MINISTRY OF TRANSPORT, WORKS AND UTILITIES
SOLOMON ISLANDS

BASIC DESIGN STUDY REPORT ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS

JULY 1996

JAPAN INTERNATIONAL COOPERATION AGENCY
PACIFIC CONSULTANTS INTERNATIONAL

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PREFACE

In response to a request from the Government of Solomon Islands, the Government of Japan decided to conduct a basic design study on the Project for the Improvement of Water Supply System in Honiara in Solomon Islands and entrusted the study to the Japan International Cooperation Agency (JICA).

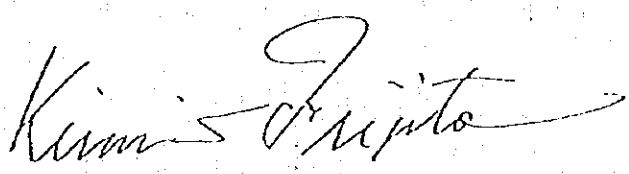
JICA sent a study team to Solomon Islands from February 23 to April 6, 1996.

The team held discussions with the officials concerned of the Government of Solomon Islands, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Solomon Islands in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Solomon Islands for their close cooperation extended to the teams.

July 1996



Kimio Fujita
President
Japan International Cooperation Agency

July, 1996

Letter of Transmittal

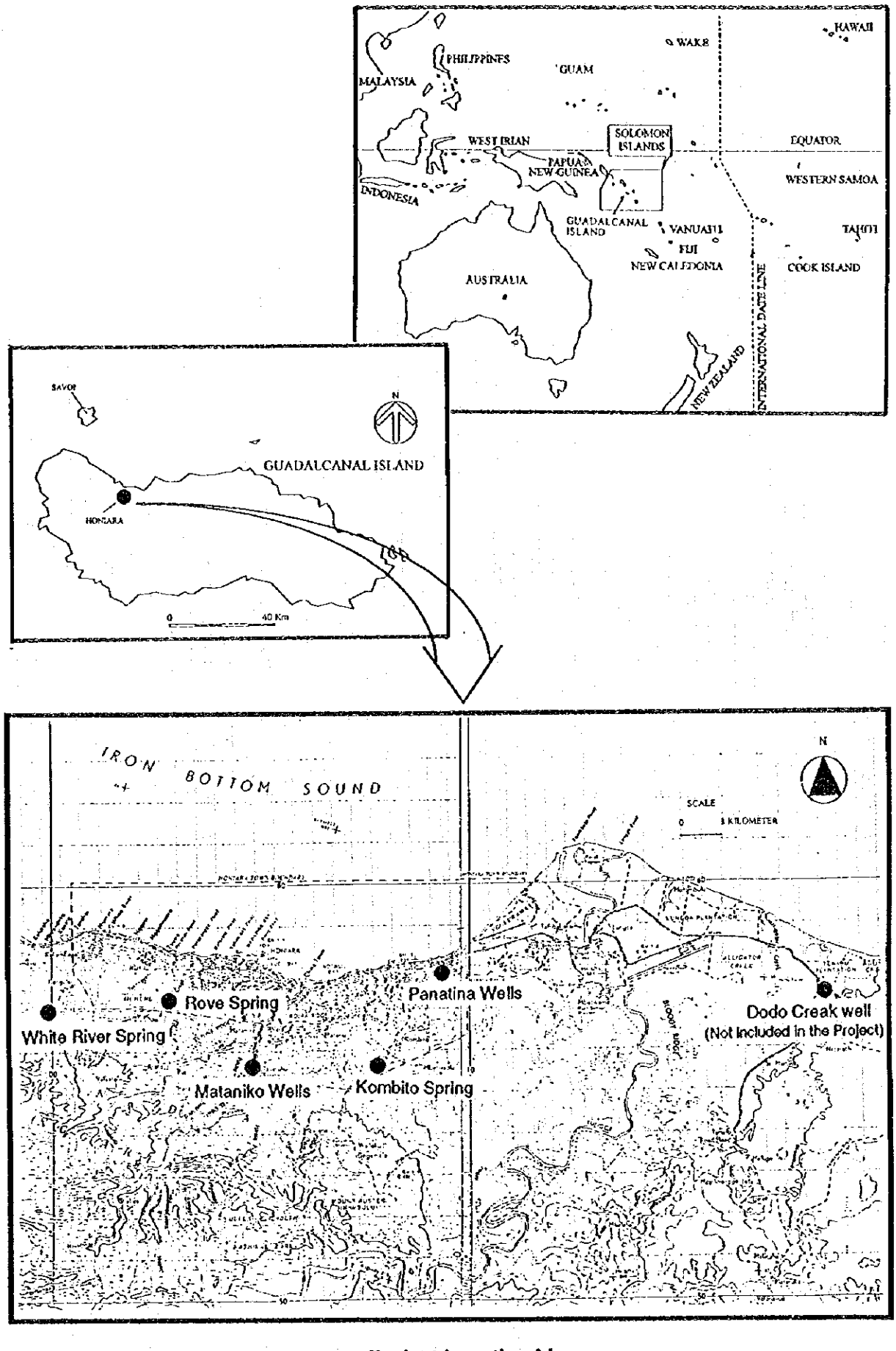
We are pleased to submit to you the basic design study report on the Project for the Improvement of Water Supply System in Honiara in Solomon Islands.

This study was conducted by Pacific Consultants International, under a contract to JICA, during the period of February 16, 1996 and August 8, 1996. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Solomon Islands and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

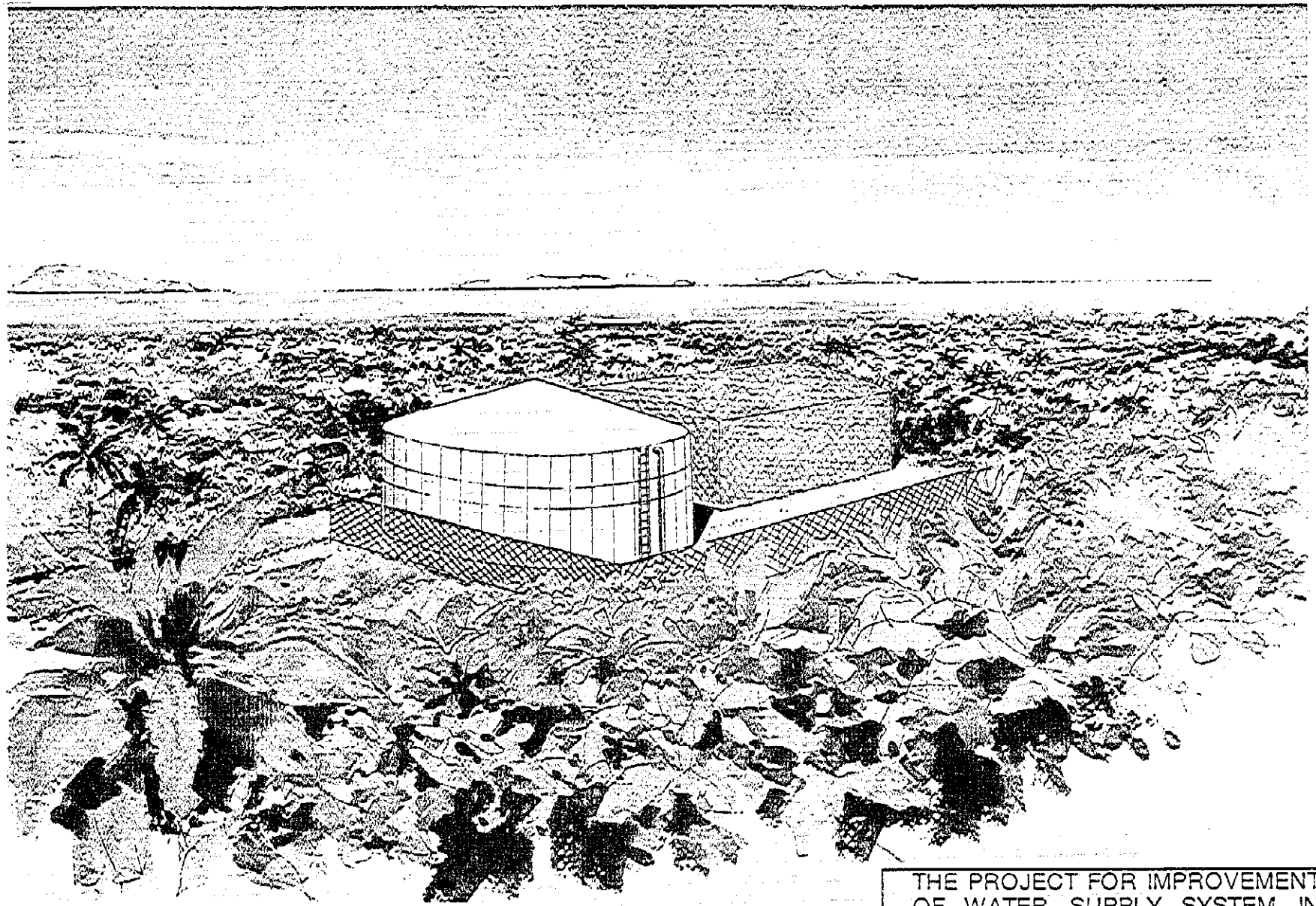
Finally, we hope that this report will contribute to the further promotion of the project.

Very truly yours,

Akira Takechi
Project Manager,
Basic Design Team on
the Project for Improvement of Water
Supply System in Honiara in Solomon
Islands,
Pacific Consultants International

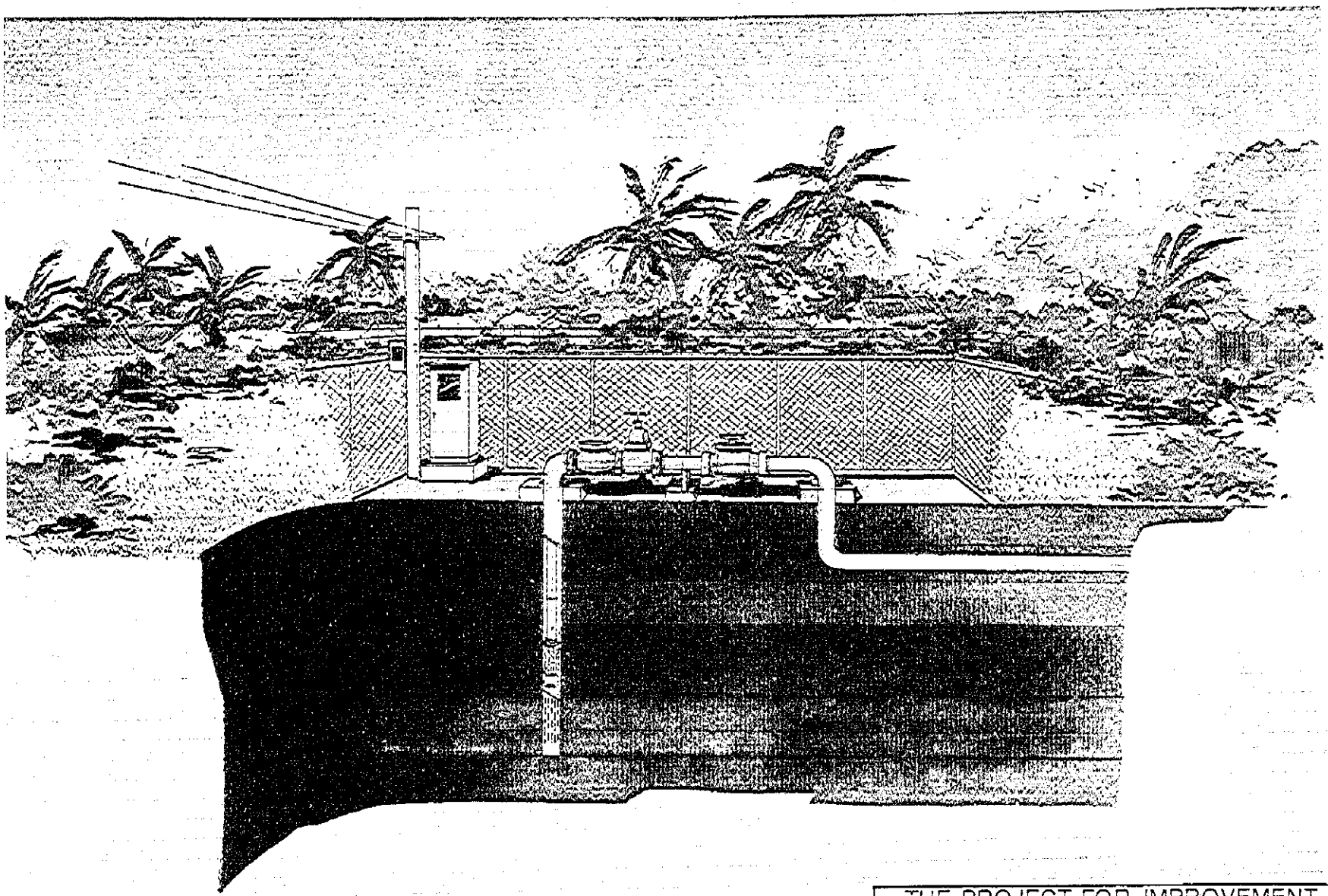


Project Location Map



THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS

RESERVOIR TANK



THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS

DEEP WELL

ABBREVIATIONS

A/P	Authorization to Pay
ADB	Asian Development Bank
AusAID	Australian Agency for International Development
B/A	Banking Arrangement
E/N	Exchange of Notes
EC	Delegation of the European Commission in Solomon Islands
EOJ	Embassy of Japan in Solomon Islands
JICA	Japan International Cooperation Agency
MEWMR	Ministry of Energy, Water and Mineral Resources
MTWU	Ministry of Transport, Works and Utilities
PVC	Polyvinylchloride
RC	Reinforced concrete
SIG	Solomon Islands Government
SIWA	Solomon Islands Water Authority

SUMMARY

SUMMARY

In 1992, Solomon Islands Water Authority (SIWA) was established as the responsible agency to takeover from the Ministry of Transport, Works and Utilities (MTWU) and other provincial municipalities the development and management of water supply and sanitation services in Honiara and other provincial centres . SIWA assigned the highest priority to the improvement of the Honiara Water Supply System to cope with the rehabilitation of aged facilities and the augmentation of its water supply capacity so as to meet the increasing water demand.

Most of the Honiara city areas are served with piped water resulting in a service rate of nearly 100%. However, the current water supply service has suffered from frequent suspensions of water supply due to the seasonal fluctuation of the spring flow, large amount of water leakage due to the aged facilities and a lack of provision for the expected water demand growth.

While SIWA prepared "SIWA Five-year Construction Plan" to address the above problems, SIWA failed to realize the plan due to its financial and technical constraints. Consequently, the Government of Solomon Islands made a request to the Government of Japan to implement projects proposed in the SIWA Five-year Construction Plan.

After the request, Honiara experienced unusually heavy rain fall in October 1995 and rapid decrease of the flow from the White River Spring, a major water source of the System covering 70% of the total service areas. People suffered form the rationing of water, supplied for only two hours in the morning and evening in a day. Moreover, some people in high ridge areas received no water at all. This water crisis caused severe inconvenience to people's daily life and Honiara's urban activities.

To address the crisis, the Government of Japan decided to conduct a basic design study on the Project for the Improvement of Water Supply in Honiara, assigning a higher priority to the restoration of the water supply in Honiara, and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent a study team to Solomon Islands from February 23 to April 6, 1996.

The team held discussions with the officials concerned of the Government of Solomon Islands, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Solomon Islands from June 2 to June 13, 1996, in order to discuss a draft basic design.

As the result of the field survey, although the flow of the White River Spring had been recovered in January, 1996, it was found that the spring water sources are not reliable in terms of water quantity and quality. After discussion with the officials concerned, the purpose of the project was agreed to be development of groundwater to supplement the existing water sources.

The components of the Project are as follows:

Location	Major Facilities	Groundwater Supply Areas	Purpose/Effect	
			Water Quantity	Water Quality
White River	Deep wells Conduction pipe Transmission Pumps Transmission Pipe Reservoir Tank Distribution Pipe Improve. Existing Tanks	Rove distribution area	Quantity stabilization	Water quality improvement in the City centre
		White river gravity distribution area	Quantity stabilization in entire White river distribution area	
Mataniko	Deep wells Conduction pipe Transmission Pumps Transmission Pipe Reservoir Tank	Skyline distribution area		Water quality improvement in Skyline distribution area
Kombito	Deep wells Conduction pipe Reservoir Tank	Kombito/Panatina distribution area	Quantity stabilization	Water quality improvement

Facilities to be constructed for the Project are as follows:

Facilities	(1) White River	(2) Mataniko	(3) Kombito
Water source facilities			
Deep wells	80m x 8inch x 4	100m x 8inch x 5	80m x 8inch x 2
Motor pumps in wells	0.60m^3/min x 80m x 4	0.43m^3/min x100m x5	0.60m^3/min x 80m x 2
Electricity and instruments equipment	1 set	1 set	1 set
Conduction facilities			
Conduction pipe	PVC-Dia150mm x 1100m steel pipe-Dia150mm x 30m	PVC-Dia150mm x 700m steel pipe-Dia150mm x 95m	PVC-Dia150mm x 1000m steel pipe-Dia150mmx115m
Receiving tanks	RC 73 m^3	RC 65 m^3	steel panel 60m^3
Transmission facilities			
Transmission pumps	1.22m^3/min x 60m x 3 pumps	0.90m^3/min x 110m x 3pumps	
Transmission pipes	PVC-Dia200mm x 550m steel pipe -Dia200mm x 75m	PVC-Dia200mm x 1620m steel pipe-Dia200mm x 60m	steel pipe-Dia150mmx100m
Distribution facilities			
Reservoir tanks	steel panel 600m^3 x 2tanks	steel panel 480m^3	steel panel 600 m^3
Distribution pipes	PVC-Dia250mm x 3100m steel pipe-Dia250mmx210m	steel pipe-Dia200mmx10m	steel pipe-Dia200mmx010m
Disinfection equipment	chlorine injection equipment	chlorine injection equipment	chlorine injection equipment
Building	pumping station + disinfection room	pumping station + disinfection room	disinfection room
Existing reservoir tanks	replacement of inflow valves in the existing tanks(Tasahe, Titingge, Lengakiki)		
Existing White river pumping station	installation of new flow control equipment(White river)		

The period necessary for the project implementation is 5.5 months for detailed designing and 14.5 months for construction works. The project cost to be borne by the Solomon Islands side is 290 thousand Solomon Dollars.

Beneficial effects of the Project are estimated as follows:

Effects	Numbers of Beneficiaries
Quantitative stabilization	42,180
Water quality improvement	25,794

The Project will contribute to the improvement of the people's living condition through the improvement of water supply service in Honiara, a basic sanitation requirement. Consequently the Project is justified as suitable for Japan's Grant Aid Program.

While SIWA has the required capability to implement the Project, it would be still advisable to remind the following points in order to ensure smooth and effective operation of the constructed Project facilities.

i) Increase of the number of engineers to up-grade the technical capability for operation and maintenance.

ii) Review of the tariff system to establish a sound financial base.

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CHAPTER 1

BACKGROUND OF THE PROJECT

CHAPTER 1 BACKGROUND OF THE PROJECT

In 1992, Solomon Islands Water Authority (SIWA) was established as the responsible agency to takeover from the Ministry of Transport, Works and Utilities (MTWU) and other provincial municipalities the development and management of water supply and sanitation services in Honiara and other provincial centres . SIWA assigned the highest priority to the improvement of the Honiara Water Supply System to cope with the rehabilitation of aged facilities and the augmentation of its water supply capacity so as to meet the increasing water demand.

Most of the Honiara city areas are served with piped water resulting in a service rate of nearly 100%. However, the current water supply service has the following problems:

- Frequent suspensions of water supply occurred in the less rainy season.
- Suspensions of water supply in terminal or higher sections of water distribution network due to the lack of water pressure.
- Bursting of pipes and permanent water leakage due to aged facilities.
- Lack of provision for the expected water demand growth.

While SIWA prepared "SIWA Five-year Construction Plan" to address the above problems, SIWA failed to realize the plan due to its financial and technical constraints. Consequently, the Government of Solomon Islands made a request to the Government of Japan to implement projects proposed in the SIWA Five-year Construction Plan.

After the request, Honiara experienced unusually heavy rain fall in October 1995 and rapid decrease of the flow from the White River Spring, a major water source of the System covering 70% of the total service areas. People suffered form the rationing of water , supplied for only two hours in the morning and evening in a day. Moreover, some people in high ridge areas received no water at all. This water crisis caused severe inconvenience to people's daily life and Honiara's urban activities.

To address the crisis, the Government of Japan responded to the request assigning a higher priority to the restoration of the water supply in Honiara.

CHAPTER 2

CONTENTS OF THE PROJECT

CHAPTER 2 CONTENTS OF THE PROJECT

2.1 OBJECTIVES OF THE PROJECT

Objective

The Project will develop groundwater and supplement the existing water supply system of Honiara to cope with the unstable water supply service in Honiara..

Background

In October 1995, flow of the White River Spring, which is the major water source for the Honiara water supply system, decreased because of blockage of sinkholes. Since then, the Honiara water supply system has experienced the worst crisis in its history, with the supply of water being restricted for only two hours in morning and evening and the service area to 70% of its total. It affected severely the Capital's urban life. The water supply was recovered with the removal of blockage fortunately in January 1996. The crisis, however, revealed the lack of reliability as the major of White River Spring water source for the city's water supply as such blockages could occur again.

Other spring water sources also have similar problems of low reliability due to seasonal fluctuation and yearly decrease of their flow rates. Moreover, people in the areas served by the spring sources suffer from the deteriorated quality of the supplied water by turbidity easily increasing after rainfall. People now recognize the risk to relying on natural springs as the single source of water supply.

2.2 BASIC CONCEPT OF THE PROJECT

2.2.1 CONFIRMATION OF THE REQUEST

As the result of the field survey, which was conducted from February to April 1996, for the Basic Design Study, the request of the Government of Solomon Islands was confirmed as follows:

Purpose: To improve the present water supply condition of the Honiara water supply system with the development of groundwater.

Scope: To develop new groundwater sources to supplement the existing spring sources; and

To construct necessary water transmission facilities to supply newly developed groundwater to the existing distribution system.

2.2.2 IDENTIFICATION OF PROBLEMS IN THE EXISTING SYSTEM

(1) Evaluation of Water Sources

White River Spring is the spring that receives its flow from another river through sinkholes and underground rock formation. Although it could be a reliable water source if the sinkholes can be managed by SIWA, source decrease in flow of the spring may recur under the present situation where SIWA can not take proper actions due to the constraints of traditional land ownership. Thus it is not a reliable source. In addition, conventional water treatment process is essential since its turbidity increases easily whenever it rains.

As for Rove Spring, its flow rates are reportedly gradually decreasing . Water quality of the spring itself is stable, but its impounding structure receives sand flushed out from surrounding slopes during rainfalls and that contain many aquatic animals and plants. Thus it requires conventional water treatment process.

Water quality of the Kombito Spring is better than the above two springs, but its flow rate is also reportedly decreasing yearly. It is expected that the flow rate would decrease further because of the new wells developed by the EC housing Project that may lower the groundwater table.

No particular problems were found with regard to quantity and quality of the existing groundwater sources in Mataniko, Kombito and Dodo.

(2) Water Supply Conditions

Water Production

The present average daily water consumption is 12,770 m^3/day and a per capita daily consumption is determined at 270 l/capita/day, while water intake rate is estimated at 23,549 m^3/day. The water intake rate from the White River Spring is approximately 16,000 m^3/day. Its normal flow rate is approximately 25,000 m^3/day and it is estimated that the flow rate decreased to 7,000 m^3/day in October 1995. At present the springs have sufficient capacity to meet the potable water demand, unless the White River Spring recurs production decreases.

The water production rate, which is almost two times of the water consumption, indicates large amount of unaccounted-for water, or water loss in the system.

Water Quality

There are no particular water quality problems with respect to groundwater, but spring water has problems such as bacteriological contamination and high turbidity after rainfall. Spring

water is easily contaminated by surface water and showed potential fecal contamination. However, the contamination can be overcome with proper disinfection, so far.

High turbidity is observed in both the White River Spring and the Rove Spring. Particularly in the White River gravity distribution area and the Rove distribution area, the problem due to high turbidity is very severe because water is directly distributed to consumers without any storage reservoir, in which removal of turbidity can be expected to some extent. Conventional water treatment process would be required to remove turbidity from the spring water.

Water transmission/distribution

As mentioned above, there is a high ratio of wastage observed between the water intake and the consumption. The loss mainly occurs in the White River Spring system. The water intake rate of the White River Spring is 15,000 m^3/day while the consumption is only 5,000 m^3/day, resulting in loss of 10,000 m^3/day. The loss is attributed mainly an over-flow from reservoir tanks in the White River Spring water distribution areas. The reservoir tanks do not have flow control system.

Another problem with the existing system is the low service pressure areas that are spread over the eastern end of the White River Spring water distribution system. It is necessary to supplement these areas with new water sources to improve their water supply condition.

(3) Groundwater Potential

New groundwater sources are expected to be developed i) along the White river, ii) along the Rove Creek, iii) around the existing wells in Tuvaruhu and iv) downstream of the existing Kombito Spring. The expected potential of these water sources is shown in Table 2-1.

Table 2-1 Potential Groundwater Development

Location	Production per well (m^3/day)	No. of wells	Production rate (m^3/day)
White river	870	4	3,480
Rove	870	3	2,610
Mataniko (Tuvaruhu)	620	5	3,100
Kombito	900	5	4,500
Total			13,690

2.2.3 MAJOR PROBLEMS AND COUNTERMEASURES FOR THE PROJECT

The current problems identified in the existing system are summarized as below:

- It has a large amount of water loss; 23,700 m^3/day of the water intake against 12,770 m^3/day of the actual consumption. This is because of overflow from the existing reservoir tanks. This results in the losses of water and operational cost efficiency.

- The White River Spring has enough flow rate presently, but decrease of the flow rate occurred in October 1995 could recur. If it happens, water supply will not be sufficient to meet the demand even if the water loss by overflow from the existing reservoir tanks is mitigated.

- Among the White River Spring water distribution areas, pumped supply areas are located from the western part of the city to the eastern part. Due to long distance of transmission, there are low service pressure areas and water distribution problems often occur in these areas.

- The spring water sources have seasonal fluctuation of the flow rates and which decrease yearly. The water supply conditions are seasonally unstable. Particularly, in Kombito, further decrease of the flow rate is anticipated because of the groundwater development by another project. The conditions may worsen further in the near future without supplemental water source development.

- Bacteriological contamination is often observed in the spring water. Although safety of the supplied water is secured by proper chlorination, it is preferable to have water sources free from contamination.

- Turbidity of all the spring water other than that of Kombito Spring increases after rainfall. In particular, it is more severe in the White River Spring gravity distribution area and the Rove Spring area, because they have no reservoir tanks which could remove turbidity to some extent. As these areas are the center of the Honiara city, where governmental buildings, public buildings and tourist facilities are concentrated, damages due to the high turbidity is very severe.

In the long term, conventional water treatment should be applied to the White River Spring water. However, it is not considered to be practical at present due to the SIWA's financial and technical constraints.

The result of the hydrogeological study indicates the possibility to develop the groundwater to replace all the spring water. However, treatment of the White River Spring water seems to be the

most practical means to address the growth in future water demand and this should be discussed in future programs.

Therefore, the following measures are considered to be practical to address the above problems urgently:

- To mitigate the overflow from the existing reservoir tanks in order to minimize the water losses and to increase operational cost efficiency, .
- To supplement the White River Spring system by the amount equivalent to deficit of supply that the occurred last year.
- To add the groundwater to the White River Spring water distribution system to solve the low pressure problems in the eastern parts of the system.
- To supplement the Kombito system with groundwater.
- To replace the spring water in the center of the city with the groundwater to remove water quality deterioration by high turbidity.

As mentioned above, the basic concept of the Project is to improve the water supply condition in Honiara by the components shown in Table 2-2. The concept of the Project is illustrated in Figure 2-1.

Table 2-2 Components of the Project

Components	Groundwater development (m^3/day)	Groundwater Supply Areas	Served Population	Purpose/Effect	
				Water Quantity	Water Quality
Groundwater Development in White River	3,500	Rove distribution area	1,441	Quantity stabilization	Water quality improvement in the City centre
		White river gravity distribution area	4,214	Quantity stabilization in entire White river distribution area	
Groundwater Development in Mataniko	3,100	Skyline distribution area	12,534		Water quality improvement in Skyline distribution area
Groundwater Development in Kombito	1,600	Kombito/Panatina distribution area	7,606	Quantity stabilization	Water quality improvement
Improvement of the Existing Reservoir Tanks	-	-	-	Quantity stabilization in entire White river distribution area	-

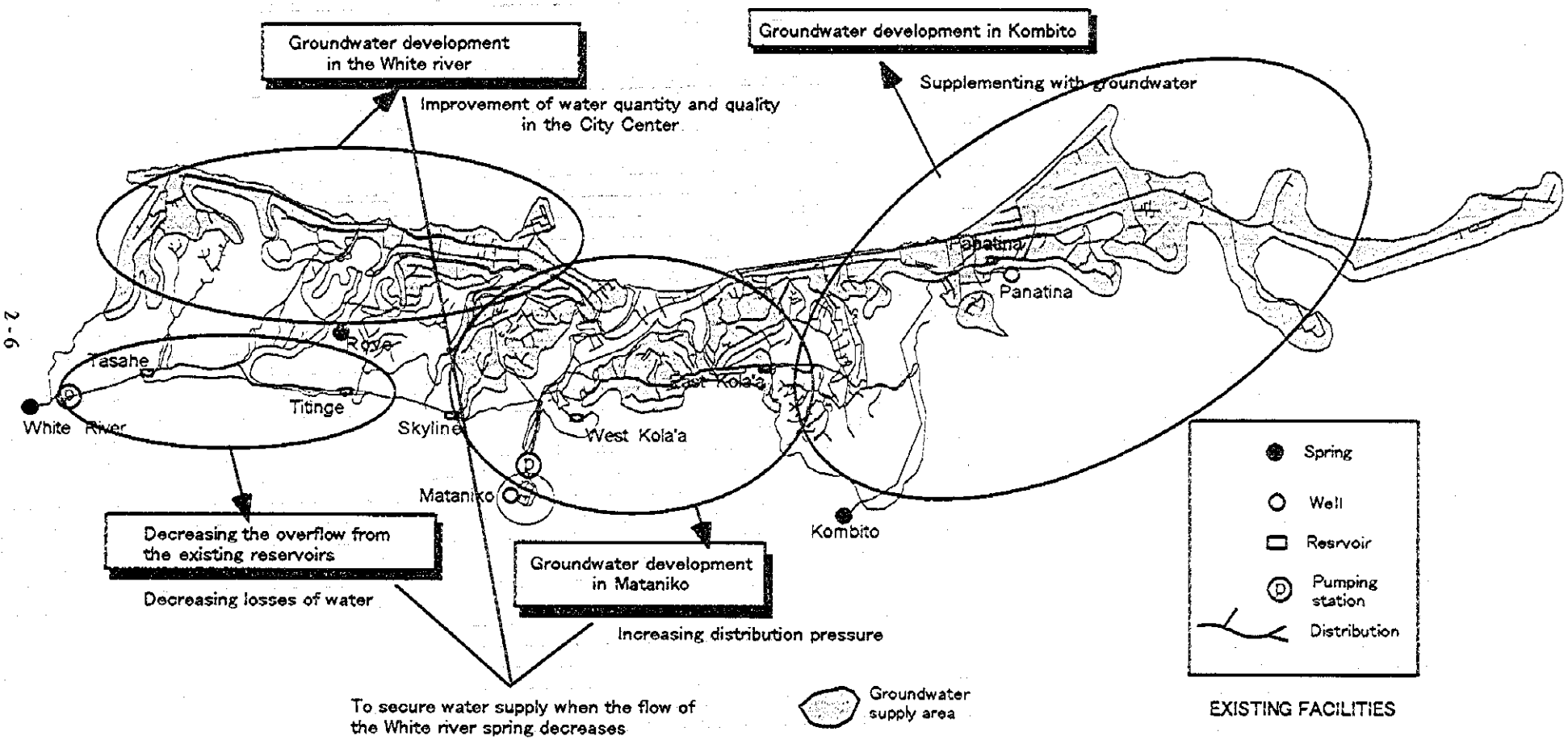


FIGURE 2-1 BASIC CONCEPT OF THE PROJECT

2.3 BASIC DESIGN

2.3.1 DESIGN CONCEPT

The present design is worked out on the basis of the following conditions:

(1) Natural Conditions

Hydrogeological conditions

Three formations, Mbonehe limestone, Honiara Beds and Honiara reef limestone, form aquifers in the study area. Of these three, formation to be developed for groundwater resources is Honiara Bed in terms of permeability, storage capacity, homogeneity, size, continuity, depth of location and actual development results.

Honiara Beds comprise alternating calcareous sandstones, siltstones and conglomerates. This formation is characterized by well stratified layers and well developed bedding planes. On the other hand, almost half of Honiara Beds comprise calcareous sandstones, which have variation of grain size with place and depth. Permeability of aquifers change largely with variation of grain size, therefore, distribution of sandstones and conglomerates forming aquifers are limited in the study area.

Effective groundwater development will be carried out by drilling bore holes in fracture zones with densely developed fractures. Therefore, promising drilling sites near the existing water resource sites were selected where fracture zones are developed, based on the results of topographical, geological survey and geophysical prospecting.

Other natural conditions

The average annual rainfall of Honiara is approximately 2000 mm. The dry and wet seasons are not so distinguishable as in those of arid areas, Nevertheless, 70% of annual rainfall is concentrated from November to April. Since rainfall intensity is high and road conditions are poor, rainfall is one of the major factors to be considered in formulating the construction plan. The temperature is slightly higher than that in summer season in Japan, and rises considerably higher during day time (sunny days). Therefore, thermal deformation during storage should be taken into account in selection of pipe material. Also prevention from damages by humid and saline air should be considered in the selection of material. Special foundation for heavy structures, such as reservoir tanks, would not be necessary because of the favorable rough surface condition in all the proposed sites, with lime stone formation.

Seismic aspects should be taken in consideration in structural design, since there is an active volcano in Savo Island located at about 50 km from Honiara and historically several strong

earthquakes have been recorded.

(2) Social Conditions

Under the traditional land ownership, special procedures would be required to enter and to conduct construction works in areas outside the city boundary. Drilling of three wells, construction of one reservoir tank and installation of portions of water transmission pipelines would be located outside the city boundary. SIWA is required to take necessary actions to secure access to those sites.

(3) Local Construction Conditions

As the opportunity of big construction projects is limited in the Solomon Islands, very small numbers of construction companies and consultants are operating in the country. The major firms are affiliated with foreign companies, such as Australia, New Zealand and Japan. Therefore, most of the construction materials, equipment, engineers and skilled workers are difficult to be obtained locally and are to be procured from Australia, New Zealand or Japan.

(4) Maintenance and Management Capabilities of Implementing Agency

The Operation Unit of SIWA is currently responsible for operation and maintenance of the facilities. The Operation Unit comprises 24 employees; two pump operators in White river and Tuvaruhu, one electrician, one assistant and other laborers. Inspections to water sources and reservoirs and repair works for leakage are being conducted daily but cleaning of reservoirs and periodical inspection of pumps are rarely conducted. There are no existing records on water intake, water transmission, pump operating periods and chemical dosage.

A water quality officer in SIWA's headquarters is responsible for water quality control. Chemical and bacteriological water quality monitoring are being conducted once a week. Since SIWA has no chemical laboratory facilities, chemical analysis is conducted in the laboratory of MEWMR and bacteriological analysis in the Malaria Centre.

Major facilities to be provided by the Project are wells, pumps and transmission pipelines. Similar facilities are currently in operation in the existing system. Therefore, the facilities by the Project can be operated by the existing skill. However additional operator(s) would be necessary because the number of pumps would be increased considerably.

As far as the capability to continue the operations is concerned, SIWA has sufficient skill. However, it would be advisable to provide following technology transfer programs to secure a more cost effective operation, to up-grade quality of supplied water and to prolong life of the facilities:

- maintenance and repairing of facilities.
- controlling of operation based on operation monitoring.

(5) Scope and Grade of the Facilities

The scope and grade of the improvement by the Project would be as follows:

- To prevent overflow from the existing Tasahe, Titingge and Lengakiki reservoir tanks by installing level control equipment and flow control equipment at the existing White River Pump system.

- Development of groundwater source in Tuvaruhu and to construct water transmission and distribution facilities to supply groundwater to the service areas covered by the existing Skyline reservoir tank.

- Development of groundwater source in Kombito and to construct water transmission and distribution facilities to supply the water to the service areas covered by the existing Panatina reservoir tank.

- Development of groundwater source along the White river and to construct water transmission and distribution facilities to supply the water to the service areas covered by the existing White river gravity .source and the Rove Spring source.

(6) Construction Schedule

Required period for the construction of reservoir tanks would be the most critical factor to determine the construction schedule. To shorten a length of the construction period, three reservoir tanks would be constructed in parallel. The Project will be an one year project.

2.3.2 BASIC DESIGN

(1) Overall Plan

1) Area and Population Served by the Project

The water sources to be developed by the Project serve for the gravity distribution area and the Skyline distribution area of the White River Spring distribution area, the Rove Spring distribution area and the Panatina Distribution area. The areas served by the Project are shown in Figure 2-2. Population in the areas is shown in Table 2-3.

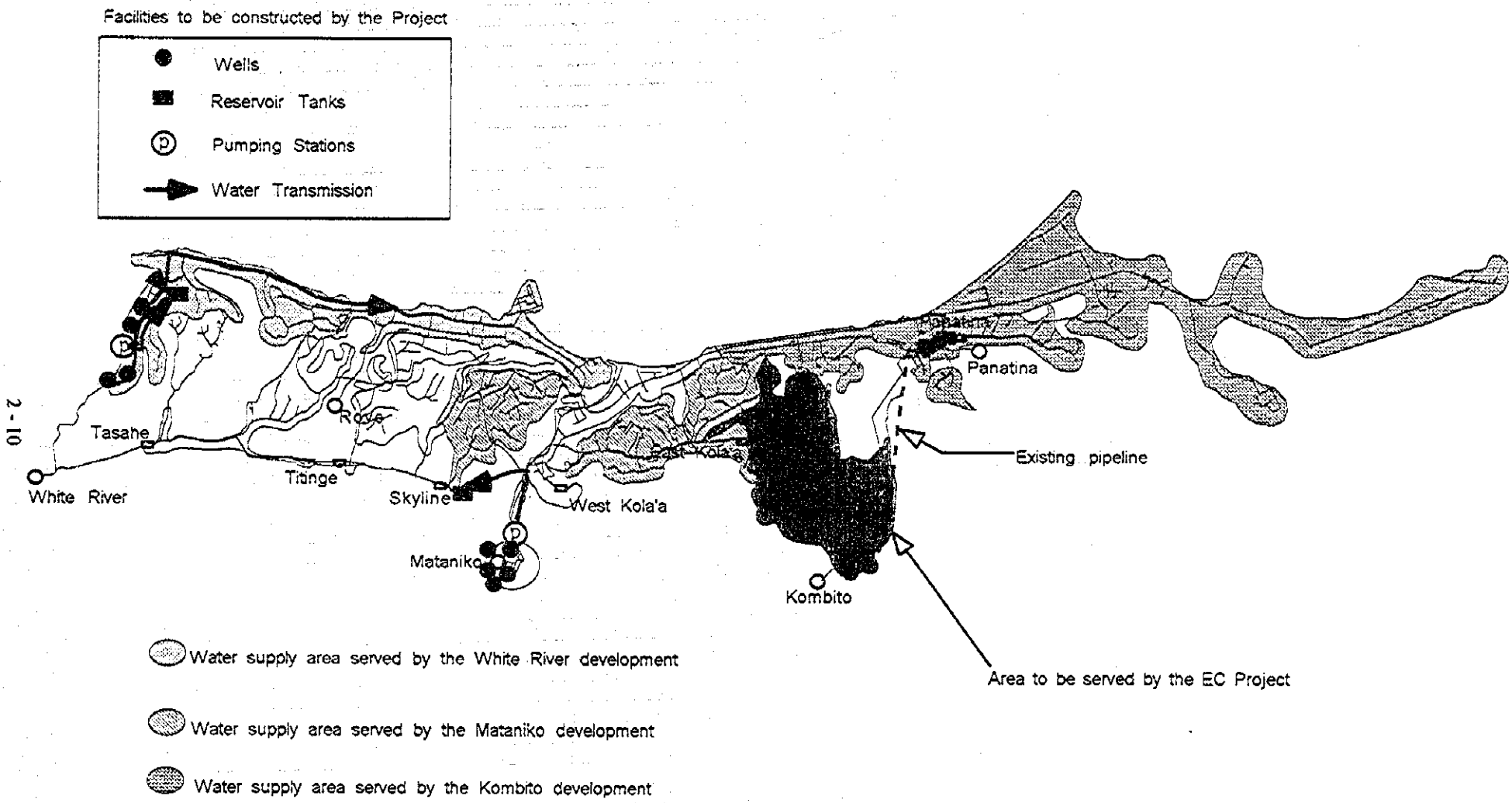


Figure 2-2 Project Facilities and Water Supply Areas

Table 2-3 Population in the Areas Served by the Project

Water Sources	Served Areas	Served Population
Mataniko Wells	Skyline Distribution Area	12,534
White River Wells	Gravity Distribution area	4,214
	Rove Spring Distribution Area	1,441
Kombito Wells	Panatina Distribution Area	7,605
Total		25,794

2) Water Demand and Design Water Supply

Water demand can be classified into a domestic demand and a commercial/industrial demand. Daily average domestic water demand was calculated by multiplying 150 l/capita/day of per capita unit consumption and population in the service area. Commercial/industrial demand was estimated by subtracting the calculated domestic water demand from actual water consumption in the area.

Unaccounted water was assumed at 20%. Thus daily average water supply was calculated by dividing the daily average consumption by 0.8. The design water supply adopted a maximum daily water consumption assumed to be 1.1 times the average daily water demand.

The design water supplies by groundwater sources to be developed in the project, namely White river, Mataniko and Kombito, are 3,500 m^3/day, 2,600 m^3/day (4,300 m^3/day, including water supply from the existing Mataniko wells) and 1,600 m^3/day respectively, as shown in Table 2-4.

Table 2-4 Water Demand and Design Water Supply

Water source	Distribution area	Population in each area	Daily average water demand (m^3/day)			Water supply (m^3/day)	
			Domestic	Commercial and industrial	Total	Daily max.	Design daily max.
White River	White River Gravity distribution area	4,214	632	9	641	881	900
	Rove distribution area	1,441	216	1,668	1,884	2,591	2,600
	subtotal	5,655	848	1,677	2,525	3,472	3,500
Mataniko	Skyline distribution area	12,534	1,880	0	1,880	2,565	2,600
	Low west Kola'a distribution area	Design water supply is same as actual one.				1,730	1,700
	subtotal					4,315	4,300
Kombito	Panatina distribution area	7,606	1,141	0	1,141	1,569	1,600

(Daily average domestic demand)=(Population served) x 150 l/capita/day
(Daily max. water supply)=(Daily average total demand) x 1.1 / 0.8
*1: Mataniko development will compensate decrease of the production rate of the existing wells that will be caused by the Project.
*2: Kombito development will supply only an amount equivalent to the domestic demand.

3) Design Water Supply and Required Groundwater Development

The require groundwater development determined by the design water supply is shown in Table 2-5.

Table 2-5 Design Water Supply and Required Groundwater Development

Groundwater Sources	Design Water Supply (m^3/day)	Required Groundwater (m^3/day)		Groundwater Development		
		From the existing wells	From new wells	Production Capacity (m^3/day/well)	Required No. of Wells	Groundwater developed (m^3/day)
White River	3,500	0	3,500	870	4	3,500
Mataniko	4,300	1,200	3,100	620	5	3,100
Kombito	1,600	0	1,600	900	2	1,800

(2) Facility Plan

1) Design Conditions

Receiving tanks

Capacity of tank is determined to maintain a retention time of 30 minutes. In principle, receiving tank would be made of concrete, while it will be of steel panel in Kombito.

Water transmission pumps

Water transmission pumps are to be of dry type considering the ease of inspection and repair. Two pumps are to be in operation and one is to be stand-by.

Reservoir tanks

The volume is determined to maintain a retention time of 8 hours.

Pipeline designing

Size of conduction pipes is determined so as to cater water intake rate from each well and size of the water transmission pipes is determined to cater a total water intake rates of all wells. Size of the distribution pipes is determined to meet the maximum hourly water supply. Friction loss in pipes is calculated by Hazen-Williams equation. C value for the friction constant would be 130 for PVC pipe. Pipe material would be mostly of PVC in most sections. Steel pipe, however, would be used in some areas, such as exposed areas and river/road crossings.

Disinfection facilities

Presently, SIWA uses Calcium hypochlorite solution with 70 % of effective Chlorine as the disinfectant of its water treatment. Therefore, same type of disinfectant will be adopted. Average dosage will be designed at 1.0 mg/l effective chlorine and the

maximum at 3.0 mg/l so as residual chlorine concentration to be maintained at 0.2 to 0.5 mg/l 30 minutes after the injection.

2) Facilities Planning

Physical components of the Project comprise the improvement of the existing reservoir tanks and the groundwater developments. Flow sheet of three groundwater development is show in Figure 2-3.

Outlines of facility plan for each physical components are explained below and the calculated capacities for major equipment are shown in Table 2-6, 2-7 and 2-8 (For calculation, please refer to Appendix-6A) :

Controlling overflow from the existing reservoir tanks

A float valve will be installed in each of the existing reservoir tanks, namely Tasahe, Titingge and Lengakiki. These valves would stop inflow to the tank once it is full, thereby mitigating tank overflow. This increases inner pressure of pipeline, as well as prevents overflow. Pressure switch installed at the existing White River Pumping Station would be activated to stop pump operation when the pressure of the pipeline increase over a certain value.

Groundwater development in the White river

Groundwater would be abstracted from four wells, each with 80 m of depth by submersible pumps and the water from every two wells is transmitted to a receiving tank through one pipe (150 mm dia., PVC). The receiving tank is located at EL+10 m and its capacity is 73 m^3. Along with the receiving tank, pumping station and disinfection facility are also provided. The water is transmitted from the pump station to the new White river reservoir tank through pipeline of 200 mm dia. and 600 m length.

Electricity is received at the pumping station and distributed to every well.

The new White river reservoir tank will be located near the abandoned White river reservoir tank. The new tank has two chamber each with capacity of 600 m^3 and made of steel panel. Its maximum and minimum water levels are 60.2 m and 55.4 m respectively. The tank has two gravity distribution lines; one for the White River Spring gravity distribution area using the existing distribution line and another for the Rove Spring distribution area by installing a new distribution pipeline of 3,300 m length.

Groundwater development in Mataniko

Groundwater will be abstracted from five wells each with 100 m of depth, by submersible pumps and the water from every two wells is transmitted to a receiving tank through one pipeline (150 mm dia., PVC). The receiving tank is located at EL+15 m and its capacity is 65 m^3. Along with the receiving tank, pumping station and disinfection facility are also provided. The water is transmitted from the pump station to the new Skyline reservoir tank through pipeline of 200 mm dia. and 1,650 m length.

Electricity is received at the pumping station and distributed to every well.

The new Skyline reservoir tank is located near the existing Skyline reservoir tank. The new tank has capacity of 480 m^3 and made of steel panel. Its maximum and minimum water levels are 112.9 m and 110.5 m respectively. The water from the tank is distributed to the service areas through the existing distribution pipe line.

Groundwater development in Kombito

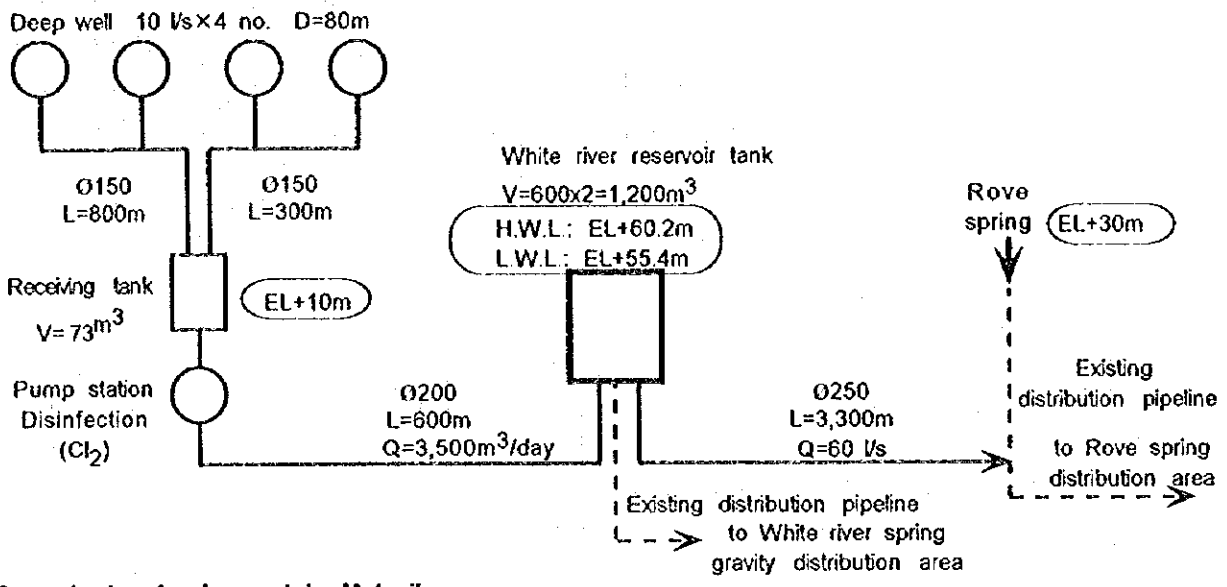
Groundwater will be abstracted from two wells each with 80 m of depth, by submersible pumps and the water from the two wells is transmitted to a receiving tank through one pipeline (150 mm dia., PVC).

Electricity is received at the one of the well site and distributed to another well.

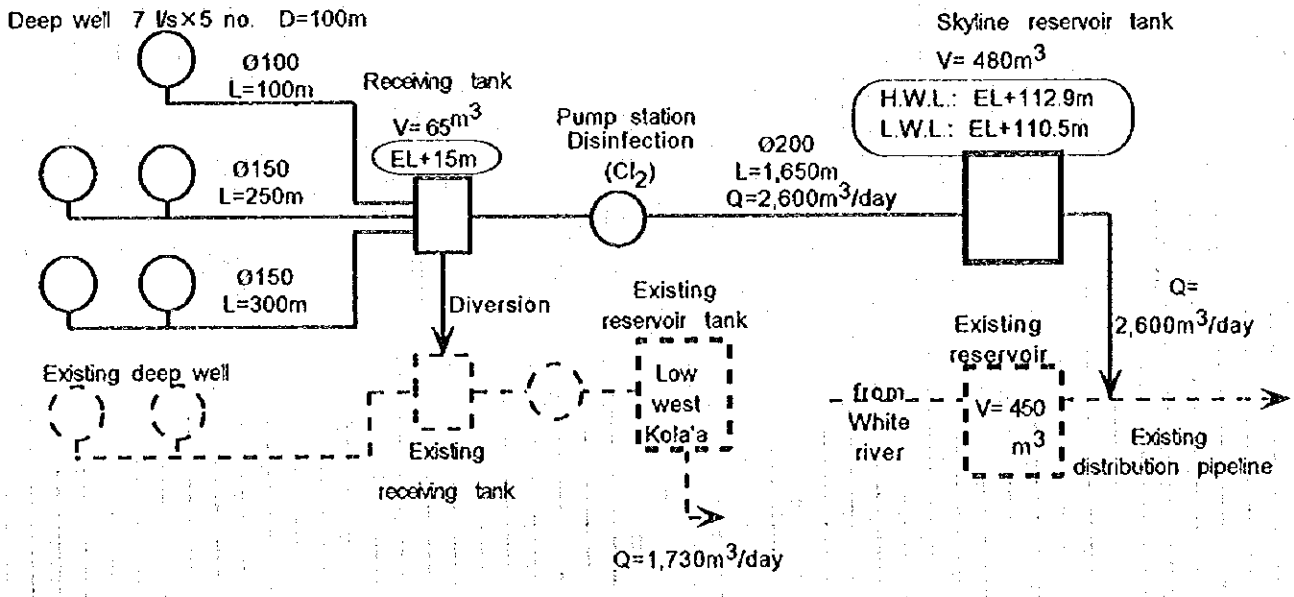
The receiving tank is located on top of a hill at EL+70 m. Its capacity is 60 m^3. Access to the site is very poor, thus it is of steel panel type. The water from the tank is transmitted to the Panatina reservoir tank by gravity through the existing pipeline.

The new Panatina reservoir tank will be located near the existing Panatina reservoir tank. The new tank has one chamber with a capacity of 600 m^3 made of steel panel. Its maximum and minimum water levels are 46.5 m and 43.5 m respectively. The water from the tank is distributed to the service areas through the existing distribution pipe line. The existing disinfection facilities will be removed to construct the new tank, and therefore, a new disinfection facilities will be constructed should have a capacity to disinfect both the present water and newly developed water sources.

1.Groundwater development in the White River



2.Groundwater development in Mataniko



3.Groundwater development in Kombito

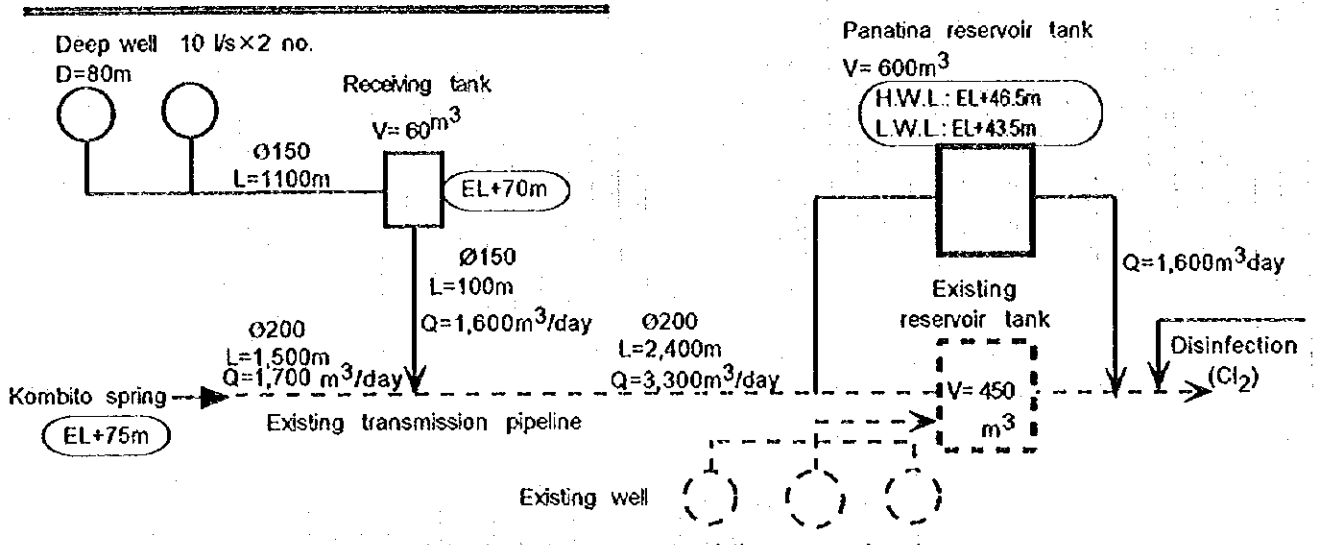


Figure 2-3 Physical components of the proposed system

Table 2-6 Calculation of Reservoir Tanks

Water source	Reservoir tanks	Daily max. water supply (m^3/day) (DR)	Storage time (h) (ET)	Required capacity (m^3) (RQ)	Existing Capacity (m^3) (EQ)	Capacity to be increased (m^3) (AQ)=RQ - EQ	Capacity to be constructed (m^3)
White River	White River	3,500	8	1,167	0	1,167	V = 600 x 2 = 1,200
Mataniko	Skyline	2,600	8	867	450	417	V = 480
Kombito	Panatina	1,600	8	533	0	533	V =600

Required capacity is calculated as below;

RQ = DR / 24 x ET

(RQ) : Required capacity (m^3/day)

(DR) : Daily max. water supply (m^3/day)

(ET) : Storage time (h)

Table 2-7 Calculation of Receiving Tanks

Water source	Amount of water intake		Storage time (h)	Capacity of required receiving tanks (m^3)	
	(m^3/day) (IR)	(m^3/sec.)	(ET)	(RQ)	Adopted value
White River	3,500	0.041	0.5	73	73
Mataniko	3,100	0.036	0.5	65	65
Kombito	1,800	0.021	0.5	38	60

Note 1) The volume of receiving tanks are calculated by adopting 30 minutes of storage time, the volume of the tank of Kombito is determined considering a flow control factor.

Note 2) Required tank capacity is calculated as below;

RQ = IR / 24 x ET

(RQ) : Required capacity (m^3/day)

(IR) : Intake water amount (m^3/day)

(ET) : Storage time (h)

Table 2-8 Calculation of Pump Capacity

				White River	Mataniko	Kombito
Well Pump (Submergible)	Ground level of well	(m)	(1)	12.5	10.0	58.0
	Depth of well	(m)	(2)	80	100	80
	Water level (GL - WL)	(m)	(3)	50	50	50
	HWL of receiving tank	(m)	(4)	11.5	16.2	73.3
	Actual head	(m)	(5)=4-(1-3)	49.0	56.2	65.3
	Friction head loss	(m)	(6)	7.8	1.5	11.7
	Other head	(m)	(7)	3.0	3.0	3.0
	Total head	(m)	(8)=5+6+7	59.8	60.7	80.0
	Head of pump design	(m)	H	80	100	80
	Water flow	(m^3/min)	Q	0.60	0.43	0.63
	Output	(kW)	P	11	10	11
	Specification of submerged pump*			0.60m^3/min x 80mH 380v x 50Hz x 11kW	0.43m^3/min x 100mH 380v x 50Hz x 11kW	0.63m^3/min x 80mH 380v x 50Hz x 11kW
Booster Pump	LWL of receiving tank	(m)	(1)	9.4	14.4	
	HWL of reservoir tank	(m)	(2)	60.2	112.9	
	Actual head	(m)	(3)=2-1	50.8	98.5	
	Friction head loss	(m)	(4)	5.4	8.3	
	Other head	(m)	(5)	3	3	
	Total head	(m)	(6)=3+4+5	59.2	109.8	
	Head of pump design	(m)	H	60	110	
	Water flow	(m^3/min)	Q	1.22	0.90	
	Output	(kW)	P	16	22	
	Specification of booster pump*			1.22m^3/min x 60mH 380v x 50Hz x 22kW	0.90m^3/min x 110mH 380v x 50Hz x 37kW	

GL: Ground level, WL: Water level, HWL: High water level, LWL: Low water level

$P=(0.163xQxH)/\gamma x(1+\alpha)$

P=Output (kW)

Q=Water flow (m^3/min)

H=Head of Pump Design

γ=0.8 (pump efficiency)

α=0.1 (transmission efficiency)

*: Pump specifications are selected from those of pumps available in markets.

3) Facilities of Project Components

Facilities to be constructed for the Project are summarized as shown in Table 2-9.

Table 2-9 Facilities to be Constructed for the Project

Facilities	(1) White River	(2) Mataniko	(3) Kombito
Water source facilities Deep wells Motor pumps in wells Electricity and instruments equipment	 80m x 8inch x 4 0.6m³/min x 80m x 4 1 set	 100m x 8inch x 5 0.43m³/min x100m x5 1 set	 80m x 8inch x 2 0.6m³/min x 80m x 2 1 set
Conduction facilities Conduction pipe	 PVC-Dia150mm x 1100m steel pipe-Dia150mm x 30m	 PVC-Dia150mm x 700m steel pipe-Dia150mm x 95m	 PVC-Dia150mm x 1000m steel pipe-Dia150mmx115m
Receiving tanks	RC 73 m³	RC 65 m³	steel panel 60m³
Transmission facilities Transmission pumps Transmission pipes	 1.22m³/min x 60m x 3 pumps PVC-Dia200mm x 550m steel pipe -Dia200mm x 75m	 0.90m³/min x 110m x 3pumps PVC-Dia200mm x 1620m steel pipe-Dia200mm x 60m	 steel pipe-Dia150mmx100m
Distribution facilities Reservoir tanks Distribution pipes	 steel panel 600m³ x 2tanks PVC-Dia250mm x 3100m steel pipe-Dia250mmx210m	 steel panel 480m³ steel pipe-Dia200mmx10m	 steel panel 600 m³ steel pipe-Dia200mmx10m
Disinfection equipment	chlorine injection equipment	chlorine injection equipment	chlorine injection equipment
Building	pumping station + disinfection room	pumping station + disinfection room	disinfection room
Existing reservoir tanks	replacement of inflow valves in the existing tanks(Tasahe, Titingge, Lengakiki)		
Existing White river pumping station	installation of new flow control equipment(White river)		

(3) Equipment Plan

Equipment used in the Project is as shown in Table 2-10. All the equipment is not manufactured in the Solomon Islands thus they will be procured from the third countries or Japan.

Table 2-10 Equipment Plan (1/2)

No.	Equipment	Major Specification	Quantity	Note
1	**Submerged pumps**			
	Type 1)	Discharge amount = 0.6m^3/min Total head = 80m Motor generator = 415Vx50Hzx11kW with water cable (100m) Accessories 200mmx80mm a well cover 80mm 90° bend 80mm sluice valve 80mm check valve Pressure gage Air release valve 80mm suction pipe 5.5m/pc 100mm flow meter Control panel (water proof outdoor) 415V x 50Hz x 11kW with a 100m electric rod	6	For pumping up from deep wells and conducting of water from wells to receiving tanks 4 pumps for WhiteRiver 2 pumps for Kombito
	Type 2)	Discharge amount = 0.43m^3/min Total head = 100m Motor generator = 415Vx50Hzx11kW with water cable (100m) Accessories 200mmx80mm a well cover 80mm 90' bend 80mm sluice valve 80mm check valve Pressure gage Air release valve 80mm suction pipe 5.5m/pc 100mm flow meter Control panel (water proof outdoor) 415V x 50Hz x 11kW with a 100m electric rod	5	For pumping up from deep wells and conducting of water from wells to receiving tanks 5 pumps for Mataniko
2	**Transmission pump**			
	Type 1)	Discharge amount = 1.22m^3/min Total head = 60m Motor generator = 415Vx50Hzx22kW Accessories 80mm porting valve 80mm reverse stopping valve 80mm foot valve Pressure gage 80mm flexible tube 80mm rubber tube Transmission pump control panel 415V x 50Hz x 22kW Power divider 22kWx2dividers, 11kWx4dividers	3	Transmission of water from receiving tank to reservoir. (White River)
	Type 2)	Discharge amount = 0.9m^3/min Total head = 110m Motor generator = 415Vx50Hzx37kW Accessories 80mm porting valve 80mm reverse stopping valve 80mm foot valve Pressure gage 80mm flexible tube 80mm rubber tube Transmission pump control panel 415V x 50Hz x 37kW Power divider 37kWx2dividers, 11kWx5dividers	3	Transmission of water from receiving tank to reservoir. (Mataniko)

Continue

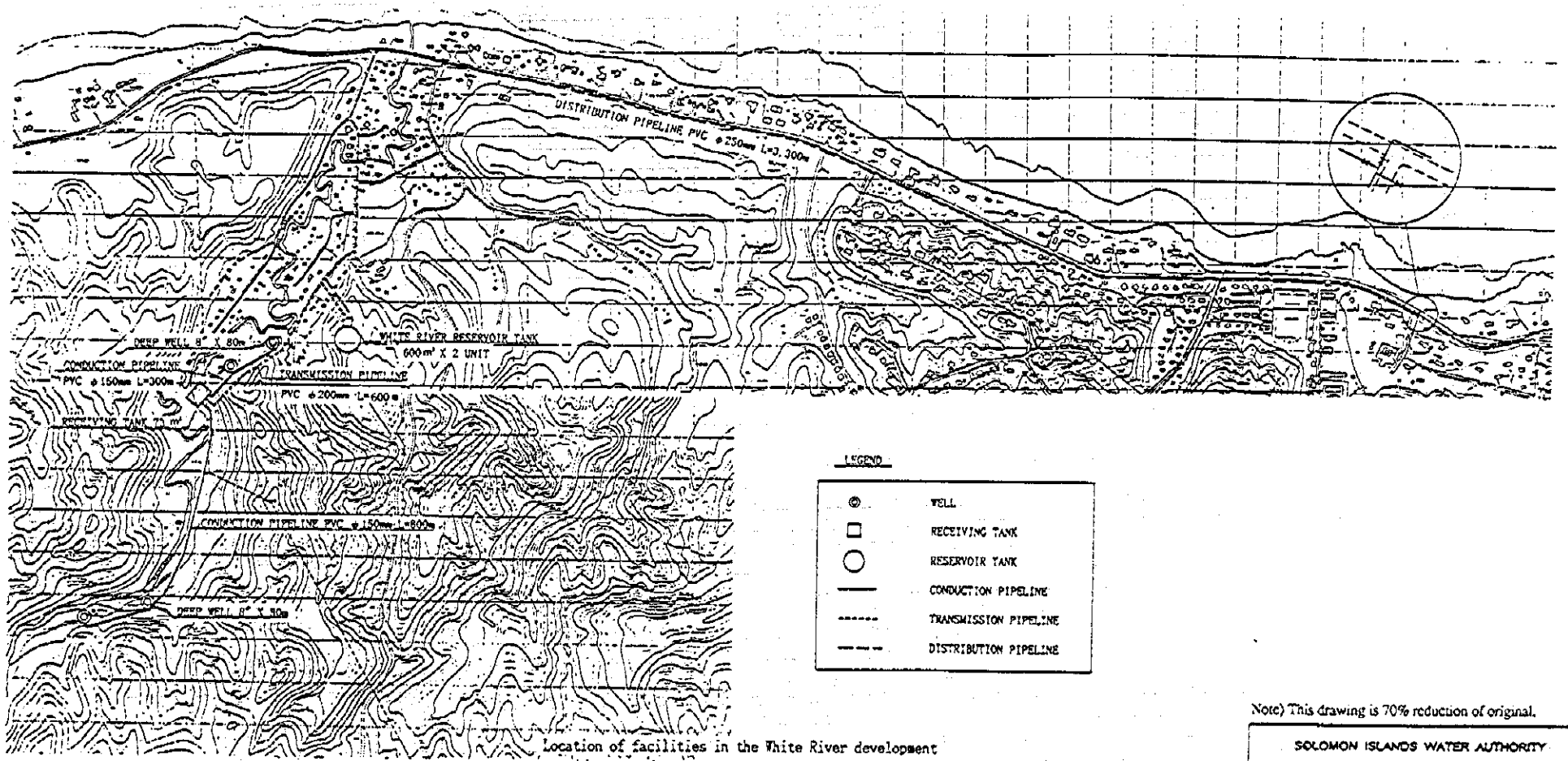
Table 2-10 Equipment Plan (2/2)

No.	Equipment	Major Specification	Quantity	Note
3	**Disinfection equipment**			
	Type 1)	Treatment capacity :3,500m^3/day		
		Chlorine injection equipment Diaphragm	2	For White River
		Discharge pressure 10Kg/cm^2 with a 100 l PVC tank		
		Mixing tank of 1050 l	2	
	Type 2)	Treatment capacity:2,600m^3/day		
		Chlorine injection equipment Diaphragm type	2	For Mataniko
		Discharge pressure 10Kg/cm^2 with a 100 l PVC tank		
		Mixing tank of 1050 l	2	
	Type 3)	Treatment capacity:5,900m^3/day		
		Chlorine injection equipment Diaphragm type	2	For Kombito
		Discharge pressure 10Kg/cm^2 with a 100 l PVC tank		
		Mixing tank of 1050 l	2	

(4) Basic Design Drawings

List of Basic Design Drawings are as below and they are shown in following pages.

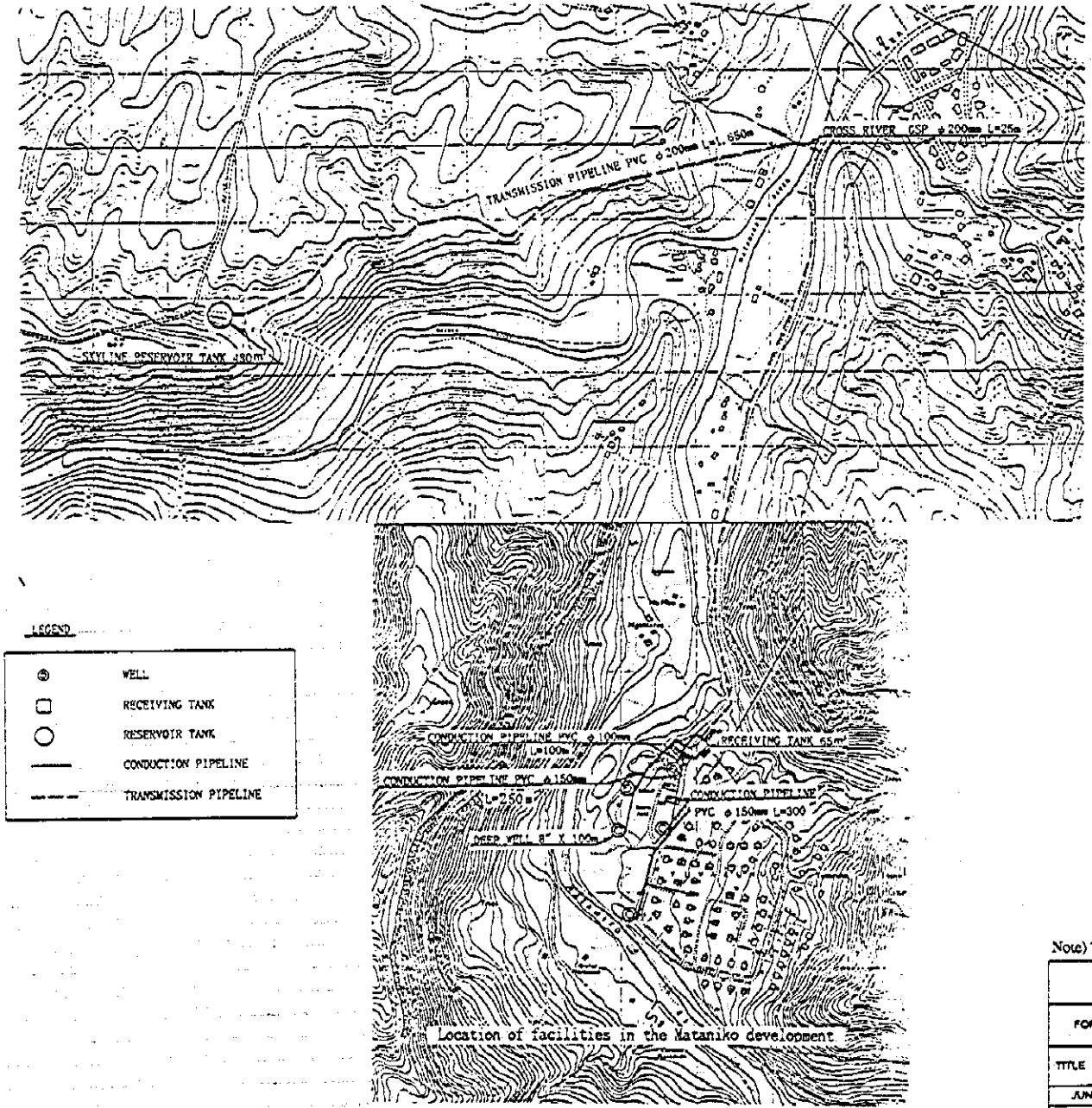
Drawing No.	Drawing Title
S - 1	Site Location (White River)
S - 2	Site Location (Mataniko)
S - 3	Site Location (Kombito -1/2)
S - 4	Site Location (Kombito -2/2)
S - 5	Schematic Flow Diagram (White River)
S - 6	Schematic Flow Diagram (Mataniko)
S - 7	Schematic Flow Diagram (Kombito)
S - 8	Pump House & Receiving Tank Plot Plan (White River)
S - 9	Pump House & Receiving Tank Plot Plan (Mataniko)
S - 10	Receiving Tank Plot Plan (Kombito)
S - 11	Reservoir Tank Plot Plan (White River)
S - 12	Reservoir Tank Plot Plan (Skyline･Mataniko)
S - 13	Reservoir Tank Plot Plan (Panatina･Kombito)
S - 14	Typical Structure of Deep Well
S - 15	Structure of Receiving Tank (White River & Mataniko)
S - 16	Typical Structure of Reservoir Tank & Receiving Tank
S - 17	Typical Installation of Booster Pump
S - 18	Structure of Pump House (White River & Mataniko)
S - 19	Structure of Disinfection House (Kombito)
S - 20	Typical Installation of Plumbing



Location of facilities in the White River development

Note) This drawing is 70% reduction of original.

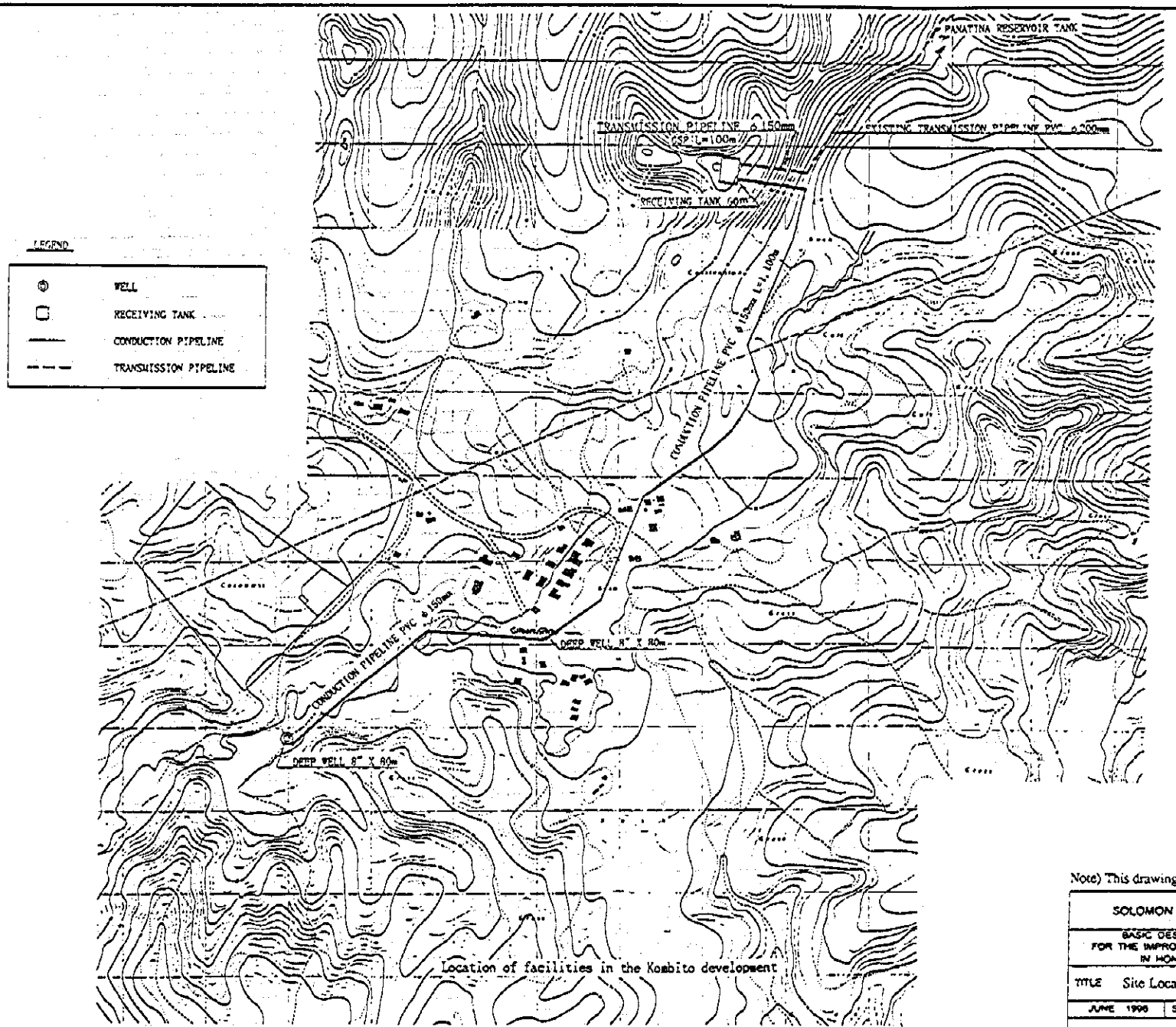
SOLOMON ISLANDS WATER AUTHORITY	
BASIC DESIGN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS	
TITLE	Site Location (White River)
JUNE 1998	SCALE 1/7500 NO. S-1
JAPAN INTERNATIONAL COOPERATION AGENCY	



Location of facilities in the Mataniko development

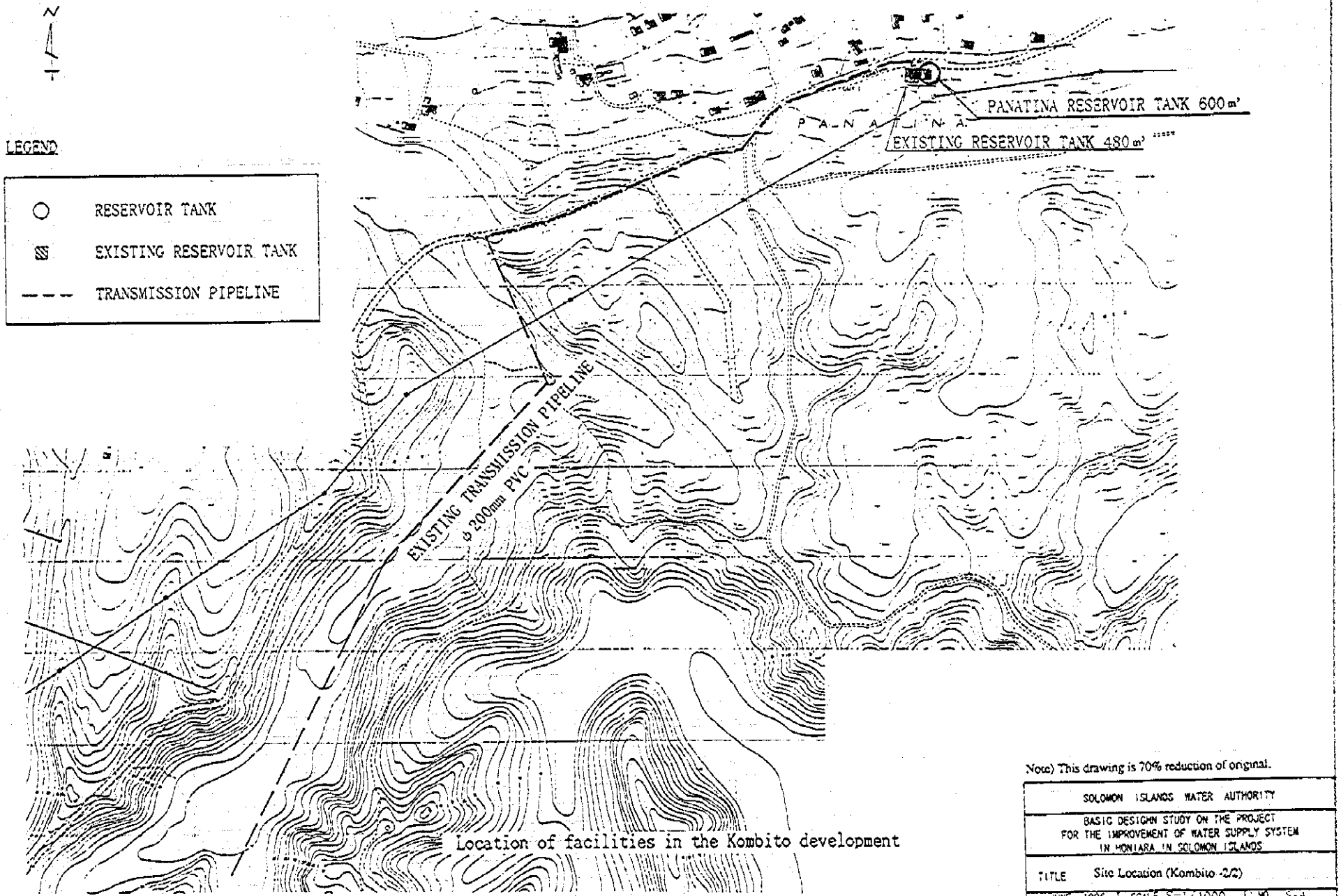
Note) This drawing is 70% reduction of original.

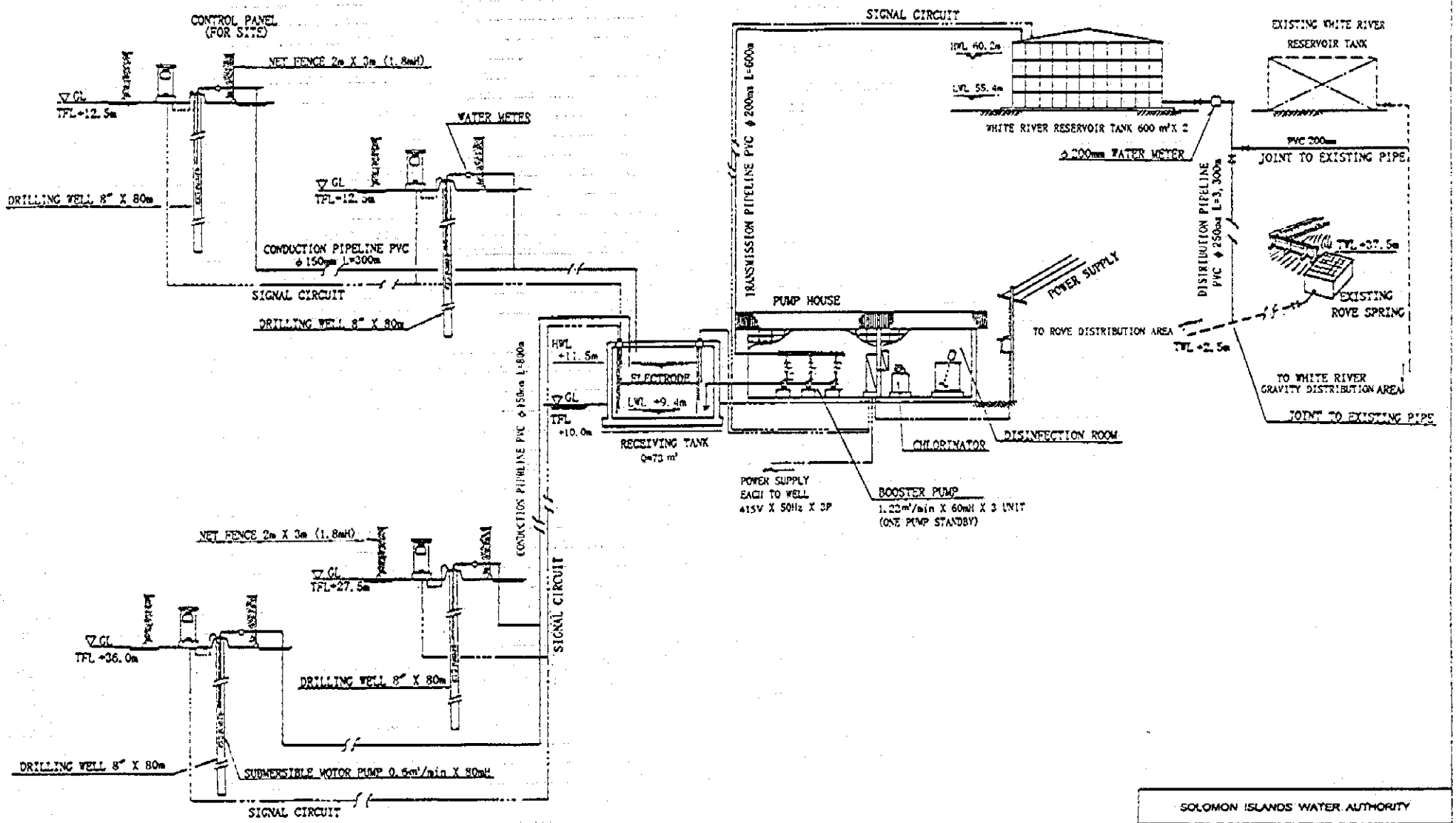
SOLOMON ISLANDS WATER AUTHORITY		
BASIC DESIGN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS		
TITLE	Site Location (Mataniko)	
JUNE 1996	SCALE 1/4000	NO. S-2
JAPAN INTERNATIONAL COOPERATION AGENCY		



Note) This drawing is 70% reduction of original.

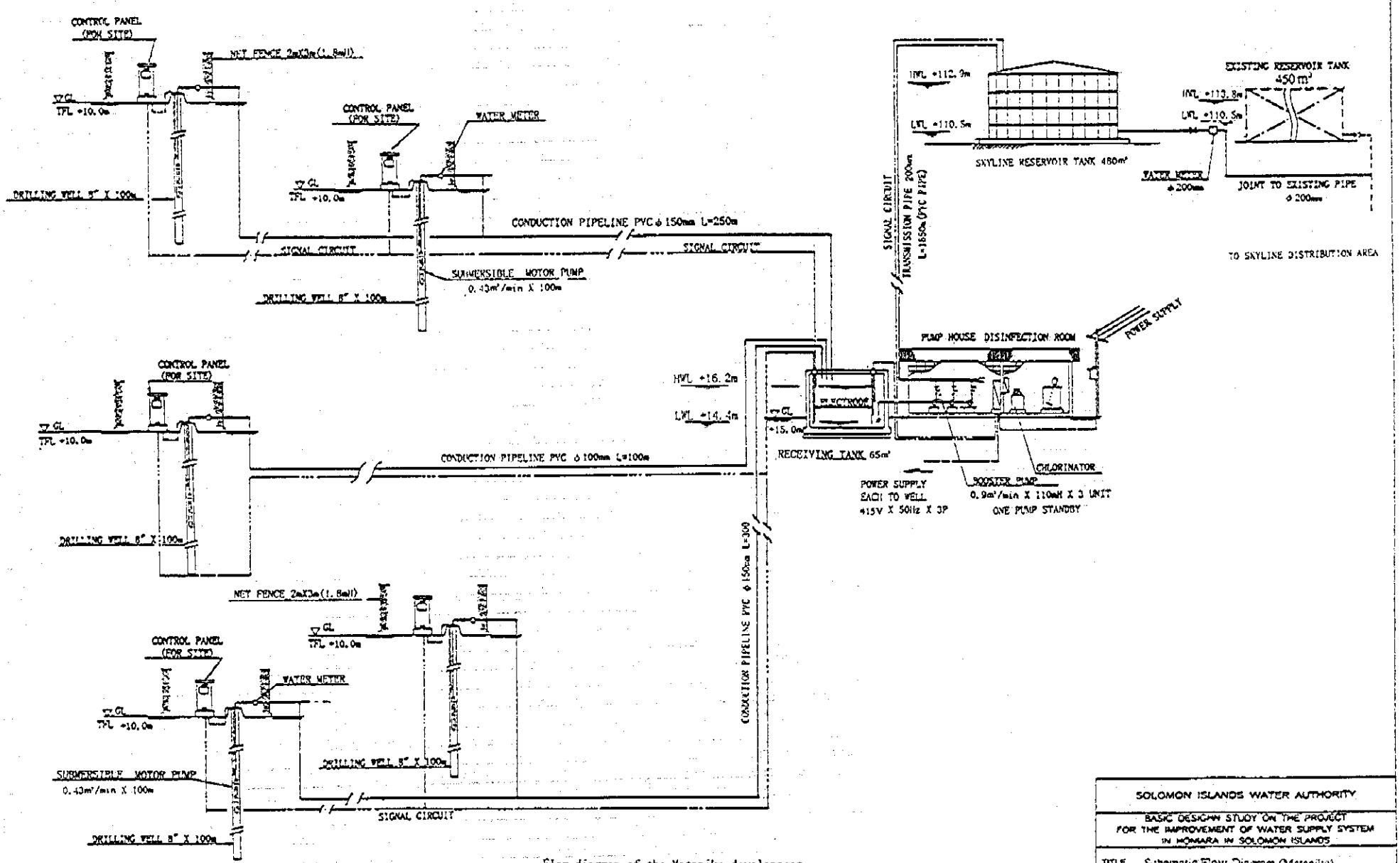
SOLOMON ISLANDS WATER AUTHORITY		
BASIC DESIGN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS		
TITLE	Site Location (Kombito -1/2)	
JUNE 1998	SCALE 1/3500	NO. S-3
JAPAN INTERNATIONAL COOPERATION AGENCY		


N
LEGEND
RESERVOIR TANK
EXISTING RESERVOIR TANK
TRANSMISSION PIPELINE
PANATINA RESERVOIR TANK 600 m³
EXISTING RESERVOIR TANK 480 m³
EXISTING TRANSMISSION PIPELINE
φ 200mm PVC
Location of facilities in the Kombito development
Note) This drawing is 70% reduction of original.
SOLOMON ISLANDS WATER AUTHORITY
BASIC DESIGHN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS
TITLE Site Location (Kombito -2/2)
JUNE 1996 SCALE S=1/4000 FIG NO. S-4
JAPAN INTERNATIONAL COOPERATION AGENCY



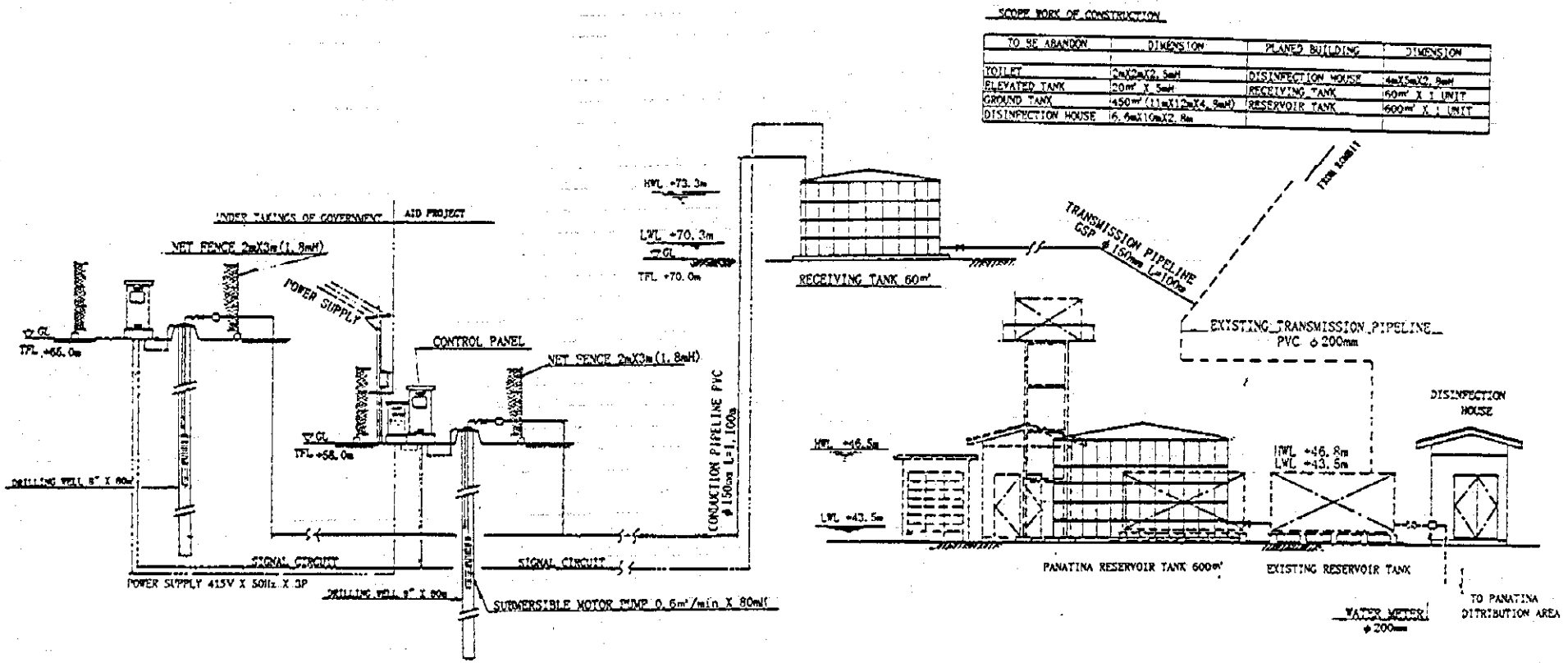
Flow diagram of the White River development

SOLOMON ISLANDS WATER AUTHORITY		
BASIC DESIGN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS		
TITLE Schematic Flow Diagram (White River)		
JUNE 1996	SCALE NO SCALE	NO. S-5
JAPAN INTERNATIONAL COOPERATION AGENCY		



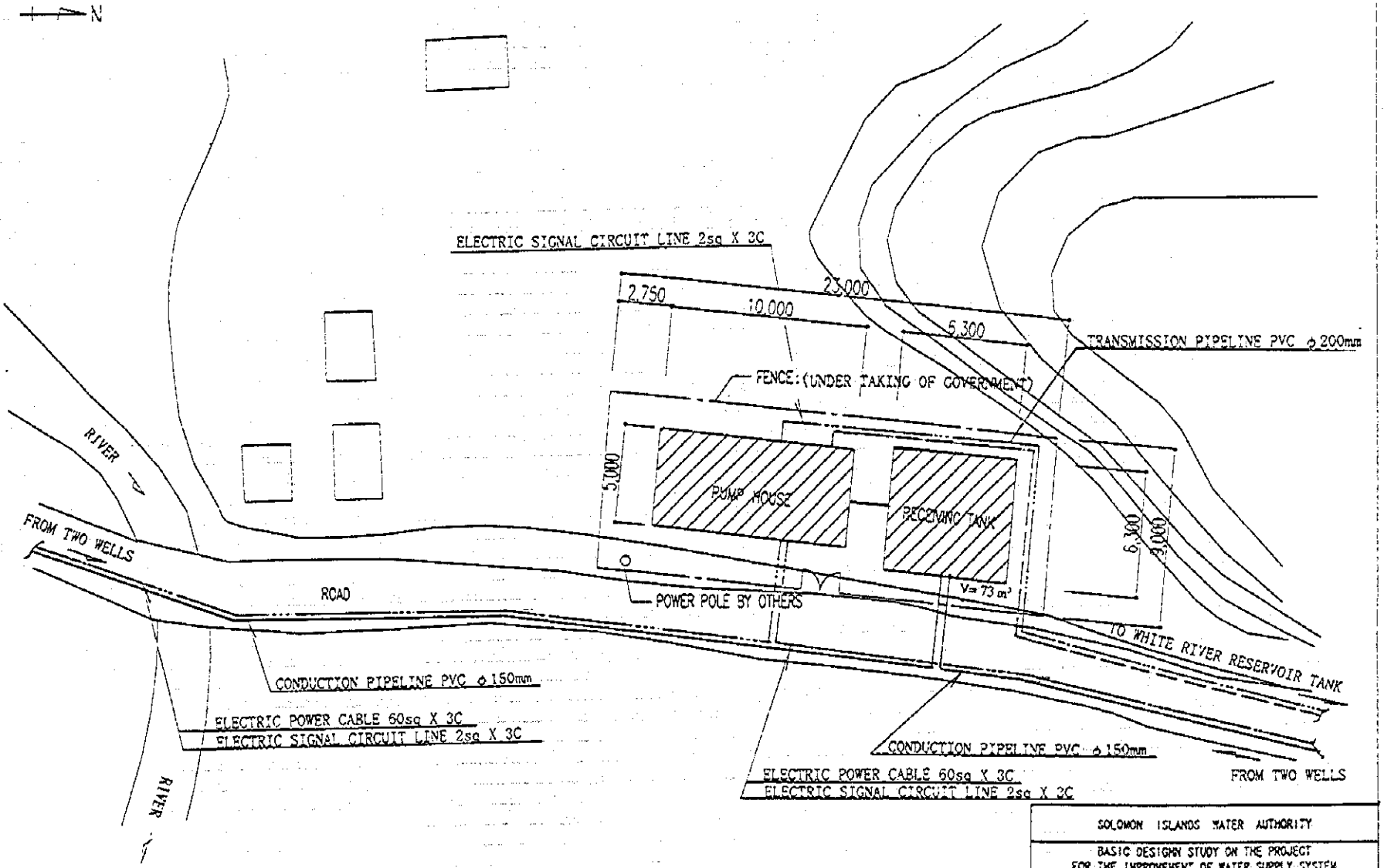
Flow diagram of the Mataniko development

SOLOMON ISLANDS WATER AUTHORITY		
BASIC DESIGN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS		
TITLE	Schematic Flow Diagram (Mataniko)	
JUNE 1995	SCALE NO SCALE	NO. S-6
JAPAN INTERNATIONAL COOPERATION AGENCY		



Flow diagram of the Kombito development

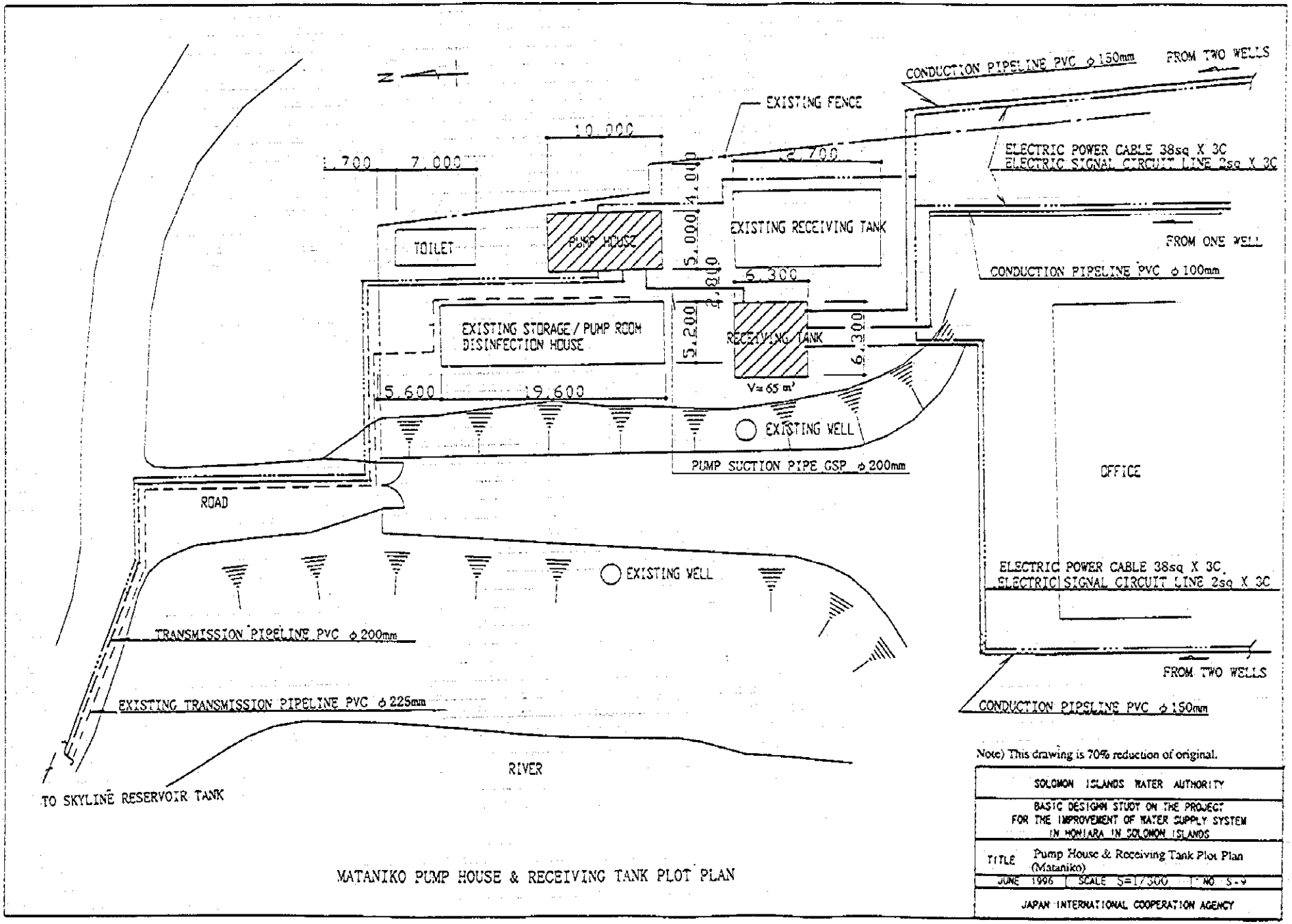
SOLOMON ISLANDS WATER AUTHORITY			
BASIC DESIGNN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS			
TITLE	Schematic Flow Diagram (Kombito)		
JUNE 1985	SCALE NO SCALE	NO. S-7	
JAPAN INTERNATIONAL COOPERATION AGENCY			



WHITE RIVER PUMP HOUSE & RECEIVING TANK PLOT PLAN

Note) This drawing is 70% reduction of original.

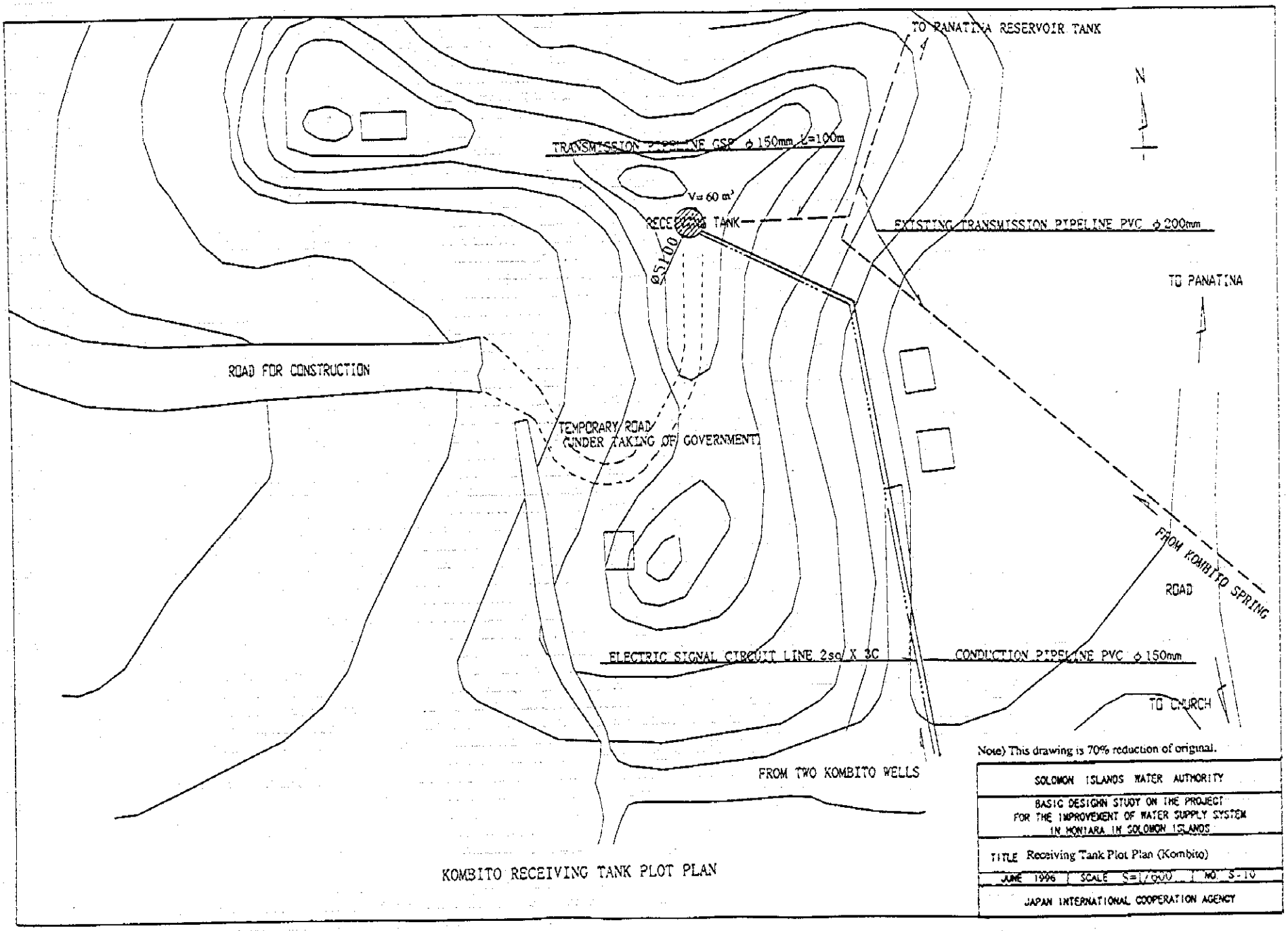
SOLOMON ISLANDS WATER AUTHORITY	
BASIC DESIGN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS	
TITLE	Pump House & Receiving Tank Plot Plan (White River)
JUNE 1996	SCALE S=1/200 NO. S-8
JAPAN INTERNATIONAL COOPERATION AGENCY	

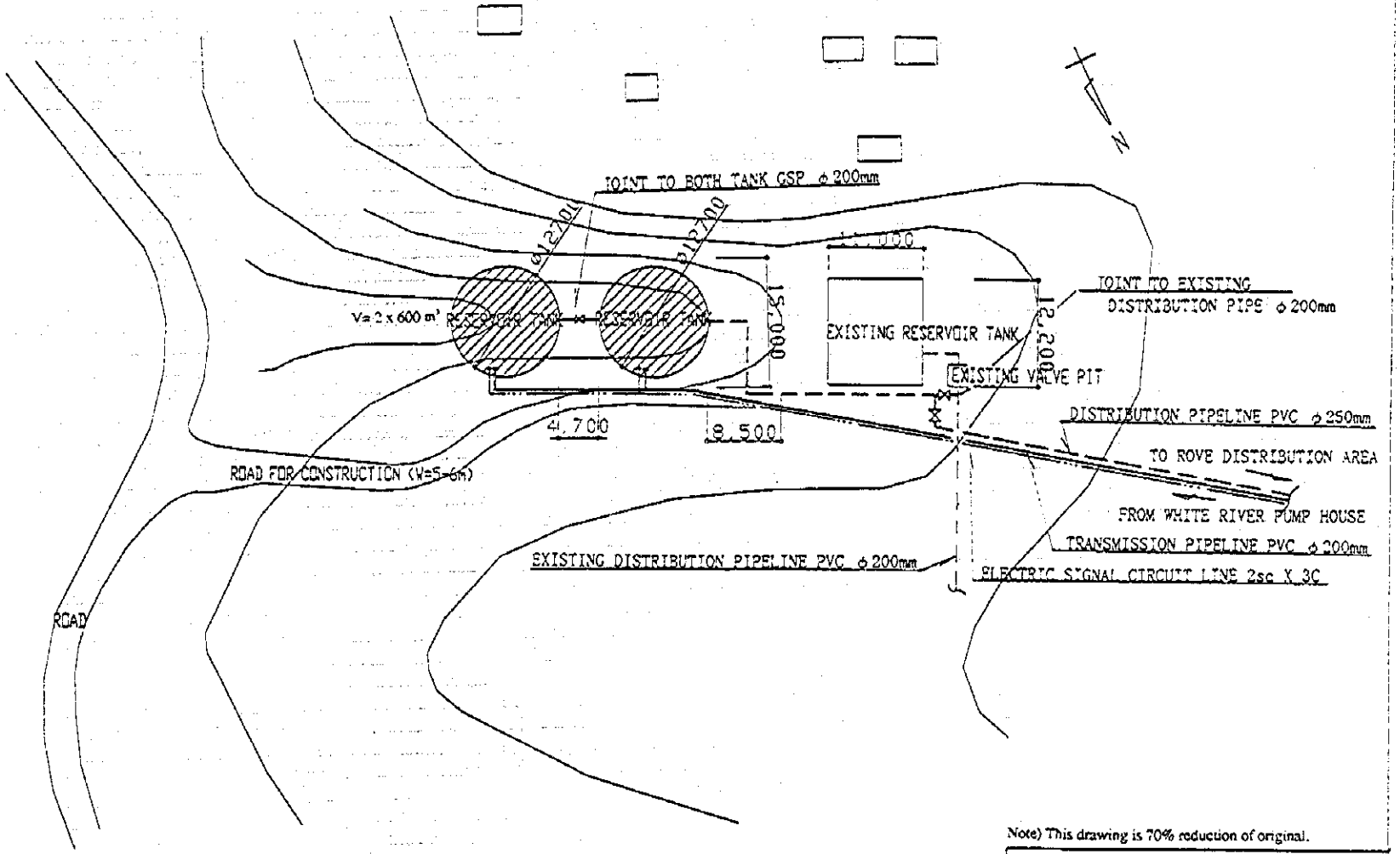


MATANIKO PUMP HOUSE & RECEIVING TANK PLOT PLAN

Note) This drawing is 70% reduction of original.

SOLOMON ISLANDS WATER AUTHORITY	
BASIC DESIGNN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS	
TITLE	Pump House & Receiving Tank Plot Plan (Mataniko)
JUNE 1996	SCALE S=1/300 NO S-9
JAPAN INTERNATIONAL COOPERATION AGENCY	

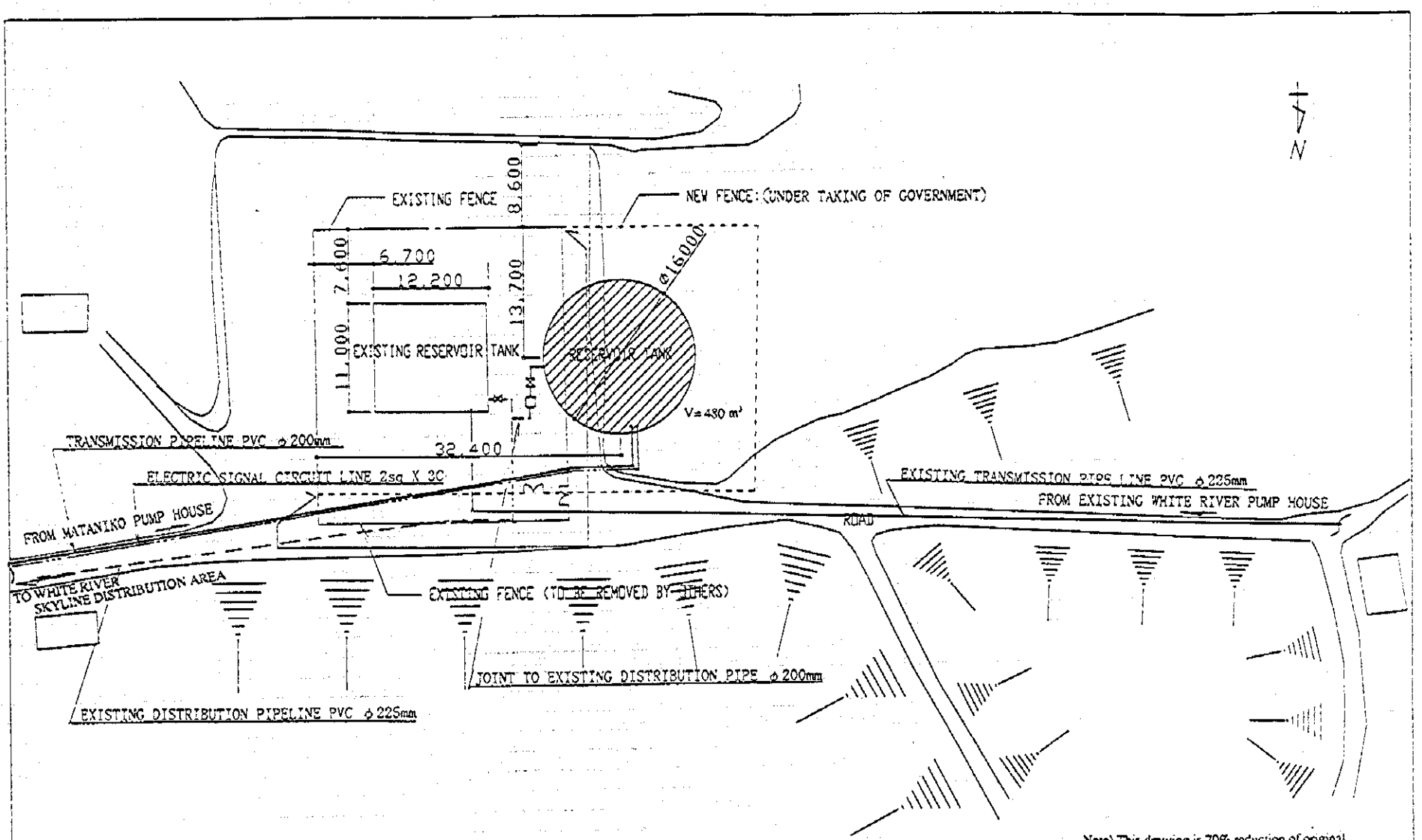

TO PANATINA RESERVOIR TANK
N
TRANSMISSION PIPELINE GSP φ150mm L=100m
V= 60 m³
RECEIVING TANK
EXISTING TRANSMISSION PIPELINE PVC φ200mm
TO PANATINA
ROAD FOR CONSTRUCTION
TEMPORARY ROAD
(UNDER TAKING OF GOVERNMENT)
FROM KOMBITO SPRING
ROAD
ELECTRIC SIGNAL CIRCUIT LINE 2sq X 3C
CONDUCTION PIPELINE PVC φ150mm
TO CHURCH
FROM TWO KOMBITO WELLS
KOMBITO RECEIVING TANK PLOT PLAN
Note) This drawing is 70% reduction of original.
SOLOMON ISLANDS WATER AUTHORITY
BASIC DESIGNN STUDY ON THE PROJECT
FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM
IN HONIARA IN SOLOMON ISLANDS
TITLE Receiving Tank Plot Plan (Kombito)
JUNE 1996 SCALE S=1/500 NO. S-10
JAPAN INTERNATIONAL COOPERATION AGENCY



WHITE RIVER RESERVOIR TANK PLOT PLAN

Note) This drawing is 70% reduction of original.

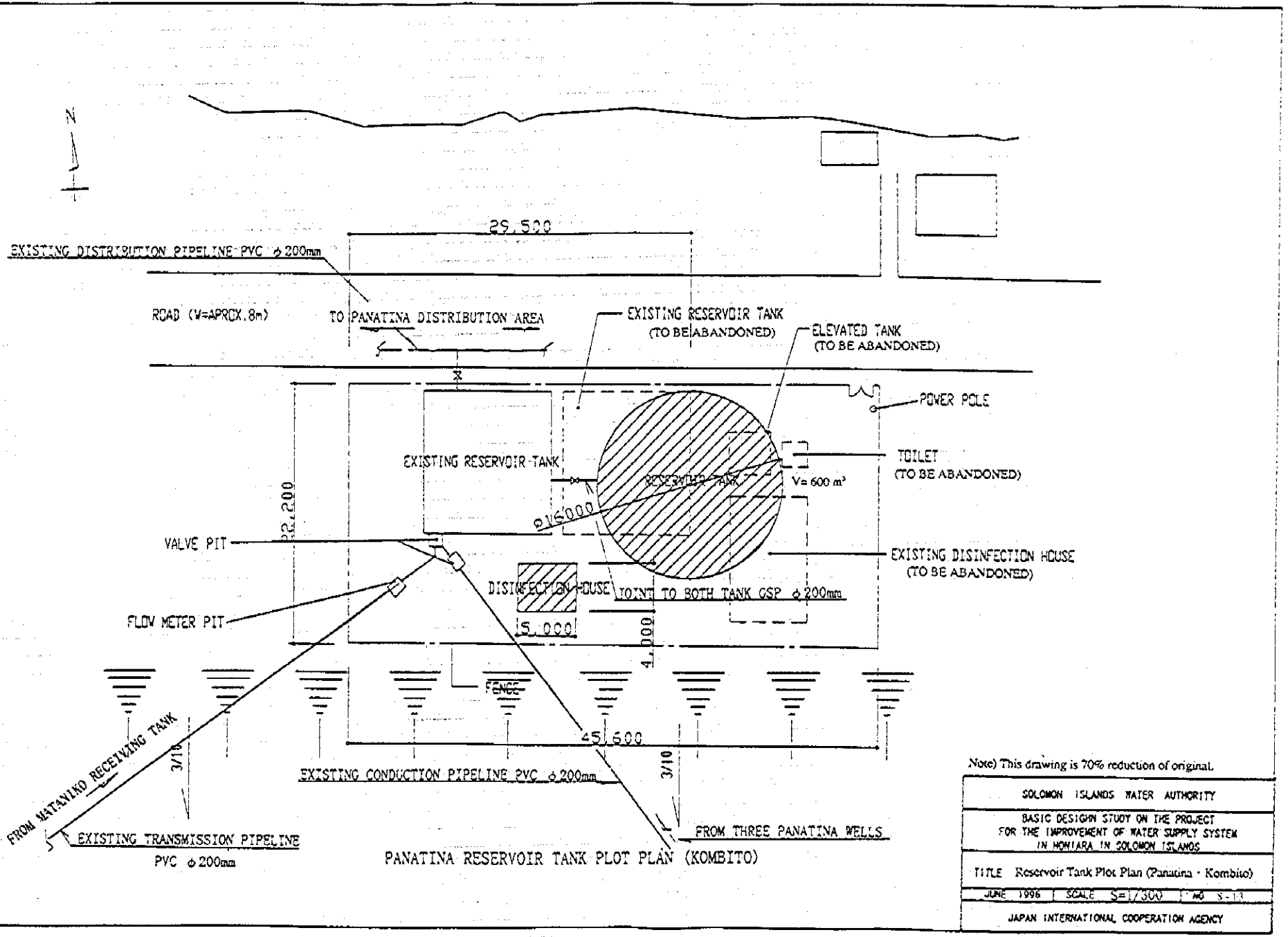
SOLOMON ISLANDS WATER AUTHORITY	
BASIC DESIGN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS	
TITLE	Reservoir Tank Plot Plan (White River)
JUNE 1996	SCALE S=1/500 NO. S-11
JAPAN INTERNATIONAL COOPERATION AGENCY	



SKYLINE RESERVOIR TANK PLOT PLAN (MATANIKO)

Note) This drawing is 70% reduction of original.

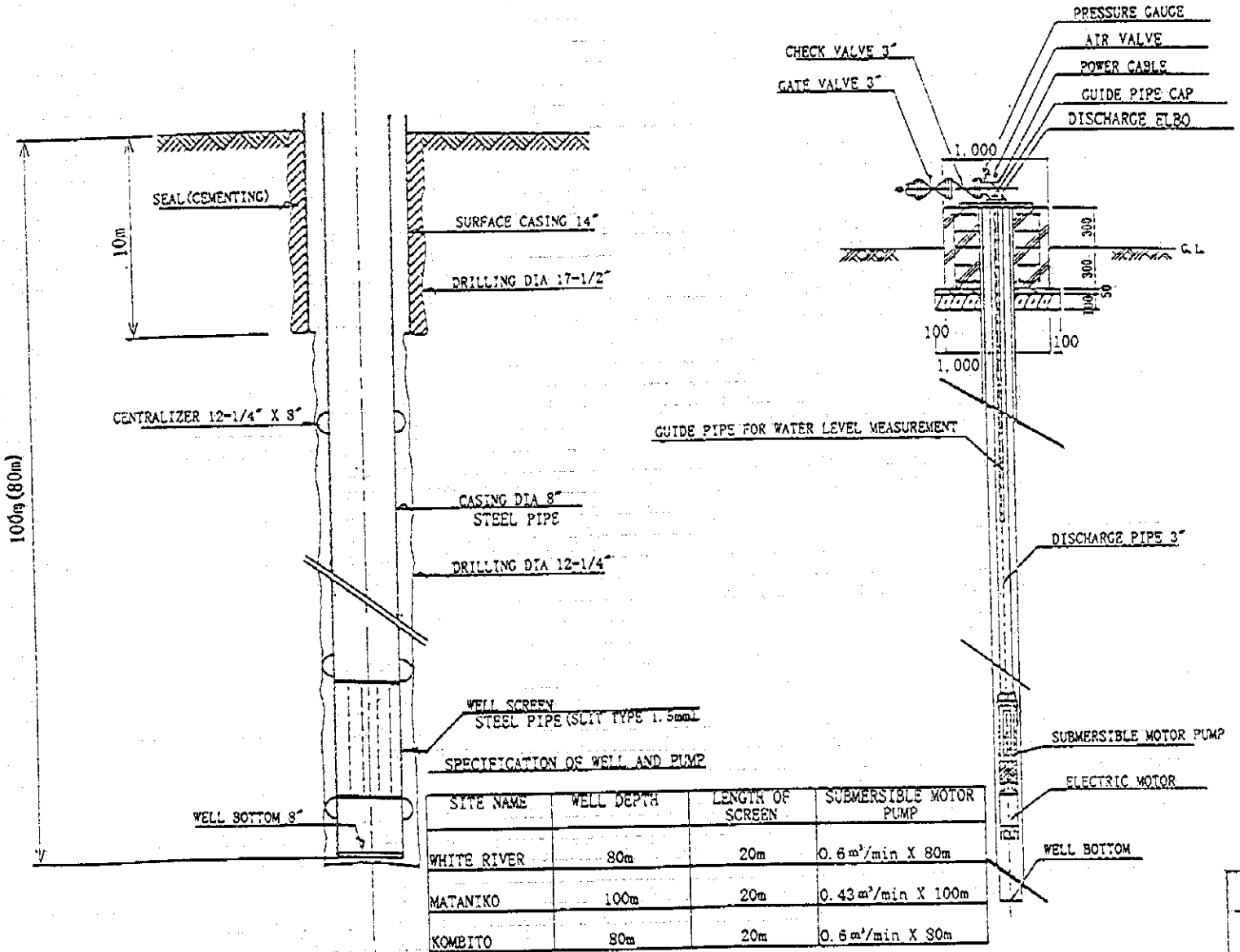
SOLOMON ISLANDS WATER AUTHORITY	
BASIC DESIGN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS	
TITLE	Reservoir Tank Plot Plan (Skyline · Matanikо)
JUNE 1996	SCALE S=1/400 NO. S-12
JAPAN INTERNATIONAL COOPERATION AGENCY	



PANATINA RESERVOIR TANK PLOT PLAN (KOMBITO)

Note) This drawing is 70% reduction of original.

SOLOMON ISLANDS WATER AUTHORITY	
BASIC DESIGN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS	
TITLE Reservoir Tank Plot Plan (Panatina · Kombito)	
JUNE 1996	SCALE S=1/300 NO S-13
JAPAN INTERNATIONAL COOPERATION AGENCY	



SPECIFICATION OF WELL AND PUMP

SITE NAME	WELL DEPTH	LENGTH OF SCREEN	SUBMERSIBLE MOTOR PUMP
WHITE RIVER	80m	20m	0.6 m³/min X 80m
MATANIKO	100m	20m	0.43 m³/min X 100m
KOMBITO	80m	20m	0.6 m³/min X 80m

BOREHOLE STRUCTURE

INSTALLATION OF SUBMERSIBLE MOTOR PUMP

Standard Well Structures

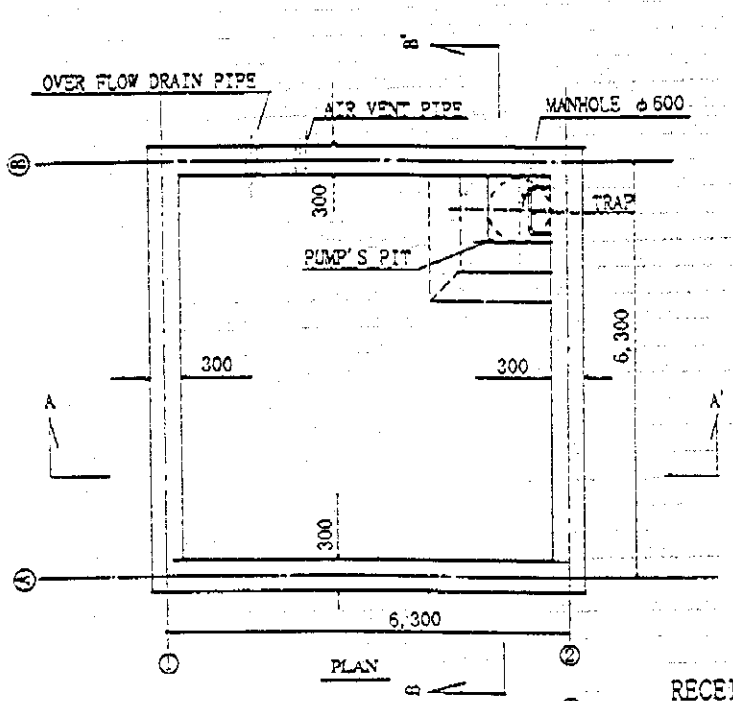
SOLOMON ISLANDS WATER AUTHORITY

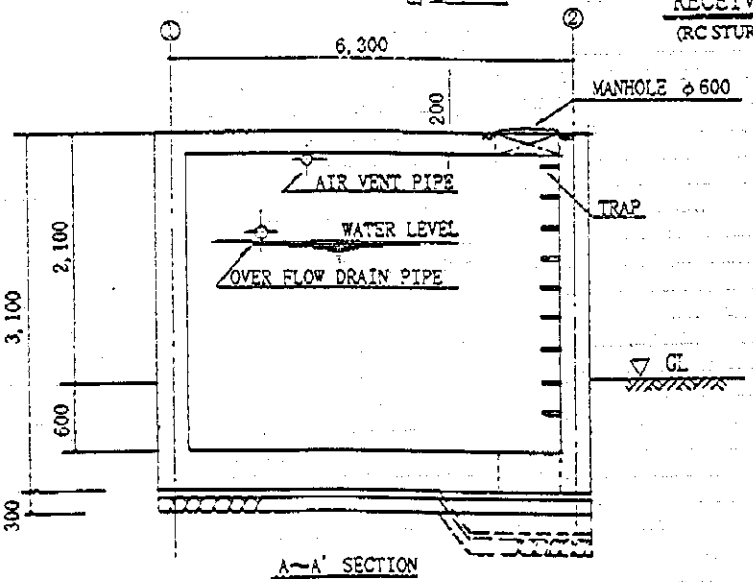
BASIC DESIGN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS

TITLE Typical Structure of Deep Well

JUNE 1996 | SCALE NO SCALE | NO S-14

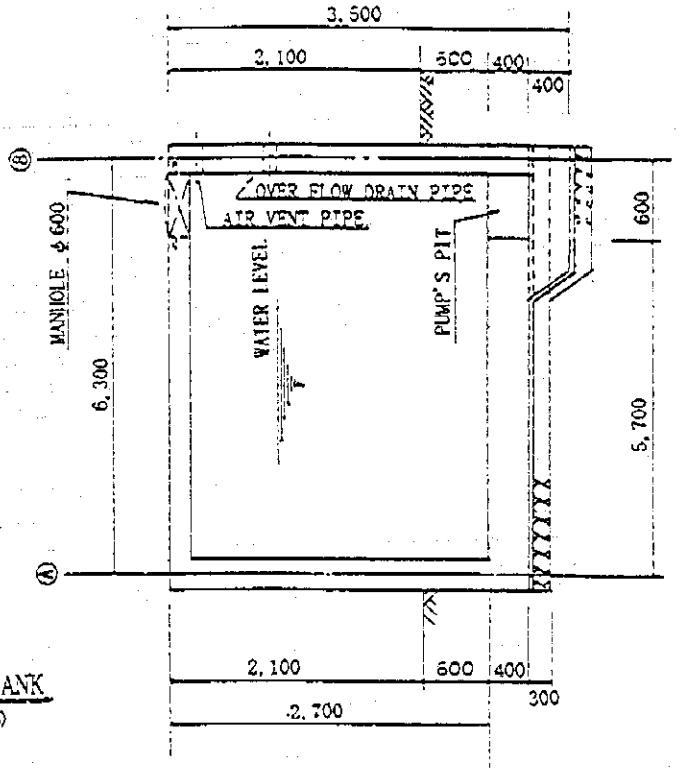
JAPAN INTERNATIONAL COOPERATION AGENCY





A~A' SECTION

RECEIVING TANK
(RC STURUCTURE)

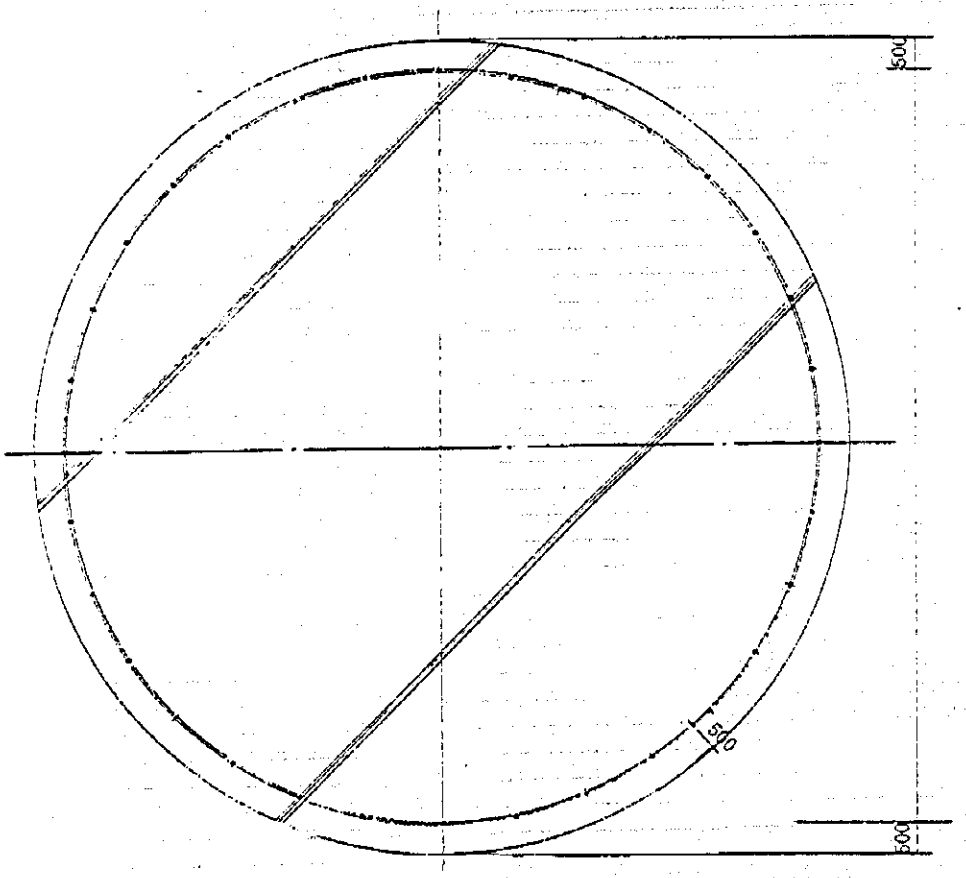


B~B' SECTION

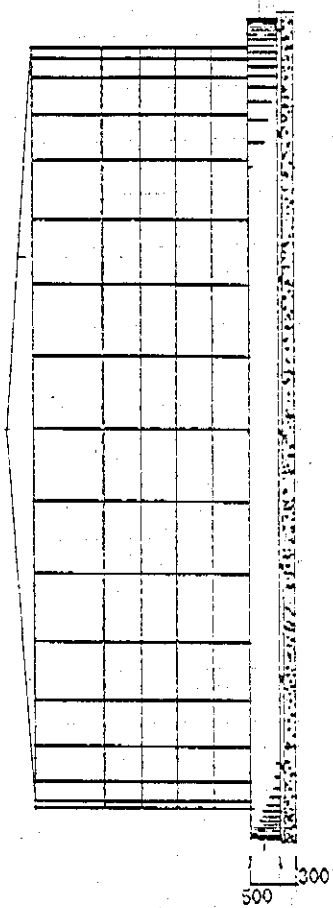
Note) This drawing is 70% reduction of original.

SOLOMON ISLANDS WATER AUTHORITY	
BASIC DESIGNN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS	
TITLE	Structure of Receiving Tank (White River & Matanikoi)
JUNE 1998	SCALE S=1/100 NO. S-15
JAPAN INTERNATIONAL COOPERATION AGENCY	

PLAN



ELEVATION



RESERVOIR & RECEIVING TANK (STEEL PANEL)

SITE NAME	KIND OF TANK	DIAMETER (mm)	HIGHT (mm)	VOLIUM (m³)	UNIT
WHITE RIVER	RESERVOIR	12700	4800	600	2
MATANIKO	RESERVOIR	16000	2400	480	1
KOMBITO	RESERVOIR	16000	3000	600	1
KOMBITO	RECEIVING	5100	3000	60	1

Standard Reservoir & Receiving Tank

SOLOMON ISLANDS WATER AUTHORITY

BASIC DESIGN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS

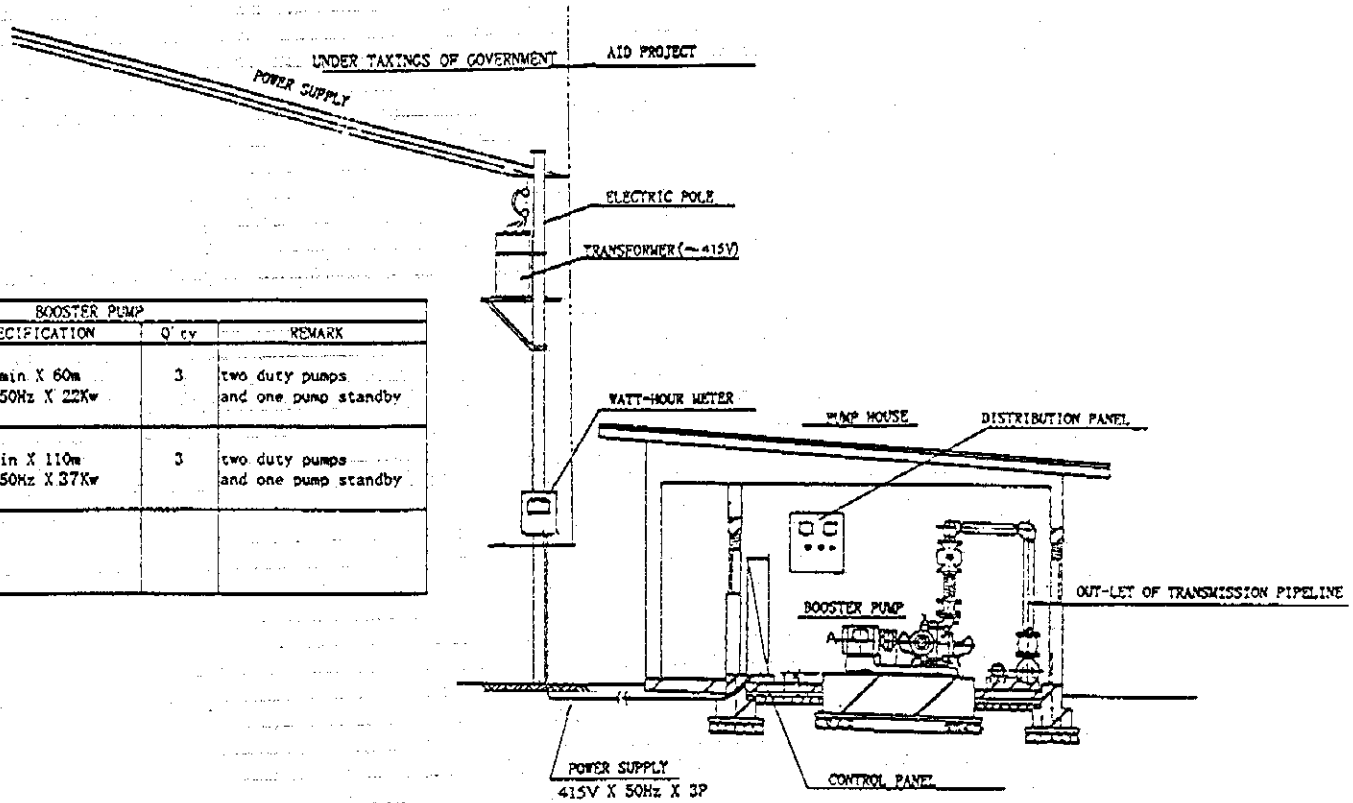
TITLE: Typical Structure of Reservoir Tank & Receiving Tank

JUNE 1998 | SCALE NO SCALE | NO. S-16

JAPAN INTERNATIONAL COOPERATION AGENCY

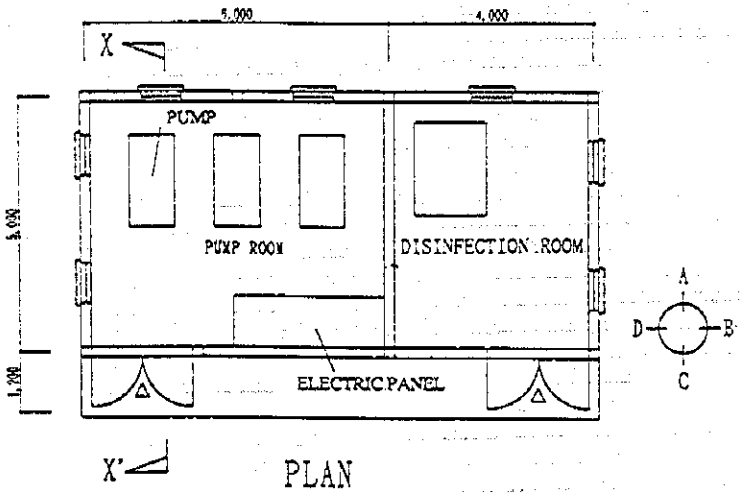
SPECIFICATION OF PUMPS

AREA	SUBMERSIBLE MOTOR PUMP		BOOSTER PUMP		
	SPECIFICATION	Q'ty	SPECIFICATION	Q'ty	REMARK
WHITE RIVER	0.6m³/min X 80m 415V X 50Hz X 11Kw	4	1.22m³/min X 60m 415V X 50Hz X 22Kw	3	two duty pumps and one pump standby
MATANIKO	0.43m³/min X 100m 415V X 50Hz X 11Kw	5	0.9m³/min X 110m 415V X 50Hz X 37Kw	3	two duty pumps and one pump standby
KOMBITO	0.6m³/min X 80m 415V X 50Hz X 11Kw	2			

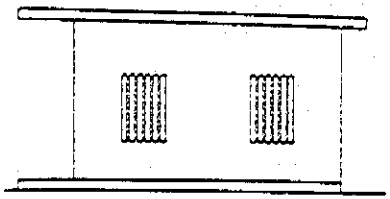


Standard Pumping Station

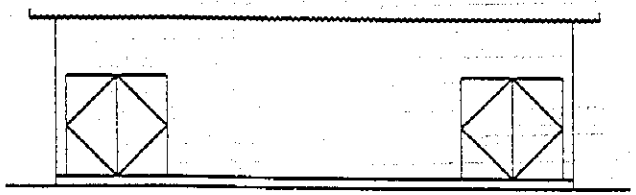
SOLOMON ISLANDS WATER AUTHORITY		
BASIC DESIGNN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS		
TITLE Typical Installation of Booster Pump		
JUNE 1996	SCALE NO SCALE	NO. S-17
JAPAN INTERNATIONAL COOPERATION AGENCY		



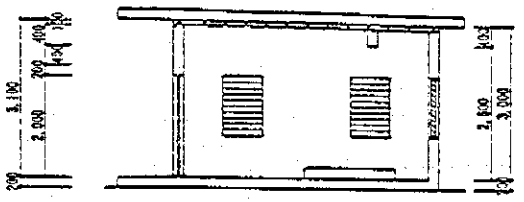
PLAN



ELEVATION B



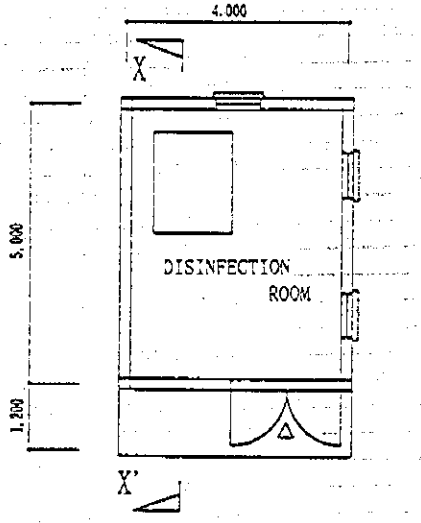
ELEVATION C



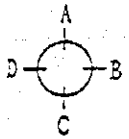
SECTION X-X'

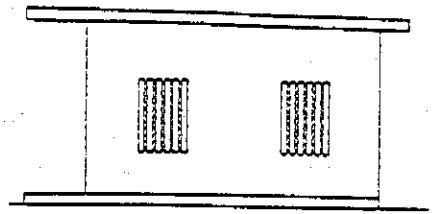
Note) This drawing is 70% reduction of original.

SOLOMON ISLANDS WATER AUTHORITY	
BASIC DESIGNN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS	
TITLE	Structure of Pump House (White River & Matanikau)
JUNE 1996	SCALE S=1/100 NO S-18
JAPAN INTERNATIONAL COOPERATION AGENCY	

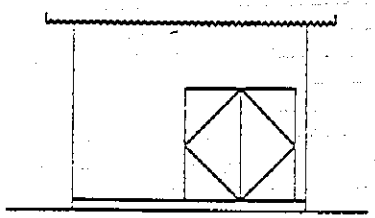


PLAN

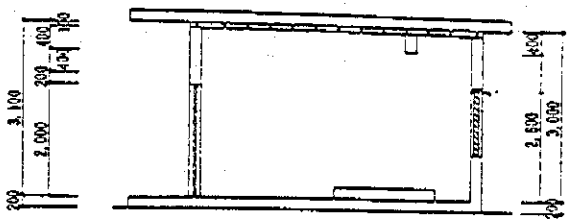




ELEVATION B



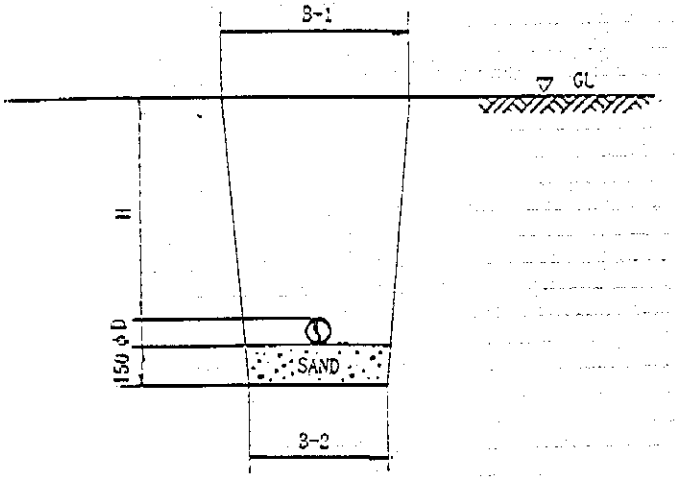
ELEVATION C



SECTION X-X'

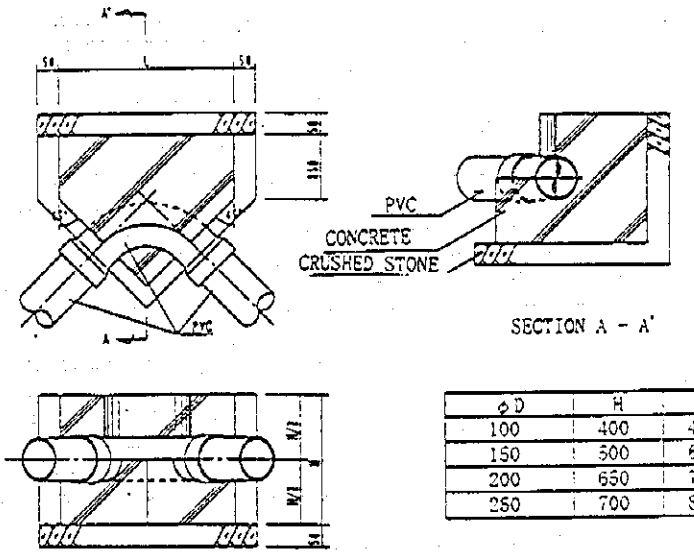
Note) This drawing is 70% reduction of original.

SOLOMON ISLANDS WATER AUTHORITY	
BASIC DESIGNN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS	
TITLE	Structure of Disinfection House (Kombito)
JUNE 1996	SCALE S=1/100 NO. S-10
JAPAN INTERNATIONAL COOPERATION AGENCY	



EXCAVATION

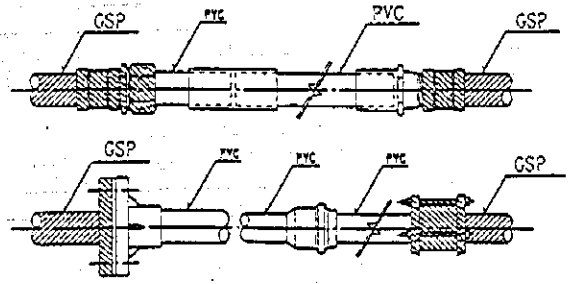
PIPE SIZE	TRAFFIC ROAD			OTHER		
φD	B-1	B-2	H	B-1	B-2	H
φ100	600	500	1000	600	500	600
φ150	600	500	1000	600	500	600
φ200	700	600	1000	700	600	600
φ250	700	600	1000	700	600	600



SECTION A - A'

φD	H	L
100	400	450
150	500	600
200	650	700
250	700	800

DETAIL OF PROTECTION



DETAIL OF JOINT

GSP : GALVANIZED STEEL PIPE
PVC : POLYVINYL CHLORIDE PIPE

SOLOMON ISLANDS WATER AUTHORITY
BASIC DESIGNN STUDY ON THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM IN HONIARA IN SOLOMON ISLANDS
TITLE Typical Installation of Plumbing
JUNE 1996 | SCALE NO SCALE | NO S-20
JAPAN INTERNATIONAL COOPERATION AGENCY

CHAPTER 3

IMPLEMENTATION PLAN

CHAPTER 3 IMPLEMENTATION PLAN

3.1 IMPLEMENTATION PLAN

3.1.1 IMPLEMENTATION CONCEPT

Major construction components of the Project are as follows:

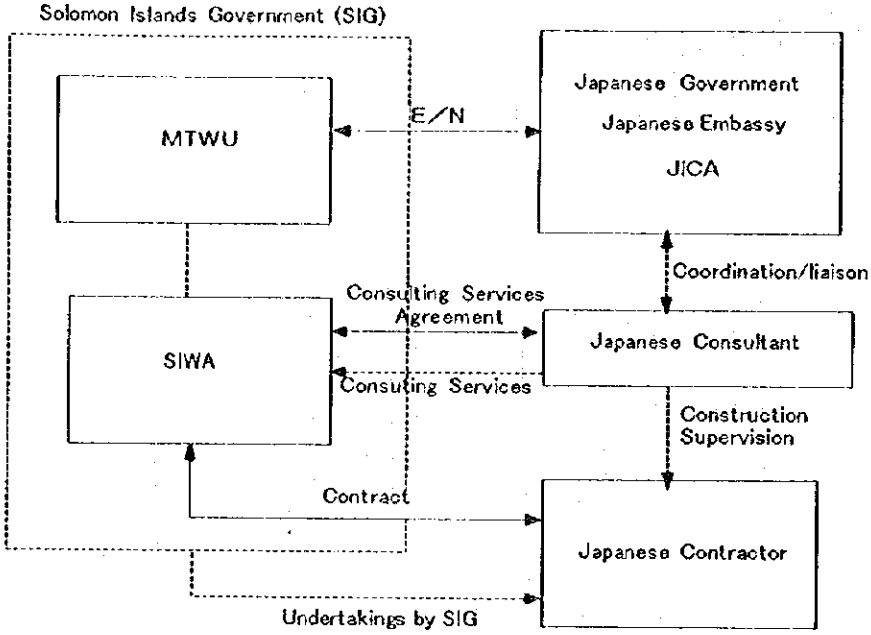
- Water intake facilities: well drilling, well finishing, pump installation
- Water transmission facilities: transmission/distribution pipelines, receiving tanks, booster pumps
- Water distribution facilities: reservoir tanks
- others

Among them, well drilling and construction of the reservoir tanks would be critical works affecting the implementation schedule, judging from their large work volumes. It would be important to prepare a construction plan so as these works to be executed efficiently in order to secure effective and smooth implementation of the Project.

As the local consultants and construction companies do not have the capability to handle large projects, most large projects are conducted by foreign companies, such as those from Australia, New Zealand, Japan and elsewhere, or by foreign affiliated companies. Thus, it is necessary to hire foreign workers and engineers as subcontractors to effectively accomplish the project implementation.

It is therefore necessary to dispatch specialists from Japan to conduct well drilling, pump installation and to supervise the reservoir tank construction.

SIWA will be the agency responsible for the implementation of the Project and MTWU will be involved in the Project as the responsible Government Ministry, which will sign the exchange of notes, conclude Banking Arrangement and issue Authorization to Pay. Organizations involved in the implementation of the Project both from the governments of Solomon Islands and Japan and their relationship are as shown below:



3.1.2 IMPLEMENTATION CONDITIONS

In the implementation of the Project, the following aspects must be taken into account:

- This project is to develop new groundwater sources to supply groundwater to some existing water distribution areas, which could be considered as the improvement of the existing system. It is therefore important to coordinate with SIWA so as to minimize interference with the current operations by the execution of the project.

- In case where the Project is implemented under a Japan's Grant Aid, the commencement of the works is estimated to be in January 1997. In Solomon Islands, frequent rainfalls occur from November to April. Major components of the Project involve much earth works such as well drilling, reservoir construction and pipe line installation, the progress of which is much affected by rainfall. It is therefore important to undertake the construction works after April and to carry out the procurement, manufacture and transportation of material and equipment until April.

- As porous lime stone is the predominant geological formation in the Project area, it is anticipated that surface activities may affect shallow groundwater quality. In fact, there are several wells abandoned due to bacteriological contamination. In order to mitigate such problems, well surface will be completed with grouting. It is required to secure the necessary grouting procedure including that of the mixture during the construction phase of the project.

3.1.3 SCOPE OF WORKS

The scope of work for the Japanese side and the Solomon Island side is shown in the following table:

Items	Japanese side	Solomon Island Side
To secure lands for facilities, including that of pipe line installation.		O
To supply electricity to the facility sites		O
To construct access road		O
To construct fences		O
Construction of Water supply Facilities		
Intakes	O	
Conduction	O	
Receiving tank	O	
Water transmission	O	
Disinfection	O	
Distribution	O	

3.1.4 CONSULTANT SUPERVISION

The scope of detailed design is as follows:

- To conduct detailed design based on the results of the Basic Design Study and to determine scales and quantities of the facilities.
- To estimate project costs and to prepare tender documents.
- To assist SIWA in the selection of contractor according to the tendering procedures described in the guidelines of Japan's Grant Aid.

The scope of the detailed design will not include any physical survey for hydrogeological investigation because such survey has already been completed in the Basic Design Study.

The basic concept of the construction supervision works are as follows:

- To maintain close communication with the authorities concerned of both the countries to ensure a smooth implementation of the Project.
- To give prompt and appropriate guidance to the concerned personnel so as the construction will be in accordance with the design drawings and specifications.
- To provide effective technology transfer to the personnel of Solomon Islands, which is an important objective of grant aid projects.

- To provide appropriate advice and guidance for the smooth maintenance and management of the constructed facilities.

- To coordinate with SIWA to minimize interference to the current operations by the construction works.

Scope of the supervision involves in addition to ensure work progress on schedule, quality control, inspection, coordination between SIWA and the contractor, construction safety. These activities would continue from the commencement to the completion of the Project. Thus, the consultant supervision system will be permanent, while engineering supervision for particular facilities will be provided an "on the spot" basis.

3.1.5 PROCUREMENT PLAN

Procurement conditions in the Project area are as follows:

- Among construction materials, only concrete, aggregate and wood plates are procured in the local market. Other construction materials are imported from Australia, New Zealand and Singapore.

- With regard to construction equipment, bulldozers, back hoes, dump cars and mixers would be available from MTWU and some construction material companies on lease base. MEWMR owns drilling rigs but they are old-fashioned and not effective to be able to be used in the Project. There are no drilling rigs in Guadalcanal Islands other than those.

- All materials and equipment for water supply system locally available are imported ones.

A procurement plan considering based on the above mentioned local conditions is as shown in Table 3.1. Routes and required shipping periods in case procured from Australia, New Zealand and Japan are as follows:

Australia: Melbourne - Sydney - Brisbane - Port Moresby - Honiara
17 days (2 ships/month)

New Zealand: Auckland - Port Moresby - Lae - Rabaul - Honiara
30 days (2 ships /month)

Japan: Kobe - Nagoya - Yokohama - Suva - Pagopago - Apia - Noumera - Port Villa - Honiara
37 days (1 ship/month)

Table 3-1 Plan of procuring equipment

S: Solomon Islands, A: Australia, J: Japan

	Works and equipment	Country procured		Justifications
1	CONSTRUCTION WORKS			
1)	Cement	S		
2)	Aggregate (sand, ballast)	S		
3)	Crushed rocks (cobble stone)	S		
4)	Reinforcement	S		
5)	Frame works	S		Required quantity is too large to purchase in the local market
6)	Doors, windows, louvers	S	J	Some of them are not available in the local and third contries' market
7)	Roofing materials	S		
8)	Concrete blocks	S		
9)	Ventilator		A	Not available in the local market
10)	Fences		A	Not available in the local market
11)	steel panels		A	Not available in the local market
2	PIPING WORKS			
1)	PVC pipes		A	Required quantity is too large to purchase in the local market
2)	Fitting		A	Required quantity is too large to purchase in the local market
3)	carbonated steel pipe		A	Required quantity is too large to purchase in the local market
4)	Fitting		A	Required quantity is too large to purchase in the local market
5)	valves (poring and reverse stopping)		A	Required quantity is too large to purchase in the local market
6)	Water meter		A	Required quantity is too large to purchase in the local market
7)	Special equipment (for automatic control) Safety valves, flowgate valves, pressure gage		J	Not available in the local market, Uncertainty in delivery date in the third country market
8)	Air vent valve		A	Not available in the local market
9)	Flexible tube		J	Not available in the local market, uncertainty in delivery date in the third country market
10)	Inflow valve (ball tap)		J	
3	PUMPS			
1)	Submerged pumps (with accessories)		J	uncertainty in delivery date
2)	Control panels		A	uncertainty in delivery date
3)	Transmission pumps (with accessories)		A	uncertainty in delivery date
4)	Control panels		A	uncertainty in delivery date
5)	Chlorine injection equipment (with accessories)		A	uncertainty in delivery date
4	DRILLING WORKS			
1)	Steel casings, screens		J	Not available in the local and third contries' market
2)	Consumable equipment			
	Bits		A	Required quantity is too large to purchase in the local market
	Benthonite		A	Required quantity is too large to purchase in the local market
	Drilling mud		A	Required quantity is too large to purchase in the local market
	Conductor pipe		A	Required quantity is too large to purchase in the local market
	Machine consumable	S		
	Fuel / Grease	S		
3)	Tools	S		
4)	Filling sand	S		
5)	Pumping test equipment		A	Uncertainty in delivery date
6)	Drilling rigs and tools		A	Not available in the local market
5	HEAVY EQUIPMENT (with accessories)			
1)	Backhoe	S		
2)	Bulldozer	S		
3)	Roller	S		
4)	Dump cars	S		
5)	Mixer cars	S		
6)	Concrete mixers		J	Not available in the local market, uncertainty in delivery date in the third country market
7)	Engine welders		J	
8)	Generators		J	
9)	Threading machines		J	
10)	Welding equipment	S		
11)	High-speed cutters		J	Not available in the local and third contries' market
12)	Engine driven vibrator		J	Limit in spare parts supply in the local market, uncertainty in delivery date in the third country market
13)	Tamper		J	
14)	Vehicles Cargo tracks, pick ups, station wagons	S		
15)	Wrecking cars	S		
6	OTHERS			
1)	Electric wire / work equipment		A J	Not available in the local and third contries' market
2)	Temporary work equipment		J	Not available in the local market, uncertainty in delivery date in the third country market
3)	Supporting frame work / metal form		J	
4)	Steel plates, steel materials		J	Not available in the local and third contries' market

3.1.6 IMPLEMENTATION SCHEDULE

The Project Implementation Schedule by Japan's Grant Aid is as shown in Figure 3.1.

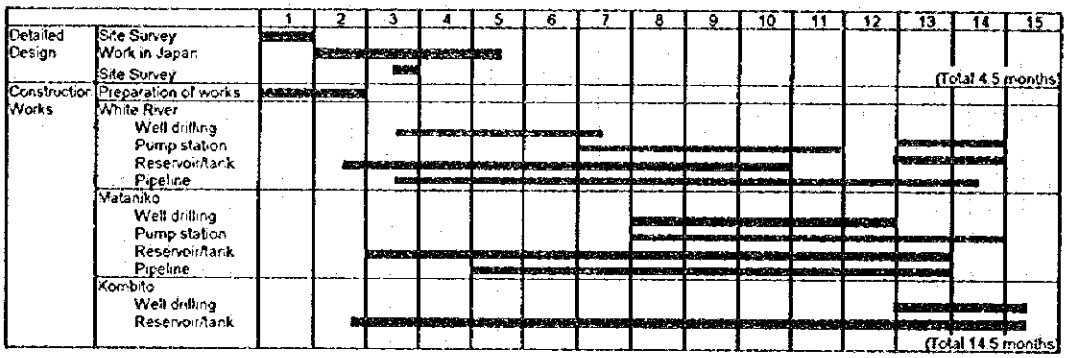


Figure 3-1 Project Implementation Schedule

3.1.7 UNDERTAKINGS OF RECIPIENT COUNTRY

Undertakings to be taken by the Solomon Islands side include the following items of the Project:

- Assurance of all the expense and prompt execution for unloading and customs clearance.
- Exemption of Japanese nationals from custom duties, internal taxes and other fiscal levies.
- Procedures necessary for entry of Japanese nationals into the Solomon Islands and stay in the country.
- Conclusion of Banking Arrangements.
- Issuance of Authorization to Pay.
- Scope of work for the Solomon Islands side described in 3.1.3 of this report. These works are to be completed by the following time limits.

To secure lands for facilities:	by the end of December 1996
To construct access road to the sites:	by the end of December 1996
To supply electricity to the facility sites:	by the end of December 1997
To construct fences around the sites:	after the end of March 1998

Moreover, the Solomon Islands side is responsible for the following matters:

- Water supply for the construction works of reservoir tanks.

- Provision of lands for an office building for a contractor/consultant, store houses, store yards and huts for labors.

- Disposal of unexploded bombs, in case they are found.

3.2 OPERATION AND MAINTENANCE PLAN

The construction works of the Project can be considered as an expansion or extension of the existing facilities, such as wells, well pumps, booster pumps, reservoir tanks and others. Thus there should be no problems with operation and maintenance of the constructed facilities by the Project.

However, the manpower, electricity and repair costs need to be increase to cope with the increase in equipment while chemical and electricity costs for the White River Pumped Water would decrease due to reducing of overflow from the existing reservoir tanks.

Estimated increase in operation and maintenance cost by the Project are shown in Table 3-2. The cost increase is considered to be insignificant because it is less than 2 % of the 1996 operation budget of SIWA. Therefore, raising of the water charge will not be required as far as the increase in the operation cost by the Project is concerned.

Table 3-2 Estimated Increase of Operation Cost by the Project

(SID1000)

Items	Amount	Remarks
Increase of electricity costs due to new pumps	80	
Decrease of electricity costs due to the improvement of the existing White river pump operations	-53	
Decrease of chemical costs due to the decrease of water to be disinfected	-49	
Increase of manpower costs for new White river pump station	13	Based on SIWA Grade 3.3 , Salary 1996
Costs for repairing	134	3% of direct construction costs of water intake facilities and water transmission facilities
Increase of operation costs by the Project	125	
Operation costs SIWA Budget 1996	6,792	

CHAPTER 4

PROJECT EVALUATION AND RECOMMENDATION

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATION

4.1 PROJECT EFFECT

4.1.1 QUANTITATIVE STABILIZATION OF WATER SUPPLY

The Project will supplement the White River Spring System with water from two groundwater sources to be developed along the White River and in the Mataniko Area. By supplementing the water supply system with groundwater and reducing overflow from the existing reservoir tanks, which is also provided by the Project, uninterrupted normal water supply service will be ensured even if the flow decrease of the White River Spring, as in October 1995, occurred again.

The water supply in the Rove Spring System, which currently suffers from water shortage due to seasonal fluctuation and yearly decreasing of the spring flow, will be replaced with groundwater from the new White River Groundwater Source.

The flow of the Kombito Spring is decreasing and is anticipated to decrease further because of the on-going EC's housing development project. The Project will provide additional groundwater source to compensate the decreasing of the flow of the Kombito Spring.

4.1.2 WATER QUALITY IMPROVEMENT

Major water quality problem in the current operation is high turbidity that occurs after rain fall making the water unsuitable and/or unpleasant for various uses such as drinking, cooking, bathing, washing and cleaning. This problem is more severe in the City centre because water is supplied through the White River Spring Gravity Distribution System and Rove Spring System that do not have a reservoir tank. The Project will improve the quality of supplied water in these areas by replacing the spring water with groundwater from the White River Groundwater Sources.

In addition, the Project will improve the quality of supplied water in the areas currently served by the existing Skyline reservoir tank and in the area served by the Panatina reservoir tank.

4.1.3 BENEFICIAL EFFECTS

The estimated beneficial effects by the Project are as shown in Table 4-1.

Table 4-1 Beneficial Effects of the Project

Effects	Numbers of Beneficiaries
Quantitative stabilization	42,180
Water Quality Improvement	25,794

4.2 RECOMMENDATION

The Project will contribute to the improvement of the people's living condition through the improvement of water supply service in Honiara, a basic sanitation requirement. Consequently the Project is justified as suitable for Japan's Grant Aid Program.

While SIWA has the required capability to implement the Project, it would be still advisable to remind the following points in order to ensure smooth and effective operation of the constructed Project facilities.

i) SIWA has sufficient experience and skill to conduct daily water supply operations. It is however, found that there are lacks in feed back to optimize the operation. Feed back of operational data to the operation conditions and mitigating of system failures by mentoring operational conditions and by periodical inspection of the facilities are very important. To achieve the ultimate purpose of optimum operation and maintenance, that is to minimize operation and maintenance costs, to avoid operational disturbance by the equipment failures and to prolong a life of the facilities, it would be advisable to up-grade the technical capability of SIWA and to increase the number of engineers.

ii) To ensure proper operation and maintenance, a sound financial base would be necessary in addition to the technical capability. SIWA balances its finance with Government subsidy. Therefore, in order to secure a sound financial base of the water supply operation, it is advisable for SIWA to review its water tariff system so that the water charge would cover the entire operation and maintenance costs, still with due consideration to users' affordability.

In the current water tariff system, the average monthly water charge per household is 30 SI$, which is equivalent to 1.5% of an average household expenditure. This indicates the possibility of users' affordability to pay a higher water charge.

APPENDICES

APPENDIX-1

THE BASIC DESIGN STUDY

MEMBERS OF THE TEAM STUDY

1. Kae YANAGISAWA, Leader
   Deputy Director, Study Review and Coordination Division,
   Grant Aid Study & Design Department, JICA
2. Akihito SANJYO, Coordinator
   First Project Study Division,
   Grant Aid Project Study Department, JICA
3. Akira TAKECHI, Chief Consultant / Water Supply Planner
   Pacific Consultants International
4. Kiyoshi NAKAHARA, Facilities Planner
   Pacific Consultants International
5. Hiroshi NAKAMURA, Hydrogeologist
   Pacific Consultants International
6. Tadashi OHASHI, Geophysical Surveyor
   Pacific Consultants International
7. Tokihiko INA, Equipment Planner, Operation & Maintenance Planner
   Pacific Consultants International

EXPLANATION OF BASIC DESIGN STUDY

MEMBERS OF THE STUDY TEAM

1. Yoshiki OMURA, Leader
   Water Supply Development Specialist,
   Institute for International Cooperation, JICA
2. Tatsuhide HAMASAKI, Coordinator
   First Project Study Division,
   Grant Aid Project Study Department, JICA
3. Akira TAKECHI, Chief Consultant / Water Supply Planner
   Pacific Consultants International
4. Hiroshi NAKAMURA, Hydrogeologist
   Pacific Consultants International

Survey Schedule (February 1996)

No.	Date		Activities
1	23-Feb	Fri	Leaving Tokyo
2	24-Feb	Sat	Arriving at Honiara
3	25-Feb	Sun	Site Survey
4	26-Feb	Mon	Courtesy call to MTWU, MEWMR, SIWA, JOCV and EOJ
5	27-Feb	Tue	Explanation on Inception Report
6	28-Feb	Wed	Site Survey
7	29-Feb	Thu	Discussion on draft of Minutes of Discussion
8	1-Mar	Fri	Signing of the Minutes, Reporting to EOJ
9	2-Mar	Sat	Site Survey
10	3-Mar	Sun	Site Survey (Members of JICA leaving Honiara)
	4-8-Mar		Site Survey
16	9-Mar	Sat	Site Survey (Mr. Nakahara arriving at Honiara)
	10-17-Mar		Site Survey
25	18-Mar	Mon	Site Survey (Mr. Ina arriving at Honiara)
	19-30-Mar		Site Survey
38	31-Mar	Sun	Site Survey (Mr. Ina Leaving Honiara)
39	1-Apr	Mon	Site Survey (Mr. Ina Surveying in Sydney)
40	2-Apr	Tue	Site Survey (Mr. Ina Surveying in Sydney)
41	3-Apr	Wed	Site Survey (Mr. Ina Surveying in Sydney)
42	4-Apr	Thu.	Report to MTWU, SIWA and EOJ(Mr. Ina Surveying in Sydney)
43	5-Apr	Fri	Leaving Honiara(Mr. Ina Surveying in Sydney)
44	6-Apr	Sat	Arriving at Tokyo

Survey Schedule (June 1996)

No.	Date		Activities
1	2-Jun	Sun	Leaving Tokyo
2	3-Jun	Mon	Arriving at Honiara
3	4-Jun	Tue	Courtesy call to SIWA, EOJ and JOCV
4	5-Jun	Wed	Meeting with board members of SIWA, Explanation of Draft Report to SIWA
5	6-Jun	Thu.	Discussion on Draft Report and Drafting Minutes of Discussion
6	7-Jun	Fri	Site Survey
7	8-Jun	Sat	Site Survey
8	9-Jun	Sun	Internal meeting
9	10-Jun	Mon	Discussion on Draft of Minutes of Discussion and signing of the Minutes
10	11-Jun	Tue	Reporting to EOJ
11	12-Jun	Wed	Leaving Honiara
12	13-Jun	Thu.	Arriving at Tokyo

LIST OF PARTY CONCERNED IN THE RECIPIENT COUNTRY

1	Ministry of Transport, Works and Utilities	
	Mr. Francis RAMOIFUILA	Permanent Secretary
2	Ministry of Energy, Water and Mineral Resources	
	Mr. Kenneth BULEHITE	Civil Engineer
	Mr. Charlie BEPAPA	Chief Water Resource Officer
	Mr. Isaac LEKELALU	Hydrogeologist
3	Ministry of Lands and Housing	
	Mr. James W. NAGHE	Deputy Commissioner of Lands
4	Ministry of Commerce, Industry and Employment	
	Mr. Derick AIHARI	Principal Investment Officer
5	Ministry of Health and Medical Services	
	Mr. Ken Marshall	Environment Health Division Project Manager for Rural Water Supply and Sanitation Project
6	Honiara Town Council	
	Mr. Robert M. ZUTU	Senior Physical Planner
	Mr. Martin Wales	Road Works
7	Solomon Islands Water Authority	
	Sir Gideon ZOLEVEKE	Chairman of Board
	Hon. Charles FERANIA	Board Member, Member of Parliament for SIG
	Hon. Pat TOMU	Board Member, Member of Honiara Town Council
	Mr. Jeffrey TEAVA	Board Member, Administration Officer of SIG
	Mr. Reuben LILO	Board Member, Head Teacher
	Mr. Gordon DARCY	Board Member, Under Secretary of Ministry of Finance
	Mr. Donald R. MAKINI	General Manager
	Ms. Freda UNUSI	Community Education and Consultation Officer
	Mr. Geoffrey KAKA	Engineer
	Mr. Collin BENTLEY	Manager Corporate Service
	Mr. Chris HUNT	Corporate/Financial Adviser
8	Solomon Islands Electricity Authority	
	Mr. Martin Rasu	Distribution Manager
9	Solomon Telekom Company Limited	
	Mr. Iro Tolaeni	Officer
	Mr. John Barrett	Officer

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY
ON
THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM
IN
HONIARA
IN
SOLOMON ISLANDS

In response to a request from the Government of Solomon Islands, the Government of Japan decided to conduct a Basic Design Study on the Project for the Improvement of Water Supply System in Honiara (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent the Basic Design Study Team (hereinafter referred to as "the Team") to Solomon Islands, headed by Ms. YANAGISAWA Kae, Deputy Director of Study Review and Coordination Division, Grant Aid Study and Design Department, JICA. The Team is scheduled to stay in the country from February 24 to April 5, 1996.

The Team held discussions with the Solomon Islands Government officials concerned with the Project and conducted a field survey in the study area.

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

Honiara, March 1, 1996

柳沢香枝

Ms. YANAGISAWA Kae
Leader,
Basic Design Study Team,
JICA

Mr. Francis RAMOIFUILA
Permanent Secretary,
Ministry of Transport, Works and Utilities

APPENDIX 4

ATTACHMENT

1. The Objective of the Project

The objective of the Project is to improve the water supply conditions in Honiara through the development of new groundwater sources.

2. The Project Site

The Project covers SIWA's area of operations in and around Honiara city. (see Annex-2)

3. Executing Agency

Solomon Islands Water Authority (SIWA) under the Ministry of Transport, Works and Utilities is responsible for the administration and execution of the Project.

4. Scope of the Project requested by the Government of Solomon Islands

After discussions with the Team, the scope of the Project requested by the Government of Solomon Islands was confirmed as follows:

i) The Project will develop new groundwater source(s) to supplement the spring water sources in the Honiara water supply system to secure stable water production in terms of quantity and quality.

ii) The Project will also cover the installation of facilities, such as pipelines, reservoirs and pumping stations, necessary to transmit the water from the new groundwater source(s) to be developed in the Project to the existing water distribution networks.

5. Japan's Grant Aid System

1) The Government of Solomon Islands has understood the system of Japanese Grant Aid Program explained by the Team. (see Annex-3)

2) The Government of Solomon Islands will take necessary measures described in Annex-4 for the smooth implementation of the Project, on condition that the Japan's Grant Aid is extended to the Project.

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6. Schedule of the Study

1) The consultants will proceed with further studies in Solomon Islands until April 5, 1996.

2) JICA will prepare the draft report of the Basic Design Study in English and will send a mission to Solomon Islands in order to explain its contents around May, 1996.

3) In case that the contents of the report is accepted in principle by the Solomon Islands Government, JICA will complete the final report and send it to the Government by July, 1996.

7. Other Relevant Issues

Major issues discussed are as follows:

1) The Solomon Islands Government requested the scope of the Project to cover;
   i) the development of new water sources sufficient for the future demand growth up to the year 2005, and
   ii) the rehabilitation works over the entire water supply systems.

   The Team explained that they will limit the scope of the Project to the development of groundwater sources for the following reasons:

   i) New water source development for the future demand growth and the rehabilitation of the entire system should be executed based on comprehensive development plans. Basic Design Studies do not cover such comprehensive development plans.

   ii) Japan's Grant Aid aims at addressing present and urgent problems. The Team considers that the first priority should be to solve the problems of current unstable water production.

   In addition, the Team suggested that some parts of the required rehabilitation would be achieved by installing new facilities from new groundwater source(s) to the existing distribution networks. The Team also suggested that the Project would be able to include the rehabilitation works of the existing facilities which are necessary for

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the efficient and effective use of water from the newly developed source(s). Consequently, both parties agreed to limit the scope of the Project as described in Item 4 of this Attachment.

2) The Team indicated that they will conduct the exploration of groundwater source in the areas where the existing water sources are located and based on the information that is currently available, Mataniko and Kombito appear to be the most possible sites. They also suggested that the Project would comprise the following components if new groundwater source(s) is developed in those areas :

   - Construction of bore wells.

   - Installation of water transmission facilities (pipelines, reservoirs and pumping stations) to connect the new water source(s) to the existing transmission pipelines between the Upper Tasahe Reservoir and the East Kola'a Reservoir.

   The Team undertook to discuss with the Solomon Islands Government further details of the components of the Project based on the results of their field survey prior to their departure for Japan. The final components of the Project will be decided after further studies are carried out in Japan.

3) The Team was questioned on the possibility of the development of surface water. The Team replied that it is not going to consider surface water as a possible water source in this Project because the construction and operations of a water treatment plant that is essential for the utilization of surface water would be costly.

4) Both parties confirmed that SIWA is responsible for the coordination among ministries and authorities concerned including Ministry of Transport, Works and Utilities, Ministry of Energy, Water and Mineral Resources, Ministry of Lands and Housing, Ministry Commerce, Industry and Employment, Honiara Town Council and Solomon Islands Electricity Authority.

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5) The Team asked whether clause 5 of the Annex-4 (Tax exemption) would be applied to the debit tax that is expected to become effective in June 1996. The Solomon Islands Representatives replied that it is yet unknown.

6) SIWA understood that it is responsible for timely acquisition of lands and provision of power supply necessary for the execution of the Project. SIWA requested that it be informed of the Project requirements as early as possible.

7) SIWA agreed to assign two full-time counterpart personnel for the smooth implementation of the Basic Design Study. The Team expressed appreciation for this undertaking given by SIWA.

8) The Team undertook to facilitate the transfer of technology during the course of the Study.

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ANNEX-1

LIST OF ATTENDANTS

Solomon Islands Representatives

Ministry of Transport, Works and Utilities

Mr. Francis RAMOIFUILA	Permanent Secretary

Ministry of Energy, Water and Mineral Resources

Mr. Kenneth BULEHITE	Civil Engineer

Ministry of Lands and Housing

Mr. James W. NAGHE	Deputy Commissioner of Lands

Ministry of Commerce, Industry and Employment

Mr. Derick AIHARI	Principal Investment Officer

Honiara Town Council

Mr. Robert M. ZUTU	Senior Physical Planner

Solomon Islands Water Authority

Mr. Donald R. MAKINI	General Manager
Ms. Freda UNUSI	Community Education and Consultation Officer
Mr. Sam VASANTHAKUMAR	Engineer
Mr. Geoffrey KAKA	Engineer

JICA Basic Design Study Team

Ms. YANAGISAWA Kae	Team Leader
Mr. SANJO Akihito	Coordinator
Mr. TAKECHI Akira	Chief Consultant/Water Supply Engineer
Mr. NAKAMURA Hiroshi	Hydrogeologist
Mr. OHASHI Tadashi	Geophysicist

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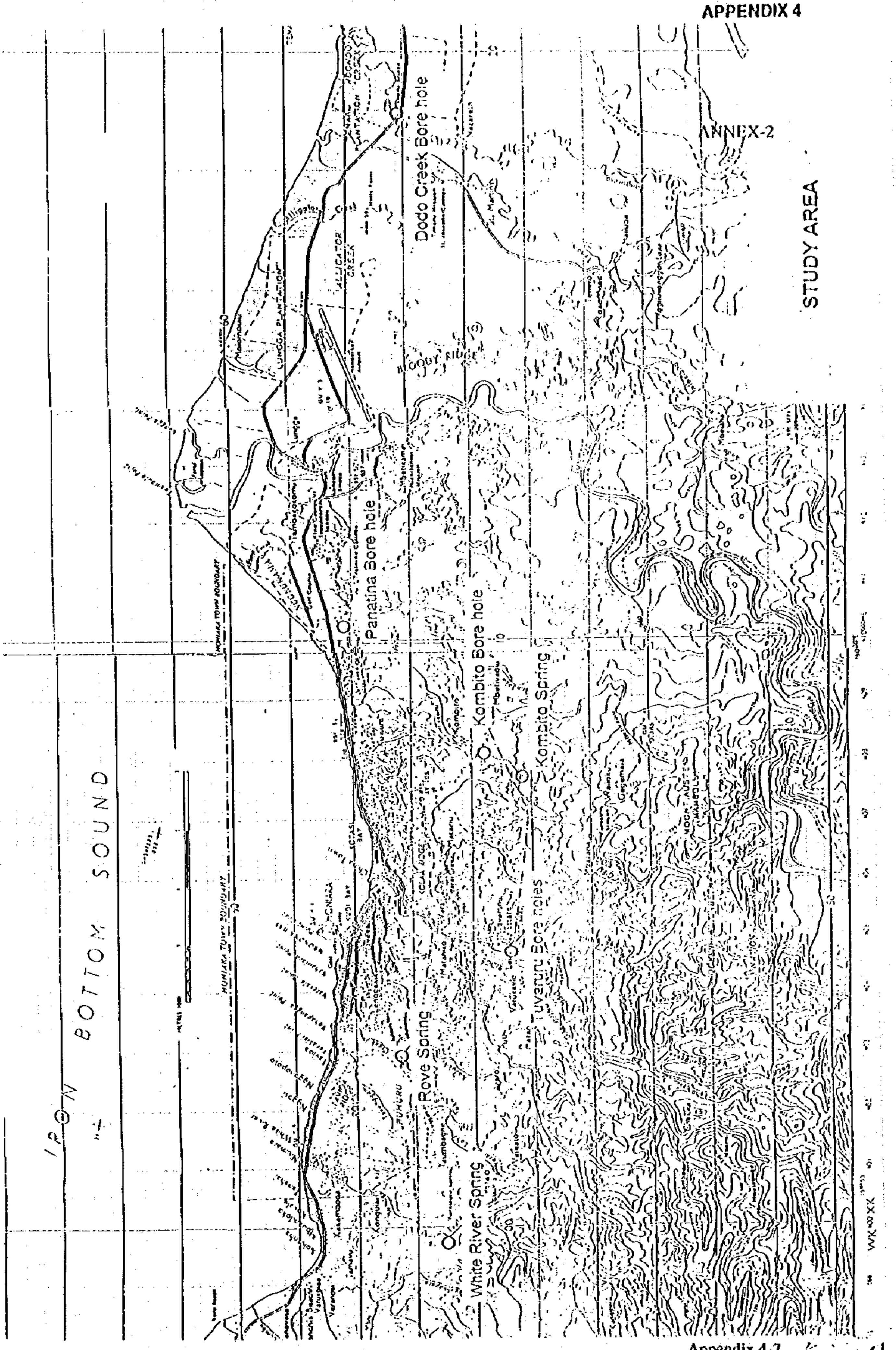
IRON BOTTOM SOUND
ANNEX-2
STUDY AREA
Dodo Creek Bore hole
Panatina Bore hole
Kombito Bore hole
Kombito Spring
Tuvaruhu Bore holes
Rove Spring
White River Spring
ALLIGATOR CREEK
BLOODY RIDGE
HONIARA TOWN BOUNDARY

ANNEX-3

JAPAN'S GRANT AID SCHEME

1. Grant Aid Procedures

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

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

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

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

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

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a) Confirmation of the background, objectives, and benefits of the requested project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation

b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.

c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.

d) Preparation of a basic design of the Project

e) Estimation of costs of the Project

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

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

2) Selection of Consultants

For smooth implementation of the Study, JICA uses registered consultant firms. JICA selects firms based on proposals submitted by interested firms. The firms selected carry out a Basic Design Study and write a report, based upon terms of reference set by JICA.

The consulting firms used for the Study are recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

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

2) Exchange of Notes (E/N)

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

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3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with consultant firms and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting, constructing and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Necessity of "Verification"

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

6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

(1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.

(2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.

(3) To secure buildings prior to the procurement in case the installation of the equipment.

(4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.

(5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

(6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

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(7) "Proper Use"

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

(8) "Re-export"

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

(9) Banking Arrangements (B/A)

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

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

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ANNEX-4

Necessary measures to be taken by the Government of Solomon Islands in case Japan's Grant Aid is extended

1. To bear advising commissions of Authorization to Pay (A/P) and payment commission to a Japanese foreign exchange bank for the banking services based upon the Banking Arrangement (B/A).

2. To ensure prompt unloading tax exemption customs clearance at port of disembarkation in Solomon Islands and prompt internal transportation of the products purchased under the Grant.

3. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port of disembarkation.

4. To accord Japanese Nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as may be necessary for their entry into Solomon Islands and stay therein for the execution of the Project.

5. To exempt Japanese nationals engaged in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in Solomon Islands with respect to the supply of the products and services under the verified contract.

6. To provide necessary permissions licenses and other authorizations for carrying out the Project.

7. To maintain and use properly and effectively the equipment purchased under the Grant.

8. To bear all expenses other than those to be borne by the Grant necessary for the procurement of equipment.

9. To take necessary actions to expedite the approval for executions of the Project by the authorities concerned in Solomon Islands.

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY
ON
THE PROJECT FOR THE IMPROVEMENT OF WATER SUPPLY SYSTEM
IN
HONIARA
IN
SOLOMON ISLANDS

(CONSULTATION ON DRAFT REPORT)

In February 1996, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on the Project for the Improvement of Water Supply System in Honiara (hereinafter referred to as the "Project") to Solomon Islands, and through discussions, field survey, and technical examination of the results in Japan, has prepared the draft report of the study.

In order to explain and to consult the Government of Solomon Islands on the components of draft report, JICA sent to Solomon Islands a study team (hereinafter referred to as the "Team"), which is headed by Mr. Yoshiki OMURA, Water Supply Development Specialist, Institute for International Cooperation, JICA.

The Team had a series of discussions with the Solomon Islands Government officials concerned from 5 to 7 June 1996. As results of discussions, both parties confirmed the main items described on the attached sheets.

Honiara, June 10, 1996

Mr. Yoshiki OMURA
Leader,
Draft Report Explanation Team,
JICA

Mr. Francis RAMOHEDILA
Permanent Secretary,
Ministry of Transport, Works and Utilities

APPENDIX 4

ATTACHMENT

1. Components of draft report

The Government of Solomon Islands has agreed and accepted in principle the components of the draft report presented by the Team, that are described in ANNEX-I.

2. Japan's Grant Aid system

(1) The Government of Solomon Islands has understood the system of Japanese Grant Aid Scheme described in ANNEX-II explained by the Team.

(2) The Government of Solomon Islands will take the necessary measures, described in ANNEX-III for the smooth implementation of the Project on condition that the Japan's Grant Aid is extended to the Project.

3. Further schedule

The Study Team will prepare the Final Report in accordance with the confirmed components described in ANNEX-I, and send it to the Government of Solomon Islands by the end of July 1996.

4. Other relevant issues

(1) The Solomon Islands side asked whether the Project would make provisions for an expert or experts for the operation of the Project facilities after the completion and commissioning of the Project. The Team replied that the Project does not cover such provision but suggested that JICA technical training courses related to the water supply may be available to SIWA personnel. The Team also suggested SIWA submit a request to the Embassy of Japan for application to such courses.

(2) The Solomon Islands side asked about the possibility of the Project to cover the water supply for a new residential development behind Kola'a Ridge areas. The Team explained that a Japan's Grant aid is aimed at dealing with current problems of emergency nature and the Project, therefore, covers no provisions for new developments. Both parties confirmed that the Project is to improve problems presently existing in the White River Spring system and the Kombito system.

(3) The Team explained that the groundwater production rate for the Kombito development was determined to cater only for the domestic demand in the service area because the scope of water supply development by Japan's Grant Aid is limited to domestic use only.

(4) The Team suggested SIWA assign an additional operator for the operation of the Project facilities. The Team also suggested that SIWA review its water rates in the near future to establish a sound financial management on the cost recovery basis, while the increase of the operation costs by the Project has been estimated to be negligible. The Solomon Islands side agreed to consider these suggestions. With regards to increase in the water rates, SIWA normally does an annual review of its rates.

(5) The Team informed the meeting that the Project will need a Project office which it prefers to be located at the SIWA Headquarters area and requested that ample land space be made available for the Project to construct its office building. SIWA responded that it will make arrangement to accommodate this request within the existing premises.

ANNEX-I

ITEMS CONFIRMED BY THE BOTH PARTIES

Items confirmed by the both parties are as follows:

Facilities	(1) White River	(2) Mataniko	(3) Kombito
Water source facilities			
Deep wells	80m x 200 m/m x 4wells	100m x 200m/m x 5wells	80m x 200m/m x 2wells
Motor pumps in wells	0.60m³/min x 80m x 4pumps	0.38m³/min x100m x5pumps	0.60m³/min x 80m x 2pumps
Electricity and instruments	1 set	1 set	1 set
Conduction facilities			
Conduction pipe	PVC-Dia150m/m x 1100m steel pipe-Dia150m/m x 30m	PVC-Dia150m/m x 700m steel pipe-Dia150m/m x 95m	PVC-Dia150m/m x 1000m steel pipe-Dia150m/mx115m
Receiving tanks	RC tank 73 m³	RC tank 65 m³	Steel Panel 60m³
Transmission facilities			
Transmission pumps	1.21m³/min x 60m x 3 pumps	0.90m³/min x 110m x 3pumps	
Transmission pipes	PVC-Dia200m/m x 550m steel pipe -Dia200m/m x 75m	PVC-Dia200m/m x 1620m steel pipe-Dia200m/m x 60m	steel pipe-Dia150m/mx100m
Distribution facilities			
Reservoir tanks	600m³ x 2tanks	480m³	600 m³
Distribution pipes	PVC-Dia250m/m x 3100m steel pipe-Dia250m/mx210m	steel pipe-Dia200m/mx10m	steel pipe-Dia200m/mx010m
Disinfection equipment	chlorine injection equipment	chlorine injection equipment	chlorine injection equipment
Building	pumping station + disinfection room	pumping station + disinfection room	disinfection room
Existing reservoir tanks	replacement of inflow valves in the existing reservoir tanks (Tasahe, Titingge, Lengakiki)		
Existing White river pumping station	installation of new flow control equipment (White river)		

Note: Above items are based on the result of the basic design study. They may be changed during a detailed design stage.

ON JAPAN'S GRANT AID PROGRAM

1. Japan's Grant Aid Procedures

(1) The Japan's Grant Aid Program is executed by the following procedures.

- Application (request made by a recipient country)
- Study (Preliminary Study / Basic Design Study conducted by JICA)
- Appraisal & Approval (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
- Determination of Implementation (Exchange of Notes between both Governments)
- Implementation (Implementation of the Project)

(2) Firstly, an application or a request for a project made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to see whether or not it is suitable for Japan's Grand Aid. If the request is deemed suitable, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency).

Secondly, JICA conducts the Study (Basic Design Study), using a Japanese consulting firm. If the background and objective of the requested project are not clear, a Preliminary Study is conducted prior to a Basic Design Study.

Thirdly, the Government of Japan appraises to see whether or not the Project is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA and the results are then submitted for approval by the Cabinet.

Fourthly, the Project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by both Governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

2. Contents of the Study

(1) Contents of the Study

The purpose of the Study (Preliminary Study / Basic Design Study) conducted on a project requested by JICA is to provide a basic document necessary for appraisal of the project by the Japanese Government. The contents of the Study are as follows:

a) to confirm background, objectives, benefits of the project and also institutional capacity of agencies concerned of the recipient country necessary for project implementation,

b) to evaluate appropriateness of the Project for the Grant Aid Scheme from a technical, social and economical point of view,

c) to confirm items agreed on by both parties concerning a basic concept of the project,

d) to prepare a basic design of the project,

e) to estimate cost involved in the project.

Final project components are subject to approval by the Government of Japan and therefore may differ from an original request.

Implementing the project, the Government of Japan requests the recipient country to take necessary measures involved which are itemized on Exchange of Notes.

(2) Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is(are) recommended by JICA to a recipient country after Exchange of Notes, in order to maintain technical consistency and also to avoid possible undue delay in implementation caused if a new selection process is repeated.

(3) Status of a Preliminary Study in the Grant Aid Program

A Preliminary Study is conducted during the second step of a project formulation & preparation as mentioned above.

A result of the study will be utilized in Japan to decide if the Project is to be suitable for a Basic Design Study.

Based on the result of the Basic Design Study, the Government would proceed to the stage of decision making process (appraisal and approval).

It is important to notice that at the stage of Preliminary Study, no commitment is made by the Japanese side concerning the realization of the Project in the scheme of Grant Aid Program.

3. Japan's Grant Aid Scheme

(1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under the following principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not in a form of donation or such.

(2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes by both Governments, in which the objectives of the Project, period of execution, conditions and amount of the Grant, etc. are confirmed.

(3) "The period of the Grant Aid" means one Japanese fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedure such as Exchange of Notes, concluding a contract with (a) consulting firm(s) and (a) contractor(s) and a final payment to them must be completed.

(4) Under the Grant, in principle, products and services of origins of Japan or the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant may be used for the purchase of products or services of a third country origin.

However the prime contractors, namely, consulting, contractor and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

(5) Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is deemed necessary to secure accountability to Japanese tax payers.

(6) Undertakings required to the Government of the recipient country

In the implementation of the Grant Aid, the recipient country is required to undertake necessary measures such as the following:

a) to secure land necessary for the sites of the project and to clear and level the land prior to commencement of the construction work,

b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,

c) to secure buildings prior to the installation work in case the Project is providing equipment,

d) to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid,

e) to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts,

f) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7) Proper Use

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

(8) Re-export

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

(9) Banking Arrangement (B/A)

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

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

ANNEX-III

Necessary measures to be taken by the Government of Solomon Islands

The following will be needed to be undertaken by the Government of Solomon Islands in case the Japan's Grant Aid is executed toward the Project:

1. To secure the acquisition of the work sites and access thereto for the Project.
2. To undertake incidental works such as fencing and gates around the sites.
3. To construct the access road to the site prior to commencement of the construction.
4. To provide electricity power line to the Project sites and water supply in the construction sites of the reservoir tanks.
5. To conclude the Banking Arrangement and to bear commissions to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement.
6. To issue Authorization to Pay without delay.
7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port of disembarkation.
8. To accord Japanese nationals whose services under the verified contract such facilities as may be necessary for their entry into Solomon Islands and stay therein for the performance of their work.
9. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.
10. 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 the installation of the equipment.
11. To dispose of misfire bombs and shells, if found.

ANNEX-IV

LIST OF ATTENDANTS

Solomon Islands Representatives

Ministry of Transport, Works and Utilities

Mr. Francis RAMOHFUILA	Permanent Secretary

Ministry of Energy, Water and Mineral Resources

Mr. Charlie BEPAPA	Chief Water Resources Officer
Mr. Kenneth BULEHITE	Civil Engineer/Hydrogeologist
Mr. Isaac LEKELALU	Hydrogeologist

Ministry of Lands and Housing

Mr. James W. NAGHE	Deputy Commissioner of Lands

Honiara Town Council

Mr. Robert M. ZUTU	Senior Physical Planner

Solomon Islands Water Authority

Mr. Geoffrey KAKA	Engineer
Mr. Donald R. MAKINI	General Manager

JICA Draft Report Explanation Team

Ms. OMURA Yoshiki	Team Leader
Mr. HAMASAKI Tatsuhide	Coordinator
Mr. TAKECHI Akira	Chief Consultant/Water Supply Engineer
Mr. NAKAMURA Hiroshi	Hydrogeologist

COST ESTIMATION BORNE BY THE RECIPIENT COUNTRY

Installation of electricity supply to the facility sites (White river, Mataniko and Kombito)	SI$ 105 thousand
Construction of access road (Kombito site)	SI$ 5 thousand
Construction of fences	SI$ 180 thousand
Total	SI$ 290 thousand