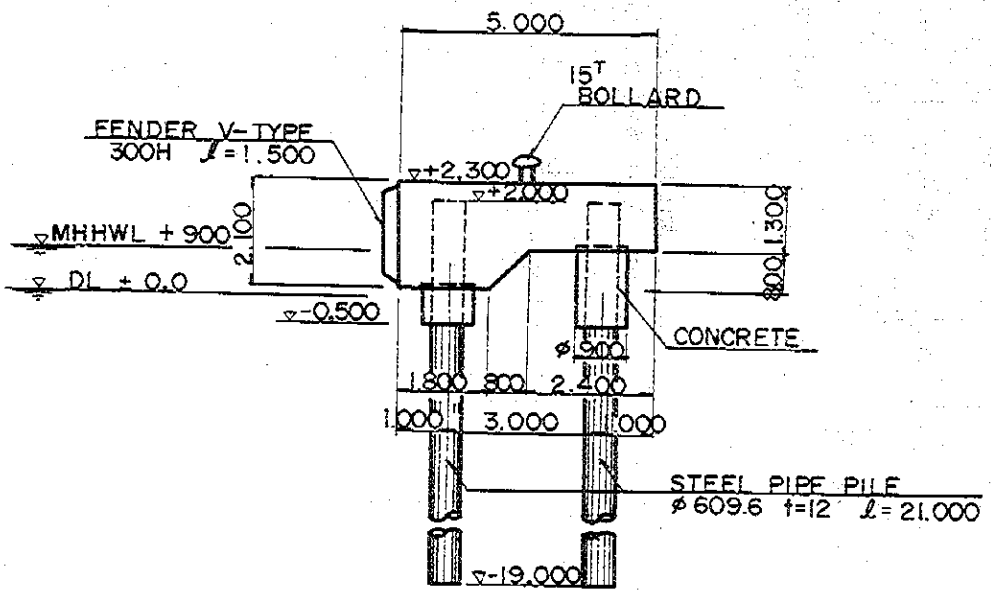


Fig. 3 - 6 - 2 -(4) MOORING SECTION



CONNECTION BRIDGE SECTION

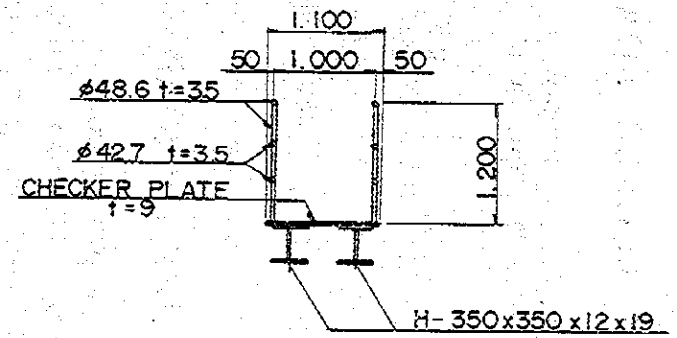
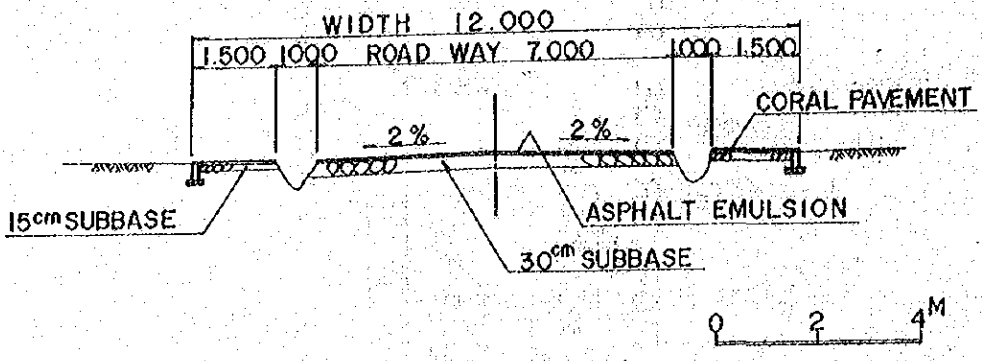
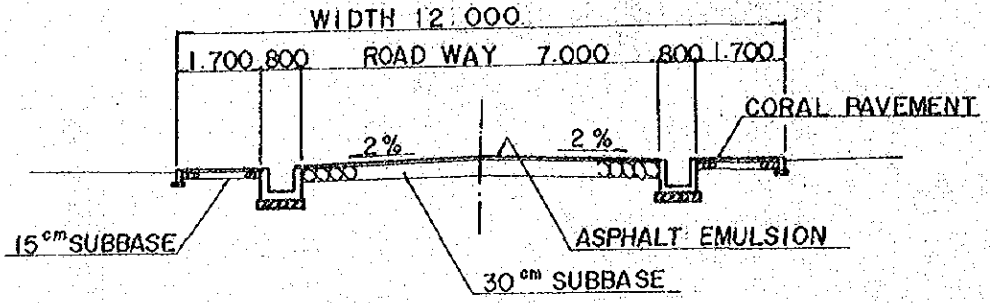
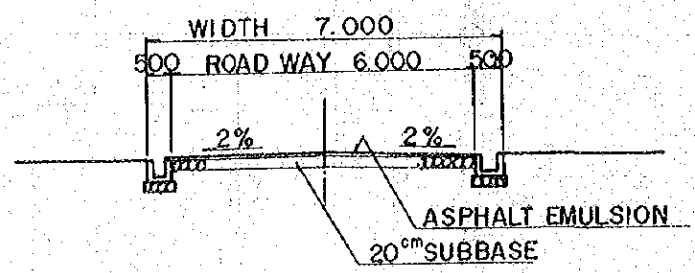


Fig. 3 - 6 - 2 -(5) ACCESS ROAD SECTION



DOCK ROAD





3-6-2 Structural Selection of Key Facilities

Same as 2-6-2.

Selected standard construction of key facilities are shown in Figs. 3-6-2-(1) ~ (4).

3-7 Construction Plan

3-7-1 Points to be Noted in Executing Work

Same as in 2-7-1. However, as to the aggregates for concrete, those producted in the Rabaul area will be used.

3-7-2 Work Stage Planning

The work stage plan has been drawn up as illustrated in Fig. 3-7-2, based on the Basic Yearly Plan for Base Construction given in Table 2-7-2-(1), to allow start of service of the base in April, 1981.

Fig. 3-7-2 Work Stage Planning by Facility

Name of facility	Q'ty	1978 Oct.	1979 Apr.	1979 Oct.	1980 Apr.	1980 Oct.	1981 Apr.
Base M.B. facilities							
- 8 m quay walt	130 m						
Dolphin	40 m						
- 4 m quay wall	75 m						
- 1.5 m east wharf	50 m						
East revetment	15 m						
- 3 m quay wall	100 m						
West wharf	40 m						
Land	17,996 m^2						
Access road	250 m						
Dock road	487 m						
Light house	2 units						
Illumination facilities	5 units						
Water supply facilities	1 set						
Office	1 building						
Superstructure M.B. facilities							
Refrigerating and cold storing facility	1 building						
Ice making and storing facility	1 building						
Fishing gear warehouse	1 building						
Waste water disposed facility	1 set						
Crew's health and welfare facility	1 building						
Handling machineries	3 units						
Water supply facilities	1 set						
Power generating facility	1 set						
Office	1 building						
Oil supply facilities	1 set						

3-8 Investment Amount

3-8-1 Investment Amount by Facility

Based on presupposed conditions similar to those indicated in 2-8-1, the investment amount with respect to the Base Management Body facilities listed in Table 3-4-2 was integrated. (See Table 3-8-1.)

3-8-2 Breakdown of Investment by Fiscal Year into Amounts in Foreign and Domestic Currencies

The total investment amount is 3,912 (1,000 kina), of which, foreign currencies account for 2,709 (1,000 kina), representing a percentage of 69.2%. (See Table 3-8-2.)

Facilities to be covered by the foreign currencies are similar to those shown in Table 2-8-2.

Breakdown of Investment Amount by Facility (Rabaul)

Table 3 - 8 - 1

Unit - Kina

Name of Facility / Type of Facility	Unit	1978 Q'ty	1978 Unit Price	1978 Foreign Currency	1978 Domestic Currency	1978 Amount	1979 Q'ty	1979 Unit Price	1979 Foreign Currency	1979 Domestic Currency	1979 Amount	Total Q'ty	Total Foreign Currency	Total Domestic Currency	Total Amount
Preliminary & Administration	Unit	1		71,416.2	30,658.7	102,074.8	1		123,185.0	57,040.8	180,225.8	1	194,601.1	87,699.5	282,300.6
Sub-total				71,416.1	30,658.7	102,074.8			123,185.0	57,040.8	180,225.8		194,601.1	87,699.5	282,300.6
Basic Facilities															
Quay Wall -8.0m Sheet Pile	m	40	5,422.4	152,936.6	63,959.4	216,896.0	90	5,470.2	345,690.0	146,628.0	492,318.0	130	498,626.6	210,587.4	709,214.0
Dolphin -8.0m SP Pile	Unit	0		0	0	0	1	59,425.9	41,269.5	18,156.4	59,425.9	1	41,269.5	18,156.4	59,425.9
Quay wall -4.0m Sheet Pipe	m	75	4,305.5	245,877.0	77,035.0	322,912.5	0		0	0	0	75	245,877.5	77,035.0	322,912.5
East wharf -1.5m "	"	50	3,164.6	111,256.5	46,973.5	158,230.0	0		0	0	0	50	111,256.5	46,973.5	158,230.0
East Revetment ±0.0m - +2.3m	"	15	2,089.1	13,142.2	18,194.3	31,336.5	0		0	0	0	15	13,142.2	18,194.3	31,336.5
Quay wall -3.0m Sheet Pile	"	0		0	0	0	100	4,012.0	294,140.0	107,060.0	401,200.0	100	294,140.0	107,060.0	401,200.0
West wharf ±0.0m	"	0		0	0	0	40	2,661.1	63,559.2	42,884.8	106,444.0	40	63,559.2	42,884.8	106,444.0
Land ±2.5m	m^2	5,537	39.94	176,858.0	44,289.8	221,147.8	12,459	40.42	399,384.2	104,208.6	503,592.8	17,996	576,242.2	148,498.4	724,740.6
Access road 12m width	"	3,000	20.2	4,465.0	56,135.0	60,600.0	0		0	0	0	3,000	4,465.0	56,135.0	60,600.6
Dock road 12m 7m width	"	0		0	0	0	3,880	36.9	19,069.0	124,103.0	143,172.0	3,880	19,069.0	124,103.0	143,172.0
Towage fee	Unit	1		9,624.7	0	9,624.7	1		9,681.9	0	9,681.9	1	19,306.6	0	19,306.6
Light house	No	0		0	0	0	2	22,399.1	31,865.0	12,933.2	44,798.2	2	31,865.0	12,933.2	44,798.2
Sub-total				714,160.5	306,587.0	1,020,747.5			1,204,658.8	555,974.0	1,760,632.8		1,918,819.3	862,561.0	2,781,380.3
Illumination facilities	Unit	0		0	0	0	1		10,626.9	2,610.2	13,237.1	1	10,626.9	2,610.2	13,237.1
Water supply facilities	"	0		0	0	0	1		6,294.1	6,294.1	12,588.2	1	6,294.1	6,294.1	12,588.2
Management facilities office	"	0		0	0	0	1		10,270.0	5,530.0	15,800.0	1	10,270.0	5,530.0	15,800.0
Sub-total				0	0	0			27,191.0	14,434.3	41,625.3		27,191.0	14,434.3	41,625.3
Total				785,576.6	337,245.7	1,122,822.3			1,355,034.8	627,449.1	1,982,483.9		2,140,611.4	964,694.8	3,105,306.2
Contingencies	Unit	1		78,557.6	33,724.6	112,282.2	1		135,503.4	62,744.9	198,248.3	1	214,061.0	96,469.5	310,530.5
Consultant fee	"	1		235,951.2	78,823.5	314,774.7	1		118,676.5	62,352.9	181,029.4	1	354,627.7	141,176.4	495,804.1
Total				314,508.8	112,548.1	427.056.9			254,179.9	125,097.8	379,277.7		568,688.7	237,645.9	806,334.6
Grand Total				1,100,085.4	449,793.8	1,549,879.2			1,609,214.7	752,546.9	2,361,761.6		2,709,300.1	1,202,340.7	3,911,640.8

Table 3-8-2-(1)

Fiscal year	Item	Amount (A)	Breakdown by foreign and domestic currencies	
			Foreign currency (B)	Domestic currency
1978		1,549,879	1,100,085	449,794
	Facilities cost	1,122,822	785,576	337,246
	Consultant fee	314,775	235,951	78,824
	Contingencies	112,282	78,558	33,724
1979		2,361,762	1,609,215	752,547
	Facilities cost	1,982,484	1,355,035	627,449
	Consultant fee	181,030	118,677	62,353
	Contingencies	198,248	135,503	62,745
Total		3,911,641	2,709,300	1,202,341
	Facilities cost	3,105,306	2,140,611	964,695
	Consultant fee	495,804	354,628	141,176
	Contingencies	310,531	214,061	96,470

Table 3-8-2-(2) Breakdown of Consultant Fee

Unit: Kina

Item	1978			1979			Total			Remarks
	Amount	Foreign currency	Domestic currency	Amount	Foreign currency	Domestic currency	Amount	Foreign currency	Domestic currency	
Grand Total	314,775	235,951	78,824	181,029	118,676	62,353	495,804	354,627	141,177	
1. Facilities design cost	137,572	121,101	16,471	0	0	0	137, 72	121,101	16,471	
1) Execution and design cost	93,160	93,160	0	0	0	0	93,160	93,160	0	Construction cost x 0.03
2) Air transportation expense	27,941	27,941	0	0	0	0	27,941	27,941	0	
3) Hotel allowance	16,471	0	16,471	0	0	0	16,471	0	16,471	
2. Construction supervision charge	177,203	114,850	62,353	181,029	118,676	62,353	358,232	233,526	124,706	
1) Personal expense	111,026	111,026	0	111,029	111,029	0	222,055	222,055	0	
2) Hotel allowance	41,177	0	41,177	41,177	0	41,177	82,354	0	82,354	
3) Air transportation expense	3,824	3,824	0	7,647	7,647	0	11,471	11,471	0	
4) Indirect expense	21,176	0	21,176	21,176	0	21,176	42,352	0	42,352	

Chapter 4 Management and Operation of Fishing Base

Chapter 4 Management and Operation of Fishing Base

4-1 New Management and Operation System of Fishing Base

In order to give full play to the functions of the constructed base, the various facilities, of which the base is composed, must be managed and operated in an adequate manner.

The present fishing base construction program is planned on the basis of the basic policy of the Government of Papua New Guinea to convert the hitherto practiced mother ship type fisheries into the base type fisheries. Since the construction period is set for 3 years, it is both possible and necessary to establish without delay a management and operation system for the new fishing base that complies with the national situation of Papua New Guinea.

In other words, in order to make the constructed base function in a manner to comply with the purpose for which it has been built, by ensuring safe entry and departure of vessels, smooth landing and disposition of catch, speedy loading of marine products and thorough supply to vessels, the establishment of a "Base Management Body" which will manage and operate the base in a comprehensive manner is needed.

In this case, in view of the strong public nature of the base operations, as well as the important role the base will play as a fundation upon which Papua New Guinea's fishing industry will be promoted, it is desired that the State itself carry out management of the base.

4-2 Management and Operation of Superstructure Management Body

As may be observed in the respective basic concepts underlying the construction of the two fishing bases, the construction aims at the promotion of local fisheries as well as the advancement of freezing and processing of skipjacks, and that of exports to the international market, thus calling for close coordination among such parties as the Base Management Body, fishing enterprises, local fisheries managers and exporters regarding the various fishery activities at the base.

While on the other hand the views of the local financial circles must be fully reflected in the operation of the base since the base is to serve as an effectual foundation upon which regional economy and related industries are to be advanced. It is also required that close exchange of information be carried out mutually between the such as Kavieng, Rabaul, Manus and Madang.

Accordingly, regarding the management and operation of the Superstructure Management Body, it is preferred that they be carried out by a system matching the national situation of Papua New Guinea, by taking into consideration such conditions as those just stated.

4-3 Duties of Base Management Body

4-3-1 Duties

(i) Establishment of "Base Management Rules" to effect positive management of base.

(ii) Establishment of "Base Management Regulations" for the management of buildings.

(iii) On the basis of the "Base Management Regulations", to effect control related to utilization of the base.

(iv) Through the regulation of the "Base Management Ledger", to grasp correctly the present state of the base and to adopt a watertight plan for the maintenance and management of the base.

(v) To compile statistics and conduct surveys and researches that are required for the advancement of the base.

4-3-2 Facilities to be Maintained and Managed

The Base Management Body shall maintain and manage the facilities given below which possess high public properties.

Mooring facilities	Parking lots
Illumination facilities	Roads
Land	Water supply facilities
	Green park
Light house	Control Office

4-4 Superstructure Management Body

(i) To construct the following facilities that is needed for carrying out fishing activities.

Freezing and cold storing facilities

Crew's health and welfare facilities

Communications facilities

Ice making and storing facilities

Handling machineries

Office

Other facilities of superstructure management body

(ii) To run the freezing and cold storing facilities.

(iii) To run the ice making and storing facilities, and to sell manufactured ice.

(iv) To sell supply materials

(v) To operate the crew's health and welfare facilities

(vi) To operate the communications facilities

Chapter 5 Economic and Financial Analysis

Chapter 5 Economic and Financial Analysis

5-1 Outline

An economic evaluation of the Fishing Base Construction Program must be examined from two different standpoints.

One is the question of what kind of economic value the construction of the fishing base will bring forth for the overall national economy. This is the national economic analysis.

The other question is whether the management can be financially established or not, when limiting the view to the fishing-base management constituent alone. This is the financial analysis.

These two analysis are totally different approaches, so they cannot be discussed on the same level. Accordingly, in this report, national economic analysis and financial analysis will be discussed separately.

5-1-1 Method of National Economic Analysis

Considering that the project has been organized as a construction of an infrastructure of a public body, we have adopted the common method for the economic evaluation of development projects: "The Cost Benefit Analysis".

(1) Cost Benefit Ratio

$$Bo/Co = \frac{\sum_{i=1}^{n} \frac{Bi}{(1+r)^i}}{\sum_{i=1}^{n} \frac{Ci}{(1+r)^i}}$$

Where,

Bo, Co: Benefit and cost in fiscal year preceding start of construction

Bi, Ci: Benefit and cost in i-th year after start of construction

r: Discount rate

n: Examination period

The B/C ratio when the benefit and cost of each year have been discounted by the present values can be determined by giving the benefit, B, cost, C, discount rate, r, and examination period, of each year.

(2) Internal Rate of Return

$$Pv = \sum_{i=1}^{n} \frac{Bi-Ci}{(1+r)^i}$$

Where,

Pv: Present values of the project in fiscal year preceding of construction

Ri, Ci: Benefit and cost in i-th year after start of construction

r: Discount rate

n: Examination period

The internal rate of return (RR) is defined as the discount rate that will make the present value Pv = 0. Since the investment officiency (relative degree of priority) of the project can be determined by the IRR without determining the discount rate in advance, the calculation of IRR alone will suffice, but since the rate of loan interest for development projects in PNG has been set at 11%, the B/C ratio for the discount rate 11% is also calculated for reference.

In due consideration of the economical durable years of the facilities, the examination period has been set at 30 years (28 years after completion of construction), from 1978 to 2007.

Because future price fluctuation is beyond our estimation, cost value and benefit value are assumed as constant values; that is, no adjustment factor has been included to account for inflation.

5-1-2 Method of Financial Analysis

(1) Since this project is planned as a public service, the benefit is small. Accordingly, we shall utilize the Table of capital operation plan to examine the project.

(2) On the assumption that 1) all the investment amount will be procured by loans, 2) the interest during the deferment term will be suspended and will be paid on completion of the deferment term in installments and that 3) the principal will be repaid in even amounts on completion of the deferment term, we shall examine the relationship between the deferment term and interest

that will make the balance of loan zero at the 30th year, i.e., the end of the term. The balance at the end of the period, i.e., the 30th year, can be written.

$$G30 = (a-3)B+(30-a)(B-D)-(30-a)\left\{H_2-\frac{(30-a-1)}{2}D+\frac{H1+(a-L)H_2}{(30-a)}\right\}r$$

Where, the codes represent the items as shown in the following table.

Table of Capital Operation Plan

Fiscal year	Raising			Operation			Sum carried forward to next term	Balance of principal at end of term
	Sum brought forward from previous term	Profit of current term	Total	Principal	Interest	Total		
i	$A_i = G_{i-1}$	B_i	$C_i = A_i+B_i$	D_i	E_i	$F_i=D_i+E_i$	$G_i=C_i-F_i$	H_i

Loan interest rate: r

Deferment term: a

Profit of current term (B_i): Profit before exx

Further, the interest during the construction period shall be as shown below.

Fiscal year	Balance of principal at end of term	Interest	
1978	H_1	H_1 r	
1979	H_2	H_2 r	
1980	H_3	H_2 r	$H_2=H_3$

Table 5-2-2-(1) Breakdown of Investment Amount for Fishing Base Construction

unit: K1,000

Fisical year	Construction work cost			Consultant fee			Contingency			Total		
	Total	F.C.*	D.C.**	Total	F.C.	D.C.	Total	F.C.	D.C.	Total	F.C.	D.C.
1978	(382)	(267)	(115)	(107)	(80)	(27)	(38)	(27)	(11)	(527)	(374)	(153)
	1,123	786	337	315	236	79	112	78	34	1,550	1,100	450
1979	(674)	(461)	(213)	(62)	(41)	(21)	(67)	(46)	(21)	(803)	(547)	(256)
	1,982	1,355	627	181	119	62	198	136	62	2,362	1,609	753
Total	(1,056)	(728)	(328)	(169)	(121)	(48)	(106)	(73)	(33)	(1,330)	(921)	(409)
	3,105	2,141	964	496	355	141	311	214	97	3,912	2,709	1,203

Note: Currency exchange rate K1 = ¥340

( ) Figures in brackets donote Japanese yen in millions

* Foreign Currency

** Domestic Currency

5-2 National Economic Analysis

5-2-1 Kavieng Fishing Base

(1) Calculation of Costs

(i) Investment for Fishing Base Construction

The investment amount consists of the construction work cost, consultant fee and contingencies. Construction work stage plan is as follows:

Detailed design work will be started in April, 1978 and will be completed in August. The contract for work will be concluded by the end of September, construction will take place during the period from October, 1978 to March, 1980.

(ii) Mainternance and Management Cost

Two per cent of the investment amount (excluding consultant fee) was appropriated as the annual maintenance and management cost.

K2,409,000 x 0.02 = K48,000

(iii) Facilities Renewal Cost

The present fishing base will be run by the Government with regard to the facilities in Table 2-8-1 and by the Superstructure Management Body regarding its superstructure.

Thus, we need only consider the cost for the facilities in Table 2-8-1. But in the present case, as the durable years are long, the cost was not appropriated during the present examination period.

(2) Calculation of Benefit

(1) Chief effects gained from construction of fishing base in Kavieng

(a) Direct Effect to Production

a. Increase of catch due to increased degree of operation of fishing boats

b. Promotion of modernization of fishing boats

c. To make more function of preparation for fishing

d. Improvement in the freshness of catch

e. Increased supply of marine products

(b) Indirect effects

a. Development of ice-making, cold-storing and processing facilities

b. Increased employment

c. Increased demand for living consumer goods

d. Consolidation of distribution mechanism of marine products

e. Promotion of coastal fisheries

(c) Propagated effects to regional industries

a. Increased demand of electricity and water

b. Progress of materials industry

c. Development of industries related to fisheries (transportation, vehicle, repair, ship machinery and instruments)

(ii) Calculated Items

As the foregoing shows, the economical effects of the construction of the fishing base are diverse consisting of direct benefits, indirect benefits and inductive effects. The beneficiaries, in most case, not only are persons concerned with fisheries and those of associated industries, but extend to the consumers, thus effecting the overall national economy.

The present analysis, however, confines the items for analysis to the following two as direct benefits that allow quantitative analysis.

a. Increase of catch due to increased degree of operation of fishing boats

b. Increased employment

(iii) Calculation of benefits

(a) Increase of catch due to increased degree of operation of fishing boats

The infrastructure is scheduled for completion by 1979 and the superstructure by 1980. Thus, the base will start displaying its functions from 1981. The benefits will start generating from the same year.

The catches of skipjack will reach 23,000 tons in 1977, and 25,000 tons, increasing 2,000 tons, after 1981. Net benefits was set to one half of the gross benefits by deducting the benefits caused by other factors (e.g., making more function of preparation for fishing and development of facilities of

ice making, freezing, processing, etc,).coastal fisheries and improvement of preserving freshness of fish, etc,) were reduced, and net benefit was set to half of the gross benefit.

Table 5-2-1-(2) Increase in Catch

Fiscal year	Skipjack				Local fish				Net profit Total (K)
	Increase in catch (ton)	Unit price (K/t)	Gross benefit	Net benefit (K)	Increase in catch (Ton)	Unit price (K/t)	Gross benefit	Net benefit	
1981	2,000	380	760,000	380,000	875	450	394,000	197,000	577,000
1982									

NOTE: The unit price of local fishes is equivalent to the average value of the prices for Grade 1 and Grade 2 products as judged by the Provincial Government.
The unit price of skipjack is the FOB prices.

(b) Increased employment

With regard to the management and operation of the fishing base, the annual gross benefit gained by the increase in employment of 60 employees of the Superstructure Management Body is K160,000. But the net benefit was set to one half by considering benefits gained by other factors. Thus, net benefit is K80,000.

(3) National Economic Analysis

The results of metric analysis based on the calculation of cost and benefit are as shown in Table 5-2-1-(3). The internal rate of

Table 5-2-1-(3) National Economic Analysis

(Unit: K1.000)

Fiscal year	(1) Investment cost	(2) Maintenance and management expenses	(1)+(2)=(3) Ci Total of costs	(4) Benefit from increased catch	(5) Benefit from increased employment	(4)+(5)=(6) Bi Total of benefits	(6)-(3)=(7) Bi-Ci Pure benefit	(8) $\frac{Ci}{(1+r)^i}$ r=11%	(9) $\frac{Bi}{(1+r)^i}$ r=11%	(10) $\frac{Bi-Ci}{(1+r)^i}$ r=16%	(11) $\frac{Bi-Ci}{(1+r)^i}$ r=17%
1978	1,204	0	1,204				-1,204	1,085	0	-1,038	-1,029
79	1,673	10	1,683				-1,684	1,368	0	-1,247	-1,228
80		24	24				-24	18	0	-15	-15
81		48	48	577	80	657	609	32	432	336	326
82		"	"	"	"	"	"	28	389	290	278
83		"	"	"	"	"	"	26	351	250	237
84		"	"	"	"	"	"	23	316	215	203
85		"	"	"	"	"	"	21	286	186	174
86		"	"	"	"	"	"	19	257	160	148
87		"	"	"	"	"	"	17	231	138	127
88		"	"	"	"	"	"	15	209	119	108
89		"	"	"	"	"	"	14	188	103	93
90		"	"	"	"	"	"	12	169	88	79
91		"	"	"	"	"	"	11	152	76	68
92		"	"	"	"	"	"	10	137	66	58
93		"	"	"	"	"	"	9	124	57	49
94		"	"	"	"	"	"	8	111	49	42
95		"	"	"	"	"	"	7	100	42	36
96		"	"	"	"	"	"	7	90	36	31
97		"	"	"	"	"	"	6	82	31	26
98		"	"	"	"	"	"	5	73	27	23
99		"	"	"	"	"	"	5	66	23	19
2000		"	"	"	"	"	"	4	60	20	16
1		"	"	"	"	"	"	4	54	17	14
2		"	"	"	"	"	"	4	48	15	12
3		"	"	"	"	"	"	3	44	13	10
4		"	"	"	"	"	"	3	39	11	9
5		"	"	"	"	"	"	3	35	10	8
6		"	"	"	"	"	"	2	32	8	6
7		"	"	"	"	"	"	2	29	7	5
Total								2,771	4,104	95	-67

Cost to benefit ratio $Bo/Co = \frac{4,104}{2,771} = 1.48$

$IRR = 16 + \frac{95}{95 + 67} = 16.6\%$

return (IRR) that will equalize cost and benefit within the examination period of 30 years will be 16.6%. The cost and benefit ratio will be 1.48 when the discount rate is 11%. The effective interest in Papua New Guinea is 11%.

When the direct benefits, the indirect benefits and connected benefits which we were unable to measure are considered in addition to the above, the present project must be highly evaluated in its degree of contribution to regional economy. Furthermore, from its public nature, its evaluation from the standpoint of national economy was judged as satisfactory.

5-2-2 Rabaul Fishing Base

(1) Calculation of Costs

(i) Fishing Base Investment Amount

The investment amount consists of the construction cost, consultant fee and contingency. The construction work stage plan is as follows: Detailed design work by the consultants will be started in April 1978 and will be completed in August. The contract for work will be concluded by the end of September, construction will take place during the period from October, 1978 to March, 1980.

Table 5-2-1-(1) Breakdown of Investment Amount for Fishing Base Construction

unit: K1,000

Fisical year	Construction work cost			Consultant fee			Contingency			Total		
	Total	F.C.*	D.C.**	Total	F.C.	D.C.	Total	F.C.	D.C.	Total	F.C.	D.C.
1978	(283)	(142)	(141)	(98)	(71)	(27)	(28)	(14)	(14)	(409)	(227)	(182)
	834	419	415	287	208	79	83	42	41	1,204	669	535
1979	(461)	(222)	(239)	(61)	(40)	(21)	(46)	(22)	(24)	(569)	(285)	(284)
	1,356	653	703	181	119	62	136	65	70	1,673	837	836
Total	(745)	(365)	(379)	(159)	(111)	(48)	(74)	(36)	(38)	(978)	(512)	(466)
	2,190	1,072	1,118	468	327	141	219	107	112	2,877	1,506	1,371

Note: Currency exchange rate K1 = ¥340

( ) Figures in brackets denote Japanese yen in millions

* Foreign Currency

** Domestic Currency

(ii) Maintenance and Management Cost

Two per cent of the investment amount (excluding consultant fee) was appropriated as the annual maintenance and management cost.

K3,480,000 x 0.02 = K70,000

(iii) Facilities Renewal Cost

Regarding the present fishing base, the Government will manage and operate the facilities in Table 3-8-1, while the Superstructure Management Body will manage and operate the superstructure. Thus, we need only consider the facilities renewal cost for the facilities in Table 3-8-1. But in the current case, as the durable years are long, the renewal cost was not appropriated for the present examination period.

(2) Calculation of Benefit

(i) Chief effect gained from construction of fishing base in Rabaul

(a) Direct effects to production

a. Increase in catch due to increased degree of operation of fishing boats

b. Furtherance of modernization of fishing boats

c. To make more function of preparation for fishing

d. Improvement in preserving freshness of catch

e. Increased supply of marine products

(b) Indirect effects

a. Progress of ice-making, cold storing and processing facilities

b. Increased employment

c. Increased demand of living consumer goods

d. Consolidation of distribution mechanism of marine products

e. Promotion of coastal fisheries

(c) Propagative effects to regional industries

a. Progress of materials industry

b. Progress of industries associated with fisheries (transportation, vehicle, repair and ship machinery and instruments)

(ii) Calculated items

As the foregoing shows, the economical effects of the construction of the fishing base are diverse, consisting of direct and indirect benefits, and inductive effects. The beneficiaries, in most cases comprise persons engaged in fisheries and associated industries as well as consumers. Thus, the base will have vast effects on the overall national economy.

The present analysis, however, confines items to be analyzed to the following two as direct benefits that can be measured quantitatively.

a. Increase of catch due to increased degree of operation of fishing boats

b. Increase in employment

(iii) Calculation of benefits

(a) Increase of catch due to increased degree of operation of fishing boats

The infrustracture is scheduled for completion by 1979 and the superstructure by 1980. Thus, the base will start displaying its functions from fiscal 1981. The benefits will start generating from the same year.

The catches of skipjack, although the catch will reach 24,800 tons in 1977, and 28,800 tons, increasing 4,000 tons, after 1981. Net benefit was set to one half of the gross benefits by deducting the benefits caused by other factors(e.g., making more function of preparation for fishing and development of ice making, freezing, processing facilities, etc.).

Regarding local fishes, although the catch amounts to 25 tons at present, it will reach 900 tons in 1981 by increasing 875 tons, by the consolidation of the base, net benefit was set to one half of gross benefits by deducting the benefits gained by other factors (e.g., development of facilities of ice making, storing, processing and promotion of coastal fisheries, and improvement of preserving freshness of fish).

Table 5-2-2-(2) Increase of Catch

Fiscal year	Skipjack				Local fish				Total net benefit (L)
	Increase tonnage of catch	Unit price (K/ton)	Gross benefit (K)	Net benefit (K)	Increase tonnage of catch	Local Unit price (K/ton)	Gross benefit (K)	Net benefit (K)	
1981	4,000	380	1,520,000	760,000	875	450	393,750	197,000	957,000
1982									

NOTE: The unit price of the local fishes is equivalent to the mean value of the prices of Grade 1 and 2 products as judged by the Provincial Government (D.P.I.).

The unit price of skipjack as the F.O.B. Prices.

(b) Increase in employment

With regard to the management and operation of the fishing base, the annual gross benefit gained by the increase in employment of 70 employees of the Superstructure Management Body is K180,000, but the net benefit was set to one half by considering benefits gained by other factors. Thus, net benefit is K90,000.

(3) National Economic Analysis

Table 5-2-2-(3) shows the results of metric analysis carried out on the basis of the calculations of cost and benefit described in the preceding section. The internal rate of return (IRR) that will equalize cost and benefit within the Examination period of 30 years will be 19.5%. Meanwhile, the cost to benefit ratio will

Table 5-2-2-(3) National Economic Analysis

(Unit: K1.000)

Fiscal year	(1) Investment cost	(2) Maintenance and management expenses	(1)+(2)=(3) Ci Total of costs	(4) Benefit from increased catch	(5) Benefit from increased employment	(4)+(5) Bi Total of benefits	Bi-Ci Net benefit	$\frac{Ci}{(1+r)^i}$ r=11%	$\frac{Bi}{(1+r)^i}$ r=11%	$\frac{Bi-Ci}{(1+r)^i}$ r=19%	$\frac{Bi-Ci}{(i+r)^i}$ r=20%
1978	1,550		1,550				-1,550	1,396		-1,303	-1,292
79	2,362	10	2,372				-2,372	1,928		-1,670	-1,647
80		34	34				-34	25		-20	-20
81		68	68	957	90	1,067	999	45	702	497	483
82		"	"	"	"	"	"	40	631	418	401
83		"	"	"	"	"	"	36	571	352	334
84		"	"	"	"	"	"	33	513	296	279
85		"	"	"	"	"	"	30	464	249	232
86		"	"	"	"	"	"	27	417	209	194
87		"	"	"	"	"	"	24	376	176	161
88		"	"	"	"	"	"	22	339	147	134
89		"	"	"	"	"	"	19	305	124	112
90		"	"	"	"	"	"	18	275	104	93
91		"	"	"	"	"	"	16	248	87	78
92		"	"	"	"	"	"	14	223	74	65
93		"	"	"	"	"	"	13	201	62	54
94		"	"	"	"	"	"	12	181	52	45
95		"	"	"	"	"	"	10	163	44	38
96		"	"	"	"	"	"	9	147	37	31
97		"	"	"	"	"	"	8	132	31	26
98		"	"	"	"	"	"	8	119	26	22
99		"	"	"	"	"	"	7	107	22	18
2000		"	"	"	"	"	"	6	97	18	15
1		"	"	"	"	"	"	6	87	15	13
2		"	"	"	"	"	"	5	79	13	10
3		"	"	"	"	"	"	5	71	11	9
4		"	"	"	"	"	"	4	64	9	7
5		"	"	"	"	"	"	4	57	8	6
6		"	"	"	"	"	"	3	52	6	5
7		"	"	"	"	"	"	3	47	5	4
Total								3,776	6,668	99	-90

Cost to benefit ratio $Bo/Co = \frac{6,668}{3,776} = 1.77$

$IRR = 19 + \frac{99}{99 + 90} = 19.5\%$

be 1.77 when considering the discount rate to be 11%.

The effective interest in Papua New Guinea is 11%.

When the direct and indirect benefits and connected benefits which we were unable to measure are considered in addition to the above, the present project must be highly evaluated for its degree of contribution to regional economy. Furthermore, from its public nature, its evaluation from the standpoint of national economy is also judged as being satisfactory.

5-3 Analysis of Public Finance

5-3-1 Outline

As stated earlier in "Management and Operation", the infrastructure is to be constructed and controlled by the Government, while the superstructure is to be constructed and run by the Superstructure Management Body. In the present project, the base facilities that are to become the object of loan are those constructed directly by the Government. In this chapter, "Analysis of Public Finance", we shall study the possibility of loan from the standpoint of funds employment.

The Government, who is the Base Management Body, will not only maintain and manage the base as an infrastructure, but will also repay the loan for the investment cost.

The Government income that is needed for covering these expenses shall be the quay wall utilization charges and charges for the exclusive use of land and the burden charge for the use of the base

paid by the Superstructure Management Body, oil supply traders, whom will be gaining profit from the use of the base.

5-3-2 Kavieng Base

(1) Base income

(a) Quay wall utilization charges

The base is just a home part for base-operating fishing boats. It is a place where the catches is landed, the boat receives supply, is repaired and where it rests. Thus it is unreasonable to collect the quay wall utilization charges from base-operated fishing boats.

Thus, the utilization charges are to be collected only from those carriers which carry the catch landed at the base to other ports, or to foreign countries. By using the quay wall utilization charges of K0.2/m.h charged by commercial ports in Kavieng, the quay wall utilization charges of the base shall be set to K0.5/m.h considering the characteristics of the base that be used exclusively for fisheries.

Carrier: 600-ton class

62(m)x96(hr)xK0.15(m/hr)x34(times/yr) = K30,355

2,000-ton class

77x120xK0.15x13 = K18,018

Total: K48,000

(b) Charges for exclusive use of land

Land to be lent for exclusive use will be the sites for the Office, freezing and cold storing facilities, ice making and storing facilities and health and welfare facilities, all of which will be built by the Superstructure Management Body, and the site for the oil supply facilities.

As for such land as the land for the road, park, parking lot, it is to be controlled by the State and thus excluded. The existing land shall also be excluded as a special Treasury revenue.

7,340 m^2 x K2/year m^2 = K15.000/year

(c) Burden charge for use of base

This is a sort of dues that will be collected from the Superstructure Management Body and oil supply traders who will be utilizing the base. The burden charge will be paid annually in a fixed amount.

Superstructure Management Body	K140.000
Oil supply traders	K 10.000
Total	K150.000

(d) Total of Base income: K213.000

(2) Base expenses

(a) Maintenance and management cost

Since the durable years of the infrastructure are not less than 50 years, the infrastructure will be excluded

as an object of depreciation.

The maintenance cost will be evaluated to be 2% of the investment cost (excluding the consultant fee):

K2,409,000 x 0.02 = K48,000

Management cost for office will be evaluated to be K4,000/year. Total K52,000.

(b) Loan

The debt of the Government will be K2,877,000 (See Table 5-2-1-(1)), the total amount of which will depend on loan.

(3) Income and Expenses of Base

Profit of present term: (213-52) thousand kina
= 161 thousand kina

(4) Financial Analysis of Base

Financial Analysis of the base shall be carried out on the assumption that the profit gained from the base will be appropriated for the repayment of the borrowed investiment amount. As a result of studying the funds employment plan, by adopting the calculation method described in 5-1-2-(2), the relation between the deferment term and loan interest rate that would make the sum carried forward to the next term "0" at the 30th year was found to be as shown below.

B = 161 thousand kina H_1 = 1,204 thousand kina

H_2= 2,877 thousand kina

a = For 10 years D = 144 thousand kina

a = For 7 years D = 125 thousand kina

a = For 5 years D = 115 thousand kina

Term of deferment	Loan interest
10 years	2.6%
7 years	2.8%
5 years	2.9%

As may be seen from the above, fund employment is possible by the sole appropriation of the profit gained from the base.

The funds employment program presupposes the income to be fixed. Although the quay wall utilization charges and charges for the exclusive use of land will pose no problem, the burden charges for use of the base which represent the major portion of income must be fully collected, if the base is to be on a paying basis. Viewed from the standpoint of promoting the sound growth of associated enterprises, the less the burden charges, the greater an effect can be expected. Also, considering the public nature of the Base, it is desired that the Government extend aid for the construction of the Base.

5-3-3 Rabaul Base

(1) Base income

(a) Quay wall utilization charges

Similar to the Kavieng Base, it will be unreasonable to collect utilization charges from base-operating fishing boats.

Thus, the charges will be collected only from carriers.

Carrier, 10-ton class: 15mx2hrs.xK0.15/hrx88 times/yr
= K 396

600-ton class: 62"x96"xK0.15/hrx39 times/yr.
= K 34,819

2,000-ton class: 77"x120"xK0.15/hrx15 times/yr.
= 20,790

Total K 56,000

(b) Charges for exclusive use of land

Land to be lent for exclusive use will be the land for the various facilities to be constructed by the Superstructure Management Body and the oil supply facilities. Land for such facilities as roads, parking places, park, and the Management Office will be controlled by the State and will be, therefore, excluded here. Further, the existing land will also be excluded as a special Treasury revenue.

9,300 m^2 x K2/yr = K19,000/yr.

(c) Burden charges for use of base

These are basic utilization charges of sorts that will be collected from the Superstructure Management Body and oil supply traders who will be utilizing the base. The burden

charges will be paid annually in a fixed amount.

Superstructure Management Body	K 170,000
Oil supply traders	K 15,000
Total	K 185,000

(d) Total of base income: K 260,000

(2) Base expenses

(a) Maintenance and management cost

Since the durable years of the infrastructure are not less than 50 years, the infrastructure was excluded as an object of depreciation. The maintenance cost will be evaluated to be 2% of the investment cost (excluding consultant fee):

K3,480,000 x 0.02 = K70,000

Management cost for office will be evaluated to be K5,000/yr. Total: K52,000

(b) Loan

The debt of the Government will be K3,912,000 (See Table 5-2-2-(1)), the total amount of which will depend on loan.

(3) Income and Expenses of Base

Profit of current term: (260-75) thousand kina
= 185 thousand kina

(4) Financial Analysis of Base

Financial Analysis of the base shall be carried out on the

assumption that the profit gained from the base will be appropriated for the repayment of the borrowed investment amount. As a result of studying the fund employment plan by adopting the calculation method described in 5-1-2-(2), the relation between the deferment term and loan interest rate that would make the sum carried over to the next term "0" at the 30th year was found to be as shown below.

B = 185 thousand kina H_1 = 1,550 thousand kina

H_2= 3,912 thousand kina

a = For 10 years D = 196 thousand kina

a = For 7 years D = 170 thousand kina

a = For 5 years D = 156 thousand kina

Term of deferment	loan interest
10 years	1.4%
7 years	1.5%
5 years	1.6%

As may be seen from the above, fund employment is possible by the sole appropriation of the profit gained from the base.

The funds employment program presupposes the income to be fixed. Although the quay wall utilization charges and charges for the exclusive use of land will pose no problem, the burden charges for use of the base which represent the major portion of revenue must be fully collected, if the base is to be on a paying basis. Viewed from the standpoint of promoting the sound growth of associated enterprises, the less the burden charges, the

greater an effect can be expected. Also, considering the public nature of the Base, it is desired that the Government extend aid for the construction of the Base.

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greater an effect can be expected. Also, considering the public nature of the Base, it is desired that the Government extend aid for the construction of the Base.

Chapter 6 Advice and Matters Requiring Future Study

Chapter 6 Advice and Matters Requiring Future Study

6-1 Advice

In order to allow the constructed fishing base to display its functions effectually, adequate measures must be taken from the multiple standpoints associated with the fishing base. The following describes those matters which are considered as most urgent.

(i) To consolidate the control system as soon as possible

As the fishing base will be constructed within a period of three years, thereby allowing its early utilization, the Base's control system must be consolidated as soon as possible.

Accordingly, in consolidating the facilities, priority should be given to the facilities related to management such as the Management Office.

(ii) To establish as soon as possible a management and operation system for the superstructures

The most suitable management and operation system must be set up for the superstructures in order to allow the Government of Papua New Guinea to set up the Fishing Base Construction Programs. Accordingly, the system must be established by the time the Base is constructed.

(iii) To carry out training in connection with the management and operation of the Base

In order to effect smooth management and operation of the constructed base, personnel proficient in management and operation are needed. However, since there is no full-fledged fishing base

existing at present in Papua New Guinea, and since it lacks experience in the management and operation of such a base, it is desired that the actual conditions of various foreign countries be inspected, or that base-supervising candidates be trained in those countries in the skills and management and operation of fishing bases.

(iv) To establish as soon as possible a stable live-bait supply system

Stable supply of live bait constitutes an essential factor to skipjack pole-and-line fishing. Thus, it calls for the early establishment of a stable live-bait supply system, realized through effort to promote the development of livebait preserve techniques and to improve the fish preserving facilities as soon as possible.

6-2 Matters requiring future study

(i) To replete statistical data relating to the base construction program

Since the statistical data obstained at the fishing base to be constructed in Kavieng and Rabaul will become fully useful as basic data for future construction of bases, it will be advisable to carry out in a systematical manner the collection of statistical data of high accuracy at the two bases.

(ii) To rear specialists associated with the construction of fishing bases

With the present base construction acting as a turning point, it is believed that demand will arise in the future for the construction of fishing bases in verious areas of Papua New Guinea.

The construction of suitable fishing bases bears extremely great significance in the promotion of the fishing industry of Papua New Guinea. Thus, specialists who possess vast knowledge associated with the planning and construction of fishing bases are needed.

Since technologies related to fishing bases belong to a special field, it will be difficult to gain immediate participation of experienced specialists from the outside. Thus, it will be advisable to have technicians who have studied civil engineering, notably dock and harbor engineering, attached to the Fisheries Section of the Primary Industry Department and rear them as specialists.

Needless to say, in this case, overseas training in advanced nations will prove to be exceedingly effective in rearing the specialists.