PROPOSED RURAL WATER SUPPLY AND SANITATION PROGRAMME FOR CENTRAL PROVINCE PAPUA NEW GUINEA

Prepared by:

The Environmental Health Section
Department of Health

The Central Provincial Government

in

collaboration with the World Health Organization

PROPOSED RURAL WATER SUPPLY AND SANITATION PROGRAMME FOR CENTRAL PROVINCE PAPUA NEW GUINEA

(1985 - 1990)

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OF

RURAL WATER SUPPLY

AND

SANITATION PROGRAMME

CENTRAL PROVINCE

PAPUA NEW GUINEA

EXECUTIVE SUMMARY

This Rural Water Supply and Sanitation Programme is based on information collected during a survey conducted in November 1983 which used questionnaires to interview village leaders and Headmasters of community schools in Central Province.

An alarming number of villages and schools were found to be without safe or adequate water supplies and excreta disposal facilities within the survey area.

	Water Supplies unsafe/inadequate	Exreta Disposal Facilities non-existent/inadequate
Villages	81%	63%
Community Schools	75%	85%

Furthermore, the information obtained indicates that misunderstandings are common as to who is responsible for the operation and maintenance of the existing installed facilities. There is very little effective community participation in the water and sanitation sectors.

After analysis of data, discussions of issues, problems and constraints with various agencies, Government officials and individuals within the province, this proposed programme was formulated.

Essentially, the aim of the Central Province 5-Year Plan is to provide safe, adequate water and excreta disposal facilities to the 160 villages and 68 Community Schools within the survey area by 1990. Villages outside of the area will be surveyed in 1986 and the programme extended to include them when the information becomes available.

The plan is based on direct community involvement, the introduction of improved simple handpump technology and development of support systems to reinforce the Central Province rural water supply and sanitation section.

Financially, the 5-Year plan detailed in Table A requires approximately Kina 1.5 million which represents an average yearly expenditure of about K300,000 over the 5-Year period.

TABLE A

SUMMARY OF PROJECT COSTS
CENTRAL PROVINCE
RURAL WATER SUPPLY AND SANITATION PROGRAMME
FIVE-YEAR PLAN

Estimated Expenditure	1985	1986	1987	1988	1989	TOTAL
Water Supplies						
Villages	70,000	140,000	175,000	175,000	187,250	747,250
Schools	66,000	21,307	2,288	2,332	2,387	94,314
Maintenance/Construction Unit	110,000	60,000	60,000	60,000	60,000	350,000
Water Quality Monitoring/ Surveillance	1,000	2,000	2,000	2,500	2,500	10,000
Health Education	8,000	10,000	10,000	6,000	6,000	40,000
Sanitation						
Villages	8,850	17,700	23,600	24,898	25,075	100,123
Schools	2,205	706	73	74	75	3,133
Monitor/Evaluation	4,000	6,000	7,000	7,000	6,000	30,000
Manpower Training	12,000	10,000	3,000	3,000	2,000	30,000
Survey (Stage II)	-	12,000	-	-	-	12,000
Total Estimated Expenditure	282,055	279,713	282,961	280,804	291,287	1,416,820
Contingencies	28,206	27,971	28,296	28,080	29,129	141,682
	310,261	307,684	311,257	308,884	320,416	1,558,502

By 1990, safe, adequate water and sanitation facilities will be provided for 51,340 people within the survey area and 42,700 people will have received new facilities as a result of the implementation of this 5-year plan.

1. INTRODUCTION

1.1 Background

The Central Province Government intends to improve the living conditions and health standards of its rural population. The Provincial Government clearly recognizes the need to help the people in the rural areas to obtain a clean, safe, adequate water supply and to have access to proper sanitary excreta disposal facilities.

In order to identify the water and sanitation needs of Central Province, the Provincial Medical authorities agreed to participate with the UNDP-funded WHO executed IDWSSD Advisory Services Project. The project area selected was the coastal plain along the West coast of the province. This area was given priority because of the acute need for water and sanitation facilities. In addition, the area was easily accessible by road. The scope of the programme was also limited by the amount of funds available.

The project area is within the hatched lines on the map in figure 1. Since the survey was aimed at the rural areas the following main district towns not included in the project are:

Bereina (Mekeo District)
Sogeri (Hiri District)
Kwikila (Rigo District) and
Kupiano (Marshall Lagoon District)

A master list of all the villages in the project area is included as Annex I.

2. PROJECT AREA

2.1 Topography

The long narrow coastal plain of Central Province extends the length of the province and gives way to a typically rugged mountain chain which forms the backbone of the interior of the Province.

2.2 Rainfall

The rainfall patterns are affected by the Northwest and the Southeast monsoons. Precipitation rates therefore, vary throughout the Province but generally, the mountainous area experiences abundant rainfall all year round while the coastal plain is dry and subject to drought.

Rainfall varies from a low of 200mm/year to a high of 2,245 mm/year. For example, some yearly averages along the coastal plain are as follows:

Bereina	1182 mm/year
Kwikila	1147 mm/year
Aroma Coast	2245 mm/year
Marshall Lagoon	1545 mm/year

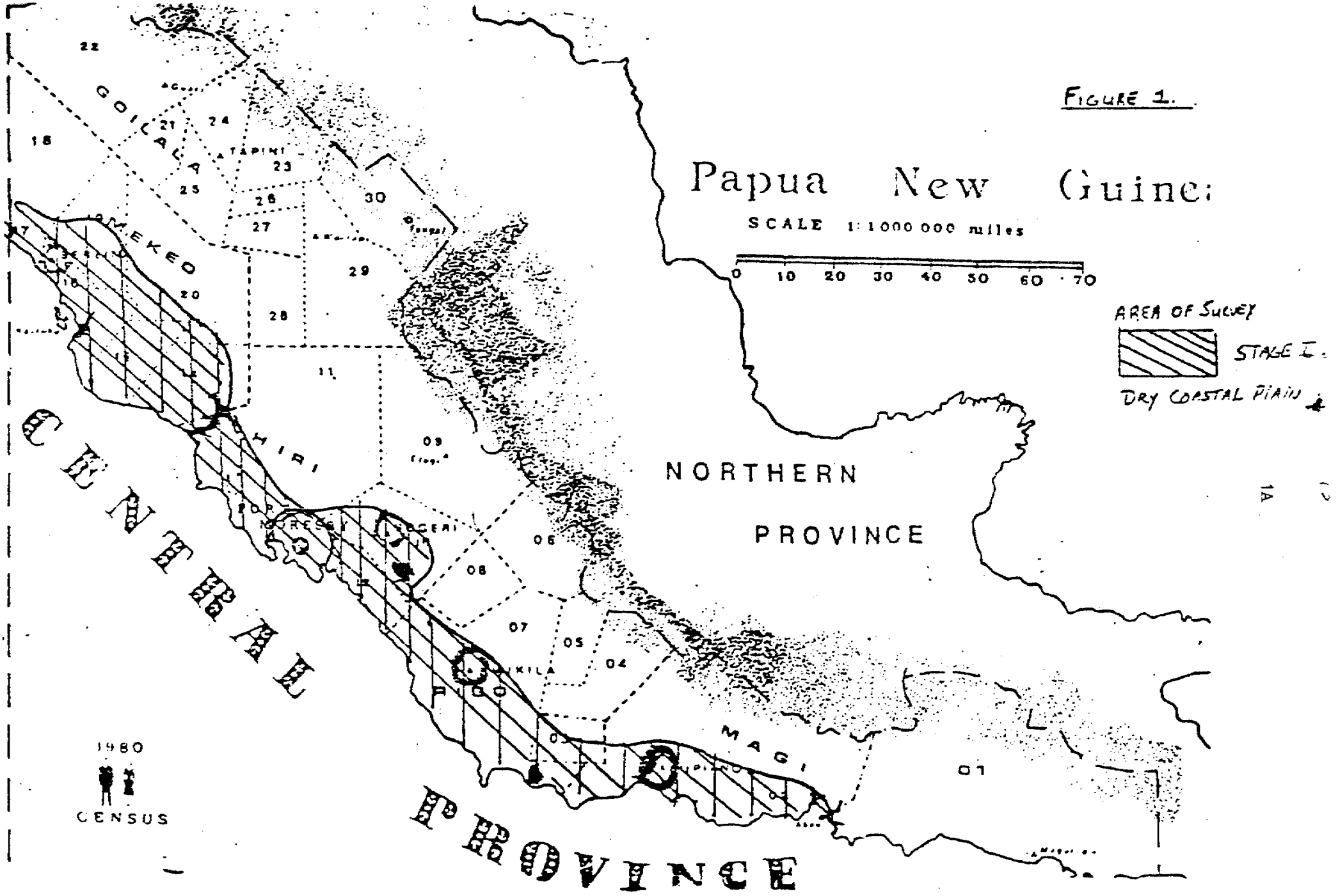
Papua New Guinea
SCALE 1:1000 000 miles
0 10 20 30 40 50 60 70
AREA OF SURVEY
STAGE I.
DRY COASTAL PLAIN
NORTHERN PROVINCE
CENTRAL PROVINCE
GOILALA
KOMEKEO
HIRI
MAGI
TAPINI
22
18
21
24
25
23
26
27
30
29
28
20
11
09
06
08
07
05
04
01
1980
CENSUS

FIGURE 1.

1A

Dry seasons also vary both in time of occurence and duration. From the Aroma Coast south toward Amazon Bay two dry seasons occur; one during January, February and March and the other in November and December. From Kwikila to Bereina, one long dry season occurs from April to October (7 months).

3. POPULATION

3.1 General

Central Province had a population of 117,242 in the 1980 National Population Census. The majority of the population live along the coastal plain in the Sogeri Valley, and in the large villages in the fringe area of the National Capital District where Port Moresby is located - the largest city and the capital of Papua New Guinea.

3.2 Population within Project Area

The 1980 population of the villages included in the project area was 46,500 or 40% of the total population of the province. The annual growth rate is estimated at 2 percent by the National Statistics Office. The villages within the area range in size from less than 10 to over 2,000 people. The average village population is 205. However, a number of urban areas, government and private institutions were not included in the project. They were not considered because all are provided with water supplies by the Department of Works and Supply.

Table I
District Towns Excluded from Survey

	District Towns	District	Pop (1980)
(1)	Bereina	Mekeo	585
(2)	Sogeri	Hiri	1,188
(3)	Kwikila	Rigo	1,019
(4)	Kupiano	Marshall Lagoon	945
		Total Population	3,737

Table II
(1980) Population within Project Area

	Category	1980 Population	% of Total Pop. of Province	Surveyed
1.	Rural villages	46,500	40%	Yes
2.	District towns	3,737	3%	No
3.	Gov/private stations/ plantations, highschools, health centres and settlements	15,438	13%	No
	Total Pop. within Survey Area	65,675	56%	40%

4. EXISTING SITUATION

4.1 General

A number of rural water supplies have been constructed in Central Province; but, a large proportion of them have broken down due to lack of maintenance. On the other hand, little has been achieved in the development of excreta disposal facilities (See Annex 2). Very few records exist showing the type, condition and distribution of water supply and sanitation facilities in the province.

4.2 Organization

Water supply and sanitation facilities serving district towns and government institutions are the responsibility of the Department of Works and Supply, whereas, plantations are responsible for their own systems. The provision of these services to rural villages and community schools are the responsibility of the rural water supply unit of the Provincial Department of Health.

4.3 Existing facilities

Water Supply: Only 24 (19% of the survey population) of the 184 villages in the project area have a a safe, adequate water supply. The remaining 160 villages (81% of the survey population) have unsafe and inadequate water supplies.

Sanitation: Approximately 37% (17,400) of the people use different forms of sanitary excreta disposal facilities. The remainder defecate in the bush.

5. PROJECT AREA SURVEY

5.1 General

In November 1983, a team consisting of: 20 members of the Papua New Guinea Defence Force (Preventive Medicine Platoon); one Health Inspector from the Central Province; two trainees from the Madang College of Allied Health Services; one Health Inspector from the Department of Health; and one WHO staff member in Port Moresby started a survey of the project area.

5.2 Objectives of the Survey

The objectives of the rural water supply and sanitation survey were to:

(a) collect information on the general environmental conditions in the rural villages and community schools;

(b) obtain information on and evaluate the condition of the existing rural water supply and sanitation facilities in the villages and community schools;

(c) identify the attitudes of villages in respect to, and collect information on present and expected village participation in developing, maintaining and operating water supply and sanitation projects;

(d) recommend improvements to the present systems or the construction and installation of new systems;

(e) identify project priorities.

5.3 Data collection

A questionnaire (see Annex 3) was developed to guide team members in collecting baseline information through interviews with the village leaders and school teachers and by direct observation of physical, environmental and socio-economic conditions in the community. Other general data on the villages and schools included names, locations (districts), number of houses, population, etc.

Information gathered on water supply and sanitation included:

(a) Water supply

(1) The main water source: type, condition, functionability and collection time

(2) Alternative water source: if applicable and collection time

(3) Utilization by community: percentage using main source. Reason for exclusion of certain groups, if applicable

(4) Protection and safety of supply

(5) Maintenance and operation procedures

(6) Village attitudes concerning future community participation

(7) Recommendations for providing water supplies

Sanitation

(1) Types of excreta disposal systems in villages or schools

(2) Estimate of percent of community using the facilities

(3) General environmental sanitation

(4) Recommendations for improvements

6. FINDINGS

6.1 General

The survey identified the water supply and sanitation facilities and needs in 184 villages with a total population of 46,500. The data show that a definite maintenance/operation problem exists probably due to misunderstandings between the communities and the government or agency which installed the systems. The assignment of responsibility for maintenance and repair was not always clearly defined. Only 12 villages claimed to have a maintenance fund while 29 did not. No information was available on maintenance and operation in 51 villages either due to their having open wells or the interviewers did not complete the questionnaires. The remaining 92 villages obtained their supplies from natural sources. The survey indicates that basically, the villages expect the Government to provide free water systems, with government labour followed by free maintenance and repair of the installed facilities.

6.2 Village Water Supplies

6.2.1 Existing Coverage

Only 19% of the survey population (24 villages) have a safe and adequate water systems. 81% of the people (160 villages) had unsafe and inadequate water supplies.

Table III
CENTRAL PROVINCE
VILLAGE WATER SUPPLIES Nov 1983

Water Supplies	Total No. of Villages	Population (1 9 8 0)	Percent of Population in Survey
Province		117,242	
Survey Area (Stage I)	184	46,500	40%
Safe, Adequate Water Supply	24	8,640	19%
Unsafe, Inadequate Water Supply	160	37,860	81%
T O T A L	184	46,500	100%

Of the 184 communities surveyed, only 56 had installed systems and of these, only 24 were functioning, as shown in Table IV.

Table IV
Installed Water Systems

Water Supply Systems	No.	%
Installed systems	56	100
Functioning systems	24	43
Non-functioning systems	32	57

6.2.2 Non-functioning water systems

More than half (55%) of the installed systems did not function. And of the systems (32) which did not function, 81% (25) were broken down due to lack of maintenance.

When the village leaders were asked why their systems did not fuction, their replies were recorded as follows:

No Maintenance	25	(81%)
Vandalism	1	(3%)
No Funds for Fuel	1	(3%)
No reply/information recorded	4	(13%)

When the village leaders were asked who was responsible for maintaining the system, they indicated that the villages assumed that whoever installed the systems was responsible for its maintenance. (Refer to Annex 4).

6.2.3 Water sources

The data show that most of the communities used either surface water or wells. Some communities had piped supplies while others used rainwater tanks as the main water source. The distribution is shown in Table V.

Table V
Water Sources

Type	No. of villages	Percentage in Survey
Natural (Surface) Water	84	(46%)
No of Wells	74	(40%)
Piped Supply	18	(10%)
Other Systems	8	(4%)
	184	(100%)

6.2.4 Surface Water

84 villages used surface water. All of these sources were considered by the interviewers/observers, unsafe for human consumption due to the present of bacteriological contamination. 53 villages obtained their water from streams, 17 from creeks, 11 from springs and 2 from swamps and 1 from a pool(Refer to Annex 5). Although 47 (56%) of these villages were able to collect water and return to their houses within 15 minutes, 12 villages (14%) took over 1 hour for water collection (Refer to Annex 5).

6.2.5 Wells

74 villages used wells. Only 15 villages however, had a protected well and of these, over one-half were found to be bacteriologically contaminated (when tested by the H_2S method) (Refer to Annex 6). In all, only 29 wells with pumps were identified of which 11 pumps were functioning. The remainder of the wells are open hand dug holes-in-the-ground without a pump or protection from surface contamination. Water collection is by bucket or similar container. 48 villages (65%) collected water within 15 minutes while 8 villages took over 1 hour for collection (See Annex 6). 7 villages claimed to have an operation/maintenance fund, while 21 did not. No information on maintenance was available for the remaining 46 villages either because they used open wells or the interviewers did not fill in the questionnaires.

Again the responsibility for operation and maintenance is not well defined. The general assumption is that the government or whoever installed the system is responsible for its maintenance. Table VII refers.

6.2.6 Piped water supplies

18 piped water supplies exist in the survey area. 15 of the systems are functioning. Only 4 villages have assumed responsibility for maintenance and operation. Some of these are large villages which are fairly close to Port Moresby. However, while they are functioning, many of them do not provide safe or adequate water.

6.2.7 Other water supplies

Only 8 systems are listed under other water supplies and most of these are rainwater tanks which range from 44 gal (200 litre) drums to 1,000 or 2,000 gal tanks. In most cases, storage capacity is insufficient and poor quality water from nearby rivers or streams is used to fill the tanks during drought periods. Some tanks need to be repaired and others should be replaced.

6.2.8 Safe, adequate and functioning water systems (Refer to Annex 7)

Only 24 villages, representating 19% of the survey population in Central Provinces were found to have safe and adequate water supplies. The types of systems in these 24 villages are listed in Table VI:

Table VI
Existing adequate water systems by type

PNG modified handpump	3
Solar	3
Motorized	10
Windmill	1
Fuji handpump	1
Well piped	3
Port Moresby City Water Supply	3
Total	24

Table VII details the agencies responsible for operating and maintaining these systems.

Table VII
Maintenance Responsibility (as identified by the villages)

Works and supply	7
Village Committee	6
Provincial Government	3
Department of Minerals and Energy	2
Private Contractor	1
No one	5
	24

The majority of these functioning system are relatively new installations which is probably why they are still functioning. None of the agencies have a preventive maintenance programme in progress.

6.3 Village sanitation

Excreta disposal facilities and defecation habits were also investigated during the survey. The results indicate that 37% (91 villages) of the survey population use various forms of acceptable sanitary excreta disposal facilities. 63% (93 villages) of the people however, defecate outdoors in the "bush" surrounding the village. See Table VIII below.

Table VIII
Central Province
Existing Village Sanitation Facilities

	Sanitary Facility	Total No. of Villages	Pop (1980)	Percentage of Pop. in Survey
1.	Acceptable facilities (latrines/pit, overhang) septic tanks, etc.	91	17,400	37%
2.	Not acceptable No facilities Outdoor defecation	93	29,100	63%
	Total	184	46,500	100%

6.4 Community schools

Community schools, for children from 8 years to 13 years old, were also included in the survey. Information was collected on 68 schools which had a total enrollment of 10,003 students.

6.4.1 Water supplies

The results show that only 25% of the school population (13 schools) have safe, adequate water supplies while 75% (55 schools) require attention as their water supply is considered unsafe and inadequate.

Table IX
Central Province
Community Schools Water Supplies

Water Supplies	No. of Schools	Enrolment	Percent
Survey area	68	10,003	100%
Safe, adequate	13	2,470	25%
Unsafe, inadequate	55	7,533	75%
Total	68	10,003	100%

The following table details the type of water supplies found at the schools.

Table X
Community Schools
Water Sources

	Source of Water	No. of Schools	Adequate	Inadequate
1.	Water tanks	40	5	35
2.	Piped supply (various sources)	13	8	5
3.	Open wells	9		9
4.	River	9		9
5.	Unprotected spring	2		2
6.	Swamp	2		2
7.	No supply	1		2

The preceding list of sources does not tally to 68 schools because some of them are served from more than one source. While most of the schools rely on rainwater catchment systems, they are frequently dry during extended drought periods. Many of the piped supplies are not functioning and the remainder of the sources are subject to contamination. Generally, the schools do not have adequate quantities of water.

6.4.2 Sanitation

Of the community schools surveyed, only 11% (5 schools) had adequate excreta disposal facilities. 85% (59 schools) will require an estimated 340 new latrines (teacher's latrines included) to bring them up to Papua New Guinea's design standard of 20 students per latrine. No information was available on the facilities at 4 schools (4%). See Table XI below.

Table XI
Central Province
Sanitary Facilities in Community Schools

Excreta Disposal Facility	No. of Schools	Enrolment	Percent
Adequate	5	1,092	11%
Inadequate	59	8,521	85%
No information	4	390	4%
Total	68	10,003	100%

7. RECOMMENDATIONS FOR IMPROVEMENT

7.1 General

In order to avoid the typical maintenance and operating problems which have been outlined, both the National and the Provincial Governments have developed policy statements which require that communities must participate in the construction, maintenance and operation of water and sanitation facilities. In effect, the policy is - no participation, no facilities. The recommendations of this programme are therefore based on these policies and provide for full community participation. However, in addition to the physical aspects of scheme construction, the communities must be better informed on the needs for such facilities.

The findings, for example, indicate that there is a definite lack of awareness at the village level, of the importance of safe water supply and sanitation facilities for the general health of the community. A need then exists to improve health education programmes by initiating innovative approaches into intensive campaigns in the communities and schools of the province. In addition, a technical assistance programme is required to assist the communities in identifying and correcting a wide range of environmental problems.

7.2 Village water supply

Basically, the field observers/interviewers recommended simple and inexpensive systems to serve the 160 villages which had unsafe, inadequate water supplies. Simple systems however, were not always appropriate due to the topography, the location of the source and the distance from the village to the waterpoint. Some complex systems were recommended by the rural water supply section officials in collaboration with a private contractor and engineer. Table XII details the proposed water supply improvements for the rural villages.

Table XII
Proposed Improvements for Village Water Supplies

		No. of Villages	Population (1980)	Percentage of Pop. in Survey
1.	Protected well with handpump	102	24,158	52%
2.	Solar systems	9	4,987	11%
3.	Motorized systems	12	7,229	15%
4.	Repairs	7	3,553	8%
5.	Boreholes	3	1,764	4%
6.	Other	6	1,558	3%
7.	Further investigation required	21	3,251	7%
	TOTAL	160	46,500	81%

7.2.1 Protected well with handpump

It is estimated that 164 wells with handpumps will be required to serve 102 villages with a population of 24,158. This is an inexpensive option which will provide safe, adequate water to the majority of the people in the province. Each handpump is expected to serve between 150-200 people and the total estimated cost is K33,000. See Annex 9.

It is proposed to use the PNG handpump (a modified version of the pump developed by the Blair Institute in Zimbabwe, Africa). This pump has been modified for use in Papua New Guinea and has been field tested for 1 1/2 years by the Government in close collaboration with World Bank and UNITECH at Lae with very good results. The pump is simple to

fabricate, install, operate and maintain and it is relatively inexpensive, (approximately Kina 85.00 per unit). Spare parts also are available locally. Health inspectors easily grasp the principles of operation of the pump and have proven through various workshops that they can easily assemble, install and repair it. It is because of its performance record, low cost, simplicity and ease of operation and maintenance, that this pump is recommended for use in this programme.

7.2.2 Complex systems (solar and motorized)

There are approximately 40 complex systems in Central Province. An additional 21 solar and motorized units have also been recommended for installation within the survey area. These systems are expensive and the mechanical systems are, in particular, difficult to maintain.

The cost of these systems, are estimated at Kina 626,000*. As they would provide water to only 12,216 people (or 26% of the survey population)(Refer to Annex 10), it is recommended that an indepth technical review of the conditions and the requirements of the villages, be carried out by the Department of Works and Supply to identify the most efficient and economical systems. In addition, indepth consultations should be held with all the members of the communities to ensure that the systems selected are affordable to the villagers and are appropriate to their social, cultural and economic circumstances.

7.2.3 Repair of existing systems

7 village water systems require repairs. It should be noted that while some systems have broken down to lack of maintenance others were damaged by individuals of different clans in disputes over land and water rights. The estimated costs of repairs are K/75,000. See Annex 11.

7.2.4 Deepwell systems

Deep well systems are required to serve the three villages listed in Annex 12. Estimated costs are K11 000.

7.2.5 Other Systems

The villages which are listed in Annex 13 will be provided with handpumps and 1 protected spring. The estimated costs are K740.

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1 Kina = $1.07 US Dollar*

7.2.6 Further investigation

The investigators were unable to identify suitable systems for the villages listed in Annex 14 because of the complex geology of the area. Salt water intrusion is a problem and the Department of Works and Supply in consultation with hydrogeologists should assess the existing water resources in order to develop appropriate recommendations.

7.3 Priority villages

Project priorities have been established on the basis of those villages which:

(1) require 60 minutes (1 hour) or more to collect their drinking water and return to their home;

(2) must buy/truck drinking water and do not have a source in the village; and,

(3) supply water to schools.

The 25 villages listed in Annex 8 were selected on the basis of the foregoing criteria. The implementation programmes are detailed in Table XIV. When implementation begins, the villages on the priority list will be given the first opportunity to participate in the programme.

7.4 Village sanitation

Only 37% of the population in the survey area have and use excreta disposal facilities. A programme to provide 100% coverage is presented in Table XV. The plan proposes to provide limited financial support and technical assistance in the provision of ferrocement latrine slabs. Total costs for the 5-year period is K100,123. A health education programme will also be instituted to encourage the villagers to use the facilities. The campaign in the rural areas will focus on the relationship between safe drinking water and sanitary excreta disposal facilities in community schools, and in the villages. Health inspectors will be in charge of these programmes and they will be supported by the health education specialists, aid post orderlies and village health workers. Guidelines for the proper location of pit latrines also have been drawn (Annex 15) and will be distributed to the villages and schools.

7.5 Community schools

7.5.1 Water supplies

68 community schools were surveyed. Only 13 (25%) were considered to have a safe and adequate water supply. 55 (75%) have unsafe, inadequate water. Table XIII below lists the proposed improvements for the 55 schools.

Table XIII
Community Schools
Water Supply Systems

	Systems	No. of Schools	Enrolment	Percent of Students
1.	Protected well with handpump	30*	3,918	39%
2.	Repair of existing systems	4	459	5%
3.	Action deferred	2	130	1%
4.	Asso. with proposed village improvement scheme	13	2,279	23%
5.	Require further investigation	6	747	7%
	T O T A L:	55	7,533	75%

30 schools require 32 wells and handpumps.*

32 protected wells with handpumps can provide safe, adequate water for 30 schools or 3,918 students which constitute 39% of the school enrolment. While 4 school systems require repairs, and 13 are dependent upon improvements to the village water supplies, 6 others require investigation by the Department of Works and Supply; action is being deferred on 2 other schools as they are either closed or relocating (see Annex 18). The provision of water supplies to community schools will receive top priority in this programme. 32 protected wells with handpumps are scheduled to be constructed and installed during 1985 - the first year of the programme. Repairs to the existing systems will be made by the maintenance/construction unit. Efforts will also be made to expedite the village projects on which the 13 schools depend for water. The total estimated costs are K94,314.

7.5.2 Sanitation

Of the 68 community schools, only 5 had adequate sanitary disposal facilities. 59 schools require 340 new latrines (teaching staff included) to provide them with adequate facilties.

7.5.3 Latrine slab programme

Concrete slabs will be distributed to the schools on the basis of one slab for every 20 students. Installation of the slabs and construction of the buildings will be implemented by the parents. Supervision will be provided by the provincial health inspectors. Guidelines for latrine location will be distributed to the headmasters of the schools (Annex 15).

8. SUMMARY OF PROPOSED PROGRAMME RECOMMENDATONS

8.1 General

This programme intends to supply all the population within the survey area with safe, adequate water and sanitation facilities within the 5 year period 1985-1989.

8.2 Village water supply systems

Table XIV indicates the water supply coverage by population. It also details the costs and the expected population coverage rate for each year of the five year period.

Table XIV
Village Water Supply Systems

Year	Population Survey Area (2)	Population to be Served[1] (3)	Pop. Served Total (4)	Pop. Served Percent[3] (5)	Estimated[2] Cost (Kina)(6)
1984	46,500		8,640	19.2	-
1985	47,430	4,000	12,640	26.6	70,000
1986	48,379	8,000	20,640	42.6	140,000
1987	49,347	10,000	30,640	62.1	175,000
1988	50,334	10,000	40,640	80.7	175,000
1989	51,340	10,700	51,340	100.0	187,250
				TOTAL	747,250

1/ Based on 2 percent annual growth rate
2/ Estimated cost per capita expenditure of K/17.5
3/ No of people to receive a safe, adequate water supply each year
4/ 1 Kina = approximately USD$1.07

The table also provides the following details:

(1) Year 1984 (Column 1)

20(2) The rural population (Column 2 - based on 2% annual growth rate) of 46,500 people (1984) will increase to 51,300 by 1990).

The following calculations are necessary to determine the total population to be served by the end of 1990 (5 years).

51,340 population base
-8,640 population served 1984 (end of survey)
42,700 population to be served 1989-90.

(3) Column 3 "Proposed Implementation" shows the population which will be served each year with safe, adequate water. For example, in 1985, 4,000 people (Column 3) will be served, in 1986, 8,000 people, in 1987, 10,000 people, etc.

(4) Columns 4 and 5 shows the cumulative population served and the % coverage attained for each year.

(5) Column 6 shows the cumulative expenditure for each year of the programme. Based on the total estimated cost of the proposed improvements detailed in Table XIV, the cost per capita is K17.5. Therefore, in 1985, the estimated cost to provide water to 4,000 people will be K17.5 x 4,000 = K70,000. Similarly, in 1986, K17.5 x 8,000 pop. = K140,000 and so forth.

The complete 5-year plan will cost approximately K747,250 (See Annexes 5,6,10,11,12,13).

8.3 Sanitation

Table XV provides information on the provision of village excreta disposal facilities (Latrine slabs construction) for the same 5-year period. The table indicates that 17,400 (Column 4) or 37.4% (Column 5) of the people have access to some type of sanitary excreta disposal facility. The population to be served is 62.6% (51,340 - 17,400) or 33,940 people. Based on an estimated per capita cost of K/2.95, the cost to serve 3,000 in 1984 will be K2.95 x 3,000 or K8,850. The total cost of the 5-year programme will be K2.95 x 33,940 or K100,123.

Table XV
Excreta Disposal Facilities - Latrines

(1) Rural Population*

Year	Total in Survey Area (2)	Population to be Served (Proposed Implementation) (3)	Pop. Served Total (4)	Pop. Served Percent (5)	Estimated* Cost (Kina)(6)
1984	46,500		17,400	37.4	
1985	47,430	3,000	20,400	43.0	8,850
1986	48,379	6,000	26,400	54.6	17,700
1987	49,347	8,000	34,400	70.	23,600
1988	50,334	8,440	42,840	85.	24,898
1989	51,340	8,500	51,340	100.0	25,075
			TOTAL		K 100,123

(1) Based on 2 percent annual growth rate

(2) Cost per capita K/2.95

8.4 Community school water supplies

All the community schools within the survey area will also be served by the end of 1986. Table XVI outlines the proposed rate of implementation.

Table XVI
Community Schools
Water Supply Systems

Year	Enrolment	Population to be Served (Proposed Implementation)	Pop. Served Total	Pop. Served Percent	Estimated* Cost (Kina)(6)
1984	10,003		2,470	25	
1985	10,203	6,000	8,470	83	66,000
1986	10,407	1,937	10,407	100	21,307
1987	10,615	208	10,615	100	2,288
1988	10,827	212	10,827	100	2,332
1989	11,044	217	11,044	100	2,387
			Total Estimated Cost		K 94,314

(1) Based on 2 percent annual growth
(2) Estimated cost per capita K/11.00

In 1985 and 1986, 7,937 students in 40 schools will be provided with clean adequate drinking water. Thereafter, supplies will be augmented as required to meet the population increase.

8.5 Community school - sanitation

Table XVII provides similar information on excreta disposal facilities for the schools.

Table XVII
Community Schools Sanitation

Year	Enrolment	Population to be Served Proposed Implementation	Pop. Served Total	Percent	Estimated* Cost (Kina)(6)
1984	10,003		2,092	21	
1985	10,203	6,300	8,392	76	2,205
1986	10,407	2,015	10,407	100	706
1987	10,615	208	10,615		73
1988	10,827	212	10,827		74
1989	11,044	217	11,044		75
			Total Estimated Cost		K 3,133

*Estimated cost K/0.35 toea/capita

The table indicates that 6,300 students will be served in 1985 and 2,015 in 1986. The programme will give 100% coverage for community school latrines within the survey area by 1990. The remaining programme provides for the population increase of 2% per annum. The total estimated cost based on a per capita cost of 0.35 toea and 20 students/latrine slab is K/3,133.

8.6 Programme implementation/support progamme

8.6.1 General

In order to implement the recommended water and sanitation programme, a number of related activities will also have to be instituted. These include: involving the rural communities in the programme; developing a construction and maintenance unit in the province; strengthening the environmental health department; and implementing a manpower training programme. These activities will have to be implemented before the construction programme can begin on 1 April 1985.

8.6.2 Comunity participation

Past experience has indicated that systems have failed because communities have not been involved in the management, construction and operation of the installed facilities. As a result, the national and provincial governments have drafted policy statements which require the rural communities to participate in the implementation of water and/or sanitation programmes. The conditions are that the community must:

(1) provide cash;

(2) contribute free labour for construction of the proposed water supply and/or sanitation facilities;

(3) provide manpower for operation and maintenance;

(4) organize a village health or water committee; and,

(5) establish adequate tariff rates to support a maintenance operation fund.

The first condition is flexible as the degree of contribution will depend on the ability of the respective villages to contribute. The remainder are mandatory. In effect, the communities will own the systems and the reliability of operation will depend upon them and not on the Government.

Initial contacts with the villages will be by letter (a copy of a proposed sample is included in Annex 16). Basically, it sets out the conditions for the installation of the facility and the interested communities will be contacted by the Government authorities so that indepth discussions can be carried out. Details such as community needs, site locations for systems and information concerning rural and cultural habits will be collected. Furthermore, community inputs such as construction labour and the provision of local materials, land rights, etc., will be identified. In addition, government inputs into finance, training and technical support for operation and maintenance will be identified. In effect, the Government officials and the community will conclude a contractual agreement which identifies the responsibilities of each party.

After these formal activities have been completed, agreements will be reached on 1) the type of training to be carried out and 2) the project implementation schedule. These periods will consider the working and religious habits of the community so that planting and harvest times and holidays do not conflict with the schedules.

8.7 Re-organization of Environmental Health Department

8.7.1 Existing organization

The existing organization of the Environmental Health Department in Central Province is shown in Table XVIII. Basically, the staffing at the districts were intended to serve environmental health requirements such as food safety and environmental pollution. The personnel at Gordons depot are involved in the construction of limited and simple rural water systems. They also construct latrine slabs for the province. The Project Manager is responsible for the implementation of the more complex installations such as solar installations and pumped and gravity systems. Both programmes, however, are severely hampered by a lack of trained technicians to carry out basic operation and maintenance tasks.

8.7.2 Proposed organization

So that the water and sanitation projects can be incorporated into the work assignments of the Districts, the organization chart at Table XIX is recommended.

The basic units or structure has been maintained but sufficient manpower resources have been allocated to ensure that the programme can be implemented. The HI in each district will still be required to carry out his existing environmental duties but the proposed structure will also enable each district to implement a latrine slab programme and simple rural water systems in the area of responsibility. Latrine slabs will continue to be constructed at Gordons.

Table XVIII
EXISTING ORGANIZATION CHART
ENVIRONMENTAL DEPARTMENT
CENTRAL PROVINCE

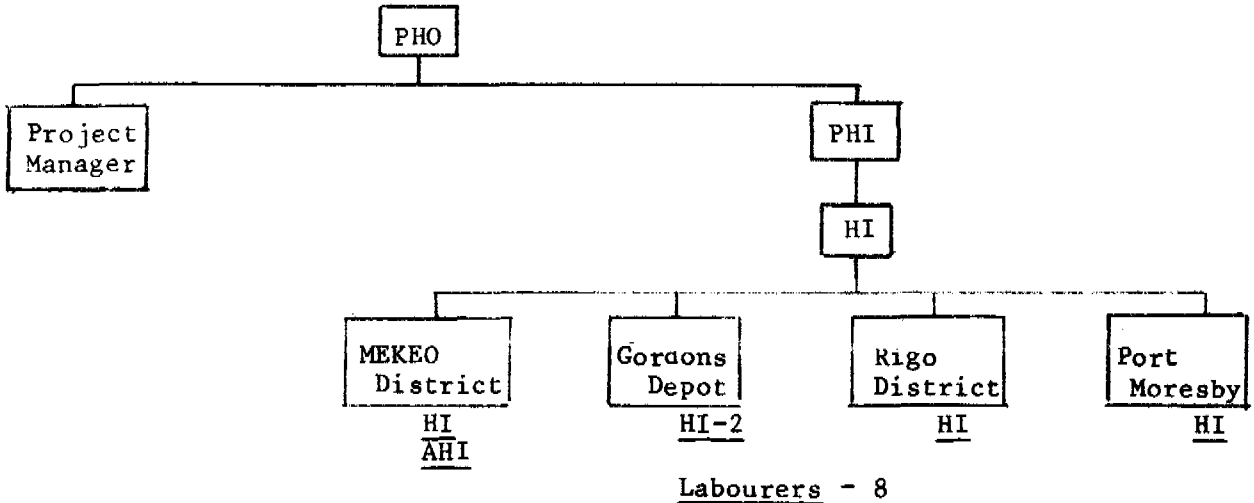
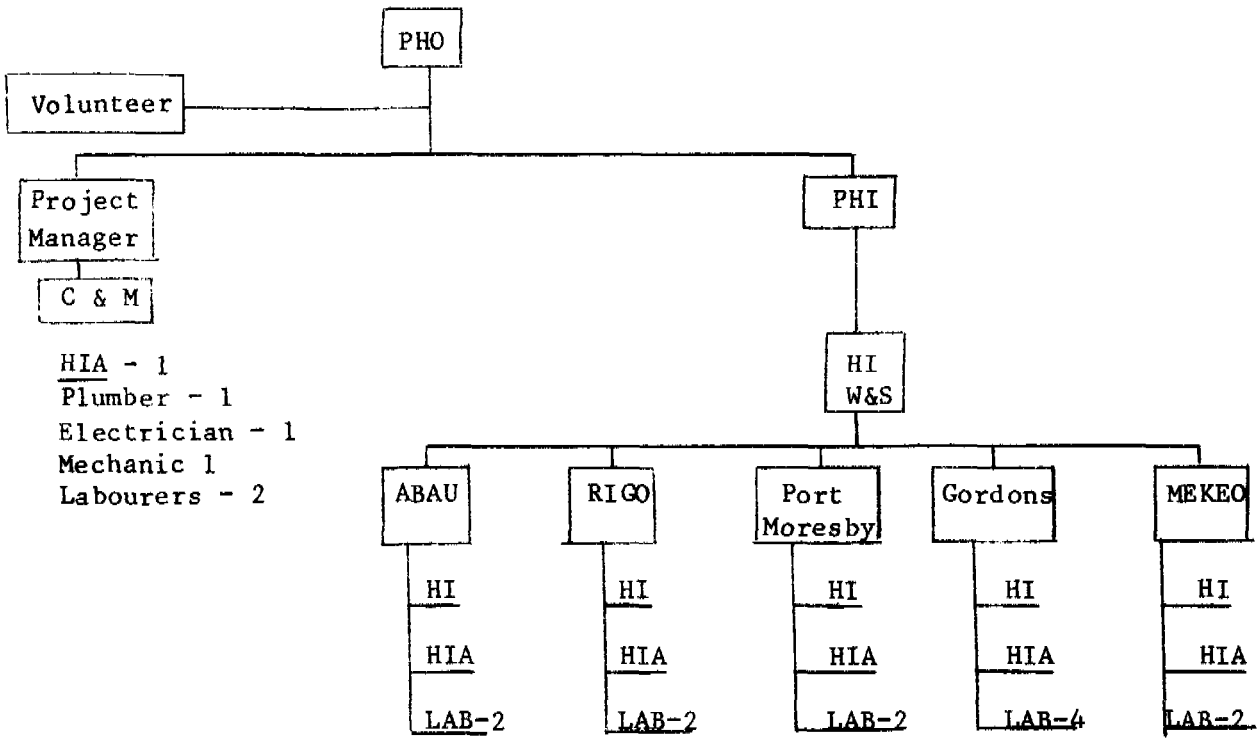


Table XIX
PROPOSED ORGANIZATION CHART
ENVIRONMENTAL HEALTH
CENTRAL PROVINCE



The Project Manager has also been given sufficient technical staff to initiate a Construction and Maintenance Unit (Annex 17) which will be mainly concerned with training community workers and supervising the construction, servicing and repair of these complex systems which the community cannot look after themselves. Basically, 40 motorized systems are operating and 12 more are being planned. In addition, 9 more solar systems are being proposed in addition to the 6 existing installations. A volunteer will assist both the Project Manager and the HI, with the management of their respective programmes.

Approximately K85,000 will be needed to provide support facilities including a workshop, 2 vehicles, materials, supplies and tools. In addition, annual costs of K60,000 are required for salaries, utilities and travelling allowances. The salaries of the permanent health staff have not been included in these recurrent expenditures.

It should be noted that the construction and maintenance unit is intended to provide technical support to the communities. The initial installation cost of water and sanitation facilities will be shared by the provincial government and the community. After installation, however, all operation and maintenance costs including labour - if technical assistance is provided by the maintenance team - will be the sole responsibility of the community. Written agreements previously mentioned will be drawn up which clearly state government and community responsibilities to avoid subsequent confusion and disagreements.

Based on a well construction capacity of 3 units/team/month, the total number of shallow wells of 196 (164 for villages and 32 for schools) can be installed in less than 1 1/2 years. The remaining projects, (complex systems and those requiring further investigation) will be phased into the construction programme.

Latrines

As the total number of latrine slabs is approximately 5,860, (5,500 for villages and 360 for schools) the implementation period is approximately 5 years based on an average annual production capacity of 280 slabs for each of the five teams. The schools will be given first priority.

8.8 Training needs

After the required staff have been recruited, the training programme which is detailed in Table XX will be implemented. Because low technology systems are being constructed and communities will be involved in the programme, priority will be given to training the provincial health staff on facilitating community meetings. The remaining courses which are shown are basically intended to review technology and monitor progress to effect any necessary programme changes.

Table XX
Training Programme

Date	Programme	Duration	Participants
1985 February	Workshop/Discussions		
	1) Hand Augering Techniques	2 weeks	All
	2) Community Participation/ Motivation		Volunteer Artisans
	Health Education/ Organization/Planning	1-2 weeks	Health inspectors Health inspectors assts
March	Workshop/Discussion Appropriate technology and Zimbabwe/Blair pump Ferro-cement technology	1 week	All Central Province Water Programme employees
March	Workshop/Technical Briefing	3 days	Artisans
July	Workshop/Group Discussion	3-5 days	All (as above)
	Review objectives, discuss field problem, implementation procedures, community participation		

Date	Programme	Duration	Participants
November	Workshop/Discussions	3-5 days	Works coordinator Volunteer
	Re-evaluate programme Discuss problems and propose solutions, Re-define objectives Present 1986 Programme		Health inspectors Health insp. assts Representative of labourer
1986-87 Quarterly	Workshop/Discussion/Training		
	Content to be determined as required	3-5 days	To be determined
1988-89 Bi-annually	Workshop/Discussion/Training	3-5 days	To be determined

9. WATER QUALITY MONITORING AND SURVEILLANCE

9.1 Background

At present, there is no organized drinking water quality surveillance programme. Sampling and testing is carried out on an ad hoc basis. This is largely due to the difficulty of transporting, storing and testing the samples for microbiological contamination at the Port Moresby Public Health Central Laboratory and for chemical testing at the University of Technology in Lae, Morobe Province.

However, because of the need to identify both fecal and chemically contaminated water supplies, a limited drinking water quality surveillance programme will be developed and implemented during 1985-90.

9.2 Method of analysis

Due to the difficulty associated with transporting water samples to the laboratories, it is planned that the field testing method which uses the generation of hydrogen sulfide as an indicator of pollution will be utilized. It is a simple and cheap method and the health inspectors are aware of its limitations. It is a qualitative test subject to a degree of error and should, where possible, be followed up by standard laboratory procedures.

9.3 Proposed monitoring and surveillance plan for Central Province

The monitoring and surveillance programme will conform to the WHO latest guidelines regarding frequency of sampling and analysis. Standards will be imposed for:

District towns
Rural villages and
Newly developed water sources

9.3.1 District towns(Bereina, Kwikila, Kupiano)

Representative samples will be taken at various designated points in the distribution system and microbiologically analyzed for evidence of contamination according to the frequency specified and quality standards set forth in the latest World Health Organization Guidelines Manual for Water quality monitoring and surveillance. Analysis will be carried out at the Central Laboratory in Port Moresby using Standards Methods in addition to routine testing by use of the H_2S field method.

9.3.2 Rural Villages

Water quality analysis will be conducted in rural villages under the following conditions:

(1) When developing or improving a new water source;
(2) After system repairs;
(3) When unusual environmental circumstances dictate and contamination is suspected;
(4) When an outbreak of a water-borne disease, including diarrhoea, occurs in the villages or nearby villages in the area;
(5) When the water is thought or suspected to be bacteriologically, chemically, or physically contaminated.

9.4 New water sources

All new water sources will be tested for microbiological and chemical contaminants before declaring the water safe to drink.

After initial tests and satisfactory microbiological results, the source should be monitored as per conditions outlined under rural village procedures for water quality analysis.

9.5 Costs

The estimated cost of the programme over the 5-year period, including the development of 300 new water sources and for the continuing monitoring and surveillance programme of existing installations is K/10,000.

10. SUMMARY

For convenience and ease of reference, the year by year costs of the activities concerned with the implementation of a water supply and sanitation programme for Central Province during the period 1985-90, are detailed in Table XXI. A 10% contingency brings the total costs of the water and sanitation programme to K1,487,819 or approximately K1.5 million.

TABLE XXI
SUMMARY OF PROJECT COSTS
CENTRAL PROVINCE
RURAL WATER SUPPLY AND SANITATION PROGRAMME
FIVE-YEAR PLAN

Estimated Expenditure	1985	1986	1987	1988	1989	TOTAL
			(Kina)			
Water Supplies						
Villages	70,000	140,000	175,000	175,000	187,250	747,250
Schools	66,000	21,307	2,288	2,332	2,387	94,314
Maintenance/Construction Unit	110,000	60,000	60,000	60,000	60,000	350,000
Water Quality Monitoring/ Surveillance	1,000	2,000	2,000	2,500	2,500	10,000
Health Education	8,000	10,000	10,000	6,000	6,000	40,000
Sanitation						
Villages	8,850	17,700	23,600	24,898	25,075	100,123
Schools	2,205	706	73	74	75	3,133
Monitor/Evaluation	4,000	6,000	7,000	7,000	6,000	30,000
Manpower Training	12,000	10,000	3,000	3,000	2,000	30,000
Survey (Stage II)	-	12,000	-	-	-	12,000
Total Estimated Expenditure	282,055	279,713	282,961	280,804	291,287	1,416,820
Contingencies 10%	28,206	27,971	28,296	28,080	29,129	141,682
	310,261	307,684	311,257	308,884	320,416	1,558,502

ANNEXES

ANNEX 1

CENTRAL PROVINCE
Water Supply and Sanitation Survey

NOV 1983

MASTER-LIST OF VILLAGES IN SURVEY

DISTRICT		VILLAGE	POP. 1980 CENSUS
MEKEO:			
Census Unit			
17 Waima Kivori	1.	Kivori-Poe	450
	2.	Kivori-Kui	367
	3.	Hereparu	84
	4.	Aviara-Oreke	141
	5.	Hauramiri	231
	6.	Roro-Aiara	474
	7.	Ere-Ere	421
19 Mekeo	8.	Inawae	205
	9.	Inawi	928
	10.	Aipeana	797
	11.	Beipa	978
	12.	Amoamoa	19
	13.	Rarai	473
	14.	Inawauni	200
	15.	Felel	32
	16.	Bebeo	169
	17.	Inawaia	790
	18.	Eboa	611
	19.	Jesubaibua	440
	20.	Oriroptana	298
	21.	Inawabui	647
	22.	Angaifu	
16 Roro	23.	Poemana	
	24.	Ponepone (s)	178
	25.	Bereina	127
	26.	Babiko	374
	27.	Mou	376
	28.	Rapa	333
	29.	Biotou	403
	30.	Nikura	193
	31.	Poukama	174
	32.	Delena	215
	33.	Keabada	204
	34.	Irobo (s)	25
	35.	Iara	

Annex 1

DISTRICT		VILLAGE	POP. 1980 CENSUS
MEKEO: Census Unit			
15 Nara	36.	Oroi	164
	37.	Ala'Ala	124
	38.	Diumana	103
	39.	Kaiau	69
	40.	Tubu	69
20 Kuni	41.	Foio	41
	42.	Adio	38
	43.	Tamala	102
14 Kabadi	44.	Hisiu	577
	45.	Pinu	396
	46.	Magabaira	219
	47.	Uka'ukana	328
	48.	Keveona	177
	49.	Koupuana	240
	50.	Aroana (p)	17
	51.	Malati (s)	24
	52.	Mariboi (p)	220
	53.	Kunimaipa (s)	008
	54.	Miri (s)	49
11 Vanapa	55.	Veimauri (s)	65
	56.	Vasagabira	51
	57.	Douramoku	79
	58.	Kanobada	96
	59.	Keakuaku	25
	60.	Kerea	122
	61.	Berere	20
	62.	Veikabu	37
	63.	Besea	
	64.	Kuriva Blocks (p)	327
	65.	Motumotu (s)	275
	66.	Rubulogo (s)	78
	67.	Dasiama (s)	48
	68.	Sabusa Sawmill	189
	69.	Siraka (s)	443
	70.	Iomare	31
	71.	Haima	34
	72.	Boteka	105
	73.	Laloki Kereava	65
	74.	Laloki DPI Stn	127
	75.	Goldie (Osabewi)	124
	76.	1 Mile Settlement	
	77.	Agefa	

Annex 1

DISTRICT	VILLAGE		POP. 1980 CENSUS
HIRI:			
Census Unit			
13 West Hiri	78.	Manumanu	249
	79.	Lea Lea	919
	80.	Papa	298
	81.	Boera	539
	82.	Porebada	2109
	83.	Kouderika	178
	84.	Roku	404
12 East Hiri	85.	Vaivai	86
	86.	Dadoga	83
	87.	Gaire	1125
	88.	Seme	91
	89.	Barakau	496
	90.	Dabunari	61
	91.	Rabuka (1)	
	92.	Rabuka (2)	
	93.	Tubusereia	1161
	94.	Kerekadi	53
	95.	Mesime	-
	96.	Gwarume-mase	70
	97	Sebore	
	98.	Variata	-
SOGERI:			
Census Unit			
10 Sogeri Valley	99.	Pulimuti	52
	100.	Mamurinumu	36
	101.	Kalakadabu	81
	102.	Beredabu/Fakonama	91
	103.	Ruburue	70
	104.	Ogotana	101
	105.	Boredabu	48
	106.	Berebei	44
	107.	Wahonaeada	62
	108.	Mageri (p)	34
	109.	Bisiahumu (p)	110
	110.	Finschhafen (s) & Kailaki Village	86
	111.	Ninoa	66
	112.	Eilogo	46

Annex 1

DISTRICT		VILLAGE	POP. 1980 CENSUS
RIGO			
Census Unit			
Rigo LGC	113.	Senunu	62
	114.	Sabuia	68
	115.	Manugoro	210
	116.	Gabagaba	547
	117.	Tagana	120
	118.	Gomore	102
	119.	Kemaea	56
	120.	Kwalimurubu	168
	121.	Babaga	45
	122.	Gidobada	157
	123.	Saroakeina	173
	124.	Ginigolo	194
	125.	Gunugau	246
	126.	Magautou	-
	127.	Gabone	302
	128.	Tauruba	439
	129.	Gamoga	93
	130.	Kemabolo	323
	131.	Bonanamo	195
	132.	Walai	86
	133.	Alomarupu	264
	134.	Babagarupu	166
	135.	Riwalirupu	328
	136.	Imaugora	305
	137.	Kaparoka	292
	138.	Gemo	214
	139.	Kamali	406
	140.	Babaga (Hula)	344
	141.	Irupara	200
	142.	Alewai	133
	143.	Hula	1079
	144.	Makirupu	259
	145.	Kalo	760
	146.	Bigairuka	83
	147.	Bore	119
	148.	Matairuka	184
	149.	Sivigolo (p)	43
	150.	Karava	206
	151.	Keapara	488
	152.	Alukuni	217

Annex 1

DISTRICT		VILLAGE	POP. 1980 CENSUS
RIGO			
Census Unit			
3 Ormond	153.	Potuna	127
	154.	Imairu	164
	155.	Kore	120
	156.	Mamalo	172
	157.	Molegoro	60
	158.	Babegoro	84
	159.	Alepa No. 1	260
	160.	Alepa No. 3	22
	161.	Geregaga	137
	162.	Dubanateboa	151
	163.	Konako	58
	164.	Poligolo	27
4 Maria	165.	Lepamagana	71
	166.	Lebagolo	78
	167.	Goada	77
2 Marshall Lagoon	168.	Loka	
	169.	Obaha	87
	170.	Bubuku	144
	171.	Kalapa	53
	172.	Waiori	1033
	173.	Maiagolo	79
	174.	Wanigela	1894
	175.	Imila	
	176.	Gavuone	1289
	177.	Kelerakwa	171
	178.	Wairavanua	306
	179.	Kelekapana	254
	180.	Madana (p)	92
	181.	Keagolo	171
	182.	Maopa No. 1	730
	183.	Pelagai	388
	184.	Paramana	181
	185.	Kapari/Viriolo	946
	186.	Lalaura	240
	187.	Iaba	114
	188.	Dom	198
	189.	Tutubu	140
	190.	Baramata (p)	79
	191.	Kauru (p)	71
	192.	Baia (p)	82
	193.	Lahara	37
	194.	Domara	528
	195.	Bomguina	76
	196.	Merani	141
	197.	Mori	83
	198.	Ianu Blocks (p)	353

ANNEX 2

WATER SUPPLY AND SANITATION SURVEY

CENTRAL PROVINCE

VILLAGE EXCRETA DISPOSAL SYSTEMS

Nov 1983

	TOTAL NOS OF VILLAGES	POPULATION (1980 CENSUS)	PERCENTAGE OF POPULATION IN SURVEY (%)
Province		117,242	100%
Survey area	184	46,500	40%
VILLAGE EXCRETA DISPOSAL SYSTEMS	184		
1. Latrines (pit, overhang)	*91	17,400	37% Estimate
2. Outdoor defecation (No sanitary excreta disposal methods, mainly bush defecation)	93	27,100	63% Estimate

*Villages where part of the population has some type of latrine, or other kind of sanitary excreta disposal system.

ANNEX 3

PAPUA NEW GUINEA
DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH DIVISION

Date: _____

Province: _____ District: _____

Village: _____ Interviewer: _____

Total Population of Village: _____

Total Number of Houses: _____

Annex 3

(1) Is the income of this village: Low /___/

Average /___/

High /___/

(2) The main source of drinking water for the village is:

Rain water tanks /___/

Water Tank Truck /___/

Piped Supply /___/

Wells /___/

Natural Sources /___/

(3) Fill in details of main source of drinking supply on relevant data sheet.

(3a) Rain Water Tanks

No. of tanks in use

Average volume of a tank

(3b) Water Tanks Truck

Approximate number of days/year water is delivered: _____

Volume of water delivered per day

(3c) Piped Supply

1/ Name and type of source _____

2/ Quality of source, subject to pollution, protected spring and uninhabited catchment area.

3/ Number of stand pipes

4/ Number of house connections

5/ Supply pumped or gravity

Annex 3

(3d) Wells

1/ Type of supply: Private: _____ Public: _____

Borehole (machine drilled)
Dug well (Hand dug or by anger)
Open

2/ Approx. depth to water

3/ Type and make of pump

4/ If not in working order, give reasons

5/ Is well properly protected from pollution

Yes /____/ No /____/

i.e., Sealed apron.
Drainage
Fenced

Adequate distance from possible surface or groundwater pollution by toilets, etc. /____/

Any seawater intrusion /____/

(4) Aproximately, what percentage of the village use the main water source

Less than 25 /____/

25 - 50 /____/

50 - 75 /____/

85 - 100 /____/

(5) What are the reasons why groups of the village are not using the installed supply?

Tradition source more convenient /____/

Water supply too expensive /____/

Water from the supply does not taste good /____/

Children cannot reach or turn the tap /____/

Children cannot operate the handpump /____/

Annex 3

The supply is unrealiable /____/

Would like to use the supply but cannot because: not a member of the water group /____/

have not paid the fees /____/

Others (specify)_____

_____

Excluded from use of water supply because of social, cultural or religious reasons /____/

(6) Who maintains the water system?

Not applicable /____/

Village Committee /____/

Village Volunteers /____/

Department of Works and Supply /____/

Department of Health /____/

Others: Explain:_____

_____

_____

_____

(7) About how long does it take to go and get water and return?
Approximate Distance _____

Less than 15 minutes /____/

15 - 30 minutes /____/

Annex 3

30 - 60 minutes /_____/

over one hour /_____/

(8) Describe any special conditions: _____

_____

(9) How often is water usually available from the main source?

Continuously /_____/

Intermittent /_____/

Comment: _____

_____

_____

(10) What is the alternative water source when the main source is unavailable?

_____

_____

_____

(11) How long does it take to go and get water and return from the alternative source?

15 minutes /_____/

15 - 30 minutes /_____/

30 - 60 minutes /_____/

over one hour /_____/

(12) How often do breakdowns in the system occur?

Very occassionally /_____/

Weekly /_____/

Annex 3

Monthly /____/

Dry Season /____/

Other /____/

(13) What is usually the reason for the breakdown?

_____

_____

_____

(14) How long does a breakdown usually last?

Few hours /____/

Few days /____/

Several weeks /____/

(15) Are spare parts easily available? Yes /____/ No /____/

(16) Have the village any maintenance fund available?

_____

_____

_____

(17) Water supply proposed - Present system adequate /____/

Repair present system /____/

Additional rainwater tanks /____/

Gravity piped supply /____/

Protected wells /____/

Protected spring /_____/

Pumped piped supply /_____/

Specify name and location of source: _____

_____

_____

Comments: _____

(18) Village recommendation for improvement of water supply

(19) Will the village supply free labour to carry out the work?

Yes /_____/ No /_____/

(20) Will the village operate and maintain the system with technical assistance?

Yes /_____/ No /_____/

(21) Any problem with water on land rights? Yes /____/ No /____/

SANITATION

(22) How do most of the people dispose of excreta?

Outdoor /_____/

Pit Latrine /_____/

Bucket /_____/

Overhang latrines /_____/

Septic Tank /_____/

Other: Explain _____

_____

_____

(23) How many latrines in the village?

(24) What percentage of the people use latrines?

0 - 10% /_____/

10% - 25% /_____/

25% - 50% /_____/

50% - 75% /_____/

More than 75% /_____/

(25) What is the condition of the village latrines?

Poor /_____/

Fair /_____/

Good /_____/

(26) Comments on general environmental conditions of the village:

_____

_____

_____

(27) Is there a community school in the village?

Name of School: _____

(28) How many children are enrolled? _____

(29) Does the school have latrines? Yes /____/ No /____/

(30) What is the condition of the school latrines?

Poor /_____/

Fair /_____/

Good /_____/

(31) How many concrete slabs does the school require?

(32) What is the water supply at the school?

Piped scheme /_____/

Rainwater tanks /_____/ Total Volume:

Wells /_____/ _____

Other: _____

_____

(33) Is the school water supply taken from the village scheme?

Yes /_____/ No /_____/

(34) Is the school scheme adequate?

(35) What improvements are necessary?

Construct wells /_____/

Protected spring /_____/ Total Volume:

Explain in detail: _____

_____

_____

_____

(36) Bacteriological Test: Yes /____/ No /____/

Results /_____/ +++

/_____/ ++

/_____/ + /_____/ No reaction

(37) Salinity Test: _____mg/l

ANNEX 4

CENTRAL PROVINCE
RURAL WATER SUPPLY AND SANITATION SURVEY
WATER SUPPLIES

INSTALLED SYSTEMS

Nov 1983

Total No. installed system	56	
functioning	25	(45%)
not functioning	31	(55%)

Reasons for non-functioning - as given by the Village

No maintenance	25	(81%)
vandalism	1	(3%)
No funds for fuel	1	(3%)
No information	4	(13%)
	31	100%

Maintenance Responsibility (identified by Village)

Functioning Systems		Non-functioning Systems	
Village Committee	6	Village volunteers	4
Dept of Works & Supply	2	Dept of W/Supply	6
Government (Prov/Local)	2	Government (Prov/Local)	1
Port Moresby City	1	Dept of Health	1
No one	5	Dept of Minerals & Energy	1
No information	9	Individuals	1
	25	Private Contractor	1
		No one	7
		No information	9
			31

ANNEX 5

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE

Nov 1983

Total Population in Survey : 46,500
Total Population of Prov : 117,242
Percentage of Pop. in Survey: 40%

Total Nos. of Villages in Survey: 184

Villages Using Natural Water Sources

Total Nos. of Villages Using Natural Water Systems	Percentage of Villages in Survey	Sources of Water Supply		Water Collection Time	Minutes	Nos. of Villages	Percent	Proposed Improvement	Nos. of Villages
84	46%	1. River	53	1.	15	47	(56%)	1. Protected well with handpumps	61
		2. Creek	17	2.	15-30	15	(18%)	2. Handpump only	2
		3. Spring	11	3.	30-60	10	(12%)	3. Solar System	3
		4. Swamp	2	4.	60+	12	(14%)	4. Motorized system	7
		5. Pool	1			—	———	5. Spring	1
			84			84	(100%)	6. Repair	
								7. No action/ hand/water rights dispute	1
								8. Require further investigation	8
								TOTAL NOS. OF SYSTEMS	84

WATER SUPPLY AND SANITATION SURVEY — ANNEX 6
CENTRAL PROVINCE

W E L L S — Nov 1983

Total No. of Villages in survey: 184

TOTAL NO. OF VILLAGES USING WELLS	PERCENT OF VILLAGES IN SURVEY	PROTECTED WELLS	TESTED FOR F. COLIFORM (H_2S METHOD)	CONTAMINATED YES	CONTAMINATED NO	WATER COLLECTION TIME MINUTES	NO. OF VILLAGES	PERCENT	PROPER WELLS
		Yes 15 (20%)	11	6	5	15	48	65%	
74	40%	No 59 (80%)	26	25	1	15-30	13	17%	
		BOREHOLES: 12	The remainder are hand dug, generally, open wells.			30-60	2	3%	
						60+	8	11%	
						No information	3	4%	
							74	100%	

Reason System Was not functioning			Wells with pumps (functioning)		Village oper/maint fund	
Broken pumps:	13	(Handpumps 9) (Motor 4)	Functioning	11	Yes	7
			Non-functioning	18	No	21
				29	No info	46
						74
Broken pipes:	3					
Well requires deepening	1					
Well dry	1					
	18					

Provision for operation and maintenance is confused. Generally villagers assume that the group who install the system is responsible for its operation and maintenance.

2 villages stated that if a new system was installed they would not operate or maintain it.

the remainder of the wells are hand dug, open pit wells without a pump and collection is by is by bucket or other similar container.

-A few of the hand dug wells are or were protected.
-usually a single public handdug well serves the entire village but in many villages there are numerous private hand-dug pit wells (too numerous to accurately count in this survey) which serve individuals, clans or households.

WATER SUPPLY AND SANITATION SURVEY

ANNEX 7

CENTRAL PROVINCE

NOV 1983

VILLAGES WHERE PRESENT WATER SUPPLY SYSTEM IS ADEQUATE

Total System: 24

	District	Master List No.	Village	Pop (1980)	Comments
1.	Mekeo	10	Aipeana	797	
2.		19	Jesubaibua	440	
3.		25	Bereina	127	
4.		26	Babiko	374	
5.		27	Mou	376	
6.		28	Rapa	333	
7.		30	Nikura	193	
8.		33	Keabada	204	
9.		44	Hisiu	597	
10.		61	Berere	20	
11.		68	Sabusa Sawmill	189	
12.	Hiri	79	Lea Lea	919	
13.		80	Papa	298	
14.		81	Boera	539	
15.		83	Kouderika	178	
16.		84	Roku	404	
17.		90	Dabunari	61	
18.	Rigo	91	Rabuka No. 1	70	
19.		116	Gabagaba	547	
20.		117	Tagana	120	
21.		120	Kwalimurupu	168	
22.		157	Gidobada	157	
23.		176	Gavuone	1289	
24.		186	Lalaura	240	
				8,640	19% of population in survey

ANNEX 8

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE

No. of System: 25

Nov 1983

PRIORITY LIST

	District	Master List No.	Village	Pop (1980)	*Priority Condition	Est. Cost Of System	Est. Cost /Capita	Comments
1.	Mekeo	1	Kivori-pui	450	A	K/ WHP		
2.		29	Biotou	403	A	K/40,000		
3.		31	Poukama	174	A	K/25,000	K/144	
4.		34	Irobo	25	B	1WHP		
5.		53	Kunimaipa	8	A&B			
6.		63	Besea	70	A	1WHP		
7.	Hiri	78	Manumanu	249	A	K/35,000	K/141	
8.		96	Gwarume-mase	70	A	1WHP		
9.	Sogeri	100	Manurinumu	36	B	Further investigation		
10.	Rigo	124	Ginigolo	194	B	K/25,000	K/129	
11.		125	Gunugau	246	B	2WHP		
12.		127	Gabone	302	A	2WHP		
13.		128	Tauruba	439	A	K/25,000	K/57	
14.		130	Kemabolo	323	A	1WHP		
15.		134	Babagarupu	166	A	Further investigation		
16.		135	Riwalirupu	328	A	Further investigation		
17.		136	Imaugora	305	A	3WHP		
18.		138	Gemo	214	A	2WHP		
19.		153	Potuna	127	A	1 WHP		
20.		156	Mamalo	172	A&B	1 WHP		

Annex 8

Nov 1983

	District	Master List No.	Village	Pop (1980)	*Priority Condition	Est. Cost Of System	Est. Cost /Capita	Comments
21.	Rigo (cont'd)	159	Alepa No. 1	260	A	WHP		
22.		161	Geregaga	137	A	Further investigation		
23.		162	Dubanateboa	151	A	WHP		
24.		183	Pelagai	388	B	Further investigation		
25.		194	Domara	528	A	K/35,000	K/66	

* A = 60 minute or more to collect water and return

B = Water not available in village. Must buy/truck water

ANNEX 9

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE
PROPOSED IMPROVEMENTS

Protected wells with Handpumps
Villages: *102

Nov 1983

No.	District	Master List No.	Village	Pop (1980)	No. of Wells/ Pumps	Est. Cost	Est. Cost/ Capita	Comments
1.	MEKEO	1	Kivori-pui	450	3			
2.		2	Kivori-kui	367	3			
3.		3	Hereparu	84	1			
4.		8	Inawae	205	2			
5.		9	Inawi	928	6			
6.		12	Amoamoa	19	1			
7.		13	Rarai	473	3			
8.		14	Inwauni	200	2			
9.		16	Bebeo	169	1			
10.		17	Inawaia	797	6			
11.		20	Oriroptana	298	2			
12.		22	Angaifu	100	1			
13.		23	Poemana		1			
14.		24	Ponepone	178	1			
15.		34	Irobo	25	1			
16.		35	Iara		1			
17.		37	Ala'ala	124	1			
18.		38	Duimana	103	1			
19.		39	Kaiau	69	1			
20.		40	Tubu	69	1			

Annex 9

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE
PROPOSED IMPROVEMENTS

Protected wells with Handpumps
Villages: *102

Nov 1983

No.	District	Master List No.	Village	Pop (1980)	No. of Wells/ Pumps	Est. Cost	Est. Cost/ Capita	Comments
21.		41	Foio	41	1			
22.		43	Tamala	102	1			
23.		45	Pinu	396	2			
24.		46	Magabaira	219	2			
25.		47	Uka'ukana	328	2			
26.		48	Keveona	177	1			
27.		49	Koupuana	240	1			
28.		51	Malati	24	1			
29.		54	Miri	49	1			
30.		55	Veimauri	65	1			
31.		56	Vasagabira	51	1			
32.		57	Douramoku	79	1			
33.		58	Kanobada	96	1			
34.		59	Keakuaku	25	1			
35.		60	Kerea	122	1			
36.		62	Veikabu	37	1			
37.		63	Besea					
38.		64	Kuriva	327	3			
39.		65	Motumotu	275	3			
40.		66	Rubulogu	78	1			

Annex 9

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE
PROPOSED IMPROVEMENTS

Protected wells with Handpumps
Villages: *102

Nov 1983

No.	District	Master List No.	Village	Pop (1980)	No. of Wells/ Pumps	Est. Cost	Est. Cost/ Capita	Comments
41.		67	Dasiama	48	1			
42.		70	Iomare	31	1			
43.		71	Haima	34	1			
44.		72	Boteka/Laloki	105	1			
45.		73	Kereava	65	1			
46.		75	Goldi(Osabewi)	124	1			
47.	HIRI	85	Vaivai	86	1			
48.		86	Dagoda	83	1			
49.								
50.		92	Rabuka No. 2		1			
51.		96	Gwarume-mase	70	1			
52.	SOGERi	108	Mageri	34	1			
53.		110	Finschhafen	86	1			
54.	Rigo	115	Manugoro	210	2			
55.		123	Sarokewa	173	1			
56.		125	Gunugau	246	2			
57.		126	Magautuo		1			
58.		127	Gabone	302	2			
59.		129	Gamoga	93	2			

Annex 9

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE
PROPOSED IMPROVEMENTS

Protected wells with Handpumps
Villages: *102

Nov 1983

No.	District	Master List No.	Village	Pop (1980)	No. of Wells/ Pumps	Est. Cost	Est. Cost/ Capita	Comments
*60.		130	Kemabolo	323	1			
61.		132	Walai	86	3			
62.		136	Imaugora	305	3			
63.		138	Gemo	214	2			
64.		139	Kamali	406	3			
		140	Babaga	344	3			
65.		141	Irupara	200	2			
66.		142	Alewai	133	2			
67.		143	Hula	1079	10			
68.		144	Makerupu	259	2			
69.		146	Bigairuka	83	1			
70.		147	Bore	119	1			
71.		148	Matairuka	184	2			
72.		150	Karawa	206	2			
73.		153	Potuna	127	1			
74.		154	Imairu	164	1			
75.		155	Kore	120	1			
76.		156	Mamalo	172	1			
77.		157	Mologoro	60	1			
78.		158	Babegoro	84	1			

Annex 9

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE
PROPOSED IMPROVEMENTS

Protected wells with Handpumps
Villages: *102

Nov 1983

No.	District	Master List No.	Village	Pop (1980)	No. of Wells/ Pumps	Est. Cost	Est. Cost/ Capita	Comments
79.		159	Alepa No. 1&2	260	1			
80.		160	Alepa No. 3	22	1			
81.		162	Dubanateboa	151	1			
82.		163	Konaka	58	1			
83.		164	Poligolo	27	1			
84.		165	Lepamagana	71	1			
85.		166	Lebagoro	78	1			
86.		167	Goada	77	1			
87.		168	Loka		1			
88.		170	Bukuku	144	2			
89.		171	Kalapa	53	1			
90.		173	Maiagolo	79	1			
91.		175	Imila		1			
92.		178	Wairavanua	306	3			
93.		180	Madana	92	1			
94.		181	Keabolo	171	2			
95.		188	Dom	198	3			
96.		189	Tutubu	140	2			
97.		190	Baramata	79	2			
98.		191	Kauru	71	1			

Annex 9

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE
PROPOSED IMPROVEMENTS

Protected wells with Handpumps
Villages: *102

Nov 1983

No.	District	Master List No.	Village	Pop (1980)	No. of Wells/ Pumps	Est. Cost	Est. Cost/ Capita	Comments
100.		193	Lahara	37	1			
101.		195	Bomuguina	76	1			
102.		197	Mori	83	1			
*61.		131	Bonanamo	195	1			(is listed under solar systems because it will use a solar panel and bilge pump in addition to a well and handpump. It should be subtracted from the total 103 so it is not counted twice. Therefore 103 - 1 = 102 villages

*One village No. 61 Master List No. 131 Bonanamo is also listed under Solar Systems but is included as it will take a well and handpump. This village should be subtracted from the final total of 103 so as not to be counted twice.

ANNEX 10A

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE
PROPOSED IMPROVEMENTS

Motorized Systems: 12

Nov 1983

	District	Master List No.	Village	Population (1980)	Est. Cost of System	Est. Cost/ Capital	Comments
1.	MEKEO	31	Poukama	174	K/25,000	K/144	
2.		36	Orio	164	K/15,000	K/91	
3.		76	1 Mile Settlement		---		
4.	HIRI	78	Manu-manu	249	K/35,000	K/140	
5.		82	Porebada	2109	K/120,000	K/57	
6.		89	Barakau	496	K/30,000	K/60	
7.	RIGO	128	Tauruba	439	K/25,000	K/57	
8.		151	Keapara	488)	K/50,000	K/71	
9.		152	Alukuni	217)			
10.		174	Wanigela	1894	K/80,000	K/42	
11.		177	Kelerakwa	171	K/10,000	K/58	
12.		194	Domara	528	K/35,000	K/66	
				7,229	K/425,000		

Annex 10B

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE
PROPOSED SOLAR SYSTEMS

Total No. Systems: 9

Nov 1983

	District	Master List No.	Village	Pop (1980)	Est. Cost	Est Cost/ Capita	Alternative System	Est. Cost	Est. Cost /Capita	Comments
1.	Mekeo	11	Beipa	978	K/10,000	K/10				
2.		21	Inawabui	647)						
3.		29	Biotou	403)	K/40,000	K/37				
4.		69	Siraka	443	K/30,000	K768				
5.	Rigo	118	Gomore	102	K 1,500	K/15				
6.		124	Ginigolo	194	K/25,0000	K/128				
7.		131	Bonanamo	195	K 1,500	K/8				
8.		137	Kaparoka	292	K/30,000	K/102				
9.		145	Kalo	760	K/28,000	K37				
10.		185	Kapari/ Viriolo	946	K/35,000	K737				
4,987 = 10.7% of population in survey				4987	K/201,000					

ANNEX 11

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE
PROPOSED IMPROVEMENTS

REPAIR

Total Nos. of Systems: 6

Nov 1983

District	Master List No.	Village	Pop (1980)	Est. Cost	Est Cost/ Capita	Comments
MEKEO						
1.	4	Aviara-Oreke	141			
2.	5	Hauramiri	231	K/15,000	K/12	
3.	6	Roro-Aiaro	474			
4.	7	Ere-Ere	421			
5.	53	Kunimaipa	8	---	---	Repair approximately 24 water tanks
HIRI						
6.	87	Gaire	1125	K/15,000	K/13	
7.	93	Tubusereia	1161	K/45,000	K/39	
		Total		K/75,000		

ANNEX 12

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE
PROPOSED IMPROVEMENTS

BOREHOLES

Total Nos. of Systems: 3

Nov 1983

District	Master List No.	Village	Pop (1980)	Est. Cost	Est Cost/ Capita	Comments
MEKEO	18	Eboa	611	K/ 5,000	K/8	
	32	Delena	215	K/ 5,000	K/23	
Rigo	119	Kemaea	56	K/ 1,000	K/18	
			882	K/11,000		

ANNEX 13

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE
PROPOSED IMPROVEMENTS

OTHER

Total Nos. of Systems: (6)

Nov 1983

	District	Master List No.	Village	Pop (1980)	Est. Cost	Est Cost/ Capita	Comments
1.	Mekeo	29	Biotou	403	See proposed improvements Systems		Shares proposed solar system with Inawabui
2.		88	Seme	91			Install one handpump
3.		94	Kerekadi	53			Install one handpump
4.	Sogeri	111	Ninoa	66			Protected spring
5.	Rigo	114	Sabuia	68			Install two handpumps
6.		172	Waiori	1033 1654	K740		No action should be taken until village complete move from lagoon to the shore(land).

ANNEX 14

WATER SUPPLY AND SANITATION SURVEY
CENTRAL PROVINCE

Nov 1983

Villages which require further investigation

District	Master List No.	Village	Pop (1980)	System Proposed	Est. Cost Of System	Est. Cost /Capita	Alternative System	Est. Cost	Est. Cost/ Capita	Comments
Mekeo										
1.	42	Adio	38							
2. Hiri	95	Mesime	40							
3.	98	Varirata	26							
4. Sogeri	99	Fulimuti	52							
5.	100	Mamurinumu	36							
6.	101	Kalabadabu	81							
7.	102	Berebabu	91							
8.	103	Ruburue	70							
9.	104	Ogotana	101							
10.	105	Boredabu	48							
11.	106	Bebebei	44							
12.	107	Wahonarada	62							

Annex 14

Rigo			
13.	133	Alomarupu	264
14.	134	Babagarupu	166
15.	135	Riwalirupu	328
16.	161	Geregaga	137
17.	179	Kelekapana	254
18.	189	Maopa	730
19.	183	Pelagai	388
20.	184	Paramana	181
21.	187	Iaba	114

ANNEX 15

GUIDELINES FOR THE PROPER LOCATION OF PIT LATRINES

GUIDELINES FOR THE PROPER LOCATION OF PIT LATRINES

BE SURE THE PIT LATRINE IS LOCATED:-

(1) AT LEAST 30M FROM ANY DRINKING WATER SOURCE: THIS INCLUDES:-

- (A) WELLS
- (B) RIVERS
- (C) STREAMS
- (D) PONDS AND POOLS

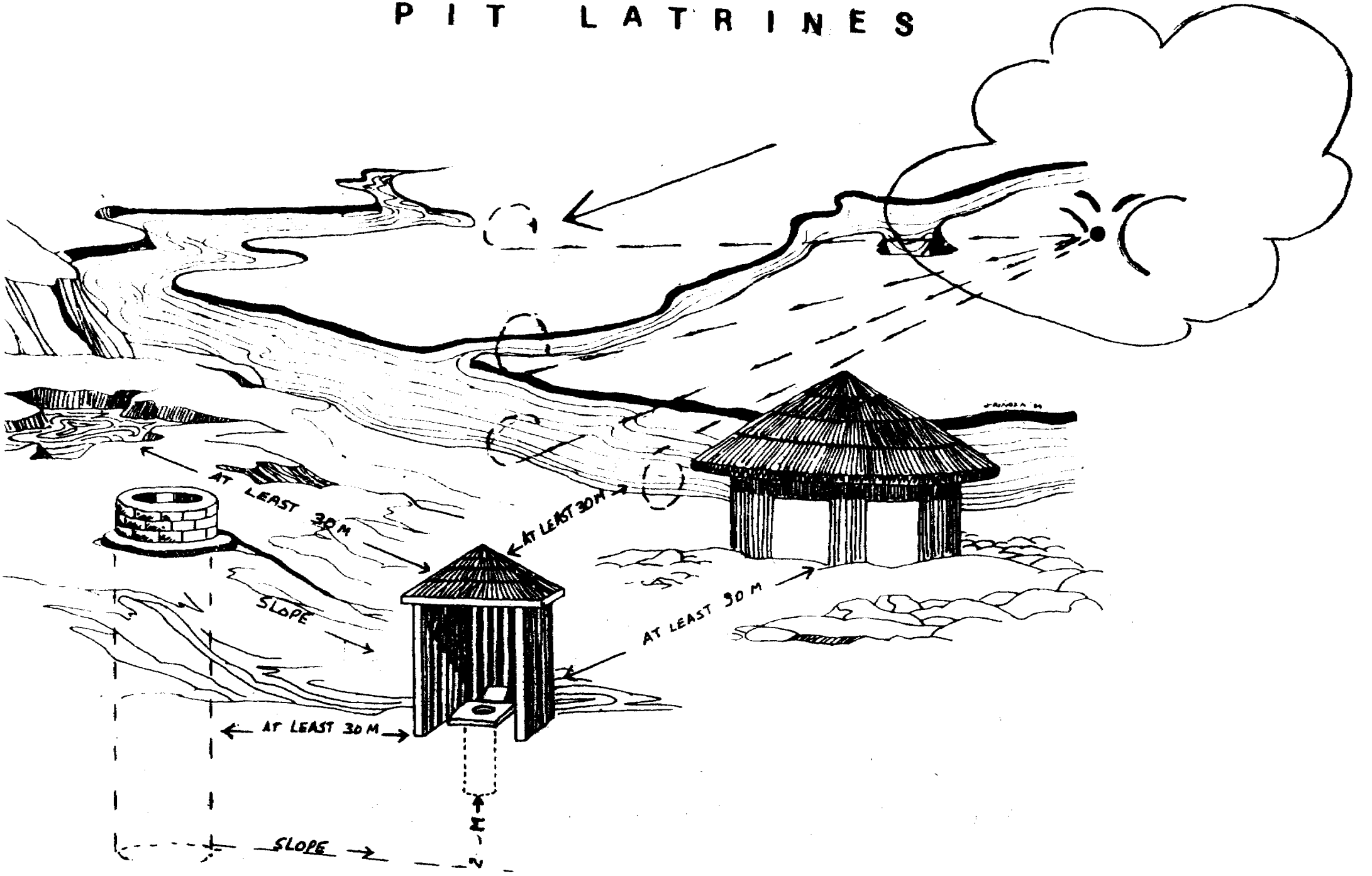
(2) DOWN SLOPE FROM ANY WELL

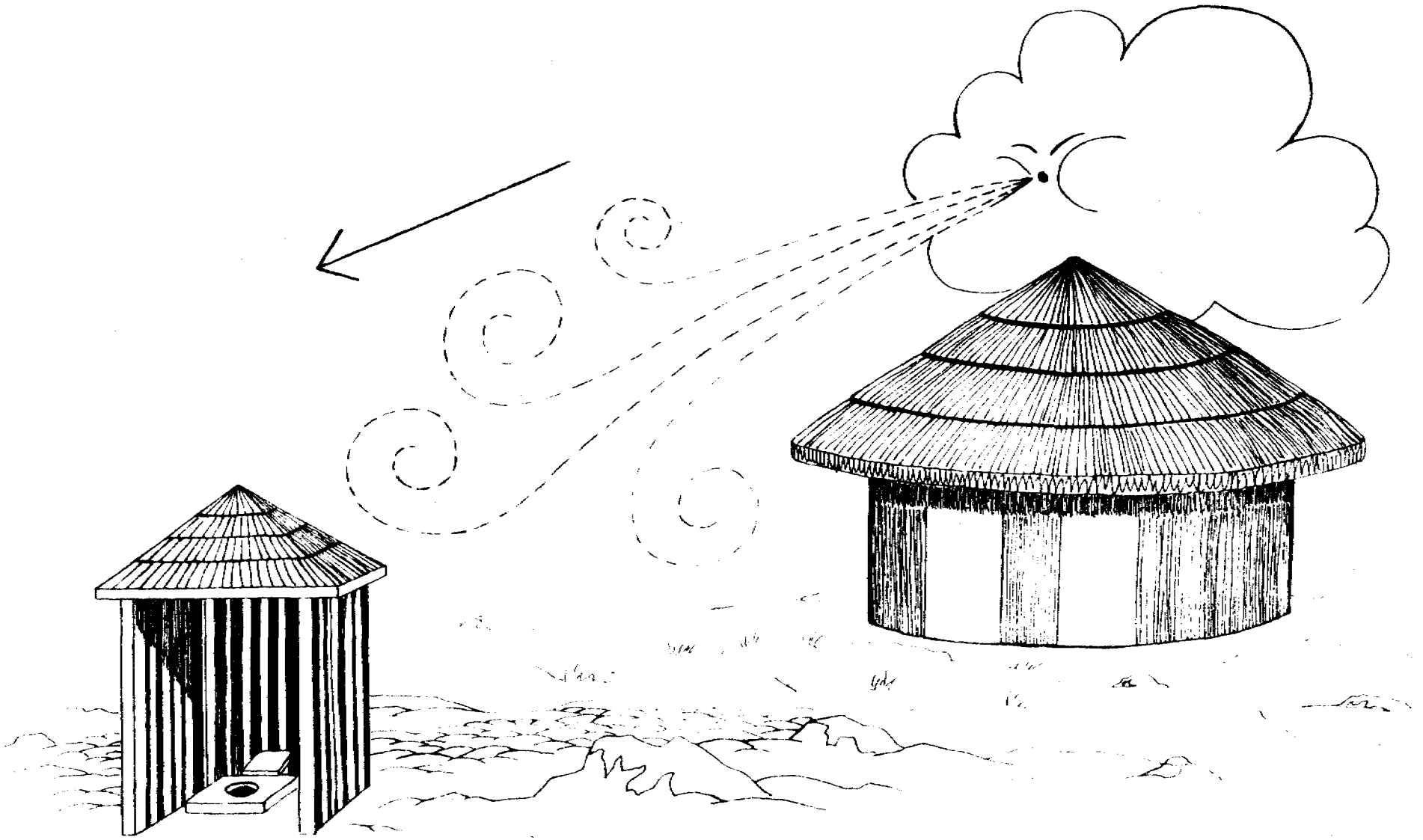
(3) AT LEAST 2 TO 3 METRES ABOVE THE GROUND WATER TABLE (SEE DIAGRAM)

(4) 30M AWAY FROM ANY HOUSE OR SCHOOL

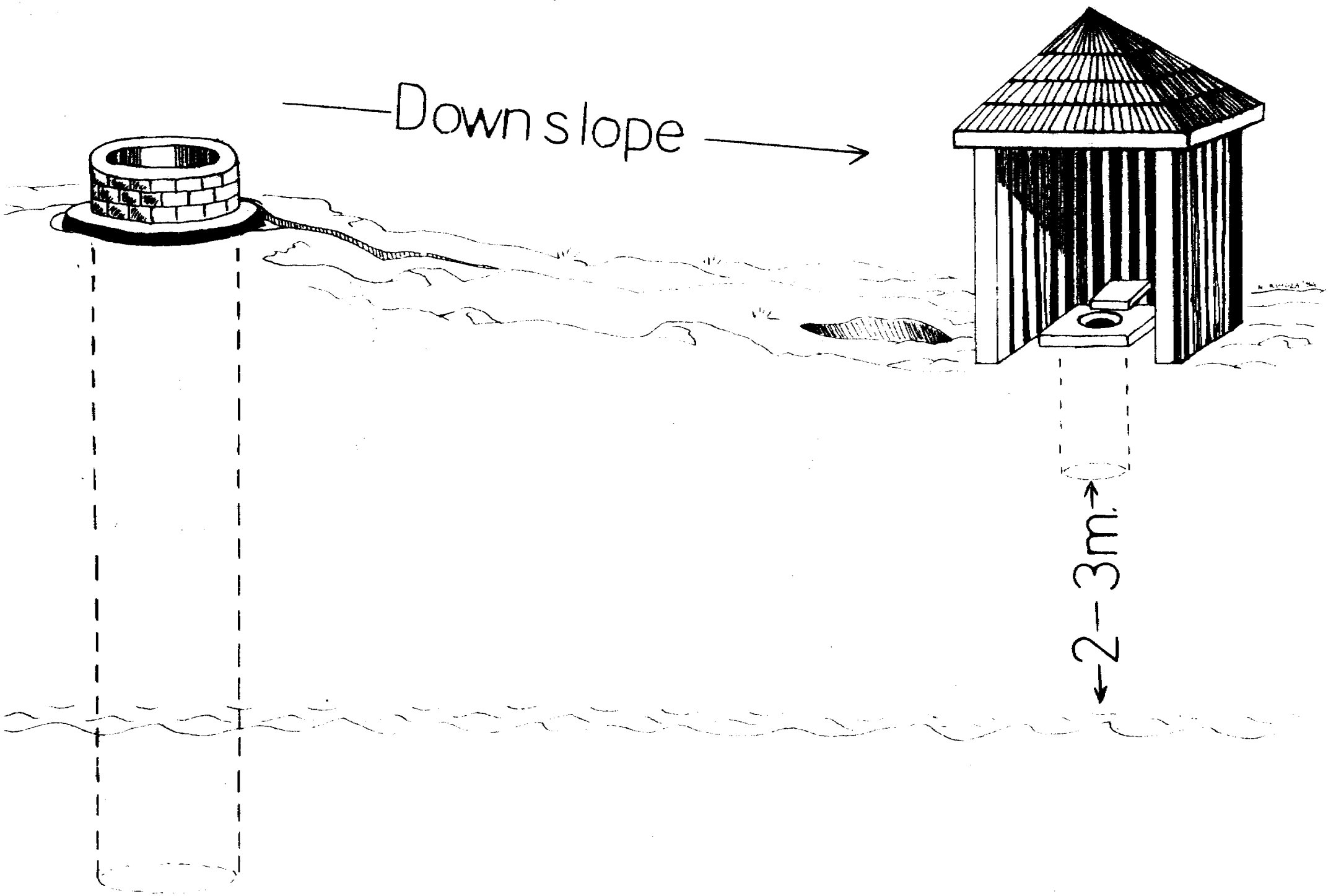
(5) GENERALLY, DOWN WIND FROM THE SCHOOL OR HOUSES.

WHERE TO PUT PIT LATRINES





Annex 15



SAMPLE LETTER TO BE SENT TO COMMMUNITIES REGARDING PARTICIPATION IN THE WATER SUPPLY AND SANITATION PROGRAMME

ANNEX 16

Draft/6

Dear Sirs,

In November 1983, a water supply and sanitation survey was conducted and one or more of your council members provided information on the water supply and sanitation needs and requirements of your community. Based upon these discussions and the information provided, it was recommended that a protected well with a handpump be installed in your village.

The Provincial Department of Health will provide your community with financial support and technical assistance for the construction and installation of this water supply system and/or sanitation facility provided the following conditions are agreed upon:

(1) the community provides some financial contribution for the construction of the system;
(2) the village must provide free labour, if required, for the construction of the system;
(3) the community must provide a volunteer to operate and maintain the system (Training will be provided by the Department of Health representatives);
(4) a water or health committee must be established;
(5) a maintenance fund of at least K/10.00 must be established.

If your community would like to participate in this programme and agree to the above conditions or alternately, if you would like more information, please contact

_____

regarding this matter.

Yours sincerely,

When a village responds positively or requests a meeting or more information regarding the preceding letter than the District Health Inspectors and/or Maintenance and Construction Unit personnel will arrange a meeting, at the village, with the councillors and hold discussions with these community representative.

ANNEX 17

CONSTRUCTION AND MAINTENANCE UNIT

In view of the large expenditure required to develop the rural water supply and sanitation programme in Central Province, it would indeed be considered unsound planning to begin the programme without the creation of a construction and maintenance unit.

This unit will be necessary to insure proper construction, installation, servicing, training and repair of all water systems in the Province. In addition, personnel in this section will be responsible to initiate, motivate and stimulate community agreement and participation in developing rural village water schemes.

1.1 Background

Central Province has approximately 40 motorized diesel water supply systems installed in the villages at the time of this writing and plans are being made to construct at least 12 more similar systems.

There are presently, 6 solar units with power pumps already installed and functioning and it is planned to construct and install 9 more within the next 5 years.

The preceding complex systems will require regular servicing, occasional repair and continuous training of village personnel to do the simple routine maintenance. Operation, repair, and the more difficult servicing also will be necessary to insure continuous operation of the systems.

In addition, it is estimated that another 300-400 handpumps, mostly shallow well-type but some deep well pumps will be necessary to provide the rural population of the province with adequate safe drinking water.

Considering the almost 1.5 million Kina will be required in the next 5 years to provide 40% of the population with an adequate safe water supply it follows that the development of a construction/maintenance section will be absolutely necessary to insure that the systems are properly constructed, installed, operated, serviced and repaired. Villagers also must be trained in operation and maintenance.

1.2 Servicing and Repair

Motorized and solar units require regular maintenance and servicing. Although some of the routine minor servicing can be done by trained village personnel, regular major servicing and repairs must be carried out on a routine basis by qualified experts of the Construction and Maintenance Unit.

Each of the approximately 50 motorized and solar units will require attention by the maintenance unit at least once every 6 weeks. This means that one team and truck will be making continuous rounds to service and repair water supply systems. The villages will be expected to pay for this service.

Annex 17

1.3 Organization and Manpower Requirements

The construction and maintenance unit will be directly responsible to the Provincial Works Coordinator. The volunteer and the health inspector-in-charge of the water supply and sanitation programme will provide supervision of personnel in this unit.

The unit will require 1-2 electricians, plumbers and mechanics and 2-4 casual labourers. Casual labour requirements will be kept to a minimum as village communities are expected to provide free labour to assist in the construction, installation, maintenance and repair of their systems.

MANPOWER REQUIREMENTS

	Existing	Required
Works Coordinator	1	1
Volunteer	0	1
Health inspector-in-charge	1	1
Artisans:		
Electrician	0	1-2
Plumbers	0	1-2
Mechanic	0	1-2
Casual labourers	0	2-4

To begin the operation, only 1 electrician, plumber and mechanic and 2 labourers will be required. Further personnel can be recruited, if necessary as the programme develops in the 2nd year.

K/85,000 will be required to render the unit functionable since a building must be constructed, transport, materials, supplies, tools, etc. must be purchased before the unit will be operational.

1.4 Conclusion

A large capital investment will be required to supply adequate, safe drinking water and sanitary facilities to the rural population of Central Province.

Past experience has shown that without the support of the maintenance unit, many of the more complex schemes will fall into disrepair as servicing will not be properly carried out and equipment will be abused. Government funds will be needlessly wasted.

It is felt that this Section is so important to the development of the Rural Water Sector in Central Province that if funding is not available for the creation of this unit, then an intensive water supply and sanitation development programme using complex systems in Central Province should be deferred until such time as a maintenance unit can be established.

ANNEX 18

CENTRAL PROVINCE - WATER SUPPLY & SANITATION SURVEY
COMMUNITY SCHOOLS
SCHOOLS WITH SAFE, ADEQUATE WATER SUPPLY

District		Name of School	No. Enrolled	Type of Supply
Mekeo		Beipa	401	wells-plus tank
	10.	Aipeana		1 x 2000 gal.
Roro	25.	Bereina	247	Piped
Kabadi	44.	Hisiu		
	72.	Nazareth	248	Piped
	81.	Boera	102	Tanks 3x2,000 1x1,000
Hiri				Pipe
	87.	Gaire	252	Tanks 5x1,000
	93.	Tubuseria	364	Piped
Sogeri				Piped through
	100.	Sogeri	296	Iara Wari High School
Rigo	116.	Gabagaba	150	Piped
	126.	Kwikila	230	Piped
	137.	Kaparoka	70	Tanks plus 1 well 5 x 2,000
Marshall Lagoon				Piped +
	176.	Gavuone	243	8,000 gal. tank
	189/195.	Bomguina	192	River (well under construction)

Annex 18

Schools Which Required Protected Well with Handpumps

District		Name of School	No. Enrolled	Type of System (Existing)	No. Wells Required w/Handpumps
Mekeo		Kirovi Poikui			
Waima/ Kivori		Hereparu	140	well	1
Mekeo				river	
	09	Inawa School	185	well	1
	13	Rarai	130	well	1
	17	Inawaia	350	well	2
Roro					
	28	Ipaipana	187	well	1
Nara					
	37	Ala'ala	41	well	1
Kuni					
	41	Kubuna	93	well	1
	48	Keveone	198	well	1
	53	Kuriua	177	well	1
Vanapa River	65	St Margaret	167		
	70	Brown River		well	1
E. Hiri					
	88	Saseva	94	well	1
Rigo					
	118	Gomore	20	well	1
	127	St. Patricks Gabone	90	well	1
	130	Kemabolo	98	well	1
	134	Bina	147	well	1
	136	Vatugoro	96	well	1
	143	Diki Ravusirol	380	well	2
	145	Kalo	196	well	1
	147	Bore	58	well	1
Ormond					
	153	Diguarobu	87	well	1
	154	Lebagoro	36	well	1
	164	Boregaina	210	well	1

Annex 18

Schools Which Required Protected Well with Handpumps

District	Name of School	No. Enrolled	Type of System (Existing)	No. Wells Required w/Handpumps
Maria				
165	Lebagoro	40	well	1
167	Toule (S.D.A.)	142	well	1
Marshall Lagoon				
172	Waiori	142	well	1
177	171/2000 Kelerakwa	120	well	1
179	Tolopo	125	well	1
180	Madana	80	well	1
181	Keagolo	29	well	1
187	Dom	60	well	1

Schools Which Required Repairs

District		Name of School	No. Enrolled	Type of System (Existing)	Repair Required
	32	Delena	106	Tank 1 x 1000 gal	Yes
	48	Keveona	198	Tank in disrepair	Yes
Kabadi	53	Kuriva	177	Tank - or Rocket Pump	Yes
	79	Lealea	260	Non-function Salty well	Yes

Annex 18

School with Required Further Investigation

District		Name of School	No. Enrolled	Type of System
Mekeo				
	21.	Inawabui	127	
	80.	Papa	100	
Rigo				
	151.	Hood Lagoon	301	
Marshall Lagoon				
	176.	Gavuone	243	
	182.	Aroma		
	184	Pramana	126	