c) Functions not Resumed

Functions have stopped because facilities are unusable due to insufficient recovery.

The X-ray inspection rooms and the houses of the X-ray technician, the pharmacist, and the dentist

(2) Damage to Equipment and Recovery

1) Damage and Measures Taken for Recovery

The two cyclones seriously damaged medical equipment at the hospital: water poured into its internal chambers and caused it to rust; winds knocked it over, ripped it apart, and smashed it. The following emergency measures were taken soon after Cyclone Val abated: equipment damaged beyond repair was discarded, equipment that was repairable was repaired, and examination and testing equipment that could not be found or repaired was borrowed from the National Hospital. The amount of equipment repaired was limited, however, and no new equipment was procured in the year following the cyclone.

2) Recovery of Functions to Date

Recovery of functions at Tuasivi Hospital taken to data can be categorized as follows.

a) Functions Recovered

As it is relatively easy to restore functions which had been supported by very basic equipment or equipment that was in short supply before the cyclones struck, such functions have been restored to previous levels.

b) Functions Reduced

Due to the shortage of essential items of equipment such as suction units and sterilizers, some daily clinical functions must be reduced or altered with temporary measures.

c) Functions not Resumed

Since no measures to restore functions have been taken to date, all functions which need vital items of equipment such as a X-ray unit and an anesthesia apparatus have been stopped.

The table below shows the degree to which the functions of each section at Tuasivi Hospital have been rehabilitated.

Table 2-46 Recovery of Functions

Section	Facilities	Functions restored	Functions reduced	Functions not resumed
Outpatient	Examination room	•		
	Treatment room		•	
	Dental clinic		•	
	Antenatal and family planning room	•		
	Pharmacy		•	
Testing	Laboratory		•	
	X-ray room			•
	Post-mortuary			•
Surgery	Delivery room		•	
	Operation theater			•
Wards	Wards	•		
	Nurses' station		•	
Administration		•		

In sections whose functions are reduced or have not been resumed, attempts have been taken to restore services to pre-cyclone levels, but despite this, the levels of service remain low. Some of the major problems after the cyclone and the measures being taken are described below.

a) Broken-down and worn-out suction units and nebulizers
   Shared use of equipment among sections

b) Shortage of sterilizers
   1/ Use of the dry-heat sterilizers as an alternative
   2/ Sterilization with medicinal supplies
   3/ Cancellation of surgery requiring total sterilization

c) Broken-down X-ray equipment
   Cancellation of all X-ray inspections

d) Broken-down anesthesia apparatus
   Cancellation of surgery requiring general anesthesia

e) Broken-down dental equipment
   Limited treatment such as pain reducing

f) Shortage of surgical equipment in acceptable condition due to rust
   Use of acceptable equipment with repeated sterilization

g) Lack of mattresses for inpatients
   Use of patients' own sheets and straw mats as beds

2-5-4 PRESENT CIRCUMSTANCES OF THE FACILITIES AND EQUIPMENT OF TUASIVI HOSPITAL

(1) Present Circumstances of Buildings

1) Buildings for Medical Services

a) Outpatient Building (171 m^2)

The outpatient building has two small examination rooms, a basic surgery room, a treatment room, and a waiting room. At present, the basic surgery room is not being used and the adjacent treatment room is used for all kinds of treatments from ordinary medical treatments for outpatients to minor emergency operations.

Damage caused by the cyclone to both the interior and exterior of the building has basically been repaired, and compared to other buildings, the outpatient building is in reasonable condition.

b) Building with the X-ray Room, Laboratory, Pharmacy, and Dental Clinic (394 m^2)

The roof of this building has been repaired with used materials but its ceiling and equipment, and almost all of its walls, have not been repaired at all. The x-ray room and laboratory are not usable. One part of the building is being used to store medical supplies and another as a dental clinic. Electricity has not been restored to the building, which seriously limits its functions.

c) Building with the Operation Theater and the Delivery, Antenatal Care/Family Planning Rooms (251 m^2)

The roof of this building has been repaired but the rest of the building is run-down. Many items of equipment in the operation theater were damaged during the cyclone and have not been replaced or repaired. As a result, the room has hardly been used since. The air-conditioners have been repaired and the delivery room has been well used.

d) Administration Building (66 m^2)

This building contains the administrative officer's room, the office, and the pharmacy. This building was constructed after Cyclone Ofa and, except for its size, there are no major problems with it.

e) Wards (615 m^2)

The building containing the wards has four wings, one which contains the entrance and nurses' station, and one each for women's, men's , children's wards. There is space for 50 beds, but only about half of it is in use. The building structure is of reinforced concrete and the roofing material is corrugated galvanized metal sheet supported by wooden trusses. The building is situated on a slope so one wing has two floors. From the lower part of the slope both floors are visible. The children's ward is in the section of the building with two floors; it is located on the ground floor but beneath it are a laundry room and a temporary clinical laboratory which was formerly the autopsy room.

The interior and exterior of the building are in reasonably good condition, but two columns in the two-story section of the building are collapsing as a result of buckling stress. Also, a support beam was cut when a refrigerator was installed in the autopsy room so the building is structurally unsound. Furthermore, plumbing for the toilets, showers, and the sluice room are poorly maintained so sanitation is a serious problem.

2) Housing for the Staff

a) Regional Medical Officer's House (99 m^2)

With aid from New Zealand, this house has been completely rebuilt.

b) X-ray Technician's House (117 m^2)

This house was almost completely destroyed by the cyclones. All that remains is the foundation and sections of the concrete block walls. Due to winds that whip salt spray from the seas onto the site, the concrete foundations have seriously corroded. As the building faces the sea and is situated on low ground, the house may be vulnerable to a direct hit from a tidal wave.

c) Dentist's House(117 m^2)

This house was almost completely destroyed by the cyclones. All that remains is the foundation and sections of the concrete block walls. Due to winds that whip salt spray from the seas onto the building, the concrete foundations have seriously corroded and its reinforcing bars are exposed.

d) Pharmacist's House(117 m^2)

Only the roof of this building has been repaired and it remains in an unlivable state. Both the interior and the exterior are in bad condition.

e) Laboratory Technician's House (104 m^2)

Both the exterior and interior of this house are old and were damaged by the cyclones. At one time the kitchen was expanded but the design was such that the windows of the toilet and shower do not open to the outside. Consequently, moisture from these rooms permeates the interior and mold grows throughout.

f) Guest House (80 m^2)

The Guest House sustained little damage in the cyclones, but it is old and its interior fixtures and bathroom are worn-out.

g) House for the Doctors and their Families (178 m^2)

Doctors and their families are housed in a two-story duplex that is in relatively good condition. Sections of the ground surrounding the house, however, are higher than the ground floor level so the house is vulnerable to flooding. The balcony on the first floor has signs of rot.

h) Nurses' House (260 m^2)

The ground floor of this two-story building is constructed of reinforced concrete and the second floor of wood. The building has deteriorated and the reinforced concrete foundation has large cracks that expose the steel reinforcing bars. The structure of the building is distorted, and the window and door frames are obviously crooked. As the building has been expanded and renovated several times, the interior is in a decrepit state.

i) Health Inspector's House (98 m^2)

The roof, ceiling, and doors of this house have been repaired, and except for the floor, the interior and exterior are in relatively good condition. The interior and fixtures of the bathroom, however, are worn-out.

3) Auxiliary Buildings

a) Building for the families of patients (*fale-style* of 126 m^2)

This building is very old, but except for the ceiling which is missing, it is in relatively good condition. The wooden cabinet housing the sink is rotten and thus unsanitary.

b) Generator Building (40 m^2)

During the field survey of the Preliminary study this building was in very bad condition, but it has since been repaired. It contains a 50 KVA diesel generator and when the electric power system is knocked out during a cyclone it comes on automatically.

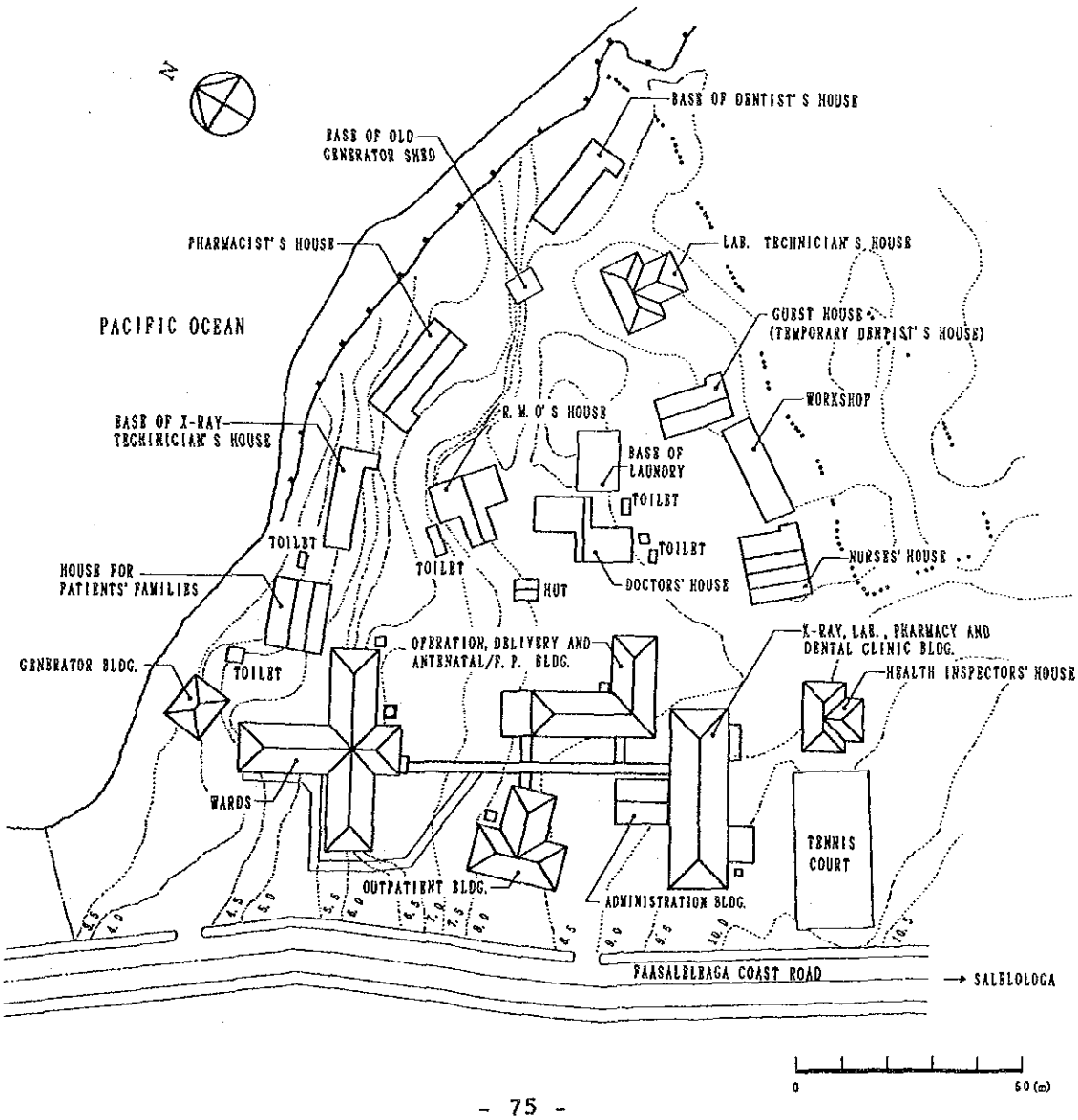
c) Public Toilets

There are two public toilets but one of them is closed. The toilet presently in use is non-flushing, and as there are is no washbasin, it is unsanitary.

d) Garage

All but the foundation of this building was destroyed during the cyclone.

Figure 2-9 Existing Facilities of Tuasivi Hospital



(2) Condition of Equipment

Most items of equipment at Tuasivi Hospital are worn-out or broken-down, and it appears that some equipment had already exceeded its service life before the cyclones struck. The present items of equipment in each section and their condition are described below.

1) Outpatient Section

Outpatient facilities consist of two examination rooms, a basic operation room, a treatment room, a dental clinic, an antenatal and family planning room, and a pharmacy. All contain only a limited amount of equipment. In each examination room, there are only a consulting desk and chair, patient chairs, and an examining table, all of which are wooden and locally made. As they are very strong, they were not damaged by the cyclones.

The existing items of equipment in the treatment room are only locally made medical tables, irrigator racks, instrument tables, and a few sterilizing drums, although it is used for everything from general treatments to emergencies. In an emergency, it is necessary to transfer equipment from the nurses' station in the wards.

The dental clinic was one of the facilities most severely damaged by the cyclones. At present, its equipment consists of a patient chair, an instrument boiling sterilizer, an amalgam mixer, and a dental instrument set. Since electricity has not been restored to the building yet, dental work is limited to simple cases such as the treatment of toothaches.

In the pharmacy, the hand mixer, medicine balance, and filter are unusable as they were worn-out before the cyclone and damaged by it, In addition, the typewriter and medicine refrigerator were severely damaged and discarded.

2) Testing Section

The clinical laboratory and the X-ray room were both seriously damaged by the cyclone. Consequently, the laboratory was moved to the room that previously functioned as the autopsy room. Although the functions of the laboratory have been reduced, most of them are gradually being restored. Most testing is done manually with basic equipment and supplies such as a laboratory instrument set and reagents. The laboratory has a glucose meter, a microscope, a

centrifuge, a refrigerator, and an autoclave, most of which are on loan from the National Hospital.

X-ray inspections are not done at present because the only X-ray unit, which had a bucky stand and a fixed bucky table, was destroyed by Cyclone Val. Even before the cyclone, it was usually difficult to produce good X-rays, because the radiation dosage was insufficient.

3) Diagnosis and Treatment Section

After the cyclone, repairmen from the Maintenance Section of the National Hospital repaired the operating lights and the delivery bed, but they are not fully operational. Other equipment such as the height and weighing scales for newborns, the suction unit in the delivery room, the anesthesia apparatus, and the device for raising and lowering the operating table were left unrepaired. In addition, as the autoclave for sterilizing linen for surgery has been lost since the cyclone, surgical operations requiring general anesthesia have been canceled.

4) Wards

In the men's, women's, and children's wards, equipment is very basic and consists of items such as standard beds, beds for children, bedside cabinets, and irrigator racks. As mattresses from all beds were lost during the cyclones, inpatients lie on their own mattresses and sheets or straw mats. The nurses' station contains a dry-heat sterilizer, a refrigerator, a suction unit, an oxygen breathing apparatus, a medicine cabinet, and emergency radio telephone. Other than the emergency radio telephone, all equipment is worn-out. In addition, because the dry-heat sterilizer and the refrigerator are shared with outpatient and delivery sections, their capacities are exceeded. Large-scale sterilization is impossible, which greatly limits the types of surgical operations that can be performed.

5) Administration Section

The administration section contains general office equipment such as work desks, lockers, a chart file shelf, and typewriters. Before the cyclone there was also a copy machine. This section is responsible for the hospital's two ambulances, which were donated by WHO and a Rotary club in Australia, and two small trucks. The beds of both trucks, however, were damaged by the cyclone and one is now unable to carry much of a load.

2-5-5 PROBLEMS AND FUTURE ISSUES FOR HEALTH AND MEDICAL SERVICES ON SAVAII ISLAND

(1) Problems

The three major problems with the health and medical services on Savaii Island are as follows.

1) Inadequate Facilities and Equipment

Most of the medical facilities on Savaii Island and their equipment was already run-down or worn-out before Cyclone Val struck. Cyclone Val then seriously damaged almost all of the medical facilities. Some facilities were temporarily repaired, but many are far from being fully rehabilitated. This is especially true of Tuasivi Hospital, the base hospital on Savaii Island: it cannot provide secondary medical care as the referral hospital, nor provide proper primary medical care.

2) The Absolute Shortage of Doctors and Dentist on Savaii Island

In September 1992, there were four doctors on Savaii Island (three at Tuasivi Hospital and one at Sataua District Hospital). There were no doctors at Fagamalo and Foalalo District Hospitals so they were only functioning as health centres. At the end of October 1992, two doctors, one of whom was a UN volunteer and the other an employee of the Government, left the country. Although there have been two doctors at the hospital since February 1993, the shortage of doctors still exists on the island and it is not just relative to Upolu Island but absolute.

In October 1992, there was an old resident dentist on Savaii Island, however, in February 1993, there was no more resident dentist because he went back to Apia.

3) By-pass Patients to the National Hospital

Patients who by-pass medical facilities on Savaii Island must go to the National Hospital by bus and ferry, it takes for them about three hours. They sometimes stay with relatives in the Apia area while being treated. The trip to the National Hospital is likely a great burden for them in terms of time and money.

(2) Present Issues

The problems with medical services on Savaii Island described above indicate that steps to reduce disparities in medical services between Upolu Island and Savaii Island have not been taken. As a result, the existing medical care system has not been functioning effectively. People on Savaii Island have to bear a burden to receive proper medical services, and the Department of Health to maintain the existing medical system both in terms of finances and staff.

To diminish these disparities and to provide residents of Savaii Island with the basic medical services they need, the Department of Health has formulated a plan to reorganize the district health and medical service system and has made this plan an important issue in DP7. However, the first step to be taken to reduce the present disparities is to secure the minimum number of doctors and a dentist.

2-6 OUTLINE OF THE REQUEST

2-6-1 HISTORY OF THE REQUEST

When Japan provided grant aid for the District Hospitals Reconstruction Project which included rebuilding of Sataua District Hospital on Savaii Island in 1983, Tuasivi Hospital was already positioned in the health and medical care system as the referral hospital for Savaii Island. Although the Sataua District Hospital had top priority at that time, the facilities and equipment at Tuasivi Hospital gradually wore out and it became difficult to provide residents of the island with proper medical services. Patients who could have been treated at Tuasivi Hospital were often referred to the National Hospital. Sometimes they by-passed Tuasivi Hospital and went directly to the National Hospital. As a result, the rate of use of the facilities of Tuasivi Hospital had declined, and the National Hospital had become burdened with too many patients.

The Department of Health came to realize that this situation was not desirable for providing medical services properly and efficiently. To improve the situation, the Department of Health decided to rebuild the hospital buildings and the housing for its personnel, and it prepared a plan. According to the plan, the new Tuasivi Hospital would be built in Saleiologa, the transportation hub and commercial centre of the island. The hospital was to have adequate facilities and equipment befitting a hospital functioning as the island's referral hospital and as the country's second national hospital. In 1988, the Cabinet classified the project as a top priority TP6 project and envisaged receiving grant aid and technical cooperation from Japan.

In 1990 and 1991, two large cyclones struck Western Samoa and Tuasivi Hospital sustained serious damage. Teams from Britain, Australia, and New Zealand temporarily repaired most facilities at the hospital. However, as repairs were very basic, the functions of most facilities remained at minimal levels. Many broken or missing items of equipment were not repaired or replaced and one of the main buildings remained in very poor condition. As daily health and medical services were limited, the Department of Health decided to implement the project. However,

acquisition of the site at Salelolonga proved to be difficult so a decision was made to rebuild on the present site. The government modified the contents of the original plan and in April 1992 made a request to Japan for grant aid.

2-6-2 CONTENTS OF THE REQUEST

Based on the preliminary study and the field survey conducted by the Study Team, the plan for the Project for which grant aid is requested is confirmed as follows:

(1) Goal of the Project

The goal of the Project is to improve medical services on Savaii Island by rehabilitating Tuasivi Hospital's buildings and equipment which were destroyed by the cyclones and by restoring its functions as the base hospital of the island.

(2) Plan for Hospital Operations

1) Contents of Operations

The hospital will provide residents of the area with primary medical care, and as the referral hospital on Savaii Island, provide all its residents with secondary medical care. It will also act as the base for implementing health policies of the Department of Health.

2) Scale of Operations

As it is presently unnecessary and impossible for Tuasivi Hospital to be developed as the second national hospital for the island, operations will be on the same scale as they were when the hospital was fully functioning as a base hospital.

3) Administration of Operations

The administration system will have the same organizational structure as it had before the cyclone.

(3) Project Site

The Project site is the present Tuasivi Hospital site (approximately 24,300 m^2).

(4) Executing Agency

The executing agency of the Project is Department of Health of Western Samoa.

(5) Facility Plan

The Government presented to the preliminary study team a facility plan; the plan's rooms and floor areas are outlined below in Table 2-47.

Table 2-47 Facilities Requested to the Preliminary Study Team (approximately 2,700 m^2)

Section	Area	Major rooms (notes)
Outpatient	110 m^2	Examination room, medical records room, treatment room, waiting room, etc.
Surgery and CSSD	185 m^2	Operation theater, preparation room, Central Supply Sterilizing Department, etc.
Wards	639 m^2	64 beds (40 standard, 10 children's, 2 special, 12 obstetric, ICU, and delivery room)
Antenatal care and family planning clinic	188 m^2	Examination room, consulting room, and waiting room
Pharmacy	135 m^2	
X-ray inspection	196 m^2	X-ray inspection room, dark room, etc.
Laboratory	135 m^2	Laboratory, blood bank, morgue, etc. (laboratory testing/autopsy section)
Dental clinic	184 m^2	Examination room, dental technician room, X-ray inspection room, etc.
Administration	322 m^2	Office, storage, conference room, etc.
Others	560 m^2	Kitchen, laundry, dining room, etc.
Housing for personnel		Doctors, nurses, health administrators, dentists, other personnel, etc.

This plan, however, was judged to be too ambitious given the scale of present operations and the underutilization of facilities. Furthermore, it was thought to be difficult for Western Samoa to properly operate and maintain in terms of funds and staff. Both sides discussed the plan focusing on the goals of the Project and the operation plan for Tuasivi Hospital mentioned above. To establish a more manageable facility plan, the following basic policies were agreed upon:

1) The facilities should be on the same scale and have the same functions as before the cyclone. To reduce maintenance costs, the existing facilities should be incorporated into the new hospital wherever appropriate. However, the facilities for core operations must be demolished and rebuilt.

2) The rebuilt and renovated buildings must be designed to withstand future cyclones. It is especially important that the building containing the Central Diagnosis and Treatment Department have a shelter structure so it can continue operations even during a cyclone.
3) All precautions to protect the environment must be adopted.

The final request for facilities after meetings with the preliminary study team includes the following:

1) Buildings to be demolished and rebuilt
   a) Building for outpatients
   b) Building containing the X-ray room, clinical laboratory, dental clinic, and pharmacy storage
   c) Building containing the operation theater, delivery room, and antenatal and family planning clinic
   d) Building for administration
2) Buildings completely destroyed and to be rebuilt
   a) Garage
   b) Building for the laundry and linen storage
   c) Building for the generator
3) Buildings to be rebuilt on existing foundations
   Housing for the dentist and X-ray technicians
4) Buildings to be renovated
   a) Wards
   b) housing for personnel other than the regional medical officer, pharmacist, dentist, and X-ray technicians
5) Environmental sanitation facilities to be built
   a) On-site facilities for water supply and drainage
   b) Soil water purification facility
   c) Incinerator

(6) Equipment Plan

As no equipment list was submitted in the first request document, the Government later submitted one to the preliminary study team. This list contained duplications that could not be incorporated into a facility of the proposed scale. Furthermore, some of the equipment was too advanced for the present hospital personnel. The Government and the preliminary study team discussed and agreed that the equipment for the hospital should

be examined by the Japanese team focusing on the goals of the Project and the operation plan of Tuasivi Hospital. The Basic Design Study Team, following the conclusions of the preliminary study team, developed an equipment plan. After discussion on the plan with the Government, the Study Team confirmed the requested equipment plan as outlined below.

Table 2-48 Outline of the List of Equipment Requested

Department		Contents of the request (top)/primary equipment requested (bottom)
Outpatient	General outpatient	Basic examining equipment for two examining rooms such as
		Consulting desk, examining table, examining light, 1-channel electrocardiograph, and instrument and dressing cabinet
	Treatment room	Various types of treatment equipment from emergencies to patient survival such as
		Examining table, suction unit, autoclave, and defibrillator
	Antenatal care and family planning clinic	Equipment for antenatal care and family planning guidance such as
		Gynecological examining table, suction unit, fetal heart detector
	Dental clinic	Equipment for the examining room and the dental mechanics room
		Dental instrument set, dental X-ray unit, dental lathe, and casting machine
	Pharmacy	Equipment for storing pharmaceutical drugs and medicine such as
		Mixer, unit pharmacy table, medicine refrigerator, shelf, and typewriter
Central diagnosis treatment	X-ray inspection	Equipment for general X-ray inspections such as
		General X-ray unit, developing tank, film dryer, and film keeping shelves
	Laboratory testing	Equipment for blood, biochemical, bacterial, and pathology testing, and equipment for the blood bank such as
		Unit laboratory table, spectrophotometer, flame photometer, water still, and blood bank refrigerator
	Delivery	Equipment for the delivery and care of newborns such as
		Labor bed, delivery bed, suction unit, fetus monitoring unit, and incubator
	Surgery	Basic equipment primarily for minor operations, including recovery and ICU such as
		Operating table, operating light, anesthesia apparatus, suction unit, and defibrillator
	CSSD	Equipment for sterilizing and storing instruments and various operation instrument sets such as
		High pressure steam sterilizer, instrument boiling sterilizer, wire shelf, and instrument and dressing cabinet
Wards	Wards	Bedding to replace that washed away by the cyclones such as
		Mattresses for patient beds
	Nurses' station	Equipment to replace worn-out equipment such as
		Suction unit, refrigerator, instrument boiling sterilizer, and bedpan sterilizer
	Administration	Equipment for health education and training and cars for external visits by a doctor such as
		Video set, conference desk and chair, car for doctors' rounds, and truck
	Reception and medical records room	Office equipment and equipment for managing medical records such as
		Typewriter, copy machine, and chart file shelf

CHAPTER 3 CONTENTS OF THE PROJECT

CHAPTER 3 CONTENTS OF THE PROJECT

3-1 OBJECTIVE OF THE PROJECT

Tuasivi Base Hospital, the referral hospital on Savaii Island, was seriously damaged by Cyclones Ofa and Val. Most facilities at the hospital were temporarily repaired shortly after Val, but as repairs were basic, many important items of equipment and parts of the main hospital buildings were not repaired or replaced. As a result, the hospital's capacity to function as a base hospital and provide even basic health and medical services is limited. To resolve this problem, it is vital that the hospital's functions be restored to at least their pre-cyclone levels.

The objective of the Project is to improve basic medical services required daily by the residents of Savaii Island by rehabilitating the facilities and equipment at Tuasivi Hospital.

3-2 EXAMINATION OF THE REQUEST

3-2-1 NECESSITY AND APPROPRIATENESS OF THE PROJECT

(1) Necessity of the Project

Tuasivi Hospital is positioned as the only base hospital providing Savaii Island's 42,700 residents with secondary medical care. Since many of its facilities were worn-out before the cyclones hit, the destruction of the facilities was exacerbated. Although they were temporarily repaired soon after, repairs were very basic: the hospital cannot properly function as a referral hospital or even as a facility offering primary medical care. As a result, Tuasivi Hospital is relying on the National Hospital even for some patients that it should be capable of providing medical services to.

Moreover, because of the large disparity in medical services between Savaii Island and Upolu Island where the National Hospital is located, many patients are by-passing Tuasivi Hospital in favor of the National Hospital. Consequently, the burdens both on the Department of Health, which spends a lot of money transferring patients to the National Hospital, and on the residents of Savaii Island who must spend considerable time and money to go to the National Hospital, have greatly increased. This is an unacceptable situation: it is urgent that the disparities be minimized and that medical services be properly provided to the residents of Savaii Island. It has been concluded, therefore, that the buildings of Tuasivi Hospital must be rebuilt or renovated and furnished with adequate equipment.

(2) Appropriateness of the Project

The Department of Health has designated the Project as the highest ranking project of District Hospital Development, which is one of the four most important issues of DP7 for the health and medical sector.

"Improvement in the health delivery system" is enumerated as one of the major policies arising from DP7. With this policy, the objective is to efficiently manage all medical facilities and staff, and to effectively provide medical services to the people in rural areas. To achieve this, the Department of Health is reorganizing the country's health and medical services system. The Project is to upgrade the facilities of Tuasivi Hospital and by doing this, to upgrade the health services system. The Project is thus in keeping with the policies of DP7.

If Tuasivi Hospital is improved so that it can function as the referral hospital for Savaii Island, the island's residents will be able to receive secondary medical care on the island and will not need to go to the National Hospital. This will also enable the hospital to provide residents of adjacent areas with adequate primary medical care. As a result, residents of Savaii Island will be able to receive all types of basic medical services on the island.

Given this, it is judged that the Project is compatible with the goals of the upper level plans and policies of the country and that the effects of the Project will be sufficient.

3-2-2 APPROPRIATENESS OF THE OPERATON PLAN

(1) Appropriateness of the Services

Tuasivi Hospital will provide residents of Savaii Island with health and medical services through the following activities:

1) Medical Activities
   a) Providing primary medical care to residents of the Faasaleleaga District
   b) Providing secondary medical care to all residents of Savaii Island
   c) Providing the external services of a doctor to lower level health and medical facilities on Savaii Island
   d) Supplying pharmaceutical drugs to lower level health and medical facilities on Savaii Island
2) Health Services Activities
   a) Providing primary health care to residents of the Faasaleleaga area
   b) Administering primary health care throughout Savaii Island
   c) Managing public health and sanitation throughout Savaii Island

The activities described above are basically the same as those presently being provided: completion of the Project will not expand the range of services Tuasivi Hospital provides. In Western Samoa, health and medical services have been integrated at the district level for many years, which is practical for a country of its population.
Therefore, the services planned for Tuasivi Hospital are appropriate.

(2) Examination of the In-hospital Diagnosis and Treatment System and Other Activities

1) Outpatient System

   There are no major problems with the conventional outpatient system at Tuasivi Hospital so it should be maintained as it is at present. However, there may be some problems with the system for managing dental records because the number of dental patients is increasing at a rapid rate. To smoothen the flow of patients, dental records should be managed together with medical records by outpatient reception.

2) Inpatient System

To upgrade inpatient care and nursing services, it would be necessary to implement a comprehensive nursing system, as in operation at the National Hospital, and to relieve patients' families of the responsibility of supplying food and bedding. However, it is too early to introduce such a system to Tuasivi Hospital for the following reasons: it is difficult to secure trained personnel; the economic burden on both the patients and the Department of Health would increase; families expect to look after their relatives while they are in hospital. Given this, the present system should be maintained.

3) Central Diagnosis and Treatment System

a) Inspection and Testing Systems

There are no major problems with the clinical laboratory testing and x-ray inspection systems so present practices should be maintained. Pathological test equipment contained in the request list, however, should not be included in the Project given the present personnel and operations of the hospital.

b) Surgical operations System

The surgical operations previously performed at the hospital should be continued; these include basic surgical operations such as the suturing of cuts from accidents, emergency incisions, emergency amputations, basic incisions and suturing, and basic abdominal surgical operations such as cesarean sections and appendectomies. However, a more stringent system for ensuring sterilize conditions should be established.

c) Delivery System

Basically, the present delivery system should be maintained. However, a more stringent system for ensuring sterilize conditions should be established. In addition, the plan proposed by the Government to have immature babies cared for at Tuasivi Hospital instead of at the National Hospital is appropriate.

d) System for Management of Sterilized Supplies

The plan outlined by the Government to create a sterilizing facility for supplies and to establish a central management system for sterilized supplies is appropriate.

4) External Services Provided by Doctors

As the reorganization of the district medical system proposed in DP7 advances, Tuasivi Hospital and Satauna will be the only hospitals on Savaii Island with doctors. To ensure the provision of medical services throughout Savaii Island, it is imperative that these doctors make regular visits to health centers. Such external services however, should be provided when time is available.

5) Other Services

Conventional services such as supplying pharmaceutical drugs to lower level health and medical facilities, and services such as functioning as an administrative base for the Department of Health, should continue to be provided.

(3) Examination of the Scale of Services

The Department of Health understands that, both in terms of personnel and funding, it is presently impossible to upgrade the functions of Tuasivi Hospital to a level appropriate for a second national hospital. It was agreed that the scale of operations would be about the same as it was before the cyclones.

In Western Samoa, the patients per population rate and the population growth rate are both low: it is unlikely that the demand for medical services on Savaii Island will increase much in the near future. Completion of the Project will improve medical services on Savaii Island and reduce the number of patients by-passing its medical facilities. As a result, the number of people using Tuasivi Hospital will increase and operations will expand accordingly. The scale of operations can be illustrated by using indexes such as the annual number of patients and the annual amount of testing based on data contained in the Annual Report of the Department of Health and the monthly reports of Tuasivi Hospital. The indexes are presented below and the data is presented in Appendix-5.

1) Number of General Outpatients

a) Trends in General Outpatients

According to data for 1985-1990 found in the Annual Report 1988-1990, the number of general outpatients has been decreasing nationally. However, in rural areas such as Savaii Island the number is increasing, particularly at Tuasivi Hospital as recent data illustrates. Table 3-1 below shows the tentative figures for

general outpatients from the monthly reports of Tuasivi Hospital for three months in both 1991 and 1992 and an estimate of the number of general outpatients for each year.

Table 3-1 Number of Outpatients

Period	All of Savaii Island	Tuasivi Hospital		Notes & Source
		Visits	Rate of use of Tuasivi Hospital	
1990 (all year)	39,298	11,028	28%	Annual Reports of the Department of Health
April 1991	4,226	1,122		Monthly reports of Tuasivi Hospital
May 1991	4,317	1,692		
July 1991	4,584	1,801		
Monthly average	4,376	1,628		a)
1991 estimate (all year)	52,512	19,536	37%	a) x 12
February 1992	4,154	1,842		Monthly reports of Tuasivi Hospital
May 1992	6,173	2,268		
August 1992	4,236	1,573		
Monthly average	4,854	1,894		b)
1992 estimate (all year)	58,248	22,732	39%	b) x 12

The figures for outpatients in 1991 and 1992, as estimated in the table above, are much higher than the figure for 1990, and the rate of use of Tuasivi Hospital as well. The rate of use of Tuasivi Hospital in 1992 is estimated to be 39 %. When the medical functions of the health centers and the subcenters are reduced by the reorganization of the district medical service system proposed in DP7, and operations at Tuasivi Hospital and Sataua District Hospital become more medically oriented, it is thought that this tendency will accelerate.

The rate of error between the tentative figures of Tuasivi Hospital's monthly reports and the final figures of the Annual Report of the Department of Health is 3%-8% for in 1989 and 1990. The tentative figures in the monthly reports are always corrected downwards. When the estimates for 1991 and 1992 above are averaged and corrected downwards by 5%, the present number of outpatients is calculated to be 20,077 as shown below.

	All of Savaii Island	Tuasivi Hospital
Estimated annual average (1991-1992)	55,380	21,134
x 0.95	52,611	20,077

At present, 8% of the outpatients on Savaii Island by-pass facilities on the island and go to the National Hospital. As the majority of them are outpatients at special clinics of the National Hospital, the 8% figure is not likely to be reduced, even when the Project is completed.

b) Estimating the Number of Outpatients

As shown above, there are presently about 52,700 outpatients on Savaii Island per year and about 40% of them use Tuasivi Hospital. Given this, the number of outpatients using Tuasivi Hospital can be calculated as follows.

1/ Number of outpatients per year = 52,700 x 0.4 = 21,080 → 21,100

2/ Number of outpatients per day = 21,100/260 = 81.2 → 82

2) Number of Users of Antenatal Care and Family Planning Services

a) Trends in the Use of Antenatal Care

When trends in the use of antenatal care described in the Annual Report 1988-1990 are analyzed, it can be seen that the percentage of people using antenatal care significantly increased throughout the country in 1989, and that the rate of increase slowed down in 1990. The rate of increase on Savaii Island was higher than in Apia in both years but it also slowed down in 1990 and was about the same as the national average. Given this, a significant increase in the percentage of people using antenatal care is unlikely to occur.

b) Estimating the Number of Users of Antenatal Care

Based on the analysis above, it is reasonable to conclude that the number of pregnant women using antenatal care in the near future will not change much. The total number of visits of pregnant women receiving antenatal care on Savaii Island was 7,351 in 1990. Using figures in Tuasivi Hospital's monthly reports for May and July in 1991, it can be deduced that 40% of these women used Tuasivi Hospital. Based on this figure, the following calculations can be made.

1/ Number of users per year = 7,351 x 40% = 2,940 → 3,000

2/ Number of users per day = 3,000 / 260 = 11.5 → 12

c) Family Planning Services Users

The only data for calculating the number of people using Tuasivi Hospital's family planning services is contained in the hospital's monthly reports for May and July 1991. According to this data, the hospital either provided birth control pills or fitted birth control devices to about 150 women each month.

1/ Number of users per year using family planning services = 150 x 12 = 1,800 → 1800

2/ Number of users per day using family planning services = 1,800 / 260 = 6.9 → 7

3) Number of Dental Outpatients

a) Trends in Dental Outpatients

According to Tuasivi Hospital's monthly reports for April, May, and July 1991, the average number of dental patients per month is 180. Based on the analysis in the previous section of this report, 84% of dental patients on Savaii Island by-pass the island's dental clinic in favor of those of National Hospital. The number of dental outpatients using Tuasivi Hospital is likely to significantly increase when the Project is completed.

b) Assuming the Number of Dental Patients

According to the analysis above, the number of dental patients should be assumed to be double the present figure.

1/ Number of patients per year = 180 x 12 x 2 = 4,380 → 4,400

2/ Number of patients per day = 4,400 / 260 = 16.9 → 17

4) Number of Inpatients

a) Trends in Inpatients

According to data in the Annual Reports of the Department of Health, the number of inpatients on Savaii Island gradually decreased between 1988 and 1990. According to data in the monthly reports of Tuasivi Hospital, however, the number is gradually increasing. The table below shows an estimate of the number of inpatients for both 1991-1992 based on the tentative figures for inpatients for three months in both 1991 and 1992 given in the monthly reports of Tuasivi Hospital.

	All of Savaii Island	Tuasivi Hospital	
		Number of Admission	Rate of use of Tuasivi Hospital
1990 (actual figures)	2,104	873	28%
1991 (estimate)	2,724	1,232	45%
1992 (estimate)	3,192	1,512	47%

The actual number of inpatients on Savaii Island is estimated by averaging the estimated figures in the above table and correcting the results downwards. The rate of error between the tentative figures of Tuasivi Hospital's monthly reports and the final figures of the Annual Reports of the Department of Health is 5%-20%. When the estimates for 1991 and 1992 are averaged and the results are corrected downwards by 10%, the following is obtained.

	All of Savaii Island	Tuasivi Hospital
Estimated annual average (1990-1992)	2,958	1,372
Above average x 0.9	2,662	1,235

According to the figures for inpatients at Tuasivi Hospital for 1990 in the Annual Report and the tentative figures for 1991 and 1992, the rate of use of Tuasivi Hospital climbed from 28% to 47%. As with outpatients, this increase is likely to continue. Furthermore, when the Project is completed, the number of patients by-passing Tuasivi Hospital in favor of National Hospital is likely to decrease. In addition, patients from other parts of the island will by-pass local facilities to go to Tuasivi Hospital. It is necessary for facility planning to assume that 50% of the inpatients on Savaii Island per year will use Tuasivi Hospital, and that 50% fewer inpatients will by-pass Tuasivi Hospital in favor of the National Hospital.

b) Estimating the Number of Inpatients

Based on the above, there will be about 2,670 people on Savaii Island per year requiring hospitalization, and about 50% of them will use Tuasivi Hospital. Of the people on Savaii Island requiring hospitalization, 22% by-pass facilities on the island and go to the National Hospital, as examined in the previous section of this report. When the Project is completed, this 22% figure will

be halved and 11% will go to Tuasivi Hospital. Given this, the following is obtained.

1/ Number of inpatients per year =

2,670 x 0.5 + 2,6470/78% x 11% = 1,712 → 1,720

2/ Average length of stay for inpatients

Between 1988-1990, the average length of stay was 4.0 days and it was 3.4 days in 1990, which indicates a downward trend. In the Project, the average length of stay for patients is assumed to be 3.7 days, which is the median of 3.4 days and 4.0 days.

3/ Number of inpatient days = 1,720 x 3.7 = 6,364 → 6,400

4/ Average number of inpatients per day

= 6,400/365 = 17.5 → 18

5) Number of Clinical Laboratory Tests

The number of clinical laboratory tests is assumed to be in proportion to the number of patients. Given this, the number of clinical laboratory tests will be calculated based on the estimated number of patients outlined above. At Tuasivi Hospital, the only year for which statistics for both the number of clinical laboratory tests and the number of patients are available is 1989. In order to estimate the number of tests for the Project, the ratio of the total number of outpatients and inpatients in 1989 to the number of patients estimated above is calculated first, and then this figure is multiplied with the number of tests in 1989.

a) Ratio of the Number of Patients

	Number of patients (1989)	Estimated number of patients	Ratio
Total number of outpatients	11,971	21,100	
Total inpatient days	4,513	6,400	
Total	16,484	27,500	1:1.67

b) Estimated Number of Patients

Type of test	Number of tests (1989)	Estimated number of tests
Blood	1,973	3,294 → 3,300
Bacteriological	204	341 → 350
Biochemical	2,183	3,645 → 3,650
Urine	603	1,052 → 1,060
Parasitical	12	20 → 20
Pathological	97	162 → 170
Total	5,099	8,530

6) Number of X-ray Inspections

As with clinical laboratory tests, the number of X-ray inspections is assumed to be in proportion to the number of patients. Given this, the estimated number of x-ray inspections is calculated as above.

Part of the body inspected by X-ray	Number of X-ray inspections (1989)	Estimated number of X-ray inspections
Chest	661	1,104 → 1,110
Abdomen	115	192 → 200
Head	147	246 → 250
Others	615	1,027 → 1,030
Total	1,538	2,590

7) Number of Surgical Operations

As data on the number of operations at Tuasivi Hospital is insufficient, it is impossible to estimate the number of operations to be performed in the future. Based on past exprience, the Department of Health has assumed the number of surgical operations, including minor surgical operations (treatment provided in the operation theatre), to be as follows.

1/ Number of major operations = 2 per week

2/ Number of minor operations = 12 per week

These figures are considered reasonable for the Project.

8) Number of Deliveries

a) Trends in Hospital Deliveries

According to the figures on page 38 of the Annual Report 1988-1990, the percentage of deliveries in hospital increased from 63% in 1986 to 75% in 1990. Since 1988, however, the percentage has only slightly increased. According to Tuasivi Hospital's monthly reports, only about 35% of the deliveries on Savaii Island are in hospitals; the remaining 65% are done by a traditional birth attendant (TBA). When the Project is completed and facilities of Tuasivi Hospital are upgraded, it is likely that the percentage of hospital deliveries on Savaii Island will soon increase to near the national average.

b) Estimating the Number of Deliveries

The number of deliveries at Tuasivi Hospital can be calculated by multiplying the total number of deliveries on Savaii Island with the percentage of hospital deliveries on Savaii Island, and then

multiplying this figure with the rate of use of Tuasivi Hospital. Based on the data of the Annual Report 1988-1999, the percentage of deliveries in hospitals is assumed to be 75% and the rate of use of Tuasivi Hospital is assumed to be 40%.

1/ Number of deliveries on Savaii Island

Population (42,700) x natural population growth rate (2.8%) = 1,195 → 1,200

2/ Number of deliveries per year = 1,200 x 75% x 40% = 360 → 360

3/ Number of deliveries per day = 360/365 = 1.0 → 1.0

9) External Services of a Doctor

To provide equal opportunities to receive medical services throughout the island, it is necessary to strengthen the external services of a doctor. The demand for external services is from medical facilities without a resident doctor, and consists of outpatient demand and inpatient demand.

a) Outpatient Demand for the External Services of a Doctor

The demand can be calculated by subtracting the number of outpatient visits at Tuasivi Hospital and Sataua District Hospital from the total number of outpatient seeking medical services of a doctor throughout the island.

1/ Outpatient demand throughout Savaii Island

Based on the assumption made in (3) 1) of this section of the report, the outpatient demand throughout Savaii Island is assumed to be 52,700.

2/ Number of outpatient accepted at Tuasivi Hospital and Sataua District Hospital

The number of outpatient accepted at Tuasivi Hospital and Sataua District Hospital is the sum of the possible outpatient visits at Tuasivi Hospital and the average number of outpatient visits at Sataua District Hospital between 1988-1990.

21,100 + 7,758 = 28,858

3/ Outpatient demand on Savaii Island for external services of a doctor is calculated as follows. 52,700 - 28,858 = 23,842

b) Inpatient Demand for the External Services of a Doctor

Demand is calculated by subtracting the number of inpatients admitted at Tuasivi Hospital and Sataua District Hospital from the inpatient demand throughout the island.

1/ Inpatient demand throughout Savaii Island

Based on the assumption made in (3) 4) of this section of the report, inpatient demand throughout Savaii Island is as follows.

2,670 + 2,670/78% x 11% = 3,047

2/ Number of inpatients admitted at Tuasivi Hospital and Sataua District Hospital

The number of inpatients admitted at Tuasivi Hospital and Sataua District Hospital is the sum of the maximum possible inpatient admissions at Tuasivi Hospital and the average number of inpatient admissions at Sataua District Hospital between 1988-1990. 1,720 + 407 = 2,127

3/ Inpatient demand for external services of a doctor

Number of patients = 3,047 - 2,127 = 920

Number of inpatient days = 920 x 3.7 = 3,404

Average number of inpatients per day = 3,404/365 = 9.3 → 10

Since the inpatient demand per day is small for facilities other than Tuasivi Hospital and Sataua Hospital, these figures need not be included when calculating the demand for external services of a doctor. They can be examined or treated while a doctor is providing external services for outpatients.

c) Required Scale of for the External Services of a Doctor Provided by Tuasivi Hospital

The required scale of external services of a doctor from Tuasivi Hospital can be calculated by subtracting the maximum possible patient visits to Sataua District Hospital from the entire demand for external services of a doctor.

1/ Capacity of Sataua District Hospital to provide external services of a doctor

Sataua District Hospital can treat 50 outpatients per day, which amounts to 13,000 patients over a period of one year. In the years 1988-1990, Sataua District Hospital averaged 7,758 outpatients per year thus it has the capacity to handle 5,442 more outpatients per year. This figure is equal to the capacity of its external services.

2/ Tuasivi Hospital's external services load

Given the above, the hospital's load in terms of the number of patients is calculated below. 23,842 - 5,442 = 18,400

The number shows that each day a doctor should examine or treat about 70 patients at external facilities. Clearly, this is beyond the capacity of one doctor, which is estimated to be about 50 patients per day and 13,000 patients per year. Therefore, subtracting 13,000 from 18,400, it is estimated that 5,400 patients will still be without the care of a doctor even after the Project is completed, unless five doctors in total are stationed on Savaii Island.

10) Scale of Tuasivi Hospital's Operations as a Pharmaceutical Supply Center

The amount of drugs Tuasivi Hospital handles and supplies to other medical facilities on Savaii Island is assumed to be in proportion to the number of patients using those facilities. When the Project is completed, the number of patients using Tuasivi Hospital is likely to be greater than now. The total number of patients on Savaii Island, however, is unlikely to increase much. Given this, the scale of Tuasivi Hospital's operations as a pharmaceutical supply center will not expand much.

11) Health Services

The scale of health services cannot be measured statistically. The scale of these services will likely remain at present levels.

(4) Examination of the Hospital's Organizational Structure

1) Tuasivi Hospital's Organizational Structure

Tuasivi Hospital's present organizational structure, which is outlined in Figure 2-7 in Chapter 2, is to be maintained after the Project is completed. There are no real problems with the structure so it should be considered appropriate.

2) Staff Configuration

As Tuasivi Hospital is to function as the referral hospital providing secondary medical care for all of Savaii Island, it is vital to increase the number of doctors and to establish 24-hour emergency care and nursing systems. To achieve this, the staff configuration should be strengthened as follows:

a) Doctors

Two doctors can examine and treat the proposed number of patients, 82 outpatients and 18 inpatients per day. However, they cannot provide any external services to other medical facilities. Therefore, at least three doctors must be stationed at the hospital.

b) Nurses

The two doctors examining and treating outpatients will require the services of two nurses. To have nurses working in shifts 24-hours a day, the following configuration for nurses should be adopted.

Time	Outpatient	Wards	Central diagnosis and treatment	External duty	Total
8:00 - 16:00	2	3	1	1	7
16:00 - 24:00	1	3			4
24:00 - 8:00	1	3			4

Of the three nurses on-duty in the wards, one can be an enrolled nurse. The nurse on-duty in the Outpatient Department outside of regular hours is on standby for emergencies.

To maintain the above system 365 days a year, a shift system providing holiday time for nurses must be established. Assuming that the nurse supervisor only performs external duties such as primary health care operations at other facilities, there must be at least 20 other full-time nurses on staff. Calculation of this figure is shown below.

$$(6 + 4 + 4) \times 365/260 = 20$$

c) Midwives

One full-time midwife is required just to provide antenatal care to 12 people per day and family planning services to 7 people per day. As there is an average of one delivery per day, it is necessary to have a midwife on-duty 24-hours a day. In addition, a midwife is required to provide family planning services at other health centers. Given this, the following configuration for midwives should be adopted.

Time	Outpatient	Wards	Delivery	External duty	Total
8:00 - 16:00	1	0	1	1	3
16:00 - 24:00	0	0	1		1
24:00 - 8:00	0	0	1		1

To maintain the above system 365 days a year, a shift system providing holiday time for midwives must be established. Calculation of the number of midwives required is shown below.

$$(3 + 1 + 1) \times 365/260 = 7$$

d) Dental Nurses

As of October 1992, the hospital has one dental nurse, but the Department of Health is planning to increase the number to two. As the number of patients is increasing, this arrangement is adequate.

e) CSSD Staff

Up to now, there has been no CSSD, but the Government request for the Project includes a CSSD. The Department of Health is planning to recruit three people for the CSSD; this is an adequate number, but it must include at least one nurse or medical technician knowledgeable in the management of sterilized supplies.

f) Administration Staff

One medical records clerk to work outside of regular hours is required for emergency and night duty. One of the present office staff could be shifted to this job. On holidays, however, nurses can assume responsibility for medical records, thus a clerk is not required to be on-duty at all times.

The present building maintenance staff of five will be sufficient when the Project is completed.

The hospital has ambulances which should be available at all times, including holidays. To meet this requirement the hospital must have eight drivers and use a driver shift system.

A porter/messenger to aid in the moving of patients is required both during the day and at night, therefore, two people must be assigned to this job. During holidays, however, another staff member can perform the functions of a porter/messenger, therefore, an additional person is not required.

A night watchman is always required outside regular hours, including holidays. Therefore, three night watchmen should be on staff.

The staff configuration for the hospital after the Project is completed is shown in Table 3-2 below. This configuration requires the following additional staff members: 2 midwives, 6 registered nurses, 2 enrolled nurses, 1 dental nurse, 3 drivers, 1 porter/messenger, and 3 CSSD staff. The present staff consists of 58 members and with the above additions, the new staff will consist of 76 members. This means 18 more people are required. However, 2 midwives and 8 nurses can be transferred from other facilities on the island. Therefore, 8 other new staff members must be hired (1 dental nurse, 3 drivers, 1 porter/messenger, and 3 CSSD staff).

Table 3-2 Configurations of Tuasivi Hospital's Overall Staff and the Staffs of Each Shift

Classification	Occupation	Number of personnel		Staff of each shift				
		Present	Post-Project	8:00	16:00	24:00	8:00	On holidays
Medical	Doctor (medical officer)	3	3	O—3—O-----<1>----O				
	Nurse supervisor	1	1	O—1—O-----<1>----O				
	Midwife	5	7	O—3—O—1—O—1—O				2
	Registered nurse	11	17	O—7—O—3—O—3—O				4
	Enrolled nurse	2	4	O—1—O—1—O—1—O				1
Dental	Dentist	1	1	O—1—O				
	Dental nurse	1	2	O—2—O				
	Dental technician	(1)	(1)	O--(1)--O				
Paramedical	Clinical laboratory technician	2	2	O—2—O-----<1>----O				
	X-ray technician	2	2	O—2—O-----<1>----O				
	Pharmacist	3	3	O—3—O				
	CSSD staff	0	3	O—3—O				
Public health	Health inspector	4	4	O—4—O				
Non-medical	Administrative officer	1	1	O—1—O				
	Office worker	4	3	O—3—O				
	Medical records clerk	1	2	O—1—O—1————O				
	Building maintenance worker	5	5	O—5—O				
	Driver	5	8	O—4—O—1—O—1—O				2
	Cleaning and laundry worker	3	3	O—3—O				
	Porter/messenger	1	2	O—1—O—1————O				
	Security guard	3	3		O—1—O—1—O			1
Total		58	76	50	9	7		10

The figures in <> indicate staff on-call at the in-hospital residence. The figure in () indicates staff members from the National Hospital making the rounds to Tuasivi hospital; they are not included in the figure for the total number of staff members. The present figures are as of October 1992.

3-2-3 PROBABILITY OF OPERATION

(1) Probability of Securing Personnel Required

Additional doctors, nurses, and X-ray technicians are the primary personnel required for the planned operations. The acquisition of nurses will not be problem because nurses from other medical facilities on Savaii Island will become available as the health and medical system is reorganized according to the DP7 proposal.

The X-ray technicians stationed at Tuasivi Hospital before Cyclone Val returned to the National Hospital after the cyclone because the X-ray apparatus at Tuasivi Hospital had been destroyed. Since the National Hospital has sufficient personnel, and funds for X-ray personnel have been allocated to Tuasivi Hospital, it should be possible to acquire X-ray technicians.

The major personnel problem is the shortage of doctors. At least three doctors are needed at Tuasivi Hospital to restore its services to pre-cyclone levels so that the hospital can function as a referral hospital. When the Government made its initial request the hospital was staffed by three doctors. But two of them left, and as mentioned earlier, they must be replaced. The success of the Project depends on whether two more doctors can be acquired. In the Minutes of Discussions signed by the Minister and the Study Team in October 1992, it was confirmed that the Department of Health would acquire two more doctors for Tuasivi Hospital. The Department of Health intends to recruit Western Samoans presently studying medicine overseas to fill these vital roles, but this is not always appropriate. It would be more appropriate to transfer doctors from the National Hospital, at which many of the doctors are concentrated. Since there are fewer patients per doctor in Western Samoa than in Japan, there is no absolute shortage of doctors in the country. In addition, the number of patients per doctor at the National Hospital is lower than at the district hospitals. Therefore, it is possible to transfer doctors from the National Hospital to Savaii Island; the problem of shortage of doctors on Savaii Island can be easily solved without recruiting new doctors.

(2) Probability of the Government Bearing Operation Costs

When the Project is completed, operation costs at the hospital will be higher than before. In particular, utility costs and costs for operation and maintenance of medical equipment will rise. The additional operating costs are estimated to be about 1.5% of the current expenditures of the Department of Health in the annual budget. (These figures are detailed in Section 3-5.) The following discussions demonstrates that it is possible for the Department of Health to secure funds for the additional costs:

1) Compatibility of the Project with Important Government Policies

Improving health and medical services is one of the primary objectives of DP7, and correcting regional disparities is one of the long-term development goals of DP7. The project is compatible with both of these. Therefore, it may be possible to obtain a consensus within the Government on an increase in the Department of Health budget, although the percentage of the national budget allocated to the Department of Health has recently been decreasing because of the Government's emphasis on development.

2) Capacity of the National Treasury

Although the national economy is experiencing negative growth, the national budget has been well planned. The ordinary balance is in the black in FY 1992-1993 with revenues of WS$ 163,337,900 and expenditures of WS$153,281,141. As a result, the current balance has a surplus of about WS$ 10 million. At this time, the Government is planning to use the surplus for some of the public sector investment, but the total balance after that is still in the black with a surplus of WS$3,258,800. On the other hand, the increase in current new expenditures of the Department of Health to operate the new hospital will be about WS$ 160,000, which is about 5.0% of the eventual surplus. Therefore, if a consensus can be reached on allocating funds for the operation costs of Tuasivi Hospital outlined in 1) above, the source of funds will not always be negative.

3) Efforts by the Department of Health

It is possible to contrive to raise a part of the funds by eliminating nonurgent expenditures in the current expenditures of the Department of Health.

3-2-4 THE RELATIONSHIP OF THE PROJECT TO SIMILAR PLANS AND OTHER AID PROJECTS

Similar plans related to the Project in Western Samoa are "District Hospital Development" (see Section 2-3-2) and "Disaster Rehabilitation" (see Section 2-2-2).

(1) Relationship of the Project to District Hospital Development

In DP7 of the health and medical sector, the Department of Health notes that the rebuilding of Tuasivi Hospital has top priority in the district hospital development. The Department of Health estimated the total cost of district hospital development to be WS$ 7,851,000 (WS$ 7,595,000 from domestic sources and WS$ 256,300 in foreign assistance). However, PSIP is providing only WS$ 705,000 (WS$ 449,000 from domestic sources and WS$ 256,000 in foreign assistance) for it, which is only one-tenth of what the Department of Health estimated. The amount of foreign assistance for district hospital development estimated by the Department of Health is WS$ 256,000, which is nearly equal to the amount of foreign assistance budgeted by PSIP. The Department of Health is planning to obtain this money for the projects below from Japan, WHO, and New Zealand.

a) Improvement of facilities	WS$ 19,800	(WHO)
b) Improvement of telecommunications	WS$ 120,000	
c) Training of personnel for district health management	WS$ 26,400	
d) Reorganization of the health and medical systems	WS$ 0	
e) Upgrading means of transportation	WS$ 68,800	
Total	WS$ 256,300	

In district hospital development, the Project is categorized as a facility improvement project. Funds from WHO in this category amount to only WS$ 19,800, which can only be provided to small-scale facility improvement projects. It can be concluded, therefore, that the Project is not going to be implemented through the PSIP.

(2) Relationship of the Project to the Disaster Rehabilitation

1) Disaster Rehabilitation in the 1992/1993 Budget

Funds for disaster rehabilitation in the national budget for 1992/1993 allocated to district hospitals amount WS$ 365,000. This is from the

development budget funded with government revenue; from foreign grant assistance funds, WS$667,600 is allocated to "District Hospital Rehabilitations (DHR)". The total of the rehabilitation budgets for district hospital amounts to WS$1,032,600 (¥50 million). These funds are to be used for the rehabilitation of some prioritized district health and medical facilities other than Tuasivi Hospital, and no funds for the Project is therein included.

2) WHO Survey and the Direction of Disaster Rehabilitation of District Hospitals

A month after Cyclone Val, WHO conducted a survey on damage to the country's health and medical facilities and prepared a report on rehabilitation which included cost estimates. Upon close inspection of Tuasivi Hospital's facilities today, it seems that the repairs have been done, as WHO recommended, with the understanding that implementation of the Project was a possibility. Therefore, there would not be any future rehabilitation plans for Tuasivi Hospital other than the Project.

Consequently, future rehabilitation work as well as that to be done within this fiscal year will not conflict with the Project.

(3) Relationship of the Project to the Temporary Repairs at Tuasivi Hospital

Tuasivi Hospital's facilities damaged by Cycline Val were immediately temporarily repaired by a team dispatched by Britain. These repairs, which were appreciated, saved the hospital and allowed it to provide basic medical services. Signs commemorating the work crews were affixed to the repaired buildings. Except for the regional medical officer's house, which was later rebuilt by Sawhorse New Zealand, all repairs were basic. The facilities are worn-out and are likely to sustain serious damage if a cyclone with the intensity of either Ofa or Val strikes again. But cyclones of such intensity usually occur once every 100 years in Western Samoa and the repaired sections of the buildings (mainly roofs and windows) now appear to be strong enough to withstand normal storms which hit the country every year. Further reinforcement of sections already repaired is not advised, for additional reinforcement may make the unrepaired sections even more vulnerable to storms as explained in Section 3-2-5. Given the situation described above, the Project renovations must be done only to sections of buildings that have not yet been repaired.

3-2-5 EXAMINATION OF FACILITIES REQUESTED

(1) Basic Policies for the Facility Plan

1) Examination of the Distinction between Buildings to be Rebuilt and Buildings to be Renovated

The Government has a plan to rebuild the buildings containing the outpatient department, the central diagnosis and treatment department, and the administration department, which includes the key functions of the hospital, and to renovate the wards and housing for the staff which was not totally destroyed. The wards are also key facilities, and because of its reinforced concrete structure, it is less worn-out than other buildings. Although staff housing is important for attracting staff to Savaii Island, buildings in which medical services are provided obviously have top priority. The existing administration building is relatively new, but it is not particularly functional and is located such that it makes implementation of the Project building plan difficult. Furthermore, the building is so small that its demolition is not much of a loss.

As a result of these examinations, the distinction between buildings to be rebuilt and buildings to be renovated is judged to be well considered and based on cost-effectiveness, the prioritization of hospital functions, and the condition of each building. However, the plans for some facilities should be changed as follows:.

a) Laundry Room and Linen Store

Although a request was made to rebuild the laundry room and linen store, it may be located on the ground floor beneath the children's ward. Therefore, it should be included in the scope of renovation together with the wards.

b) The Morgue and Autopsy Department

The Department of Health has decided to have a morgue and autopsy building built outside the Project. The Department of Public Works is designing the building and funds have already been allocated. Therefore, the Morgue and Autopsy Department should be excluded from the Project.

c) Pharmacist's House

There was a plan to renovate the pharmacist's house soon after the preliminary study, but renovations have not yet been done. The house remains unlivable and should be renovated as part of the Project.

d) Generator Building

Although the building housing the generator was still destroyed when the preliminary study was conducted, it has since been rebuilt. Therefore, it should not be included in the Project. However, it was rebuilt on low ground close to the sea, and if another large cyclone strikes, the generator and the receiving panel will probably sustain serious damage. If this happens, the power will be cut and the hospital will not be able to continue providing adequate medical services even if the main hospital buildings are undamaged. In the Project, therefore, the building must be rebuilt away from the sea so that the generator can be installed in a safer location.

2) Examination of Anti-cyclone Measures

The first step in reinforcing the existing buildings is to reinforce the windows. There are two ways to do this: replace the present windows with stronger air-tight windows with thicker glass; or, provide all windows with tight-fitting shutters. The second step is to reinforce structural members such as the roof, roof frames, and the main framework of the building. The structural members of wooden buildings 20-35 years old, however, have a limited life expectancy and their strength cannot be guaranteed. Therefore,

a) Even if member joints are reinforced, the structural members themselves may still be weak.

b) When the roof materials and roof framing members are reinforced, other structural members such as columns and beams may become relatively weak, which could make the whole structure vulnerable to storms.

c) In order to completely reinforce the roof, the roof framing, and the main framework as well, it is necessary to replace the ceiling, interior and exterior walls, and fixtures. This will cost as much as new construction.

Given the above, it is obvious that measures to reinforce existing buildings so that they can withstand even large cyclones are not cost-effective. In the Project, therefore, such reinforcement measures should not be adopted for buildings to be renovated and should be limited to new buildings.

3) Examination of the Environmental Sanitation Facility Plan

The Department of Health is responsible for maintaining environmental sanitation in the country and is thus very concerned about the treatment of solid waste and wastewater. The Department of Health requested the installation of an incinerator and soil water treatment facility for the Project to implement the following policies for treating solid waste and wastewater, respectively:

a) Solid Waste Processing

Garbage from the hospital should be separated. Organic waste is to be distributed to neighbors for their livestock and most other solid waste is to be incinerated.

b) Wastewater Treatment

Although wastewater is presently discharged from the hospital buildings into septic tanks, from which it seeps directly into the ground, wastewater from all buildings should be collected by sewage pipes laid underground on the site and treated together at a treatment facility.

c) Treatment of Sludge and Other Solid Waste

Sludge from the soil water treatment facility and unburned materials from the incinerator should periodically be disposed of outside the hospital. For this purpose, the Department of Health will ask the Department of Public Works to pump up the sludge and ask the Department of Land and Environment to provide a dumping area.

The issue of environmental protection is now being raised all around the world. To ensure that the environment is protected, it is vital to install sanitation facilities at the hospital as part of the Project. Along with incorporation of these facilities and practices for treating waste, the following items must also be carefully considered.

a) Stable Power Supply

Stable power to operate the facilities outlined above must be supplied. The new buildings require more power than the existing ones, so the present transformer, distribution lines, and the power receiving equipment must be replaced to cope with the increased capacity. The present generator is available for stable power supply during emergencies.

b) Stable Water Supply

The flush toilets must be functional at all times so that wastewater can always be processed. To ensure this by maintaining adequate water pressure, a water receiving tank, elevated water tanks, and new water pipelines must be installed.

c) Soil Water Treatment System

The soil water treatment facility should both putrefy and disinfect the waste. At the National Hospital, an activated sludge-type soil water treatment facility has just been put in operation. However, its disinfection system uses ultraviolet lamps and running costs must be very high. The disinfection system of the Project uses sodium hyponitrite which is much cheaper and simpler to maintain. The Department of Health, therefore, must continuously procure sodium hyponitrite so that Tuasivi Hospital can obtain them.

d) Operation of the Incinerator

The incinerator is one of the most sophisticated units of equipment in the Project and it must be operated and maintained correctly. Therefore, it is vital that operations staff master its operation and maintenance and that it be housed in a shed to avoid climatic influences.

e) Isolating the Hospital from its Surroundings

Providing a sanitary environment involves much more than just installing equipment and operating it correctly. Since hospitals contain concentrations of sick people and a host of pathogens, the interaction between the hospital and its surroundings must be considered. It is not acceptable to have livestock roaming the hospital grounds or vehicles crossing the covered corridor connecting hospital buildings. To improve the present situation, fences must be erected around the premises and roads must be paved to clearly demarcate transportation zones.

4) Basic Policies for the Facility Plan

Based on the examination of the requested facilities above, facilities of the Project are summarized as follows:

a) Facilities to be Rebuilt

1/ Facilities for the Outpatient Department:

General outpatient clinics, Antenatal care and family planning clinic, Dental clinic, and Pharmacy

2/ Facilities for the Central Diagnosis and Treatment Department:

X-ray inspection rooms, Clinical laboratory rooms, Operation theatre, Delivery rooms, and CSSD rooms

3/ Facilities for Administration Department

4/ Other facilities: Garage and generator building

b) Facilities to be Renovated

1/ Facilities for medical services:

Wards (including the laundry and linen store)

2/ Housing for staff:

Houses for X-ray technician and dentist (only existing foundations are usable)

Guest house and Houses for pharmacist, clinical laboratory technicians, doctors, nurses, and health inspectors (renovation of interior and exterior finishes, and utilities.)

3/ Ancillary facilities:

House for patients' families (renovation of interior and exterior finishes, and utilities)

Former generator building (adopted for another use)

c) On-site Infrastructure

1/ Power supply facilities:

Power supply installations, Power receiving installations, Emergency power generator, and Distribution lines

2/ Water supply facilities:

Water receiving tank, Elevated water tank, and Water pipelines

3/ Drainage facilities:

Soil water treatment facility and Sewage pipelines

4/ Solid waste processing facility: Incinerator

5/ *Facilities to ensure safety: Roads and Fences*

(2) Examination of Rooms Needed in the Buildings to be Rebuilt

1) Outpatient Department

a) General Outpatient Rooms

1/ Examination Rooms

Three doctors will be stationed at the hospital. As one will make the rounds to other facilities, two examination rooms are required for the other two doctors.

2/ Treatment Room

One treatment room for general treatment and basic surgical operations is sufficient for the scale of clinical care at Tuasivi Hospital. However, this room must available for emergency treatment 24 hours a day.

b) Antenatal Care and Family Planning Rooms

1/ Antenatal Care and Family Planning Counseling Room

Up to now, antenatal care and instruction on family planning have been provided in groups. As this practice will continue, a room for these activities is required. One room is sufficient because a midwife can give three classes a day to accommodate the daily average of 12 women wanting antenatal care and 7 women wanting family planning counseling.

2/ Gynecological Examination Room

A gynecological examination room is required because regular check-ups will to be provided to pregnant women. These check-ups can be done before or after antenatal care and family planning classes. This room is also used for fitting birth control devices.

c) Dental Clinic and Attached Rooms

The dentist and two dental nurses require a clinic to provide dental care. Additional requirements include work space for a dental technician from the National Hospital, space for a dental X-ray unit, and a dark room for developing X-ray film.

d) Pharmacy

Tuasivi Hospital's pharmacy functions as both a hospital pharmacy and a pharmaceutical supply center for all medical facilities on Savaii Island. The pharmacy requires a dispensary, including a reception area, a formulation room, and a drug storage room.

1/ Dispensary

In the dispensary, drugs are itemized and distributed as per prescription specifications. Space is required for weighing and dispensing, calculating prices, preparing dosage instructions, and reception.

2/ Formulation Room

Ingredients for medicine and ointment have been bought in powder form in bulk up to now. The powder is then dissolved and itemized in the formulation room. As present practices are to be continued, a similar space is required.

3/ Storage of Pharmaceutical Drugs

Tuasivi Hospital stores pharmaceutical drugs and distributes them to all medical facilities on Savaii Island. When the Project is completed, more drugs will be shipped to the hospital in accordance with the increase in the number of patients. However, in terms of the Project's economic efficiency, drug storage should be maintained at present levels and supplies should be delivered more frequently.

4/ Cool and Dry Storage

A cool and low-humidity room equipped with a small air conditioner is required for pharmaceutical drugs that must be stored in such an environment.

e) Common Facilities

The outpatient department requires a waiting room and a toilet for patients and their families.

2) Central Diagnosis and Treatment Department

a) Examination and Testing Rooms

1/ Clinical Laboratory and Attached Rooms

A clinical laboratory for blood testing, bacteriological testing, biochemical testing, urine testing, and parasitical testing is required. Also required is a room for cleaning and sterilizing instruments and distilling water. This room must be separate from the clinical laboratory because of the heat generated by these processes. An additional requirement is a room for collecting blood and urine from patients.

2/ Pathology Testing Rooms

Pathology testing will not be conducted at Tuasivi Hospital. Dissections for sampling will be conducted in a building to be constructed by the Government. This space is not included in the Project.

3/ X-ray Room and Attached Rooms

An X-ray room to house a general X-ray unit is required. The X-ray unit should be operated from a separate room to protect the X-ray technician from radiation. This room must contain a X-ray table, space for storing film, a film viewer, and a work area, and be adjacent to a dark room for developing film.

b) Surgical Operations Rooms

1/ Operation Theatre

Since there will be only 2 operations and 12 minor operations per week, one operation theatre is sufficient. The most serious surgical operations at the hospital will be cesarean sections and appendectomies. It is necessary to ensure more sterile conditions than presently exist by shutting out the inflow of outside air and by providing a buffer zone between the operation theatre and other rooms.

2/ Preparation Room

A room for scrubbing and sterilizing hands is required. This room can function as the buffer zone described above and must be kept as sanitary as the operation theatre. For this, personnel not directly involved in the surgical operations must be prohibited entry and the inflow of outside air must be shut out.

3/ Recovery Room

The surgical operations section requires a room in which patients can resume consciousness after an operation. As nursing staff monitor a patient's condition after an operation, space for a bed and the nurses' activities are required. This room can also be used for postpartum recovery.

4/ Change Room, Toilet, and Shower for Staff

A change room, toilet, and shower are required by staff both before and after an operation. According to the maximum number of staff involved in an operation, two sets of a room with a booth are reqruied for men and women.

c) Delivery Rooms

1/ Delivery Room

One delivery room is sufficient because only one delivery per day is expected. As two deliveries sometimes take place at the same time, however, two beds must be provided. As with the operation theatre, a sterile environment must be ensured. As well, the room should be soundproof.

2/ Labour Room

A labour room is required for women in labour. In a big hospital there are usually two labour beds for each delivery bed. Tuasivi Hospital is small, however, and a bed in the women's ward can be used for emergencies. Although there is an extra bed in the delivery room, it is to be used only for concurrent deliveries. Therefore, the labour room requires only one bed which can also be used for postpartum recovery. A toilet must be installed near the labour room.

3/ Bathing Room

A bathing room adjacent to the delivery room is required for bathing and weighing babies.

4/ Premature-Baby Room

A room with an incubator where a premature baby can be nursed 24 hours a day is required. In the room, space for feeding, bathing, and changing diapers must be provided.

5/ Nurses' Station

There are always two nurses on-duty including a midwife to deliver babies and to care for an immature baby. A nurses' station is required for them.

6/ Change Room, Toilet, and Shower for Staff

A change room, toilet, and shower are required by staff both before and after a delivery. As a baby is delivered by a midwife and one or two assistants, a room with only one booth is sufficient.

d) CSSD Rooms

A central supply sterilizing system will be introduced. In order to wash, sterilize, and systematically store hospital instruments, a washing room, a cleaning and sterilizing room, and a store room are required.

1/ Washing Room

Instruments used in surgical operations and delivery are washed in the washing room. As instruments are taken from the operation theatre and delivery room, the washing room must be adjacent to both. The washing room must also be connected to the cleaning and sterilizing room, therefore, it is necessary to provide two separate washing rooms.

2/ Cleaning and Sterilizing Room

A cleaning and sterilizing room is required for collecting, accepting, classifying, prewashing, assembling, and sterilizing instruments.

3/ Store Room for Sterilized Instruments

Sterilized instruments and unsterilized instruments must be handled in different areas. The store room for sterilized instruments should be adjacent to both the operation theatre and the delivery room because most sterilized instruments are used in these rooms and they must be frequently supplied. Instruments should be delivered through a pass box.

3) Administration Department

a) Rooms for Office Work

1/ Room for Administration and Medical Records

A room for office work such as collecting medical fees, keeping medical records, and other administration work is required.

2/ Executive Officer's Office

At present, Tuasivi Hospital has an office for the executive officer who handles all administrative functions. The new hospital requires a similar room.

3/ Regional Medical Officer's Office

Since the regional medical officer is responsible for all health and medical services on Savaii Island and for the management of Tuasivi Hospital, an office room is required for such administrative works.

4/ Multipurpose Room

A multipurpose room is required for staff meetings, especially those chaired by the regional medical officer, and a variety of other administrative jobs. This room may occasionally be used by the Under Secretary of Health.

b) Rooms for Health-Related Activities and Education/Training

1/ Nurse Supervisor's Office

To manage nursing activities and primary health care throughout Savaii Island, and nursing activities at Tuasivi Hospital, an office for the nurse supervisor is required.

2/ Health Inspectors' Office

Health inspectors spend most of their time outside the hospital for providing public health services, but once or twice a week they do office work such as preparing work plans and writing reports on their activities. One small room is required for these activities.

3/ Health Education/Training Room

After the Project is completed, seminars for staff working at health and medical facilities on Savaii Island and meetings for staff providing guidance to village women's committees will be more frequently held. Since such seminars and meetings were previously attended by 18-31 people, a room with this capacity is required. In addition, as it is a custom in Western Samoa to serve snacks or tea during meetings, the room should have a kitchenette.

c) Common Rooms

Storage rooms and a staff toilet are required.

4) Other Facilities

To accommodate all the hospital's functions, the following facilities are also required: a garage for vehicles, buildings for the emergency generator, a power receiving panel, a water pump, a blower for the soil water treatment facility, and an incinerator. The present generator building can house the blower and the incinerator.

(3) Examination of Renovations to Facilities

Through discussions with the Government, the Study Team confirmed the contents of the renovations requested. Most of the request concerned renovation of building interior and exterior finishes and of utilities, which is in keeping with the basic policies of the facility plans outlined in (1) of this Section. Careful examinations have been made on the renovations based on the field survey of the existing facilities; and the renovations to be done to each building are outlined as follows:

1) Wards

a) On the ground floor, some reinforced concrete columns and beams show signs of decay. These members must be reinforced by additional structural frames.

b) A small laundry room and a temporary clinical laboratory are located on the ground floor. It is appropriate to remove existing partitioning walls and equipment installed and to renovate this space for a laundry room and a utility room for patients' families.

c) Toilets and showers in the wards are in bad condition because some parts are not ventilated to the outside. These facilities need major renovation.

d) Since the interiors and exteriors are in relatively good condition, repairs are only required in places that are damaged or have missing parts. The repainting of interior and exterior walls is to be included in renovations. All metal frames of the louvered windows should be replaced with plastic frames, because many are rusty and cannot be moved.

e) Partition walls will be installed in the women's ward to provide for postpartum beds.

2) Housing

Each building will be renovated according to its condition. Basic renovation requirements are described below:

a) Houses for the Dentist and the X-ray Technician

Since these houses are completely destroyed except for the foundations and parts of the concrete block walls, they must be rebuilt referring to the designs of the pharmacist's house. The remaining parts of the foundations and sections of the concrete block walls can be repaired and incorporated into the new buildings.

b) Houses for the Pharmacist and the Clinical Laboratory Technician

The interiors and exteriors are seriously worn-out and damaged: except for the main frameworks and the roofs, all parts must be renovated. Interior and exterior materials, utilities, electric appliances, and lines must all be replaced.

c) Nurses' House

Compared to the interior, the exterior is in quite good condition. Interior materials, doors and windows, plumbing fixtures, electric appliances and lines, and pipes must all be replaced. The exterior requires only partial repair and repainting. The concrete foundation has serious cracks in some parts, but it is impossible to repair them without removing the upper structure. Therefore, the foundation should be repaired by adding mortar to cracked areas.

d) Guest House and Houses for the Doctors and the Health Inspectors

Both the interiors and exteriors are in reasonable condition and only worn-out or damaged parts should be renovated. As for interior and exterior materials, only seriously worn-out or damaged areas are to be repaired or replaced. As in the wards, the metal frames of the louvered windows should be replaced with plastic ones. To increase the durability of the buildings, both the interiors and exteriors should be repainted. In addition, the balcony on the first floor of the doctors' house is decayed and must be replaced.

e) Other Buildings

The house for patients' families (*fale-style*), requires only the ceiling finish, replacement of the sink, and repainting. It is appropriate to reuse the existing generator building to house the incinerator and the blower pump for the soil water treatment facility.

3-2-6 EXAMINATION OF EQUIPMENT REQUESTED

(1) Basic Policies

Equipment to be introduced in the Project is needed to support Tuasivi Hospital in its roles and thus must be effectively used in the hospital's activities. The items, specifications, and numbers of units of equipment must be carefully examined based on the medical services to be provided by Tuasivi Hospital, the facilities at the hospital discussed in the previous section, the technical capabilities of the staff, and the probability of equipment maintenance. The four principal points in examining the equipment are discussed below.

1) Selecting Items and Models

The medical equipment market in Western Samoa is so small that manufacturers have not established an agency system in the country. As a result, purchasers cannot completely rely upon manufacturers or their agents for proper maintenance of equipment in the country. Therefore, it is important to select products that the staff is familiar with and that are produced by manufacturers with relatively good after-sales service systems. In addition, equipment that is relatively easy to maintain should be selected.

2) Deciding the Grade

The grade of the equipment should be decided based on the medical services provided at Tuasivi Hospital, the number of patients, the number of staff members, and the technical capabilities of the staff. Considering all of these factors, equipment of the most basic grade should be selected.

3) Deciding the Number of Units

The numbers of units should be decided based on the correlation of the number of patients, the number of staff members, and the grade of the equipment. In most cases, the minimum number of units is judged to be sufficient at Tuasivi Hospital.

4) Use of Present Equipment

Most of the present equipment at Tuasivi Hospital is worn-out or partially broken and cannot be reused. Table 3-3 shows the items of equipment that can be reused and their possible applications.

Table 3-3 Plan for Reuse of Existing Equipment

Department/section	Equipment to be reused	Application
Pharmacy	Refrigerator	Pharmacy
Surgery	Operating light	After disassembly, can possibly be used in the autopsy room to be built by the Government
	Operating light	After disassembly, can possibly be used at another medical facility
Delivery	Delivery table	Rusty, but should be used at another medical facility
	Desk and chair	Administration Department
Administration	Typewriter	Administration Department
	Vehicles	Same as present use

(2) Examination of Equipment Required by Each Department

1) Outpatient Department

a) General Outpatient Equipment

1/ Examination Rooms

Doctors at Tuasivi Hospital are required to provide all-round medical services in the following areas: internal medicine, surgery, pediatrics, obstetrics, ophthalmology, otolaryngology, and dermatology. Therefore, equipment for the examination room must be adaptable to a wide range of applications. Not only the same items of equipment but also new items of equipment which Tuasivi Hospital has not had up to now must be examined from this viewpoint. For example, a 1-channel electrocardiograph is essential for the hospital, given the high rate of death from heart disease in the country, the effectiveness of this device for diagnosis of heart disease, and its relative ease of use. Therefore, the hospital should have one even though it has not had one to date.

2/ Treatment Room

The treatment room is used for internal medicine, surgery, and emergencies, therefore, equipment for it must be applicable to general treatment, minor operations, and resuscitation. As seriously injured patients are treated in the operation theatre, duplication of equipment should be avoided except for some items of equipment needed for minor operations. A defibrillator is unnecessary for the treatment room, becuase it is not likely to be used often and the nearby Central Diagnosis and Treatment Department is requesting a portable defibrillator. As this room is open 24 hours a day 365 days a year, it must have its own instrument boiling sterilizer. The hot air sterilizer requested is not required, because CSSD will be in operation and boiling sterilizers will suffice for sterilization requirements of the treatment room.

b) Antenatal Care and Family Planning Room

The antenatal care and family planning counseling room, which is managed by midwives, is used to care for pregnant women and for family planning counseling. In the room, a gynecological examining table, a weighing scale, a fetal heart detector, and a chart file

shelf are required. Generally, equipment for this room should be basic and not beyond the capabilities of the midwives. An ultrasound scanner is not requested, but because of its usefulness and ease of operation, one should be introduced. However, midwives of Tuasivi Hospital should be trained at the National Hospital before the Project is completed to operate ultrasound machines and to analyze the images it produces.

c) Dental Clinic Equipment

At Tuasivi Hospital, primary dental care is usually limited to maintenance and surgical treatments such as filling cavities, pulling teeth, and removing plaque. Highly technical procedures such as making crowns are not done here because it is difficult to obtain skilled dental technicians permanently and these procedures can be done in Apia at the National Hospital. Items of equipment for such procedures are to be deleted from the Project.

An X-ray unit is useful for examining teeth to be removed and is easily operated. Therefore, it should be installed in the dental clinic. A dental work table and chair are not included in the request but the present ones are worn-out and should be replaced.

d) Pharmacy Equipment

Tuasivi Hospital's pharmacy functions as both an in-hospital pharmacy and a pharmaceutical supply center for all medical facilities on Savaii Island. The items handled by the present pharmacy, which are listed below, should also be handled by the new one.

Classification	Item
Pharmaceutical drug	tablets, powders, liquids, ointments, creams, vials, and intravenous drip
Sanitation supplies	disinfectants, detergent, soap, bandages, gauze, materials for casts, cotton swabs, toilet paper
Others	hypodermic syringes, suturing needles, X-ray film, instillator, rubber gloves, reagents, linen, and an operation instrument set

The following are also required: a table to facilitate work from receiving to assorting, and from packaging to shipping of supplies; a medicine cabinet for storing drugs and sanitation supplies; a table for formulating liquid medicine; a dispensing table; a medicine refrigerator; and a drug safe.

2) Central Diagnosis and Treatment Department

a) Clinical Laboratory Equipment

In Tuasivi Hospital's clinical laboratory, almost 90% of the tests are blood and biochemical tests. Urine and bacteriological tests are the next most common. Altogether, about 8500 tests will be performed per year. As pathological examinations are not conducted at the hospital, it is appropriate to exclude them from the Project. However, a blood bank refrigerator and a dissection instrument set has been used and should be provided for the new clinical laboratory. Equipment required for clinical laboratory testing at Tuasivi Hospital is outlined below.

1/ Blood Tests

Most blood tests are screening tests such as hemoglobin density tests, leucocyte counts, and sedimentation tests. Except for hemoglobin density tests, all tests are done manually, a practice which need not be changed. However, existing testing equipment should be replaced or updated.

2/ Biochemical Test Equipment

Most biochemical tests are blood sugar level tests or pregnancy tests. There is no data on other types of biochemical tests performed before the cyclones. The flame photometer being requested may be considered necessary if its effectiveness is taken into consideration. However, it is difficult to maintain properly in the country as shown by the fact that the same unit at the National Hospital has been left unrepaired. Therefore, the flame photometer should be deleted from the list. Compared to a flame photometer, a spectrophotometer is easy to maintain and has a wide range of applications such as checking blood sugar levels, urea, serum proteins, and serum enzymes for diagnosing kidney and liver diseases. Up to now, a glucose meter has been used at Tuasivi Hospital for biochemical testing but it should be replaced by a spectrophotometer.

3/ Bacteriological Test Equipment

Although a rather small number of bacteriological tests are performed at Tuasivi Hospital, the types of tests, primarily smear tests and culture tests, are diverse. Most equipment at Tuasivi Hospital used for these tests is either in poor

condition or is on loan from the National Hospital. Therefore, the equipment should be replaced with new models of the same grade. A small incubator, a sterilizer with the capacity to sterilize both general testing instruments and culture media, and a medium-sized refrigerator for keeping reagents and samples are required. Considering past experience, the deep-freeze requested should be deleted from the list.

4/ Urine Test Equipment

Most urine tests are qualitative and are done with test paper. The 10 most common items in urine testing, including pH, protein, glucose, occult blood, and bilirubin are checked. As these tests require little time and labour, they are likely to be continued at the new clinical laboratory. Therefore, new additional items of equipment are not necessary, except for a hydrometer. A new microscope for urine tests should not be required because the microscope for bacteriological tests can be used for this purpose by changing lenses.

5/ Unit laboratory Table

Most of the equipment for blood tests, biochemical tests, bacteriological tests, and urine tests is used on tables. Therefore, a 12 m-long unit laboratory table is required to accommodate all this equipment.

b) X-ray Inspection Room

Given the size of Western Samoan's bodies, a general 500 mA X-ray unit equipped with a bucky stand and bucky table is appropriate for Tuasivi Hospital. As for dark room equipment, it is judged that a manual developing tank is sufficient because as few as 10 X-rays are taken per day. A cassette pass box and a film dryer should be deleted from the list.

c) Operation Theatre

Equipment required for the operation theatre is used for emergency surgical operations for traffic accident injuries, appendectomies, hernias, cesarean sections, and ruptured uteruses, and for minor surgical operations. All of these contingencies could be met before the cyclone. For emergency surgical operations, the operation theatre requires an operating table, an anesthesia apparatus, an operating light, and a defibrillator. Various

operating instrument sets for minor surgical operations such as suturing, incisions, and extirpation are also required. Since all existing items of equipment in the operation theatre are either worn-out or broken, they should be replaced with those of a similar grade such as: a standard hydraulic operating table, an anesthesia apparatus with an attached breathing device, and an operating light comprised of eight lights without a sidelight.

Since the defibrillator, which is new for the hospital, is indispensable for emergencies, a portable unit which can be used throughout the hospital should be introduced.

Operating instrument sets are consumable items, therefore, they must be continuously restocked. The types and numbers of sets should be decided by examining present inventories.

As nurses monitor patients after surgical operations, a desk and chair are required for this work even though they are not requested.

d) Delivery Room

Although Tuasivi Hospital will have only one delivery per day on average, on occasion it is likely that two deliveries will take place at the same time. Therefore, two beds must be provided. For labour, one bed is sufficient as a bed in the women's ward can be used in emergency. The fetal monitor requested is useful for avoiding dangerous situations during delivery and for monitoring the health of a fetus; however, this machine is beyond the capabilities of midwives at Tuasivi Hospital who usually perform deliveries. Instead of a fetal monitoring machine, a fetal heart detector which is simpler to operate is appropriate. Immature babies, which are thought to constitute about 15% of all newborns, are intensively cared for by nurses. To care for these babies properly, the existing broken incubator must be replaced. As in the past, very immature babies are to be transferred to the National Hospital. Therefore, a portable incubator is needed for this purpose. The requested multifunctional nursing equipment for immature babies will not be introduced because it is still difficult for staff to operate and properly maintain such equipment.

e) CSSD Rooms

The purpose of establishing the CSSD is to improve the sterilization process for supplies and to establish a central clean-management system for medical equipment and supplies. Medical instruments and supplies are temporarily being sterilized at the nurses' station in the wards at present. In the CSSD, a small high-pressure steam sterilizer with three drums will be the primary unit, and it will be supplement by an instrument boiling sterilizer. The present practice of using hot-air sterilizers and lots of disinfectant is to be improved. Medical instruments and sanitation supplies, which are presently kept in various places around the hospital, are to be kept in one place so that a centralized management system can be adopted.

3) Administration Department

a) Administrative and Clerical Offices

A chart file shelf and a typewriter are required in the medical records room, and a copy machine is required in the administrative officer's office. Before the cyclone, a copy machine was often used to prepare materials for meetings, notices for distribution within the hospital and external facilities, and monthly reports.

b) Education/Training Room

A slide projector, an overhead projector, and a video set are requested. These items are useful for educating and training staff on health care and for providing guidance on health care to women's committees. Materials to be used with this equipment are the existing educational videos, slides, and OHP transparencies of the Health Education Section of the Public Health Division. Instruction will be provided by doctors, nurses, midwives, and health inspectors.

c) Vehicles

A four-wheel drive vehicle for doctors providing external services and a truck for transporting pharmaceutical drugs and sanitation supplies to the 13 lower level health and medical facilities on the island are both required. The truck is also useful for providing building maintenance to such facilities. Tuasivi Hospital has two trucks now, but one of them is worn-out and the other is used to transport doctors dispatched from the National Hospital, by doctors

providing medical services to schools and homes, and by health inspectors for surveys. At present, the doctor often must drive a truck or an ambulance when providing external services.

4) Wards

To reduce the gap in equipment between the newly rebuilt buildings and the renovated wards, it is desirable to replace some of the worn-out equipment in the wards. In the nurses' station the refrigerator, the suction unit, the autoclave should be replaced and in the bedrooms mattresses for patients should be provided. A bedpan sterilizer should be introduced to prevent in-hospital infections. Other equipment in the wards can continue to be used.

(3) Examination Results of the Equipment Plan

1) Equipment to be Deleted from the Request List

From the examinations above, the following items of equipment are considered to be unnecessary at Tuasivi Hospital at this time, and thus are deleted from the request list.

Section	Equipment	Reason for exclusion
Outpatient treatment	Defibrillator	Not frequently used
	Hot air sterilizer	Instrument boiling sterilizer to be used instead
Dental clinic	Centrifuge, Casting machine, Ring furnace, etc.	Sophisticated dental technical services to be provided by the National Hospital
Clinical laboratory	Flame photometer	Difficult to operate and maintain
	Deep-freeze	not justifiable for the limited testing
X-ray	Cassette pass box, Typewriter	Few patients require x-rays
Delivery	Brush sterilizer, Soap dispenser	Liquid soap is difficult to procure
	Fetal monitor	

Two labour beds and two bedside cabinets were requested, but considering the delivery rate at Tuasivi Hospital, one of each is sufficient.

2) Equipment to be Added to the Request List

After examination of the hospital's functions, it is concluded that the following items of equipment, which are not requested, are to be added to the list of equipment of the Project.

Department/section	Equipment	Number	Reason for being added
Antenatal care/family planning clinic	Chart file storage	1	Separation of records
	Ultrasound scanner	1	Usefulness
Dental clinic	Dental chair	1	Dental work
	Work table and chair	1 set	Dental and office work
Clinical laboratory	Work table and chair	1 set	Technician's desk work
Operation theatre	Work table and chair	1 set	Nurse's desk work
CSSD	Work table and chair	1 set	Staff's desk work
Delivery	Weighing scale for newborns	1	Needed for the immature baby room
Wards	Mattresses	20	Equalization of grades
	Suction unit	1	
	Autoclave	1	
	Refrigerator	1	
	Bedpan sterilizer	1	
	Bedpan and urinal rack	1	

3) Principal Equipment of the Project

The following principal items of equipment are basically needed for the Project.

Section/room	Principal equipment
General outpatient	Consulting desk, Examining table, Examining light, 1-channel electrocardiograph, Instrument, Dressings cabinet
Treatment room	Medical table, Suction unit, Autoclave, Refrigerator
Antenatal care/family planning clinic	Gynecological examining table, Suction unit, Fetal heartbeat detector, Ultrasound scanner
Dental clinic	Dental unit, X-ray unit for dental care, Autoclave, Instrument and dressings cabinet
Pharmacy	Unit pharmacy table, Medicine refrigerator, Dressing case cabinet, Typewriter, Medicine balance
X-ray inspection	General X-ray unit, Manual developing tank, Film keeping shelf, X-ray film viewer
Clinical laboratory	Unit laboratory table, Microscope, Centrifuge, Spectrophotometer, Water distiller, Blood bank refrigerator
Operation theatre	Operating table, Operating light, Anesthesia equipment, Suction unit, Defibrillator
CSSD	High-pressure steam sterilizer, Instrument boiling sterilizer, Dressing case cabinet, Instrument and dressings cabinet
Delivery	Labour bed, Delivery bed, Suction unit, Fetal heart beat detector, Incubator
Administration	Slide projector, Video set, Conference desk, Vehicle for exernal services of a doctor, Truck
Reception and medical records	Typewriter, Copy machine, Chart file shelf
Wards	Matresses for patients, Suction unit, Refrigerator, Autoclave, Bedpan sterilizer

3-2-7 EXAMINATION OF THE NECESSITY OF TECHNICAL COOPERATION

(1) Medical Field

Tuasivi Hospital has been in operation for a long time, and when the Project is completed, no new types of medical services will be added. The present knowledge and technical capacity of the staff is adequate for its planned operations, thus it is not necessary for the hospital to obtain advanced technical cooperation in the medical fields.

(2) Dental Field

As dentists in Western Samoa are in short supply, dental operations at Tuasivi Hospital could face serious problem if staff planned for are not secured. It is therefore recommended that JICA Western Samoa Office monitor the acquisition of dental staff by the Government and examine the possibility of dispatching dental staff, such as a dentist, a dental nurse, or a dental technician, through the Japan Overseas Cooperation Volunteers Scheme, when the need arises.

3-2-8 BASIC POLICY FOR COOPERATION

From the examinations above, the necessity and effects of the Project, the capability of the Government for proper operation, and the reality of the Project have been confirmed. Since the goal of the Project is to fulfill a basic human need (BHN) by improving health and medical services for the residents of Savaii Island, the Project is consistent with the objectives of Japan's Grant Aid Programme. Therefore, the Project should be implemented under Japanese grant aid.

However, some parts of the request must be amended according to the results of the examinations mentioned in Sections 3-2-5 and 3-2-6, and as summarized in Paragraph 3-3. The following chapter examines the Project from a technical perspective and presents the basic design.

3-3 OUTLINE OF THE PROJECT

3-3-1 OPERATION PLAN

(1) Services Provided

After the Project is completed, Tuasivi Hospital will continue to provide the same health and medical services as it provided in the past. These services are listed below.

1) Medical Services
   a) Provision of primary medical care to residents of the Faasaleleaga area
   b) Provision of secondary medical care to residents of Savaii Island
   c) Provision of doctors providing external services to lower level health and medical facilities on Savaii Island
   d) Supplying of pharmaceutical drugs to lower level health and medical facilities on Savaii Island

2) Health Services
   a) Provision of primary health care to residents of the Faasaleleaga area
   b) Administration of primary health care throughout Savaii Island
   c) Management of public health and sanitation throughout Savaii Island

(2) Scale of Operations

Table 3-4 Planned Scale of Operations

	Numbers	
Index of operation scale	Yearly average	Daily average
Outpatients	21,100	82
Women using antenatal care	3,000	12
Women using family planning services	1,800	7
Dental patients	4,400	17
Inpatients	1,720	18
Inpatient days (Average length of stay for inpatients = 3.7)	6,400	- 18
Operations (2 per week)	100	
Minor operations (12 per week)	600	
Deliveries	360	1
Laboratory tests	8,530	33
X-ray inspections	2,590	10
External services load	18,400	70

3-3-2 OPERATING ORGANIZATION

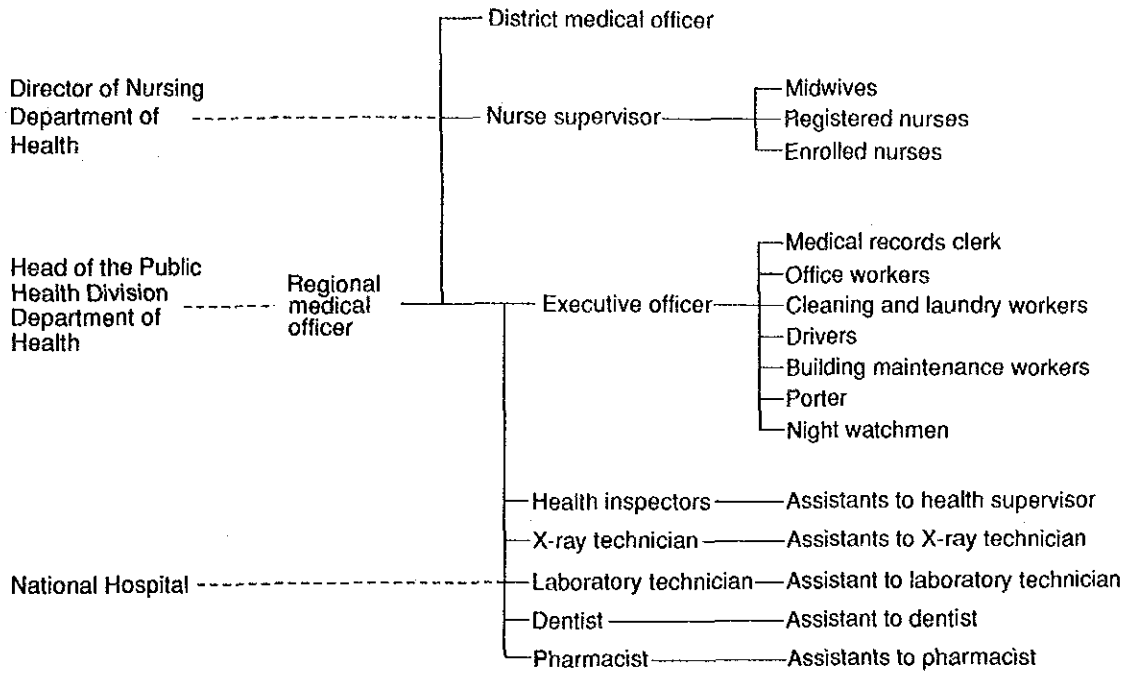
The operating body of the Project facilities is Tuasivi Hospital. Tuasivi Hospital is the only referral hospital providing secondary medical care on Savaii Island. It also functions as a local agency of the Department of Health which administers health services on the island. The hospital's staff configuration is shown in Table 3-46 and its organization chart is shown in Figure 3-1.

Table 3-5 Configurations of Tuasivi Hospital's Overall Staff and Staffs of Each Shift

Classification	Occupation	Number of personnel		Staff of each shift				
		Present	Post-Project	8:00	16:00	24:00	8:00	On holidays
Medical	Doctor (medical officer)	3	3	O—3—O- - - - -<1>- - - -O				
	Nurse supervisor	1	1	O—1—O- - - - -<1>- - - -O				
	Midwife	5	7	O—3—O—1—O—1—O				2
	Registered nurse	11	17	O—7—O—3—O—3—O				4
	Enrolled nurse	2	4	O—1—O—1—O—1—O				1
Dental	Dentist	1	1	O—1—O				
	Dental nurse	1	2	O—2—O				
	Dental technician	(1)	(1)	O-(1)-O				
Paramedical	Clinical laboratory technician	2	2	O—2—O- - - - -<1>- - - -O				
	X-ray technician	2	2	O—2—O- - - - -<1>- - - -O				
	Pharmacist	3	3	O—3—O				
	CSSD staff	0	3	O—3—O				
Public health	Health inspector	4	4	O—4—O				
Non-medical	Administrative officer	1	1	O—1—O				
	Office worker	4	3	O—3—O				
	Medical records clerk	1	2	O—1—O—1————O				
	Building maintenance worker	5	5	O—5—O				
	Driver	5	8	O—4—O—1—O—1—O				2
	Cleaning and laundry worker	3	3	O—3—O				
	Porter/messenger	1	2	O—1—O—1————O				
	Security guard	3	3		O—1—O—1—O			1
Total		58	76	50	9	7		10

The figures in <> indicate staff on-call at the in-hospital residence. The figure in () indicates staff members from the National Hospital making the rounds to Tuasivi hospital; they are not included in the figure for the total number of staff members. The present figures are as of October 1992.

Figure 3-1 Organization of Tuasivi Hospital



3-3-3 OUTLINE OF FACILITIES AND EQUIPMENT

(1) Outline of Project Facilities

1) Project Facilities

a) Buildings to be Rebuilt

1/ Facilities for the Outpatient Department:

General outpatient clinics, Antenatal care and family planning clinic, Dental clinic, and Pharmacy

2/ Diagnosis and Treatment Department:

Clinical laboratory, X-ray rooms, Operation theatre, Delivery rooms, CSSD

3/ Administration Department

4/ Other Facilities:

Garage and generator building, Connecting corridors

b) Buildings to be Renovated

1/ Facilities for Medical Services:

Wards (interior, exterior, and utilities)

2/ Housing for Staff:

Housing for the X-ray technician and dentist (existing foundations usable)

Guest house and Housing for the pharmacist, laboratory technicians, doctors, nurses, and health inspectors (renovation of interiors, exteriors, and S/E)

3/ Other Facilities:

Accommodations for patients' families (renovation of the interior, exteriors, and S/E) and Generator building (repaint and use)

c) On-site Facilities to be Improved

1/ Power Supply Facilities:

Power supply installations, Power receiving equipment, Emergency power generator (relocate), and Distribution lines

2/ Water Supply Facilities:

Water receiving tank, Elevated water tank, and Water pipes

3/ Sewage Facilities:

Waste water treatment facility and sewage pipes

4/ Solid Waste Processing Facility:

Incinerator

5/ Facilities to Ensure Safety:

On-site roads and Fences (to be constructed by the Government)

2) Size of the Facilities

a) Buildings to be Rebuilt

1/ Medical Facilities:

Outpatient and administration building	870 m^2
Central diagnosis and treatment building	585 m^2
Subtotal	1,455 m^2

2/ Other Facilities

Garage and generator building	144 m^2
Connecting corridor	60 m^2
Total	1,659 m^2

b) Buildings to be Renovated

1/ Medical Facilities:	Wards	640 m^2
2/ Housing for Staff	(rebuild): two buildings	232 m^2
	(renovate): six buildings	819 m^2
3/ Other facilities:	Two buildings	154 m^2
	Total	1,845 m^2

c) On-site Facilities to be Improved

1/ Power Supply Facility:

Power receiving capacity of 77 KVA, Emergency generating capacity of 50 KVA

2/ Water Supply Facility:

24 m^3 water tank, 3 m^3 elevated tank

3/ Drainage Facility:

Combined soil water and wastewater treatment facility with a 350 person capacity

4/ Solid Waste Processing Facility:

Incinerator with a burning capacity of 10 kg/hr

5/ Facilities to Ensure Safety:

340 m stone-paved road, 370 m of fencing

(2) Outline of Project Equipment

1) Outpatient Department

Section	Primary equipment	Application/Reason required
General outpatient	Consulting desk and chair	Consulting, processing of medical records/present set worn-out
	Examining table	Examining/present set worn-out
	Examining light	Ditto
	1-channel electrocardiograph	Detecting heart disease at an early stage
	Instruments and dressings cabinet	Storing examining instruments in a sanitary manner
Treatment room	Medical table	Injections, bandaging, applying casts, and basic surgery/present table worn-out
	Suction unit	Emergency treatment/present table broken
	Autoclave	Operational 24 hours a day so require own unit/present autoclave broken
	Refrigerator	Operational 24 hours a day so require own unit for keeping medicine and vaccine (in ampules) administered by nurses
Antenatal care/family planning room	Gynecological examining table	General examination and treatment, fitting of birth control devices
	Suction unit	Sucking body fluids/present table broken
	Fetal heart detector	Monitoring the fetus heart
	Ultrasound scanner	Monitoring the health of pregnant women and fetuses/used daily at the National Hospital (training of midwives to operate required)
Dental clinic	Dental unit for dental care	Even simple treatment presently impossible/present unit broken
	X-ray unit	Confirming diagnosis to upgrade medical standards
	Autoclave	Sterilizing dental instruments
	Instrument and dressings cabinet	Storing dental instruments in a sanitary manner
Pharmacy	Unit pharmacy table	Present table worn-out and too small
	Medicine refrigerator	Storing medicine requiring refrigeration/present refrigerator worn-out
	Dressing case cabinet	New cabinet required for the layout of the new building
	Typewriter	Preparing dosage instructions
	Medicine balance	Present medicine balance broken

2) Central Diagnosis and Treatment Department

Department/section	Primary equipment	Application/Reason required
Laboratory	Unit laboratory table	New laboratory table required for the layout of the new building
	Microscope	Microscope on loan from the National Hospital
	Centrifuge	Present centrifuge broken
	Spectrophotometer	Improving diagnosis capacity of Tuasivi Hospital (up to now, samples sent to the National Hospital)/simple to operate and maintain
	Water distiller	Distilling water/present water distiller broken
	Blood bank refrigerator	Storing blood for emergency surgery (occasions few but inventories should be maintained)
X-ray inspection	General x-ray unit	Upgrading services to base hospital level (for daily use and emergencies)/present unit broken
	Manual developing tank	Present unit broken or worn-out
	Film keeping shelf	Present film keeping shelf built into the building/shelf required for the new building
	X-ray film viewer	Viewing X-ray film/no unit at present
Operation theatre	Operating table	Present table worn-out
	Operating light	New operating light required for the layout of the new building/present light worn-out
	Anesthesia apparatus	Present apparatus broken
	Suction unit	Present unit broken
	Defibrillator	Upgrading emergency services
Delivery	Labour bed	Providing a stable environment and pre-delivery treatment
	Delivery bed	Present bed worn-out
	Suction unit	Present unit worn-out
	Fetal heart detector	Monitoring the fetal heartbeats during delivery
	Incubator	Caring for immature babies/present unit broken
CSSD	High-pressure steam sterilizer	Sterilizing all linen and operating instruments
	Instrument boiling sterilizer	Sterilizing instruments too large for the high-pressure steam sterilizer
	Cast cabinet	Storing sterilized casting supplies
	Instrument and dressings cabinet	Storing operating instruments and disposable supplies

3) Administration Department and Wards

Department/section	Primary equipment	Application/Reason required
Administration	Slide projector	Training health and medical staff and providing guidance to local people
	Video set	Same as above
	Conference desk and chair	Same as above, staff meetings
	Vehicle for doctors	Transporting doctors providing external service to lower level heath facilities
	Truck	Transporting drugs and supplies to lower level heath facilities
	Typewriter	Preparing documents/present unit worn-out
	Copy machine	Improving office efficiency, creating PR and educational materials/present unit discarded
	Chart file shelf	Shelf required for the new building/present shelf worn-out
Wards	Mattresses for patients	Assuming responsibility for bedding so patients need not bring their own
	Suction unit	Present unit worn-out
	Refrigerator	Present unit worn-out
	Autoclave	Sterilizing instruments frequently used in the wards
	Bedpan sterilizer	Preventing hospital infections

3-4 OUTLINE OF THE PROJECT AREA

3-4-1 LOCATION OF THE PROJECT SITE AND CIRCUMSTANCES OF THE AREA

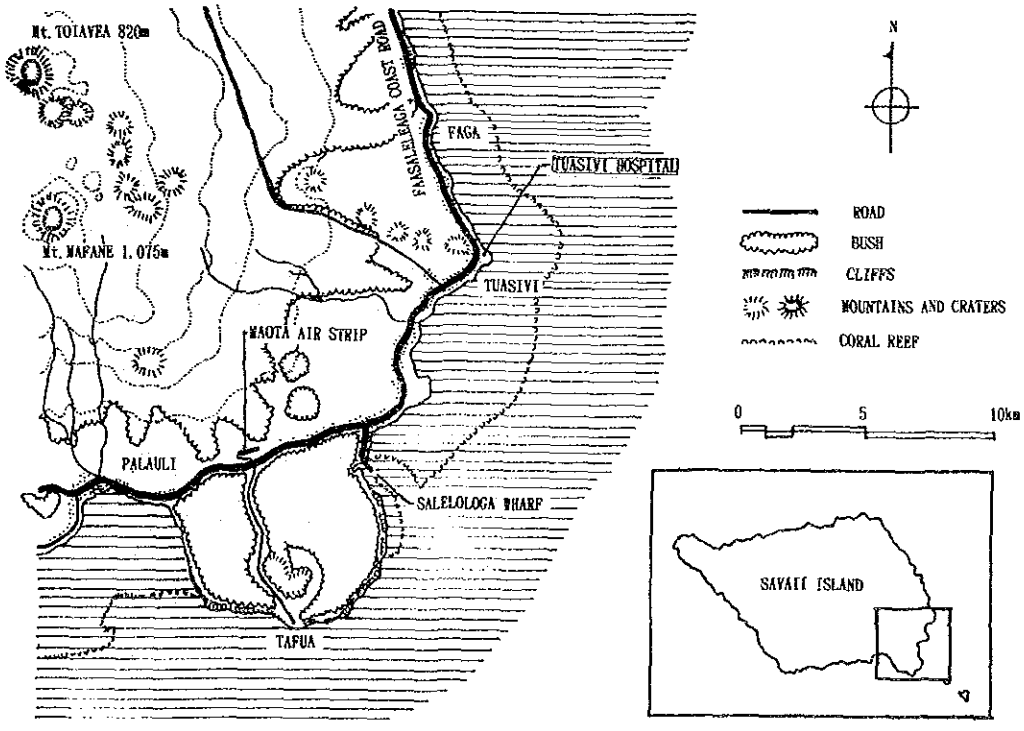
(1) Location of the Site

The Project site is the same site as the present Tuasivi Hospital. As shown in Figure 3-2, it is located on the east coast of Savaii Island in the district of Faasaleleaga. The site faces a trunk road that runs around the perimeter of the island.

(2) Circumstances of the Area

The district of Faasaleleaga is the most densely populated area of Savaii Island. A paved trunk road provided with bus service runs through the district. Houses and other buildings such as churches are strung out along the road. The government owns the land next to the Project site and on it are the Land and Titles Court, a police station, single-story offices, and staff houses. About 10 km south of the Project site is Slelologa, where the terminal for ferries running between Savaii Island and Upolu Island is located. In Slelologa there are also commercial facilities such as markets and shops. Maota Airport, which is serviced by 10-passenger planes, is about 4 km further west of the commercial area.

Figure 3-2 Location of the Project Site



3-4-2 NATURAL ENVIRONMENT

(1) Climate

1) Temperature

Western Samoa is located in the tropics and thus has hot weather year round. The average monthly temperature of coastal areas is 26-27 degrees centigrade. The hottest months are February and March, and the coolest month is August. Table 3-6 shows the average monthly high and low temperatures for 1956-1986.

Table 3-6 Average Monthly High and Low Temperatures

	Jan	Feb	Mar	April	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Annual mean
High temp.	31.8	31.8	31.8	31.7	31.5	31.1	29.9	30.6	30.8	31.1	31.5	31.5	31.3
Low temp.	21.8	22.2	22.3	22.1	21.5	20.8	20.0	20.1	20.4	21.2	21.4	21.7	21.3

2) Humidity

In coastal areas, the annual average humidity is 75-80%, and it is rare to have the humidity drop below 60%. The average monthly humidity ranges only 6%: it is lowest in August and September and highest in October and November. The daily humidity ranges about 15%: it is highest just before sunrise and lowest between 1:00 p.m. and 2:00 p.m. It is very humid at night and in the pre-dawn humidity is usually about 90%.

3) Rainfall

The average annual rainfall in Western Samoa is 3,000-3,500 mm, which is typical of heavy rain areas in the South Pacific. Rainfall varies with altitude and location and some mountain areas receive 5,000-7,000 mm annually. Figure 3-3 shows distribution of rainfall throughout the country.

Table 3-7 shows the average monthly rainfall in the Tuasivi area for 1951-1980, based on the records of the defunct rainfall measuring center near the site, and the average monthly rainfall in Apia for 1957-1980.

Figure 3-3 Distribution of Rainfall in Western Samoa

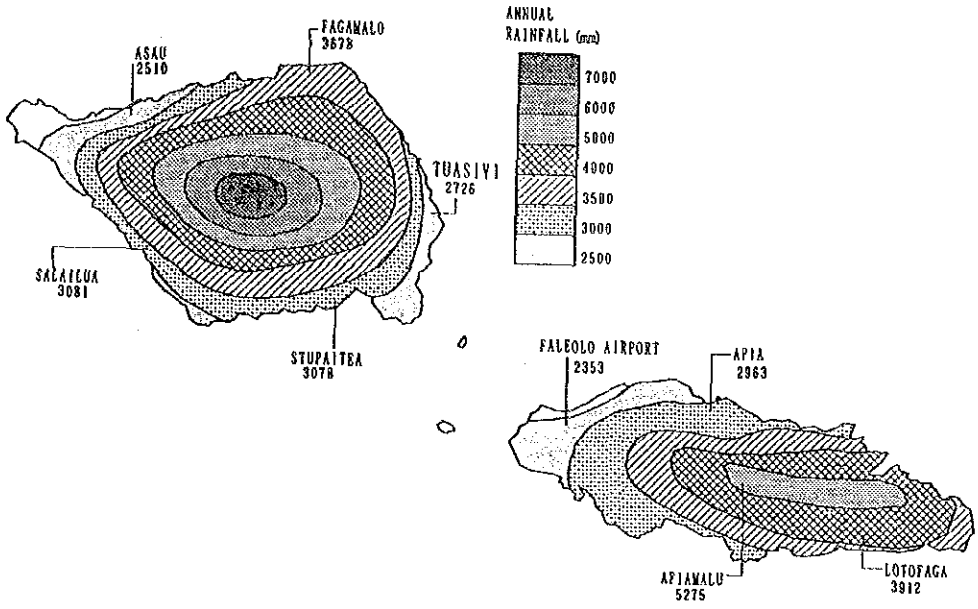


Table 3-7 Average Monthly Rainfall in TAusivi and Apia (mm)

	Jan	Feb	Mar	April	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Annual total
Tuasivi	294	229	290	216	191	137	152	149	176	274	319	299	2726
Apia	410	319	376	237	166	151	122	122	163	252	275	370	2963

4) Wind Direction and Speed

The prevailing wind in Western Samoa blows from the north-east and south-east 45-70% of the time, depending on the area. Winds blow from the north-west and south-west only 5% of the time. All year in all areas of the country, easterly winds are dominant. During the rainy season, winds shift slightly to the north; in the dry season they shift slightly to the south. The weather station with conditions most similar to those of Tuasivi Hospital is located at Faleolo International Airport on the west side of Upolu. Annual readings at this station average a moderate 2.5 m/sec.

(2) Natural Disasters

1) Tropical Cyclones

Tropical depressions, which are the sources of tropical cyclones, often form in the vicinity of Western Samoa, however, in this area it

is rare for storms (winds of 24-32 m/sec) to develop out of them. Records from 1941-1978 indicate that storms hit Western Samoa only once every 10 years, which is fewer than hit Fiji and Tonga. However, tropical cyclones do strike Western Samoa occasionally. In March 1889, a cycline with strong wind and high seas sank three American navy vessels anchored in Apia. And on 29-30 January 1966, a cyclone passed south of Western Samoa and caused more damage than any other cyclone since records were first kept until that time. During this cyclone, the highest average wind speed over a 10 minute period was 60 knots (30.8 m/sec), the maximum gust was 82 knots (42.2 m/sec), the pressure at the center was 987 hectopascals, and rainfall in Apia over a 48-hour period was 222 mm. Ten people were killed and damage amounted to NZ$ 6 million at that time. Cyclone Ofa broke on Western Samoa on 31 January 1990 and raged for eight days. The greatest damage occurred on Savaii Island. Cyclone Val, however, was the most violent cyclone since records were first kept. The pressure at the center was estimated to be 935 hectopascals just before it landed in Western Samoa. In keeping with its ferocity, it also caused more damage than any other cyclone.

2) Earthquakes

At the meteorological office in Apia there is no data on earthquakes and their damage. Earthquakes have occurred in Western Samoa, however, as the country is located along a line extending off the end of the active Tonga Trench. Western Samoa is advised to take aseismic measures to minimize damage in the event of an earthquake.

3) Lightning

Lightning often occurs in Western Samoa, and at the Apia meteorological station it is usually observed about 60 times a year. Fortunately, however, lightning usually just flashes over in the sky and rarely strikes the ground.

3-4-3 CIRCUMSTANCES OF THE SITE

(1) Size and Shape of the Site

The Government owns a 53,310 m^2 parcel of land of which 24,300 m^2 is allocated to the present hospital. The boundary between the hospital property and the adjacent property on the government land is not

particularly clear, but it is generally considered to be the cluster of planted trees in the middle of the parcel. The hospital property is an irregular triangular: the northern boundary along the coastline is 220 m; the south-west boundary along the road is 160 m; and the south-east boundary along the other government property is 190 m. The sea along the northern boundary is shallow with a coral reef about 1 km offshore. The road along the south-west boundary is called the Faasaleleaga Coastal Road; it is 9 m wide and goes around the island.

(2) Topography and Soil Conditions

1) Topography

The site slopes gently to the sea. The lowest ground level of existing hospital buildings is 3.5 m and the highest is 10.0 m, which is a difference of 6.5 m.

2) Soil

The soil is basically volcanic ash mixed with pumice boulders. It drains well and has good bearing capacity.

(3) Infrastructure

1) Water Supply

The main water pipe in the area is 100 mm in diameter and run along the trunk road. Each hospital building is directly supplied with water by a 50 mm intake pipe. The source of water in the Tuasivi area is a well in Faga about 3 km north of Tuasivi Hospital. Water pressure and volume are low and the well pump stops operating at night, which creates problems for the hospital. According to the Department of Public Works, it is not able to install bigger gauge water intake pipes to the hospital, because the present water capacity of the source is limited. To improve the situation the Department of Public Works is installing a second pump at the well in Faga which will be in operation some time in 1993. This pump will operate 24 hours a day and the water supply in the Tuasivi area will improve dramatically. In addition, a feasibility study for the EC funded Rural Water Supply Programme is being conducted to upgrade rural water supplies in 23 districts of Western Samoa. In the programme, the Faasaleleaga district which includes the Tuasivi area is given top priority together with the west coast of Upolu, and Manono Island.

2) Drainage

Each building has its own septic tank for soil water, from which sewage seeps into the ground. Other wastewater is drained directly from buildings into the ground. Wastewater from the hospital is not treated and the septic tanks host countless maggots and cockroaches. It is urgent that this extremely unsanitary situation be improved.

3) Electricity

Along the road run 6600 V power lines. Pole-mounted transformers reduce the power from these lines to 400/230 V to supply electricity to Tuasivi Hospital and other nearby buildings. The frequency of this power is 50 HZ. At present, the capacity of the transformer is 50 KVA but when the Project is completed an estimated capacity of 80 KVA will be required. A transformer for exclusive hospital use and a new line connecting it with a receiving panel must be installed, costs for which must be born by the hospital. The electricity is diesel-generated and the system has capacity to expand. Demand for electricity on Savaii Island varies from place to place and the supply for the Tuasivi area, which is relatively densely populated, is not stable. During the evening when demand peaks, the system overloads and the power goes out. To upgrade the system, a rural electrification project funded by Japanese Grant Aid is underway. The project is expected to be completed by 1995, at which point a power loop will ring the island and ensure a stable power supply to all communities.

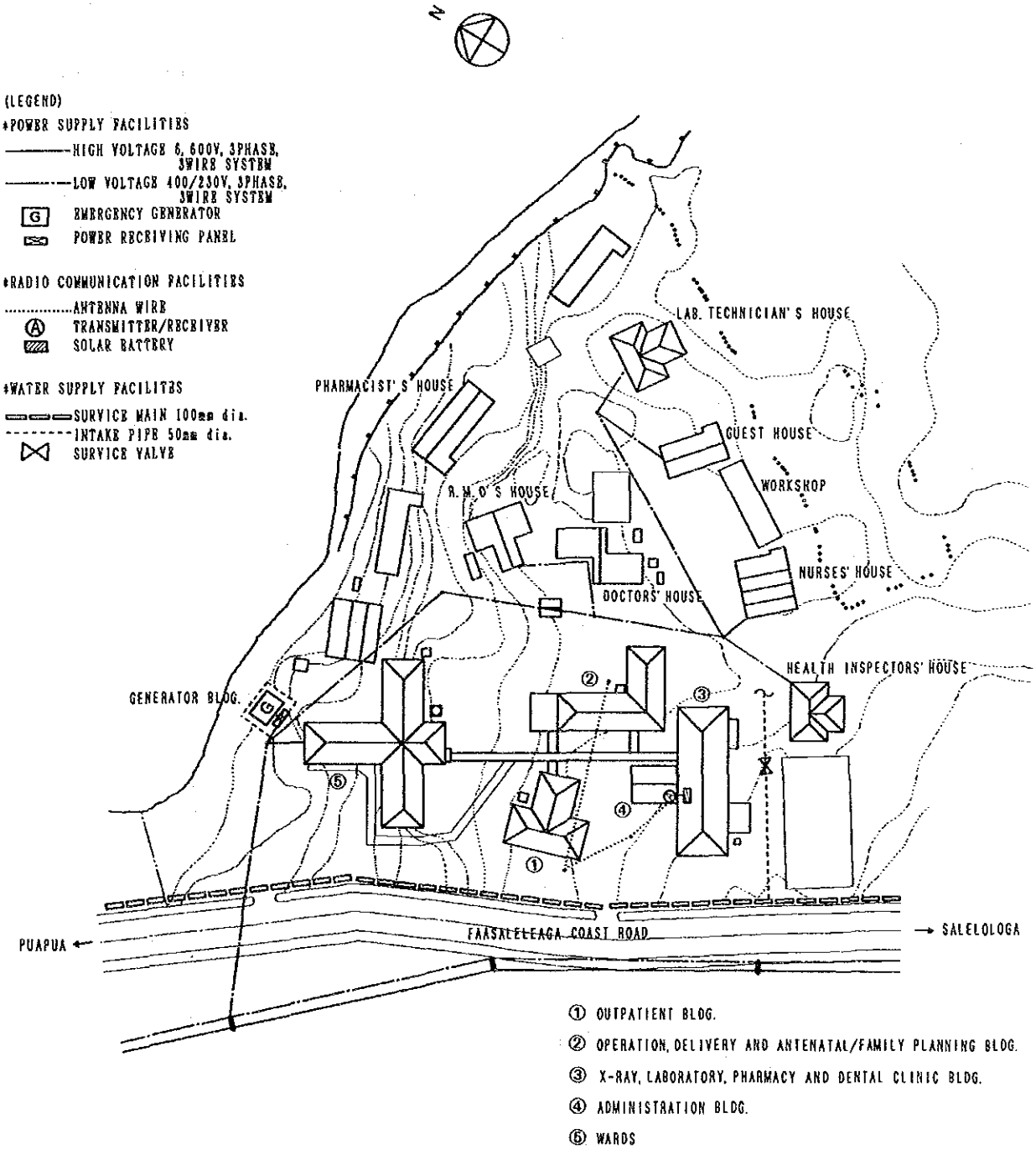
4) Telecommunications

Two telephone lines have recently been installed at Tuasivi Hospital, but most other district hospitals have no telephones and rely on radio telephones. For the Project, a total of three lines are planned, including one fax line.

5) Garbage collection

There is no official garbage collection system is in place and each community is responsible for disposal of its own garbage. At Tuasivi Hospital, organic waste is distributed to neighbors as feed for livestock and other solid waste is dumped into a pit on the site.

Figure 3-4 Infrastructure



3-5 OPERATION AND MAINTENANCE PLANS

The facilities to be built and the equipment to be procured in the Project are indispensable for improving health and medical services for the residents of Savaii Island; they are also symbols of the friendship between the people of Western Samoa and Japan. Therefore, these facilities and equipment must be properly operated and maintained and fully utilized.
An operation and maintenance system has been established and the maintenance staff stationed at Tuasivi Hospital has repaired the facilities when required. It is therefore expected that the staff will continue to take good care of the hospital.
This section of the report, however, discusses how to implement operation and maintenance practices more systematically for both facilities and equipment, and examines the costs for operation and maintenance.

3-5-1 METHODS OF MAINTENANCE

(1) Maintenance of Facilities

1) Maintenance Activities

Maintenance of facilities includes daily cleaning, inspections to prevent breakdowns, replenishment and replacement of consumables, and troubleshooting. Implementation of energy conservation practices is also very important. The present maintenance personnel consisting of carpenters, a plumber, and an electrician will be responsible for maintenance and troubleshooting in their respective fields. When it is impossible for them to make repairs, the services of local dealers will be requested.

2) Methods

Methods and frequency of maintenance for the Project facilities are outlined in Table 4-7.

Table 3-8 Facility Maintenance

Facilities	Element	Maintenance	Frequency
Building	Entire building	Thorough examination	Once a year
	Rooms	Daily cleaning	Once a day
		Energy conservation checks	Once a day
		Disinfection of the operation theater and delivery room	Once a month
	Doors and windows	Cleaning of window glass	Once a week
		Replacement of broken glass	1% a year
		Inspection, lubrication, and adjustment of movable parts	Twice a year
		Inspection and lubrication of window shutters	Once a year
	Painted areas	Repainting	Once every 5 years
Indoor installations	Electrical installations	Replacement of bulbs and tubes	Once every 3 years (all)
	Air-conditioning installations	Replacement of filters	Once every 4 years
	Plumbing installations	Periodic inspection and thorough checks for proper use	Once a month
		Replacement of faucet packings	When required
Outdoor installations	Soil water treatment facility	Supply of disintectant	160 kg a year
		Sludge treatment	Twice a year
	Incinerator	Cleaning of the burner and strainer	Once a month
	Water tanks	Cleaning of the water receiving tank and the elevated water tank	Once a year
	Solar water heating system	Periodic inspection	Twice a year

(2) Maintenance of Equipment

1) Types and Methods of Maintenance

Basically, there are two categories of maintenance: daily maintenance and troubleshooting. Daily maintenance is to ensure the smooth operation of equipment and includes inspections, cleaning, adjustments, supply of consumables, and replacement of basic parts. Personnel operating each item of equipment are responsible for its daily maintenance. Troubleshooting varies with each type of equipment and the complexity of each breakdown: requests for repairs can be made to either the repair staff at the National Hospital, local agents, or agents or manufacturers in foreign countries.

2) Procurement of Consumables for and Repair of Major Items of Medical Equipment

Table 3-9 Equipment Maintenance

Item	Consumable or parts	Frequency	Repair
Ultrasound scanner	Consumables	Once a year	Order repairs from the manufacturer or its agent in abroad
Dental unit	Replacement parts	Once every 3 years	Order repairs form the Japanese manufacturer
Dental X-ray unit	Consumables	Once a year	Same as above
General X-ray unit	Consumables	Once a year	Order repairs from the manufacturer or its agent in abroad
Hemoglobinometer	Reagent	Once a year	Same as above
Spectrophotometer	Reagent	Once a year	Same as above
Anesthesia apparatus	Consumables	Once a year	Same as above
	Replacement parts	Once every 3 years	Same as above
Operating light	Replacement parts	Once every 3 years	Repair in Western Samoa
Defibrillator	Replacement parts	Once every 3 years	Order repairs from the manufacturer or its agent in abroad
High pressure steam sterilizer	Replacement parts	Once every 3 years	Order repairs from the Japanese manufacturer

3) Operation and Maintenance of Administration Equipment

Equipment	Maintenance	Frequency
Copy machine	Periodic inspection and cleaning by a local agent	Twice a year
	Supply of consumables	When required
	Repair of breakdowns by a local agent	When required
Vehicles	Pre-use checks	Once a day
	Periodic inspection and replacement of parts	Once a year
	Repair of breakdowns by a local dealer	When required

(3) Maintenance Organization

1) Superintendent

It is appropriate for the executive officer to assume the role of maintenance superintendent of all facilities and equipment provided by the Project.

2) Maintenance Staff

a) Facilities

As has been the practice to date, it is appropriate for maintenance staff consisting of carpenters, a plumber, and an electrician to be responsible for maintenance in their respective fields.

b) Equipment

It is appropriate for staff operating each item of equipment to be responsible for its daily maintenance as shown below:

1/ Administrative equipment: Executive officer

2/ Vehicle: Transport inspector

3/ Outpatient equipment: Nurses

4/ Ward equipment: Nurses

5/ Operation theatre equipment: Nurses

6/ Delivery room equipment: Midwives

7/ Laboratory equipment: Clinical laboratory technician

8/ X-ray equipment: X-ray technician

3-5-2 OPERATION AND MAINTENANCE COSTS

(1) Operation and Maintenance Costs of New Facilities

Costs for operation and maintenance of the facilities to be built in the Project consists of the following: utility costs including the electricity rate and the cost of kerosene to operate the incinerator; costs for regular supplies of consumables and parts; the cost for maintenance of the soil water treatment facility. The total facility operation and maintenance costs per year is estimated to be WS$ 104,100 (about ¥5,290,000).

A breakdown of this estimate is shown below:

1) Electricity Rate

a) Power Consumption

1/ Power Consumption on Weekdays

Based on Tuasivi Hospital's operating system, patterns of power consumption on weekdays at the hospital are set as follows:

Load	Average power consumption per time period (%)			Hours per day if used 100%
	8-16	16-22	22-8	
Lighting and power outlets	100	20	20	11.2 hrs
Air-conditioners	100	50	0	11.0
Power for plumbing facilities	100	100	100	24.0

Using the figures for total hours of use per day estimated above and the maximum demand shown in Table 4-3 in Section 4-3-4, power consumption on weekdays is calculated to be as follows:

Load	Hours per day if used 100%	Maximum demand (Kw)	Power consumption (Kwh)
Lighting and power outlets	11.2 hrs	16.5	184.8
Air-conditioners	11.0	34.6	380.6
Power for plumbing facilities	24.0	1.0	24.0
Total			589.4

As the average daily power consumption on weekdays is 589.4 Kwh, annual power consumption on weekdays is calculated to be as follows: 260 days x 589.4 Kwh/day = 153,244 Kwh → 154 Mwh

2/ Power Consumption on Holidays

As with 1/ above, power consumption patterns on holidays at the hospital are assumed to be as follows:

Load	Average power consumption per time period (%)			Hours per day if used 100%
	8-16	16-22	22-8	
Lighting and power outlets	20	20	20	2.4 hrs
Air-conditioners	50	50	0	7.0
Power for plumbing facilities	100	100	100	24.0

As with 1/ above, using the total hours of use per day and the maximum demand, power consumption on holidays is calculated to be as follows:

Load	Hours per day if used 100%	Maximum demand (Kw)	Power consumption (Kwh)
Lighting and power outlets	2.4 hrs	16.5	39.6
Air-conditioners	7.0	34.6	242.2
Power for plumbing facilities	24.0	1.0	24.0
Total			305.8

As the average daily power consumption on holidays is 305.8 Kwh, annual power consumption on holidays is calculated to be 33 Mwh.

105 days x 305.8 Kwh/day = 32,109 Kwh → 33 Mwh

3/ Annual Power Consumption

Based on 1/ and 2/ above, annual power consumption is calculated to be 187 Mwh.

b) Electricity Rate

According to the rate system of the Electric Power Corporation, the unit price of electricity is WS$ 0.4/Kwh, therefore, the annual electricity rate is calculated to be WS$ 74,800 (¥3,800,000).

2) Incinerator Kerosene Cost

As the examination in Section 4-3-4 shows, it is estimated that the incinerator is operated three hours a day. As the incinerator to be installed consumes 3.8 litres/hr, the annual consumption is calculated to be 4,161 litres as shown below:

3.8 litres/hr x 3 hrs/day x 365 days = 4,161 litres

In 1992, the market price of kerosene was WS$ 0.8/litre, thus, as shown below, the annual kerosene cost is calculated to be WS$ 3,329.

4,161 litres x WS$ 0.8/litre = WS$ 3,329 → WS$ 3,400 (¥170,000)

3) Procurement Cost for Consumables

a) Replacement of broken glass:

Area of glass x rate of breakage x unit price of glass

300 m^2 x 1%/year x WS$ 100/m^2 = WS$ 300 → WS$ 300

b) Replacement of bulbs:

Total number of bulbs x frequency of replacement x unit price of bulbs

500 bulbs x 1 time/3 years x WS$ 10/m^2 = WS$ 1,800 → WS$ 1,800

c) Repainting:

Painted area x frequency of repainting x unit price for repainting

3,200 m^2 x 1 time/5 years x WS$ 30/m^2 = WS$ 19,200 → WS$ 19,200

d) *Air-conditioner filters:*

Number of air-conditioners x frequency of replacement x unit price of filters

15 units x 1 time/4 years x WS$ 40 = WS$ 150 → WS$ 200

e) Total: WS$ 21,500 (¥1,100,000)

4) Soil Water Treatment Facility Operation and Maintenance Costs

a) Supply of disinfectant:

Amount of hypochloride soda used x unit price

160 kg/year x WS$ 25 = WS$ 4,000 → WS$ 4,000

b) Sludge treatment:

Number of truck loads x unit price

2 times/year x WS$ 200/time = WS$ 400 → WS$ 400

c) Total WS$ 4,400 (¥220,000)

(2) Operation and Maintenance Cost of New Equipment

The total annual cost for operation and maintenance of equipment to be procured in the Project is estimated to be WS$ 45,500 (about ¥2,310,000). A breakdown of this estimate is shown below:

1) Consumables Cost

Item	Consumables	Amount of use per year	Unit price (WS$)	Annual procurement cost (WS$)
Electrocardiograph	Recording paper	500	1.0	500
Fetal heart detector	Gel	600	0.5	300
Ultrasound scanner	Gel	400	0.5	200
Dental X-ray unit	Film and developer	400	1.0	400
General X-ray unit	Film and developer	2,600	2.5	6,500
Hemoglobinometer	Reagent	2,000	0.2	400
Spectrophotometer	Reagent	2,000	1.7	3,400
Anesthesia apparatus	Medical gas	50	10.0	500
Operating light	Hologen bulbs	500 hrs	0.8	400
Copy machine	Toner and others	5,000	0.3	1,500
Others	Bulbs and others			2,000
Total				16,100
				(¥820,000)

2) Troubleshooting and Replacement Part Cost

Troubleshooting and/or replacement parts are expected to be required for principal equipment such as ultrasound scanner, dental X-ray unit, general X-ray unit, dental unit, spectrophotometer, high pressure steam sterilizer, binocular microscope, and incubator. But it is difficult to estimate costs for troubleshooting and replacement parts, because it is almost impossible to specify all the conditions of use for each item of equipment at this time, which is vital for the cost estimate. Therefore, the costs are estimated based on previous practices of grant aid projects which show such costs are usually 3% of the CIF price of applicable items of equipment. WS$ 17,000 (¥860,000)

This amount includes no fees for hiring technicians from abroad for troubleshooting. They must be funded when needs arise.

3) Vehicle Operating Cost

Information from interviews shows that the Department of Health presently operates nine vehicles on Savaii Island. In the FY1992/1993 budget, vehicle operating costs on Savaii Island amount to WS$ 55,475. The Project will add two more vehicles to this total, so the additional vehicle operating cost is calculated as follows:

WS$ 55,475 x 1/9 x 2 = WS$ 12,330 → WS$ 12,400 (¥630,000)

(3) Appropriation of Funds Required for Operation and Maintenance

The operation and maintenance cost for Tuasivi Hospital will increase by WS$ 162,000 (about ¥8,240,000) after the Project is completed. The national budget must allocate funds for this additional cost. Calculation and a breakdown of the additional cost are as follows:

1) Personnel Expenses

Based on the 1992/1993 budget, the standard salaries and wages of the staff to be recruited for the new hospital are set and the required personnel expenses are estimated as follows:

Occupation	Number	Unit Amount (WS$)	Total Amount (WS$)
Dental nurse	1	2,200	2,200
Driver	3	2,600	8,400
Porter	1	2,200	2,200
Head of the CSSD	1	5,000	5,000
CSSD staff	2	2,200	4,400
Total	8		22,200
			(¥1,130,000)

2) Office Expenses

Based on the budget allocated to office expenses such as communications, stationary, and transportation detailed in the 1992/1993 budget, it is calculated to be 10% of personnel expenses. Therefore, additional offices expenses are estimated to be as follows:

WS$ 22,200 x 10% = WS$ 2,220 → WS$ 2,200 (¥110,000)

3) Drug Procurement Cost

After the Project is completed, the number of patients using Tuasivi Hospital is expected to increase because of its upgraded medical services. It naturally follows that the amount of drugs handled by the hospital will increase. The total amount of drugs consumed in the

country will not increase, however, because the drugs that were being supplied to the National Hospital will be supplied to Tuasivi Hospital. Therefore, drug procurement costs will not be a part of the increased operating costs to be provided for in the national budget.

4) Facility Operation and Maintenance Cost

Funds required for the additional cost for the facility operation and maintenance can be calculated by subtracting the assumed utility expenses for the buildings to be demolished from the facility operation and maintenance cost (WS$ 104,100) estimated in (1) above. The actual utility expense for Tuasivi Hospital is considered mostly to be the electricity rate, which amounts WS$ 24,000 according to the explanation of the Department of Health. It is assumed that half of this amount is for buildings to be demolished which contain three air-conditioners that are continuously operated.

Therefore, additional funds required are calculated to be as follows:

WS$ 104,100 − WS$ 12,000 = WS$ 92,100 → WS$ 92,100 (¥4,680,000)

5) Equipment Operation and Maintenance Costs

Using the examination in (2) above, equipment operation and maintenance cost is estimated to be WS$ 45,500. → WS$ 45,500 (¥2,310,000)

CHAPTER 4 BASIC DESIGN

CHAPTER 4 BASIC DESIGN

4-1 DESIGN POLICY

4-1-1 POLICY FOR THE PHYSICAL ENVIRONMENT

(1) Considerations for the Climate

Western Samoa is hot and humid with lots of rain and intense sunshine all year round. The prevailing winds at the Project site are from the north to the east. To build comfortable buildings that require minimal maintenance costs, these climatic factors should be carefully considered and the following design policies are drawn out.

1) To extend eaves so as to prevent direct sunlight from entering buildings and to reduce the amount of rain that strikes walls and outside corridors
2) To provide sloped roofs for heavy rainfall as flat roofs are impractical
3) To raise roofs above the main structure to provide as much ventilation as possible to the attic.
4) To layout buildings in the direction of the prevailing winds so breezes can reach leeward sections of the site
5) To make building openings as large as possible to maximize ventilation.

(2) Policy to Minimize Damage from Natural Disasters

1) Anti-cyclone Measures

Measures to reinforce buildings to withstand cyclones will be incorporated into all buildings to be rebuilt. Main structures will be made of reinforced concrete and roofs are made of steel. To prevent airborne debris from breaking windows, shutters or protective grill panels will be installed on windows. It is vital to ensure that the central diagnosis and treatment section can continue to provide at least basic services during powerful cyclones such as Val. The building housing this section will have a shelter structure and will be connected to the emergency power supply. To secure an emergency power supply, the generator shall be relocated to a safer location on

the site. To provide water in the event that the city main supply is cut off, tanks to collect rainwater will be installed.

No special anti-cyclone measures will be taken for buildings to be renovated, because as mentioned in 3-2-5 (1), they would not be cost-effective.

For the X-ray technician's house and the dentist's house, however, both of which will be rebuilt, reinforcing measures will be taken within the limitations of a wooden structure. These possible measures include connecting foundations and groundsills with anchor bars and reinforcing joints of structural members with hardware.

2) Aseismic Measures

Data on earthquakes and the damage they cause in Western Samoa is insufficient, but as the country is affected by earthquakes with epicenters along the Tongan Trench and has experienced earthquakes in the past, measures to reinforce buildings to withstand earthquakes will be taken.

3) Measures to Protect Buildings from Lightning

Lightning is a common phenomenon in Western Samoa, but it rarely strikes the earth. As there are no tall buildings in the Project, a lightning protection system is not required.

4-1-2 POLICY FOR SITE FEATURES

The site is on the coast so salt spray may blow onto the buildings, but as rainfall is abundant, it is easily washed out and damage is usually minimal. During storms, however, seawater can be hurled directly onto the buildings so consideration should be given to measures to protect buildings from such damage.

Buildings will be laid out to use land efficiently and to take full advantage of the natural features of the site to minimize earthworks. As the site is sloping, buildings will be built on the slopes by varying the elevations of floors to maximize economic efficiency.

4-1-3 CONSIDERATIONS FOR THE CULTURAL ENVIRONMENT

(1) Traditional Style of Architecture

In Western Samoa, traditional buildings called *fale* are open and consist only of a roof and support columns. This style of architecture is still prevalent for houses and assembly halls. Some wards at the National Hospital are constructed in this style, and patients with minor illnesses often prefer them because of their good ventilation. Some Samoan words that apply to traditional architecture will be used in the project. An example is the *fale* which will serve as a waiting area for outpatients because of its openness, comfort, and familiarity.

(2) Customs

Western Samoans have no particular customs that must be taken into consideration when planning facilities and equipment. However, as Western Samoans are bigger than Japanese, ample space for their movements and furniture must be carefully considered.

4-1-4 CONSIDERATIONS FOR CONSTRUCTION CIRCUMSTANCES

(1) Building Code and Permit System

In Western Samoa, building codes have not been enacted, but a draft of the National Building Code for Western Samoa, which is based on building standards in New Zealand, is used. This draft describes standards for layout, structure, fire prevention, and building installations.

Western Samoa has a permit system for building construction. A permit is required for all building construction, including that of government buildings. The Department of Public Works receives building permit applications and assess them according to the draft code. Applications are also assessed by the Department of Lands and Environment, the Fire Brigade, and the Department of Health on matters that concern them. The facilities of the Project require a building permit and thus will be designed to meet the draft codes.

(2) Use of Local Contractors and Consultants

1) Local Contractors

There are several construction companies in Western Samoa, most of