2.3.3 Outline of Social Conditions

(1) Accessibility and Secondary Disaster Risk

1) Outline of Accessibility

The highland resettlement areas, where the Project water supply facilities are to be constructed, are located at 100 m to 750 m above sea level. They are situated on comparatively high undulated hills or mountain areas. Thus, the construction sites lay at about 15 Km away from major roads. During rainy season, access to those areas poses a big problem.

Accessibility to each construction site is shown in Table2.15.From the major roads, it takes almost one hour to reach the sites in Villa Maria, Nabuklod, Camies, and Dueg areas.

Table2.15 Accessibility of Each Sites

Site Name	Accessibility: Distance from Main Road: Distance (km)	Accessibility: Distance from Main Road: Time by Vehicle (min.)	Accessibility: Road Condition	Accessibility: Secondary Disaster Risk	Priority Works of Reconstruction Required
ZAMBALES					
1. Dampay Salasa, Plauig	8	30	Mostly good	Low	Basic infrastructure
2. Baquilan, Botolan	0.5	1	- do -	Low-medium	- do -
3. Loob-Bunga, Botolan	4	15	- do -	Low	- do -
4. Iram, New Cabalan	2	5	Mosrtly bad	Low	・Access Road improvement #1 ・under construction by Olongapo city Gov. ・Basic infrastructure
5. Cawag, Sabic	12	30	- do -	Low	- do -
PAMPANGA					
6. Villa Maria, Porac	12	50	Bad	Medium-high	・Access Road improvement #2 ・under construction by NHA ・Mud flow control
7. Nabuklod, #3 Floridsablanca	11	45	Bad	High	・Mud flow control #2
8. Camias Porac	10	50	Bad	Medium	・Access Road improvement #1 ・under construction by NHA ・Basic infrastructure
TARLAC					
9. Kalangitan, Capas	8	25	Partly Bad	Low-medium	Basic infrastructure
10. Dueg, San Clemente	18	60	Bad	Low	・Access Road improvement #1 ・Detailed engineering study was completed ・Basic infrastructure

NOTE : #1 Improvement programs of access road are under proccessing by district and provincial offices, though the infrastructure conditions are inadiquate.

#2 It is considered that the settlement development will be limited due to accessibility.
Mud flow control and improvement of access road will be strongly proposed before construction of infrastructure as first priority.

#3 Settlement development will be restricted since the mud flow risk of access road.

Field Survey Result

2) Safety Against Secondary Disasters

The Philippines Volcanic Seismic Institute and the Philippines Soil Research and Development Center have forecasted a secondary disaster mainly caused by mud flows (see Appendix). It is said that secondary disasters triggered by mud flows during the rainy seasons from May to October will surely happen over a period of several years. However, at this point an appropriate study has not been conducted. The scientific forecasting of secondary disasters and the appropriate countermeasures have not been established.

Surveys for forecasting secondary disasters (possible disaster locations and the degree of the disaster) are presently carried out under USAID in two-thirds of the primary disaster areas.As a result of the surveys, there is a forecasting probability of secondary disaster.

When the future development of the reconstruction and restoration project is investigated, an appropriate plan should be established based on scientific secondary disaster forecasts.

However, due to the above-mentioned reasons, aid agencies and DPWH are unable to propose a precise project program. Even for the Project, the boundaries and sizes of the damaged areas and the movement of population in the areas are still unclear, and the clarification of the basic conditions for the Project remains impossible.

In view of the above situation, MPR-PMO of DPWH has placed the resettlement areas that are not likely to be affected by secondary disaster (areas where the victims of the volcano were resettled) as the first priority areas and they have prepared a project plan.

It is considered that there is little risk that the highland resettlement areas where water supply facilities are to be constructed by grant aid will be affected by secondary disaster.

According to the results of the field survey, the possibility of mud flows caused by a secondary disaster is virtually nil since all of the sites in the 10 Project areas are located on relatively high plateaus or hills (see the following figure).

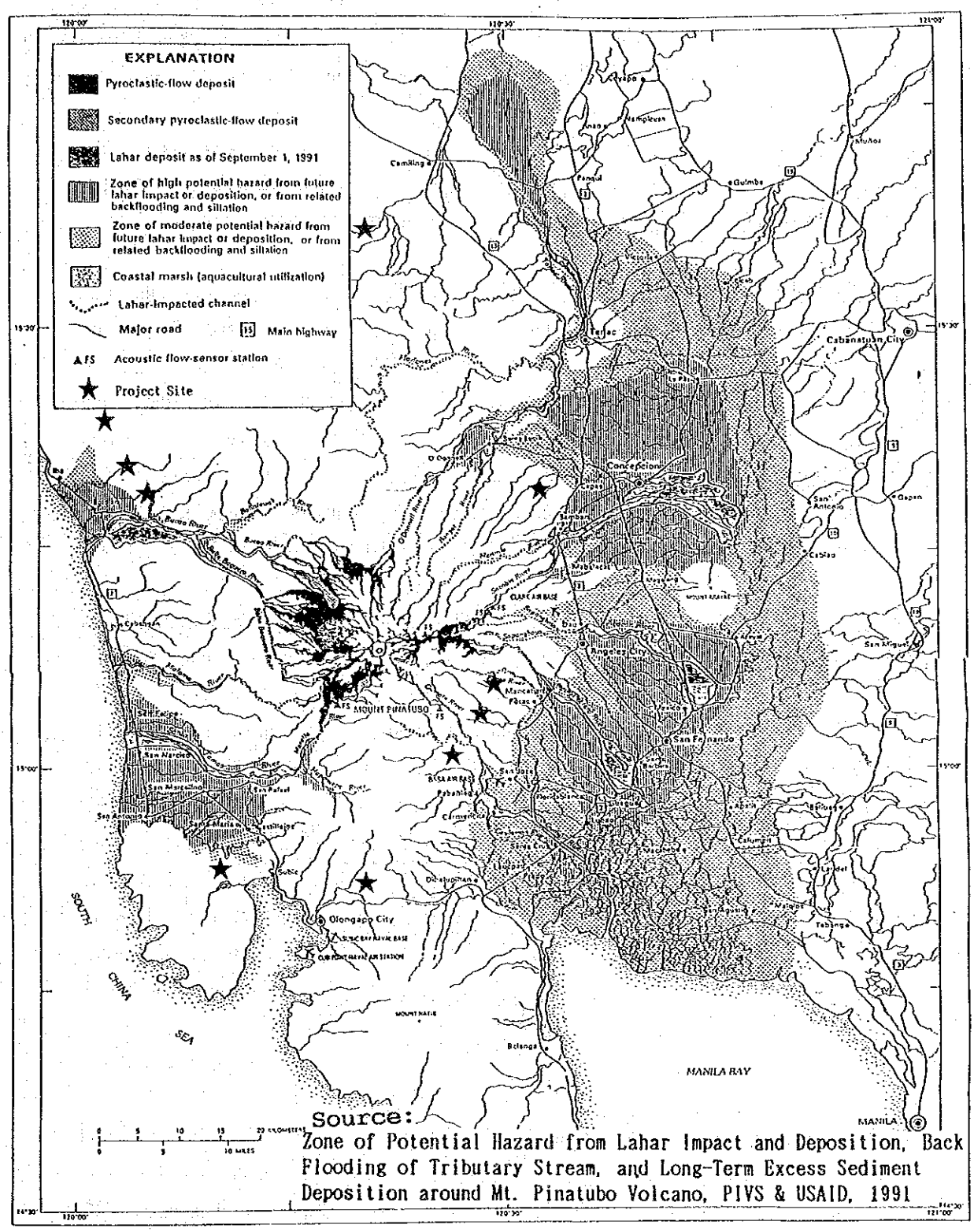


Fig. 2.11 Zones of Potential Hazard from Lahar Impact and Deposition, Back-flooding of Tributary Streams, and Long-term Excess Sediment Deposition around Mt. Pinatubo Volcano

As a result of the above examination, Villa Maria and Nabuklod were selected as the areas where access roads have a high risk of being damaged by mud flows triggered by secondary disasters. Iram, Cawag, Villa Maria, Nabuklod, Camies, and dueg were selected as having poor access road conditions.

In some of the above mentioned areas, access road improvement plans or projects are implemented either by DPWH or on a regional administration level.

In Villa Maria and Nabuklod, improvement plans have yet to be established. Mud flow control and securing of access roads are urgently required.

(2) The Highland Resettlement Areas' Present Conditions and Improvement Situation

1) Problems and Improvement Situation

The highland resettlement areas are basically for the resettlement of the minority tribe, Aetas. The third generation of mixed-blood tribe members are also allowed in the area.

Most parts of the resettlement areas are national forests that come under the jurisdiction of DENR. This land will be leased to the settlers.

The primary domestic infrastructure to be built in the highland resettlement areas is the same type as that of all other resettlement areas as shown in Table 2.16.

Table 2.16 Basic Living Conditions for High Resettlement Area

a. Access Road	g. Health Clinic
Concrete Rd.	Macadam Rd.
	h. Tribal Market
Bailey Rd.	i. Productivity Center
b. Road Network	
	j. Communal Facilities
c. Deepwell	k. Playground
	l. School
d. Housing Kit	
	m. Spring Development
e. Household Implements	
f. Gov't Center	

All of the facilities will be simple, easy-to-build structures. The planning, design and construction of the facilities have been undertaken mainly by NHA. The construction of roads and deep wells at some sites are undertaken by DPWH.

The design drawings of the facilities are very simple. Standard design drawings are being used at every site. The only drawings that are different for each site are the arrangement plans. The use of standard drawing at different sites is appropriate for this project.

The amount of construction work at each site is planned as shown in Annex. As only a small amount of work is required at each site, the construction progress of the primary domestic infrastructure is rapid; construction work in most of the resettlement areas has already been completed. However, the quality of the construction work accomplished on the access roads, drainage channels, and village roads is poor. A much higher level of infrastructure construction is desired. In particular, the construction of drainage channels and road pavement for erosion protection is urgently needed. Thus, the work based on appropriate studies and designs is essential.

In addition to the above situation, insufficient water supply facilities are causing problems in many resettlement areas. Even though the sanitary facilities such as toilets are installed, many of them are functioning improperly due to the lack of water supply.

As for public health, the disease infection rate in the highland resettlement areas is lower than the refugee relief centers. This is particularly true in the highland resettlement areas having health posts, stationed paramedical personnel, supplies of medicine, and where doctors visit periodically. However, medical treatment has been provided to only few residents. In many cases, the medical activities are supported by NGOs or by volunteer doctors and nurses coming from neighboring areas.
DOH's administration services are insufficient.

2) Livelihood Conditions and Problems.

DSWD provided food aid to the resettlers having no income. To encourage the resettlers to become independent and to promote the improvement of their facilities by their own efforts, DSWD, since the beginning of the year, has established a food aid program called the "Food for Work or Cash for Work Program".

In the highland resettlement areas it would be impossible for the resettlers to live without food supply until they were able to produce their own food on their reclaimed farmland. The Task Force has been conducting various training programs for residents in the production centers to help them secure their livelihood. However, due to a number of problems, the results of their effects remain uncertain.

In certain resettlement areas, it would be extremely difficult to establish a system covering production and product sales without comprehensive assistance.

Unfortunately, the future prospect for the residents is bleak.

By taking into account of the above situation, the food supply program will be needed for at least another few years. To secure livelihoods for the residents, it will be necessary to examine the food aid program along with the Aeta tribe's traditional life.

From the viewpoint of community restoration, the resettles lack the willingness to establish community functions. Most of the Aeta tribe people came from the most severely damaged areas by the eruption. It is felt that they might have become mentally unstable as a result of the pressure caused either by the sudden change in their living environment, the loss of family and community members, or the process of moving from one refugee relief center (or resettlement area) to another. In some cases, there is no traditional leader at their new resettlement area, whereas in other cases, there is more than one leader within the new community, making cooperation and adjustments needed. At this present stage, it is hard to expect sufficient teamwork to develop within a community.

In some resettlement areas, DSWD and NGOs started either social psychology counseling activities or community organizing programs, such as leadership training, barangay meetings, women and youth group activities, and so on. However, greater emphasis is still being placed on housing construction and securing food and income.

3) Public Facilities

Each resettlement area has some public facilities that were either built by governmental agencies or NGOs. Generally speaking, public health related facilities are the first to be built in each area.

Daily necessary facilities, such as public toilets, are not often used. Their structure, layout, and facility standard should be reexamined.

Major public facilities in each are listed in Table 2.17 .

Table 2.17 Public Facilities in Each Area

Site	Sanitary Facilities	Clinic	Public Facilities: Health Center	Nursery School	High School	Church	Community Center	Others
ZAMBALES								
1. Dampay Salasa, Plauig	8		1	3	-	2	2	-
2. Baquilqn, Botolan	4/Barangay		1	5	-	5	8	-
3. Loob Bunga, Botolan	8	exist	4	10	1	5	4	1
4. Iram, New Cabalan	10	exist	1	4	-	1	-	-
5. Cawag, Subic	1	exist	1	2	-	1	-	1
PAMPANGA								
6. Villa Maria, Porac	-	-	-	1	-	1	-	-
7. Nabuklod, Floridablanca	1	-	1	1	-	1	-	-
8. Camias, Porac	1	-	1	1	-	1	-	-
TARLAC								
9. Kalangitan, Capas	10	exist	1	1	-	1	-	1
10. Dueg, San Clemente	8	exist	1	3	-	3	-	-

Field Survey Result

(3) Management System of Resettlement Areas

1) Government Agencies' Management Coordination System

According to the policy making and program implementation system of the resettlement committee which was established based on the Task Force, a manager for coordinating between the various administrative agencies have been dispatched to each resettlement area from TLRC. The managers will control their respective area. However, due to the differences of each agency's interests, management level coordination is not sufficient in some areas.

In general, no government staff is involved, although funds are governmental: Only staff of JVO-FI (NGO) provides health care services.

Typical administration services in a resettlement area can be classified as follows:

. DENR - Local Agency for Resettlement
  a. Identify/survey area and issue land tenure contract
  b. Provide livelihood activities like Reforestation contract
  c. Implement Agro-forestry and soil/water conservation program
  d. Construct infrastructure project such as access trail and small water impounding structure
  e. Provides water system
  f. Train and organize the settlers as partners in upland developmental work

. DPWH
  a. Construct access road to site/road network in homesite and farm-lots
  b. Construct public infrastructure such as health center, barangays/multi purpose hall, school building, multi-purpose payment, etc.
  c. Install deep/shallow well or water system in strategic places.

. DSWD
  a. Maintain food supply on gradually reducing basis
  b. Supervise distribution of materials donations
  c. Supplemental feeding for mal-nourished children
  d. Operate Day Care centers

. DOH
  a. Provide medical attention
  b. Conduct hygienic training

. DECS
  a. Provide school house/teachers
  b. Conduct adult-education class

. DTI/DOST/NMYC
  a. Short and long-term livelihood project-training and facilities of production

. DOA
  a. Identify area/suitable crops through soil analysis
  b. Provide initial seeds for production including inputs
  c. Provide basic tools/equipment

. Military/PNP
  a. Provide security
  b. Training for CAFGU style security members

. NHA
a. Provide shelter by giving home kits
b. Supervise and assist in construction of houses and other structures

. Local Government Unit
a. Implement resettlement development programs

2) Management System for Resident Level

At each resettlement area there is a tribal mayor or tribal chairman who acts as the leader. In many of the areas where the highland and lowland people have been resettled, there is a very definite distinction between the two groups.

As a general rule, the leaders were chosen by an election held in April 1992, although some of the leaders were appointed by regional chiefs.Each leader has a deputy under whom are the tribal council, secretary, accountant, and security personnel.

There is a tribal leader (sometimes referred to as the Barangay chieftain, or cluster chief in some areas) representing each sitio, the latter being divided into clusters. Every cluster, which is the smallest unit of a group, consists of 20 to 25 families. Some resettlement areas were established for only one cluster. In other areas, several sitios were integrated into one cluster.

It is assumed that a community will be formed at each barangay, sitio, or block, unit. Thus, it will be necessary to take into account of the basic community structure when examining the maintenance and operation of facilities in the resettlement areas.

3) NGOs' Activities for Supporting Resettlement Areas

More than 80,000 NGOs are officially registered in the Philippines. About 3,000 of them are involved in community development. Many are quite active in Mt. Pinatubo disaster relief and restoration work. Their urgent relief activities were highly evaluated not only by the Philippines Government but also by international aid organizations.

Some NGOs are performing relief work in cooperation with governmental agencies, such as DSWD. In general, NGO's cooperation with the government is limited only to the exchange of information.

NGOs are mainly concentrated on relief activities, but they have been shifted to project planning for the reconstruction and restoration of the domestic infrastructure, such as water supply facilities.

In general, four to ten NGOs ar either stationed or periodically visiting the resettlement areas to provide medical care, social welfare, food distribution, community organizing, and educational services.

The major NGOs are as follows:

St. Paul College of Manila
World Vision International
Jaime V. Ongpin Foundation
Philippines Rural Reconstruction Movement
Asian Volunteer Network
Philippines Relief and Development Services Inc.
Ecomenical Foundation for Minority Development Inc.
Plan International
Holy Spirit Mission
Care Philippines
Tarlac Association of Organization
People's Economic Council
Regeneration Philippines ..... Others

(4) Number of Families and Population in the Project Areas

1) Outline

Data obtained during the month of November 1991, April and November 1992 have been clarified (see Table 2.18).

As the resettlement of three areas in the Pampanga Region started in March 1992, their data were only obtained by the November 1992 field survey. In the lapse of time, the number of families increased in Loob Bunga, Iram, Cawag, and Kalangitan, and decreased in Dampay and Dueg. The figures haven't changed in Baquilan judging from the originally planned resettlement capacity.

When investigating the number of household or population to be provided with water supplies, the population change in the area should be evaluated from the viewpoint of differences of living conditions or on the development potential. As a result, the area should be evaluated as to whether it will grow continuously or deteriorate. It is desirable to establish a water supply plan considering the evaluation.

Table 2.18 Trend of Family Number and Population of Each Site

Site	Area(ha) Total	Houselot	No. of Block	Family No.(Population) Target	91/11	92/4	92/11
ZAMBALES							
1 Dampay Salasa, Palauig	652	52	13	700	-	330 (1,555)	279 (1,193)
2 Baquilqn, Botolan	393	40	16	775	946 (4,204)	887 (3,838)	850 (3,800)
3 Loob Bunga, Botolan	328	28	14	1,695	332 (1,292)	1,418 (6,335)	1,506 (6,673)
4 Iram, New Cabalan	100	30	12	700	326 (-)	481 (2,352)	513 (2,630)
5 Cawag, Subic	824	24	9	1,600	171 (387)	221 (955)	350 (2,901)
PAMPANGA							
6 Villa Maria, Porac	10	10	-	531	-	-	350 (-)
7 Nabuklod, Floridablanca	403	13	3	1,500	-	-	320 (1,300)
8 Camias, Porac	12	12	3	640	-	-	300 (1,700)
TARLAC							
9 Kalangitan, Capas	123	23	9	1,000	290 (1,304)	347 (1,612)	424 (2,300)
10 Dueg, San Clemente	1,100	100	19	2,000	-	689 (3,000)	550 (2,700)

Field Survey Result

The previous table, based on 3 surveys, indicates that the population increased in four resettlement areas, but decreased in three others: In the former case, the target value should be taken into consideration for the design plan, whereas in the latter case, the medium value should be kept.

2) Population and Tribal Structures

The percentage of highland people (Aeta tribe) in all of the highland resettlement areas is quite high. There is a strong demand to develop the living environment of these people.

Table 2.19 Number of Family, Population Structure, and Percent of AETA Tribe in High Resettlement Area

	Site	No. of Family	Population Total	Population 6 Years	% of AETA
Zambales	Dampay Salasa	330	1,555	188	90
	Loob Bunga	1,418	6,335	1,285	50
	Baquilan	887	3,838	688	70
	Cawag	221	955	49	70
	Iram	481	2,352	300+a	75
Tarlac Dueg		689	3,000	603	100
	Kalangitan	347	1,612	82+a	More than 90
Pampanga	Nabuklod	- Under Construction -			

Field Survey Result

(5) Outline of the Water Supply Situation and Facilities

The supply of water for drinking and other uses in all of the resettlement areas is insufficient.The drinking water supply facilities in the areas are shallow wells, deep wells, and springs.

During the early stages of resettlement area development, the water supply facilities were constructed mainly by NHA, but shortly thereafter the job was undertaken either by NGOs or DPWH region level projects. More than 60% of these facilities are not functioning due to the following reasons:

Deep Wells(located in hard rock hilly areas):

- Low ground water level. Wells did not reach the appropriate aquifers.
- Poor construction: finish work has defects.

Shallow Wells(located in highly populated hilly areas):

- Low ground water level.
- Construction and structure problems. Easily damageable.
- Contamination by domestic sewerage.

Springs (located at remote points from the village):

- Water is not taken from the springs; surface water is taken.
- Intake facilities are the open type and are subjected to contamination from the surrounding areas.
- The facilities are easily damaged due to the use of low quality construction materials and shoddy workmanship.

The conditions of the water supply facilities and the agencies that constructed the facilities in each resettlement area are clarified as shown in Table 2.20.

Although the water supply facilities mentioned were constructed only a short while ago, many of them are inadequate because of facility or water quality problems.

The appropriateness of water supply facilities in each resettlement area was evaluated as outlined in Table 2.20. Six deep wells, twenty shallow wells, and only three springs were evaluated as adequate water supply facilities.

Table 2.20 General Conditions of Existing Water Supply Facilities

Site	Water Supply Facilities												
	Deep Well				Shallow Well				Spring Dev.				Spring
	Function	Not-function*			Function	Not-function*			Function	Not-function*			
		B	L	Q		B	L	Q		B	L	Q	
ZAMBALES													
1 Dampay Salasa, Palauig	0			2	0				0			1	
2 Baquilqn, Botolan	0	1	2		0			4	1		1		
3 Loob Bunga, Botolan	3			1	0			12	1		2		
4 Iram, New Cabalan	0		1		0		4		0	1			1
5 Cawag, Subic	3				0			2	0	1	1		
PAMPANGA													
6 Villa Maria, Porac**	0				0				0				2
7 Nabuklod, Floridablanca**	0				3		3		0				5
8 Camias, Porac	0				0			5	1				
TARLAC													
9 Kalangitan, Capas	0				17	8			0				
10 Dueg, San Clemente	0				0				0	1		1	

Note: * B : out of order, L : low water table/small yield
Q : bad water quality,
** The sites will be excluded from the Project.

Field Survey Result

(6) Water Qualify and Public Health Environment

1) Outline of Water Quality

During the field survey period, the basic measurement of conductivities and pH of groundwater and spring water were taken. The conductivities were in the range of 100 to 350mmho and the PH values were around 6 (see Table 2.21). Basically, the water quality is good.

Table 2.21 Water Quality Analyzed at Sites

SITE NAME	Surface Water at Faucet pH	EC	Stream pH	EC	Well Deep pH	EC	Shallow pH	EC
Dampay-Salaza, Palauig			6.4	170	6.6	228		
Baquilan, Botolan	6.4	238			6.6	260	6.2	312
					6.4	276	6.4	395
							6.2	334
Iram, New Cabalan	6.4	274						
Loob Bunga								
Floridablanca,	6.0	215					6.0	126
Cawag, Subic	6.2	300(334)					6.0	231
Kalangitan, capas							6.0	252
							6.0	236
Dueg	6.0	164						
AVERAGE	6.2	209	6.4	170	6.4	230	6.1	299

By comparing the sampled water with the water quality analyses data from a limited number of areas, contamination of shallow ground water and surface water is progressing. The contamination is most likely caused by domestic sewers as shown in the following Table. Special attention should be paid to securing drinking water.

Table 2.22 Outline of Water Quality Field Tests

Kalangitan Area:

Periodical water test (DOH, Capas) for detecting coliform were conducted. The results of the October tests were negative whereas November tests at well No.8 were positive.

Barangay	Type of Source	Time	pH	Colif.G	Cl
Binangge	Spring	am 10:30	6.8	-	-
Maguisguis	Spring Reservoir	am 10:45	7.8	+	-
Maguisguis	Shallow Well	am 11:05	6.8	+	-
Moraza	Deep Well	am 11:15	7.2	-	-
Moraza	Deep Well	am 11:30	6.8	+	-

During the field survey period, electric prospecting was conducted at representative sites. The results revealed the possibility of aquifers up to the depth of 100m at all of the sites. At the shallow depths there were signs of water contamination by domestic sewers. Thus, it is believed that it would be appropriate to develop groundwater at the depths of 50 to 70 m by avoiding the primary aquifer (zone having free surface water) at 20 to 30m depths.

2) Medical Services and Major Diseases

A semi-permanent medical team, such as DOH, the Philippines Red Cross or NGO, is assigned to each resettlement area. A typical medical team is comprised of six members: a medical doctor, a nurse, a midwife, a dietician, a public health specialist, and an organization leader. Each team provides 24 hour medical service. However, the installed medical facilities and equipment are poor and only simple treatments can be given.

The common diseases include fever, lung disease, diarrhea, skin disease; cases of malaria have also been reported.

The following medical report, prepared by a JVO-FI (agency in charge of local medication through DOH), lists all the different diseases observed in the resettlement areas:

Table 2.23 Morbidity at Resettlement Area

Diseases	Site Name				
	Loob-Bunga Nov.-Dec.	Cawag Sep.-Oct.	Iram Nov.-Dec.	Baquilan Oct.-Dec.	Kalangitan Oct.-Dec.
Measles	-	-	-	-	-
Conjuntivities	7	25	-	43	2
Cough W/Fever	62	577	98	395	126
Cough	57	744	189	378	-
Burns	-	-	-	-	-
Diarrhea	42	199	43	107	-
Fever	-	-	65	-	-
Malaria	2	-	-	17	1
Skins Rashes	9	-	-	68	-
Bronchitis	-	-	-	-	31
Infected Wound	-	-	-	-	2
Gastritis	-	-	-	-	16
Ischemic Heart Diseases	-	-	-	-	1
Other 8	102	730	163	137	238
Total Case	281	2,275	558	1,145	417

Field Survey Result

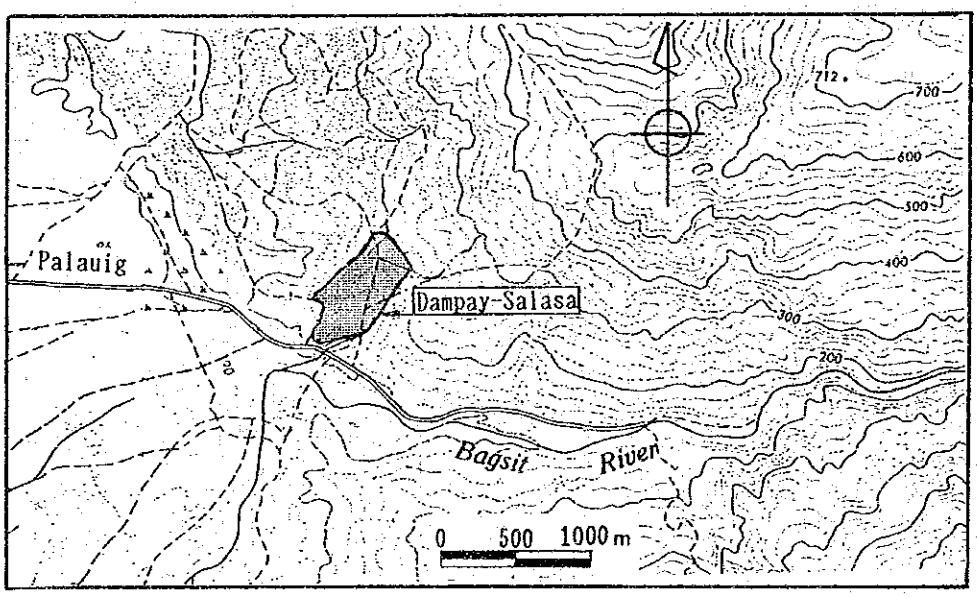
2.2.4 Present State of the Resettlement Areas

The natural,social and water supply conditions in the highland resettlement areas where the Grant Aid cooperation is to be given differs according to each site, and there is an imbalance even within the same site. An outline of the differents sites are presented below:

1) Dampay Salasa

Location and topography

This site is located at the entrance of a hill that is accessed through an 8 Km unpaved road (30 minutes by car) to the east from Highway No. 7 in Palauig, Zambales Province. The site is on the mouth-slope of Bagsit River and is divided into two parts by Maaya Creek which is originated from a height of about 300 m. Height of the site is 100 to 200 m; 652 ha have been provided for resettlement purposes.



Outline of the Site

The inhabitants of the district are composed of lowland and highland people from the mountainous disaster areas of San Marceline, San Xarciso, San Felipe and Butland in the state of Zambales. The population has decreased from a peak of 1,695 people in November 1991 to 1,193 in November 1992.

The district is composed of 13 sitios (housing blocks). The western side is inhabited by

lowland people; the eastern side is inhabitated by highland people. As for sickness, there are numerous cases of typhus and malaria.

Hydrogeology and water source

The site is on a ridge-shaped highland in the west piedmont of Zambales Mountains and the nearby geology is plutonic rock of Meso-Paleozoic age. As in the surrounding places, fresh hard rock outcrops can be found as well as big boulders at the bottom of the valley; it is supposed that under ground fissures are very few and groundwater potential is very low. There are two deep wells drilled to a depth of 140 ft (43 m) by means of a percussion rig, but it took four months till its completion. According to its well log, a 4 inches casing pipe has been inserted 33.5 m deep together with a strainer pipe from 26 m to 33.5 m; static water level is 19.5. Water quality of deep well is normal with 228 mmho in conductivity and 6.6 in pH, but some turbidity of a yellow-brownish color was observed.

There is a small waterway on the slope near the center of the site and surface water was flowing at a rate of about 100 l/m coming from an upstream spring (height: 300 m). This spring provides life-supporting water for the site dwellers but it becomes contaminated due to inadequate use by upstream dwellers.

It is estimated that the groundwater potential in this site is low and the conditions of the water source are severe.

Water Supply

There are 2 deep wells (50 m) and one surface water facility. The wells are of a rusty color and there are problems with both quantity and quality of the water. The water intake area of the surface water facility is too far downstream, and, as the intake facility is of open type, the quality of the water is not very good. A new water source facility should be developed for the entire area.

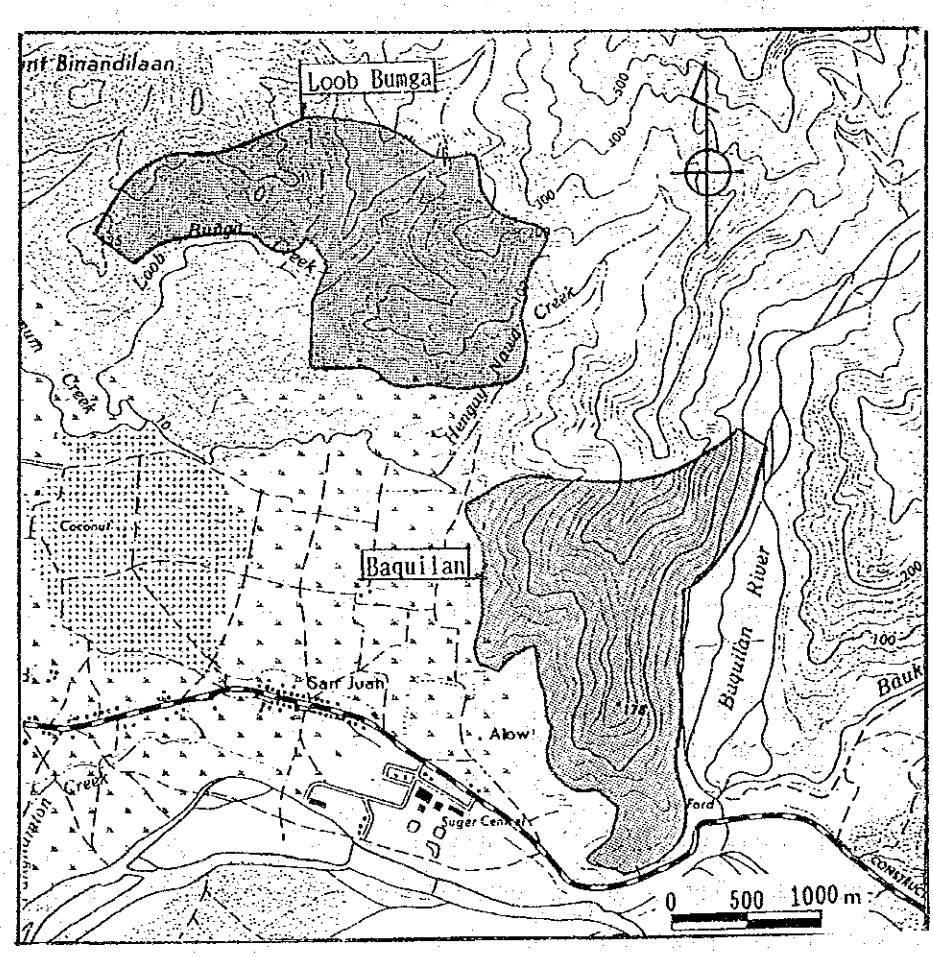
The deep wells were bored by the DPWH's Zambales office. However, the water is not used for drinking purposes. The surface water facility is composed of a simple 1 x 5m intake weir and a 700 m PVC pipe and is a major source of household water.

2) Baquilan

Location and topography

The site is on the north hill of Bacao River along the road from Botolan to Capas. The traffic in and around that area is impossible due to the eruption. Distance from Batolan is about 8 km and the roadway is almost completely paved. The site is lowland bounded along the Baquitan River in the east and in the west. Total resettlement area is 393 ha and its height above sea level is 50 to 170 m. Drivelling houses are set on and around the southern part and at the center of a narrow ridge extending from north to south.

Bacao River is completely buried by flows of mud and the lowland below 40 m high has a risk of suffering a second disaster.



Sites of Baquilan and Loob Bunga

Outline of the Site

The inhabitants of the district are composed of people from the barangays of Villar, Owang, Biangge, Cabatuan, Baquilan, Maguisguis, Quitombok, Maligaya, Xacolcol, Bituin, Poonbato, Burgos, Malamboy and Tumengan from the district of Botolan. Basically, they are divided into 16 housing blocks (sitios) according to barangay.

Although the population has decreased (4,204 in November 1991), 850 families are still living there, exceeding the planned number of 775 families.

This district's development as a resettlement area is believed to have been completed; however, due to its location on an isolated hill, the houses are built very close to each other.

Hydrogeology and water source

The site is also on the ridge-shaped highland of an old rock-based zone in the Zambales Mountains. Fresh hard rocks outcrops can be found in the surroundings. There are several wells that were drilled recently but some of them are suffering from problems due to accidents and breakdowns. Water quality is 260 to 395 mmho in conductivity and 6.2 to 6.6 in pH, but the water of one of the wells has some turbidity in it. According to the hearing survey, some wells dry up over dry season.

Two wells log data were collected, and from them it was found out that their depth was 36.6 m and 27.4 m having a static water level of 12.2 m and 6.1 m respectively and the drilling period was 2 to 3 months per one well. Part of the life-supporting water in the site is conducted from a spring located at a far away disance (about 7 km). However, this spring is almost at its maximum capacity utilization level.

This site has problem concerning quantity and quality of groundwater and spring. The site is considered to be under unfavorable conditions for water source.

Water supply

The district has 3 deep wells (60 m), 4 shallow wells and one spring water facility. The water level of the wells are dropping, and due to contamination from the surface water, they may not be used for drinking purposes.

The spring water facility provides water to public pipe stands at nine locations, and its capacity is believed to be at a maximum level.

This district is a mixed lowland and highland resettlement area. The water supply at the highland area is not very good.

The deep and shallow wells were bored by the DPWH's Zambales office and XGO. One of the wells has a water pump; however, due to power supply problems, it has basically been inoperative.

The water supply comes from the upper stream of the Hengay Nama Creek that is located on the western edge of the district at a height of 250 m. The facility has GI pipes with 5 tanks facilities in between; it was built by NHA.

3) Loob Bunga

Location and topography

This site is on the south-facing slope at the northwestern portion of Baquilan. It is accessed through an unpaved road, 4 km to the east from the paved road running into Iba from Olongapo. There is a temporary bridge that crosses Tutulonun River in the site entrance, and it is judged that traffic of above 5 tons vehicles is difficult.

Altitude of the site is 50 to 200 m, and in the south part, Loob Bunga Creek extends towards the west. Total area of resettlement site is 328 ha.

Outline of the Site

The inhabitants come from the Barangays of Palis, Owaog, Belbel, Maguisguis, Cabatuan, Nacolcol, Morega and Poonbat of the district of Botolan. The housing area is divided into 14 blocks.

This is the most densely populated site and the population continues to increase rapidly. In November 1991 there were 1,292 people, but as of November 1992 there were 6,673.

This site was the first to start rehabilitation work after the eruption of the volcano. Compared to other sites, it has the most developed infrastructure and the greatest number of organizations involved.

Hydrogeology and water source

Like Baquilan site, this site is on the highland of the west piedmont in Zambales Mountains and is laid on an old rock-based zone; however, the ground surface is fairly weathered. There are a number of water wells drilled recently and most of them are shallow, and some of them are dry wells of low water level. Water quality of one deep well was 2.76 mmho in conductivity and 6.2 in pH. but dust was observed to be mixed in it. Also in a shallow well, its water had a conductivity of 334 mmho and 6.2 pH and it was noticed that the conductivity tended to be high.

There are three valleys ranging from small to medium in the site, and in the east valley, surface water flows at a rate of about 500 l/m. Also water from an upstream spring is supplied by a pipeline.

An electrical survey was carried out at one point near the center of the site. Upto a depth up to 8 m, a low resistivity of 4 to 33 ohm-m was found due to the existence of a weathered zone and contamination of life-supporting water. From 8.8 to 26 m depth, resitivity had a fairly high value of 44.0 ohm-m and this is caused by the existence of relatively small fissures; and at 26 to 98 m depth, resistivity varied from a low level of 6.9 ohm-m at the 9.8 m level to a high value of 1.630 ohm-m near the hard rock-base. From these results, it is estimated that the site has fairly high possibilities for groundwater. Shallow depths are to be avoided during the well construction in order to avoid contamination of the water.

Water Supply

There are 4 deep wells (30 - 59 m), 12 shallow wells (10 m) and 3 spring water facilities. The quality of the water in some of the wells is poor. As the wells are improperly located, the number of wells is insufficient compared to the number of inhabitants. Some blocks do not have any source of water. The spring water facilities cover the eastern side of the site and are functioning satisfactorily. The construction of water supply facilities is necessary in those blocks not having a water source.

The wells were bored by DPWH, NHA, and individuals from NGOs. The spring water facilities were constructed by NGO (CFS). As shown in the Annex, each spring water facility is composed of a 1 km pipeline, 3 tanks and 2 water intake facilities (height 150 - 170 m).

The water supply facilities and the water resources of this site are the best among the highland resettlement areas.

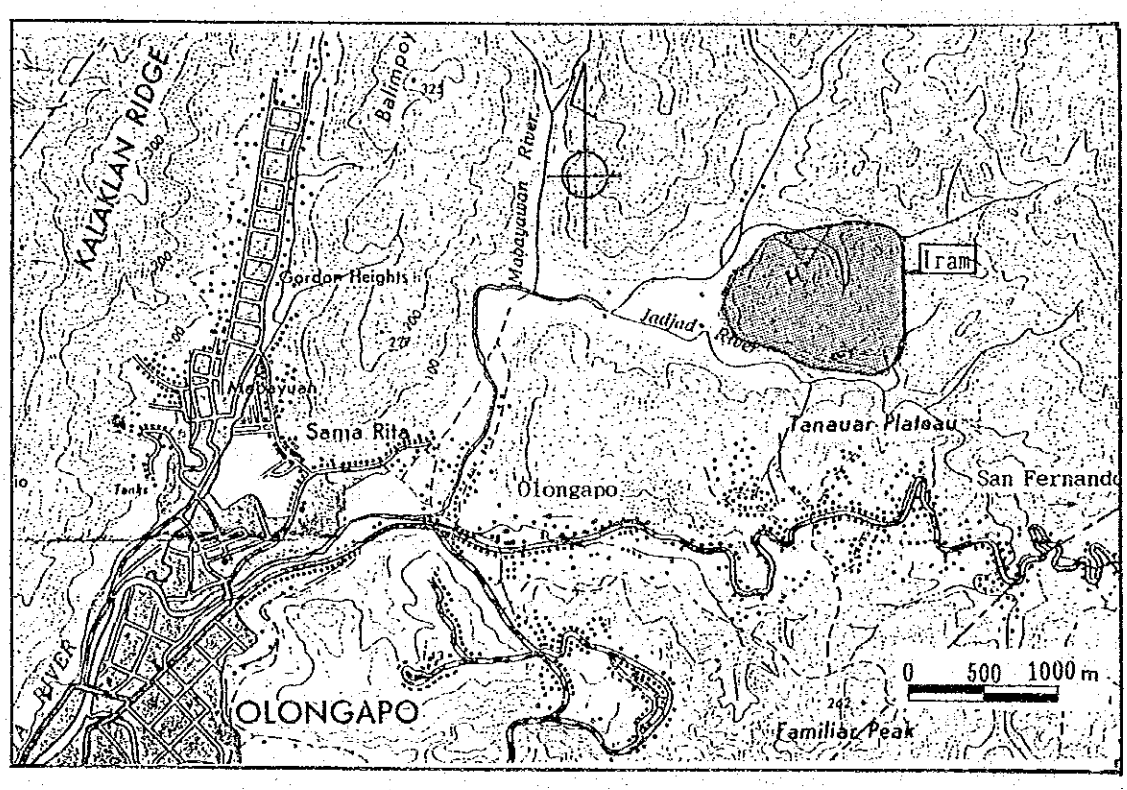
A culture farming project has also begun. Apart from the contamination problem, the facilities for producing drinking water is considered to be adequate.

4) Iram

Location and topography

The site is located on an isolated hill accessed from the north, 2 km from New Cabalan where a paved road runs from San Fernando to Olongapo. Access road is not very good as it is very steep, but its improvement is carried out by DPWH at present.

The site is bounded by steep cliff formed by the Jadjad River in the south and Santa Rita River in the west. It is located at a height of 100 to 200 m above sea level. Total area of resettlement site is 100 ha and resettled population is planned to be around 700 families.



Outline of the Site

The inhabitants come from various districts of the state of Zambales. The major Barangays being Kamanggahan, Kakilingan, Botolan, Baliwet, Banaba, Payhudpod, Kasoy, Santa Fe, San Rafael, Lubao and San Isidro. The population has increased from 326 families in November 1991 to 513 families (2,630 people) in November 1992. The block is divided into 12 sitios; however, there are some illegal inhabitants on the eastern side of the site.

This site is located near Olongapo city. The area is quite small; It has a suburban atmosphere and the living conditions there are quite different than the other sites.

Hydrogeology and water source

The site is located on the ridge shaped isolated highland in the east side of the Subic Bay. From the foot of the hill, its relative height is about 80 m; consequently, a hand pump will not be powerful enough to convey the groundwater. Surrounding geology is conformed by tertiary phroclastic rock.

Life-supporting water in the site is supplied by two springs; one provides a small volume of 10 liter/m in the closest valley and another provides spring water by means of a pipeline. From dwelling patterns and topographical conditions, it is considered that the arrangement of the spring supply is the best alternative since the site has problems concerning groundwater development.

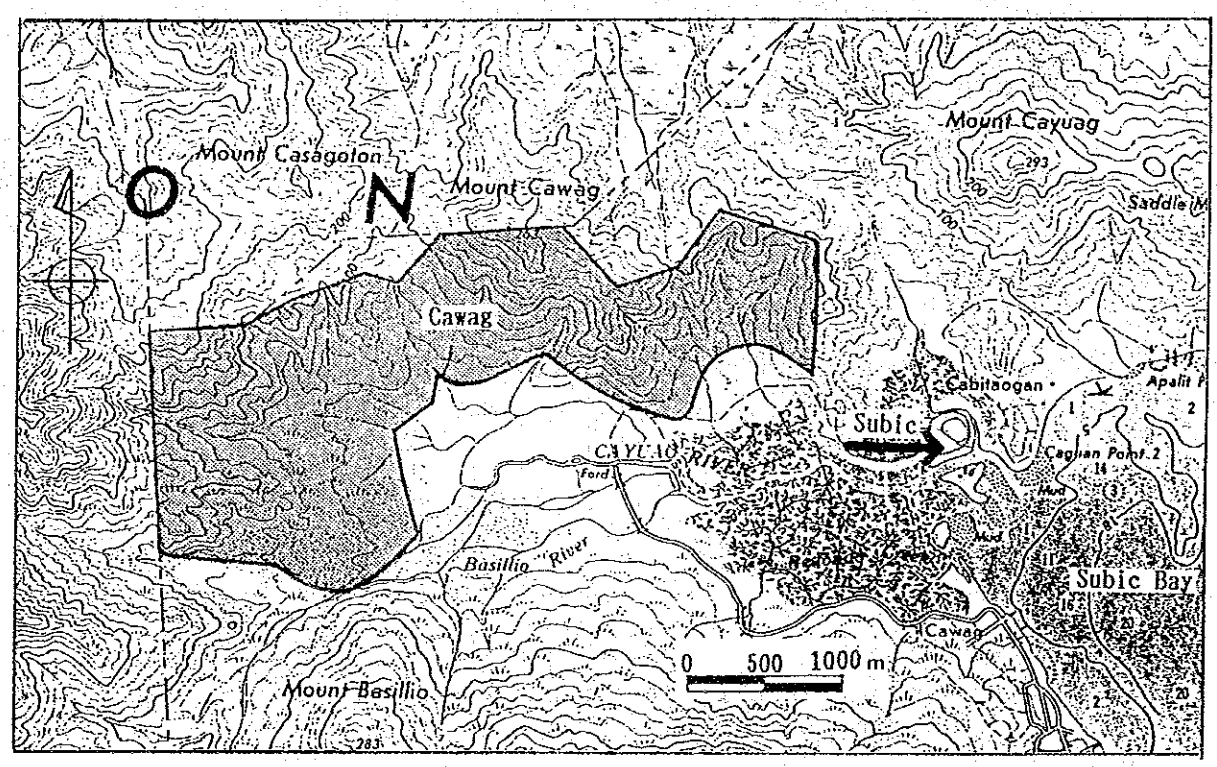
Water supply

There are 1 deep well, 4 shallow wells, 1 spring water facility, and a spring water utilization facility (NHA). Since the water level in the wells is too low, they are not being used. As the spring water facility is an open structure, and as the construction material is not appropriate, modifications are required. As for the utilization of the spring water, modifications are planned, as shown in the Annex, to use the Santa Rita R. tributary as a water source; however, the budget allotment is not clear.

5) Cawag

Location and topography

The site is located on the southern slope of Mt. Caway and it is accesed from the west, 12 km from Subic Town, by using the paved road which joins Olongapo and Iba. In the south, Cayuag River flows to the east and forms fairly low-flat plains. It is located at 20 to 150 m above sea level and its total area contains 824 ha. Traffic on the access road is difficult during the rainy season, but traffic in dry season may be possible if it is partially fixed.



Outline of the Project

This site has an area of 24 ha. Its inhabitants form the Barangays of Baliwet, Dsan Isidro, Lawin, Kakilingan, Lomboy, Ravanes, Palayan, San Martin and Cabangaan are living in 9 separate blocks. With the improvement of the area, the population increased from 387 in November 1991 to 2,901 in 1992.

Although the infrastructure is built, it is corroding and ruining the environment. No restoration work is being done. There are management problems. DSWD has no involvement in this site.

Hydrogeology and water source

The site is located on the eastern highland of Mt. Nazasa in the southern part of Zambales Province. It is located on an old rock based zone. Freshly outcropped hard rocks can be found in some parts; ground surface is fairly weathered.

Existing well water quality is good; resistivity is 231 mmho and a pH of 6.0. There is a spring flowing upstream at a rate of 40 liter/m and is used by means of a vinyl pipeline. However, during the dry season its discharge greatly decreases because of its small catchment area.

One electrical survey was carried out at the site center during field survey. At a depth of 0 to 22 m, resistivity is very low because of the weathering of the ground surface, but it increases gradually while going deeper as hard rock fissures are few. Therefore, aquifers will be fairly found in shallow depth but at greater depths it becomes more difficult.

Groundwater potential of the site is judged as of medium condition as a whole. Also there is a good spring at the west site, but a rather long length of pipe line has to be constructed on the mountainous part in order to benefit the site dwellers with drinkable water.

Water Supply

There are 3 deep wells, 2 shallow wells (both are about 30 m deep) and 2 spring water facilities. The water in the deep wells is being contaminated; thus, the number of water facilities is small compared to the number of inhabitants. The development of water facilities is urgently required.

6) Villa Maria

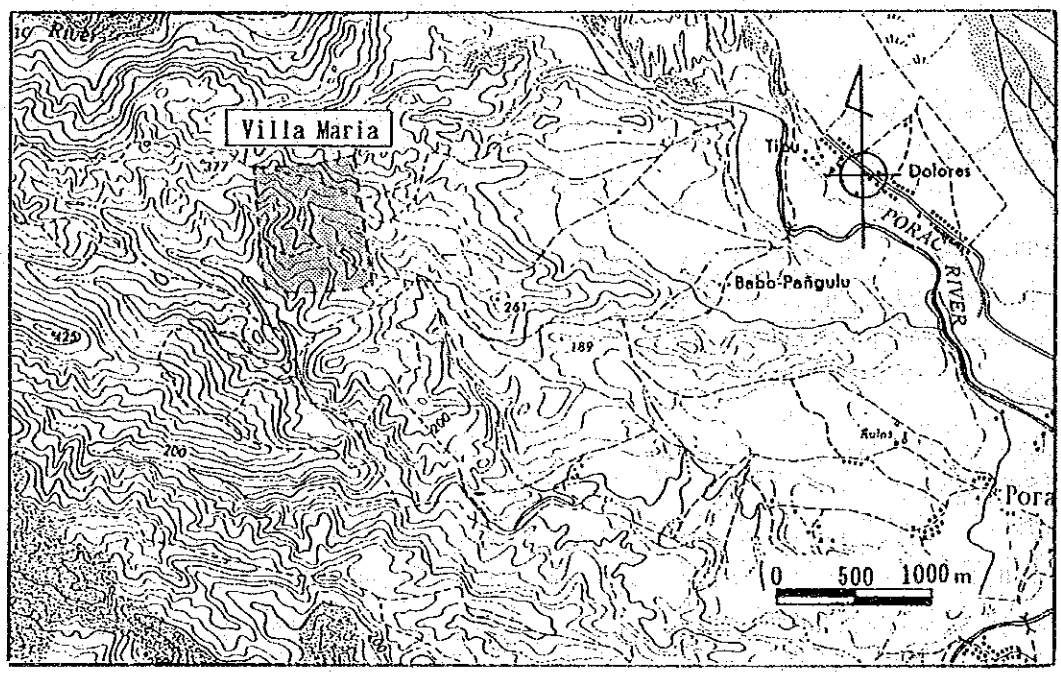
Location and topography

The site is on the mountain area that is accessed through an unpaved road, 12 km to the west from Porac (50 minutes by car). In the Porac River and its affluents, erosion and accumulation of mud flow frequently occurs, making access to the site quite difficult. It is located at an altitude of 200 to 250 m and the site is formed by a narrow ridge and some stripe valleys.

The site is a new resettlement place that has just been set up by the Task Force in June 1992, and so the site arrangements and facilities are not quite adequate. Surrounding area is covered by fairly thick volcanic ash layers. The access road arrangement is a first priority target. The population reached 350 families in November 1992.

Outline of the Site

This new site was only approved by the Task Force in June 1992; thus, no development has taken place. More than 10 cm of volcanic ash has accumulated around the area and access roads need to be cleared before anything else is done. In November 1992, there were 350 families in this site.



Hydrogeology and water source

The site is on a ridge-shaped highland on the eastern side of Mt. Pinatubo and the nearby geology is conformed by volcanic rock that erupted in Pleiscene -Quaternary era.

As the valley is deep and the ridge is narrow and the site is on a mountain side, groundwater development by means of a handpump faces many problems. Therefore careful consideration must be taken during the well drilling period.

Water Supply

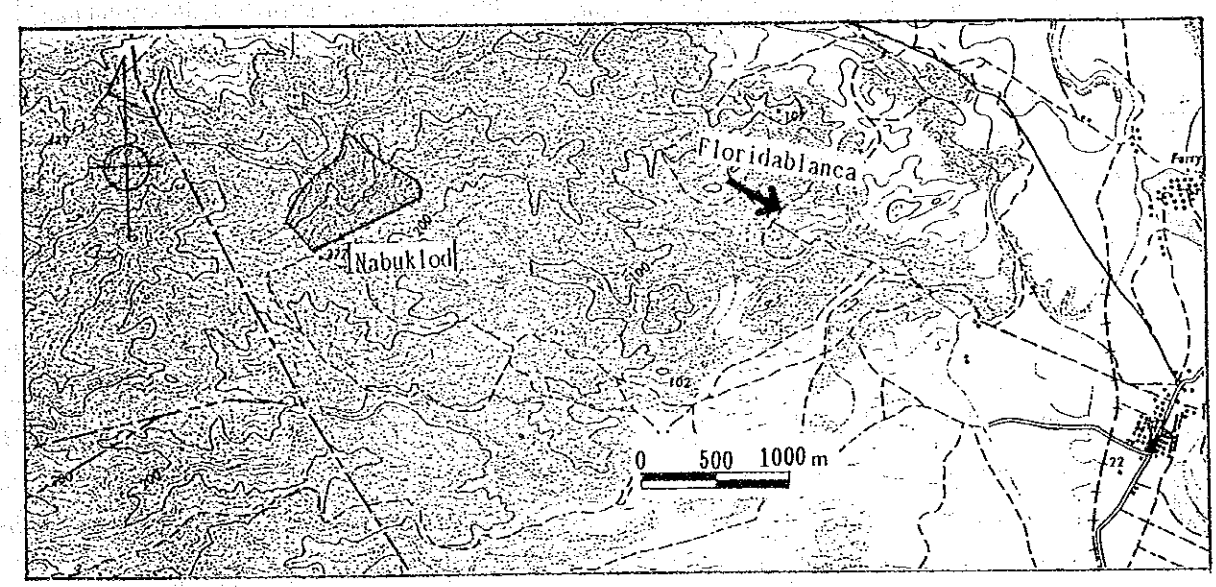
Apart from the 2 springs, there are no water supply facilities. Construction of other infrastructure is being delayed. It is considered that water facilities should be constructed as soon as possible to enable the development of the site.

7) Nabuklod

Location and topography

The site is on the mountain side to the west of Floridablanca and access is made possible by an unpaved road (45 minutes by car), 11 km from the Basa Air Base. It is located at an altitude of 180 to 260 m above sea level and the nearby topography is the same as Villa Maria. As the access road is crossed by Gumain River and its affluents, mud carried out by them damage it in a serious way. As future disasters caused by huge mudflows may be expected to occur, it is advisable to make arrangements in order to improve and protect it.

The area of the site totals 403 ha.



Outline of the Site

The inhabitants of this site are from the western Barangays of Floridabanca. The site is divided into 3 main blocks. It was planned to have 1,500 families in this site; however, as of November 1992, there were only 320 families (1,300 people).

Due to mud flows during the wet seasons, the road conditions are bad. Access roads must be maintained and protected against secondary damage for the sake of future development in this site.

Hydrogeology and water source

The site is formed by volcanic rock of Pliocene-Quaternary age as Villa Maria. It is estimated that a full-scale preliminary study is necessary before carrying out any groundwater development.

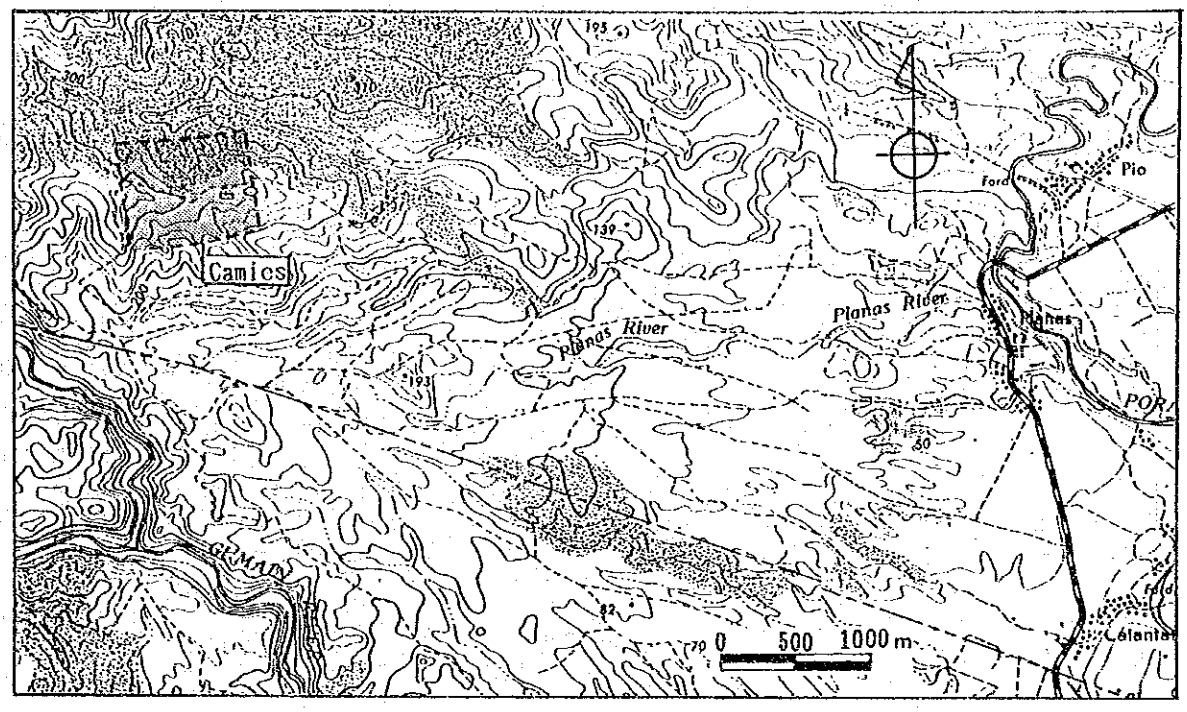
Water Supply

There are 6 shallow wells and 5 springs in this area. 3 of the wells are not in use because the water levels are too low. There is no data on water quality; yet there is fear that the other wells will become contaminated in the future. Upon considering the lowering of the water levels in the wells and the decrease of spring water during the dry seasons, an appropriate water supply plan is deemed necessary.

8) Camies

Location and topography

The site is on the ridge portion of the mountain side where access is made through an unpaved road, 10 km to the west (50 minutes by car) from the paved road that runs from Florida Blanca to Porac. Access road is in very bad conditions and traffic during the rainy season is very difficult. The site is located at an altitude of 260 to 320 m above sea level and the dwelling area within the site totals 12 ha.



Outline of the Site

The access roads and public facilities are maintained by NHA. As with Villa Maria, this site was approved in June 1992. Yet, the basic living facilities have not been built.

Hydrogeology, water source and Water Supply

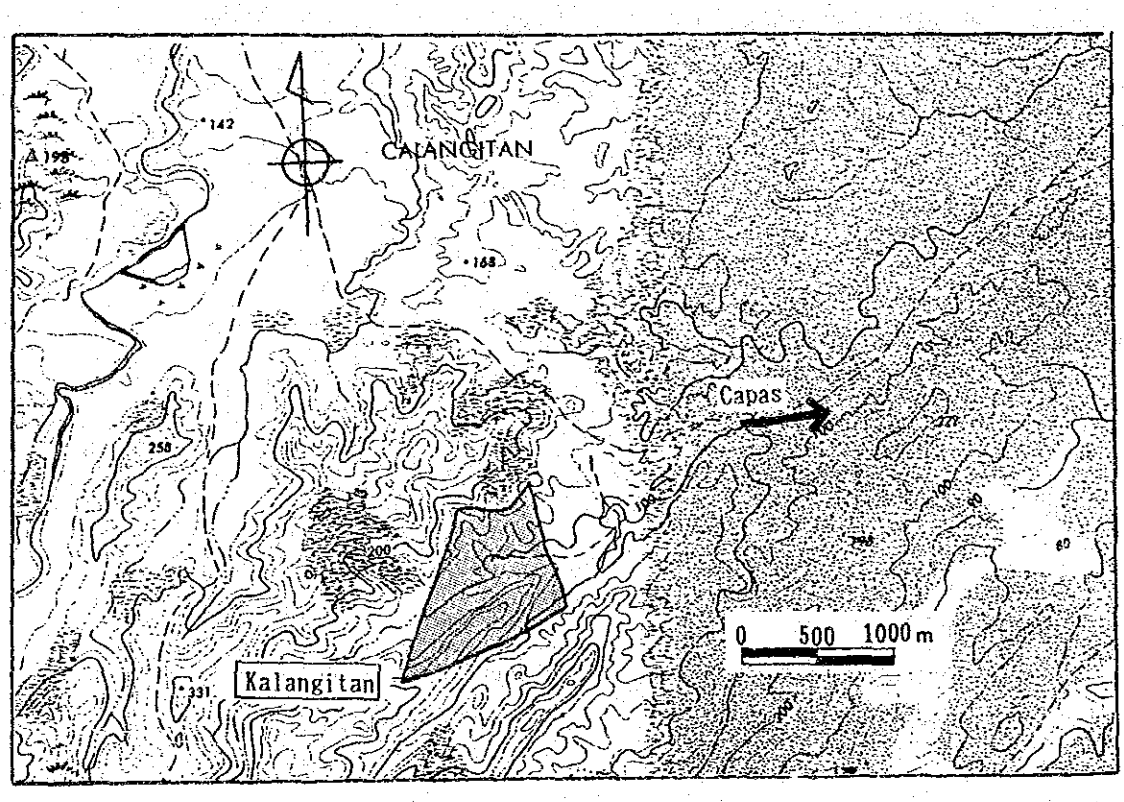
The site has the same natural conditions as Villa Maria and Nabuklod. As life-supporting water is supplied only by dug wells at 5 places and a small spring, water sources can be considered to be suffering from severe conditions. Especially, spring facilities have problems concerning capacity and dug wells' water is feared to be contaminated by human detritus.

9) Kalangitan

Location and topography

The site is on a soft slope and accessed by an unpaved road, 8 km to the west from the paved road that runs from Bamban to Capas. It is located at an altitude of 120 to 180 m above sea level and Bobon and Matandaco rivers flow towards the north in the southern and central parts. The area totals 123 ha.

Access condition is estimated as good except during the rainy season. Transport of construction machinery will be possible with some ad-hoc arrangements.



Outline of the Site

This site's inhabitants come from the Barangays of Kalangitan, Malasa, Gayaman, Elora, San Martin, Cawayan, Maruglo, Baguingan and Manabayucan from the state of Tarlac. The site is for highland dwellers. There are 9 housing blocks that are divided by Barangays. The population increased from November 11, 1992's figure of 1,304 to 2,300 in November 1992.

Hydrogeology and water source

The site is on the northern piedmont of Mt. Pinatubo and its geology is formed by volcanic sediment of Pleiscene-Quaternary era. Hydrogeological condition is considered as good concerning water wells, and during the field survey, the existing handpump of a shallow well was working smoothly. The well's water quality had a conductivity of 250 mmho and a pH of 6.0; and a nearby small river has a fair discharge of 250 liter/m.

One electrical survey was carried out at the nearby center of the site. Silt, sand, clay and mudstone were found at a depth of 0 to 11 m, 11 m to 19 m, 19 m to 60 m and below 60 m respectively. Law resistivity was measured in shallow depth and one of its causes is thought to be contaminated life drainage. Groundwater development is to advance as deep as possible.

The site is the most favorable among resettlement sites as far as the groundwater development is concerned.

Water Supply

Deep wells (30 - 40 m) were constructed by an NGO (TSTF) and NHA. The water is used for drinking. Although there are many wells, a number of them are not functioning. Hence, a safe and stable supply of water is needed. The maintenance of the wells is conducted by an inhabitant who has received a special training.

Water supply facilities are needed in the following places:

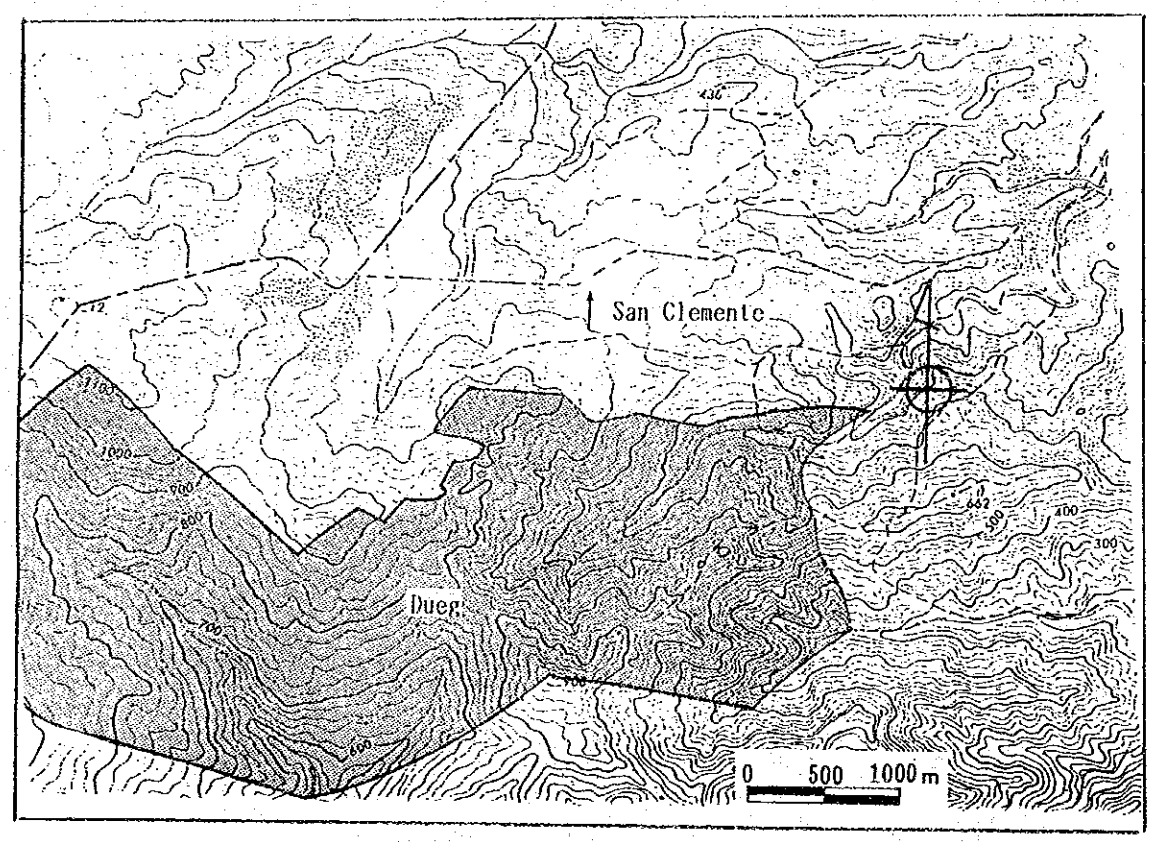
Kalangitan	:	2 of the 4 wells are not functioning and the water in the other two wells is not adequate.
Cawayan	:	There are no wells nearby - the closest is 200 m away.
Manabayucan	:	This is a new sitio and, as yet, there are no wells.
Malasa	:	2 of the 4 wells are not functioning.
Gayaman	:	3 of the 4 wells are not functioning.
Baguingan	:	No well
San Martin	:	2 of the 4 wells are not functioning.
Mataba	:	The only well at this location is not functioning. The nearest spring is 300 m away.

Water supply facilities for meeting places and public facilities are required.

10) Dueg

Location and topography

This site is on a high mountain side accessed by an unpaved road 18 km south-west from San Clemente. It is located at 600 to 800 m above sea level and it is characterized by having a deep valley and steep cliffs. Total area is 1,100 ha and resettlement of 2,000 families is planned.



Outline of the Site

The inhabitants are all highland people coming from the mountain barangays of Capas and Bamban. The housing area is divided into clusters. There are 19 sitios in 5 clusters. The population is decreasing and now stands at 3,000.

This resettlement area is located on the slopes of a 1,000 m mountain. The conditions

here for development are not very good. The area is wiped out and the access roads become dangerous during wet seasons. Compared to other resettlement sites, the development here has been delayed. However, detailed plans have been made by the DPWH Tarlac office for maintaining the access roads and the roads within the site. This project is likely to begin in 1993.

Hydrogeology and water source

The site is on a ridge-shaped highland and its slope is steep. It is located on an old rock zone. One electrical survey is carried out near the site center and earth surface is seen as weathered. But it is judged that water level is low and groundwater development is topographically difficult.

Nearby the mountains, some springs are found at about 800 to 900 m above sea level, but hardly usable as facilities construction may face big problems due to natural conditions of the area.

Water Supply

There are 2 spring water facilities that were constructed by DENR. The structures are open types and their construction is poor. The water is not suitable for drinking. Improvement is necessary.

The number of blocks in each settlement area and their water supplies are listed below:

	No. of Sitio	Water Supply & Sources
Cluster A :	4	No water source
Cluster B :	2	Water from DENR's spring
Cluster C :	5	Half of the area's water comes from DENR's spring
Cluster D1:	5	No water source

CHAPTER 3 OUTLINE OF THE PROJECT

Chapter 3 Outline of the Project

3.1 Objectives

Access to water system facilities being a major concern because of previously understood reasons, their construction in the resettlement areas is of the upmost importance.

In that instance, DPWH established the urgent water supply Plan in order to provide the water needed to rebuild the victims' domestic infrastructure and to stabilize their livelihoods. †Part of the works contemplated within the Plan will be financed by a Japanese Aid Grant (see next section for durther details); those works will be called "the Project".

This Project planifies more than 100 wells as well as other water supply facilities, and the procurement of equipment for their construction. The objectives are:

- To provide safe, clean drinking water to the refugees living in the resettlement areas.

- To reconstruct and restore the barangays' water supply facilities that were either destroyed or contaminated by volcanic ash, mud flows, or rocks.

3.2 Study and Examination on the Request

(1) Necessity and Appropriateness of the Project
Areas to be covered by the Project are the highland and lowland resettlement areas and the damaged barangays.

This Project obviously benefits the Highlanders of Mt. Pinatubo, mainly Aetas, who now live in remoted highland resettlement areas. As mentioned before, their locations bring upon several problems: Poor road system, lack of commodities, hard topographic conditions making well construction extremely difficult.

Beneficiaries of the said project are also the Lowlanders whose homes and lands - or other means of making a living - have been destroyed, as were several barangays'water supply facilities.

Although lowland resettlement areas have fairly good transportation systems having easier access to national road, possibilities of secondary disasters are feared and resettlement facility not yet fully developed.

It should be said that intensive work has been undertaken by both NGOs and governmental agencies (mainly NHA and DPWH); temporary shallow wells and spring-water use facilities were installed, to name a few.

But, because of obvious financial restraints, much is left yet to be done. The existing facilities being of an open type, waterbone diseases due to poor drinking water quality are feared.

A safe, reliable drinking water supply being one of the most important element in restabilizing the victims' quality of life, the Government of Japan, under the request of the Republic of the Philippines, has agreed to provide grant aid cooperation for constructing simple water supply facilities, including the procurement of well drilling equipment as well as Japan's know-how in that matter.

(2) Positioning of the Project Among Other Related Projects
Based on the water supply master plan's target year of 2000, DLG, DPWH, and LWUA have been implementing rural water supply development projects nationwide.

Previous to the eruption, several of the areas were already included in the above project. After the disaster, the coordination of the reconstruction and restoration project was undertaken by the Task Force.

The emergency plan contained the followings:

(A) Water supply facility development in resettlement areas; NHA
(B) Disaster areas' urgent water supply project; DPWH
(C) Disaster areas' schools and water supply facilities reconstruction project; DPWH

In certain lowland resettlement areas, Level III water supply facilities (water pumped from a deep well and supplied to households) are being constructed as a part of the lot division and sale project established by NHA.

Since the Task Force is involved in coordinating various projects with MPR-PMO, and in order to avoid overlapping of Project areas and work fields with other projects, DPWH will integrally manage the Plan.

(3) Conception of the Project

In order to understand the relationship of the Project with the Plan and its inception, a review of the Plan will be caried out below.

Basic Policies

MPR-PMO (newly created) will eventually manage both DPWH (A) & (B) water supply projects as follows:

Policies:

- Priority should be given to areas where housing can be permanently secured.
- Priority should be given to areas easily accessible from the outside.
- Priority should be given to areas having a certain number of population to serve.

Priority Order of the Areas for the Water Supply Plan:

- 1st Priority Area	: Resettlement areas accommodating highlanders.
- 2nd Priority Area	: Disaster area schools (including school building construction and restoration).
- 3rd Priority Area	: Damaged barangays (improve acceding to a regional unit).

Overall Plan Conception:

MPR-PMO is at present adjusting the Plan contents for the above mentioned five Plan's areas in order to facilitate its implementation based on the above policies.

The outline of overall Plan is as follows:

1993 to 1995:

- The construction of water supply facilities in the first priority highland resettlement areas with Grant Aid Cooperation .

1995 to 2000:

- The construction of water supply facilities in all other resettlement areas and affected barangays and the construction of wells for schools in disaster areas.

By clarifying the requests received from local, provincial, and regional offices, the preliminary study results propose the following number of necessary facilities (the numbers were calculated in detail as shown in Annex):

Table 3.1 Required Number of Water Supply Facilities for Overall Programm

Name of Province	1st Priority			2nd/3rd Priority			Total
	Hand Pump Well	Spring Rev.	Total	Hand Pump Well	Spring Rev.	Total	
1.BATAAN	-	-		87	5	92	92
2.ZAMBALES	41	2	43	202	-	202	245
3.TARLAC NUEVA ECIJA	15	1	16	135	-	135	151
4.PAMPANGA I	-	-		129	-	129	129
5.PAMPANGA II	8	-	8	249		249	257
TOTAL	64	3	67	802	5	807	874

As a result, the overall Plan includes 866 wells equipped with hand pumps and 8 spring-water use facilities.

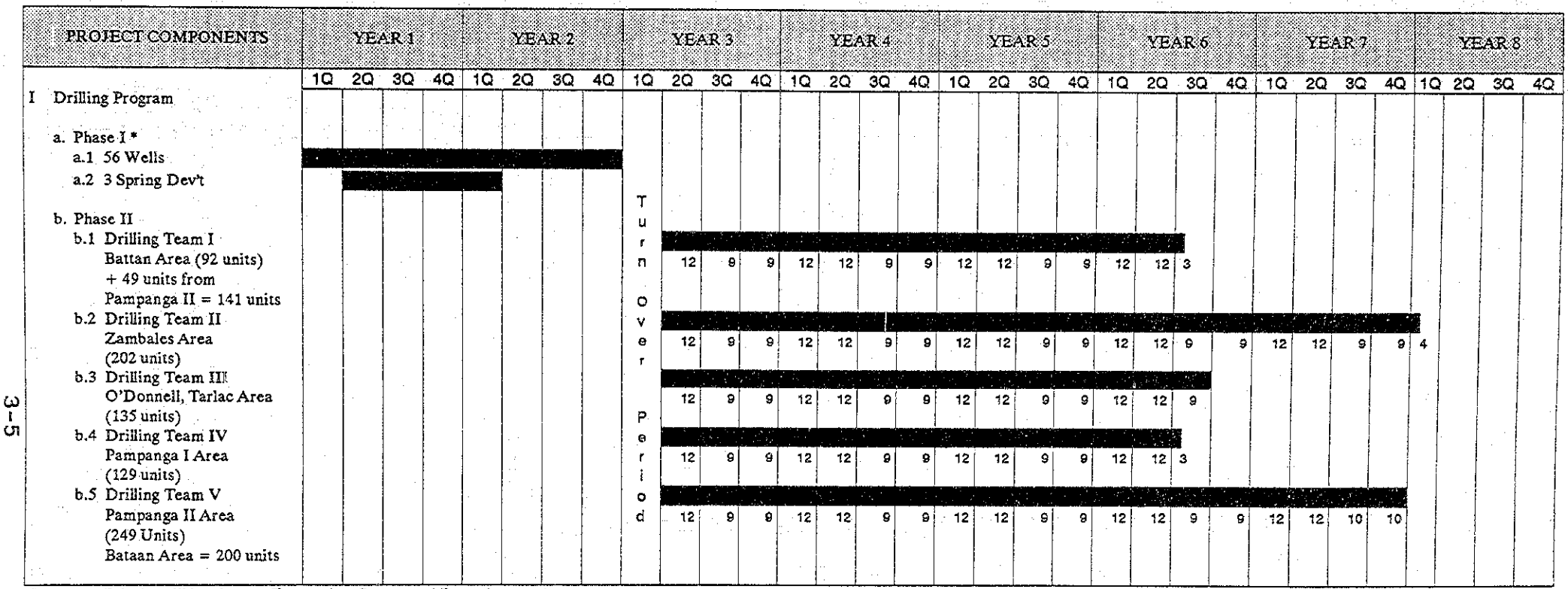
Highland resettlement areas to be covered by the Grant Aid Cooperation , the Project, are included in the first priority area even by MPR-PMO.

Implementation Schedule of Overall Plan:

According to MPR-PMO, implementation of the overall Plan will be completed by the year 2000, an 8-year period (see the Fig.3.1).

The part of the works of the Plan to be executed under the Japanese Government's Grant Aid Cooperation, the Project, will consist in the implemention of the highest priority project and provide on-site training for water supply facility and ground water development engineers and related engineers.

JICA–ASSISTED URGENT WATER SUPPLY PROJECT
PROPOSED IMPLEMENTATION SCHEDULE



Note: Priority will be given to Evacuation Center and Resettlement Areas.
Estimated @ 3–4 wells/month/year/drilling equipment including mobilization and standby

* To be undertaken by Japanese Drilling Company.
Phase I schedule starts upon delivery of equipment/drilling rigs
Phase II starts after turn–over of drilling equipment to MPR – PMO

Fig. 3.1 Implementation Schedule Proposed by DPWH (1)

JICA-ASSISTED URGENT WATER SUPPLY PROJECT
PROPOSED IMPLEMENTATION SCHEDULE

PROJECT COMPONENTS	YEAR 1				YEAR 2				YEAR 3				YEAR 4				YEAR 5				YEAR 6			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
II. Training Program for DPWH-MPR-PMO Staff (On-the-job) * Each Team consist of one engineer, 1 well driller and one foreman or eng'g assistant (optional)	■	■	■	■	■	■	■	■																
III. INSTITUTIONAL DEVELOPMENT	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

* On-the-job training will be accomplished by sending counterpart staff to join/be part of the Japanese drilling team as observer/on-the-job trainees during the first two years. (Phase I)

Fig.3.1 Implementation Schedule Proposed by DPWH (2)

After complition of the Project, all of the construction equipment will be transferred to MPR-PMO. Then, a Philipino team will construct wells at the rate of 42 wells a year (including associated equipment): 18 wells will be constructed during the rainy season and 24 during the dry season.

As the evaluation of MPR-PMO's overall Plan implementation schedule found various problems (see below), it would be necessary to revise the schedule as shown in Fig. 3.2.

- As the number of rainy days during the period of June through September often exceed 20 days per month, well construction in the mountain region, because of the conditions in the disaster area, should only be undertaken in flat areas.

- As mountain areas are included, it will take an average of about 12 days to construct one well including the temporary staging work. More reasonable would be an estimation of 2 to 2.5 wells a month. Thus, it would be appropriate to reschedule and construct 25 wells per one year per team.

- 1.5 to 2 months will be required to construct on spring water use facility. The construction should be rescheduled to 5 spring-water use facilities in Batann during one full year period.

- A period of one month during the rainy season (June to September) should be set aside for equipment maintenance.

(4) Appropriateness of Plan Implementation and Maintenance System

PlanImplementation System

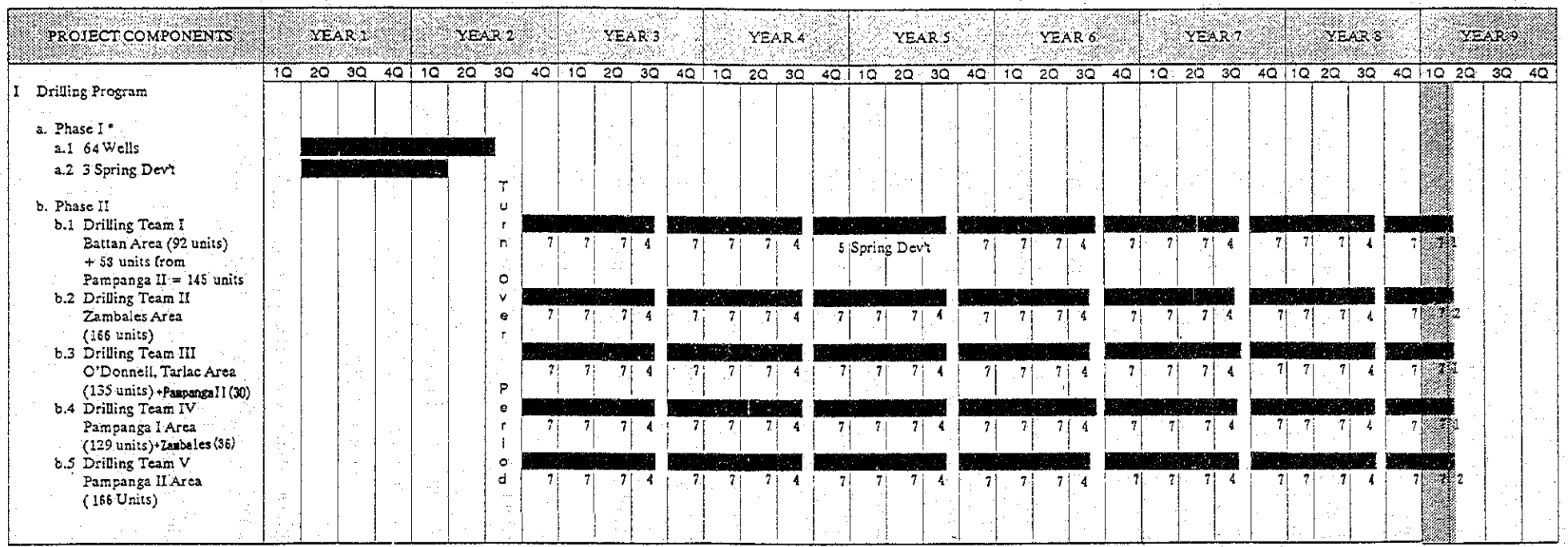
DPWH MPR-PMO will be the Project implementation agency.

As for other infrastructure development projects, the Plan will be implemented by dividing the Project's disaster areas into the five area groups - for which work schedule is being prepared - as shown in Fig. 3.3.

A boring team, each of which controlled by hydro-geologists or water supply engineers, will be assigned at each of the five area groups to undertake well construction.

Notice that each team consists of six to seven people.

JICA-ASSISTED URGENT WATER SUPPLY PROJECT
PROPOSED IMPLEMENTATION SCHEDULE



Note: Priority will be given to Resettlement Areas.
Estimated @ 7 wells/3 months/a drilling equipment including mobilization and standby

Four months extension of MPR-PMO original schedule shall be required for appropiate project implementation plan

* To be undertaken by Japanese Drilling Company.
Phase I schedule starts upon delivery of equipment/drilling rigs
Phase II starts after turn-over of drilling equipment to MPR-PMO

Fig.3.2 Implementation Schedule Proposed by JICA Study Team

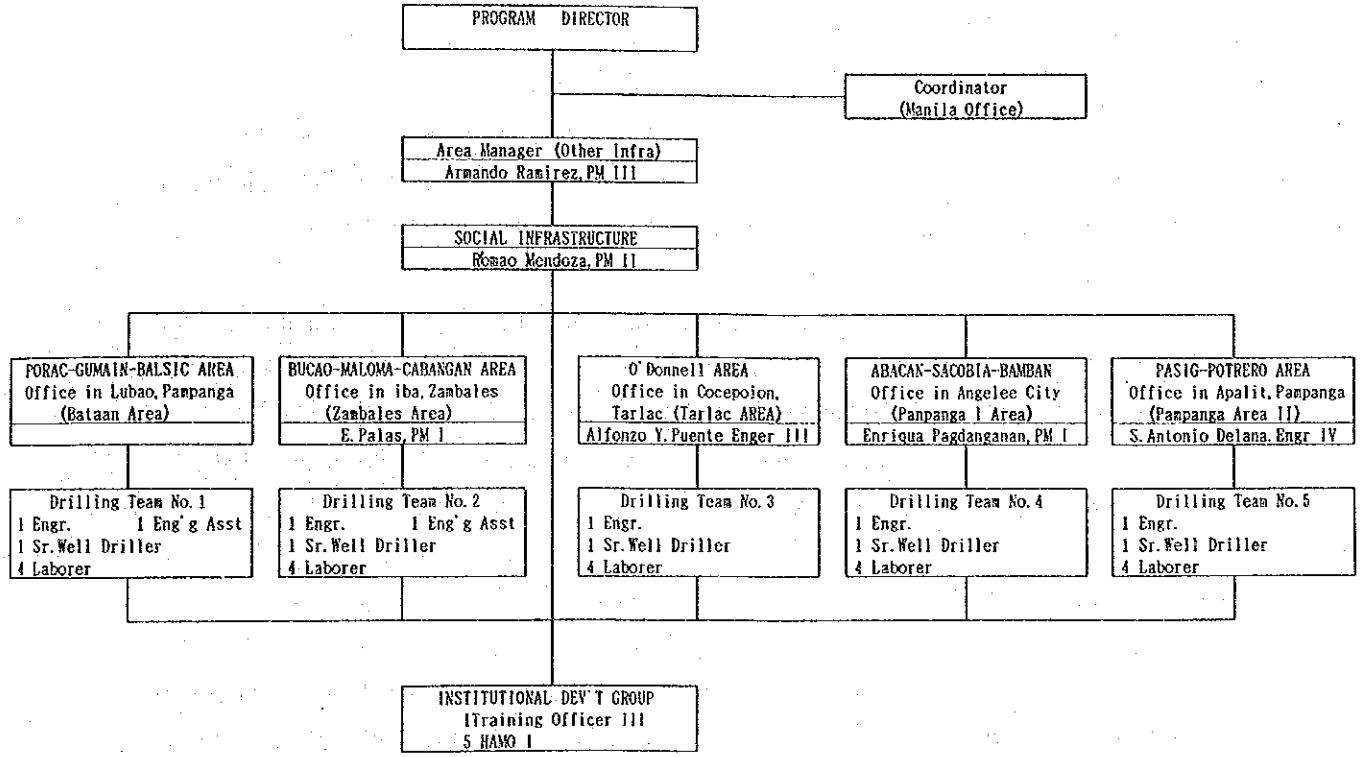


Fig. 3.3 Organizational Chart of MPR-PMO for Implementation of Plan

According to MPR-PMO's project implementation schedule, each boring team will undertake well construction work in each area group after completion of the Project carried out under the Japanese Government's Grant Aid Cooperation:

Table 3.2 Required Number of Water Supply Facilities Remaining to Be Constructed After Completion of the Project Executed UnderJapan Grant Aid

Province	Site	No. of Facilities Well	pipedSystem
Team I	. Bataan	87	5
	. Pampanga II	53	-
Team II	. Zambales	166	-
Team III	. Tarlac	135	-
	. Pampanga II	30	-
Team IV	. Pampanga I	129	-
	. Zambales	36	-
Team V	. Pampanga II	166	-
Total		802	5

As far as the Plan implementation is concerned, special attention should be paid on the following aspects, and sufficient care should be given:

- o Staff members for Plan implementation should be assigned by the end of 1993.
- o Facilities required for the construction equipment's maintenance and management should be built during the years 1993 and 1994.
- o Overall Plan schedule including staff training program should be established during the years 1993 and 1994.

O/M System

Government agencies/organizations involved in the implementation of rural water supply and sanitation projects are the DPWH, LWUA, DLG and its Local Government Units (LGU), DOH, Department of Education, Culture and Sports (DECS) and Rural Waterworks and Sanitation Associations/Barangay Waterworks and Sanitation Associations (RWSA/BWSA).

These agencies and organizations agreed on a strengthen BWSA program. The basic O/M system of Level I is outlined as follows:

- o For Level I project, training of LGUs and BWSAs in the operation, maintenance and management of water supply systems is the principal undertaking of the DLG and the DPWH which provides the technical outputs and infrastructure aspects.

- o The DPWH appropriates funds to help defray expenses of the DLG in connection with the conduction of the training.

- o Operation and maintenance are funded by beneficiary contributions and are undertaken by the beneficiaries themselves with some technical assistance from the DPWH.

- o Completed projects are managed by the beneficiaries through the BWSAs at minimal or no compensation.

- o Monitoring and evaluation of the performance of facilities and operation of BWSAs are the responsibility of the DPWH with the assistance of the DOH and the DECS, and the budget for administration/supervision allotted to the respective projects are utilized as source of funds to sustain these activities.

Administrative support will be strongly required for the O/M works of BWSA, given the low level of the infrastructure and the standard of living in the heavily damaged area.

(5) Relationship with Other Foreign Aid Project

Although requested by the Government of the Philippines, it is understood that all aid projects are integrally adjusted and managed by the said government. Possible aid organizations include Japan, the World Bank, the Asian Development Bank, USAID, Germany, and the Netherlands.

The Philippine Government has classified project fields into the provision of construction equipment for reconstruction and restoration work, development of disaster alarming and monitoring systems, ground water development, and water supply facility construction in order to request assistance in those fields from Japan.

(6) Project Elements

Considering the Plan's background and conditions explained above, evaluation of request areas' conditions, request elements and the amount of required works was made taking into account the basic policies of the Japanese Government grant aid program, maximization of grant aid cooperation, and the possibility of Project implementation. From that analysis, the following conclusions have been made:

- o Project areas should be those that were damaged by Mt. Pinatubo eruption and that are located within Region III.

- o Providing the urgency of water supply, water supply facilities to be provided by the Project should basically be of Level I. However, in such area where it is difficult to develop wells, Level II facilities, having spring-water source and pipeline, should be installed.

- o Areas to be included and facility elements to be built shall be decided upon by carefull investigation of the areas proposed by the Philippine counterpart.

- o Units of equipment, including vehicles, should be determined by taking into account requested work items and Project implementation program and organization.

- o Types and number of the existing facilities which were built by the first urgent reconstruction and restoration project shall be taken into consideration when the Project be evaluated.

- o Due to the different conditions of both rainy and dry seasons, it should be proposed that Project construction under the Japanese Government's grant aid cooperation be undertaken in two phases.

(7) Examination of Facilities and Equipment Required

1) Study of Water Source

Possibility of Groundwater Development
- Previous data study

There are some previous data regarding the hydrogeology and groundwater development as follows.

- Hydrogeology of Central Luzon, Bureau of Mines, 1970
- Hydrogeology (Zambales, Pampanga and Tarlac Province) Natural Water Resources Council, 1983
- Report on Water Resource Investigation and Georesistivity Survey for the proposed Castillejos, Zambales Resettlement Area, by DCCD Engineering Corp., June 1992
- Report on Water Resources Investigation for the proposed Clark Air Base Resettlement Area, Mabalacat, Pampanga, by AGS Management Resources, Inc. May 1992.
- Report on Water Resources Investigation and Georesistivity Survey for the proposed Bamban, Tarlac Resettlement Project Bgy, Anupul, Bamban, Tarlac, by Urban Integrated Consultants Inc. (UICI), July 1992.

According to the above data (including hydrogeological map and possible discharge map etc.), alluvial plain contains, in general, high potential groundwater; the highland is regarded as a poor area because permeability is low and development is difficult. Water well data is only available for alluvial plain and lowland. The well depth is under 160 m, transmissivity 300 to 500 $m^3/d/m$, total harness (water quality) 60 to 180 ppm. Good aquifers are distributed broadly.

On groundwater development of hilly-highland, proper well drilling depth is reported as 80 to 120 m; sufficient hydrogeological survey is required for its development, given the conditions of underground geology.

- Groundwater development potential

Since there are no previous well data for the resettlement highland areas, composed of old base rock, these sites have little potential for groundwater. Nevertheless, the best potential exists in Kalangitan and, to a lesser extent, in Baquilan, Loob Bunga and Cawag.

- Concept of water source development

For groundwater development to be possible, the minimum catchment area is of 1 Km2. 23% of underground reflown rainfall will give a potential of 1,500 m3/d.

A handpump discharge per well is only about 10 m^3/d; the handpump well will not affect the groundwater conditions.

Table 3.3 Groundwater Development Potential

Site	Topography	Geology	Aquifer	Dev't. Potentiality
ZAMBALES				
1. Dampay Salasa, Palauig	Hilly Areas	Plutonic Rock (Meso-Paleozoic)	Fissure Zone	Low
2. Baquilan, Botolan	Rolling Land	Plutonic Rock (Meso-Paleozoic)	- do -	Medium
3. Loob-Bunga, Botolan	Rolling Land	Plutonic Rock (Meso-Paleozoic)	- do -	Medium
4. Iram, New Cabalan	Isolated Hill	Volcanic Rock (Tertiary)	- do -	Low
5. Cawag, Subic	Rolling Land	Plutonic Rock (Meso-Paleozoic)	- do -	Medium
PAMPANGA				
6. Villa Maria, Porac	Hilly Areas	Volcanic Sediment (Quarternary)	Porous Layer	Low-medium
7. Nobuklod, Floridablanca	Hilly Areas	Volcanic Sediment (Quarternary)	- do -	Low-medium
8. Camies, Porac	Hilly Areas	Volcanic Sediment (Quarternary)	- do -	Low-medium
TARLAC				
9. Kalangitan, Capas	Undulating Lowland	Volcanic Sediment (Quarternary)	Porous Layer	High
10. Dueg, San Clemente	Mountainous Land	Plutonic Rock (Meso-Paleozoic)	Fissure Zone	Very Low

Note: Sites which fall into the category of "Low Development Potentiality", are considered to be unsuitable for groundwater development. Alternative scheme of water resource development, such as spring development, should be established at the sites.

Therefore, the development should be possible in deeper aquifer, starting 50 m and deeper - if surface water available, use of springs, for exemple, should be considered. Careful consideration and planning should be taken for difficult groundwater development.

The sites for spring development to be planned are:

. DAMPAY SALASA, Palauing
. IRAM, New Cabalan
. DUEG, San Clemente

The topographic maps of the sites are presented in Fig. 3.4.

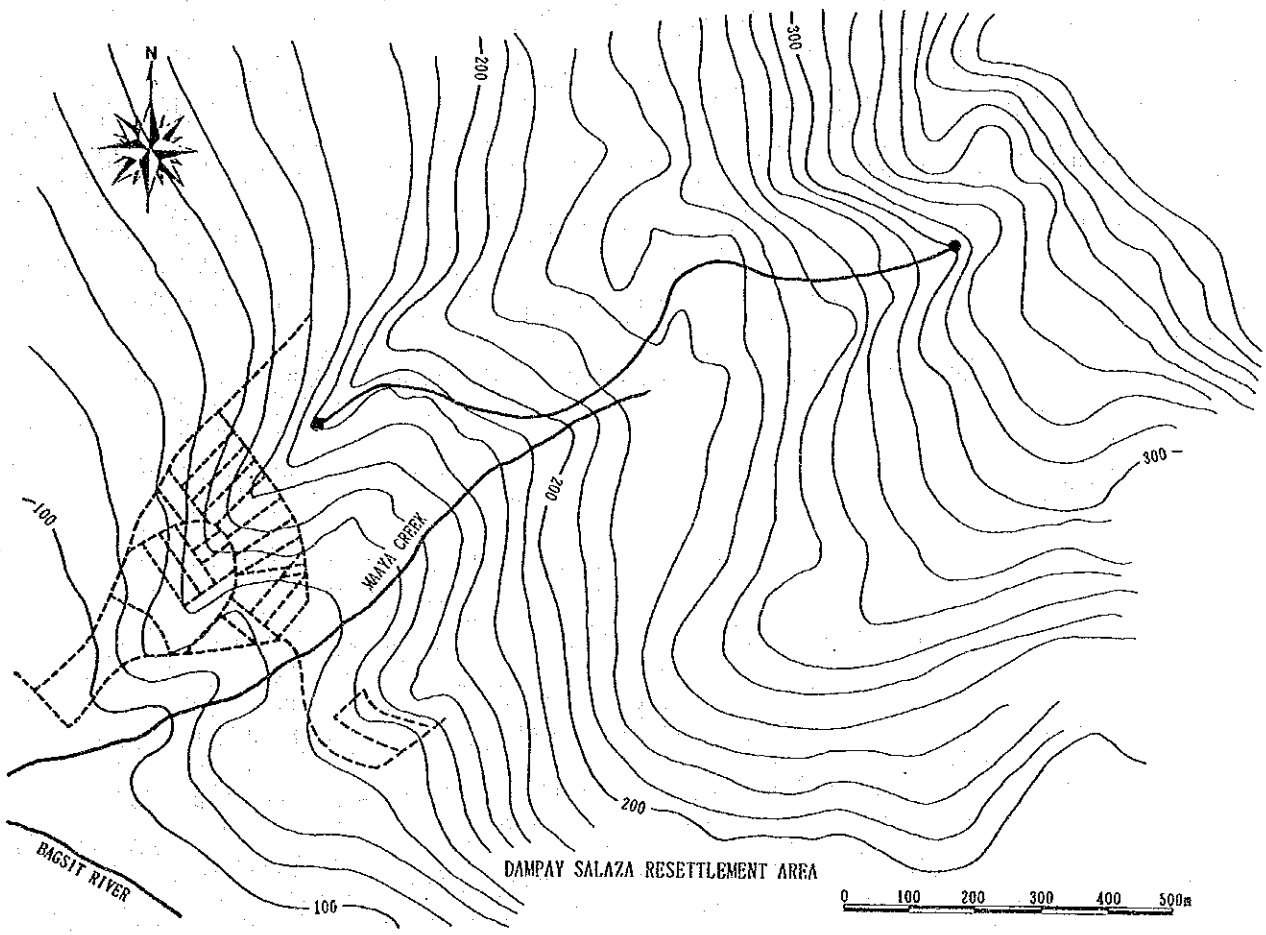
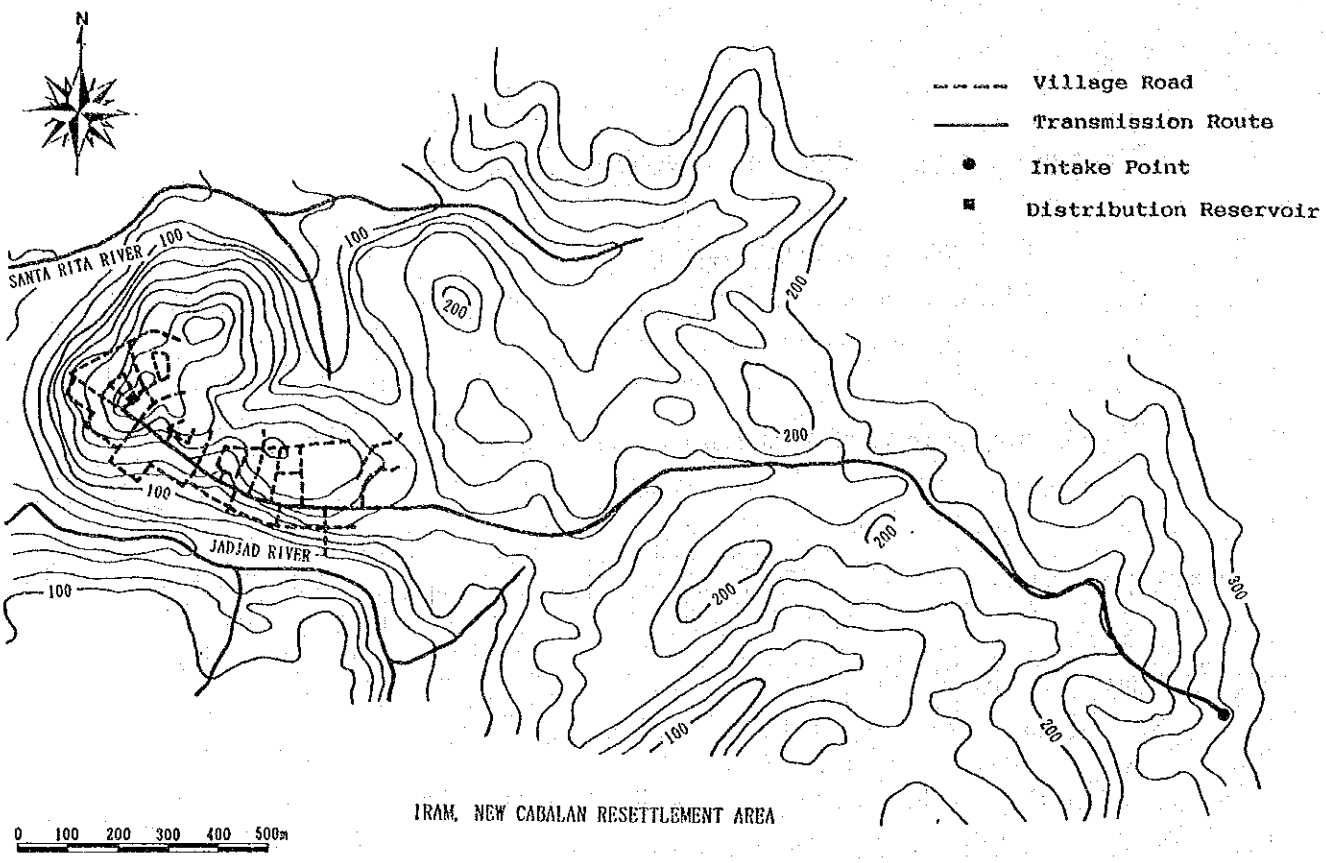
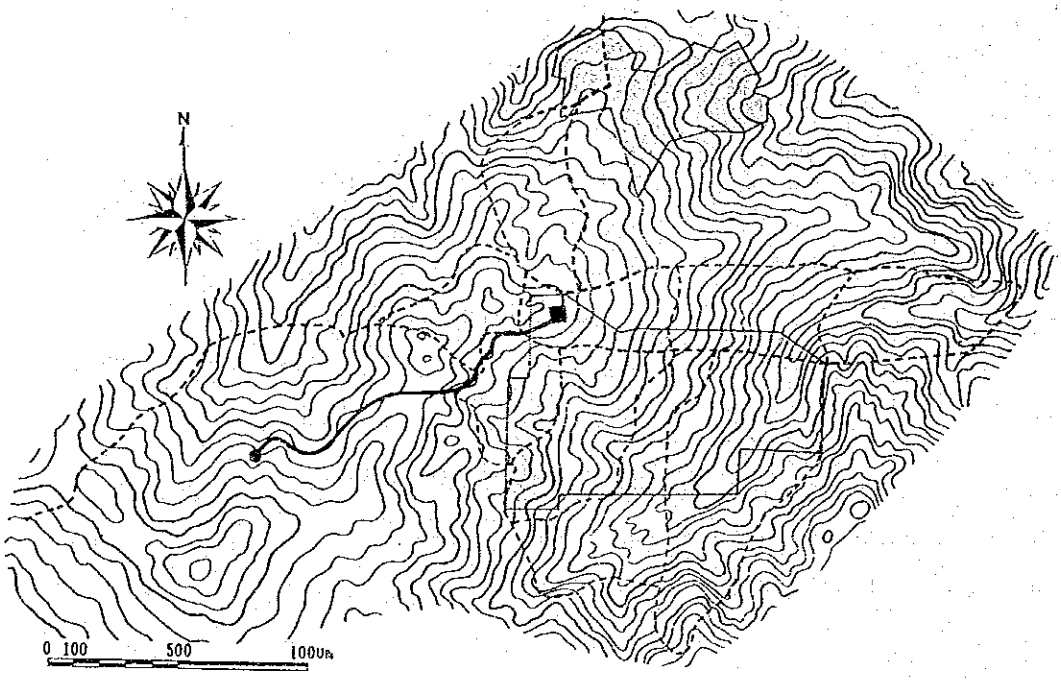


Fig.3.4 Proposed Spring Water Development Sites



IRAM, NEW CABALAN RESETTLEMENT AREA



DUEG, SAN CLEMENTE RESETTLEMENT AREA

Fig. 3.4 Proposed Spring Water Development Sites

The recommended springs have enough quantity of safe quality water (hearing and field check during field survey period of the B/D, Nov.- Dec., 1992).

However, a reconfirmation survey of water source condition is proposed for the end of the dry season (Apr. - May).

Table 3.4 Condition of Water Sources of Spring Water

Site	EL	Stream	Estimated Yield	Note
Dampay Salasa	300m	Maaya Creek	100 l/min.	by Site Survey
Iram	280m	Santa Rita R.	350 l/min.	Hearing Data
Dueg	870m	Nagbabailiam Creek	200 l/min.	Hearing Data

2) Examination of Water Supply Facility Construction Works Contents

Project Areas:

The following 3 areas were excluded from the Project:

1) Evacuation Centers: because they are temporary facilities
2) Lowland : because of the difficulty to forecast secondary
   resettlements : disaster and Level III is already under NHA projects
3) Affected Barangays : because of the impossibility to forecast secondary disaster

10 highland resettlements were first selected, from which 2 were finally excluded, leaving 8 areas being part of the Project. Nabuklod, Floridablanca was excluded because of its risk of mud flow damage to the access road; Villa Maria, Porac, the second one, because of its risk of mud flow damage to the access road and poor access road conditions. However, it is advised to urgently go on with mud flow protection work as well as access road improvement work in these two areas.

Number of Facilities:

Number of facilities to be provided by the Project was evaluated. Based on the results of field surveys and the Philippine standards, the evaluation is as follows:

- Wells with Hand Pumps:

Design water supply rate : 30 per person liters/day/person.
(Design Standard and the Philippines' average)

Hand pump's design pumping rate : 15 liters/minute
(Well capacity)

Hand pump operating rate (maximum operation) : 12 hours/day

Thus, design maximum daily pumping amount will be:
10,800 liters/day (15 liters/min.x 60 mm x 12 hr/day)

Design maximum water supply population will be:
10,800 liters/day /30 liters/day/person = 360 people
(60 to 72 units of 5 to 6 member families per well)

Based on the above, 70 families (maximum figure) per well was basically used to calculate the number of wells to be constructed.

- Spring Water Use Facilities:
The lengths and capacities of pipelines were decided upon area topographies and settlement patterns. The design was prepared based on the Philippines' rural water supply design manuals.

In an area that has existing deep wells or spring-water use water supply facilities, the number of those facilities were subtracted from the number calculated by the above-mentioned methods. When existing facilities were not functioning or their water qualities were problematic, those facilities were not regarded as existing facilities.

As the turbidities of existing shallow-well water were progressing, the water qualities would be inadequate for drinking even in future.

Design Water Supply Population:

Design water supply population was calculated based on the number of households in the resettlement areas in the Project's target year.

The target values are used in cases where population has not decreased since the survey of 1991-92; if the population did decrease, the medium values (see Table 2.18) are used.

The water supply population in the 9 Project areas will be 7,541 households.

Table 3.5 Number of Water Supply Facilities for Master Plan

Site Name	No. of Family Plan
<ZAMBALES>	
Dampay-Salaza, Palauig	330
Baquilan, Botolan	887
Loob Bunga, Botolan	1,695
Iram, New Cabalan	700
Cawag, Subic	1,600
<Pampanga>	
Villa, Maria, Porac	-
Nabuklod, Floridablanca	-
Camies, Porac	640
<Tarlac>	
Kalangitan, Capas	1,000
Dueg, San Clemente	689
Total	7,541

3) Equipment Plan

Six equipment items were originally requested by the Philippine Government but their details were not clear.

A newly established agency will undertake the Project implementation. Facilities to manage the requested boring machinery are inadequate. The items were revised in the Minutes of Discussions:

- 3 well operating equipment units shall be one item
- Work equipment for repairing provided equipment will be added

Items to be procured:

- Truck-mounted boring machine
- Maintenance service trucks
- Management vehicles
- Well operation and monitoring equipment (for pumping tests, water quality tests, and water table measuring)
- Workshop equipment for the operation and maintenance of boring machinery

Basic policies of equipment investigation are as follows:

Boring Machine:

- o Hard rocks (Mesozou to the Tertiary period igneous rocks) are widely distributed in Project areas. Suitable boring machine to drill the hard rocks should be selected.

- o Many of the Project wells have to be drilled in mountains areas. A type of machine to drill wells deeper than medium depth and suitable for mountainous areas should be selected.

- o Specifications of the machinery should be selected considering the technical and manageable capacities of the implementation agencies.

To drill a deep well in areas with old hard-rock strata, it would be appropriate to provide a top-head-drive type Danzer Hal hammer with rotary and air hammers in addition to a conventional percussion or rotary type drilling machines.

Vehicles and Equipment for the Operation and Maintenance of Boring Machinery:

- o The amount and specification of Vehicles and equipments should allow smooth implementation work, given the topography and width of the terrain (4,000 to 6,000 square km).

- o Types of vehicles and equipment should be selected considering Project implementation organization and system.

Operation and Monitoring Equipment:

- o Its specifications should be suitable for deep wells' operation and monitoring.

- o Its type should be selected by taking into account the Philippine side's operation and maintenance system and capability

The following vehicles and equipment would be required for well construction work. Thus, the details of operation and monitoring equipment will be proposed.

- o Water-supply truck
- o Air compressor
- o Submersible pumps
- o Electrical prospecting equipment
- o Electrical welding machine
- o Small and medium size bulldozers

4) Equipment Management and Maintenance Plan

A space for the equipment management and maintenance work is secured within DPWH's Region III Equipment Service Yard and establishment of a new equipment management and maintenance organization as the Equipment Maintenance Section of MPR-PMO is under way.

Construction equipment for disaster areas that were donated by various countries are already stored in the space. As an equipment management and maintenance system will be developed within several months, this place will serve as a base.

Assignment and mobilization of Project equipment to each Project area will be conducted by MPR-PMO's Equipment Maintenance Section. The type of the equipment management and maintenance system will be the same as the one of DPWH's regional office and district office.

3.3 Project Description

3.3.1 Execution Agency and Operational Structure

The main body to execute the Project is to be the MPR-PMO, DPWH.

The MPR-PMO shall secure the personnel, procure materials other than those procured by Japan, and bear the expense incurred therein.

Because the Project areas expand over 3 provinces, it is desired that the direct responsibility of this Project be borne by MPR-PMO with coordination of Regional and District offices of DPWH.

The Headquarters, specially RWS-PMO shall support the MPR-PMO in connection with the implementation of this Project.

To support each MPR-PMO concerning coordination among the MPR-PMO Regional Office and government agencies concerned (such as Task force and Infrastructure committee), the DPWH Headquarters shall make effects to continue securing the annual budget.

3.3.2 Plan of Operation

1) Urgent Water Supply Plan in Affected Area

- Construction of borehole facilities equipped with hand-pump and piped water supply facilities, aiming to provide healthful potable water, economical to the inhabitants.
- The Project plan shall be planned linking it with the Mt. Pinatubo Rehabilitation and Reconstruction Program (1992 - 2000), as an urgent drinking water supply project.
- The target communities of the Project are as below:

Province	Municipality	Facilities required
Zambales	8	245
Pampanga	25	386
Tarlac	7	151
Bataan	6	92
Total	46	874

- Designed water demand is 30 lit.cd.; maximum pumping rate is 10,800 lit./day.

  Criteria of borehole allocation is as follows:

  . Max. number of families per 1 point water source facility
  . One water source facility (well and/or faucet) should be constructed in each community block in the site.

- Number of water supply facilities constructed is estimated as 866 borehole equipped with hand-pump and 8 piped water supply systems (Level II), as given in Table 3.6:

Table 3.6 Outline of Total Urgent Water Supply Plan (1992-2000)

Province	No. of Municipality	No. of BGYs	Level I	Level II
Bataan	6	41	87	5
Zambales	8	44	243	2
Tarlac/Nueva Ecija	7	72	150	1
Pampanga I	11	62	129	-
Pampanga II	14	150	257	-
Total	46	369	866	8

- The water supply facilities are borehole facilities equipped hand-pump, intake facilities of spring water, reservoir tank and distribution facilities with appurtenant facilities to keep the facilities clean, health and erosion protection.

2) The Project under Japanese Grant Aid Corporation

a. Cooperation for Water Supply Facility Construction

The construction cooperation will be conducted with staff training of concerned personnel of the Philippine agencies. Areas to be covered are resettlement areas in Zambales, Pampanga, and Tarlac regions that most suffered from Mt. Pinatubo eruption.

Table 3.7 Contents of Construction Cooperation

SITE NAME	AREA (ha)	No. of Family Target	No. of Family Plan	No. of Barangay /Sitio	Total No. of Well Required	Existing Facilities No Function	Existing Facilities Function	Quantity of Water Supply Facilities Required Under the Project
(ZAMBALES)								
Dampay-Salasa, Palauig	652	700	330	13	10	DW(4)	SD(1)	SD(14-20)
Baquilan, Botolan	393	775	887	16	12	S-DW(7)	SD(9)	DW(8)
Loob Bunga, Botolan	328	1,695	1,695	14	25	SW(12), DW(1)	DW(3), SD(9)	DW(13)
Iram, New Cabalan	100	700	700	12	10	SW(4), SD(1)	SD(1), S(1)	SD(13-42)
Cawag, Subic	824	1,600	1,600	9	23	SD(2), SW(2)	DW(3)	DW(20)
(PAMPANGA)								
VillaMaria, Porac	10	530			8		S(2)	Excluded from the Project
Nabuklod, Floridablanca	403	650		3	10	SW(3)	SW(3), S(5)	Excluded from the Project
Camies, Porac	12	640	640	3	9	SW(5)	SD(1)	DW(8)
(TARLAC)								
Kalangitan, Capas	123	1,000	1,000	9	15	SW(8)	SW(17)	DW(15)
Dueg, San Clemente	110	2,000	689	19	29	SD(2)		SD(20-42)
TOTAL					151			DW 64Wells, SD 3sites

NOTE : *1 DW-Deep Well; SW-Shallow Well; SD-Spring Development; S-Spring;
number in the branket shows point sources and stand-pipe faucets

*2 Contaminated Water sources fall into the category of "No Function"

*3 Quantity required for each site is estimated based on the following factors:

There are 64 wells, spring water use facilities in three sites, 47 public stand pipes as shown in table 3.7.

b. Equipment Procurement

The Project consists of water supply facility construction, procurement and transportation of well drilling equipment. After completion, the Philippine side will continue the water supply facility construction by themselves using the equipment, which include a set of repair equipment and tools, along with spare parts for boring equipment. This should be sufficient to construct bore holes at 64 sites and spring water use facilities in three areas.

3.3.3 Outline of Facilities and Equipment

o Hand-pump well

Well Facilities

These include well drilling, well casing installation, well finishing work, and hand pump installation. The appurtenant facilities consist of concrete slab and sink with drainage ditches.

o Piped water supply system

Intake Facilities

An intake facility will consist of an intake weir or pit, a san removed facility (if necessary), and a drain pipe.

Transmission System

A transmission system consists of a pipeline, valves, sand flushing units, and air relief valves.

Distribution Reservoir

A reservoir tank stores water for use during peak water demand times, intake pump shutdown periods (for pump maintenance work), or for well repair periods in order to distribute water without interruption.

Distribution Systems

The system consists of a pipeline, drainage units, regulater tank, and air relief valves.

Public Faucet

The facility consists of a concrete made sink and water faucet.

3.3.4 Operation and Maintenance Plan

MPR-PMO will be responsible for the maintenance and management of well facilities, piped water supply facilities, drilling machines and the supporting equipment.

(1) Maintenance and Management of the Well Facilities

1) Basic Policy

The maintenance and management of the existing well and water supply facilities are undertaken by DPWH's District Officer who is under the supervision of the manager of DPWH's Regional Office and RWS-PMO in each Province of the country.

The responsibilities and functions of the agencies/institutions which are related with the water supply are still under consideration at the upper Regional and national level. The maintenance and maintenance aspects to be considered at the post-construction stage are as follows:

- Operation maintenance and management of water supply systems at the site level are taken care of by the BWSAs with the technical assistance of the DPWH.

- Training on operation, maintenance and management is supported technically by the DPWH, LWUA and DOH for water supply, with the BWSAs as recipients of the training.

- Monitoring of performance of water supply systems is the responsibility of the DPWH with the active participation of the DLG, LGUs, provincial/ municipal councils, DOH, DECS and Non-Government Organizations (NGOs). Problems encountered in connection with the activities are acted upon by the DPWH.

Therefore, staff shall be assigned and spare parts for the equipment maintenance shall be prepared for the O/M work of the Project, by MPR-PMO, DPWH.

- The committee of "Joint Department Order" will be requested for the total coordination of O/M activities in the post-construction stage.

2) Basic System of Operation and Maintenance

In view of the above background, the Study Team recommends that a "Management and Maintenance Center" be established at the San Fernando Central Office of the MPR-PMO in order to maintain and manage wells and piped water supply facilities.

Repair and maintenance tools for the repair workshop will be provided under the Project. The staff level and the repair shop's lot and facilities in San Fernando will be sufficient for accomplishing the maintenance and management of more than 800 wells, and a few piped water supply facilities.

Personnel of the "Management and Maintenance Center" shall be brought in from DPWM's District Offices (one person from each office) in order to introduce the management and maintenance system smoothly to each district office from MPR-PMO in the future. Once the system is introduced, the person who is assigned from each District Office for the Project's maintenance and management system will become the chief of the District Office's maintenance and management.

The personnel of the Maintenance and Management Center will consist of the following members (the Japanese engineers to be dispatched under the Project shall participate in the maintenance and management system to provide the transfer of techniques upon the system's commencement, if possible):

a) Center manager (assistant engineer class)	:	1 person
b) Clerk	:	1 person
c) Maintenance and management chief (mechanical engineer):		1 person
d) Workers (selected from each District Office*)	:	5 persons
TOTAL		8 persons

Note:* 5 District Offices of Panpanga I, Panpanga II Zambales, Tarlac and Battaan cover the Project area.

The required inspection intervals of hand pumps generally vary depending upon the pump types. The shortest inspection intervals are required for the piston packing which must be replaced at every three to six months. Therefore, the periodical inspections of Project wells must be conducted at three months interval. The inspections are to start upon the completion of well construction.

The Manager will control the Center, conduct periodic inspections of the water supply facilities, check on user complaints, evaluate any damages to the facility, and provide directions to the maintenance and management group for effective damage repairs. The Center Manager will also be responsible for taking warehouse inventory.

In response to the manager's direction, the maintenance and management group will repair the damaged facility and replace the damaged parts.

The clerk will prepare the periodic inspection reports and repair report for each district and will clarify the documents for the smooth introduction of the maintenance and management system to other districts in the future.

The Maintenance and Management Center shall retain the repair tools and spare parts in MPR-PMO's San Fernando Work shop.

Three light vehicles for periodic inspections and regular patrols will be assigned to the Center.

3) Detailed Operation and Maintenance Work

The items of operation and maintenance include the following: proper handling of hand pump; safe-guarding the facilities like the hand pump, transmission pipes, and spring boxes and appurtenances from damages; preventing wastage of water; and keeping cleaned and well-drained water source at surroundings or fetching points.

For wells, periodic check-up regimen to be carried out to determine required maintenance work are as follows :

- o Observation per every 3 months of the condition of concrete well platform, water turbidity and sand content, taste and odor of water, and well surroundings.

- o Bi-annual conduct of bacteriological examination to determine water level measurement, total depth measurement and analysis of water levels to determine the need for rehabilitation.

For hand pump maintenance, the activities shall consist of the following:

- o Check-up of parts that are easily worn out and detached like bolts, nuts, pins and bearings, and corrosion of metal parts.
- o Annual check-up of all bolts, nuts, washers, and other major parts like drop pipe and sucker rod, cylinder assembly, leather cup, handle and crank plate bearing, and handle shake.

Application of oil, tightening of loose screws, and replacement of damaged/missing parts, if necessary, after the check-up.

Schedule of maintenance of spring intake facilities is as follows:

- o Conduct of bacteriological examination, as required by the presence of potential contaminating agents at the upstream side of the spring source.
- o On daily basis, cleaning of spring intake box area, ensuring safety of source from intruders, and checking/cleaning of drain ditch.
- o On three monthly basis, checking/repair of intake box structure, and checking/replacement of damaged intake box appurtenances.

Maintenance schedule for reservoir tank consists of the following :

- o Routine procedures like keeping the structure and its surrounding clean, making sure that the reservoir is tightly covered, checking/repairing loose ladder rungs and railings, and checking the plumbing system.
- o On three monthly basis, flushing out collected silt, flushing out overflow pipe, and checking structures including plumbing and valves for leaks.
- o On an annual basis, removal of accumulated silt and sand.
- o Periodical testing for leaks in reservoir and differential settlement of water tank.

Routine maintenance of pipeline and appurtenances shall include the following :

- o Regular dialogue with the beneficiaries to gather information regarding the system.

- o Checking wet spots along the pipeline route at least once a month as these wet spots may indicate leaks.
- o Checking faucet, valve, and water meter for leaks.
- o Checking/cleaning communal faucet concrete pedestal and its surroundings including the drainage ditch.

Records of all these observations/activities shall be kept in a maintenance data sheet for future reference.

4) Monitoring System

Monitoring and evaluation of the performance of the facilities constructed under the Project shall be carried out to determine the extent to which the Project objectives have been attained. If found warranted by the results of said undertakings, ways and means shall be formulated to optimize benefits which could possibly be in the form of improved operation and maintenance practices.

Moreover, the performance monitoring and evaluation outputs can help to identify and to rectify the deficiencies in implementation procedures as well as to provide guidance for future planning, programming and budgeting activities.

A Project Benefit Monitoring and Evaluation program has been developed by the DPWH for the purpose of carrying out the above tasks. Its features and description of activities are shown below. A similar program of monitoring system shall be created for the post-project operation by MPR-PMO.

- o Conduct bench mark surveys on conditions in the proposed project sites during the pre-construction stage concerning relevant;

  - Socio-economic (main source of livelihood, family structure and income, number of users and habits),
  - Technical (water supply and sanitation conditions before construction, and plan for proposed system) and
  - Institutional/management (willingness of beneficiaries to establish BWSA, to pay for operation and maintenance of facilities, and to assist during construction) aspects.

- o Collection of data and information during the construction stage including;
  - Technical (well log; problems encountered and countermeasures taken; and the facilities constructed, actual well yield, and actual construction schedule in comparison with those planned) and
  - Institutional (status of establishment of BWSA) aspects.

- o Gathering of data/information during the operation and maintenance stage upon completion of facilities, and 3 months, 6 months, 1 year and 3 years (in dry and wet seasons) thereafter. Data shall include the following;
  - Socio-economic conditions (family structure and income, increase in economic activities, improvement in public health and hygiene, and improvement in living standard),
  - Technical aspects (source data, service population, distance & time spent for fetching, problems in operation and maintenance, water consumption and data on repairs) and
  - Institutional/management aspects (status of BWSA, water fee collection, and propagation of sanitation improvement).

- o Results of monitoring shall be evaluated with reference to the bench mark survey and the monitoring activity immediately preceding it, as a basis for determining required improvement for the following monitoring period.

- o Final evaluation shall be made in 5 years in both dry and wet seasons after completion of the projects, and the results will serve as reference for similar projects in the future.

(2) Maintenance and Management of Machines and Supporting Equipment

MPR-PMO, DPWH is responsible for the maintenance and management of the drilling machines and supporting equipment provided by the Project.

Equipment, tools, and spare parts which will be provided under the Project for workshop use shall be maintained in MPR-PMO's San Fernando Office. These items must be properly managed.

Especially, a close coordination is required between MPR-PMO and DPWH Regional II Equipment Service for construction machinery maintenance. Also, the spare parts are

limited and any additional replacement of spare parts required by the Project, must be made with the costs borne by MPR-PMO, DPWH.

3.4 Technical Cooperation

Needs for Technical Transfer

Specialists are presently dispatched to PMO-RWS and they are providing technical cooperation in the water supply field.

It is appropriate to provide a technical cooperation by dispatching specialists through PMO-RWS. Further, it is necessary to provide technical assistance through actual field work.

The following needs for technical cooperation have become evident:

- o The percussion well drilling method has been widely used in the Philippines, but experience of using the rotary drilling method is limited.
  In particular, experience of drilling a well in a hard rock area, like the Project areas, is almost nil.
- o Japanese know-how is required, as well as on-the-site training.
  As a newly established organization to serve as the Project's implementation agency, it is inevitable to provide technical assistance for MPR-PMO.

Basic Policies for Providing Grant Aid Cooperation

Basic policies for providing grant aid cooperation for the Project were clarified as followings:

- o The Project is regarded as a part of Mt. Pinatubo disaster areas' reconstruction and restoration project.
  The Project will contribute to improve domestic infrastructure by providing the facilities that will directly help to improve public health and sanitation.
- o MPR-PMO will undertake the overall reconstruction and restoration program for the implementation of the Project.

- o The Project's urgency and implementation benefits are quite high. Contents of the Project will serve for the residents' basic needs. Thus, the Project will meet the basic human principle of the Japanese Government's grant aid cooperation.
- o Areas to be included in the Project and Project constituents were selected through discussions with the concerned officials of the Philippine Government in accordance with the basic policies of the Japanese Government's grant aid cooperation. It is necessary to construct the Project facilities in two phases.

In view of the above, the Project is judged appropriate under the Japanese Government's grant aid cooperation.