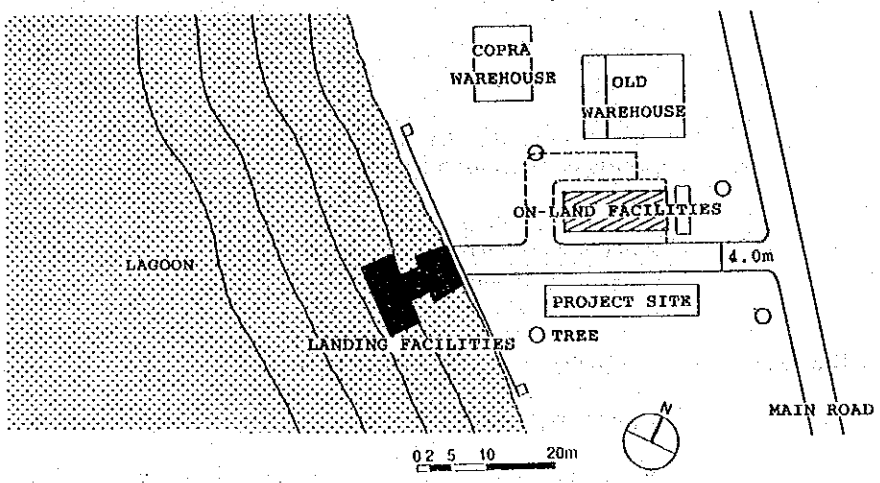
4.3 Basic Design of Facilities

4.3.1 Layout Plan

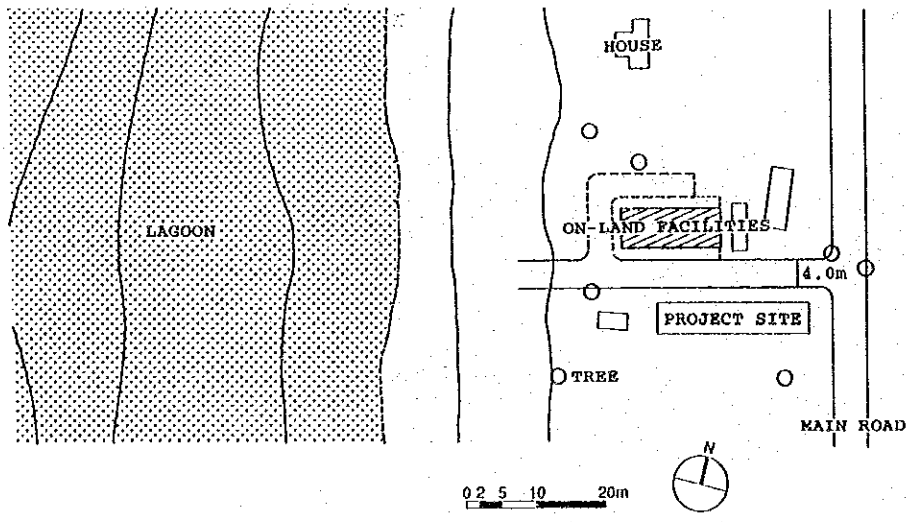
(1) Likiep

The facilities at the Project site at Likiep will be located on the lagoon side of the northwestern part of Likiep Island. Within the selected site, there are particularly large trees along the shoreline. In order to avoid cutting down these trees, an unpaved road approximately four (4) meters wide will be made to function as an access way to the fish landing jetty from the existing main road on the northeast side of the planned facilities. In addition, the on-land facilities will face the northwest in the same direction as the existing copra warehouse to harmonize with the surrounding scenery as shown below.



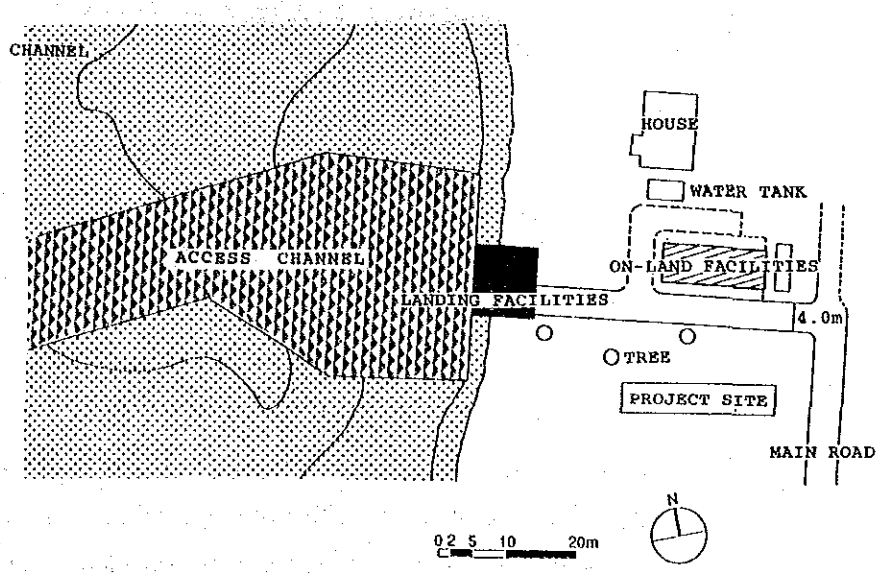
(2) Namu

The Project site of Namu will be located in the central part of Majikin Island on the lagoon side. A few small houses exist within the vicinity of the Project site and in order to avoid these houses, an unpaved road about four (4) meters wide will be made to create an access way to the shore from the main road on the east side of the planned construction site. The on-land facilities will be built along this road. A layout plan is shown below.



(3) Ailinglaplap

The Project site at Ailinglaplap will border the channel connecting the lagoon and the ocean on the western tip of Airok Island. There are large trees in the adjacent land neighboring the south side of the Project site. An unpaved road four (4) meters wide will be made to create an access way from the landing jetty along the shoreline to the existing main road on the south side of the site. On-land facilities will be built in the same direction as the existing houses and water tank on the north side, in order to blend in with the surrounding scenery. The layout plan is shown below.



4.3.2 Plan of Facilities

(1) Landing Facilities

1) Likiep

a) Plan

- Quay wall; length 10 meters, width 5.0 meters

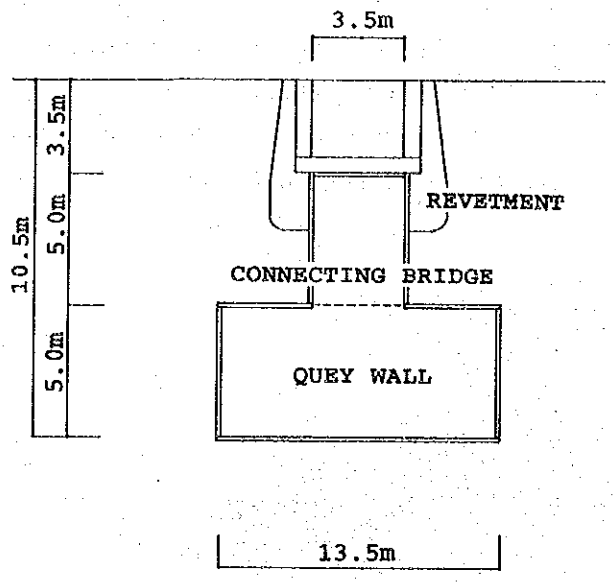
As the topography of the area in front of the Project site inclines steeply down, the front side of the quay wall will be placed near the shoreline Some dredging will be carried out for the water depth at the quay wall to reach -2.0 meters.

- Connecting bridge; length 5.0 meters, width 3.5 meters

The bridge connecting the quay wall and the land will be about 5.0 meters long. A width of 3.5 meters will be provided in order to safely transport the fish and other commodities.

- Revetment; length 20 meters

A revetment will be constructed at the base of the connecting bridge to the jetty.



b) Section Plan

The standard height of small quay in Japan is is 0.5 - 1.5 meters higher than the mean high water spring. Such factors as the effect of wave height (1.1 meters) and the convenience of loading/unloading at low tide were considered and a height of 0.7 meters above the mean high water spring was planned for the height of the quay. Consequently the height of quay wall will be 2.35 meters from the datum line.

c) Structural Plan

- Quay Wall

The quay wall will be supported by two rows of steel tube piling (diameter 300mm x 14m) and the flooring will be pre-cast concrete slabs. In addition, in order to facilitate convenient loading/unloading at the low tides, steps will be installed at quay wall.

- Connecting Bridge

The flooring of the connecting bridge between the quay wall and land will be pre-cast concrete slabs.

- Others

* Beacon Light

One beacon light will be installed on the quay wall in order to pinpoint the position of the wall at night and to ensure safe navigation.

* Fender

A fender will be attached to the front side of the quay wall.

* Mooring Pillar

Two mooring pillars will be installed on the quay wall and on land, respectively.

2) Namu

The small barge which will be provided will be a FRP model, approximately 6m x 3m x 0.7m. In order to facilitate landing of barge, the bottom of both ends of the barge will be sloped. In addition, a fender will be attached to the side of the barge and a ring will be attached to the barge to secure the mooring line. An anti-skid treatment will be done to prevent workers from slipping during loading and unloading.

3) Ailinglaplap

a) Plan

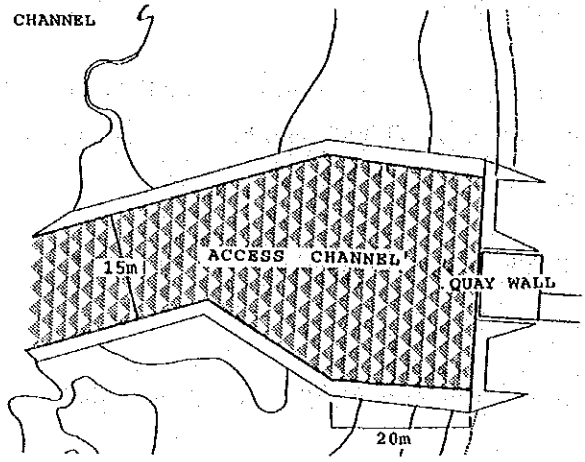
- Quay Wall; length 10 meters

A channel will be excavated at the reef about 60 meters from offshore waters to the shoreline where a gravity type quay wall will be constructed. The gravity quay will not be constructed like a groyne, but will run parallel to the shoreline to avoid changing the topography of the shore as much as possible. Hence, structurally and functionally, the quay's safety standards are improved and construction is made easier. The length of the quay will be 10 meters and a water depth of -2.0 meters on the front side of the quay wall will be provided.

- Channel; the width of the front side of the quay wall is approximately 30 meters to allow the boat to change direction; the width of the channel is 15 meters.

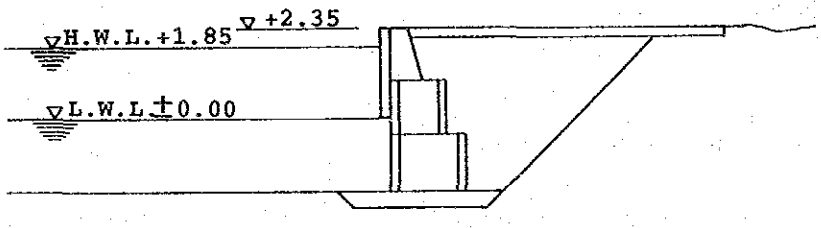
A channel with a depth of -2.0 meters will be excavated where a shallow trench currently exists to allow the boat to be brought about. This area will have a width of 30 meters, running approximately 40 meters from the quay wall in the direction of offshore. The width of the channel in the area where it runs into offshore is

approximately twenty (20) meters, and it will be gradually narrowed to 15 meters.



b) Sectional Plan

The standard height of small quay in Japan is 0.5-1.5 meters higher than mean high water spring. However, such factors as the effect of wave height (1.2 meters) and convenience during loading/unloading at the low tide were taken into consideration. Subsequently, the height of quay was set at 0.7 meter higher than mean high water spring and 2.35 meters higher than the datum line.



c) Structural Plan

- Quay Wall

The quay wall will be constructed by laying two rows of cellular blocks. A concrete wall will be placed from 1.0 meters above the datum line. The land side of quay will be filled with the sand and gravel dug out during excavation.

As a countermeasure against wave conditions when the direction of the wind changes during September through November, coral rock will be laid on the left and right of the bottom section of the quay wall.

- Channel

The hard layer of coralline gravel and sand will be excavated -2.0 meters depth by blasting. The slope inclination at the edge of excavation is 1:1 with the exception at the land side near quay wall where the inclination is 1:3.

- Others

* Beacon Light

One beacon light operated by solar power will be installed on the quay wall in order to pinpoint the quay wall at night and to ensure safe navigation.

* Fender

A fender will be attached to the front side of the quay wall.

* Mooring Pillar

Two sets of mooring pillars one on the jetty and one set on the wharf will be attached, respectively.

(2) On-land Facilities

The Project building on all three islands will have the same specifications and structure.

1) Plan

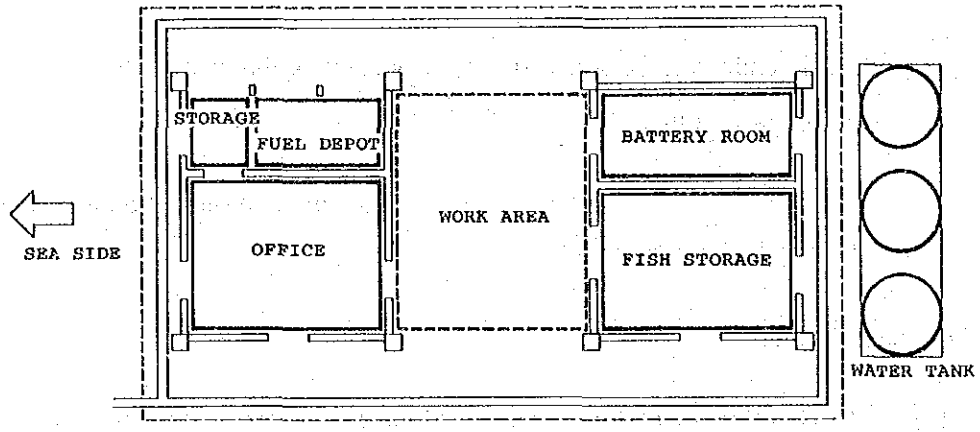
The facilities will be composed of the following:

Room/Facility	Purpose
Fish Storage	Ice making and storing fish products.
Battery Room	Installation of solar storage battery, distribution panel, and emergency generator.
Work Space	Collect, washing and sorting fish.
Office	Organize bills, collection slips, accounting.
Store House	Store fishing gear and spare parts.
Fuel Depot	Store diesel oil and gasoline drum cans.
Water Tank	Collect rainwater.
Toilet	

The office will be located where it will have an overall view of the landing facilities. The movement from the jetty will be short and simple. The fish storage room and the office will face the work space for convenient handling of fish. In order to collect rain water from the roof to the water tanks, water tanks will be installed at the gable side of the building.

Emphasis will be placed on ventilation and safety of the fuel depot. Therefore, a wire screen door will be attached to the depot. Since the work space will also function as a garage, two sides of the area will be enclosed to avoid the effects of the salty winds.

The layout plan of the on-land facilities is shown below.



2) Sectional Plan

The building structure will be a one-story building with a ceiling height of approximately 3 meters due to such factors as the tropical oceanic climate and work space for the repair of fishing gear and fish handling. The work space will be a partially enclosed area bordered by the fish storage room, battery room, office, and storage. Open area and wall area will be clearly separated.

3) Structural Plan

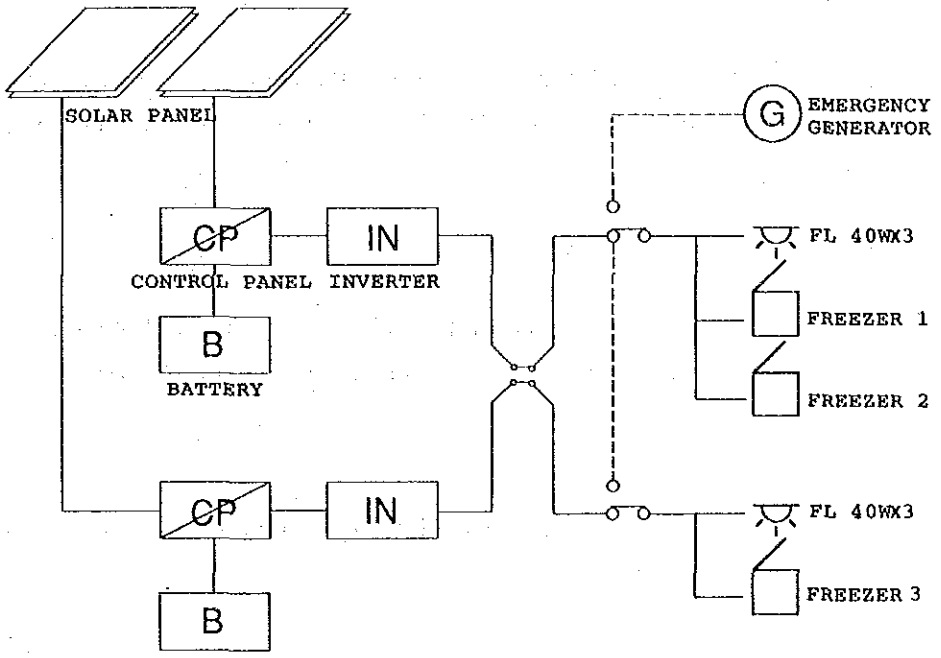
As the structure is a one-story building with minimum load, it can be supported by the upper layer of coral sand and gravel. Therefore, the direct foundation method will be applied.

The foundation and pillars will be reinforced concrete and the girders and roof truss will be wood. The compression strength of the concrete is 210 kg/cm^2 and a deformed steel bar will be supplied as reinforcement.

4) Utilities

a) Solar Power System

The electricity generated from the solar panels attached to the roof will be directly converted by the inverter into an alternating current of 110V 60Hz which will be used to operate the freezer and the lights. The schematic diagram for the main electrical wiring is shown below.



b) Freezer

Three (3) chest freezers with a 450 liter capacity capable of maintaining an interior temperature of -20°C to manufacture ice required for fish preservation and transport will be installed in the fish storage room. Each freezer will contain 8 to 15 ice trays (10 to 20 liters) and will be able to produce about 150 kg of ice at one time. The ice trays will be as thin as possible (within 10 cm) and will be placed in the freezer at set distances apart in order to increase efficiency of the ice making.

c) Radio telephone

An SSB radio telephone will be installed in the office for communication with Ebeye, Majuro, and the transport boat and an antenna will be placed outside..

d) Lighting

Damp-proof and corrosion resistant type fluorescent lights suitable for use in salt air will be installed.

e) Water Supply and Drainage

Water tanks (3 tons x 3 tanks) will be provided for each Project site which will store rainwater collected from the roof of the building. Water from this tank will be supplied to the sink in the work space and to the toilet facility.

Drainage facilities will include the sink in the work space and a Japanese style ceramic toilet and floor drainage will be installed in the fish storage room and in the battery room.

f) Sewage Treatment Facility

A septic tank and infiltration sump will be installed in front of the toilet. After the waste water has been treated, it will be released underground.

5) Finished Materials

The following finished materials will be used in the facilities to prevent rust caused by salt wind:

Location	Materials
Landing Jetty	
(Upper structure)	Cast-in-place concrete
(Piling)	Synthetic resin coated steel pile (only in Likiep)
On-Land Facilities	
Exterior Finish	
Roof	Corrugated aluminum sheet
Outer Wall	Plywood with painted finish
Fixtures	Aluminum glass louver window, plywood flash door
Interior Finish	
Ceiling	Plywood with painted finish
Interior Wall	Plywood with painted finish
Floor	Concrete steel troweled

6) External Work Plan

A four meter wide unpaved road will be built within the compound connecting the jetty and the building from the main road which borders the Project site. In addition, one street light operating on solar power will be installed on each island.

4.3.3 Equipment

The equipment which will be utilized for the Project can be largely divided into fishery related equipment and equipment for use in the fishing villages. Type and quantity of fishery related equipment essential to fishing and fish transport on each island were examined. The type and quantity of equipment required for use in the villages were examined focussing on transport equipment which will improve conveyance of commodities within the village.

(1) Transport Boat

The transport boat will transport fresh fish and other commodities from the islands to the consumption area of Ebeye and will carry rice and other daily commodities back to the outer islands on its return trip.

In order to maintain low operating costs, the boat length was set around 15 meters considering minimum required space allocated for captain and crew quarters, fish hold, engine room, etc. The boat will be of maximum width for stable navigation in ocean conditions of this area; and the boat should have a keel at the bottom. A boat which can be easily repaired will be selected.

The bow will be given sufficient flare to heighten its seaworthiness. In addition, the fish hold with sufficient space for insulated ice boxes will be provided by the Project and will allow easy loading and unloading of fish products.

Horse power of engine should be minimum in order to keep the fuel cost to a minimum, and the cruising speed be approximately 8 knots to transport the fish to Ebeye in one day to ensure the fish freshness.

The required specifications for the transport boat is shown below.

Overall length	Approx. 15 meters
Registered boat length	Approx. 12 meters
Maximum boat width	Approx. 3.3 meters
Depth	Approx. 1.1 meters
Gross tonnage	Approx. 8 tons
Main engine (diesel)	Approx. 100 hp
Capacity	
Fish hold	15 insulated boxes of 160 liters
Fuel tank	Approx. 1,500 liters
Fresh water tank	Approx. 500 liters
Cruising speed	Approx. 8 knots
Cruising range	Approx. 600 nautical miles
Equipment	
SSB radio telephone, G.P.S., Radar, Magnetic compass, Barometer, Steering console, Main engine control stand	

(2) Fishing Boat (for demonstration)

A small and economical diesel FRP fishing boat will be provided to supplement the fish catch from existing local fishing methods. The foremost objective of this fishing boat will be to secure an economically viable volume of fish catch for transport to Ebeye. Therefore, fish will be caught by proven fishing methods such as spear fishing, drive-in net, gill-net, etc. using this fishing boat. A total of three fishing boats, one for each island, will be provided.

The fishing boat will be of adequate length to accommodate 10 fishermen, fishing gear, and a small canoe used to collect the fish during spear fishing. Consequently, the length of the fishing boat will be approximately 9 meters. It will operate on a diesel engine which is ideal in terms of durability and fuel economy. Considering possible damage to the boat by reefs the boat will be equipped with a screw which can be lifted up over the reef. It will have sufficient power to maintain a cruising speed which will allow the boat to travel to undeveloped waters within the atolls within the same amount of time it takes canoes to go to existing fishing grounds (one hour). Based on the size of each atoll (minor axis 5 to 15 nautical miles, major axis 20 to 30 nautical miles), the cruising speed of the fishing boat will be set to enable the boat to reach fishing grounds within a range of about 15 nautical miles (half of an atoll) in one hour.

The specifications of the fishing boat are as follows:

Overall length	Approx. 9 meters
Registered length	Approx. 7 meters
Maximum boat width	Approx. 2.2 meters
Depth	Approx. 0.8 meters
Gross tonnage	Approx. 1.5 tons
Main diesel engine	Approx. 40 hp
Fuel tank	Approx. 120 liters
Crew	10 people
Cruising speed	Approx. 15 knots

(3) Fishing Gear

The fishing gears which will entail low operational costs, have a highly efficient fish catch rate, and guarantee a stable volume of fish catch were selected. Such fishing gear will be distributed on each island, since the initial objective of the Project is to secure a stable volume of fish catch for collection and thereby, help Project operations get off to a successful start. Fishing gear which will be utilized in Project operations are as follows:

1) A Set for Spear Fishing

In order to fulfill the fish catch volume planned by the Project, 20 sets of spear fishing gear will be provided to each island for a total of 60 set for all three islands, for the 10 fishermen who will utilize the Project fishing boat and other fishermen. One set consists of spear, mass, fins, underwater light, etc.

2) Drive-in Net

Drive-in net is used to catch fish such as goat fish in the shallow waters near the shore. Approximately ten people will surround the fish groups. Presently, coconut leaves are used, but for the Project the following net will be used to increase fishing efficiency. Two sets of the net will be provided to each island for a total of six sets.

Multi-filament 50m x 1.5m Mesh size: 3 inches

3) Gill Net

This method requires the nets to be set around the edge of the reef or near the shore towards offshore waters and the fish are then driven into the nets. Two sets will be provided to each island and for a total of six sets.

Monofilament 50m x 1.5m Trammel net; mesh size of inner net 2 inches

4) Hook and Line

Hook and line which have a high fishing efficiency rate for catching bottom fish will be provided for demonstration purposes. Four complete sets of hook and line and one spare of hook and line will be provided for each island.

5) Lantern for Flying Fish

There is a shortage of lantern for flying fish and the government of Marshall Islands requested this equipment during draft report explanation. Kerosene type lantern will be provided; six (6) for each island, and in total 18. Two (2) of them will be used in the demonstration boat in each island.

6) Floating Type Cage

For temporary stocking of live lobster and fishes. A 2 meters x 2 meters x 2 meters net cage including one spare net will be provided for each island, in total of 6 cages.

7) Insulated Fish Boxes

700 kg of fish catch volume will be kept in 15 insulated fish boxes of 160 liter capacity (equivalent to 50 kg of fresh fish /box). An equivalent number of fish boxes will be required for the transport boat and a total of 60 boxes will be provided.

8) Scale

Two types of spring scales, one capable of measuring two to twenty pounds and another set capable of weighing twenty to 150 pounds will be provided as a set for each island. A spare set will also be included for a total of six sets for the three islands.

9) Rain Wear

Rain wear will be provided for the captain and engineer of the transport boat, nine members of the three fishing boats, the three person in charge of island operations, and the one personnel in charge of sales on Ebeye for a total of 30.

10) Drums for Fuel

There is a shortage of drums, and the government of Marshall Islands requested drum cans during the draft report explanation. Three (3) drums for diesel which will be used for the demonstration fishing boat, tractor and emergency generator, and

one (1) drum for kerosene which will be used for lantern will be provided at each island. In total 16 drums including those for transport were planned.

(4) Equipment for Fishing Villages

1) Bicycle trailer

Used for fish transport on the islands. Two for each island, for a total of six

2) Compact tractor

Used for landing fishing boats, unloading/loading of cargo and other commodities, and for road repairs. One set for each island, for a total of three sets.

3) Repair tools

Used for basic repair of the equipment provided by this Project. One set for each island for a total of three sets.

The quantity and type of equipment selected for Project is shown below.

Equipment List

Equipment	Quantity
(1) Transport Boat (length: 15 m)	1
(2) Fishing Boat (length: 9 m)	3
(3) Fishing Gear	
1) Spear Set	60 sets
2) Drive-in Net	6 set
3) Gill Net	12 sets
4) Hook and Line	12 sets
5) Lantern	18 sets
6) Floating Cage	6 sets
7) Insulated Box	60 boxes
8) Scale	6 sets
9) Rain Wear	30 pieces
10) Drums for Fuel	16 sets
(4) Equipment for Fishing Village	
1) Bicycle Trailer	6 sets
2) Compact Tractors	3 sets
3) Repair Tools	3 sets

4.3.4 Basic Design Drawings of Facilities

The basic design drawings of the facilities are shown in the following pages.

1. Likiep Collection Center
   - Layout Plan

2. Likiep Collection Center Landing Facilities
   - Plan , Elevation, Sectional

3.Namu Collection Center
   - Layout Plan

4. Ailinglaplap Collection Center
   - Layout Plan

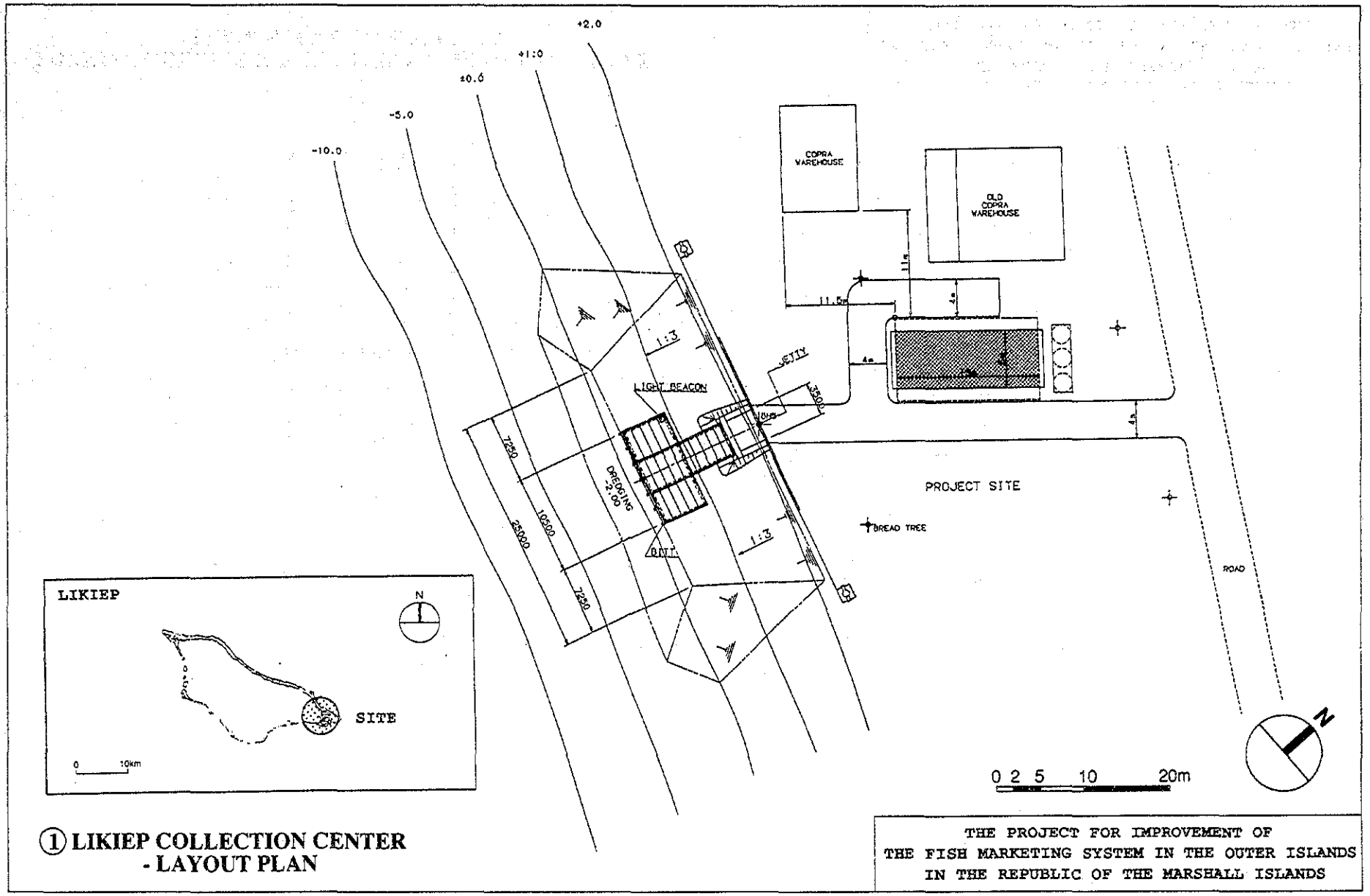
5. Ailinglaplap Collection Center Landing Facilities
   - Plan , Elevation, Sectional

6. On-land Facilities for the Three Collection Centers
   - Plan , Elevation, Sectional

7. Transport Boat (For Reference)

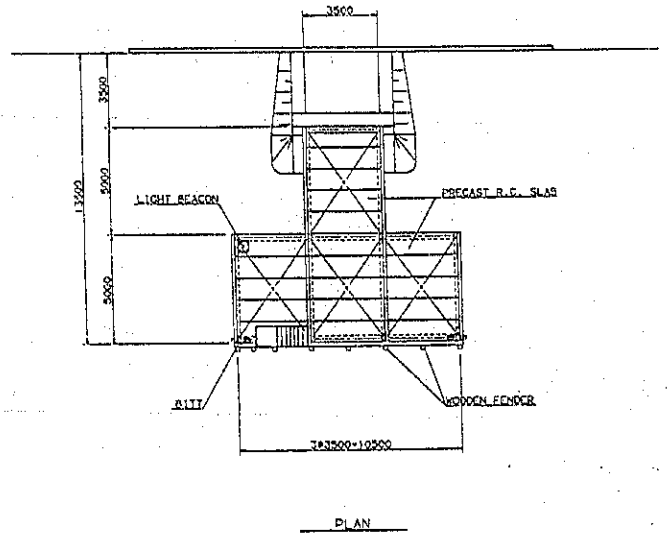
8. Fishing Boat (For Reference)

9. Small Barge (For Reference)

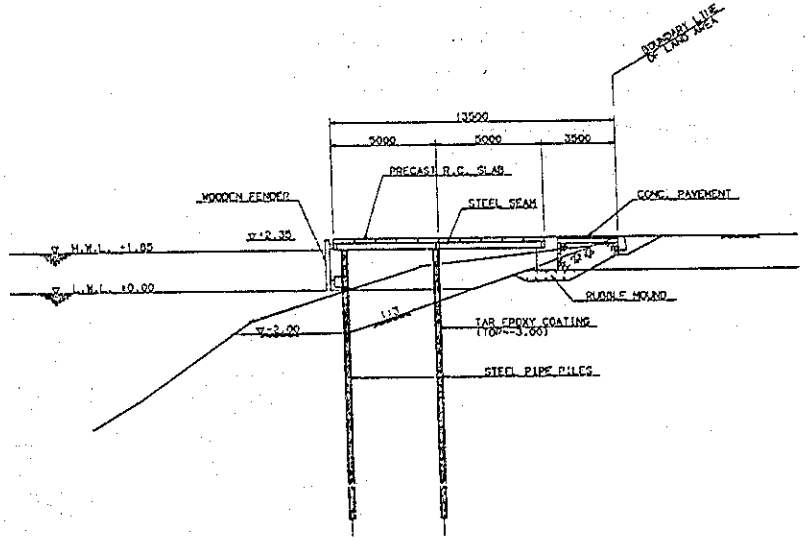


① LIKIEP COLLECTION CENTER - LAYOUT PLAN

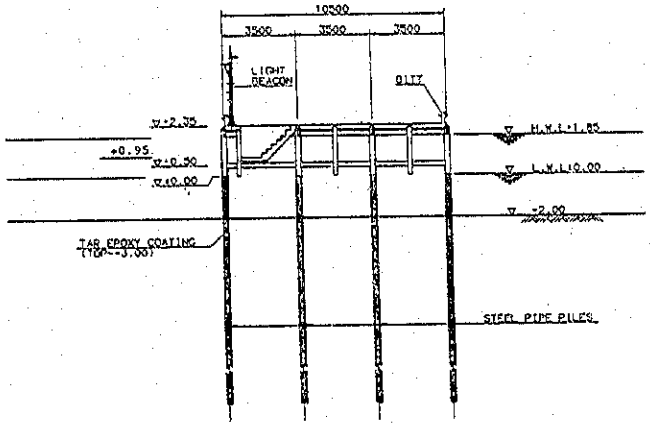
THE PROJECT FOR IMPROVEMENT OF
THE FISH MARKETING SYSTEM IN THE OUTER ISLANDS
IN THE REPUBLIC OF THE MARSHALL ISLANDS



PLAN



SIDE VIEW

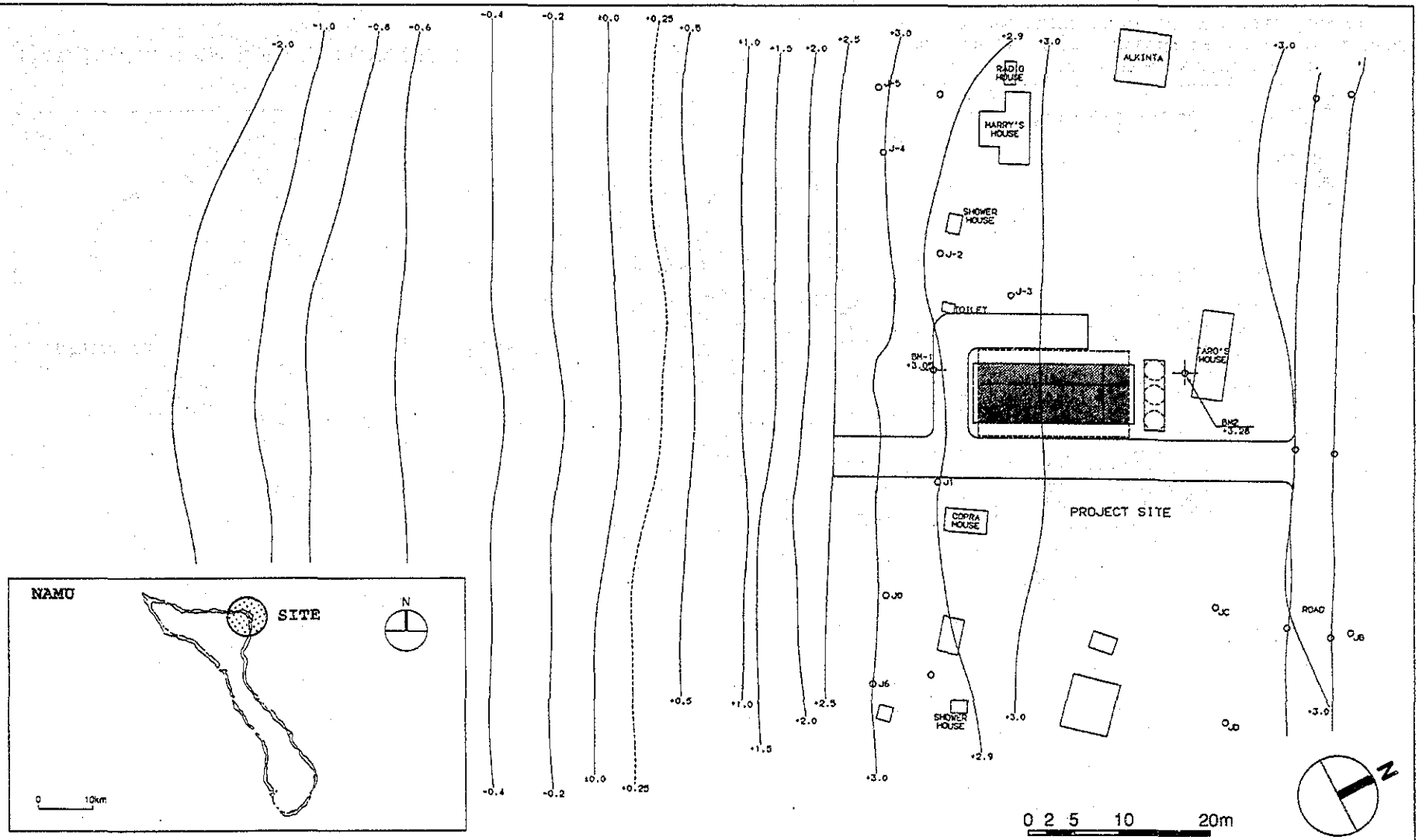


FRONT VIEW

JETTY (LIKIEP)

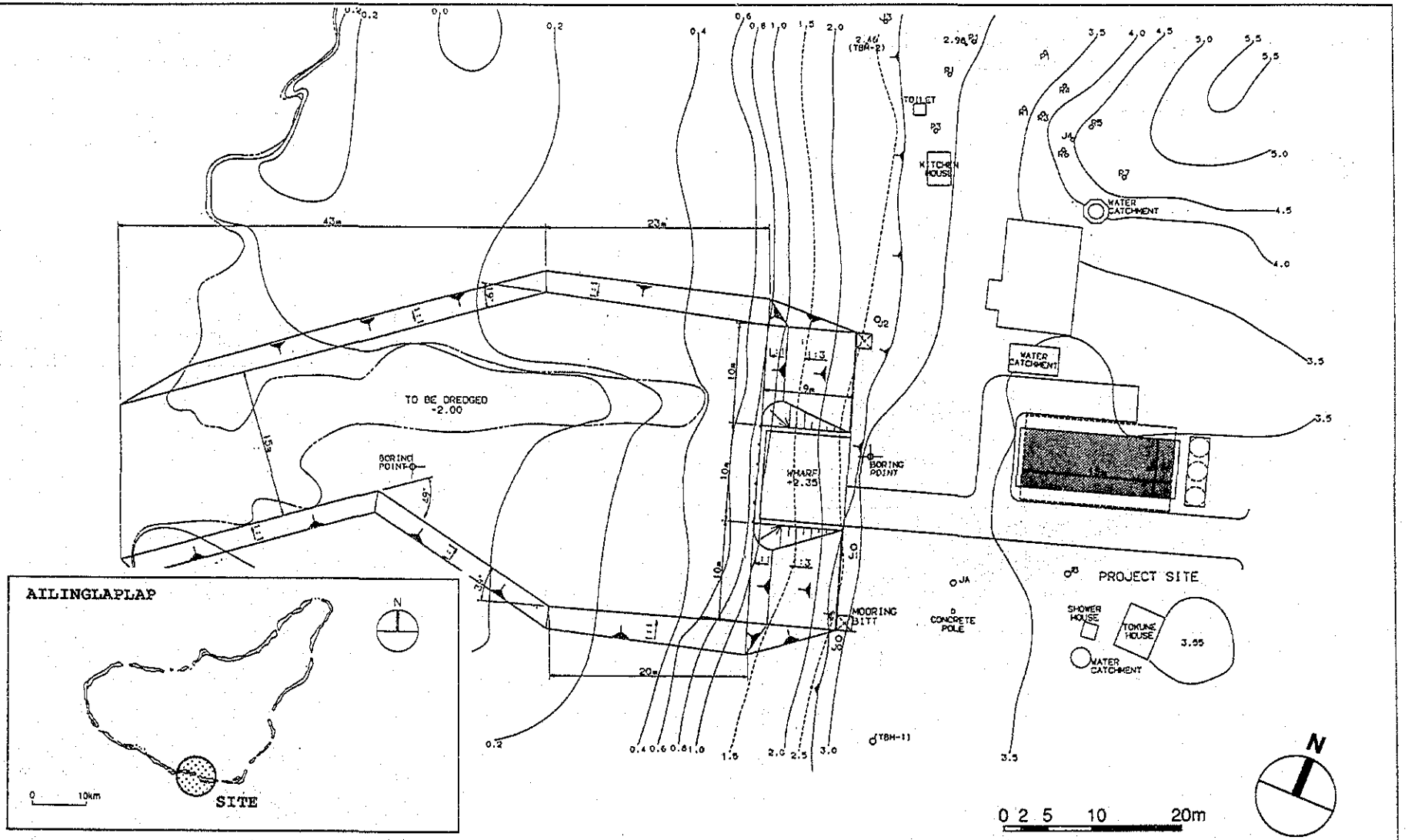
② LIKIEP COLLECTION CENTER, LANDING FACILITIES - PLAN, ELEVATION, SECTION

THE PROJECT FOR IMPROVEMENT OF
THE FISH MARKETING SYSTEM IN THE OUTER ISLANDS
IN THE REPUBLIC OF THE MARSHALL ISLANDS



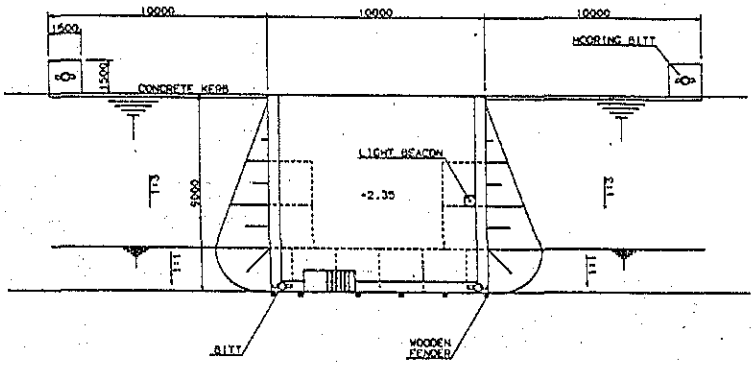
③ NAMU COLLECTION CENTER - LAYOUT PLAN

THE PROJECT FOR IMPROVEMENT OF
THE FISH MARKETING SYSTEM IN THE OUTER ISLANDS
IN THE REPUBLIC OF THE MARSHALL ISLANDS

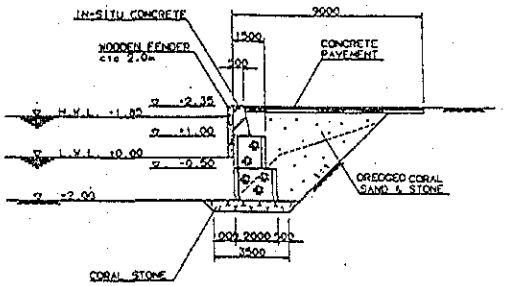


④ AILINGLAPLAP COLLECTION CENTER - LAYOUT PLAN

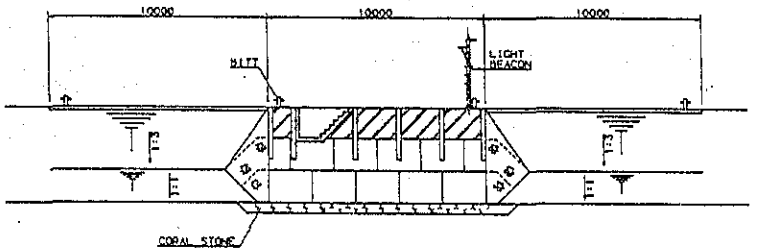
THE PROJECT FOR IMPROVEMENT OF
THE FISH MARKETING SYSTEM IN THE OUTER ISLANDS
IN THE REPUBLIC OF THE MARSHALL ISLANDS



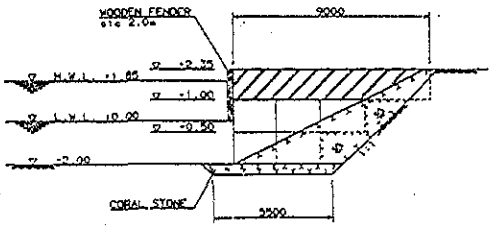
PLAN



TYPICAL SECTION



FRONT VIEW

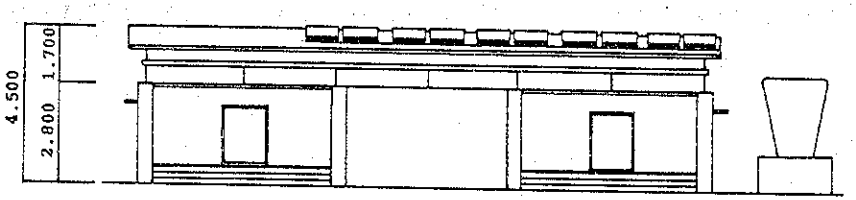


SIDE VIEW

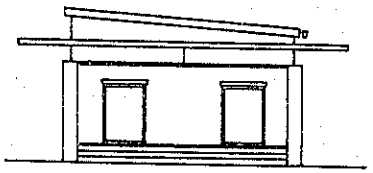
WHARF
AILING LAP LAP S=1:200

⑤ AILINGLAPLAP COLLECTION CENTER, LANDING FACILITIES - PLAN, ELEVATION, SECTION

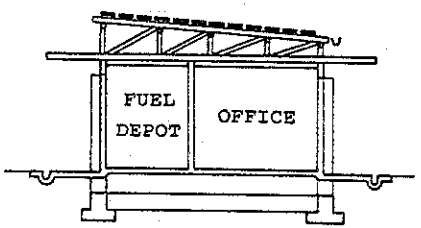
THE PROJECT FOR IMPROVEMENT OF
THE FISH MARKETING SYSTEM IN THE OUTER ISLANDS
IN THE REPUBLIC OF THE MARSHALL ISLANDS



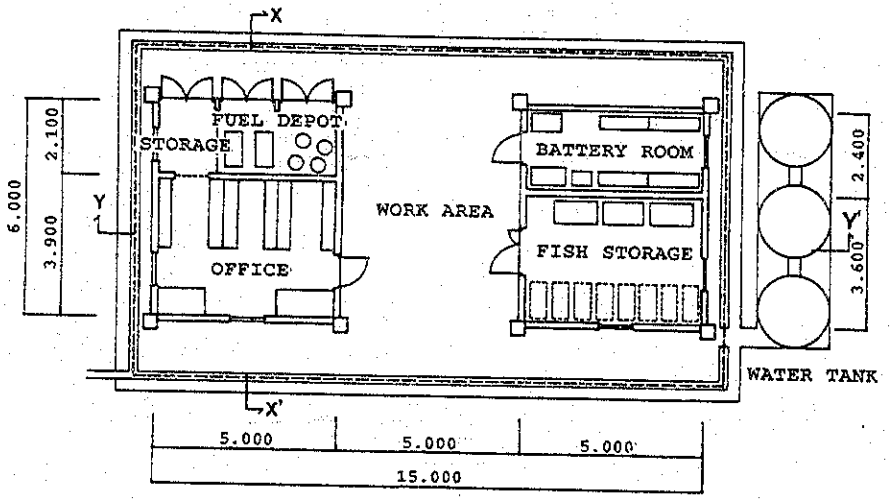
SOUTH ELEVATION



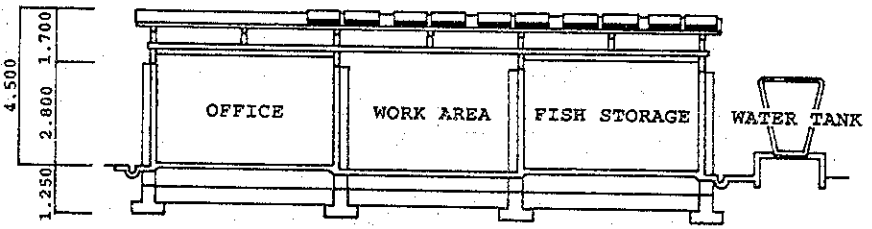
WEST ELEVATION



X-X' SECTION



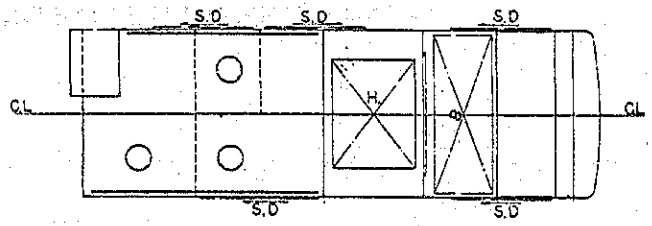
PLAN



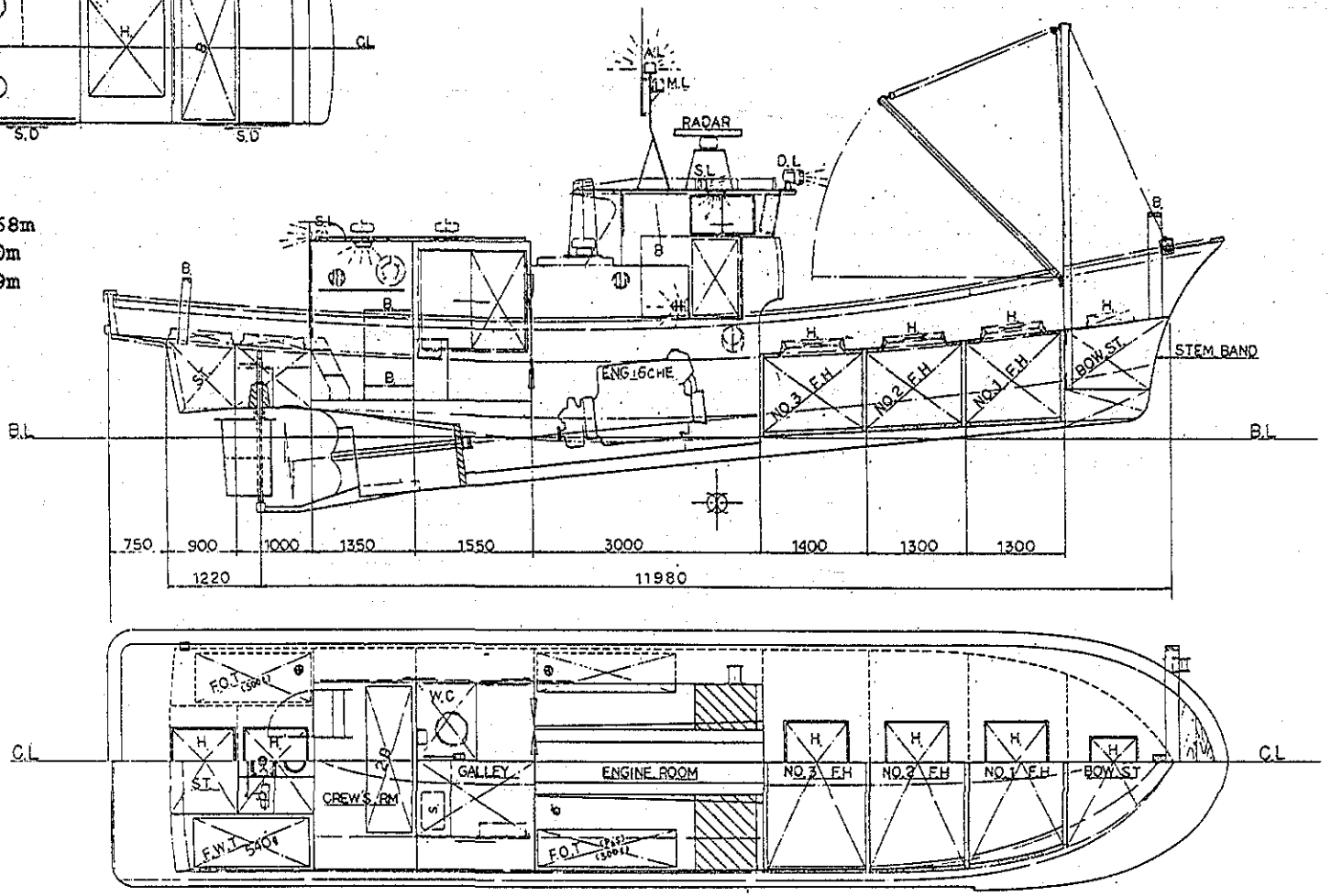
Y-Y' SECTION

⑥ ON-LAND FACILITIES FOR THE THREE COLLECTION CENTERS -PLAN, ELEVATION, SECTION

THE PROJECT FOR IMPROVEMENT OF
THE FISH MARKETING SYSTEM IN THE OUTER ISLANDS
IN THE REPUBLIC OF THE MARSHALL ISLANDS



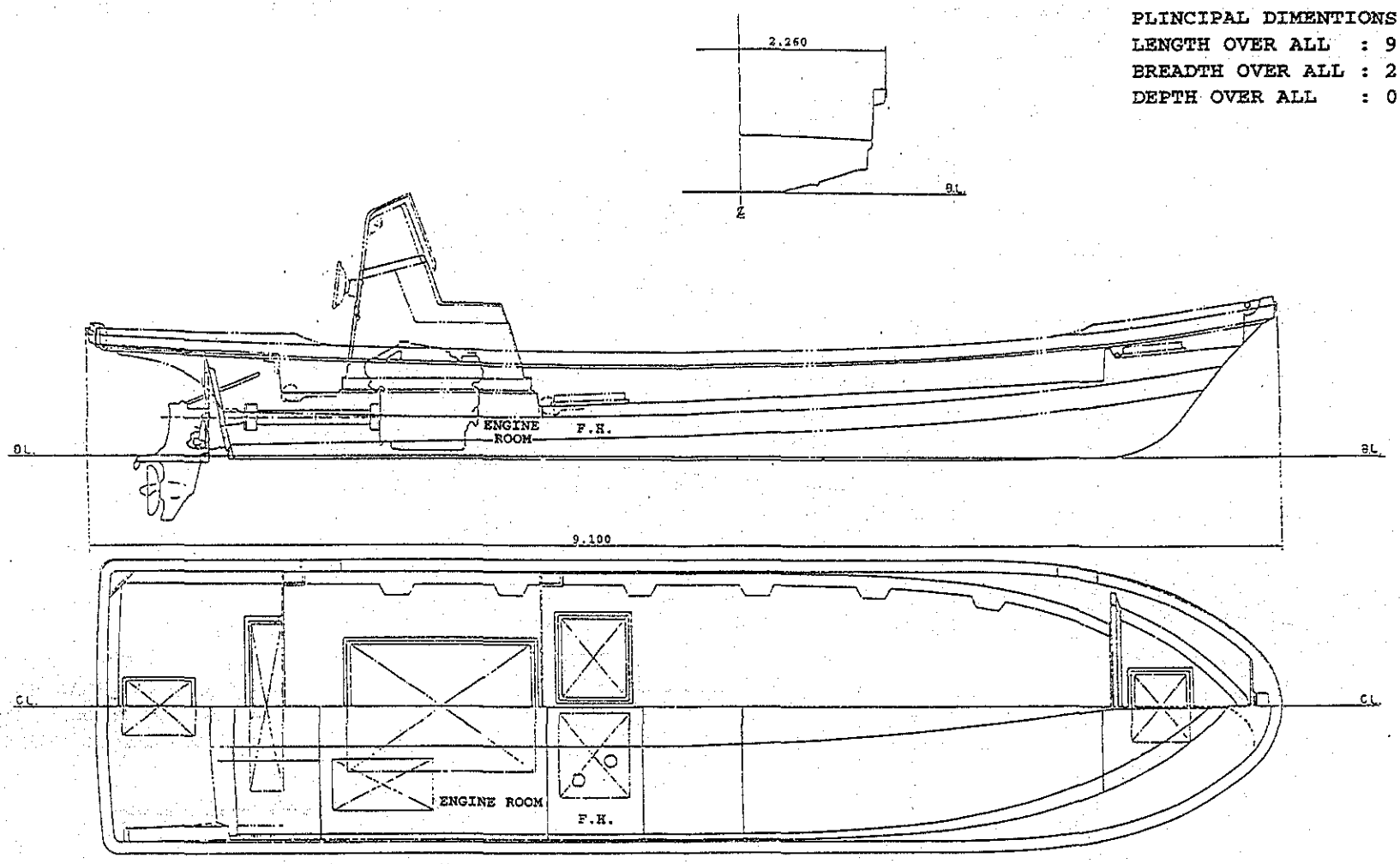
PLINCIPAL DIMENTIONS
LENGTH OVER ALL : 14.68m
BREADTH OVER ALL : 3.30m
DEPTH OVER ALL : 1.59m



⑦ TRANSPORT BOAT (FOR REFERENCE)

THE PROJECT FOR IMPROVEMENT OF
THE FISH MARKETING SYSTEM IN THE OUTER ISLANDS
IN THE REPUBLIC OF THE MARSHALL ISLANDS

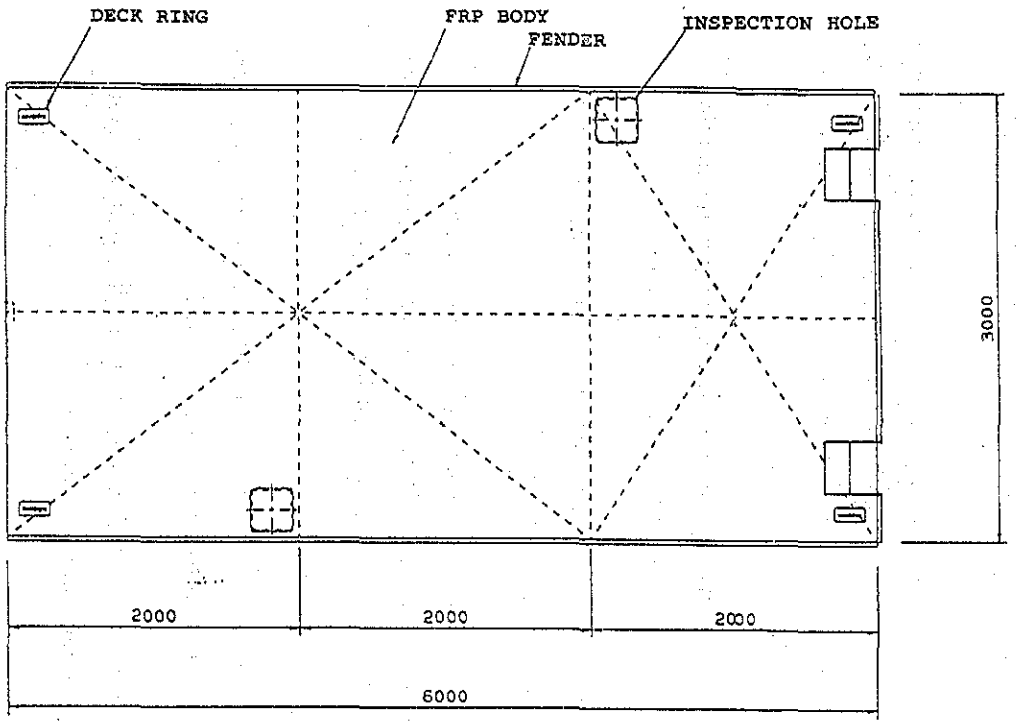
PLINCIPAL DIMENTIONS
LENGTH OVER ALL : 9.10m
BREADTH OVER ALL : 2.26m
DEPTH OVER ALL : 0.82m



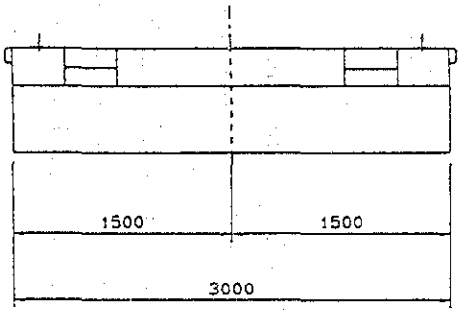
⑧ FISHING BOAT (FOR REFERENCE)

THE PROJECT FOR IMPROVEMENT OF
THE FISH MARKETING SYSTEM IN THE OUTER ISLANDS
IN THE REPUBLIC OF THE MARSHALL ISLANDS

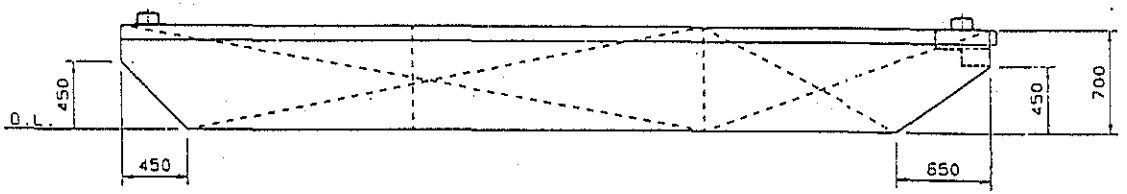
PLINCIPAL DIMENTIONS
LENGTH OVER ALL : 6.00m
BREADTH OVER ALL : 3.00m
DEPTH OVER ALL : 0.70m



PLAN



FRONT VIEW



SIDE VIEW

⑨ SMALL BARGE (FOR REFERENCE)

THE PROJECT FOR IMPROVEMENT OF
THE FISH MARKETING SYSTEM IN THE OUTER ISLANDS
IN THE REPUBLIC OF THE MARSHALL ISLANDS

4.4 Implementation Plan

4.4.1 Construction Condition

The following basic policy was applied to the construction, assuming the Project will be implemented under the grant aid programme of the Government of Japan.

(1) The Project sites are divided into the three areas of Likiep atoll, Namu atoll, and Ailinglaplap atoll; and the distances among these sites are far. Therefore, an appropriate construction period will be set up to enable rational and effective use of construction machinery.

(2) Experienced workers, construction materials, machinery, electrical power, water facilities are extremely difficult to obtain on the islands. Therefore, they will be supplied and transported from Majuro.

(3) The technicians with specialized skills in solar power system are already engaged in the maintenance and operation of existing facilities and therefore were not available for this Project. Hence technicians to install the solar power system will be brought from either Japan or third country.

(4) As explained above in (3), technicians required for excavation and maintaining construction machinery will be brought from Japan or third country.

(5) The availability of accommodation for Project workers on the islands will be thoroughly considered in planning temporary facilities.

(6) Since there are no construction related technicians (civil engineers, architects, mechanical or electrical engineers) within MIMRA, the implementing agency, the technicians from the Capital Improvement Project Office (CIP) will act as the technical supervisors.

(7) Official permission to begin construction will be obtained from the Environmental Protection Agency (EPA) before construction work is started.

(8) An exchange of opinion and close communication will be maintained between MIMRA, the Japanese consultants, and the contractor.

4.4.2 Implementation Method

Factors which should be taken into consideration during construction are as follows:

(1) Strict observation of the construction schedule and safety of construction workers, construction materials, and machinery during transport from Majuro to each respective island.

(2) Measures to ensure safe handling of explosives.

(3) Informing the people of the island about construction conditions in order to prevent accidents to existing adjacent facilities and to third parties when blasting commences.

4.4.3 Construction and Supervisory Plan

(1) Factors to Be Considered During Construction

1) In order to facilitate smooth implementation of Project construction, the consultants will ensure that complete plans are made with MIMRA and other related agencies.

2) The implementation plan submitted by the contractor prior to construction commencement will be examined in detail to ensure that safe construction, quality work, appropriate construction period, etc. are satisfactory.

3) Since the Project sites are scattered, the plan for temporary facilities, the plan for the allocation of workers, and for the transport of construction machinery will be examined carefully, and the plans will be implemented and managed rationally.

(2) Organization for Supervision of Construction

1) For construction supervision, the consultants will arrange to have a minimum of two personnel, a civil engineer and an architect to carry out periodic supervisory activities.

2) In consideration of special work conditions (excavation of coral rock, blasting, driving steel tube piling) and difficulties due to transporting machinery and materials to the islands, Project headquarters will be set up in Majuro to help establish a communication network. A highly experienced, permanent construction supervisor, civil engineer and architect will be placed there, in addition to an electrical technician specializing in electrical repair (solar power system) who will also carry out training of a person in charge of maintenance of the facility. A

temporary office clerk will also be employed to oversee the collection and shipment of machinery and materials from overseas to the islands during the initial stages of construction, and to prepare the headquarters in Majuro, etc.

4.4.4 Procurement Plan (Construction Machinery and Materials)

Although efforts will be made to utilize materials which can be obtained locally, most of the construction materials will be imported with the exception of sand and gravel from local coral rock. Materials and machinery which are locally unfamiliar will not be used due to difficulties in maintenance. Therefore, known machinery and materials will be given priority.

Supply, provision and transport of materials and machinery required for construction are given below.

Item	Marshall	Japan	Transport	Reason
1. Construction Machinery				
1) Excavating machine		O	Ship	Based on comparison of costs
2) Generator		O	Ship	Based on comparison of costs
3) Small machinery consumables		O	Ship	Based on comparison of costs
4) Others	O			Locally supplied
2. Construction Materials (Civil work)				
1) Steel pile, steel		O	Ship	Local supply unavailable
2) Beacon light		O	Ship	Local supply unavailable
3) Sand, gravel	O		-	Local materials given priority
4) Cement, steel bar	O		-	Local materials given priority
5) Fender	O		-	Local materials given priority
3. Construction Materials (Building work)	O		-	Local materials given priority
4. Facility Equipment				
1) Electrical equipment (solar power system		O	Ship	Local supply unavailable
2) Water supply, sewage treatment facilities	O		-	Local materials given priority
5. Equipment				
1) Transport boat		O	Ship	Local supply unavailable
2) Fishing boat		O	Ship	Local supply unavailable
3) Fishing gear		O	Ship	Local supply unavailable
4) Equipment for fishing village		O	Ship	Local supply unavailable

4.4.5 Implementation Schedule

An Exchange of Notes between the Governments of the Marshall Islands and Japan will take place before the Project is implemented. Detailed design of the Project and supervision of construction will be the responsibility of the Japanese consultant company and construction will be undertaken by a Japanese construction company. Project implementation will commence after each party signs a contract with the Government of the Marshall Islands. The pertinent contracts for the consultant and construction companies will be issued upon approval by the Government of Japan.

MIMRA will take the required measures and smoothly carry out the construction phase of the Project with the cooperation of the Ministry of Public Works, the EPA, and other ministries.

(1) Undertakings of Both Governments

The various responsibilities to be undertaken during the construction phase of the Project are divided between Japan and the Marshall Islands as follows:

Work Items	Japan		Marshall Islands
	Phase 1	Phase 2	
1. Securing of land			O
2. Clearing of site			O
3. Construction of road within site	O	O	
4. Construction of facilities			
a) Landing facilities	O		
b) Transport boat	O		
c) On-Land Facilities (including freezer)	O	O	
d) Fishing boat	O		
e) Fishing gear	O		
f) Equipment for fishing village	O		
5. Payment of commission for B/A Banking Arrangement to Japanese foreign exchange bank			O
6. Import/Custom clearance			
a) Transport cost to Marshall Islands	O	O	
b) Tax exemption/custom clearance			O
c) Transport within Marshall Islands	O	O	
7. To accord Japanese nationals whose services may be required in connection with the supply of products and services under contract entry into Marshall Islands and stay therein for the performance of their work.			O
8. To properly and effectively maintain and use facilities and equipment provided under grant aid.			O
9. To bear all expenses necessary for transport and installation of equipment not covered by the grant.			O
10. To secure construction approval, etc.			O

(2) Implementation Schedule

The implementation schedule for the Project is divided into detailed design, procurement of materials and equipment and construction of facilities.

1) Detailed Design

Tender documents will be drawn up based on basic design. The details of these documents will be compiled from the detailed design, technical specifications, structure design, budgetary schedule, etc. Detailed discussions will be held with the concerned

agency of the Government of the Marshall Islands at the initial, intermediate, and final stages of detail design; and the final documents will go to tender after approval by the said government.

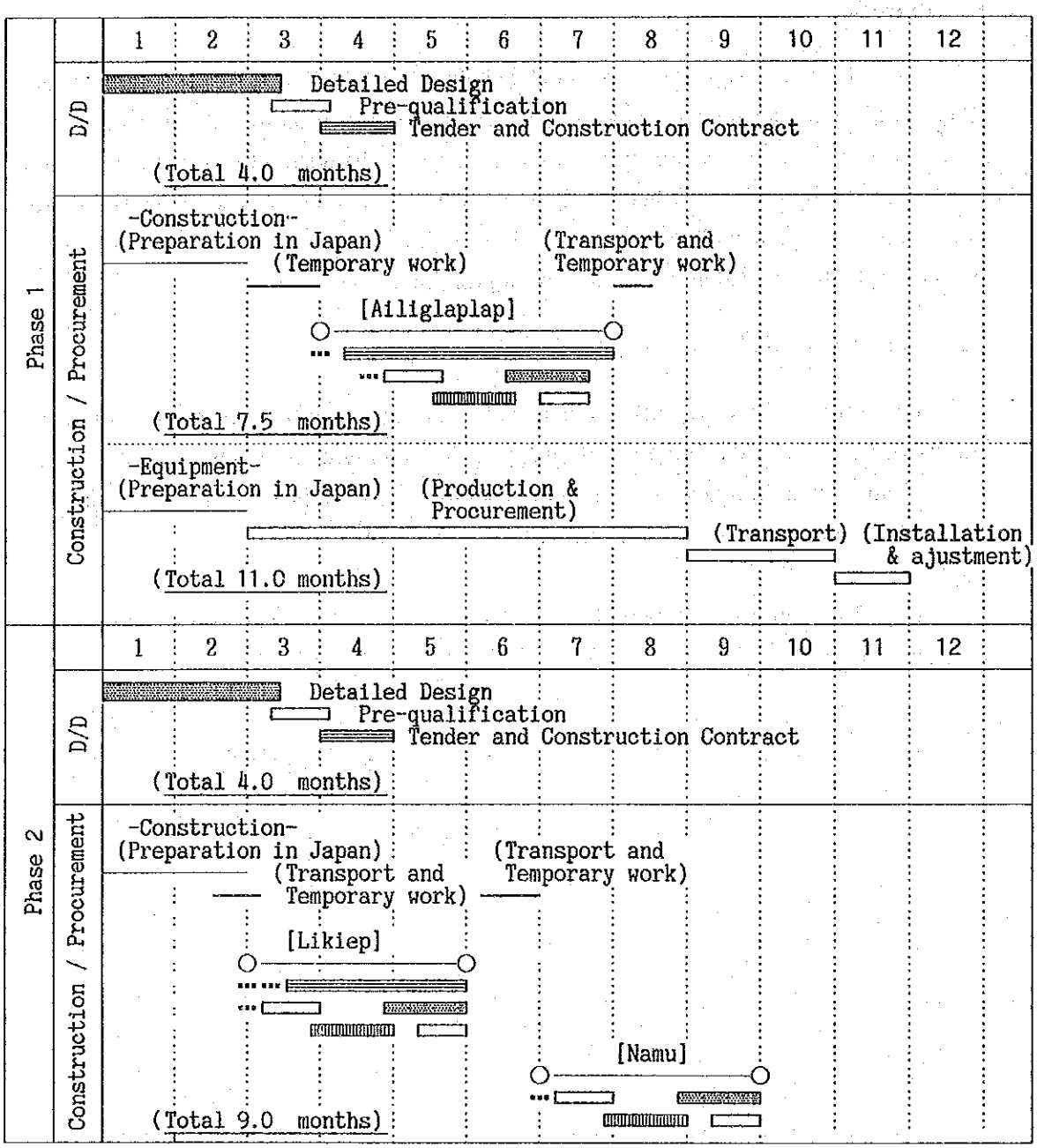
After detailed design has been completed, the pre-qualification of tender participants (P/Q) will be conducted through the announcement of tender in Japan. The executing agency will invite participating firms for tender based on the result of pre-qualification and conduct tendering in the presence of witnesses. The lowest tenderer will be the successful bidder and will sign a contract for construction with the Government of the Marshall Islands, if the firm's tender is judged to be appropriate.

2) Construction and Procurement

The construction work will commence after the signing of the construction contract and its verification by the Government of Japan. An optimum construction schedule will be set up after examining the actual schedule, temporary work, procurement of materials and construction cost, etc. of each construction work item.

The construction schedule will be divided into two phases and is shown on the following page.

Implementation Schedule



Legend

- Construction period
- Temporary work
- Civil work
- Bldg.foundation
- Bldg.structure
- Utility & interior
- Exterior & external

4.4.6 Portion of Project Cost Borne by Government of the Marshall Islands

The Project cost to be borne by the Government of the Marshall Islands except for land cost is estimated as follows:

Unit: US$

Division of Operational Cost	Phase 1	Phase 2	Total
1. Clearing land	1,624	3,248	4,872
TOTAL	1,624	3,248	4,872

5. PROJECT EVALUATION AND CONCLUSION

5. PROJECT EVALUATION AND CONCLUSION

5.1 Project Evaluation

The objective of the Project is to narrow the economic gap between the outer islands and the urban areas by developing the existing fishery from the traditional self-sufficient type, to a source of cash income by implementing a plan to periodically supply fish products from the outer islands to Ebeye Island where the population is concentrated. Subsequently, this Project supports the foremost goal of the national development policy of the Government of the Marshall Islands to develop the islands in order to close the economic gap between urban and rural areas.

The Project does not incorporate the use of modern fishing methods with high operating costs in order to secure targeted fish catch volumes, but rather supports and strengthens existing fishing methods where the operation costs are minimal. Operation costs will be further reduced by the use of freezers utilizing a solar power system to maintain fish freshness. Fish products which will be supplied to Ebeye will maintain their freshness. In addition, other commodities such as coconut products, breadfruit, handicrafts, etc. from the islands will also be transported to Ebeye. Fish products transported to Ebeye will be distributed to approximately 9,600 people of Ebeye through existing supermarkets and grocery stores. Consequently, it is anticipated that with improvements in the supply and distribution of fresh fish, consumption of imported canned fish will decrease.

The benefits derived from Project implementation are outlined below.

(1) Direct Benefits

1) Increase of catch and value added fish by the introduction of fish transport and marketing facilities

With the provision of collection facilities and fishing gear on the outer islands and introduction of a transport system between Ebeye and the outer islands, the fishermen on the outer islands will catch fish in greater volume than the quantities currently harvested for self-consumption. In addition, it will be possible to supply fish to Ebeye in which freshness has been preserved. Therefore, fish products from the islands will have increase commercial value on Ebeye.

The annual volume of fish products collected from the islands is anticipated to be approximately 50.4 tons and with the increase in added value, it is estimated that annual benefit will be about US $50,400.

2) Increase in Fresh Fish Consumption in Ebeye and a Decrease in Consumption of Imported Canned Fish

The Project will supply 50.4 tons of fresh fish annually to Ebeye from the outer islands and this is expected to contribute to an increase in annual consumption of fresh fish of 5.2 kg per capita in an area with a population of approximately 9,600 people. It is estimated that the potential demand is 42 kg in annual per capita and in total about 400 tons on Ebeye. Although the volume of fish supplied by the Project will satisfy only 13 percent of this demand, it is anticipated that the Project will help decrease imported canned fish consumption. A decrease in the consumption of imported canned fish, will lead to saving in foreign currency. It is estimated that 50.4 tons of fresh fish annually will replace about 26.7 tons of imported canned fish or US $49,900

(2) Indirect Benefits

1) Increase in the Distribution Between the Outer Islands and Ebeye

Currently the distribution of commodities between the outer islands and the heavily populated Ebeye Island is by inter-atoll transport vessel. The frequency of its visit to the islands is only once every three months. When the Project commences, commodities other than fresh fish will be transported at a rate of two times a month between Ebeye and the outer islands on the transport boat. Commodities such as coconuts, breadfruit, and handicrafts will be transported to Ebeye and on its return trip, the transport boat will carry rice, wheat, sugar, kerosene oil, etc. With an increase in the frequency of transport, the people of the outer islands will be given an opportunity to increase their incomes, and in addition obtain a stable supply of necessary daily commodities.

2) Upgrading of the Fishermen's Consciousness on Fishery Activities

Traditionally fishery by the local fishermen on the outer islands was carried out on self-sufficiency levels only. However, with the implementation of this Project, the objective of their fishing activities will be to earn cash income; and they will be required to become aware of important factors such as fishing techniques and fish handling. Therefore, fishermen will be expected to upgrade their awareness of their occupation and become independent.

3) Influence of the Project on Other Outer Islands

Opportunity to earn cash revenue will be given to the outer islands with implementation of the Project and it is anticipated that the people of the other surrounding outer islands will be influenced to further their economic activities. In particular, there are four outer islands within a 100 nautical mile radius of Likiep Atoll and information on the Project will spread to these islands. It is anticipated that economic activities will be activated by information exchange and transport of commodities will become active among these islands with Likiep.

5.2 Conclusion

The Project has been concluded as an appropriate Japanese grant aid program, as it is anticipated to contribute to Marshall Islands' foremost national objective of developing the outer islands and to contribute to improving the daily life of the people of Ebeye Island. In addition, it has been concluded that the executing agency is fully capable in terms of personnel and funds, to cope with the management and operation of the Project. However, in order to effectively and smoothly implement the Project, it is essential that the Government of the Marshall Islands take responsibility in implementing the following items:

1) Prior to Project implementation, MIMRA will be required to set up a supplementary operating fund in the amount of US $5,000 and to prepare an annual budget of US $12,000 as a supplementary fund to cover any future deficits.

2) Prior to Project implementation, MIMRA will be required to thoroughly explain to the people of the islands the basic Project contents, concrete implementing schedule, expected economic results, and required actions to be taken for the Project and to receive their understanding and cooperation.

3) MIMRA should select the essential and suitable personnel required for Project implementation.

- One person in charge of island operations (collecting fish)
- One captain, one engineer for the transport boat
- One person in charge of fish sales on Ebeye Island
- One person in charge of Project supervising

4) During the initial phase of Project implementation, MIMRA should bring in specialists in the field of fish distribution to strengthen Project implementation.

5) MIMRA and related organization should compile and analyze fish catch data after the commencement of the Project and monitor resources in the Project areas. Based on that, MIMRA should formulate fishing regulations such as protected areas, closed season, mesh size of net, if it is necessary from viewpoint of resource management.

APPENDIX

APPENDIX

APPENDIX - 1

Appendix - 1 Information on Field Survey

1.1 Members of the Basic Design Study Team

(1) Basic Design Study

Name	Speciality (Present Department)
1) Masao KISHINO	Team Leader (Research Division, Research Department, Fishery Agency)
2) Takumi MATSUDA	Grant Aid Cooperation (Grant Aid Cooperation Division, Ministry of Foreign Affairs)
3) Kazuo TANAKA	Fisheries Development Policy (Fisheries Insurance Division, Fishery Agency)
4) Katsuhiro SASAKI	Coordinator (Second Basic Design Study Division, Grant Aid Study and Design Department, Japan International Cooperation Agency)
5) Tamotsu TOMIYAMA	Fisheries Development Planner (System Science Consultants Inc.)
6) Akira IMAI	Fish Marketing Planner (System Science Consultants Inc.)
7) Yukitaaka DATE	Architect (System Science Consultants Inc.)
8) Shigeru IWASAKI	Rural Development Planner (System Science Consultants Inc.)
9) Shinji OKADA	Natural Condition Surveyor (System Science Consultants Inc.)
10 Hiroshi ABO	Cost Estimator (Work in Japan) (System Science Consultants Inc.)

(2) Draft Report Explanation

Name	Speciality (Present Department)
1) Kazuo TANAKA	Team Leader (Fisheries Insurance Division, Fishery Agency)
2) Katsuhiro SASAKI	Coordinator (Kanagawa International Fisheries Training Centre, Japan International Cooperation Agency)
3) Tamotsu TOMIYAMA	Fisheries Development Planner (System Science Consultants Inc.)
4) Akira IMAI	Fish Marketing Planner (System Science Consultants Inc.)

1.2 Survey Schedule

1) Basic Design Study

(1/5)

Date	Itinerary	Description
1991		
1. April 8 (Mon)		
Official Government Members: OM (Mr. Matsuda, Mr. Tanaka and Mr. Sasaki)		
Consultant Members: CM (Mr. Tomiyama, Mr. Imai, Mr. Date and Mr. Iwasaki)		
	Narita - » Guam	Departure to Marshall Islands of Study Team
2. April 9 (Tues)		
OM + CM	Guam	Courtesy call to Consulate General of Japan in Agana
CM (Mr. Okada)	Narita - » Guam	Departure for Guam
3. April 10 (Wed)		
OM (Mr. Kishino)	Narita - » Guam	
OM + CM	Guam - Majuro	Departure for Majuro
4. April 11 (Thu		
OM + CM	Majuro	Courtesy call to Minister of F/A and R/D
5. April 12 (Fri)		
OM	Majuro	Meeting with R/D and MIMRA
OM (Mr. Kishino)		Guam - » Majuro Departure for Majuro
CM (Mr. Tomiyama and Mr. Date		
	Majuro	Meeting with R/D and MIMRA
CM (Mr. Tomiyama, Mr. Imai, Mr. Iwasaki and Mr. Okada)		
	Majuro -» Arno	Field survey (Arno Fishing Base)
6. April 13 (Sat)		
OM	Majuro - » Arno	Field survey (Arno Fishing Base)
	- » Majuro	
CM (Mr. Tomiyama)	Arno - Majuro	Field survey (Arno Fishing Base)
CM (Mr Imai, Mr. Iwasaki and Mr. Okada)		
	Arno	Interview survey (Arno and Ine)
CM (Mr. Date)	Majuro	Preparation of site survey
7. April 14 (Sun)		
OM	Majuro	Field survey (Related facilities in Majuro)
CM (Mr. Imai, Mr. Iwasaki, and Mr. Okada)		
	Arno - » Majuro	
CM (Mr. Tomiyama and Mr. Date)		
	Majuro	Preparation of site survey
8. April 15 (Mon)		
OM	Majuro - » Kwajalein	Site survey
	- » Ebeye	
OM (Mr. Sasaki)	Majuro - » Likiep	Site survey
CM (Mr. Imai and Mr. Iwasaki)		
	Majuro - » Kwajalein	Site survey
	- » Ebeye	
CM (Mr. Tomiyama and Mr. Date)		
	- - » Likiep	Site survey
CM (Mr. Okada)	Majuro	Natural condition survey

Date	Itinerary	Description
9. April 16 (Tue)		
OM	Ebeye	Site survey
OM (Mr. Sasaki)	Likiep - » Kwajalein	
	- Ebeye	Site survey
CM (Mr. Imai and Mr. Iwasaki)		
	Ebeye	Interview survey
CM (Mr. Tomiyama and Mr. Date)		
	Likiep - » Kwajalein	
	- Ebeye	Site survey
CM (Mr. Okada)	Majuro	Natural condition survey
10. April 17 (Wed)		
OM	Ebeye- » Kwajalein	
	- Ailinglaplap	Site survey
OM (Mr. Matsuda)		Ebeye Site survey
CM (Mr. Imai and Mr. Iwasaki)		
	Ebeye	Interview survey
CM (Mr. Tomiyama and Mr. Date)		
	Likiep - » Kwajalein	
	- Ailinglaplap	Site survey
CM (Mr. Okada)	Majuro	Natural condition survey
11. April 18 (Thu)		
OM	Ailinglaplap	Site survey
OM (Mr. Matsuda)		Ebeye- » Kwajalein
	-Guam	Departure to Guam
CM (Mr. Imai and Mr. Iwasaki)		
	Ebeye	Interview survey
CM (Mr. Tomiyama and Mr. Date)		
	Ailinglaplap	Site survey
CM (Mr. Okada)	Majuro	Natural condition survey
12. April 19 (Fri)		
OM	Ailinglaplap - » Namu	Site survey
OM (Mr. Matsuda)		Guam - » Narita Arrival in Narita
CM (Mr. Imai and Mr. Iwasaki)		
	Ebeye - » Kwajalein	
	- Namu	Interview survey
CM (Mr. Tomiyama and Mr. Date)		
	Ailinglaplap - » Namu	Site survey
CM (Mr. Okada)	Majuro	Natural condition survey
13. April 20 (Sat)		
OM	Namu	Site survey
CM (Mr. Tomiyama and Mr. Date,Mr. Imai and Mr. Iwasaki)		
	Namu	Site survey
CM (Mr. Okada)	Majuro	Natural condition survey
14. April 21 (Sun)		
OM	Namu - » Majuro	
CM (Mr. Tomiyama and Mr. Date,Mr. Imai and Mr. Iwasaki)		
	Namu - » Majuro	
CM (Mr. Okada)	Majuro - » Ailinglaplap	

Date	Itinerary	Description
15. April 22 (Mon)		
OM + CM	Majuro	Meeting of team members; Meeting with R/D, MIMRA, Preparation of minutes of meeting
CM (Mr. Okada)	Ailinglaplap	Natural condition survey
16. April 23 (Tue)		
OM + CM	Majuro	Meeting of team members; Meeting with R/D, MIMRA, Preparation of minutes of meeting
CM (Mr. Okada)	Ailinglaplap	Natural condition survey
17. April 24 (Wed)		
OM + CM	Majuro	Courtesy call to F/A, R/D and MIMRA
CM (Mr. Okada)	Ailinglaplap - » Majuro	
18. April 25 (Thu)		
OM	Majuro - » Guam	
CM (Mr. Imai, Mr. Date,Mr. Okada and Mr. Iwasaki)	Majuro -» Ailinglaplap	Interview survey and Natural condition survey
CM (Mr. Tomiyama)	Majuro	Data collection
19. April 26 (Fri)		
OM	Guam - » Narita	Courtesy call to Consulate General of Japan in Agna, and Arrival in Narita
CM (Mr. Imai, Mr. Date,Mr. Okada and Mr. Iwasaki)	Ailinglaplap	Interview survey and Natural condition survey
CM (Mr. Tomiyama)	Majuro	Data collection
-- The schedule of consultant members is indicated below. --		
20 April 27 (Sat)		
Mr. Imai, Mr. Date and Mr. Iwasaki	Ailinglaplap -» Likiep	Interview survey
Mr. Tomiyama	Majuro	Data collection
Mr. Okada	Ailinglaplap	Natural condition survey
21. April 28 (Sun)		
Mr. Imai, Mr. Date and Mr. Iwasaki	Likiep	Interview survey
Mr. Tomiyama	Majuro	Data collection
Mr. Okada	Ailinglaplap	Natural condition survey
22. April 29 (Mon)		
Mr. Imai, Mr. Date and Mr. Iwasaki	Likiep -» Utirik	Field survey of solar power system
Mr. Tomiyama	Majuro	Data collection
Mr. Okada	Ailinglaplap	Natural condition survey

Date	Itinerary	Description
23. April 30 (Tue)		
Mr. Imai, Mr. Date and Mr. Iwasaki		
	Utirik -»Majuro	
Mr. Tomiyama	Majuro	Data collection
Mr. Okada	Ailinglaplap	Natural condition survey
24. May 11 (Wed)		
Mr. Tomiyama,Mr. Imai, Mr. Date and Mr. Iwasaki		
	Majuro	Data collection
Mr. Okada	Ailinglaplap	Natural condition survey
25. May 2 (Thu)		
Mr. Tomiyama,Mr. Imai, Mr. Date and Mr. Iwasaki		
	Majuro	Data collection
Mr. Okada	Ailinglaplap	Natural condition survey
26. May 3 (Fri)		
Mr. Tomiyama,Mr. Imai, Mr. Date and Mr. Iwasaki		
	Majuro	Data collection; Meeting with local government
Mr. Okada	Ailinglaplap	Natural condition survey
27. May 4 (Sat)		
Mr. Tomiyama,Mr. Imai, Mr. Date and Mr. Iwasaki		
	Majuro	Data collection
Mr. Okada	Ailinglaplap	Natural condition survey
28. May 5 (Sun)		
Mr. Tomiyama,Mr. Imai, Mr. Date and Mr. Iwasaki		
	Majuro	Meeting of team members
Mr. Okada	Ailinglaplap	Natural condition survey
29. May 6 (Mon)		
Mr. Tomiyama,Mr. Imai, Mr. Date and Mr. Iwasaki		
	Majuro	Data collection; Meeting with local government
Mr. Okada	Ailinglaplap	Natural condition survey
30. May 7 (Tue)		
Mr. Tomiyama,Mr. Imai, Mr. Date and Mr. Iwasaki		
	Majuro -»Guam	
Mr. Okada	Ailinglaplap -»Namu	Natural condition survey
31. May 8 (Wed)		
Mr. Tomiyama,Mr. Imai, Mr. Date and Mr. Iwasaki		
	Guam -»Narita	Courtesy call to Consulate General of Japan, Arrival in Narita
Mr. Okada	Namu	Natural condition survey

Date	Itinerary	Description
-- The schedule of Mr. Okada is indicated below. --		
32. May 9 (Thu)	Namu	Natural condition survey
33. May 10 (Fri)	Namu	Natural condition survey
34. May 11 (Sat)	Namu	Natural condition survey
35. May 12 (Sun)	Namu	Natural condition survey
36. May 13 (Mon)	Namu	Natural condition survey
37. May 14 (Tue)	Namu	Natural condition survey
38. May 15 (Wed)	Namu	Natural condition survey
39. May 16 (Thu)	Namu -»Majuro	
40. May 17 (Fri)	Majuro -»Namu	Natural condition survey
41. May 18 (Sat)	Namu	Natural condition survey
42. May 19 (Sun)	Namu	Natural condition survey
43. May 20 (Mon)	Namu	Natural condition survey
44. May 21 (Tue)	Namu	Natural condition survey
45. May 22 (Wed)	Namu	Natural condition survey
46. May 23 (Thu)	Namu -»Majuro	
47. May 24 (Fri)	Majuro	Data collection and analysis
48. May 25 (Sat)	Majuro	Data collection and analysis
49. May 26 (Sun)	Majuro	Data collection and analysis
50. May 27 (Mon)	Majuro -»Guam	
51. May 28 (Tue)	Guam -»Narita	Arrival in Narita

2) Draft Report Explanation

Date	Itinerary	Description
1991		
1. August 4 (Sun)	Narita - » Guam	Departure to Marshall Islands
2. August 5 (Mon)	Guam - » Majuro	Arrival in Majuro; and Courtesy call to Secretary of Foreign Affairs
3.August 6 (Tue)	Majuro	Courtesy call to Minister and Secretary of IOIA, and Meeting with MIMRA
4. August 7 (Wed)	Majuro	Explanation and discussion of draft final report; and Courtesy call and discussion with R & D
5. August 8 (Thu)	Majuro	Discussion with MIMRA; Preparation of draft of Minutes of Discussion and Party held by Team Members
6. August 9 (Fri)	Majuro	Preparation and signing of Minutes of Discussion and Party held by MIMRA
7. August 10 (Sat)	Majuro -»Arno Arno -» Majuro	Visit to Arno Fishing Centre
8. August 11 (Sun)	Majuro	Data collation
9. August 12 (Mon)	(Majuro -»Honolulu)	Majuro -»Guam Stay in Guam Mr. Imai stay in Honolulu)
10. August 13 (Tue)	Guam -»Narita	Arrival in Narita (Honolulu -»Narita) Supplementary survey of Solar Power System by MR. Imai, and return to Narita)

1.3 Member List of Concerning Party in the Recipient Country

(1/2)

Name / Organization	Position
Related Japanese Personnel	
1. Consulate General of Japan, Office, Agana	
1) Masao Wada	Consulate General
2) Yoshio Koshio	Consulate
2. OFCF	
1) Katsuji Fujita	OFCF Expert (Majuro)
2) Kohichi Sakonju	OFCF Expert (Majuro)
Authorities Concerned in Marshall Islands	
3. Ministry of Foreign Affairs	
1) Tom Kijiner	Minister
4. Ministry of Resources and Development	
1) Brenson S. Wase	Minister
2) Donald F. Capelle	Secretary
5. Ministry of Interior and Outer Islands Affairs	
1) Luckner K. Abner	Minister
2) Carmen Bigler	Secretary
3) Danay F. Jack	Chief of Outer Islands Affairs
6. Ministry of Public Affairs	
1) Amsa Jonathan	Minister
2) Jackie Kijrik	Cost Inspector
3) Gordon Madison	Budget Officer
7. Office of Chief Secretary	
1) Johnson Riklon	Assistant Attorney General
2) Jewon Lemari	Chief Planner
8. Marshall Islands Marine Resources Authority	Director
1) Danny Wase	Acting Director
2) John Bungitak	
9. Marshall Islands Development Authority	
1) Steve Muller	General Manager
2) Don Piepgrass	CIP Administrator
10. Environmental Protection Authority	
1) Robert Kelen	Managing Director

Name / Organization	Position
11. Ministry of Social Services	
1) Zed Zedhkela	Chief of Food Services
12. Office of Planning and Statistics	
1) William Elderleamp	Association Expert
13 ADB Project Team	
1) Robert E. Hood	Senior Project Economist, ADB
2) Charles F. Greenwald	Consultant
3) John A. Maynard	Consultant
14. Authorities Concerned in Outer Islands	
1) Abon Jeadrik	City Manager, Kwajalein Atoll Local Government
2) David J. Blake	Controller/Finance Director, Kwajalein Atoll Development Authority (KADA)
3) Jeban Riklon	Executive Officer, KADA
4) Maza Attari	Mayor, Utrik Atoll
5) Netab Zebty	Mayor, Namu Atoll
6) Paul deBrume	Mayor, Likiep Atoll
7) Juaer Loeak	Mayor, Ailinglaplap Atoll
15. Private Sector	
1) Samson T. Bellu	Marshalls Inc.
2) David Tejada	Air Marshall Island
3) Daniel Banning	Majuro Long Line Fish Base Operation
4) Ramsey Reimers	Robert Reimers Enterprises Inc.
5) John Smith	Pacific Marshall Inc.

1.4 Minutes of Discussion

1) Basic Design Study

MINUTES OF DISCUSSION

BASIC DESIGN STUDY ON

THE PROJECT FOR IMPROVEMENT OF THE FISH MARKETING SYSTEM

IN THE OUTER ISLANDS

IN THE REPUBLIC OF THE MARSHALL ISLANDS

In response to a request of the Government of the Republic of the Marshall Islands, the Government of Japan decided to conduct a Basic Design Study on the Project for Improvement of Fish Marketing System in the Outer Islands (hereinafter referred to be as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Republic of the Marshall Islands a study team headed by Mr. Masao Kishino, *Senior inspection officer, Research Division, Research Department, Fishery Agency,* and is scheduled to stay in the country from April 10th to May 27th, 1991.

The Team held discussions with the officials concerned of the Government of Marshall Islands and conducted field surveys at the study area.

In course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Majuro, April 24, 1991

岸野昭雄

Masao Kishino, Leader,
Basic Design Study Team,
(JICA)

Danny S. Wase, Director
Marshall Islands Marine
Resources Authority,
Republic of the Marshall Islands

ATTACHMENT

1. Objectives of the Project:

The objective of the Project is to raise the standard of living in the outer islands and to narrow the urban and rural gap by enhancing income-generating fishery through establishment of the most appropriate fishery related infrastructure to be recommended by the Study.

2. Project Site:

The proposed sites for the Project are located at;

A) Likiep, Likiep Atoll,

B) Majkin, Namu Atoll,

C) Airok Ailinglaplap Atoll *

(Project sites are shown in ANNEX-I)

* Bouj was found as the better location for the project site in Ailinglaplap Atoll by the Team. (ANNEX-III).

3. Executing Agency:

Responsible Agency: Ministry of Resources and Development

Implementing Agency: Marshall Islands Marine Resources Authority (MIMRA)

4. Items requested by the Government of Marshall Islands:

The following items were requested.

A) Loading and unloading facilities and/or equipment

B) Transportation vessel

C) Cold storage with shed

D) Demonstration fishing boat

岸野 昭雄 (M)

E) Fishing gear

F) Equipment for fishing village

However, items for the Project may be differed depend upon the result of the Study and will be finalized at Draft Report discussion.

5. Japan's Grant Aid Program:

A) The Government of Marshall Islands has understood the system of Japanese Grant Aid explained by the team.

B) The Government of Marshall Islands will take necessary measures, described in ANNEX-II, for smooth implementation of the Project on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. Schedule of the Study:

A) The consultants will proceed to further studies in Marshall Islands until May 27th, 1991.

B) JICA will prepare the draft report of the study in English and dispatch a mission in order to explain its contents.

C) The Government of Marshall Islands will inform to the Japanese side the result of discussion with Appraisal Mission of Asian Development Bank on the Fisheries Development Project.

D) In case that the contents of the report is accepted in principle by the Marshallese side, JICA will complete the final report and send it to the Government of Marshall Islands by September, 1991.

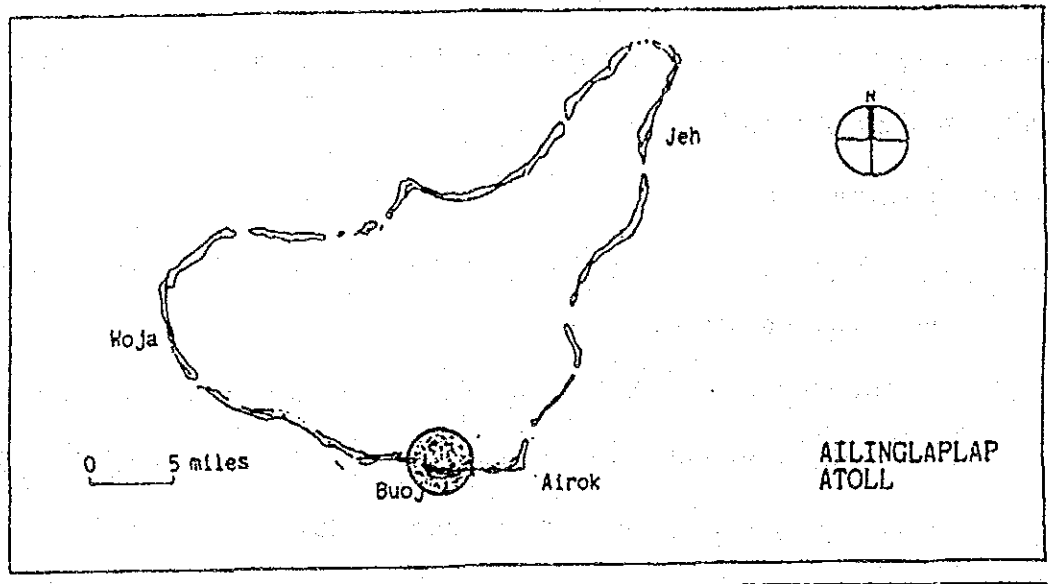
7. Technical Cooperation:

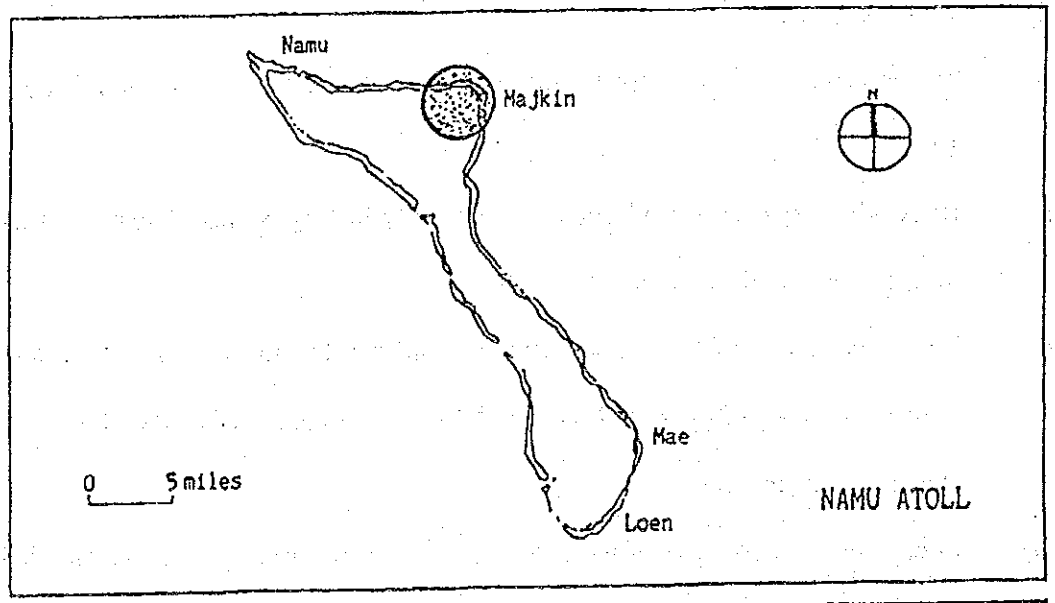
The Marshallese side explained the need for assistance of Japanese experts as well as technical training of counterpart personnel in Japan. Another official request should be submitted through diplomatic channels.

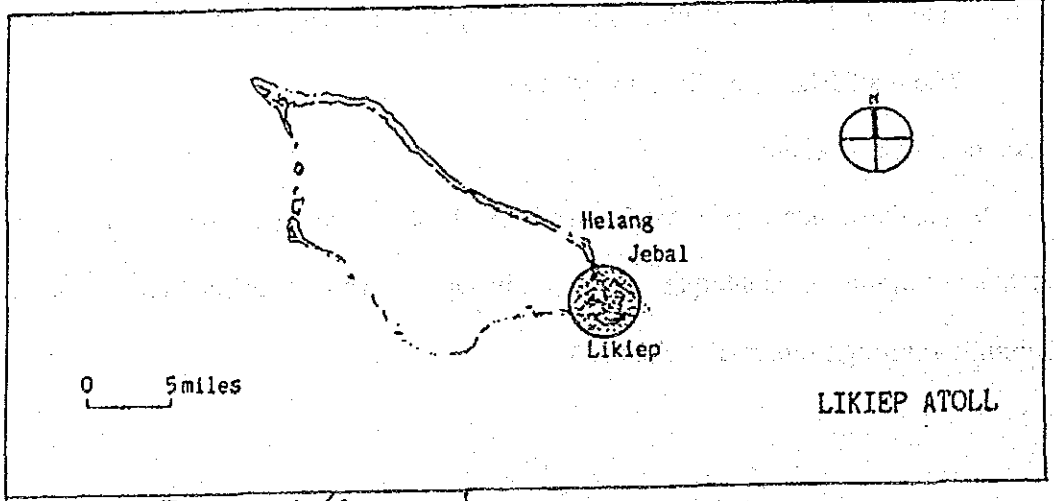
岸野昭雄 印

ANNEX-I

Project Site Map







岸野昭雄 印

ANNEX-II

Necessary measures to be taken by the Government of Marshall Islands are as follows:

1. To secure the ownership and/or the right to use the Project site.
2. To clear, level and reclaim the Project site, when needed, prior to the commencement of the Project.
3. To construct wall and fences around the Project site.
4. To improve the access road to the Project site.
5. To provide facilities for the distribution of the electricity, water supply, drainage, telephone line and other incidental facilities.
6. To bear advising commission of the Authorization to Pay (A/P) and Payment commission to the Japanese foreign exchange bank for banking services based upon the Banking Arrangement (B/A).
7. To ensure prompt unloading, banking tax exemption, and custom clearance of the goods for the Project at port of disembarkation.
8. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contract such facilities as may be necessary for their entry into Marshall Islands and stay therein for the performance of their work.
9. To exempt Japanese nationals from custom duties, Marshall Islands internal taxes and other fiscal levies which may be imposed in Marshall Islands with respect to the supply of the products and services under the verified contracts.
10. To maintain and use properly and effectively the facilities constructed and equipment under the verified contracts.

芳野 昭雄

11. To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment.

12. To coordinate and solve any matters related which may arise with third party and inhabitants living in the Project area during implementation of the Project.

岸野 昭雄

ANNEX-III

The Team found that Bouj in Ailinglaplap Atoll has the following advantages compared with Airok, originally proposed site by the Government of the Marshall Islands:

1. Calmness - as it is protected from the North-easterly winds.
2. Less reef - therefore less cost for the construction of the required facilities.
3. Near the Pass - therefore cost saving in the long-run, mainly transport costs of fish to the Ebeye market.
4. Additional benefits to the islanders - Currently the side is being used for the field trip ships. The site could be used to speed up loading/offloading of copras, cargoes, and even passengers on available basis.

岸野昭雄 印

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON

THE PROJECT FOR IMPROVEMENT OF THE FISH MARKETING SYSTEM

IN THE OUTER ISLANDS

IN THE REPUBLIC OF THE MARSHALL ISLANDS

In April 1991, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Project for Improvement of the Fish Marketing System in the Outer Islands (hereinafter referred to as "the Project") to the Republic of the Marshall Islands, and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft final report of the study.

In order to explain and to consult the Marshallese representatives of the components of the draft final report, JICA sent to the Marshall Islands a study team, which was headed by Mr. Kazuo Tanaka, Fisheries Mutual Insurance Officer, Fisheries Insurance Division, Fishery Agency, Ministry of Agriculture, Forestry and Fisheries, and stayed in the country from August 5 to 12, 1991.

As a result of the discussions, both parties have confirmed the main items described on the attached sheets.

Majuro, August 9, 1991

Kazuo Tanaka

Mr. Kazuo Tanaka
Leader
Draft Final Report Explanation Team
JICA

Mr. Donald D. Capelle
Secretary
Ministry of Resources &
Development

ATTACHMENT

1. Components of Draft Final Report

The Government of the Marshall Islands has agreed in principle the components of the Draft Final Report produced by the team.

2. The Marshall representatives requested additional equipment as follows:

(1) Appropriate light source to catch flying fish, with waterproof and battery powered if available.

(2) Fuel drums *

* Nowadays, fuel drums are very much deficit in the Marshall Islands.

3. Japan's Grant Aid System

(1) The Government of the Marshall Islands understands the system of Japanese Grant Aid explained by the team.

(2) The Government of the Marshall Islands will take all necessary measures, described in ANNEX, for smooth implementation of the Project on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

4. Technical Cooperation in connection with the Project

The Marshallese representatives pointed out the need for technical assistance of a Japanese expert in fish marketing and management of the transport vessel at the beginning of the operation.

The official request to dispatch of the expert in the above fields will be submitted to the Japanese government through diplomatic channels.

K. T

5. Further Schedule

The team will make the final report in accordance with the Minutes of Discussions, and send it to the Government of Marshall Islands by the end of October 1991.

K. T

ANNEX: Necessary measures to be taken by the Government of the Marshall Islands in case Japan's Grant Aid is executed.

1. Secure the ownership and/or right to use the sites for the Project.
2. To clear the sites prior to commencement of the construction.
3. To secure land for the storage of material and for temporary construction facilities at all project sites.
4. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
5. Exempt from taxes and take all necessary measures for custom clearance of the materials and equipment brought for the project at the port of disembarkation.
6. Accord to Japanese nationals whose services are required in connection with the supply of products and services under the verified contract, such facilities as may be necessary for their entry into and stay therein the Marshall Islands, for the performance of their work.
7. Ensure that the facilities and equipment provided under the Grant, are used for the agreed purpose and are effectually maintained.
8. Bear all the expenses, not included under the Grant, necessary for the construction of the facilities and for the transportation and the installation of the equipment.
9. Coordinate and solve any related matters which may arise with third parties or inhabitants living in the Project areas during implementation of the Project.

K. T

1.5 List of References

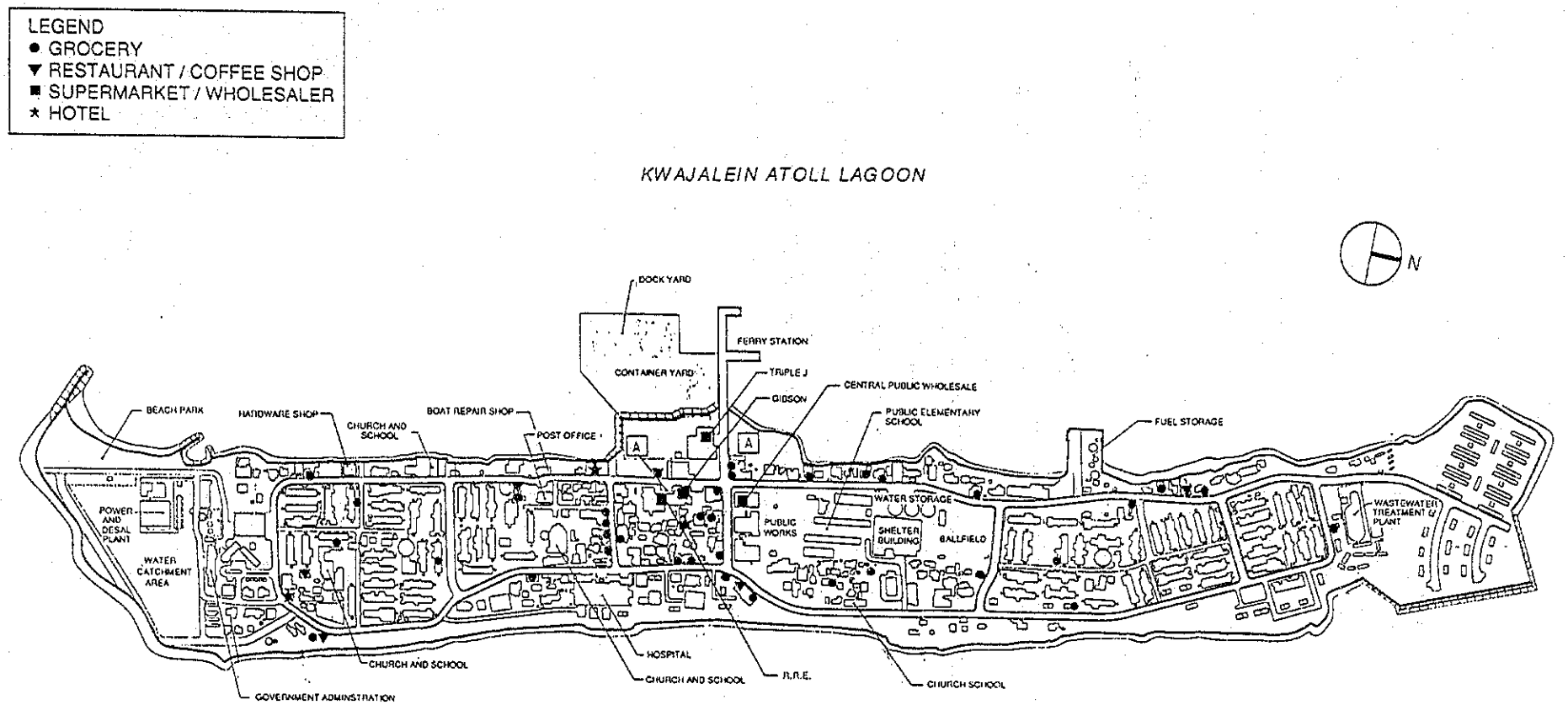
(1/2)

Title	Source	Year
1. General		
1) Investor's Guide to the Republic of the Marshall Islands	The Micronesia Institute	Sept. 1989
2) Prospects for Economic Self-sufficiency in the New Micronesia States	Centre for Southeast Asian Studies Occasional Paper No. 25	1986
3) Coral Reef Newsletter	University of Guam	March 1983
4) Constitution of the Marshall Islands	Micronitor News & Printing Co.	May 1989
5) Census of Population and Housing 1988	Office of Planning and Statistics	Aug. 1989
6) Marshall Islands Statistical Abstract 1988/89	Office of Planning and Statistics	Aug. 1989
7) GDP, etc.	Office of Planning and Statistics	Aug. 1989
8) First Five Year Development Plan 1985-1989	Office of Planning and Statistics	Dec. 1987
9) Commercial Imports Fiscal Year 1988	Office of Planning and Statistics	1989
2. Fisheries		
1) Coastal Fisheries Development Programme		
2) Imports Amounts (C.I.F)		
3) Canned Fish Prices	RRE	May 1991
4) 1992 Proposed Budget for Food Stuffs for the Listed Schools	Division of Food Services	May 1991
5) List of Poisonous Fish	MIMRA	1987
6) Quantity of Fuel per Regular Field Trip of Microship		
3. Regional Data		
1) Five Year Local Government Development Plan, Likiep		
2) Five Year Local Government Development Plan, Namu		

(2/2)

Title	Source	Year
3. Regional Data(Cont.)		
3) Five Year Local Government Development Plan, Ailinglaplap	Pacific Concerns Resource Center	1984
4) Business License Fee Ordinance of 1990	KALGOV	Jan. 1991
5) The Property Tax on First Sale 1991	KALGOV	March 1991
6) List of Wholesalers, Importers, Exporters	KALGOV	
7) KALGOV Organization Chart		
8) PM & O Line Sailing Schedule		
9) Kwajalein Atoll Coastal Resource Atlas		
10) Fishery Development Project	ADB	Dec. 1990
4. Construction		
1) Earthmoving Regulations		May 1989
2) Earthmoving Permit Application (Form Sheet)		
3) Social Security System Fresh Fish	Social Security Administration	
4) Price List of Construction Material	MJCC	May 1991
5) Price List of Construction Material	RRE	May 1991
6) Price List of Construction Material	PMI	May 1991
7) Labourer Charge	Public Service Commission	
8) Oil Price	Mobil Oil Micronesia	April 1991
5. Natural Conditions		
1) Local Climatological Data, Majuro 1989	NOAA	
2) Saul Price	NOAA	
3) Tide Table	Marine Laboratory University of Guam	Nov. 1990

APPENDIX - 2



Appendix 2 Figures and Tables

Fig. 2.1 Location of Grocery Stores on Ebeye Island

Fig. 2.2 Ice Making Schedule

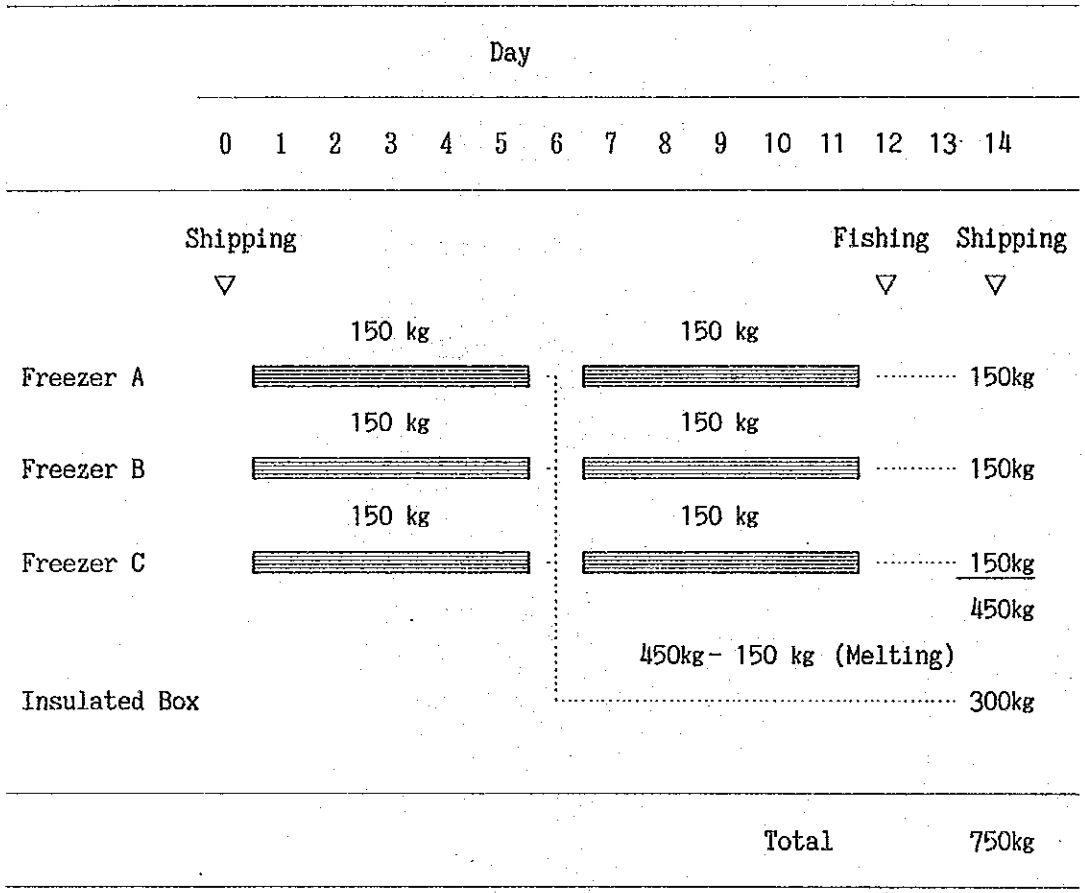


Table 2.1 Population and Annual Growth Rate by Atolls/Islands (1984-1988)

Atolls	Population		Average Annual Growth Rate (%)	Projected Population		
	1980	1988		1990	1995	2000
Whole Country	30,873	43,380	4.3	46,185	56,197	68,511
A. Majuro	11,791	19,664	6.6	22,246	30,166	40,904
	38%	45%		48%	54%	60%
B. Other Atolls	19,082	23,716	2.8	23,939	26,031	27,607
1. Ailinglaplap	1,385	1,715	2.7			
2. Ailuk	413	488	2.1			
3. Arno	1,487	1,656	1.4			
4. Aur	444	438	-0.2			
5. Bikini	-	10	-			
6. Ebon	887	741	-2.2			
7. Enewetak	542	715	3.4			
8. Jabat Island	72	112	5.7			
9. Jaluit	1,450	1,709	2.1			
10. Kili	489	602	2.6			
11. Kwajalein	6,624	9,311	4.3			
12. Lae	237	319	3.8			
13. Lib Island	98	115	2.0			
14. Likiep	481	482	0.0			
15. Maloelap	614	796	3.3			
16. Mejit Island	325	445	4.0			
17. Mili	763	854	1.4			
18. Namorik	617	814	3.5			
19. Namu	654	801	2.6			
20. Rongelap	235	-	-			
21. Ujae	309	448	4.8			
22. Ujelang	-	-	-			
23. Utrik	336	409	2.5			
24. Wotho	85	90	0.7			
25. Wotje	535	646	2.4			

Source: Marshall Islands Statistical Abstract 1988/89

Table 2.2 Copra Production by Atolls/Islands (1984-1988)

Unit: Short Tons

Atolls	1984	1985	1986	1987	1988 (US$)
1. Ailinglaplap	427	433	958	679	692 (152,240)
2. Ailuk	162	50	89	201	127 (27,940)
3. Arno	708	753	1,096	941	1,031 (226,820)
4. Aur	134	157	252	265	158 (34,740)
5. Ebon	315	371	684	432	453 (99,660)
6. Enewetak	57	33	14	-	37 (8,140)
7. Jabat Island	19	23	48	29	45 (9,900)
8. Jaluit	169	386	664	352	305 (67,100)
9. Kili	53	3	1	-	- -
10. Kwajalein	12	15	13	29	24 (5,280)
11. Lae	44	62	78	58	33 (7,260)
12. Lib Island	25	21	77	43	51 (11,220)
13. Likiep	237	121	82	74	63 (13,860)
14. Majuro	262	260	209	172	261 (57,420)
15. Maloelap	209	238	287	268	291 (64,020)
16. Mejit Island	172	60	150	208	166 (36,520)
17. Mili	411	586	746	588	729 (160,380)
18. Namorik	280	257	447	247	253 (55,660)
19. Namu	162	132	482	239	282 (62,040)
20. Rongelap	63	18	-	-	- -
21. Ujae	63	43	81	66	45 (9,900)
22. Utrik	102	33	52	81	86 (18,920)
23. Wotho	25	23	32	40	28 (6,160)
24. Wotje	372	223	380	390	358 (78,760)
	4,483	4,301	6,922	5,402	5,518 (1,213,960)

Source: Marshall Islands Statistical Abstract 1988/89

Table 2.3 Gross Domestic Product (1982-1988)

Unit : US$ Million

	1982	1983	1984	1985	1986	1987	1988
Gross Domestic Product (GDP)	36.1	42.2	46.4	45.2	56.5	64.8	68.7
Gross Domestic Product (GDP) at factor cost	33.3	38.5	41.9	41.8	51.9	61.5	65.2
Net Domestic Product at factor cost	31.8	36.7	40.1	39.9	49.4	58.6	62.1
Compensation of Employees	20.1	22.3	23.5	25.8	31.6	39.9	43.1
Operating Surplus	10.8	14.5	16.5	14.1	17.8	18.6	19.0
Consumption of Fixed Capital	1.6	1.7	1.8	1.9	2.5	2.9	3.1
Indirect taxes (less subsidies)	2.8	3.7	4.5	3.4	4.6	3.3	3.5
Per Capita GDP (US$)	1,093	1,214	1,284	1,232	1,458	1,643	1,608
Annual Growth Rate (%)	8.9	11.1	5.7	-4.1	20.6	10.6	-2.1

Source: Office of Planning and Statistics

Table 2.4 Balance of Trade (1982-1988)

Unit: US$ 1000

	1982	1983	1984	1985	1986	1987	1988
Imports	18,777	17,503	22,608	29,176	30,571	33,541	33,764
Exports	2,225	3,143	5,522	2,691	1,159	1,918	2,108
Balance	-16,552	-14,360	-17,086	-26,485	-29,412	-31,623	-31,656

Source: Marshall Islands Statistical Abstract 1988/89

APPENDIX - 3

RESULT OF 15DAYS TIDAL HARMONIC ANALYSIS

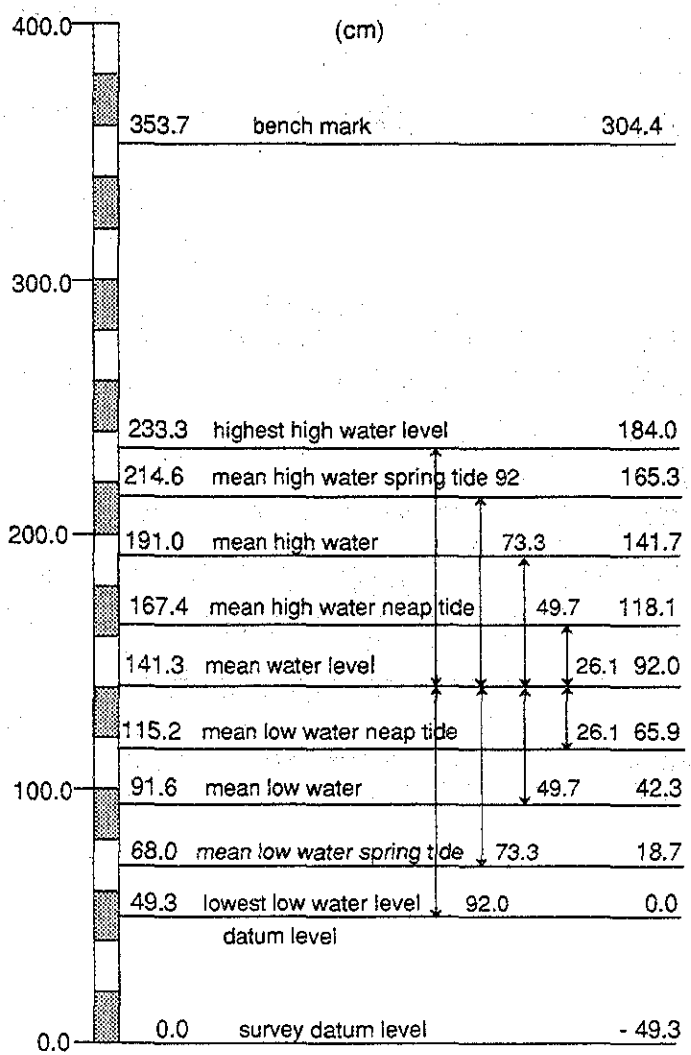
LOCATION : Namu Atoll, Majikin
north latitude:9°9'15"
east longitude:168°10'20"
SURVEY:Started May 8th 1991
Finished May 22nd 1991
180°E

H : wave height K : cofficient of reflection

component tides	Hcm	K°	remarks
K_1	11.3	242.2	Lunisolar diurnal
O_1	7.4	199.8	Principal lunar diurnal
P_1	3.8	242.2	Principal solar diurnal
Q_1	1.4	206.2	Larger lunar elliptic
M_2	49.7	111.2	Principal lunar
S_2	23.6	123.8	Principal solar
K_2	6.4	123.8	Lunisolar semidiurnal
N_2	10.9	104.2	Larger lunar elliptic
M_4	2.6	162.3	Lunar quater-diurnal
MS_4	1.2	93.8	M_2+S_2
A_0 : mean water level from survey datum level			
A_0 : 141.3cm			

TIDAL LEVEL

(cm)



TIDAL CONSTANT

element \ location		Namu Majikin	remarks
component tides (cm)	K_1	11.3	Lunisolar diurnal
	O_1	7.4	Principal lunar diurnal
	M_2	49.7	Principal lunar
	S_2	23.6	Principal solar
Z_0 (cm)		92.0	total of 4 component tides
T type of tide		0.255 mixed tide	$T=\frac{K_1+O_1}{M_2+S_2}$
spring range(cm)		146.6	$2(H_m+H_s)$
neap rangecm)		52.2	$2(H_m-H_s)$
spring rise(cm)		165.9	$Z_0+(H_m+H_s)$
neap rise(cm)		118.1	$Z_0+(H_m-H_s)$
mean low water spring tide (cm)		18.7	$Z_0-(H_m+H_s)$
mean low water neap tide (cm)		65.9	$Z_0-(H_m-H_s)$
mean high water interval (h)		3.84	K_m /28.9841

H_m wave height during principal lunar
H_s wave height during principal solar
K_m cofficient of reflection during principal lunar
K_s cofficient of reflection during principal solar

3.1 Figures of Tide Levels Namu Atoll (1/2)

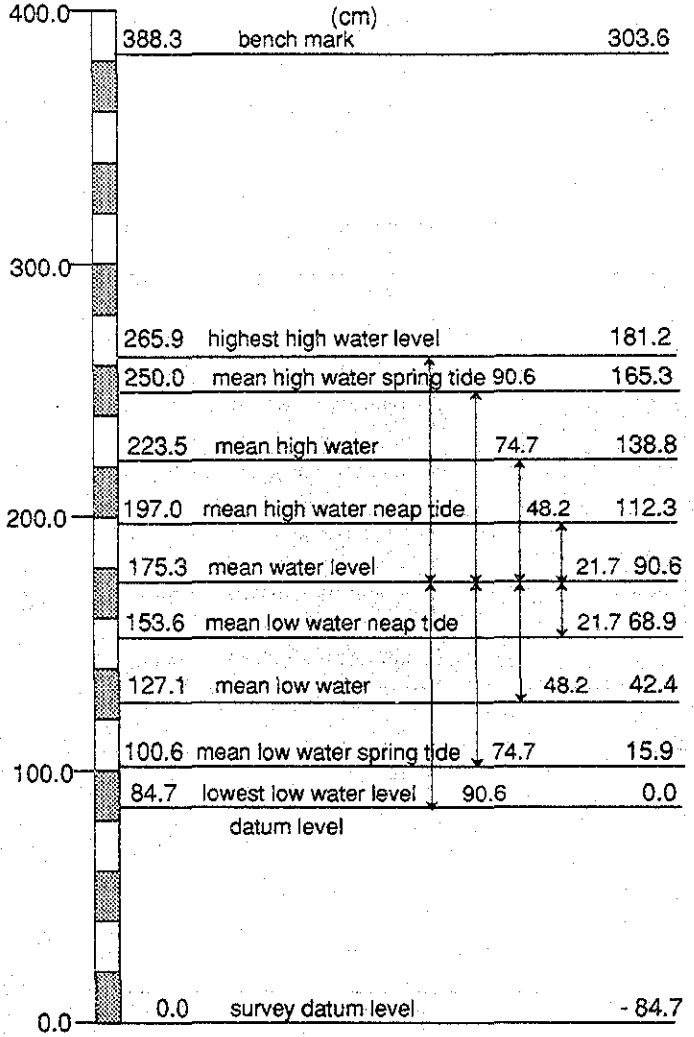
RESULT OF 15DAYS TIDAL HARMONIC ANALYSIS

LOCATION :Ailinglaplap
north latitude:7°17'20"
east longitude:168°45'10"
SURVEY:Started April 23rd1991
Finished May 6th1991
180°E

H : wave height K : cofficient of reflection

component tides	Hcm	K°	remarks
K_1	9.5	228.2	Lunisolar diurnal
O_1	6.4	207.1	Principal lunar diurnal
P_1	3.2	228.2	Principal solar diurnal
Q_1	1.8	156.9	Larger lunar elliptic
M_2	48.2	115.4	Principal lunar
S_2	26.5	132.3	Principal solar
K_2	7.2	132.3	Lunisolar semidiurnal
N_2	5.7	152.0	Larger lunar elliptic
M_4	1.5	233.9	Lunar quater-diurnal
MS_4	4.2	195.6	M_2+S_2
A_0 : mean water level from survey datum level			
A_0 : 175.3cm			

TIDAL LEVEL

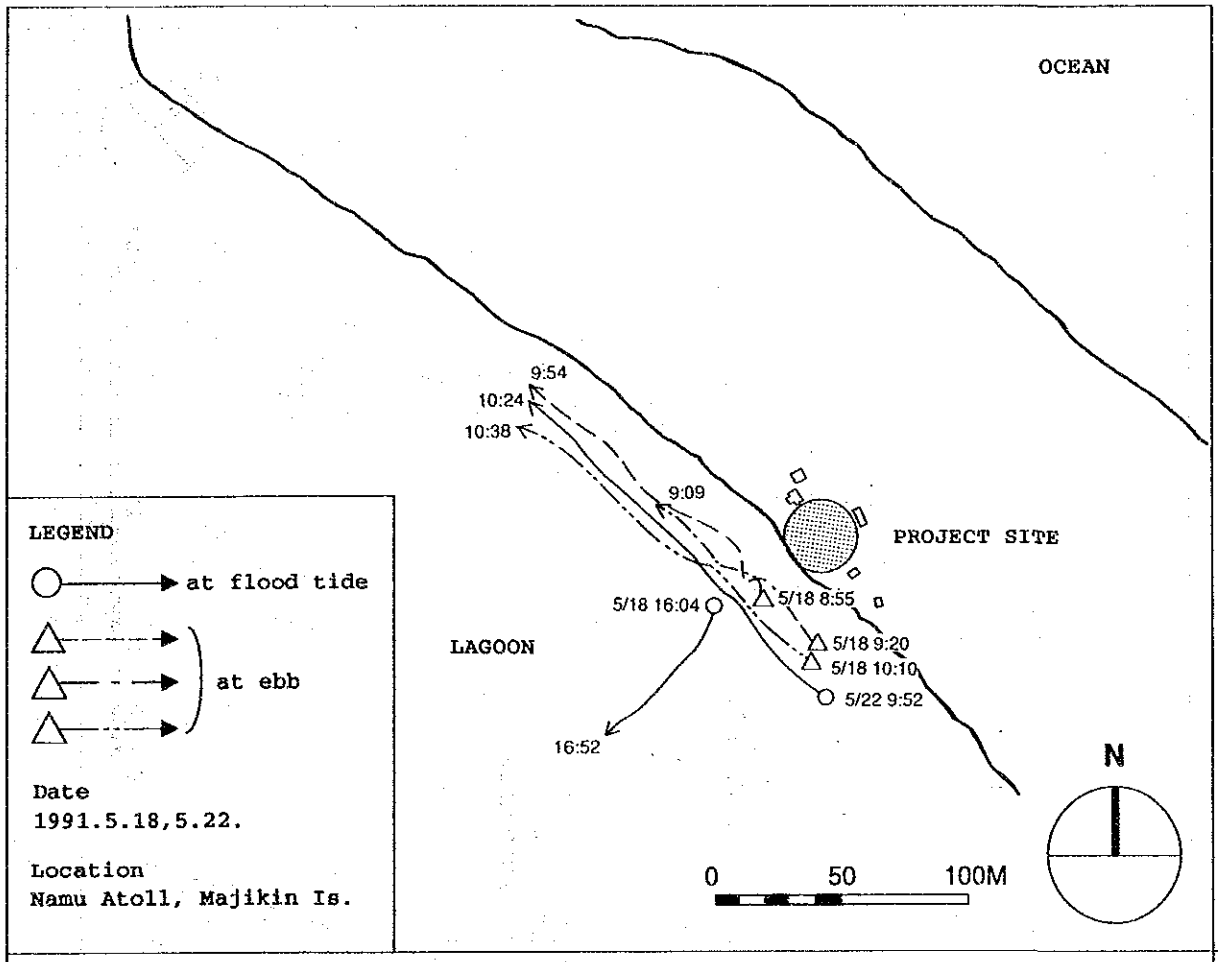


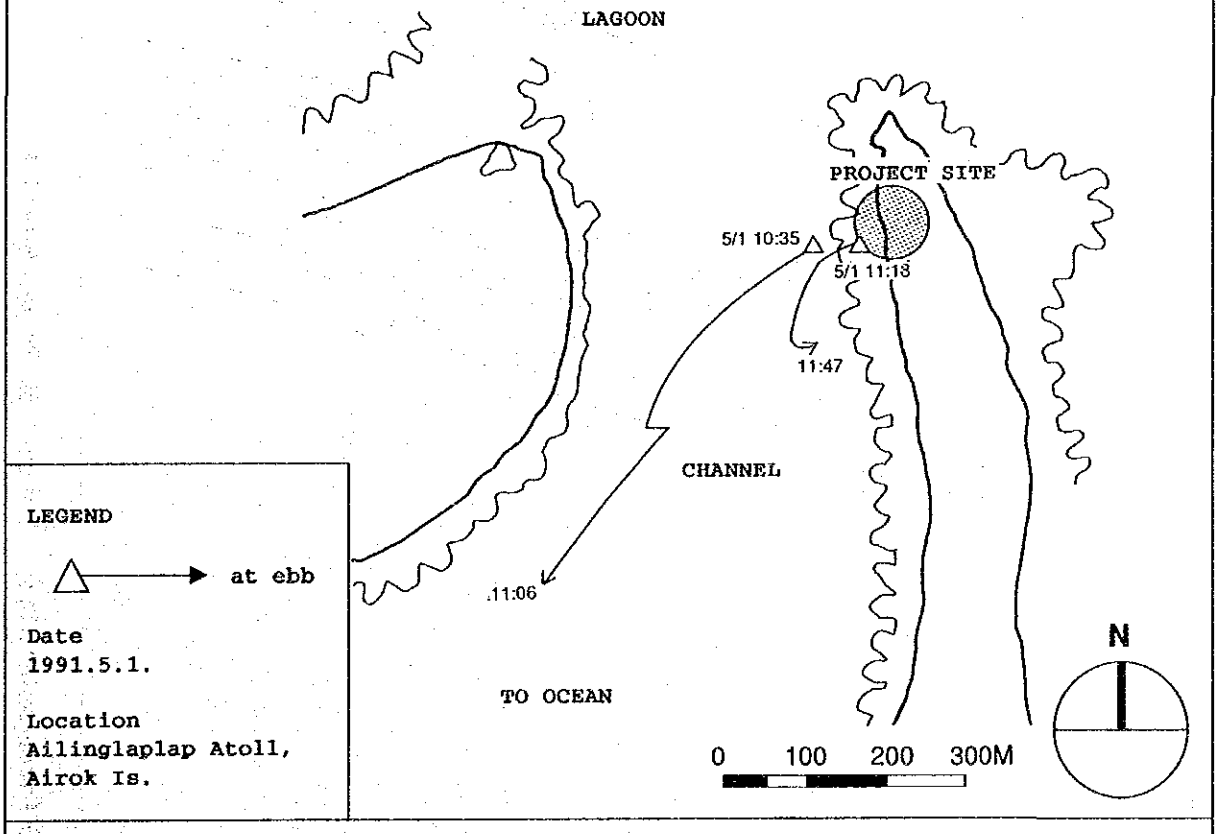
TIDAL CONSTANT

element	location	Ailinglaplap	remarks
component tides (cm)	K_1	9.5	Lunisolar diurnal
	O_1	6.4	Principal lunar diurnal
	M_2	48.2	Principal lunar
	S_2	26.5	Principal solar
Z_0 (cm)		90.6	total of 4 component tides
T type of tide		0.213 mixed tide	$T=\frac{K_1+O_1}{M_2+S_2}$
spring range(cm)		149.4	$2(H_m+H_s)$
neap range(cm)		43.3	$2(H_m-H_s)$
springe rise(cm)		165.3	$Z_0+(H_m+H_s)$
neap rise(cm)		112.3	$Z_0+(H_m-H_s)$
mean low water spring tide (cm)		15.9	$Z_0-(H_m+H_s)$
mean low water neap tide (cm)		68.9	$Z_0-(H_m-H_s)$
mean high water interval (h)		39.81	K_m /28.9841

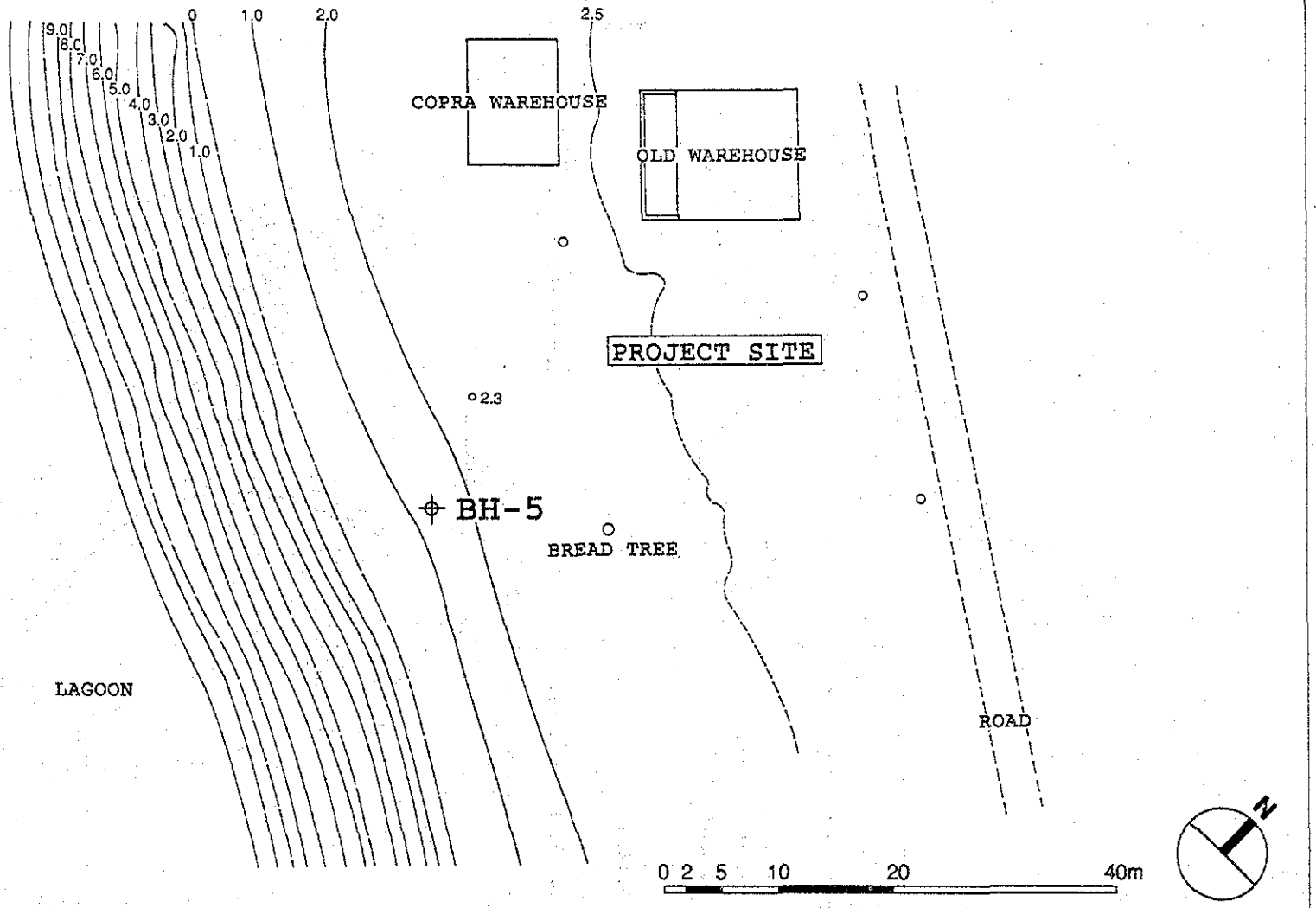
H_m wave height during principal lunar
H_s wave height during principal solar
K_m cofficient of reflection during principal lunar
K_s cofficient of reflection during principal solar

3.1 Figures of Tide Levels Ailinglaplap Atoll (2/2)

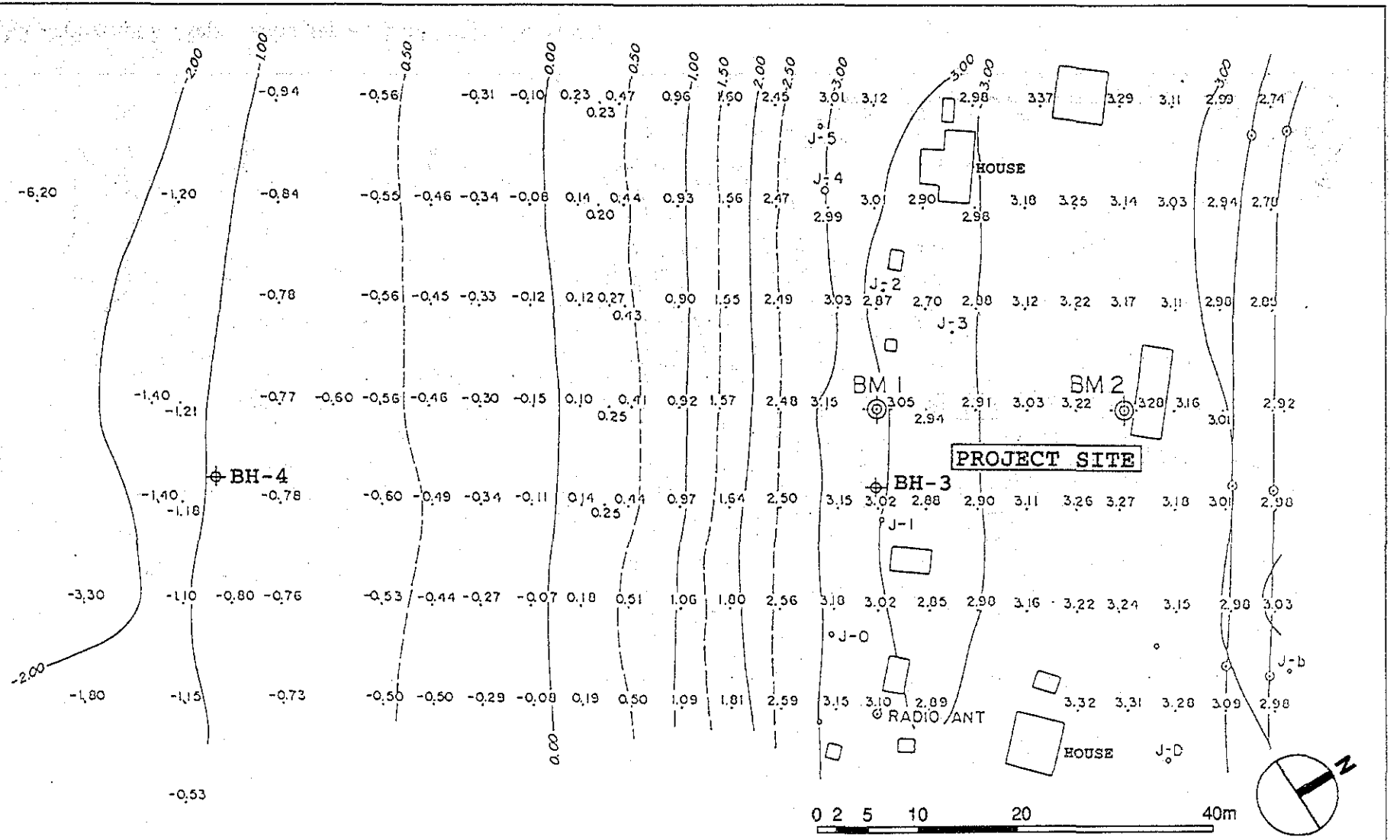




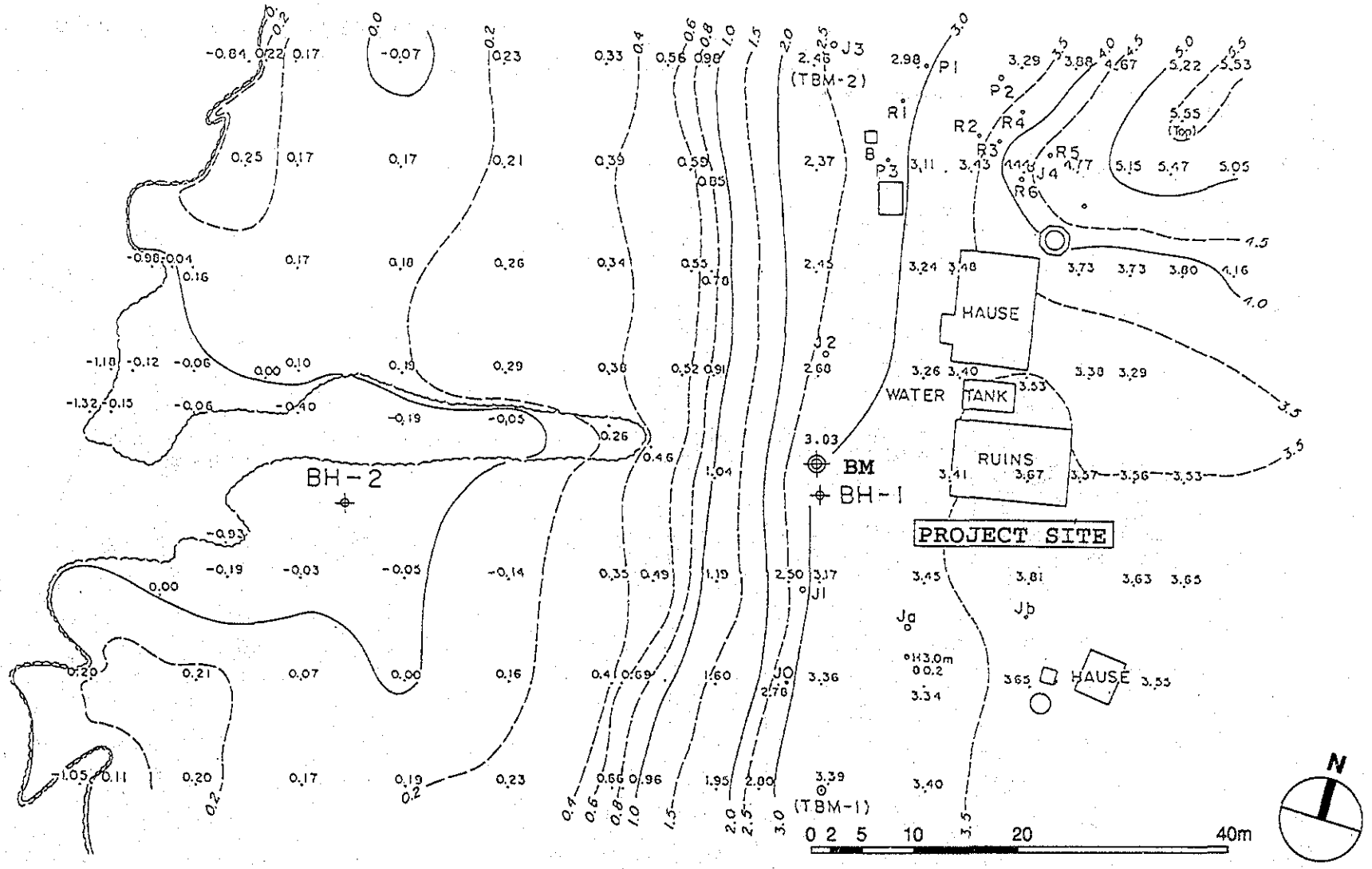
3.2 Sea Current Near the Sites



3.3 Topographic Map Likiep Atoll Project Site (1/3)



3.3 Topographic Map Namu Atoll Project Site (2/3)



3.3 Topographic Map Ailinglaplap Atoll Project Site (3/3)

WORLEY CONSULTANTS LIMITED

LOG OF DRILLHOLE

PROJECT Fish Marketing System, Marshall Islands — HOLE No BH 1

FEATURE Ailinglaplap Atoll – Bouj District ..... LOCATION Shoreline ..... CO-ORDINATES —

ANGLE FROM HORIZONTAL 90° ..... DIRECTION Down ..... R.L. COLLAR —

DESCRIPTION OF CORE (WEATHERING, RELATIVE STRENGTH, COLOUR, NAME, DEFECT TYPE, LITHOLOGICAL FEATURES (bedding, foliation, mineralogy, cement etc), STRATIGRAPHIC UNIT)	DEFECT DESCRIPTION (JOINTS, BEDDING, SEAMS, SHATTER, SHEAR AND CRUSH ZONES, FOLIATION, SCHISTOSITY – attitude, spacing, continuity, roughness, infilling, etc.) SOIL DESCRIPTION (consistency, relative density, water content, plasticity, grading, group symbol etc.)	DRILLING METHOD
Beach storm debris Coralline rock and shell Uncemented	Coralline gravel, sand and shells loose, permeable -with coralline boulders < 250 mm Ø. 4,8,9 @ 0.5 m; 4,25,11 @ 1.0 m -with cementacious shell and sand fragments, loose 5,12,7 @ 1.5 m (total water loss) 9,36,Ref @ 2.0 m	SPT
Reef coral rock & Coral debris Cemented. Jointed up to 100 mm	Coral Boulders, gravel, heads and shell cemented. Jointed, vesicular, with rare worm holes. Some voids and loose shell infilling.	NQ Triple Tube Coring
Reef coral rock and sand. -White uncemented coralline rock < 100 mm Ø and gravel with infilled sand forming beds.	Uncemented gravel & cemented sand < 50 mm. loose from 3.2 m. Some cemented and jointed up to 100 mm. -Pink/red stain on coral 3.9 – 4.2 m -Cemented 4.2 – 4.35 -Sand loose 4.5 – 4.7 m -Weakly cemented sand & gravel 4.7 – 5.1 m -Sand loose 5.1 – 5.2 m 8,6,4 @ 5.0 m	SPT
	-gravel uncemented < 20 mm with black staining, loose. -Sand loose 7.2 – 7.35 m (from drilling advance) -Sand 7.8 – 7.9 m, loose 9,7,5 @ 7.5m -Gravel <20 mm Ø, loose -Sand 8.2 – 8.3 m, loose -Sand 8.7 – 8.8 m, loose -Gravel, loose < 25 mm Ø -Sand 10.1 – 10.4 m, loose (from drilling advance)	NQ Triple Tube Coring
	End of Bore = 10.5 m	

TEST RESULT (SPT 'N'): 17, 36, 19, >50, 10, 12

CORE LOSS/LIFT %: 50 70 90

DEPTH H.A.D. (m): 1 2 3 4 5 6 7 8 9 10 11 12

DATE/DEPTH R.O.D.: 29/4/91; 30/4/91

WATER LEVEL: Date 30/4/91

DRILL WATER LOSS %: 0—100

DRILLER: Brown Bros, J. Moore

STARTED: 29-4-91

FINISHED: 30-4-91

DRILL: Gemcodril HP 7

WEATHERING
UW — Unweathered
SW — Slightly weathered
MW — Moderately weathered
HW — Highly weathered
CW — Completely weathered

RELATIVE STRENGTH
VS — Very Strong
S — Strong
MS — Moderately strong
MW — Moderately weak
W — Weak
VW — Very weak

DEFECT LOG (cms) — Spacing of natural defects. Defects/m of core

EXPLANATION
SPT = Standard Penetration Test 'N' Blows/300 mm (Ref = Refusal)
Sand size particles
Silt size particles
Gravel and boulders
Shell
-Hole collapsed @ 1.7 m 1/5/91
-Sand assessed from rate of drilling advance. No water return

PROJECT Ailinglaplap
HOLE NO: BH 1
LENGTH: 10.5 m
CORE BOXES: 2
LOGGED D.R. Schubert
DATE: 29-30/4/91
TRACED:
CHECKED:
ORIGINAL SCALE 1:50 (A3)
SHEET 1 OF 1
DRG NO 42 – 404 – 01

WORLEY CONSULTANTS LIMITED

LOG OF DRILLHOLE

PROJECT Fish Marketing System, Marshall Islands

HOLE No BH 2

FEATURE Ailinglaplap Atoll - Bouj LOCATION Centre of Shelf Recess CO-ORDINATES —

ANGLE FROM HORIZONTAL 90° DIRECTION Down R.L. COLLAR —

DESCRIPTION OF CORE WEATHERING, RELATIVE STRENGTH, COLOUR, NAME, DEFECT TYPE, LITHOLOGICAL FEATURES (bedding, foliation, mineralogy, cement etc), STRATIGRAPHIC UNIT	DEFECT DESCRIPTION (JOINTS, BEDDING, SEAMS, SHATTER, SHEAR AND CRUSH ZONES, FOLIATION, SCHISTOSITY — attitude, spacing, continuity, roughness, infilling, etc.) SOIL DESCRIPTION (consistency, relative density, water content, plasticity, grading, group symbol etc.)
Reef Platform - Debris	Coralline Boulders, gravel & shell Uncemented, loose
In-situ reef coral rock	Massive with rare joints well cemented, rare worm holes
White coralline rock Uncemented with infilled sand forming beds.	Coralline gravel and heads Uncemented with shell or sand infilling between beds. Gravel < 50 mm Dense to vesicular -Sand 2.5 - 3.1 m (sample lost) -Sand, fine, f. gravel, shell frag < 4 mm Dense compact 10,11,24 @ 3.1 m -Sand 4.0 - 4.2 m -Gravel loose 26,Ref,Ref @ 4.2 m -Sand 4.35 - 4.8 m -Gravel loose -Sand 5.2 - 5.5 dense 7,6,9 @ 5.6 m -Coralline fingers, loose -Sand 6.5 - 7.6 m dense (sample lost) -Sand dense with rare gravel frag 6,15,10 @ 7.6 m -Sand, dense 8.6 - 9.1 m 5,4,5 @ 8.6 m -Sand 9.4 - 9.6 7,10,4 @ 9.6 m -Silty Sand 9.95 - 10.1 m, loose
	End of Bore = 10.1 m

DEPTH m	TEST RESULT SPT N	CORE LOSS/LIFT %	DATE/DEPTH	WATER LEVEL Date	DRILL WATER LOSS %	DRILLING METHOD
1						75mm Rotary wash Drill NQ Triple Tube
2						
3	35		1/5/91			SPT
4	>50					NQ TT SPT
5						NQ TT
6	15					SPT
7						NQ TT
8	26		2/5/91			SPT with wash drilling
9	9					
10	14					
11						
12						

WEATHERING
UW — Unweathered
SW — Slightly weathered
MW — Moderately weathered
HW — Highly weathered
CW — Completely weathered

RELATIVE STRENGTH
VS — Very Strong
S — Strong
MS — Moderately strong
MW — Moderately weak
W — Weak
VW — Very weak

DEFECT LOG
Spacing of natural defects. Defects/m of core

EXPLANATION
SPT = Standard Penetration Test 'N' Blows/300 mm (Ref = Refusal)
Sand size particles
Silt size particles
Gravel and boulders
Shell
-Hole cased to 9.6 m
-Sand assessed from rate of drilling advance if no sample recovered

DRILLER: Brown Bros. J. Moore
STARTED: 1-5-91
FINISHED: 2-5-91
DRILL: Gemcodril HP 7

PROJECT: Ailinglaplap
HOLE NO: BH 2
LENGTH: 10.1 m
CORE BOXES: 1

LOGGED: D.R. Schubert
DATE: 29-30/4/91
TRACED:
CHECKED:
ORIGINAL SCALE 1:50 (A3)

SHEET 1 OF 1 DRG NO 42 - 401 - 01

WORLEY CONSULTANTS LIMITED

LOG OF DRILLHOLE

PROJECT: Fish Marketing System, Marshall Islands — HOLE No: BH 3

FEATURE: Namu Atoll, Majikin Island — LOCATION: Shoreline — CO-ORDINATES: —

ANGLE FROM HORIZONTAL: 90° — DIRECTION: Down — R.L. COLLAR: —

DESCRIPTION OF CORE (WEATHERING, RELATIVE STRENGTH, COLOUR, GRAIN SIZE, DEFECT TYPE, LITHOLOGICAL FEATURES (bedding, foliation, mineralogy, cement etc), STRATIGRAPHIC UNIT)	DEFECT DESCRIPTION (JOINTS, BEDDING, SEAMS, SHATTER, SHEAR AND CRUSH ZONES, FOLIATION, SCHISTOSITY — attitude, spacing, continuity, roughness, infilling, etc.) / SOIL DESCRIPTION (consistency, relative density, water content, plasticity, grading, group symbol etc.)	TEST RESULT (SPT 'N')	CORE LOSS/LIFT %	DEPTH R.H.D. (Core size, casing)	GRAPHIC LOG	SPACING OF NATURAL DEFECTS (cms)	DATE/DEPTH	R.Q.D.	WATER LEVEL (Date)	DRILL WATER LOSS %	DRILLING METHOD
Beach Storm Debris White coralline sand and gravel	Coralline Sand 1,1,2 @ 0 m Medium to fine loose	3		1							SPT with wash drilling
	-becoming, gravelly sand < 15 mm ø, loose 2,2,3 @ 1.0 m	5									
	-Sand 9,12,18 @ 2.0 m	30		2							
	9,Ref @ 3.0 m	>50		3							
Reef Limestone White corraline rock. Massive	-Coralline Rock Bounce Dense, hard. Jointed 100 – 200 mm			4							NQ Triple Tube Coring
White coralline sand and gravel Uncemented	-Gravelly Sand Med. to coarse sand, gravel < 5 mm ø			5			4/5/91				
	3,7,11 @ 5.1 m	18									SPT with wash drilling
	9,10,10 @ 6.0 m	20		6							
	-Sand (?) 5,6,6 @ 7.0 m	12		7							
	-Becoming Sandier Gravel < 20 mm ø 8,1,4 @ 8.0 m	5		8							
	11,7,5 @ 9.0 m	12		9							
	9,8,9 @ 10.0 m	17		10							
	End of Bore = 10.5 m			11							
				12							

DRILLER: Brown Bros. J. Moore

STARTED: 4-5-91

FINISHED: 4-5-91

DRILL: Gemcodrill HPZ

WEATHERING: UW — Unweathered; SW — Slightly weathered; MW — Moderately weathered; HW — Highly weathered; CW — Completely weathered

RELATIVE STRENGTH: VS — Very Strong; S — Strong; MS — Moderately strong; MW — Moderately weak; W — Weak; VW — Very weak

DEFECT LOG: Spacing of natural defects. Defects/m of core

EXPLANATION

SPT = Standard Penetration Test 'N' Blows/300 mm (Ref = Refusal)

Sand size particles

Silt size particles

Gravel size particles

Shell

-Hole cased to 10.0 m

-Sand assessed from rate of drilling advance if no sample recovered.

PROJECT: Namu Atoll — LOGGED: D.R. Schubert

HOLE NO: BH 3 — DATE: 4/5/91

LENGTH: 10.5 m — TRACED:

CHECKED:

CORE BOXES: 1 — ORIGINAL SCALE: 1:50 (A3)

SHEET 1 OF 1 — DRG NO 42-404-01

WORLEY CONSULTANTS LIMITED

LOG OF DRILLHOLE

PROJECT Fish Marketing System, Marshall Islands — HOLE No BH 4

FEATURE Namu Atoll, Majikin Island — LOCATION Marine — CO-ORDINATES

ANGLE FROM HORIZONTAL 90° — DIRECTION Down — R.L. COLLAR

DESCRIPTION OF CORE (WEATHERING, RELATIVE STRENGTH, COLOUR, NAME, DEFECT TYPE, LITHOLOGICAL FEATURES (bedding, foliation, mineralogy, cement etc), STRATIGRAPHIC UNIT)	DEPTH m	DEFECT DESCRIPTION (JOINTS, BEDDING, SEAMS, SHATTER, SHEAR AND CRUSH ZONES, FOLIATION, SCHISTOSITY — attitude, spacing, continuity, roughness, infilling, etc.) / SOIL DESCRIPTION (consistency, relative density, water content, plasticity, grading, group symbol etc.)	TEST RESULT SPT 'N'	CORE LOSS/LIFT %	GRAPHIC LOG
Lagoon storm wash debris White coralline sand & shell & gravel. Uncemented Becoming finer with depth.	1	Coralline sand. Med to coarse with shell frags < 3 mm and rare gravel < 15 mm	17		
		5,8,9 @ 0.8 m			
	2				
		7,9,10 @ 2.3 m	17		
	3	-with gravel 2.9 – 3.2 m			
		-sand becoming finer with depth. 3,9,12 @ 3.3 m	21		
	4				
		-with coral fingers < 12 mm 5,8,10 @ 4.3 m Increasing gravel to 50%	18		
—?— — —?— — — —?	5				
White and tan coralline Sand and Shell. Uncemented Very Sensitive		Fine sand with shell frags < 2 mm ø 8,11,10 @ 5.3 m	21		
	6				
		-Quick 1,0,0 @ 6.3 m	0		
	7				
		-with shell frags < 5 mm and rare shells (conical) < 20 mm long. 3,0,0 @ 7.3 m	0		
	8				
		3,3,4 @ 8.3 m	7		
	9				
		-with v.rare gravel < 25 mm 1,3 @ 9.3 m	4		
	10	-wash drill only. No wash return core not seen.			
	11				
	12	End of Bore = 11.7 m			

WATER LEVEL Date	DRILL WATER LOSS % 0—100	DRILLING METHOD
6/5/91		SPT with wash drilling

DRILLER: Brown Bros. J. Moore
STARTED: 6-5-91
FINISHED: 6-5-91
DRILL: Concodrill HP 7

WEATHERING
UW — Unweathered
SW — Slightly weathered
MW — Moderately weathered
HW — Highly weathered
CW — Completely weathered

RELATIVE STRENGTH
VS — Very Strong
S — Strong
MS — Moderately strong
MW — Moderately weak
W — Weak
VW — Very weak

DEFECT LOG
Spacing of natural defects (cm) 200 60 20 6 2 0.6 0.2 <0.2
Defects/m of core

EXPLANATION
SPT = Standard Penetration Test 'N' Blows/300 mm (0 = Sunk under own weight)
Sand size particles
Gravel size particles
Shell
-Hole cased to 9.3 m.
-Wash drill cuttings observed between SPT's

PROJECT: Namu Atoll
HOLE NO: BH 4
LENGTH: 11.7 m
CORE BOXES: 1

LOGGED: D.R. Schubert
DATE: 6/5/91
TRACED:
CHECKED:
ORIGINAL SCALE 1:50 (A3)

SHEET 1 OF 1
DRG NO 42-404-01

WORLEY CONSULTANTS LIMITED

LOG OF DRILLHOLE

PROJECT Fish Marketing System, Marshall Islands

HOLE No BH 5

FEATURE Likiep Atoll ... LOCATION Shoreline ... CO-ORDINATES —

ANGLE FROM HORIZONTAL ...90° ... DIRECTION ...Pwn... R.L. COLLAR ...—...

DESCRIPTION OF CORE

WEATHERING, RELATIVE STRENGTH, COLOUR, NAME, DEFECT TYPE, LITHOLOGICAL FEATURES (bedding, foliation, mineralogy, cement etc), STRATIGRAPHIC UNIT

ROCK WEATHERING — SW — MW — HW

RELATIVE STRENGTH — S — MS — W

TEST RESULT — SPT 'N'

CORE LOSS/LIFT % — 5 — 10 — 50

DEPTH H.A.D. — Core barrel, casing — E

GRAPHIC LOG

SPACING OF NATURAL DEFECTS (cms) — 50 — 10 — 5 — 1

DEFECT DESCRIPTION
(JOINTS, BEDDING, SEAMS, SHATTER, SHEAR AND CRUSH ZONES, FOLIATION, SCHISTOSITY — attitude, spacing, continuity, roughness, infilling, etc.)

SOIL DESCRIPTION
(consistency, relative density, water content, plasticity, grading, group symbol etc.)

DATE/DEPTH R.Q.D. — WATER LEVEL — Date — DRILL WATER LOSS % — 0—100 — DRILLING METHOD

Description	Test / Depth	Defect / Soil Description
Lagoon Storm Wash Debris White and tan coralline Sand and gravel. Decreasing gravel with depth. Uncemented		
	13 @ 1	Coralline Gravel < 100 mm ø — 5,6,7 @ 1.0 m
	12 @ 2	Coralline Sand and Gravel. Interbedded 20 mm to 200 mm Sand fine – med. gravel < 25 mm Dense with rare vesicles and worm holes — 6,8,4 @ 2.0 m
	14 @ 3	–Sand becoming fine – coarse — 6,6,8 @ 3.0 m
	16 @ 4	–with rare shell < 5 mm — 7,7,9 @ 4.0 m
	18 @ 5	–5.3 m gravel black stain gravel content decreasing with depth — 1,8,10 @ 5.0m
	27 @ 6	–Compact — 4,14,13 @ 6.0m
	13 @ 7	–with rare gravel — 5,7,6 @ 7.0 m
	16 @ 8	6,7,9 @ 8.0 m
	16 @ 9	5,7,9 @ 9.0 m
	21 @ 10	7,10,11 @ 10.0 m
	12 @ 11	2,5,7 @ 11.5 m
	12	End of Bore = 12.0 m

9/5/91

SPT with wash drilling

DRILLER: Brown Bros. J. Moore
STARTED: 9-5-91
FINISHED: 9-5-91
DRILL: Gemcodrill HP 7

WEATHERING
UW — Unweathered
SW — Slightly weathered
MW — Moderately weathered
HW — Highly weathered
CW — Completely weathered

RELATIVE STRENGTH
VS — Very Strong
S — Strong
MS — Moderately strong
MW — Moderately weak
W — Weak
VW — Very weak

DEFECT LOG
(cms) 100 50 20 10 5 1
Spacing of natural defects.
Defects/m of core

EXPLANATION
SPT = Standard Penetration Test 'N' Blows/300 mm
Sand size particles
Gravel size particles
Shell
–Hole cased to 11.5 m
–Wash drill cuttings observed between SPT's

PROJECT: Likiep Atoll
HOLE NO: BH 5
LENGTH: 12.0 m
CORE BOXES: 1

LOGGED: D.R. Schubert
DATE: 9/5/91
TRACED:
CHECKED:
ORIGINAL SCALE 1:50 (A3)

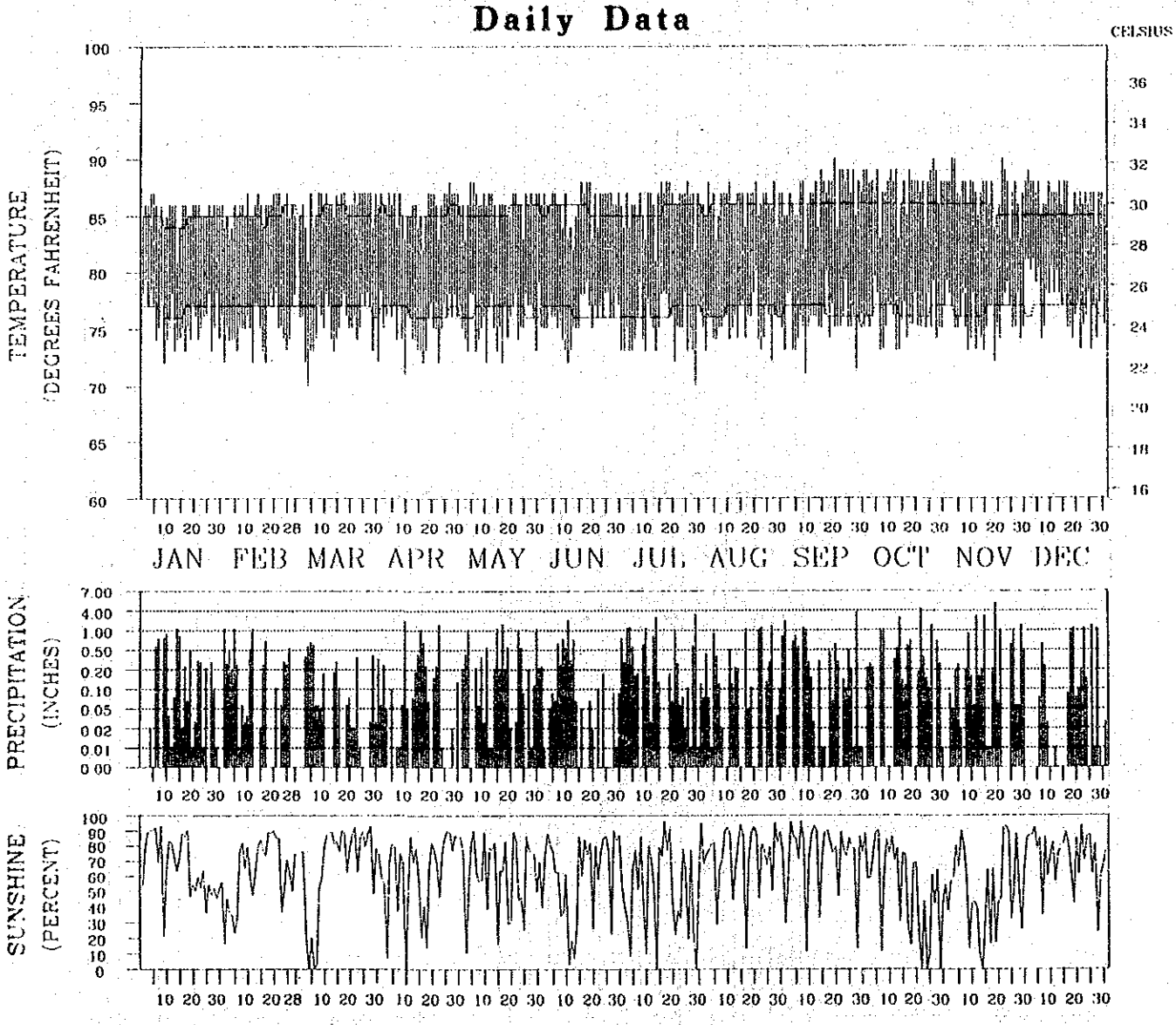
SHEET 1 ...OF... 1
DRG NO 42 – 404 – 01

(1/4)
ISSN 0198 4330

1989 ANNUAL SUMMARY WITH COMPARATIVE DATA

MAJURO, MARSHALL ISLANDS,
PACIFIC

Daily Data



TEMPERATURE DEPICTS NORMAL MAXIMUM, NORMAL MINIMUM AND ACTUAL DAILY HIGH AND LOW VALUES (FAHRENHEIT)
PRECIPITATION IS MEASURED IN INCHES, SCALE IS NON-LINEAR
SUNSHINE IS PERCENT OF THE POSSIBLE SUNSHINE

I CERTIFY THAT THIS IS AN OFFICIAL PUBLICATION OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, AND IS COMPILED FROM RECORDS ON FILE AT THE NATIONAL CLIMATIC DATA CENTER, ASHEVILLE, NORTH CAROLINA, 28801

Kenneth D Hadeen
DIRECTOR
NATIONAL CLIMATIC DATA CENTER

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METEOROLOGICAL DATA FOR 1989

MAJURO, MARSHALL ISLANDS, PACIFIC

LATITUDE: 7°05' N LONGITUDE: 171°23E ELEVATION: FT. GRND 10 BARO 8 TIME ZONE: 180E MER WBAN: 40710

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:													
Averages													
-Daily Maximum	85.5	85.6	86.0	85.8	86.1	86.0	86.1	86.4	86.9	87.5	87.1	86.8	86.3
Daily Minimum	75.5	75.0	75.2	75.2	75.5	75.9	74.9	75.4	75.3	75.6	75.7	77.1	75.5
Monthly	80.5	80.3	80.6	80.5	80.8	81.0	80.5	80.9	81.1	81.6	81.4	82.0	80.9
-Monthly Dewpt.	74.6	74.3	73.9	74.9	75.8	75.2	75.2	75.1	74.9	75.4	75.6	76.1	75.0
Extremes													
-Highest	87	87	87	88	88	88	88	88	90	90	90	83	90
-Date	5	25	30	27	6	19	26	28	20	27	22	2	NOV 22
-Lowest	72	72	70	71	72	72	70	72	71	73	72	73	70
-Date	9	17	4	10	17	11	29	27	28	14	19	26	JUL 29
DEGREE DAYS BASE 65 °F:													
Heating	0	0	0	0	0	0	0	0	0	0	0	0	0
Cooling	488	436	492	473	499	488	488	499	493	521	500	534	5911
% OF POSSIBLE SUNSHINE	66	63	67	62	63	61	52	73	73	52	51	73	63
AVG. SKY COVER (tenths)													
Sunrise - Sunset	7.8	8.4	7.6	9.2	9.2	8.2	8.8	8.7	8.9	8.5	9.3	9.2	8.7
Midnight - Midnight	7.8	8.2	7.6	9.0	9.1	7.9	8.7	8.6	8.7	8.4	9.0	9.0	8.5
NUMBER OF DAYS:													
Sunrise to Sunset													
-Clear	2	0	1	0	0	1	0	0	0	0	0	0	4
-Partly Cloudy	9	7	13	4	3	7	6	7	7	8	3	5	79
-Cloudy	20	21	17	26	28	22	25	24	23	23	27	26	282
Precipitation .01 inches or more	23	20	21	22	26	21	27	23	24	21	25	18	271
Snow, Ice pellets 1.0 inches or more	0	0	0	0	0	0	0	0	0	0	0	0	0
Thunderstorms	0	0	0	0	2	1	4	0	5	3	2	0	17
Heavy fog, visibility 1/4 mile or less	0	0	0	0	0	0	0	0	0	0	0	0	0
Temperature °F													
-Maximum													
90° and above	0	0	0	0	0	0	0	0	1	1	3	0	5
32° and below	0	0	0	0	0	0	0	0	0	0	0	0	0
-Minimum													
32° and below	0	0	0	0	0	0	0	0	0	0	0	0	0
0° and below	0	0	0	0	0	0	0	0	0	0	0	0	0
AVG. STATION PRESS. (mb)	1008.1	1009.1	1009.5	1008.5	1009.5	1010.5	1009.8	1009.8	1009.8	1009.1	1007.8	1009.5	1009.1
RELATIVE HUMIDITY (%)													
Hour 00	82	82	83	85	85	83	86	85	84	84	83	80	84
Hour 06 (Local Time)	83	85	83	85	85	85	86	85	85	85	84	80	77
Hour 12	77	77	75	78	81	78	79	78	76	75	77	77	81
Hour 18	80	80	79	81	84	82	82	80	79	81	81	80	84
PRECIPITATION (inches):													
Water Equivalent													
-Total	7.75	8.30	4.76	8.54	11.18	7.20	17.44	10.34	14.55	16.41	19.84	8.52	134.83
-Greatest (24 hrs)	1.50	1.59	1.34	2.52	1.98	2.75	4.02	1.75	3.75	4.70	5.20	1.85	5.20
-Date	9-10	1-2	5-6	10	16-17	11-12	28-29	27	28	22-23	18-19	18-19	NOV 18-19
Snow, Ice pellets													
-Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-Greatest (24 hrs)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-Date													
WIND:													
Resultant													
-Direction (!!)	068	066	065	066	068	072	073	076	071	083	091	062	068
-Speed (mph)	12.9	10.2	10.7	11.8	12.3	10.1	7.2	5.3	2.1	3.2	2.8	11.3	8.3
Average Speed (mph)	13.3	11.7	11.5	12.4	12.9	10.8	9.3	7.6	6.3	6.8	7.7	11.9	10.2
Fastest Obs. 1 Min.													
-Direction (!!)	06	06	06	10	07	07	06	06	15	11	10	06	06
-Speed (mph)	28	26	24	24	25	23	25	23	21	24	22	25	28
-Date	21	19	9	23	27	21	13	21	1	14	30	23	JAN 21
Peak Gust													
-Direction (!!)	NE	E	E	NE	NE	E	E	E	NE	E	W	NE	NE
-Speed (mph)	35	33	32	35	37	35	40	32	31	40	29	40	40
-Date	28	17	31	18	14	12	13	25	18	14	19	23	DEC 23

(!!) See Reference Notes on Page 68

NORMALS, MEANS, AND EXTREMES

MAJURO, MARSHALL ISLANDS, PACIFIC

LATITUDE: 7°05'N LONGITUDE: 171°23'E ELEVATION: FT. GRND 10 BARO 8 TIME ZONE: 180E MER URBAN: 40710

	Tal	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:														
Normals														
-Daily Maximum		84.7	85.1	85.3	85.2	85.4	85.5	85.5	85.9	86.0	86.0	85.6	85.0	85.4
-Daily Minimum		76.7	77.0	76.9	76.5	76.6	76.4	76.4	76.6	75.5	76.5	76.6	76.8	76.6
-Monthly		80.7	81.1	81.1	80.9	81.0	81.0	81.0	81.3	81.3	81.3	81.1	80.9	81.1
Extremes														
-Record Highest	34	89	88	89	89	90	89	90	91	90	91	90	90	91
-Year		1979	1988	1988	1983	1986	1986	1980	1969	1989	1958	1989	1979	AUG 1969
-Record Lowest	34	69	70	70	70	70	70	70	71	71	70	70	70	69
-Year		1958	1985	1989	1985	1985	1958	1989	1986	1989	1984	1984	1984	JAN 1958
NORMAL DEGREE DAYS:														
Heating (base 65°F)		0	0	0	0	0	0	0	0	0	0	0	0	0
Cooling (base 65°F)		487	451	499	477	496	480	496	505	483	505	483	493	5861
% OF POSSIBLE SUNSHINE	29	62	64	66	58	59	55	56	61	59	55	54	54	59
MEAN SKY COVER (tenths)														
Sunrise - Sunset	33	8.6	8.3	8.4	8.6	8.6	8.6	8.6	8.4	8.6	8.6	8.7	8.7	8.6
MEAN NUMBER OF DAYS:														
Sunrise to Sunset														
-Clear	33	0.9	1.0	1.2	0.7	0.7	0.4	0.6	0.7	0.9	0.8	0.5	0.6	8.9
-Partly Cloudy	33	6.6	7.5	7.3	6.8	6.8	6.6	6.2	8.1	6.3	6.7	6.6	6.1	81.5
-Cloudy	33	23.5	19.8	22.5	22.5	23.5	23.1	24.2	22.2	22.8	23.5	22.9	24.3	274.9
Precipitation .01 inches or more	35	17.3	15.6	18.2	21.0	23.4	24.2	24.5	23.4	22.6	23.6	23.1	22.0	259.0
Snow, Ice pellets 1.0 inches or more	35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thunderstorms	19	0.3	0.5	0.6	0.5	1.0	1.9	1.7	1.7	2.8	2.2	2.1	1.0	16.4
Heavy Fog Visibility 1/4 mile or less	20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature °F														
-Maximum														
90° and above	35	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.3	0.3	0.5	0.2	0.1	1.4
32° and below	35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-Minimum														
32° and below	35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0° and below	35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AVG. STATION PRESS.(mb)	12	1008.8	1009.3	1009.5	1009.3	1009.6	1009.4	1009.2	1009.5	1009.3	1008.8	1008.3	1008.5	1009.1
RELATIVE HUMIDITY (%)														
Hour 00	33	80	80	81	83	84	84	83	82	82	82	82	82	82
Hour 06 (Local Time)	34	81	80	81	84	85	85	84	84	83	83	83	82	83
Hour 12	34	75	74	74	77	78	78	78	77	76	76	77	77	76
Hour 18	33	78	77	78	80	81	80	80	78	78	79	80	79	79
PRECIPITATION (inches):														
Water Equivalent														
-Normal		7.99	6.37	8.96	11.91	12.32	12.04	12.65	11.61	13.09	15.24	13.47	11.52	137.17
-Maximum Monthly	35	21.97	18.34	18.51	31.10	22.23	17.63	21.17	19.98	21.11	24.26	23.56	24.80	31.10
-Year		1961	1957	1955	1971	1956	1975	1987	1986	1964	1955	1978	1968	APR 1971
-Minimum Monthly	35	0.78	0.40	0.66	1.97	1.49	5.40	5.34	5.33	6.42	7.11	4.53	2.28	0.40
-Year		1973	1970	1983	1983	1983	1984	1961	1959	1984	1969	1972	1957	FEB 1970
-Maximum in 24 hrs	35	9.57	6.28	8.14	6.63	5.86	7.39	5.86	5.29	5.76	8.74	10.01	17.88	17.88
-Year		1961	1957	1972	1973	1962	1983	1987	1986	1982	1974	1957	1972	DEC 1972
Snow, Ice pellets														
-Maximum Monthly		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
-Year														
-Maximum in 24 hrs	35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
-Year														
WIND:														
Mean Speed (mph)	25	12.8	13.6	13.1	12.1	11.2	10.0	8.5	7.4	7.1	7.5	8.9	12.4	10.4
Prevailing Direction through 1963		ENE	ENE	ENE	ENE	ENE	ENE	ENE	ENE	E	E	E	ENE	ENE
Fastest Mile														
-Direction (!!!)	31	W	E	NE	E	E	NE	E	NW	E	E	SW	E	W
-Speed (MPH)	31	47	35	36	35	38	38	34	33	36	38	45	38	47
-Year		1988	1962	1959	1963	1962	1964	1973	1986	1973	1985	1982	1973	JAN 1988
Peak Gust														
-Direction (!!!)	6	W	E	E	NE	NE	E	E	NW	E	E	SW	E	W
-Speed (mph)	6	52	39	40	35	37	40	40	38	39	47	39	43	52
-Date		1988	1984	1986	1989	1989	1984	1989	1986	1984	1985	1984	1988	JAN 1988

(!!!) See Reference Notes on Page 6B.
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PRECIPITATION (inches)

MAJURO, MARSHALL ISLANDS, PACIFIC

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
1960	9.17	3.60	11.17	23.41	14.27	13.22	14.10	14.59	16.93	9.71	16.32	6.64	153.03
1961	21.97	6.50	4.24	8.50	8.34	13.90	5.34	11.31	11.14	11.50	12.04	16.91	131.69
1962	17.55	5.15	11.48	5.95	12.01	7.54	11.02	8.91	21.03	16.36	22.69	11.71	151.40
1963	17.46	9.57	12.43	6.21	11.31	11.96	11.69	10.76	6.83	13.13	11.60	8.57	131.52
1964	1.40	6.99	7.23	11.46	22.02	11.16	18.69	15.58	21.11	22.79	16.85	7.42	162.70
1965	9.85	5.32	1.98	4.69	7.93	11.45	14.85	6.92	15.46	14.71	13.15	9.55	114.81
1966	3.79	4.42	5.80	16.03	8.64	9.40	14.94	6.52	13.96	13.53	13.24	19.44	138.70
1967	11.88	9.72	12.46	7.64	4.93	10.98	13.87	7.99	13.78	15.16	11.16	6.48	126.05
1968	5.38	3.49	11.12	8.86	9.33	16.07	11.39	11.50	9.77	12.06	11.97	24.80	135.74
1969	8.22	2.35	16.17	17.21	8.78	13.01	16.65	10.24	15.65	7.11	11.68	7.21	134.28
1970	5.62	0.40	1.73	2.87	9.23	10.66	7.73	11.24	11.75	12.64	6.68	8.40	88.95
1971	8.21	5.74	9.80	31.10	19.86	13.42	15.49	14.92	7.93	18.06	9.46	8.40	162.39
1972	9.58	7.11	15.45	9.17	14.96	14.88	14.76	10.84	18.96	14.06	4.53	23.36	157.66
1973	0.78	1.84	11.05	14.59	14.33	12.23	7.29	13.86	12.78	13.79	14.21	7.24	123.99
1974	11.09	8.07	7.18	15.67	12.84	13.66	12.48	13.69	10.44	19.90	9.29	14.49	148.80
1975	5.20	3.21	7.77	12.76	10.58	17.63	14.23	16.35	16.51	18.29	15.28	13.95	151.76
1976	8.57	9.42	15.68	19.41	15.28	9.43	16.78	8.36	17.66	8.95	12.70	2.77	145.01
1977	2.39	0.77	2.60	10.62	17.21	8.37	10.88	11.15	9.72	17.59	11.85	18.88	122.03
1978	3.60	5.25	3.39	12.65	13.90	10.70	16.25	8.86	9.73	20.56	23.56	14.35	142.80
1979	6.78	2.77	7.14	11.75	7.91	13.23	6.67	13.03	6.54	15.04	11.33	7.10	109.29
1980	8.11	9.70	5.05	7.03	11.34	6.73	8.48	13.89	12.85	9.25	5.35	10.56	108.34
1981	0.90	4.34	17.40	10.20	9.04	5.43	16.53	12.24	6.71	7.28	14.61	14.47	119.15
1982	12.63	9.72	13.29	4.68	11.46	16.98	14.66	11.72	18.94	8.17	19.08	3.17	144.50
1983	0.83	0.98	0.66	1.97	1.49	14.45	12.58	6.05	11.25	13.47	9.84	12.74	86.31
1984	16.12	16.83	1.29	3.87	4.18	5.40	9.35	9.20	6.42	14.77	13.31	14.95	115.69
1985	8.70	16.56	4.59	15.38	9.67	14.67	13.18	16.77	8.03	18.06	12.81	11.30	149.72
1986	10.51	3.91	14.75	12.23	14.94	15.89	12.09	19.98	10.52	7.32	9.37	17.10	148.61
1987	6.24	10.38	4.90	2.14	9.22	14.76	21.17	8.36	11.09	11.29	15.45	7.48	122.48
1988	14.65	1.52	6.76	5.92	6.85	9.11	14.33	10.59	13.86	17.87	7.19	13.65	122.30
1989	7.75	8.30	4.76	8.54	11.18	7.20	17.44	10.34	14.55	16.41	19.84	8.52	134.83
Record Mean	8.17	6.80	8.61	10.71	11.22	11.97	13.05	11.55	12.62	14.52	13.37	11.28	133.86

See Reference Notes on Page 6B.
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AVERAGE TEMPERATURE (deg. F)

MAJURO, MARSHALL ISLANDS, PACIFIC

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
1960	81.0	81.6	81.5	80.2	80.6	80.6	81.1	81.2	81.7	82.3	81.8	81.7	81.3
1961	81.3	81.8	82.6	81.7	81.5	81.2	81.5	81.3	81.1	81.9	81.4	80.9	81.5
1962	80.9	81.6	80.7	81.7	82.2	81.3	81.2	81.8	81.0	81.5	80.7	81.5	81.3
1963	80.5	80.5	80.7	82.1	82.3	81.8	81.7	82.2	82.8	81.7	81.8	81.3	81.6
1964	81.8	81.6	81.3	81.4	81.1	80.7	80.8	80.8	80.5	80.7	80.7	80.8	81.0
1965	80.2	80.5	81.5	81.3	81.0	81.2	80.7	82.1	81.3	81.4	81.0	80.8	81.1
1966	81.0	81.3	81.3	80.7	81.7	81.7	81.9	82.5	81.8	81.9	81.2	80.9	81.5
1967	81.0	80.8	80.2	81.2	82.0	81.3	81.4	82.2	82.0	81.4	81.2	81.5	81.4
1968	81.1	81.4	80.3	80.6	80.8	81.1	80.9	81.4	81.8	81.1	81.1	80.6	81.0
1969	80.1	81.1	81.0	80.7	81.5	81.2	80.5	81.6	81.5	82.4	82.0	81.3	81.2
1970	81.2	82.0	82.0	82.1	81.5	80.7	81.1	80.8	81.1	80.6	81.2	80.6	81.3
1971	80.6	80.9	80.9	79.5	80.0	80.2	80.5	80.1	80.8	80.5	81.1	80.5	80.5
1972	80.2	80.9	80.8	80.8	81.2	81.5	80.9	81.2	81.3	80.9	81.7	80.8	81.0
1973	80.9	81.8	81.6	81.3	80.6	80.8	80.9	80.8	80.2	80.5	80.7	81.1	80.9
1974	79.9	80.8	80.8	80.5	80.8	80.6	80.7	81.0	80.9	81.0	80.9	80.3	80.7
1975	80.4	81.0	80.7	80.2	80.5	79.7	79.7	79.9	80.0	78.8	79.4	79.5	80.0
1976	79.4	79.4	79.6	79.5	80.0	80.0	80.0	80.7	80.4	81.4	80.2	80.1	80.1
1977	80.3	81.3	81.5	80.5	80.1	81.2	80.9	81.2	82.4	81.1	81.2	81.1	81.1
1978	81.2	81.1	81.5	80.9	80.5	80.9	80.4	81.5	81.6	81.2	80.6	80.3	81.0
1979	81.2	81.0	81.6	79.7	80.9	81.5	81.5	80.9	82.0	82.1	81.8	81.7	81.3
1980	81.4	81.3	81.3	81.6	81.5	81.9	81.5	81.5	81.7	82.2	81.9	81.0	81.6
1981	81.4	81.5	81.0	80.9	81.4	82.0	80.8	81.4	82.0	82.0	81.0	80.6	81.3
1982	80.5	80.7	80.5	81.8	81.3	81.3	81.1	81.3	81.4	82.0	81.4	80.2	81.1
1983	80.1	80.5	81.4	82.2	83.0	81.4	81.3	82.2	81.8	80.9	81.0	80.3	81.3
1984	80.6	80.6	82.0	81.9	81.5	80.3	80.6	81.1	81.2	80.8	80.6	80.9	81.0
1985	80.8	80.3	80.7	79.8	81.1	80.4	80.7	80.4	81.5	81.4	81.5	80.9	80.8
1986	81.1	81.9	80.3	81.1	81.7	81.1	81.7	81.8	81.8	82.1	81.9	80.5	81.4
1987	80.6	80.7	81.0	81.8	81.5	81.1	80.9	82.1	81.8	82.2	81.8	81.2	81.4
1988	80.9	81.9	81.8	82.1	81.8	81.3	80.2	80.9	80.6	80.3	81.2	80.4	81.1
1989	80.5	80.3	80.6	80.5	80.8	81.0	80.5	80.9	81.1	81.6	81.4	82.0	80.9
Record Mean	80.7	81.1	81.1	81.0	81.2	81.0	80.9	81.3	81.4	81.3	81.2	80.8	81.1
Max	84.9	85.3	85.5	85.5	85.8	85.7	85.6	86.1	86.3	86.2	85.9	85.2	85.7
Min	76.5	76.8	76.6	76.5	76.6	76.3	76.2	76.4	76.4	76.3	76.4	76.5	76.5

See Reference Notes on Page 6B.
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APPENDIX - 4

Appendix 4 Estimation of Fish Demand in Ebeye Island

The trend of fresh fish consumption indicated below is based on the interview survey conducted in Ebeye Island.

	Present Condition	Potential Demand
Frequency of fresh fish consumption	Once a week	Thrice a week
Amount of fish fish consumed each time (g/person)	270	270

Potential demand is estimated based on the dialogue with each family on actual consumption of available fresh fish while comparing their preference with other proteins including chickens and canned fish.

Based on the above, the annual per capita consumption of fresh fish is estimated as shown below.

0.27 kg/person x 365 days x 3/7 = 42.2 kg/person

Therefore, the annual potential demand of fresh fish for Ebeye Island (population of 9,600 persons) is estimated as follows.

42.2 kg/person x 9,600 persons = 405,000 kg

On an average, the potential demand of fresh fish per day is estimated as indicated below.

405,000 kg ÷ 365 days = 1,110 kg

Meanwhile in Ebeye Island the present consumption of fresh fish caught for self consumption meets one third of the potential demand shown in the above table. The consumption is mainly on Saturdays and Sundays, and the consumption volume is estimated as shown below.

0.27 kg/person x 9,600 persons = 2,590 kg

APPENDIX - 5

Appendix 5 Financial Analysis

5-1 Estimation of Revenue

Revenue which will be generated with the implementation of the Project was calculated on the following conditions:

1) The volume of fish products which will be transported from the outer islands to Ebeye will be 700 kg per trip. Profits do not include income from handicrafts, rice, and other commodities which will be transported.

2) In the initial year of Project operations, fish products will be transported once a month from each of the three outer islands to Ebeye. This will be increased to twice a month from the second year of operations.

3) The purchase price of fish products from the producers and the sales price on Ebeye Island are given in section 3.2.1 of this report. However the retail price of fish may drop with an increase in the supply volume of fish. The sales price was set assuming 10 percent drop from the price mentioned in section 3.2.1.

Producer's price of fish from the fishermen: US $1.00/kg
Sale's price of fish on Ebeye Island: US $2.47/kg x 0.9 = US$2.22/kg

Based on this the estimated revenue for the first and second years of operation is shown as follows:

In the first year of operation: 700 kg/time x 1 time/month x 12 months x (US$2.22 - $1.00) x 3 islands = US $30,700

In the second year of operation: 700 kg/time x 2 times/month x 12 months x (US$2.22 - $1.00) x 3 islands = US $61,400

5-2 Estimation of Operation Costs

(1) Fuel Costs

Fuel costs incurred by the transport boat, emergency generator, and tractor will be included. The fuel cost of the fishing boat which will be used for demonstration purposes will be collected from the fishermen using the boat and will not be included in the financial analysis of the Project.

1) Transport Boat

The fuel costs incurred by the transport boat was estimated under the following conditions.

- Cruising speed: 8 knots
- Frequency and navigational hours of each trip (the effects of the wind and waves have also been considered):

		First Year	Second Year
From Likiep to Ebeye	40 hours	Once/month	Twice/month
From Namu to Ebeye	13 hours	Once/month	Twice/month
From Ailinglaplap to Ebeye	37 hours	Once/month	Twice/month
From Majuro to Ebeye (for inspection)	78 hours	Once/year	Once/year

- Rate of fuel consumption: 25 liters/hour
- Price of diesel oil: US$0.30/liter (assuming 10 percent increase in fuel price)

Based on the above, the fuel costs of the transport boat for the first and second year of Project operations are as follows:

In the first year of operation: {(40+13+37)hours/time x 12 times +78 hours} x 25 liters/hour x US $0.30/liter = US $8,690

In the second year of operation: {(40+13+37)hours/time x 24 times + 78 hours} x 25 liters/hour x US $0.30/liter = US $16,790

2) Emergency Generator

Operating hours : 880 hours annually (about 2.4 hours/day)

Rate of fuel consumption: 2.0 liters/hour

Based on the above conditions, the fuel costs for the emergency generator have been calculated as follows:

880 hours x 2.0 liters/hour x US $0.30/liter x 3 freezers = US$1,590

3) Tractor

Operating hours : 200 days/year x 5 hours/day = 1000 hours/year

Rate of fuel consumption: 3.0 liters/hour

Based on the above, fuel costs for the tractor have been calculated as follows:

1000 hours x 3.0 liters/hour x US $0.30/liter x 3 tractors = US $2,700

The total estimated fuel cost of items 1), 2), and 3) in the above is as follows:

In the first year of operation: US$12,980

In the second year of operation: US $21,080

(2) Personnel Costs

Based on the salary scale of civil service personnel and workers in the private sector, technical skills, and working hours, the personnel costs of the Project for the first year and second year of operations were estimated and are shown below. The supervision of the Project will be carried out by MIMRA personnel and are therefore, not included in the personnel costs of the Project.

Unit: US$/year

	First Year Operation	Second Year Operation
Three (3) personnel in charge of collection on the outer islands	3,600	7,200
One (1) personnel in charge of sales on Ebeye	3,000	6,000
Captain of transport ship	4,200	8,400
Engineer of transport ship	3,600	7,200
Total	14,400	28,800

(3) Maintenance Costs of Facilities

The maintenance of major facilities and equipment outlined in section 3.3.5, are as follows:

1) Transport Boat

	First Year Operation	Second Year Operation	Unit (US$)
Replace engine oil & filter	4 times a year	8 times a year	120
Replace fuel filter	2 times a year	4 times a year	50
Replace transmission oil	1 time a year	2 times a year	90
Periodic inspection	1 time a year	1 time a year	2,200
Total Annual Costs (US$)	2,870	3,540	

2) Fishing Boat (for demonstration)

Replace engine oil & filter	1 time/year	100 x 3 boats	=	US $300
Replace fuel filter	1 time/2 years	50 x 3 boats	=	US $150
Replace transmission oil	1 time/3 years	90 x 3 boats	=	US $270
Periodic inspection	1 time/5 years	1,600 x 3 boats	=	US $5,400

3) Solar Power System

Supplement distilled water	once/year	negligible
Replace batteries	once/7 years	US$15,400 x 3 islands = US$46,200 or US$6,600/year

5-3 Balance Sheet

An estimated balance and cash flow of the Project based on the revenue and operating costs given in the above is as follows:

Balance Sheet

Unit: US$

Year	1	2	3	4	5	6	7	8	9	10
Revenue	30,700	61,400	61,400	61,400	61,400	61,400	61,400	61,400	61,400	61,400
Operation Cost	30,550	53,870	59,390	53,870	53,720	59,540	99,920	53,870	59,390	53,870
Fuel Cost	12,980	21,080	21,080	21,080	21,080	21,080	21,080	21,080	21,080	21,080
Personnel Cost	14,400	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800
Maintenance Cost	3,170	3,990	9,510	3,990	3,840	9,660	50,040	3,990	9,510	3,990
Net Income	150	7,530	2,010	7,530	7,680	1,860	-38,520	7,530	2,010	7,530

Source: Marshall Islands Statistical Abstract 1988/89

Cash Flow

Unit: US$

Year	1	2	3	4	5	6	7	8	9	10
Balance at begining	0	5,150	12,680	14,690	22,220	29,900	31,760	0	7,530	9,540
Government Fund	5,000	0	0	0	0	0	6,760	0	0	0
Depreciation	0	0	0	0	0	0	0	0	0	0
Net Income	150	7,530	2,010	7,530	7,680	1,860	-38,520	7,530	2,010	7,530
Sub-total	5,150	12,680	14,690	22,220	29,900	31,760	0	7,530	9,540	17,070
Construction Cost	0	0	0	0	0	0	0	0	0	0
Reinvestment	0	0	0	0	0	0	0	0	0	0
Sub-total	0	0	0	0	0	0	0	0	0	0
Net Income	5,150	12,680	14,690	22,220	29,900	31,760	0	7,530	9,540	17,070

Remarks: Depreciation was not included, and US$ 5,000 is supposed to be prepared as initial operating fund.

APPENDIX - 6

Appendix 6 Outline of Specification for Solar Power System

Main Equipment

1.Solar Panel (4 modules in series and 15 modules in parallels; 2 systems)

Specification

Max. output	:	48.0 W
Voltage:	:	17.0 V
Current	:	2.82 A

Structure

Matetial	:	Single crystal silicon
Cover glass	:	Tempered glass, thickness 3 mm
Dimension	:	422 x 954 x 30 mm (thickness)
Weight	:	6.1 kg

2. Battery(4 batteries in series and 15 batteries in parallels; 2 systems)

Specification

Voltage	:	12 V
Rated capacity	:	200 Ah/100 hour

Structure

Dimension	:	255 x 505 x 220 mm
Weight	:	57 kg

3. Inverter(DC/AC; 2 systems)

Specification

DC/AC convert efficiency	:	Approx. 85%
DC output		
Rated voltage	:	39.0 ~ 61.6 V
AC output		
Rated capacity	:	2.2 KW
Rated voltage	:	117V $\pm$ 2
Frequency	:	50 Hz or 60 Hz $\pm$ 0.04%
Phase	:	One phase, two wire
Protection circuitary	:	For over- and under-voltage in AC and DC.

Structure

Dimension	:	160 x 255 x 315 mm
Weight	:	18 kg

APPENDIX - 7

Appendix 7 Environmental Regulations (on Earthmoving)

REPUBLIC OF THE MARSHALL ISLANDS
ENVIRONMENTAL PROTECTION AUTHORITY

EARTHMOVING REGULATIONS

PART I - GENERAL PROVISIONS

1. Authority

a) These regulations are promulgated by the Republic of the Marshall Islands Environmental Protection Authority with the approval of the Minister of Health Services pursuant to Section 21 of the National Environmental Protection Act 1984.

b) These regulations supercede all previous publications and repeal 63 Trust Territory Code Chapter 13, Subchapter III, Regulations Concerning the Control of Earthmoving and Sedimentation in the Trust Territory of the Pacific Islands.

c) These regulations have the force and effect of law.

2. Effective date

These regulations shall come into force 30 days after their approval by the Cabinet.

3. Interpretation

In these regulations, unless the context otherwise requires:

a) "Accelerated Erosion" means the removal of the surface of the land through the combined action of human activities and natural processes, at a rate greater than would result through the action of natural processes alone.

b) "Accelerated Sedimentation" means the sedimentation resulting from the combined action of human activities and the natural processes resulting from storms, heavy rains, and high winds at a rate greater than would result through the action of natural processes alone.

c) "the Authority" means the Republic of the Marshall Islands Environmental Protection Authority or its authorized representative.

d) "Conveyance Channel" means a channel other than an interceptor channel used for the conveyance of water through a project area.

e) "Cultural resource" means an historical, architectural, archeological or cultural site, remain, or artifact, including any place or object that enhances the knowledge or preservation of the environmental and cultural heritage of the Marshallese people.

f) "Diversion Terrace" means a channel or dike constructed upslope of a project for the purpose of diverting storm water away from the unprotected slope.

g) "Earthmoving" means any construction or other activity which disturbs or alters the surface of the land, a coral reef or bottom of a lagoon, including, but not limited to, excavations, dredging, embankments, land reclamation in a lagoon, land development, subdivision development, mineral extraction, ocean disposal, and the moving, depositing or storing of soil, rock, coral, or earth.

h) "Embankment or Fill" means a deposit of soil, rock, or other material placed by human activity.

i) "Erosion" means the natural process by which the surface of the land is worn away by the action of water, wind or chemical action.

j) "Excavation" means a cavity formed by, but not limited to, quarrying, dredging, uncovering, displacing, or relocating soil, coral, or rock.

k) "Interceptor Channel" means a channel or dike constructed across a slope for the purpose of intercepting storm water, reducing the speed of water flow, or diverting it to outlets where it can be disposed.

l) "Land Developer" means any person who is engaged in land development as a principal, rather than an agent or contractor.

m) "Land Development" means the construction, installing, placing, planting, or building of surface structures, land reclamation, navigation channels, harbors, utility lines, piers, shopping centers and malls, causeways, recreational areas, apartment complexes, hotels, schools, roads, parking areas, or any other similar activity.

n) "Person" means any individual, corporation, company, association, partnership, agency, authority, commission, foundation, the Republic of the Marshall Islands government or its political subdivisions, or any local, state, or foreign government or municipality, or other institution or entity, whether public or private.

o) "Sediment" means soils or other surface materials transported by water as the result of erosion, earthmoving activity on a reef or in a lagoon, excavation or fill.

p) "Sedimentation" means the process by which sediment is deposited on the bottom of a body of water, including, but not limited to, rivers, streams, ponds, lakes, lagoons or the tops of reefs.

q) "Sedimentation Retention Boom" means a watertight membrane suspended from floats and weighted to the bottom of water bodies arranged in a manner that will confine sediments to the local area of marine earthmoving activity.

r) "Stabilization" means the proper placing, grading or covering of soil, rock or earth, including the use of vegetation, to ensure their resistance to erosion, sliding, or other movement.

s) "Subdivision" means the division or redivision of a lot, tract, or parcel of land by any means into two or more lots, tracts, parcels, or other division of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, transfer of ownership, or building or lot development.

4. Applicability

These regulations shall apply to all earthmoving activities as follows:

a) Ongoing activities or operations of a continuous nature such as dredging or quarrying in progress on the effective date of these regulations shall be in compliance with these regulations within three months from the effective date.

b) Construction operations in progress on the effective date of these regulations shall be in compliance with these regulations within three months from the effective date.

c) All new projects and new operations that begin on or after the effective date of these regulations shall be in compliance with these regulations.

5. General Requirement

All earthmoving activities within the Republic of the Marshall Islands shall be conducted in accordance with these regulations and in such a way as to prevent accelerated erosion, accelerated sedimentation, and disturbance of potential cultural resources. To accomplish this, all persons engaging in earthmoving activities shall design, implement and maintain erosion control, sedimentation control, and cultural preservation measures which effectively prevent accelerated erosion, accelerated sedimentation, and adverse impact on cultural resources.

PART II - EROSION AND SEDIMENTATION CONTROL PLAN

6. Plan required

The erosion and sedimentation control measures referred to in regulation 5 of these regulations must be set forth in a plan, which must be available at all times at the site of the activity and must be filed with the Authority.

7. Preparation

The erosion and sedimentation control plan shall be prepared by a person trained and experienced in erosion and sedimentation control methods and techniques.

8. Factors

The erosion and sedimentation control plan shall be designed to prevent acceleration of erosion and acceleration of sedimentation and shall consider all factors which contribute to erosion and sedimentation, including, but not limited to, the following:

a) The topographic or hydrographic features, or both, of the project area.

b) The types, depth, slope and area of the soils, coral and reef

c) The original state of the area as to plant and animal life.

d) Whether any coral reef which may be affected by the earthmoving is alive or dead.

e) The proposed alteration to the area.

f) The amount of runoff from the project area.

g) The staging of earthmoving activities.

h) Temporary control measures and facilities for use during earthmoving activity.

i) Permanent control measures and facilities for long-term protection.

j) A maintenance program for the control facilities including disposal of materials removed from the control facilities or project area.

9. Project involving water

If the project involves an earthmoving activity in a lagoon, or a reef, or any body of water, the Authority may require the plan to show existing marine life populations as well as maximum and minimum turbidities.

PART III - EROSION AND SEDIMENTATION CONTROL MEASURES AND FACILITIES

10. Control measures and facilities required

The erosion and sedimentation control measures and facilities set forth in regulations 11 and 12 of these regulations shall be incorporated into all earthmoving activities unless the designer of the erosion and sedimentation control plan shows that alteration of these measures or facilities, or inclusion of other measures or facilities, will prevent accelerated erosion and accelerated sedimentation.

11. Control measures

a) All earthmoving activities shall be planned in such a manner so as to minimize the area of disturbed land, reef or lagoon.

b) All sedimentation resulting from underwater earthmoving activities, shall be contained, confined and restricted by the best available means in such a manner that turbidities will be kept to a minimum.

c) All permanent facilities for the conveyance of water around, through or from the project site shall be designed to limit the velocity of flow in the facilities to a speed that will not contribute to erosion.

d) All slopes, channels, ditches or any disturbed area shall be stabilized as soon as possible after the final grade or final earthmoving has been completed within a section or area of the project.

e) Where it is not possible to permanently stabilize a disturbed area immediately after the final earthmoving has been completed or where the activity stops for more than 14 days, interim stabilization measures shall be promptly implemented.

f) Before filling or land development within a body of water or tidal zone, adequate seawalls or breakwater facilities, or both, shall be constructed to safely contain the fill without failure and to prevent accelerated sedimentation.

g) All runoff from a project area shall be collected and diverted to facilities for removal of sediment.

h) Runoff from a project area shall not be discharged into the waters of the Republic of the Marshall Islands without effective means to prevent sedimentation.

12.Control facilities

a) Sedimentation retention booms shall be used to restrict accelerated sedimentation around earthmoving or earth disturbing activity on reefs or in lagoons in all cases, except when a finding has been made after actual demonstration that no facilities are needed to prevent accelerated sedimentation. Approval of use of alternate facilities or a finding that no facilities are necessary shall be made in writing by the Authority.

b) Diversion terraces:

(i) shall be constructed upgrade of a project area to convey runoff around the project area, and shall have sufficient capacity to convey such runoff without overflowing;

(ii) shall be grassed or lined with erosion-resistant materials to prevent accelerated erosion within the channel; and

(iii) shall be designed so that outlet structures reduce the discharge speed to a level that will not cause accelerated erosion and are stabilized before use.

c) Seawalls and breakwaters to contain fill or reclaimed land shall be sufficiently watertight to prevent accelerated sedimentation, well constructed on a solid foundation, and built to a level at least 2 feet above the highest tide or flood level of historical knowledge. These facilities shall be planned, designed and constructed under the direction of a person trained and experienced in building seawalls and breakwater facilities.

d) Interceptor channels:

(i) may be used within a project area to reduce the speed of flow and prevent accelerated erosion;

(ii) shall convey collected waters to sedimentation basins or to vegetated areas but not directly to streams or other bodies of water; and

(iii) shall be designed so that outlets to vegetated areas reduce the discharge speed to a level that will not cause accelerated erosion.

e) All conveyance channels shall be grassed or lined with erosion resistant materials or designed to reduce the speed of flow of surface runoff to a level that will not cause accelerated erosion.

f) Solids separation facilities:

(i) shall have a basin for settling solids out of water that is structurally sound and has sufficient capacity to hold the water that drains into the basin until the solids have settled out;

(ii) shall have a basin which is cleaned when the settling of solids has reduced the basin's capacity by 25%; and

(iii) shall be designed so that outlet structures allow only adequately settled water to be discharged, and at a rate that will not cause accelerated erosion.

g) The discharge from construction of fills, whether by pumps, hydraulic dredges, or any other means, used to construct fills shall be sufficiently treated and sufficiently retained with dikes, levees, seawalls, or other structures so that accelerated sedimentation will not take place in the waters which receive the effluent. Transmission pipelines transporting fill material shall be maintained in a watertight condition at all times of excavation and fill operation.

h) Barges, scows, platforms, vessels, or anything used for hauling dredged material operating in the waters of the Republic of the Marshall Islands shall be sufficiently tight and secure that accelerated sedimentation will not occur by reason of leaking or premature dumping due to faulty mechanisms.

PART IV - CULTURAL PRESERVATION MEASURES

13. Cultural preservation measures required

Any person who engages in an earthmoving activity shall prevent adverse impact on potential cultural resources by identifying and preserving all such resources.

14. Prior determination

a) Any person who engages in an earthmoving activity, whether or not that activity requires a permit pursuant to regulation 22, shall first make every reasonable effort to determine if a cultural resource may be unearthed, disturbed, or in any way affected by the earthmoving activity.

b) Efforts to identify potential cultural resources pursuant to subregulation a) may include, but are not limited to, the following:

(i) inquiries to surrounding traditional landowners;

(ii) inquiries to the Secretary of Interior & Outer Island Affairs, appointed by Cabinet as the Republic of the Marshall Islands Historic Preservation Officer, or to any other officer so designated;

(iii) inquiries to the Ministry of Interior & Outer Islands Affairs Division of Cultural Heritage, or Alele Museum; and

(iv) inquiries to any recognized authority on historic, architectural, archeological or cultural preservation.

15.Declaration to Authority

When investigation conducted pursuant to regulation 14 reveals that a potential cultural resource may be affected by an earthmoving activity, the person who wishes to engage in that activity shall immediately declare the results of the investigation in the following manner:

(i) if the earthmoving activity requires a permit pursuant to regulation 22, declaration shall be made on the permit application form; or

(ii) if the earthmoving activity does not require a permit pursuant to regulation 22, declaration shall be made by written instrument to the Authority before earthmoving begins.

16.Adverse impact

If the Authority determines an earthmoving activity may adversely affect a cultural resource, the Authority shall, by written instrument attached to the earthmoving permit, or, in the case where no permit is required, by written instrument alone, require the person engaging in the earthmoving activity to design, implement and maintain appropriate cultural preservation measures.

17.Duty to inform

In the event a cultural resource is discovered during the earthmoving process, the person engaged in the earthmoving activity shall inform the Authority by the quickest means available, and in writing, of the discovery.

18.Mitigation

a) When informed of a discovery pursuant to regulation 17, the Authority shall, in consultation with the person engaging in the earthmoving activity, develop mitigation procedures to limit potential damage to the cultural resource.

b) Mitigation procedures may include a requirement to stop work temporarily at the earthmoving site so that the full extent of the cultural resource and the potential damage to that resource may be assessed.

c) Mitigation procedures shall be :

(i) reasonable;

(ii) clearly described by the Authority by written instrument; and

(iii) delivered to the person engaged in the earthmoving activity in a timely manner.

PART V - RESTORATION

19. Stabilization

Upon completion of the project, all areas which were disturbed by the project shall be stabilized so that accelerated erosion, or accelerated sedimentation, or both, will be prevented.

20. Interim control measures

Any erosion and sedimentation control facility required or necessary to protect areas from erosion during the stabilization period shall be maintained until stabilization is completed.

21. Final measures

On completion of stabilization, all unnecessary or unusable control facilities shall be removed, the areas shall be graded and the soils shall be stabilized.

PART VI - PERMITS

22. Permit required

a) Any person who engages in an earthmoving activity within the Republic of the Marshall Islands shall first obtain a permit from the Authority for the proposed activity except that no permit is required for:

(i) earthmoving activity that involves plowing or tilling for agricultural purposes; or

(ii) earthmoving activity for the purpose of erecting a one or two family residence, or for the purpose of erecting structures associated with them consistent with residential use.

b) Those persons who qualify under the provisions of subregulation a) (i) and (ii) to engage in earthmoving activities without a permit must otherwise comply with all of the provisions of these regulations.

23. Application for permit

a) Application for permits shall be on a form approved by the Authority and shall be submitted by the person undertaking the earthmoving activity. In the case of land development, the application shall be submitted by the land developer rather than the contractor or agent.

b) Applications shall be made no later than 1 month before the proposed earthmoving activity is scheduled to begin.

c) Applications shall be accompanied by an erosion and sedimentation control plan and such other documents as the Authority may require.

d) Applications shall be accompanied by a processing fee of $100.00, which is not refundable, except that no fee is required by the government of the Republic of the Marshall Islands.

e) The Authority may, before issuing or denying a permit, hold a public hearing to determine the facts on which to base a decision.

24. Special conditions

The Authority may, upon issuing a permit, impose any conditions or special requirements as it sees fit. All such conditions and requirements shall be listed on a written instrument attached to the permit.

PART VII - ENFORCEMENT

25. Violations

a) A person who violates any provision of these regulations or any permit, requirement or order issued thereunder, shall be subject to enforcement action by the Authority.

b) The enforcement action may be any or all of the following:

(i) revocation of an earthmoving permit;

(ii) the making of a cease and desist order in relation to the subject matter of the violation;

(iii) the imposition of a civil penalty, fixed by the Authority, not exceeding $10,000.00 for each day on which the violation continues;

(iv) the institution of civil proceedings to restrain the violation; and

(v) any other action authorized by the National Environmental Protection Act 1984 or any other law.

26. Public hearing

a) When the Authority revokes a permit or a cease and desist order is made under regulation 25 b) (i) or (ii), or both, a public hearing shall be conducted by the Authority to determine the authenticity of the facts upon which the order was made.

b) Adequate notice of the hearing, and an adequate opportunity to appear and be heard at the hearing, shall be given to all interested persons.

27. Penalty for lack of permit

Any person required to have a permit and engaged in earthmoving activity without a permit shall be subject to a civil penalty of $100.00 per day for each day the earthmoving activity is conducted without a permit.

Accepted by the Authority on March 29, 19 89.

Jiba Kabua, Chairman
Environmental Protection Authority
Republic of the Marshall Islands

Approved by the Minister of Health Services on April 3, 19 89.

Ruben Zackhras
Minister of Health Services
Republic of the Marshall Islands

EFFECTIVE DATE: MAY 20, 1989

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APPENDIX - 8

Appendix 8 Summary of Environmental Impacts

During the discussion with the Government of the Marshall Islands on the contents of this report at draft report explanation stage, the Environmental Protection Authority (EPA) requested the study team to summarize environmental impacts by the implementation of this Project according to the following five items, and to attach it as appendix. The study team accepted the request and summarized accordingly as indicated below.

8-1 Positive Environmental and Cultural Impacts

The supply fresh fish to Ebeye will contribute to an increase of protein for which people are mainly dependent on canned meat /fish or frozen meat at present, and promote healthy food habit from a nutritional viewpoint. On the other hand in outer islands, the improvement in transport of necessary goods for daily needs such as food, soaps, clothes, etc. will contribute to upgrading of living environment.

Solar power system which will be installed by the Project will not bring about air pollution which is caused by burning fossil fuel in generators. In addition there is no need for transport of fuel. This provision of solar system will bring further impact on the promotion of clean energy in other island.

8-2 Adverse Environmental Impacts

Since the on-shore facilities were excluded in Namu from this Project and those facilities in Ailinglaplap and Likiep were designed to minimize the effect on erosion of shoreline and other marine environments, it is concluded that the facilities will not bring any adverse impacts on the environment.

As the on-land facilities were allocated or designed in such a manner to minimize the cutting down of trees and utilize them, there will not be serious problems.

After the commencement of the operation, it is suggested that the fish resources will decrease due catch for fish transport. However, it is quite difficult to predict as to how the decrease of resources will affect the reproductivity of resources and its ecological system. The optimum fish yield in coral areas, though it varies largely depending on areas and also on the estimation method, is 4-27 tons/km^2 according to study in several other areas. The catch volume by this Project will be 16 tons annually at each island. As the coral area of fishing ground at lagoon side is estimated to be 5-6 km^2, the catch possibly be less than the optimum fish yield. However it is recommended to carry out the monitoring of the resources.

8-3 Alternatives of proposed Action

As described above, there will not be any serious negative environmental impacts by implementing the Project. However it is recommended to implement the following action from a long-term point of view..

1) Periodical observation on the impacts on shoreline and corals near the site after completion of the on-shore facilities in Ailinglaplap and Likiep.

2) Planting of trees to compensate for avoidable cutting of trees.

3) Resources management through data analysis or catch effort and catch volume of major species and ecological survey in each outer island. If it is necessary fishing regulation such as protection of spawning area, limitation of fish size or fishing season should be formulated and implemented.

8-4 Relation between Short-Term and Long-Term Effect on Environment

The main purpose of the Project is to increase the opportunity for fishermen's cash income in outer islands through the transport/marketing of fresh fish. However, the Project will also contribute to improve the living environment in outer islands through activation of transport of commodities between urban area to outer islands, and it is desirable to promote local industry utilizing resources of coral areas stably. In order to utilize stably on the productivity of coral ecological system, it is recommended to clarify the long-term effect of construction of the facilities and the fishing activities on ecosystem of corals through the resources assessment and ecological survey

8-5 Unretrievable Destruction of Resources

The Project does not have any factor to bring unretrievable destruction including effect on marine turtles or rare species of corals.