Appendix-4 Minutes of Discussion

MINUTES OF DISCUSSIONS ON THE BASIC STUDY ON THE PROJECT FOR IMPROVEMENT OF COMMUNITY BOAT HARBOUR IN THE REPUBLIC OF NAURU

In response to the request from the Government of Nauru, the Government of Japan has decided to conduct a Basic Design Study (hereinafter referred to as "the Study") on the Project for Improvement of Community Boat Harbour in Nauru (hereinafter referred to as "the Project"), and entrusted the Study to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Nauru a Basic Design Study Team (hereinafter referred to as "the Study Team"), headed by Tsutomu Matsunaga, Deputy Director, Fishing Port Department, Fisheries Agency of Japan, which is scheduled to stay in the country from October 28, 1997 to December 1, 1997.

The Study Team conducted field surveys at the study areas and held discussions with the officials concerned of the Government of Nauru. As a result of the field surveys and discussions, both parties confirmed the main items described on the attached sheets.

The Study Team will proceed to further works in Japan and prepare the Basic Design Study Report.

Nauru, November 10, 1997

Mr. Tsutomu Matsunaga
Leader
Basic Design Study Team
JICA

The Honorable Vassal Gadoengin
Acting Minister
The Ministry of Island Development and Industry

Mr. Ramos Agege
Acting Chief Executive Officer
Nauru Fisheries & Marine Resources Authority

ATTACHMENT

1. Objective of the Project

The objective of the Project is to contribute to the fishery development in the Republic of Nauru by constructing a fishing port at Anibare district.

2. Responsible Agency and Implementing Agency

The Ministry of Island Development and Industry is the Responsible Agency and the Nauru Fisheries and Marine Resources Authority is the Implementing Agency of the Project.

3. Project Site

Anibare District in Nauru (ANNEX-1).

4. Items requested by the Nauru side

The facilities requested by the Nauru side for the Project are listed in ANNEX-2. However, the facilities may be modified in their types and sizes or be omitted in the further studies by the Study Team.

5. Undertakings required of the Nauru side

1) The Nauru side will take necessary measures described in ANNEX-3 for smooth implementation of the Project on condition that the Grant Aid from the Government of Japan is extended to the Project.

2) The Nauru side will take action on extending the period of the Grant Aid, if necessary.

6. Japan's Grant Aid Program

The Nauru side has understood the system of Japan's Grant Aid Program described in ANNEX-4 and explained by the Study Team.

7. Further Schedule of the Study

1) The Study Team will proceed to further study in Nauru until December 1, 1997.

2) Based on the results of the Basic Design Study, JICA will prepare a Draft Basic Design Report and dispatch a Draft Report Explanation Team to Nauru around the end of January, 1998 in order to explain and to confirm the contents of the

Draft Basic Design.

3) Upon acceptance of the Draft Basic Design by the Nauru side, JICA will complete the Basic Design Study Report and send it to the Nauru side around March, 1998.

8. Major Points of Discussions

1) The Nauru side has understood that the Project may be implemented with the budget of 1998-Japanese fiscal year which starts in April 1998 and ends in March 1999 so that the Project can have an enough period of construction on condition that the Grant Aid by the Government of Japan is extended to the Project with that budget.

2) The Nauru side has made the following requests differing from their original ones:

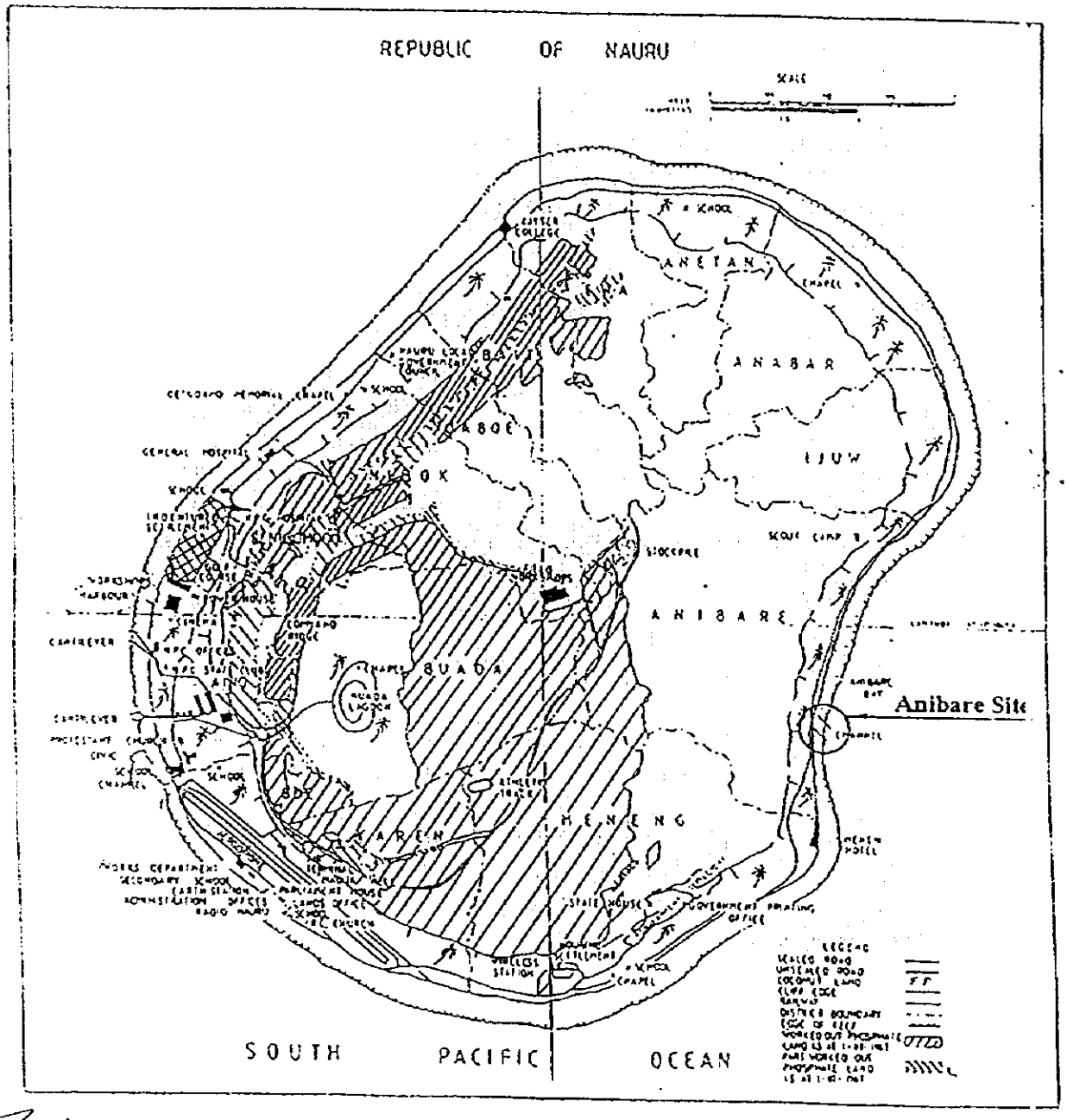
- the parking area be expanded to 120m(long) x 30m(wide) since the 14m width can not provide the enough space for a large boat to launch;
- lighting apparatus be installed in the parking area;
- one sub-breakwater closer to the channel be located at the north side of the channel to be functional as a sand barrier; and,
- the existing channel and the water basin be dredged to the depths of –4.5 m and –3.5 m respectively to accommodate a large boat.

The Study Team has claimed that careful studies will be conducted to examine the appropriateness for these requests and that the decisions to accept them are subject to the studies.

3) The Nauru side has confirmed that an environmental assessment for the Project will be conducted by the Nauru side prior to the Exchange of Notes.

4) The Nauru side has requested some of counterpart engineers to be trained in Japan. The Study Team has recommended that the official request be submitted to the Government of Japan, in due course, in case that the Grant Aid is extended to the Project.

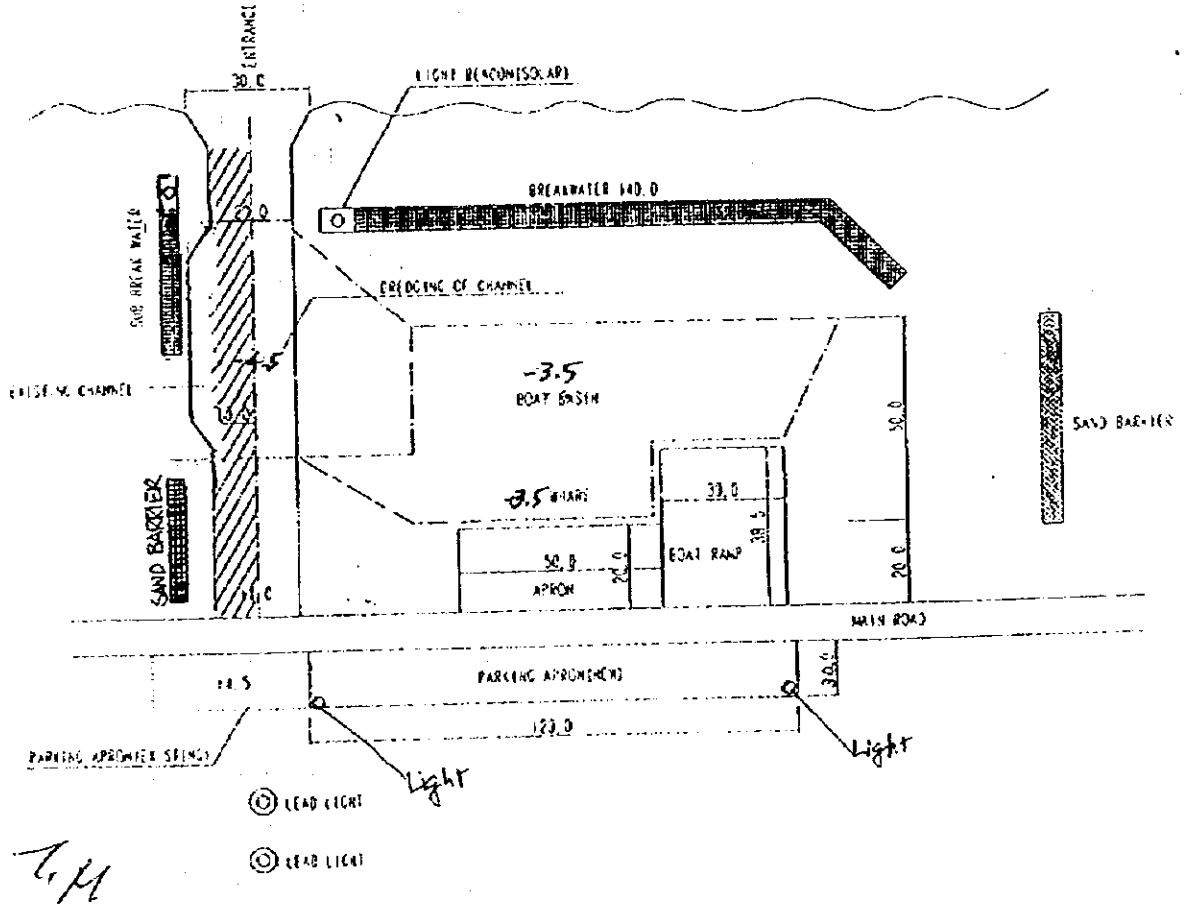
ANNEX-1 LOCATION MAP



ANNEX-2 MAJOR ITEMS REQUESTED BY THE NAURU SIDE

The main components of the Project are as follows:

(1) Dredging of the Existing Channel	-4.5 m deep
(2) Dredging of the Water Basin	-3.5 m deep
(3) Wharf	50 m long x 20 m wide
(4) Slipway	38.5 m long x 30 m wide
(5) Main Breakwater	140 m long
(6) Sub Breakwater	32 m long
(7) Sand Barrier Breakwaters	50 m long, 32 m long
(8) Parking Lot	3,600 square meters (120 m x 30 m)
(9) Lighting Apparatus	2 places
(10) Navigational Aids	Light Beacons, Channel Markers



ANNEX-3 UNDERTAKINGS REQUIERED OF THE NAURU SIDE

Following necessary measures shall be taken by the Nauru side on condition that the Grant Aid by the Government of Japan is extended to the Project.

1. to secure lands necessary for the Project and to clear, level the lands if needed prior to commencement of the construction;

2. to secure disposal areas for dredged soil and rocks ;

3. to provide roads outside the site;

4. to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities outside the site;

5. to ensure prompt unloading, tax exemption and customs clearance at ports of disembarkation in the recipient country and internal transportation therein of the products purchased under the Project;

6. to exempt Japanese nationals from custom duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the Project;

7. to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Project such as facilities as may be necessary for their entry into the recipient country and stay therein for the performance of the works;

8. to ensure that the facilities constructed under the Project be maintained and be used properly and effectively, and to assign the necessary staff for operation and maintenance of them;

9. to bear commissions to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement, namely the advising commission of the "Authorization to Pay" and payment commissions;

10. to provide with necessary permissions, licenses and other authorizations for implementing the Project, if necessary; and

11. to bear all the expenses other than those covered by the Grant Aid, necessary for the Project.

ANNEX-4 JAPAN'S GRANT AID PROGRAM

1. Grant Aid Procedure

1) Japan's Grant Aid Program is executed through the following procedures.

Application (Request made by a recipient country)
Study (Basic Design Study conducted by JICA)
Appraisal & Approval (Appraisal by the Government of Japan and Approval by the Japanese Cabinet)
Determination of Implementation (The Notes exchanged between the Governments of Japan and the recipient country)

2) Firstly, a request for the Grant Aid submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for the Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using a Japanese consulting firm.

Thirdly, the Government of Japan appraises the project so as to see whether or not it is suitable for the Grant Aid, basing on the Basic Design Study report prepared by JICA, and then it is submitted to the Cabinet for approval.

Fourthly, once the project is approved by the Cabinet, its implementation is officially determined by signing the Exchange of Notes between the Governments of Japan and of the recipient country.

Finally, in the course of implementation of the project, JICA will take charge of expediting the execution of the project by assisting the recipient country in such matters as preparing tenders, contracts and so on.

Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study, conducted by JICA on the requested project, is to provide basic documents necessary for the appraisal of the project by the Government of Japan. The contents of the study are as follows:

a) to confirm the background, objectives and benefits of the project and also institutional capacity of the agencies concerned of the recipient country necessary for the project implementation;
b) to evaluate the appropriateness of the project from the technical, social and economic points of view;
c) to confirm items agreed on by both parties concerning the basic concept of the project;
d) to prepare a basic design of the project; and,
e) to estimate costs of the project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the project. Such measures must be guaranteed even through they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the project. Therefore, the implementation of the project is confirmed by all relevant organizations of the recipient country in the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the study, JICA selects a consultant among those who registered at JICA by evaluating competitive proposals submitted by those consultants. The selected consultant carries out the Basic Design Study and prepare a report based on the terms of reference made by JICA.

At the beginning of the implementation after the Exchange of Notes, JICA recommends the same consultant who participate in the Basic Design Study to the recipient country for the services of Detailed Design and construction supervision of the project in order to maintain the technical consistency between the Basic Design and the Detailed Design as well as to avoid any undue delay caused by the selection of a new consultant.

2. Japan's Grant Aid Scheme

1) What is the Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) Period

The period of the Grant Aid means the one fiscal year which the Cabinet approves the project for. Within the fiscal year, all procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed. However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Purchase of Products and Services

Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors,

namely consulting, contracting or procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Verification

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This verification is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required to the Government of the recipient country
(As described in ANNEX-3)

7) Proper Use

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.

8) Re-export

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

9) Banking Arrangement (B/A)

a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments to the Bank in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.

b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under "Authorization to Pay" issued by the Government of recipient country or its designated authority.

NAURU FISHERIES &MARINE RESOURCES AUTHORITY

P.O.BOX 449
REPUBLIC OF NAURU
CENTRAL PACIFIC

Phone: (674) 444 3733 / 3739, Fax: (674) 444 3812

27 April 1998

Mr. Tsutomu Matsunaga
Leader
Basic Design Study Explanation Team
Anibare Community Boat Harbour Project

Sir,

1. On behalf of the Minister for Island Development and Industry, please allow me to state the views of the Government of Nauru on the draft *Basic Design Study Report on the Project for the Improvement of the Community Boat Harbour in the Republic of Nauru* which your Basic Design Study Explanation Team has presented since your arrival on Tuesday 21 April 1998.

2. The Government of Nauru values very much its cordial relations with Japan, particularly in the field of cooperation through the bilateral fishing agreement which our two Governments were able to establish in 1994.

3. Nauru made the initial approach to Japan for dialogue towards establishing a bilateral fishing agreement between our two countries because the Government of Nauru recognises the assistance that the Government of Japan can extend to other countries through technical assistance and grant aid.

4. The Government of Nauru is very keen to develop its fisheries sector in anticipation of the depletion of its only natural resource, the phosphate, in the very near future. The fisheries resources of Nauru is a major resource which has yet to be fully exploited and utilised in a sustainable manner by the Government of Nauru, for the social and economic well being of the people of Nauru.

5. We place therefore a lot of importance to any form of assistance that may be forthcoming to Nauru through the generosity of other countries, of which Japan is one, for the development of the fisheries sector in Nauru.

6. In recognising the importance of the Anibare Community Boat Harbour project to the development of the fisheries sector in Nauru, the Government of Nauru, through His Excellency the President, submitted a formal request to the Government of Japan, through the Embassy of Japan in Fiji, for Japan to consider extending grant aid assistance to Nauru for the project.

7. The Government of Japan responded by sending the Project Formulation Team to Nauru in April 1997 which was followed by the Basic Design Study Team in November 1997.

8. In discussing our needs with the Basic Design Study Team which came to Nauru in November 1997, we identified and requested the following major works for the proposed Anibare Community Boat Harbour project to be taken into consideration :-

i. dredging of the existing channel to a depth of -4.5m
ii. construction of the boat basin to a depth of -3.5m
iii. construction of a wharf 50m long x 20m wide
iv. construction of a slipway 38.5m long x 30m wide
v. construction of main breakwater 140m long
vi. construction of sub breakwater 50m long
vii. construction of two sand barrier breakwaters 32m long and 50m long respectively
viii. construction of a parking area 120m long x 30m wide (3,600 sq.m)
ix. installation of navigation aids such as light beacons and channel markers
x. installation of parking lights and wharf flood lights.

9. We now acknowledge that the draft Basic Design Study Report has omitted the inclusion of the wharf, the two sand barriers and the navigation aids and lighting, as part of the basic components of the basic design of the proposed Anibare Community Boat Harbour, as well as reducing the size of the channel and therefore the related breakwaters and boat ramp (slipway) and the parking area, for reasons explained by your team.

10. It is noted from the draft Basic Design Study report that the determination of the level of fishing activity in Nauru was based on 1994 statistics. It is our view that the current (1998) statistics should be used for the determination of the level of fishing activity in Nauru, since there is evidently more fishing activity in Nauru now than in 1994.

11. We have taken note that the draft Basic Design Study report and your side's explanation that the thickness of sand sedimentation would be 20cm over a 30 year period, and that the sand barriers therefore will not be required. We seek your side's assurance that immediate action will be taken in the future, should the project proceed, to overcome any problems associated with the sedimentation of sand in the channel should the thickness of the sand sedimentation exceed that estimated in the Basic Design Study report.

12. We also have taken note of the assurance given by the your side that the installation of the navigation aids such as light beacons and channel markers will be submitted to the Government of Japan for reconsideration to be included as one of the basic components of the project. The fishermen require to use the channel at night time as well as during daytime and a lot of night fishing activity using the local fishing boats takes place when the weather and sea conditions permit. The safety of fishermen should always be a prime consideration of any responsible authority and therefore we consider the installation of the navigation aids to be useful and necessary. The offer by your side to reconsider the inclusion of the navigation aids is highly appreciated.

13. We consider the wharf to be a necessity because it would enable the landing and loading of fish catches as well as provisioning for the local fishing boats, irrespective whether it is high tide or low tide. The omission of the wharf would mean that the fishermen would have to wade in the water to load or land their fish catches or provisioning their boats with supplies during high tide, or to pull their boats out of the water on trailers, which would mean lost time and therefore less fishing effort. Your proposal for the Government of Nauru to construct the wharf at its own cost is not the issue here. The issue, in our view, is whether the wharf should be one of the basic components of the project. It is our view that the wharf should be one of the basic components of the project, for reasons explained above.

14. We kindly ask the Government of Japan to reconsider the basic design basic components to include the wharf and the navigation aids, as earlier requested, but reduced in size to meet the project size as presented in the draft Basic Design Report, and to keep open the option in the future for the Government of Japan to address and overcome any problems associated with the thickness of the sand sedimentation exceeding that estimated in the Basic Design Study report.

Yours sincerely,

FELIX KUN
CHAIRMAN
BOARD OF DIRECTORS
NAURU FISHERIES AND MARINE RESOURCES AUTHORITY

Appendix-5 Natural Conditions

1-1 Climatic Conditions

The weather in Nauru belongs to tropical oceanic climate. Temperature varies little and relative humidity is high throughout the year. The easterly trade winds blow between March and October and the westerly winds occasionally blow between November and February. The dry season is from March to October and the wet season is from November to February. As a result of interviews and surveys, the histories of typhoon, cyclone and earthquake have not been found.

(1) Temperature

Figure A-1-1 shows the monthly changes of the maximum, mean and minimum temperatures in 1994. The maximum temperature is recorded at 29.9 ° C in July and the minimum is 28.1 ° C in March and the difference is approximately 2 ° C, which highlights that the annual change is small. The annual mean temperature is 28.9 ° C.

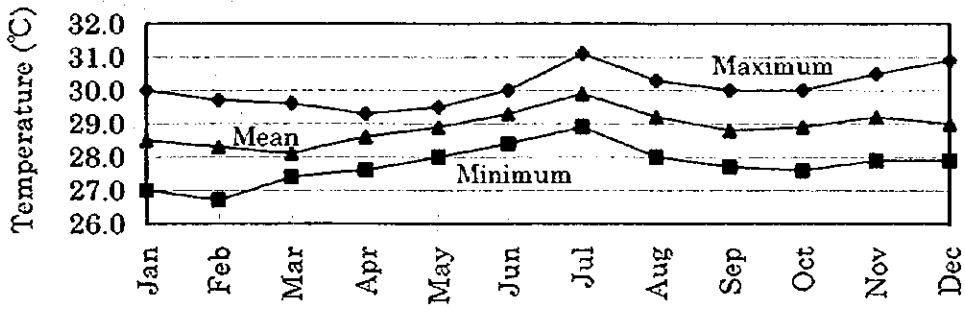


Figure A-1-1 Monthly Changes of Temperatures in 1994

(2) Rainfall

Figure A-1-2 shows the monthly average rainfall of 10 years from 1987 to 1996. The rainfall is recorded in both the dry and wet season, but the wet season has a relatively large rainfall. The annual mean rainfall is 2,400mm with some fluctuations such like an occasional drought lasting over a year.

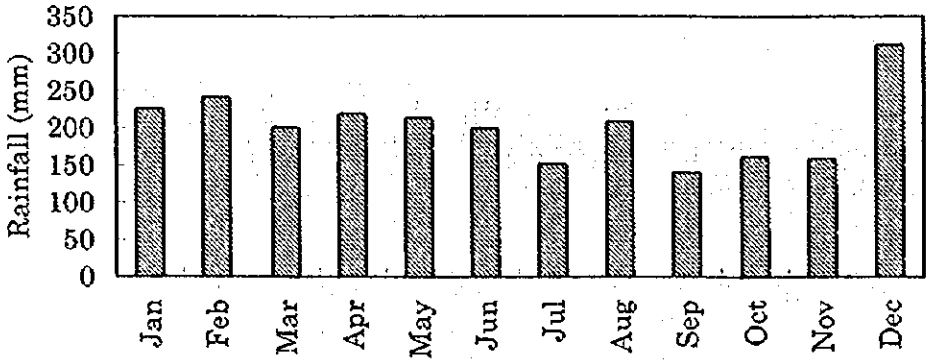


Figure A-1-2 Monthly Average Rainfall (1987 - 1996)

(3) Wind Direction and Speed

Since there is no reliable wind data in Nauru, the study team obtained the wind data off Nauru Island (N0° 00', E167° 30') from Wind Model Database of National Meteorological Center (NMC) in USA. Tables A-1-1 and A-1-2 show the monthly mean wind speed and the frequencies of occurrence of wind by speed and direction from 1989 to 1997, respectively. And Figures A-1-3 and A-1-4 show the monthly and annual wind roses. These data show that monthly mean wind speed is 3 to 5m/s, which is classified to a light breeze. The wind direction from North-east to South-east is predominant with 60% of all and the wind less than 7m/s is 90% of all. Nauru is influenced by the trade wind all year around.

Since Nauru is located close to the equator in the Central Pacific, which is close to the region where cyclones and typhoons generate, the climate in Nauru is relatively calm having less influences of those as mentioned above. The westerly winds generated by small depressions in the vicinity of Nauru blow sometimes between November and February, but its speed is not more than 14m/s.

Table A-1-1 Monthly Mean Wind Speed (1989 - 1997)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(m/s)	4.8	5.3	4.6	4.2	4.0	3.8	3.7	4.4	4.0	4.2	4.4	4.7

Table A-1-2 Frequencies of Wind Occurrence by Direction and Speed (1989 - 1997)

Wind Speed (m/s)	Wind Direction (%)																
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Total
0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00
0.0 - 1.0	0.12	0.10	0.32	0.17	0.20	0.12	0.17	0.10	0.27	0.13	0.23	0.03	0.12	0.20	0.22	0.13	2.62
1.0 - 2.0	0.63	0.60	0.68	0.57	1.08	0.73	0.85	0.62	0.70	0.53	0.55	0.37	0.45	0.53	0.50	0.48	9.89
2.0 - 3.0	0.73	0.88	1.45	1.33	1.77	0.98	1.33	0.88	0.75	0.70	0.72	0.42	0.65	0.50	0.57	0.38	14.06
3.0 - 4.0	1.00	0.85	1.70	1.67	2.72	1.98	1.72	0.75	0.88	0.55	0.55	0.52	0.60	0.52	0.70	0.37	17.08
4.0 - 5.0	0.87	1.12	1.68	2.45	3.64	1.77	1.58	0.63	0.62	0.53	0.62	0.35	0.47	0.48	0.52	0.48	17.81
5.0 - 6.0	0.82	0.82	1.38	2.35	2.93	1.92	1.32	0.48	0.40	0.32	0.45	0.35	0.37	0.27	0.55	0.23	14.96
6.0 - 7.0	0.60	0.65	1.08	1.85	2.57	1.58	0.83	0.25	0.17	0.12	0.35	0.28	0.37	0.25	0.32	0.13	11.41
7.0 - 8.0	0.38	0.25	0.88	1.43	1.62	0.63	0.55	0.05	0.08	0.12	0.17	0.05	0.42	0.13	0.22	0.05	7.04
8.0 - 9.0	0.05	0.15	0.23	0.62	0.62	0.38	0.15	0.03	0.02	0.03	0.15	0.12	0.20	0.13	0.12	0.08	3.08
9.0 - 10.0	-	0.02	0.05	0.32	0.28	0.07	0.02	-	-	-	0.07	0.12	0.10	0.07	0.12	0.02	1.23
10.0 - 11.0	-	-	0.03	0.08	0.08	-	-	0.02	-	-	0.05	0.02	0.12	0.07	0.05	-	0.52
11.0 - 12.0	-	-	-	-	0.02	-	-	-	0.02	0.02	-	0.02	0.08	-	0.02	-	0.17
12.0 - 13.0	-	-	-	-	-	-	-	-	-	-	-	0.05	0.03	0.02	0.03	-	0.13
13.0 - 14.0	-	-	-	-	-	-	-	-	-	-	-	-	0.02	-	-	-	0.02
14.0 - 15.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00
15.0 -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00
Total	5.20	5.44	9.50	12.84	17.53	10.17	8.52	3.82	3.90	3.05	3.90	2.68	3.99	3.17	3.92	2.37	

Wind Speed (m/s)	Min	Max	Mean
	0.00	13.37	4.34

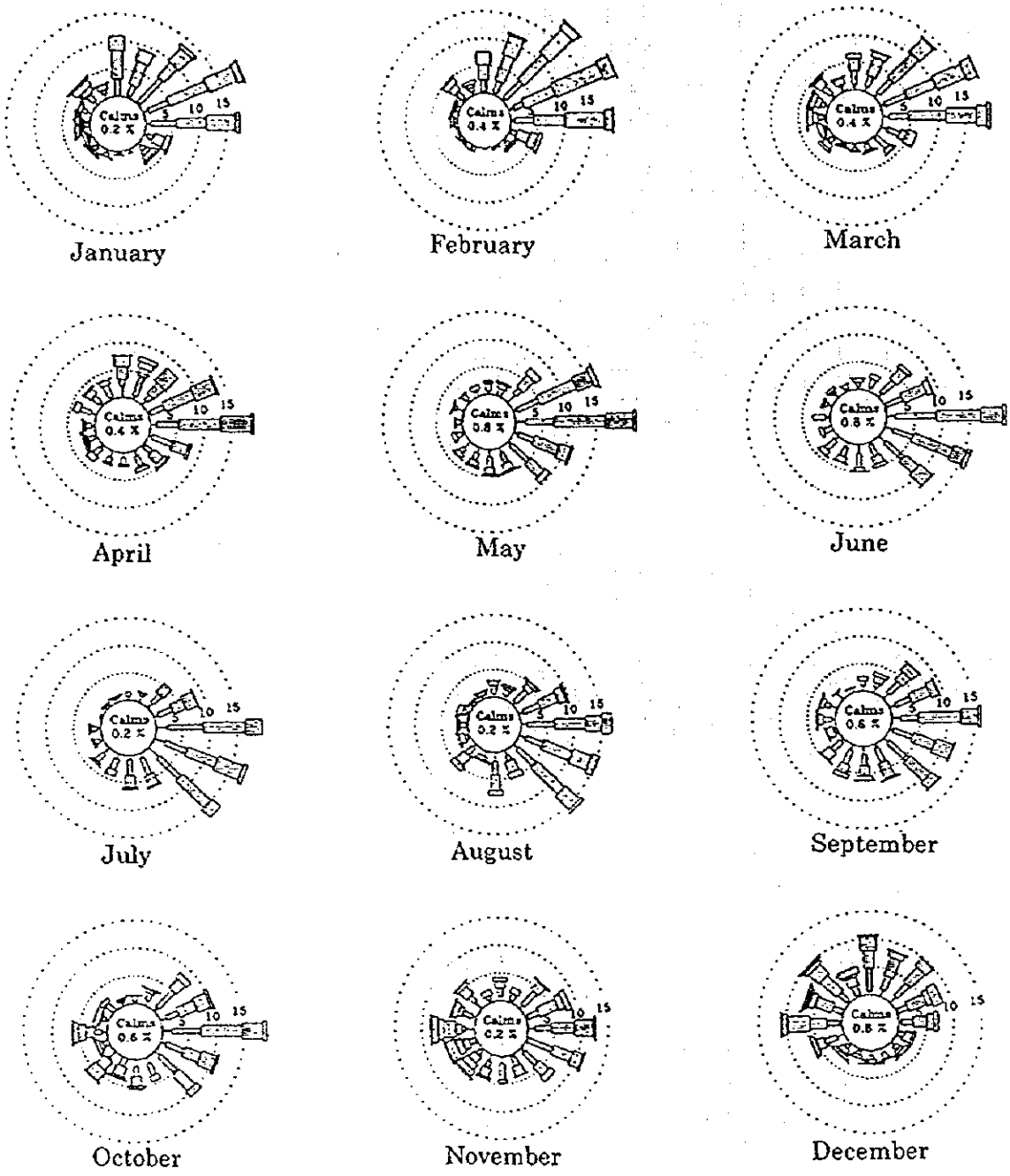


Figure A-1-3 Monthly Wind Rose (1989 - 1997)

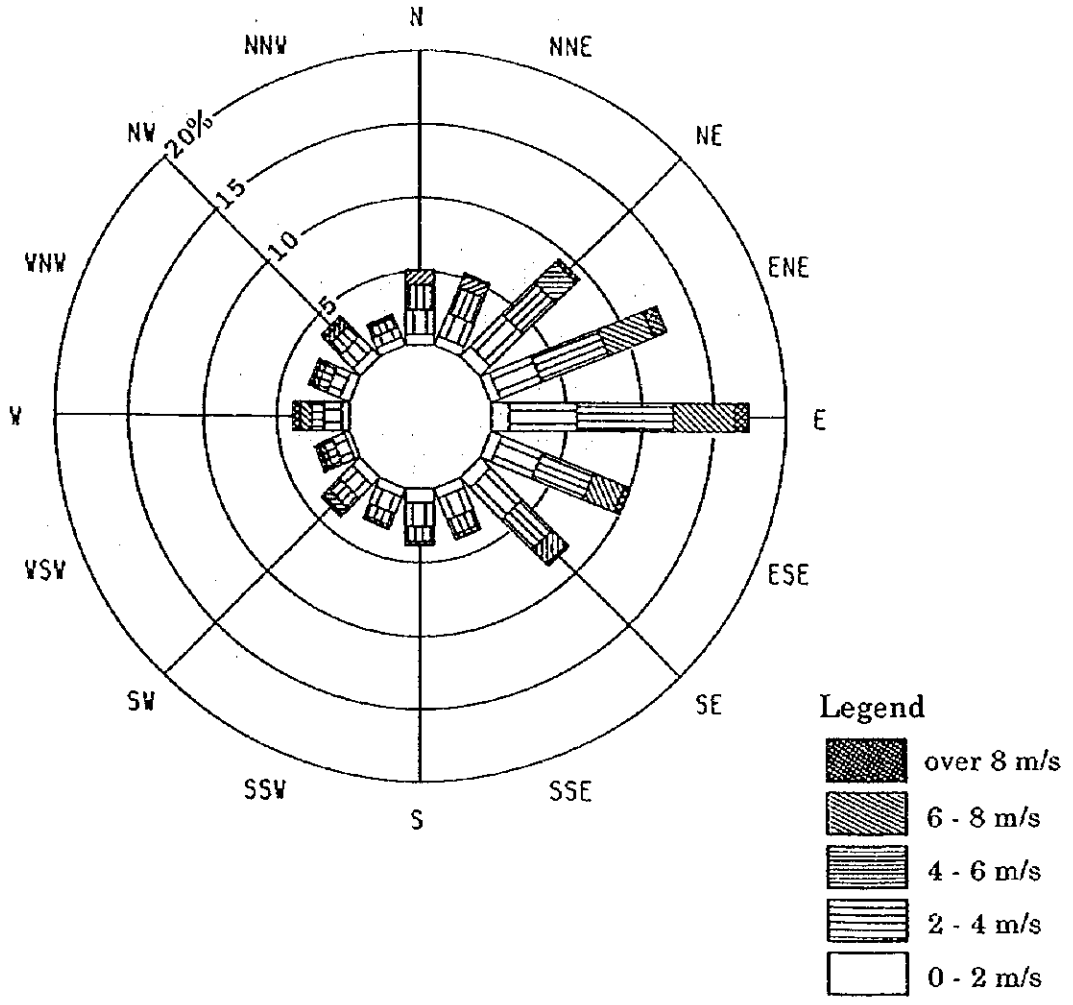


Figure A-1-4 Annual Wind Rose (1989 - 1997)

1-2 Topography

Topographic and Sounding surveys were conducted in the project site. The results are shown in Figure A-1-5.

From the shoreline, the coral reefs spread about 100m wide and the ground level is about +1.5m above Chart Datum Level (C.D.L.). Outer reefs quickly incline down to the deep sea with 40 degrees.

There are a channel, a slipway, a parking area and an island main road in the project site. Palm trees, Pandanus and Pinnacles lava rocks are dotted between shoreline and landward plateau. There are several ten meter high plateau with dense palm trees sharply rising 100m away from the island main road.

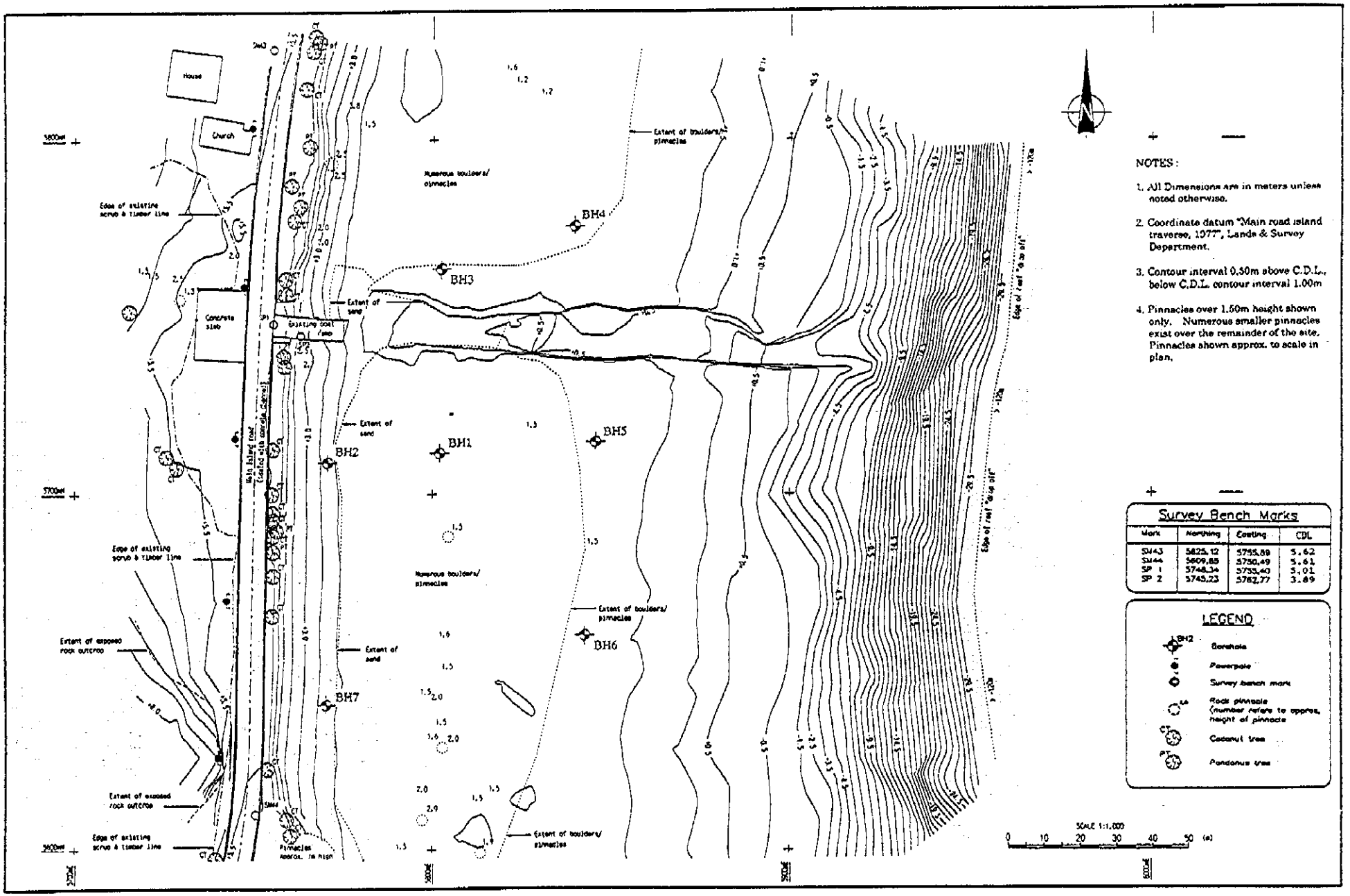


Figure A-1-5 The Topography at the Project Site

1-3 Sea Conditions

(1) Tide and Current

The tide level chart is shown in Figure A-1-6. Each tide level is based on the results of "The South Pacific Sea Level and Climate Monitoring Project" by Flinders University in South Australia. According to this report, oceanographic effects such as astronomical tide, tropic tide, El Nino and so on can produce large scale variations in mean sea level of up to 50cm. Accordingly, the C.D.L. is established 50cm below Nearly Lowest Low Water Level.

The tracks of drifting floats are charted in Figure A-1-7. Current survey was conducted in outer reef using drifting floats at flood and ebb tides of spring tide on 15 and 16 November, 1997. The current direction predominates south at both ebb and flood tides. The maximum current speed is low with 20cm/sec (0.4 knots) for both ebb and flood tides.

(2) Waves

1) Offshore wave characteristics

Since there is reliable wave data in Nauru, the study team obtained the wind data off Nauru Island (1989 to 1997) from Wind Model Database of National Meteorological Center (NMC) in USA and computed them to hindcast offshore wave dimensions by using Global Spectral Ocean Wave Model. Table A-1-3 shows the frequencies of wave occurrence by direction and height at project site offshore. And Figure A-1-8 shows the wave rose. According to these data, the wave directions predominate from north-northeast to southeast with about 89% of all. The waves 1 meter or less in height account for about 90%. The influence of large waves generated by typhoons or cyclones is very small.

The project site is located at east side of the island with no capes, shoals and other small islands offshore, so that the site is directly influenced by predominant waves. Accordingly, easterly deep sea water waves run up steep seabeds and increase its height quickly at reef edge.

Westerly waves occasionally attack the Nauru between November and February, but its influence to the project site, east side of the island, is relatively small compared with the easterly waves, because the height of the westerly wave has

decreased 20% at the east side of the island by wave diffraction.

2) Design offshore waves

For the wave hindcast, the low pressures, which are assumed to have caused impacts on Nauru from 1989 to 1997, were sampled. 10 extreme events are shown in Table A-1-4. The top 3 events are westerly waves. The wind velocity, wave height and period for each return period were calculated by statistically processing the wave data. Table A-1-5 shows the offshore wave heights for each return period. The offshore wave for a return period of 50 years is adopted in designing the port facilities and the dimensions of the design offshore waves are shown in Table A-1-6. The eastern wave, which is considered to affect the project site most severely, is used as a design offshore wave.

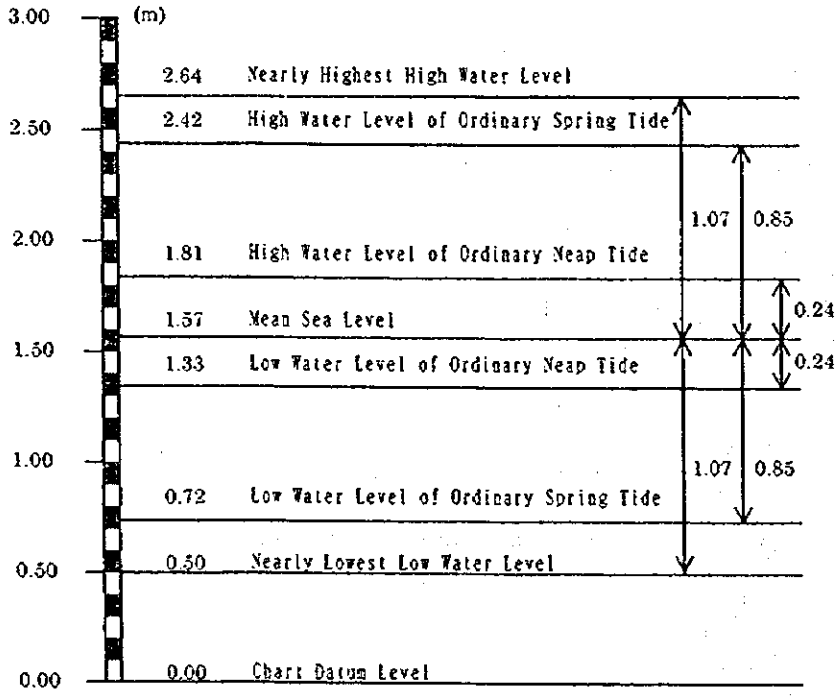


Figure A-1-6 Tide Level Chart

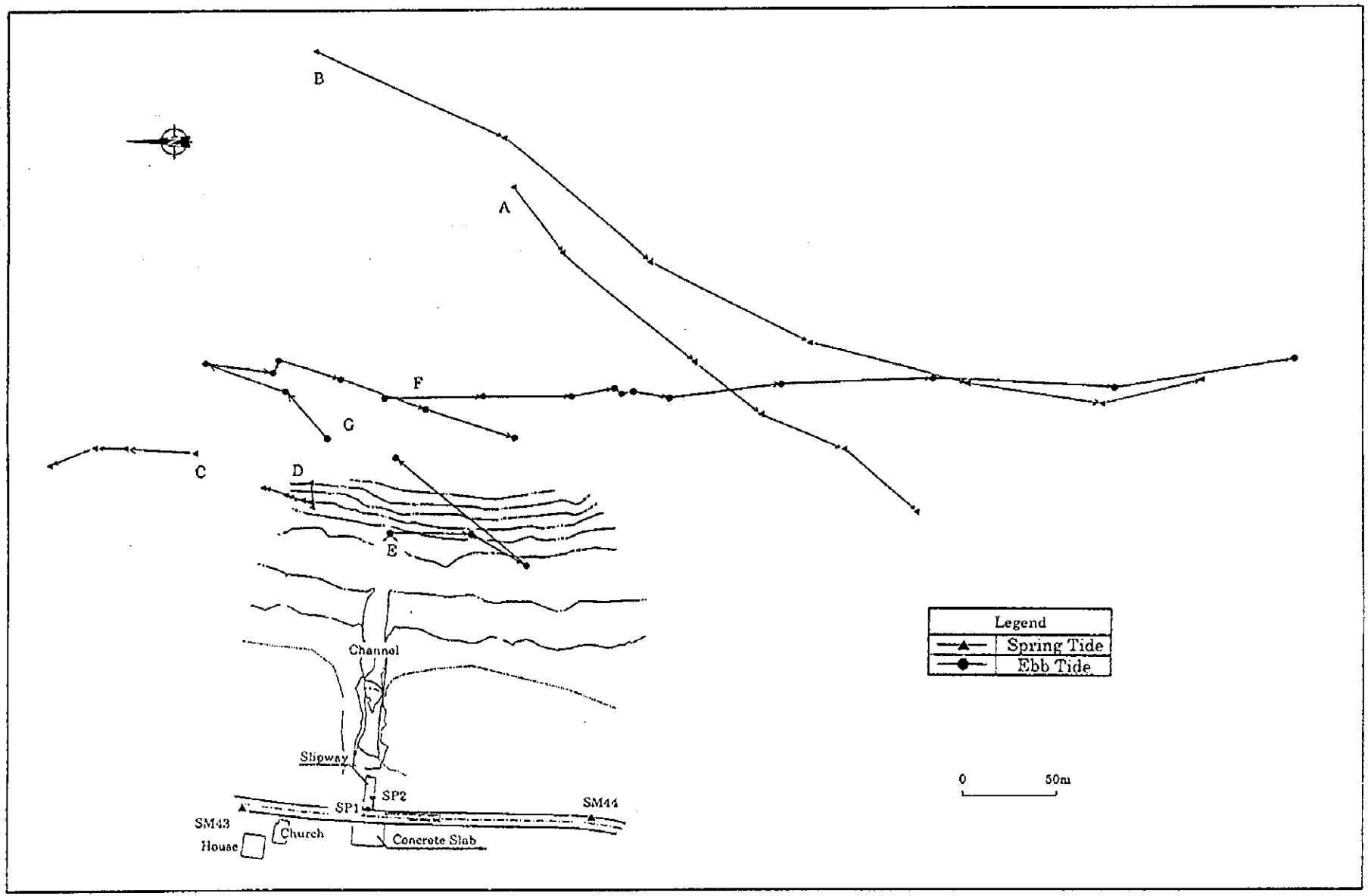


Figure A-1-7 Current Distribution

Table A-1-3 Frequencies of Wave Occurrence by Direction and Height (1989 -1997)

Significant Total Wave Direction	Significant Total Wave Height (m)								
	0.0	0.0 to 0.5	0.5 to 1.0	1.0 to 1.5	1.5 to 2.0	2.0 to 2.5	2.5 to 3.0	3.0	Total (%)
N	-	1.05	2.67	1.71	0.42	0.09	0.02	0.03	6.00
NNE	-	3.20	7.05	3.54	0.38	0.02	-	-	14.19
NE	-	7.69	7.46	2.60	0.46	-	-	-	18.22
ENE	-	7.71	2.96	0.88	0.08	-	-	-	11.64
E	-	6.58	2.55	0.64	0.02	-	-	-	9.78
ESE	-	12.26	3.62	0.46	0.05	-	-	-	16.39
SE	-	12.68	5.12	0.87	0.06	-	-	-	18.73
SSE	-	1.79	0.95	0.16	0.10	-	-	-	3.00
S	-	0.61	0.17	0.04	-	-	-	-	0.82
SSW	-	0.05	0.02	-	-	-	-	-	0.08
SW	-	-	0.03	-	-	-	-	-	0.05
WSW	-	-	-	-	0.05	-	-	-	0.05
W	-	-	-	0.01	0.04	0.03	-	-	0.08
WNW	-	-	0.02	0.03	0.05	0.02	-	-	0.12
NW	-	0.02	-	0.10	0.03	-	-	-	0.16
NNW	-	0.14	0.23	0.20	0.10	-	-	-	0.67
Total (%)	0.00	53.79	32.85	11.24	1.88	0.17	0.03	0.03	100.00

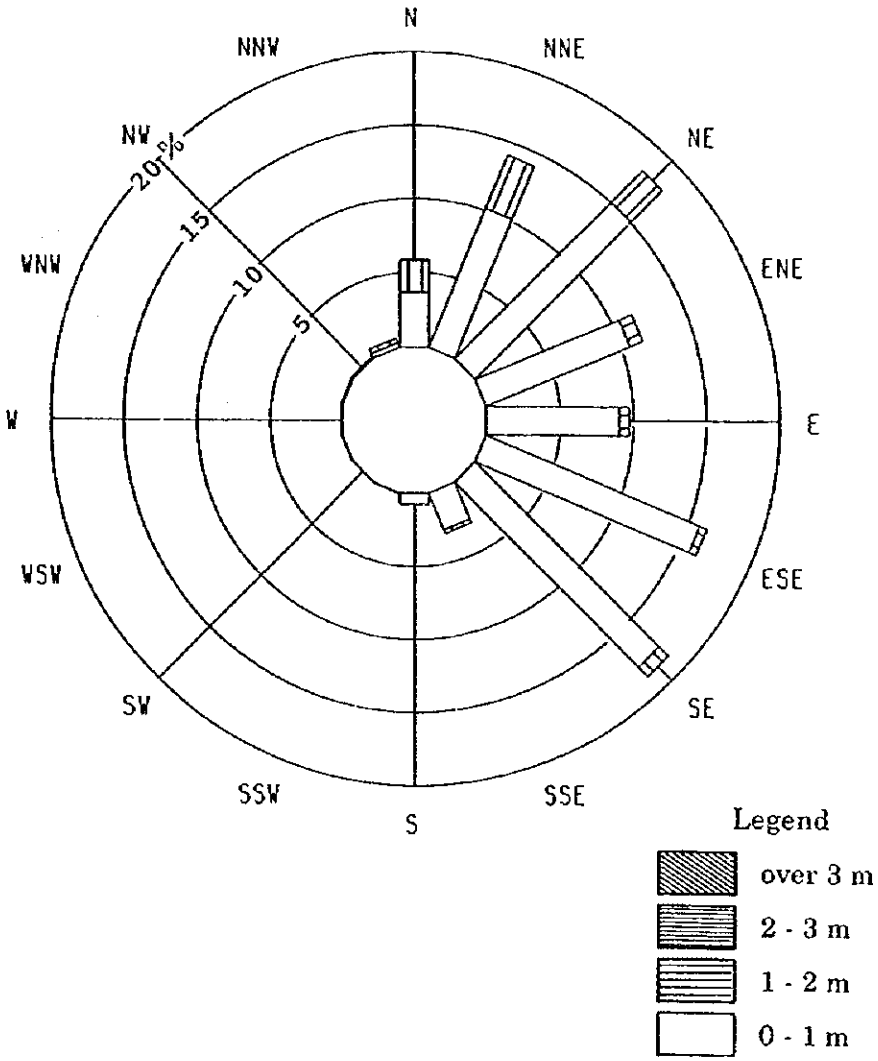


Figure A-1-8 Wave Rose (1989 - 1997)

Table A-1-4 10 Extreme Events from All Directions

Date	Wind		Wave		
GMT	Direction	Speed(m/s)	Height(m)	Period(sec)	Direction
1500 02 Dec 1990	225	8	5.20	20.4	003
1500 14 Mar 1997	285	27	4.50	9.7	283
1500 03 Jan 1992	265	27	4.30	9.7	282
1500 02 Feb 1989	60	12	4.20	18.2	351
1200 02 Mar 1989	60	6	4.00	18.2	034
1500 08 Oct 1992	275	26	4.00	9.7	298
1200 03 Feb 1997	60	17	4.00	16.4	060
0000 29 Feb 1996	120	9	3.90	18.2	005
1500 01 Mar 1997	360	8	3.90	18.2	008
0900 24 Dec 1996	355	8	3.80	16.4	021

Table A-1-5 Heights of Offshore Waves by Return Period

Return Period(Year)	1	2	5	10	25	50	100
Wave Height(m)	3.90	4.15	4.48	4.74	5.08	5.34	5.60

Table A-1-6 Dimensions of Offshore Design Waves

Wave Height, H_o (m)	Period, T_o (sec)	Wave Length, L_o (m)	Wave Steepness, H_o/L_o
5.34	10.2	162.30	0.033

1-4 Soil Conditions

This study executed the soil investigations with 7 borings (BH1 to 7) in the project site. The location of the boring points and the borehole logs are shown in Figures A-1-5 and A-1-9, respectively. From the boring survey and the results of laboratory test, the soil conditions in the project site are characterized as follows:

(1) Soil Properties

7 boring points have no particular difference in a soil nature. The soil strata consist of one unit, very hard coral rock (N value is more than 100), from the surface to the bottom of borehole, 10m deep. Only the surface is covered by several centi-meters thickness of coral sand, coral gravels and shells. The coral gravel and sand of several centi-meters thick were found place to place in the coral rock layer. Specific gravity of the coral rock is about 2.45 and Unconfined Compression Strength is about 422kgf/cm^2 as shown in Table A-1-7.

Table A-1-7 Results of Laboratory Test

Borehole No.	1	2	3	4	5	6	7	Average
Bulk Density (t/m^3)	2.65	2.60	2.39	2.60	2.61	2.53	2.46	2.55
Specific Gravity	2.61	2.54	2.18	2.55	2.51	2.45	2.32	2.45
Water Content (%)	1.7	2.3	9.5	2.2	3.7	3.4	6.0	4.11
Unconfined Compression Strength (kgf/cm^2)	910	820	300	360	440	95	28	421.86

(2) Engineering Evaluation

Soil conditions at the project site is evaluated to be suitable for the foundation of breakwater and wharf. Because of the above mentioned hard coral rock, dredging works of the channel and the basin will require blast excavation. Dredged rocks will be suitable for backfilling behind wharf and filling or base course of the slipway and the parking area.

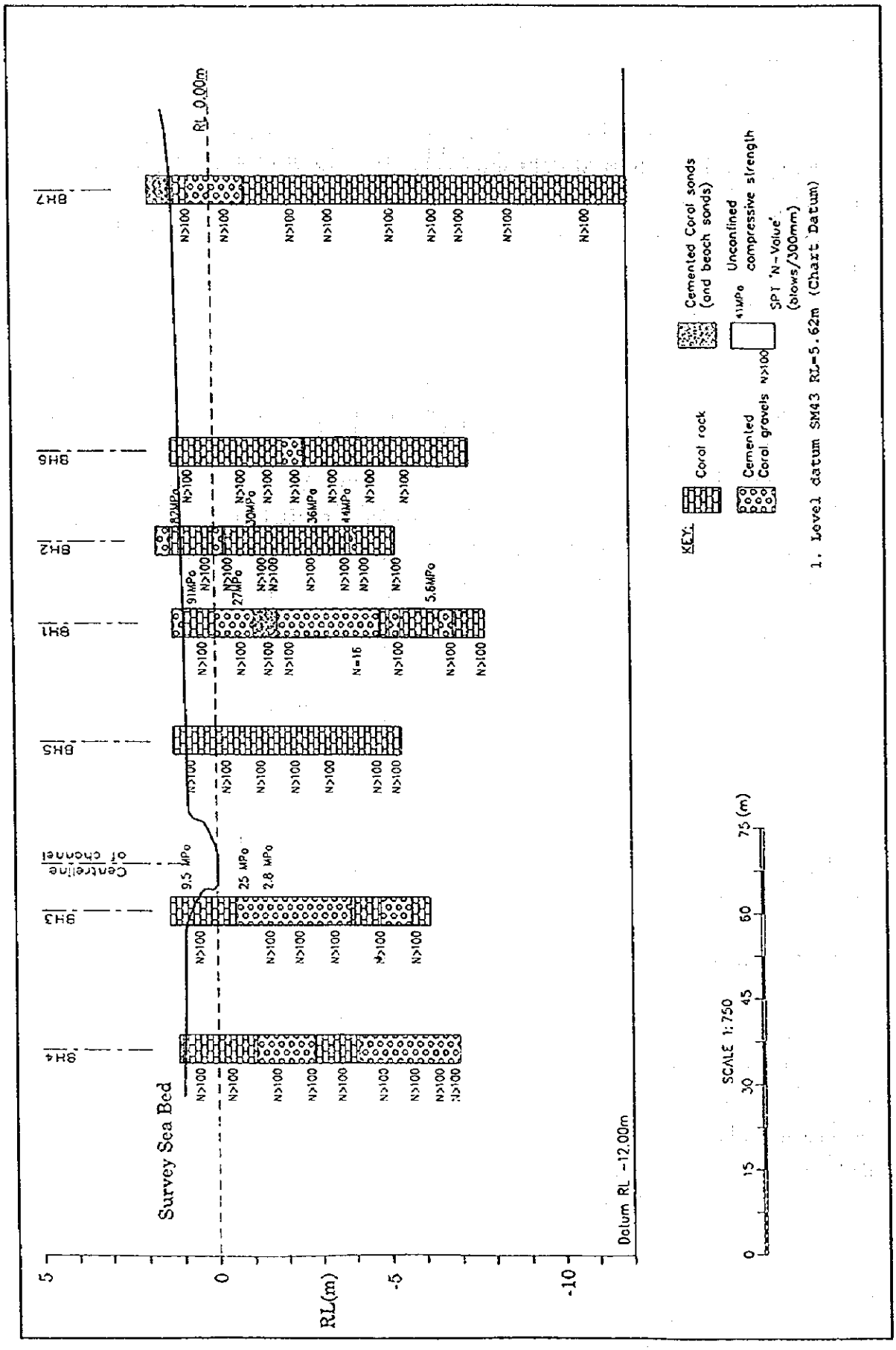


Figure A-1-9 Borehole Logs

1-5 Littoral Drift

As a result of field survey along the coast of Nauru, it was found that there were almost no sands accumulated and only less than 20 meters wide coral sand beach, only supply source of littoral drift, lay along the coast. There is no supply source of sand such as river etc.

The Anibare site has about 20cm thick coral sand accumulated keeping the balance of sand flowing in and out by the action of waves and tides. For the laboratory testing, coral sand were sampled at 2 points (Anibare channel and shore line) and analyzed for specific gravity and grain size distribution. The results are shown in Section 2-3 (Appendix-2).

1-6 Material Survey

For the laboratory testing, coral sand and rocks were sampled at the project site, and phosphate sand and rocks were sampled at the phosphate mining site. Grain size and specific gravity test for each sample were performed. The results were shown in Table A-1-8.

Table A-1-8 Material Testing Results

Item/Stations	Project site		Phosphate mining site	
	Coral sand	Rocks	Sand	Rocks
Median diameter (D_{50}:mm)	0.2	---	1.0	---
Uniformity coefficient (D_{60}/D_{10})	1.8	---	4.3	---
Silt fraction (%)	0.0	---	1.0	---
Specific gravity	2.75	2.62	2.97	2.66
Strength (kg/cm^2)	---	290	---	370

Both kind of sand have a sufficient specific gravity. Seeing median diameter, the coral sand and phosphate sand are classified into fine sand and coarse sand, respectively. Uniformity coefficients (D60/D10) of both sand are less than 5, which means grain distribution is bad. But the mixture of both sand can be used for fine aggregate of concrete and filling material and subgrade of wharf, slipway and parking area. The specific gravity and the strength of the rocks meet the coarse aggregate of concrete and base course.

Appendix-6 Environmental Consideration

Prior to requesting this project, Ministry of Island Development and Industry established Anibare channel improvement plan drafted by Economic and Social Commission for Asia and the Pacific (ESCAP) in 1995. In May 1996, they made Environmental Impact Assessment (EIA) entrusting to South Pacific Regional Environmental Program (SPREP).

The study team discussed with Ministry of Island Development and Industry whether or not another EIA is necessary because an area covered by the requested plan is about 3 times of that of the draft plan. As a result, they agreed to conduct EIA immediately after the clarification of details of this plan and to complete it before the conclusion of Exchange of Notes.

2-1 Biological Survey

There are few sea-grass beds and high coral coverage areas contributing highly to reproduction and species diversity of the tropical marine organisms in the project site and the adjacent area.

There are coral reefs in the project site and the adjacent area, where are dried up at low tide. Calappa sp., marine crab and sea cucumber sp., which inhabit commonly at the coral reef flats in the tropical region, are observed at the project site.

When the project will be implemented, these common species may lose a limited part of their habitat, but it is considered that the scale of constructions such as breakwaters and filling is not to large to force their local population to disappear.

2-2 Water Quality Survey

Water quality survey was conducted at 3 stations set up at the project site (refer to Figure A-2-1) during the high tide on 15th and the low tide on 16th November 1997. Water samples were taken at the sea surface (50cm below surface) at each station and were tested for hydrogen ion concentration (pH) and temperature. The results are shown in Table A-2-1. Comparing with Japanese Environmental (Sea water) Quality Standard of Environmental Conservation for livelihood, the values of pH meet the Criteria A, high quality of water (pH: 7.8 to 8.3). As the project site will not be closed, there will be little influence to the water quality during the construction period and after the completion of facilities.

Table A-2-1 Water Quality Test Results

Date	1997/11/15, 13:30			1997/11/16, 08:00		
Location	W1	W2	W3	W1	W2	W3
Temperature(℃)	29.5	29.4	29.1	29.0	28.9	28.7
pH	8.3	8.3	8.2	8.3	8.3	8.3

Notes:

W1: on the reef flat
W2: in the channel
W3: outside of reef edge

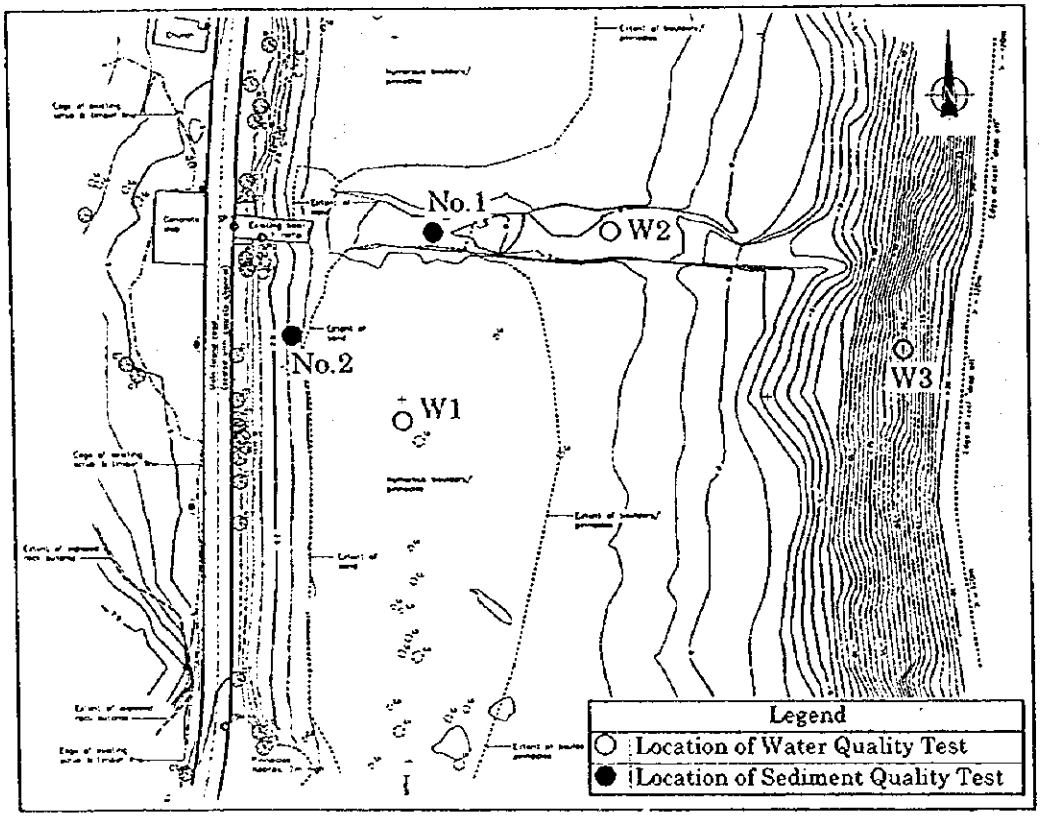


Figure A-2-1 Locations of Water and Sand Sampling

2-3 Sediment Quality Survey

Coral sands were sampled for laboratory testing at two stations set up at the project site (refer to Figure A-2-1). The results are shown in Table A-2-2.

Table A-2-2 Sediment Quality Test Results

Item/Stations	No. 1	No. 2
Specific gravity	2.73	2.75
Median diameter (D_{50}:mm)	0.22	0.21
Uniformity coefficient (D_{60}/D_{10})	1.73	1.60
Silt fraction (%)	0	0

The specific gravity is more than 2.7. The median diameter is less than 1 mm. The uniformity coefficient (D60/D10) is about 2. The silt fraction (less than 0.074 mm of particle size) is 0 %.

From the test results, it can be considered that the coral sand in this area has a sufficient specific gravity, but they are classified into fine sand from the values of the uniformity coefficient and the median diameter. As the coral sand do not contain silt and the soil foundation at the project site consists of the coral rock, it is considered that the water contamination from the dredging operation is not serious.

Appendix-7 Design Wave for Structures on the Reef Flat

The design wave at the front of structures on the reef flat has been estimated as follows with calculating wave deformation in a shallow area at the front of reef edge and on the reef flat using offshore design wave estimated in Appendix-1.

(1) Design Conditions

- Offshore Wave Height (Ho'): 5.34 m
- Offshore Wave Period (To): 10.20 seconds
- Offshore Wave Length (Lo): 162.30 m
- Shoaling Coefficient: not applicable
- Water Depth in Reef Flat (h): 1.10 m (H.W.L. - G.L. = 2.60 m - 1.50 m)
- Sea Bottom Slope ($\tan\theta$): 0.10

(2) Wave Height at the front of Reef Edge after Breaking

Wave height at the front of reef edge after breaking is calculated applying the following equation:

$$H_{1/3} = \min\{(\beta_0 + \beta_1 \times h/H_0'),\ \beta_{max},\ ks\} \times H_0' \quad (h/L_0 < 0.20)$$

where, $\beta_0 = 0.028(H_0'/L_0)^{-0.38}\exp(20\tan^{1.5}\theta)$

$= 0.193$

$\beta_1 = 0.52\exp(4.2\tan\theta)$

$= 0.791$

$\beta_{max} = \max\{0.92, 0.32\exp(H_0'/L_0)^{-0.29} \times \exp(2.4\tan\theta)\}$

$= 1.090$

Accordingly, the significant wave at the front of reef edge after breaking is as follows:

$H_{1/3} = \min\{0.338, 1.020, -\} \times 5.34$

$= 1.901$m

(3) Calculation of Wave Deformation on the Reef Flat

Wave deformation on the reef flat is calculated applying the following equation:

$$H_{1/3}/H_0' = B \times \exp(-0.05x/H_0') + 0.33(h + \eta_\infty)/H_0'$$

where, η_∞ is the height of wave set up at the point of $x = \infty$, and B is constant.

From Figure A-3-1,

h/H_0' = 0.21

H_0'/L_0 = 0.03

η_0/H_0' = 0.08

$C_0 = \{(\eta_0 + h)/H_0'\}^2 + 3/8 \times \beta (H_{1/3}/H_0')^2$

= 0.108

$(\eta_\infty + h)/H_0' = \sqrt{C_0/(1 + 3/8 \times \beta \alpha^2)}$

= 0.325

(where、 α =0.33、 β =0.56)

$B = H_{1/3}/H_0' - \alpha(h + \eta_\infty)/H_0'$

= 0.249

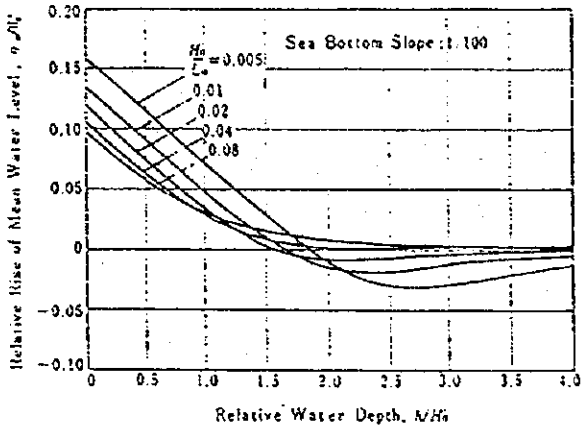


Figure A-3-1 Variation of mean water level due to shoaling and breaking of random sea waves

Accordingly, wave heights on the reef flat are calculated in the following equation:

$H_{1/3} = 1.334\exp(-0.009x) + 0.573$

And, the height of wave set up is as follows:

$\eta = -h + H_0'\sqrt{\{C_0 - 3/8\,\beta (H_{1/3}/H_0')^2\}}$

= 0.42m

The results of above calculation are as shown in Figure A-3-2 and Table A-3-1.

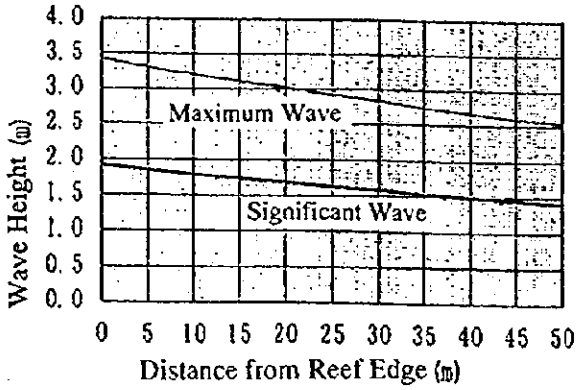


Figure A-3-2 Wave Heights on Reef Flat

Table A-3-1 Wave Heights by the Distance from Reef Edge

Distance from Reef Edge (m)	20	25	30	35	40	45	50
Significant Wave Height (m)	1.68	1.62	1.58	1.53	1.49	1.45	1.41
Maximum Wave Height (m)	3.02	2.92	2.84	2.75	2.68	2.61	2.61