6. PAST FINANCIAL PERFORMANCE IN WATER SUPPLY AND SANITATION

6.2 Past Public Investment

6.2.1 Sources of Local Funds

Table 6.2.1 Income and Expenditure of Sarangani, 1994-1998

Municipality	1994	1995	1996	1997	1998
1. Alabel					
RECEIPTS					
Local Revenues	3,208,676.11	3,496,605.00	4,466,089.00	6,643,944.00	38,288,786.20
IRA	14,564,640.00	16,144,722.00	17,392,926.00	22,280,593.00	25,818,376.00
Other Income	-				
Total Revenues	17,773,316.11	19,641,327.00	21,859,015.00	28,924,537.00	64,107,162.20
Expenditures					
Current Operating Expenditures:	14,547,303.44	17,540,902.00	21,352,088.00	29,035,614.00	41,089,496.50
Personal Services (P.S.)	10,032,254.47	12,320,309.00	15,016,159.00	21,690,527.00	18,891,834.48
Maint. & Other Oper. Exp. (MOOE)	4,515,048.97	5,220,593.00	6,335,929.00	7,345,087.00	22,197,662.02
NET INCOME	3,226,012.67	2,100,425.00	506,927.00	(111,077.00)	23,017,665.70
Less: Capital Outlays	4,034,994.28	5,774,367.00	4,259,704.45	1,415,196.00	29,090,983.82
Non Office	-	-	-	-	-
5% Budgetary	-	-	-	-	-
Sub-Total Other Expenditures	4,034,994.28	5,774,367.00	4,259,704.45	1,415,196.00	29,090,983.82
Add: Other Receipts					
Grants	212,651.50	1,184,500.00	-	-	-
Borrowings		2,400,000.00	3,132,522.00	-	10,000,000.00
Extraordinary Receipts	19,965.00	20,270.00	1,560.00	-	-
Sub-Total Other Receipts	232,616.50	3,604,770.00	3,134,082.00	-	10,000,000.00
Net Income	(576,365.11)	(69,172.00)	(618,695.45)	(1,526,273.00)	3,926,681.88
2. Glan					
RECEIPTS					
Local Revenues 1/	3,521,777.47	5,041,256.51	4,351,190.00	6,178,226.00	3,999,137.19
IRA	20,668,897.00	23,038,648.00	24,693,046.00	32,198,232.00	37,527,848.00
Other Income	-				-
Total Revenues	24,190,674.47	28,079,904.51	29,044,236.00	38,376,458.00	41,526,985.19
Expenditures					
Current Operating Expenditures:	14,807,180.20	19,751,483.17	20,429,977.00	29,036,339.00	31,913,324.38
Personal Services (P.S.)	9,210,103.00	10,625,452.13	13,177,685.00	18,268,933.00	20,339,209.88
Maint. & Other Oper. Exp. (MOOE)	5,597,077.20	9,126,031.04	7,252,292.00	10,767,406.00	11,574,114.50
NET INCOME	9,383,494.27	8,328,421.34	8,614,259.00	9,340,119.00	9,613,660.81
Less: Capital Outlays 2/	2,869,148.06	7,170,245.41	6,728,546.00	4,213,610.00	3,541,493.50
Non Office	-	-	-		-
5% Budgetary	-	-	-		-
Sub-Total Other Expenditures	2,869,148.06	7,170,245.41	6,728,546.00	4,213,610.00	3,541,493.50
Add: Other Receipts					
Grants	-	-	-	-	-
Borrowings	-	-	107,913.00	-	-
Extraordinary Receipts	89,699.86	266,110.46	-	70,088.00	37,126.74
Sub-Total Other Receipts	89,699.86	266,110.46	107,913.00	70,088.00	37,126.74
Net Income	6,604,046.07	1,424,286.39	1,993,626.00	5,196,597.00	6,109,294.05
3. Kiamba					
RECEIPTS					
Local Revenues 1/	4,495,476.62	7,182,718.90	5,103,430.00	7,458,449.00	5,235,400.00
IRA	13,851,897.00	15,321,424.00	16,480,111.00	20,033,364.00	23,039,456.00
Other Income	-				
Total Revenues	18,347,373.62	22,504,142.90	21,583,541.00	27,491,813.00	28,274,856.00
Expenditures					
Current Operating Expenditures:	14,489,942.51	20,856,941.21	21,765,985.84	25,289,962.00	30,670,477.67
Personal Services (P.S.)	8,689,350.93	13,624,119.54	14,523,014.84	18,583,447.00	21,968,462.31
Maint. & Other Oper. Exp. (MOOE)	5,800,591.58	7,232,821.67	7,242,971.00	6,706,515.00	8,702,015.36
NET INCOME	3,857,431.11	1,647,201.69	(182,444.84)	2,201,851.00	(2,395,621.67)
Less: Capital Outlays 2/	1,760,486.19	2,094,142.19	1,080,013.00	1,016,392.00	525,732.00
Non Office	-				-
5% Budgetary	-				-
Sub-Total Other Expenditures	1,760,486.19	2,094,142.19	1,080,013.00	1,016,392.00	525,732.00
Add: Other Receipts					
Grants	679,320.00	171,672.33	-	13,000.00	-
Borrowings	-	-	-	-	-
Extraordinary Receipts	-	-	-	-	-
Sub-Total Other Receipts	679,320.00	171,672.33	-	13,000.00	-
Net Income	2,776,264.92	(275,268.17)	(1,262,457.84)	1,198,459.00	(2,921,353.67)
4. Maasim					
RECEIPTS					
Local Revenues 1/	1,576,570.25	2,160,575.64	2,191,634.00	7,352,238.00	1,999,300.00
IRA	15,317,214.50	16,861,284.00	18,019,053.00	18,019,053.00	16,757,112.00
Other Income	-				
Total Revenues	16,893,784.75	19,021,859.64	20,210,687.00	25,371,291.00	18,756,412.00
Expenditures					
Current Operating Expenditures:	13,138,834.59	15,399,551.67	16,818,523.00	22,206,323.00	27,058,870.64
Personal Services (P.S.)	8,082,410.37	9,399,201.76	10,396,248.00	13,312,198.00	16,171,282.90
Maint. & Other Oper. Exp. (MOOE)	5,056,424.22	6,000,349.91	6,422,275.00	8,894,125.00	10,887,587.74
NET INCOME	3,754,950.16	3,622,307.97	3,392,164.00	3,164,968.00	(8,302,458.64)
Less: Capital Outlays 2/	4,439,093.82	5,517,990.32	3,362,656.00	2,062,733.00	2,122,176.00

Table 6.2.1 Income and Expenditure of Sarangani, 1994-1998

Municipality	1994	1995	1996	1997	1998
Non Office	-	-	-	-	-
5% Budgetary	-	-	-	-	-
Sub-Total Other Expenditures	4,439,093.82	5,517,990.32	3,362,656.00	2,062,733.00	2,122,176.00
Add: Other Receipts					
Grants	2,193,512.50	1,035,897.00	48,795.00	6,600.00	137,500.00
Borrowings	-	-	-	-	-
Extraordinary Receipts	-	-	-	-	-
Sub-Total Other Receipts	2,193,512.50	1,035,897.00	48,795.00	6,600.00	137,500.00
Net Income	1,509,368.84	(859,785.35)	78,303.00	1,108,835.00	(10,287,134.64)
5. Maitum					
RECEIPTS					
Local Revenues 1/	2,530,298.48	5,513,037.47	4,518,940.95	6,697,262.90	5,134,376.11
IRA	11,826,481.00	12,936,864.00	14,346,761.05	18,678,199.10	20,738,737.00
Other Income	-	-	-	-	
Total Revenues	14,356,779.48	18,449,901.47	18,865,702.00	25,375,462.00	25,873,113.11
Expenditures					
Current Operating Expenditures:	12,084,790.04	14,172,811.97	15,321,261.00	20,462,106.00	22,504,716.99
Personal Services (P.S.)	8,347,662.40	10,199,600.90	11,165,313.00	14,741,286.00	16,068,900.49
Maint. & Other Oper. Exp. (MOOE)	3,737,127.64	3,973,211.07	4,155,948.00	5,720,820.00	6,435,816.50
NET INCOME	2,271,989.44	4,277,089.50	3,544,441.00	4,913,356.00	3,368,396.12
Less: Capital Outlays 2/	1,124,497.24	3,848,101.33	3,649,630.00	2,843,405.00	2,713,778.75
Non Office	-	-	-	-	-
5% Budgetary	-	-	-	-	-
Sub-Total Other Expenditures	1,124,497.24	3,848,101.33	3,649,630.00	2,843,405.00	2,713,778.75
Add: Other Receipts					
Capital Revenues		123,722.46	45,000.00	-	
Grants	-			-	667,500.00
Borrowings	-			-	
Extraordinary Receipts	-		150,000.00	100,000.00	
Sub-Total Other Receipts	-	123,722.46	195,000.00	100,000.00	667,500.00
Net Income	1,147,492.20	552,710.63	89,811.00	2,169,951.00	1,322,117.37
6. Malapatan					
RECEIPTS					
Local Revenues 1/	922,380.50	1,519,181.00	3,102,142.00	2,016,513.00	1,086,838.86
IRA	17,734,540.50	19,329,162.00	19,329,162.00	27,460,645.00	30,033,364.00
Other Income	-				
Total Revenues	18,656,921.00	20,848,343.00	22,431,304.00	29,477,158.00	31,120,202.86
Expenditures					
Current Operating Expenditures:	12,975,205.00	15,179,292.00	17,934,599.00	24,943,444.85	28,025,721.98
Personal Services (P.S.)	7,881,080.00	8,172,369.00	9,874,570.00	14,033,503.85	17,490,232.72
Maint. & Other Oper. Exp. (MOOE)	5,094,125.00	7,006,923.00	8,060,029.00	10,909,941.00	10,535,489.26
NET INCOME	5,681,716.00	5,669,051.00	4,496,705.00	4,533,713.15	3,094,480.88
Less: Capital Outlays 2/	1,791,687.00	2,406,843.00	2,683,772.00	3,349,846.00	4,438,058.05
Non Office	-	-	-	-	-
5% Budgetary	-	-	-	-	-
Sub-Total Other Expenditures	1,791,687.00	2,406,843.00	2,683,772.00	3,349,846.00	4,438,058.05
Add: Other Receipts					
Grants	-	-	-	-	-
Borrowings	-	-	-	-	-
Extraordinary Receipts	-	-	-	-	-
Sub-Total Other Receipts	-	-	-	-	-
Net Income	3,890,029.00	3,262,208.00	1,812,933.00	1,183,867.15	(1,343,577.17)
7. Malungon					
RECEIPTS					
Local Revenues 1/	2,702,914.72	3,617,462.16	3,332,407.00	4,244,620.46	3,394,840.16
IRA	22,380,930.00	24,704,482.00	26,510,724.00	41,989,312.00	49,023,518.00
Other Income	-	-			-
Total Revenues	25,083,844.72	28,321,944.16	29,843,131.00	46,233,932.46	52,418,358.16
Expenditures					
Current Operating Expenditures:	15,615,243.81	23,297,737.07	24,792,794.00	34,255,091.90	48,047,270.87
Personal Services (P.S.)	9,747,206.12	15,331,966.18	18,003,285.00	23,481,694.95	27,840,667.55
Maint. & Other Oper. Exp. (MOOE)	5,868,037.69	7,965,770.89	6,789,509.00	10,773,396.95	20,206,603.32
NET INCOME	9,468,600.91	5,024,207.09	5,050,337.00	11,978,840.56	4,371,087.29
Less: Capital Outlays 2/	3,738,581.60	6,184,887.25	1,223,750.00	4,757,243.52	1,997,000.00
Non Office	-	-	-	-	-
5% Budgetary	-	-	-	-	-
Sub-Total Other Expenditures	3,738,581.60	6,184,887.25	1,223,750.00	4,757,243.52	1,997,000.00
Add: Other Receipts					
Grants	286,381.00	143,197.00	-	-	-
Borrowings	-	-	-	-	-
Extraordinary Receipts	-	-	-	-	-
Sub-Total Other Receipts	286,381.00	143,197.00	-	-	-
Net Income	6,016,400.31	(1,017,483.16)	3,826,587.00	7,221,597.04	2,374,087.29

Table 6.2.2 Past Internal Revenue Allotment for the Province of Sarangani

	Item	1994	1995	1996	1997	1998
1.	**IRA to All Municipalities (National)**	16,325,888,074.00	18,768,925,000.00	19,607,715,553.00	24,849,000,000.00	28,245,815,434.00
2.	**IRA by Municipality**	116,344,599.50	128,336,586.00	136,771,819.05	180,659,398.10	202,938,411.00
	Alabel	14,564,640.00	16,144,722.00	17,392,962.00	22,280,593.00	25,818,376.00
	Glan	20,668,897.00	23,038,648.00	24,693,046.00	32,198,232.00	37,527,848.00
	Kiamba	13,851,897.00	15,321,424.00	16,480,111.00	20,033,364.00	23,039,456.00
	Maasim	15,317,214.50	16,861,284.00	18,019,053.00	18,019,053.00	16,757,112.00
	Maitum	11,826,481.00	12,936,864.00	14,346,761.05	18,678,199.10	20,738,737.00
	Malapatan	17,734,540.00	19,329,162.00	19,329,162.00	27,460,645.00	30,033,364.00
	Malungon	22,380,930.00	24,704,482.00	26,510,724.00	41,989,312.00	49,023,518.00
3.	**% Share by Municipality**	0.71	0.68	0.70	0.73	0.72
	Alabel	12.52	12.58	12.72	12.33	12.72
	Glan	17.77	17.95	18.05	17.82	18.49
	Kiamba	11.91	11.94	12.05	11.09	11.35
	Maasim	13.17	13.14	13.17	9.97	8.26
	Maitum	10.17	10.08	10.49	10.34	10.22
	Malapatan	15.24	15.06	14.13	15.20	14.80
	Malungon	19.24	19.25	19.38	23.24	24.16

7. WATER SOURCE DEVELOPMENT

7.3 Groundwater Sources

7.3.2 Groundwater Availability in the Province

(1) Major Information and References

The Groundwater Availability Map was prepared using the following information and reference (detailed list of reference is presented in Table 7.3.1, Data Report):

- Administrative and Topographical Maps of the Province published by NAMRIA with scales of 1:250,000 and 1:50,000, respectively.
- Geological Map of the Philippines published by BMGS with a scale of 1:1,000,000.
- Water Resource Investigation conducted by NWRB, 1986.
- Well Inventory Database prepared by NWRB, LWUA and DPWH.
- Well Inventory Database in the province.
- General information on groundwater condition by DPWH-DEO and PPDO.
- Well Log Data by DPWH-DEO and PEO.
- Water source information by Water Districts.

(2) Approach and Methodology

The procedure in preparing the Groundwater Availability Map is explained below with workflow depicted in Figure 7.3.1.

1) Prepare a base map with an approximate scale of 1:600,000 (fit to the A4 map size). The topographical map of NAMRIA (1:250,000) was used as a reference map. Basic information including rivers and provincial and municipal boundaries are indicated in the prepared base map.

2) The groundwater potential areas, based on the geology of the province, are delineated on the base map. The Recent alluvial and/or beach deposits, Pliocene-Quaternary sedimentary formation (clay, silt, sand and gravel) and Pliocene-Quaternary volcanic rock units (pyroclastics, debris flow and tuff) are regarded as possible aquifers considering their high porosity and permeability.

Boundaries between groundwater development potential area and difficult area were defined and delineated as presented in Figure 7.3.1, Main Report.

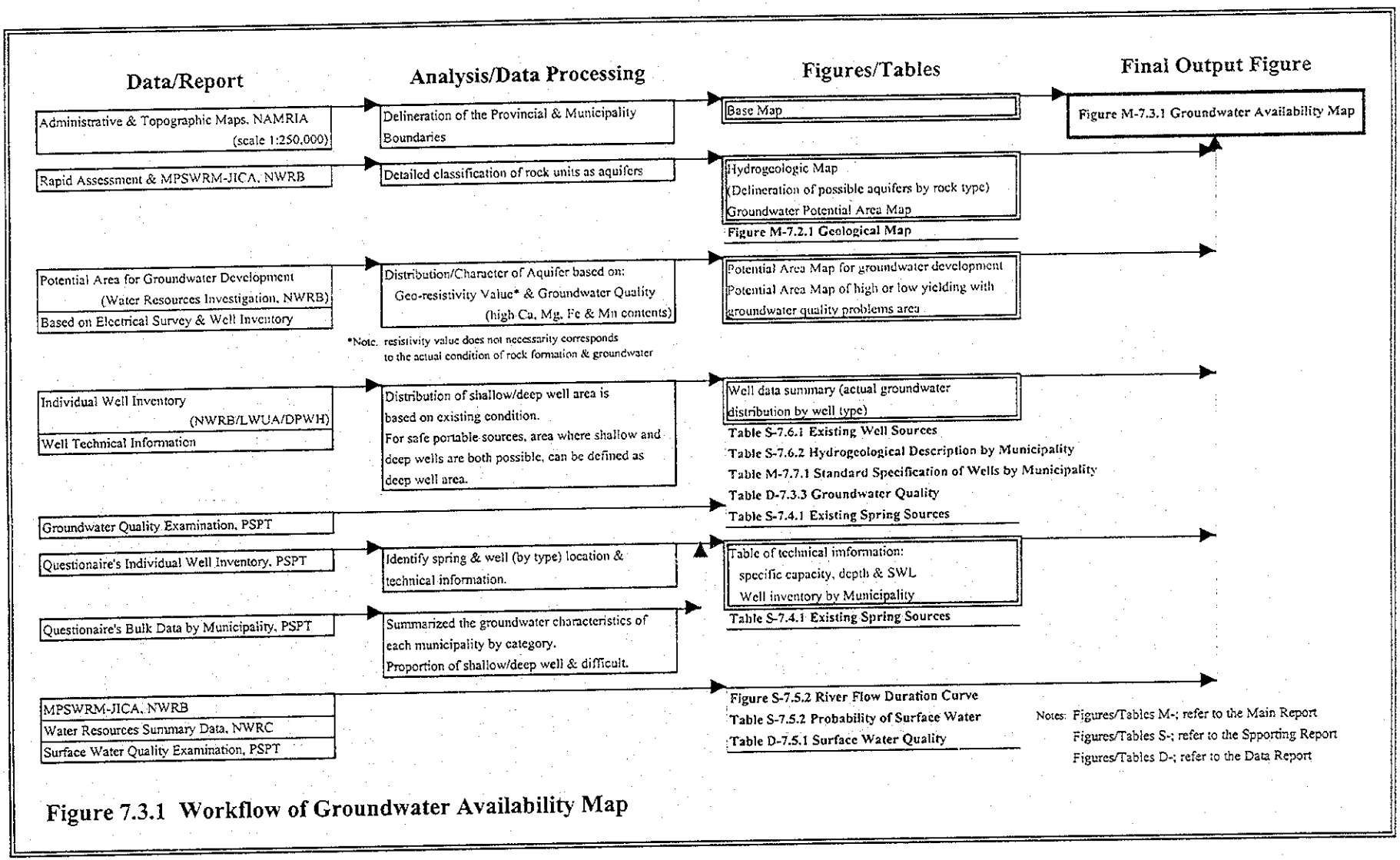


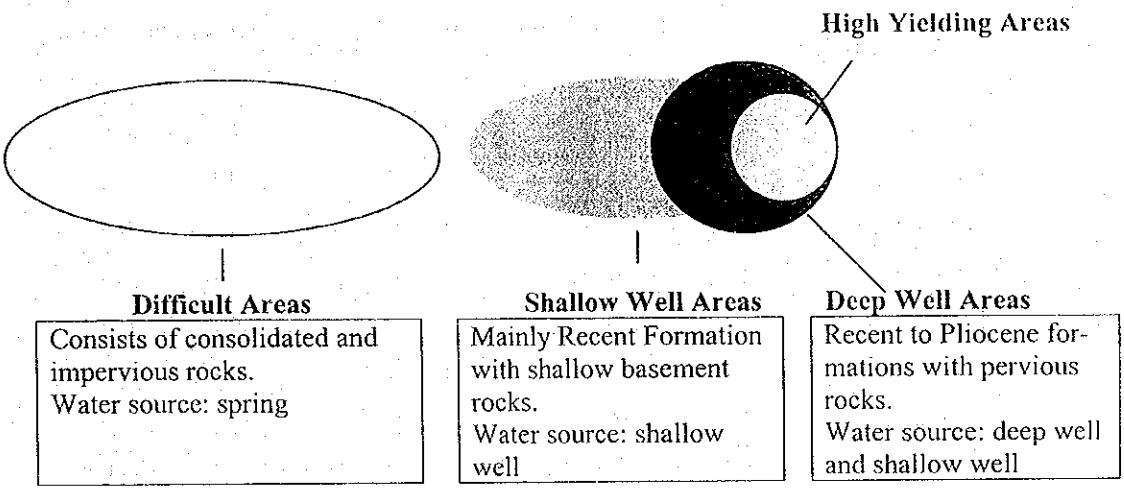
Figure 7.3.1 Workflow of Groundwater Availability Map

3) Areas with potential high yielding aquifer in the Water Resources Investigation of NWRB, are reflected in the defined groundwater potential areas.

Based on the results of electric resistivity survey of the above investigation, resistivity values from 20 to 210 ohm-meter indicate a potential high yielding formation. Values less than 10 ohm-meter suggest clayey layer. Figure 7.3.1, Main Report, shows the boundaries of areas with high and low yielding aquifers.

4) Delineate shallow and deep well areas based on well database of NWRB and DPWH-central offices, well inventory of DPWH-DEO (refer to Table 7.3.1, Data Report) and rock distribution. Figure 7.3.2 presents the categorization in terms of groundwater utilization.

Figure 7.3.2 Area Category by Groundwater Utilization



Shallow well areas are defined on the following basis:

(a) Predominance of serviceable shallow wells and presence of deep wells with water quality problem and/or low yielding aquifers.

(b) Occurrence of impervious rocks beneath the Recent formation at shallow depth.

5) Based on the information provided by NWRB's well inventory and the data obtained through the questionnaires, well specification for each municipality is established as shown in the map. These specifications are used as references in evaluating the groundwater availability in each locality. Individual well locations with technical information are presented in Figure 7.6.1, Data Report.

(3) Future updating and utilization of the map

For future updating of the map, the following procedure shall be employed.

1) Referring to the results of any supplementary water sources investigation by various agencies, re-define the potential area for groundwater development by applying the aforementioned procedures.
2) Update the provincial database using the questionnaire made for the study to make necessary revision of the delineated boundaries of groundwater categories.

7.4 Spring Sources

The numbers and discharge of developed and untapped springs by municipality are shown in Table 7.4.1. The data are derived from and the information obtained through the questionnaires and Table 7.1.1 Water Sources Information, Data Report.

Table 7.4.1 Existing Spring Sources

Municipality	No. of Developed Spring		Untapped Spring		
	Q<2.8lps	Q>2.8lps	No.	Ave. lps	Range lps
Alabel	9	0	3	8.0	8.0 ~ 8.0
Glan	8	1	9	1.9	0.5 ~ 6.0
Kiamba	19	0	4	1.1	0.5 ~ 1.5
Maasim	15	0	7	1.0	0.8 ~ 1.2
Maitum	30	0	14	0.8	0.7 ~ 1.0
Malapatan	7	0	3	0.9	0.8 ~ 0.9
Malungon	46	1	5	41.3	1.0 ~ 200.0

Notes; "Ave.lps" & "Range lps" mean the average discharge and the range of discharges in lps (liter/second).

7.5 Surface Water Sources

The major rivers in the province were selected to evaluate their potential as water supply sources to meet the future water needs of the province. The following criteria were adopted for the selection:

- rivers currently utilized for domestic water supply
- rivers which have gauging stations, and
- rivers with watershed of 100 km^2 or more.

Based on the above criteria, the selected major rivers are Glan, Lun Padidu, Buayan, Siguel and Kapalong Rivers as shown in Figure 7.5.1 River Network Map. All these rivers belong to WRR-XI, except for Kalaong, which is in WRR-XII.

The gauging station in the province is located at the Buayan River, which is shown in Figure 7.5.1. The runoff records are obtained from the "Philippine Water Resources Summary Data" prepared by the NWRC in 1980. The information on the gauging stations and the present uses (water rights) of the major rivers in the province is summarized in Table 7.5.1.

(1) Surface Water Utilization/Water Rights

As seen in Table 7.5.1, the present water utilization in the watershed of the Glan, Lun Padidu and Buayan Rivers totals to 4.8 m^3/sec. Of this total, the water rights of 4.6 m^3/sec are registered for irrigation use in the province. There are no registered water rights for domestic and industrial uses. Only 2 private companies had registered surface water rights for fisheries (aqua-culture) in Alabel.

(2) River Flow Analysis

The flow duration curves, derived from the available runoff records, are shown in Figure 7.5.2. Also, for the Silway River duration curve, the specific discharges at the Clinan (Polomolok) and the Lagao (General Santos) gauging stations in the province of South Cotabato are added for comparison.

The stream flow, maintenance flow, diversion flow and return flow are usually used to estimate the exploitable surface water potential. In this study, the stream flow was considered as flow potential for domestic use and the diversion flow value was treated as the equivalent to the discharge of water rights registration in surface water use. No detailed study on the return flow has been performed yet due to the difficulties in investigating the irrigation, evapotranspiration and recharge value to groundwater, etc. within the entire watersheds in the province. Therefore, the return flow was not considered for the estimation of exploitable potential.

It is generally accepted that to secure the required volume for water supply, each water use sector adopts the different return periods. Usually, the dependability of domestic water supply is taken to be 90% or higher (10-year or longer return-period) of the whole hydrological period.

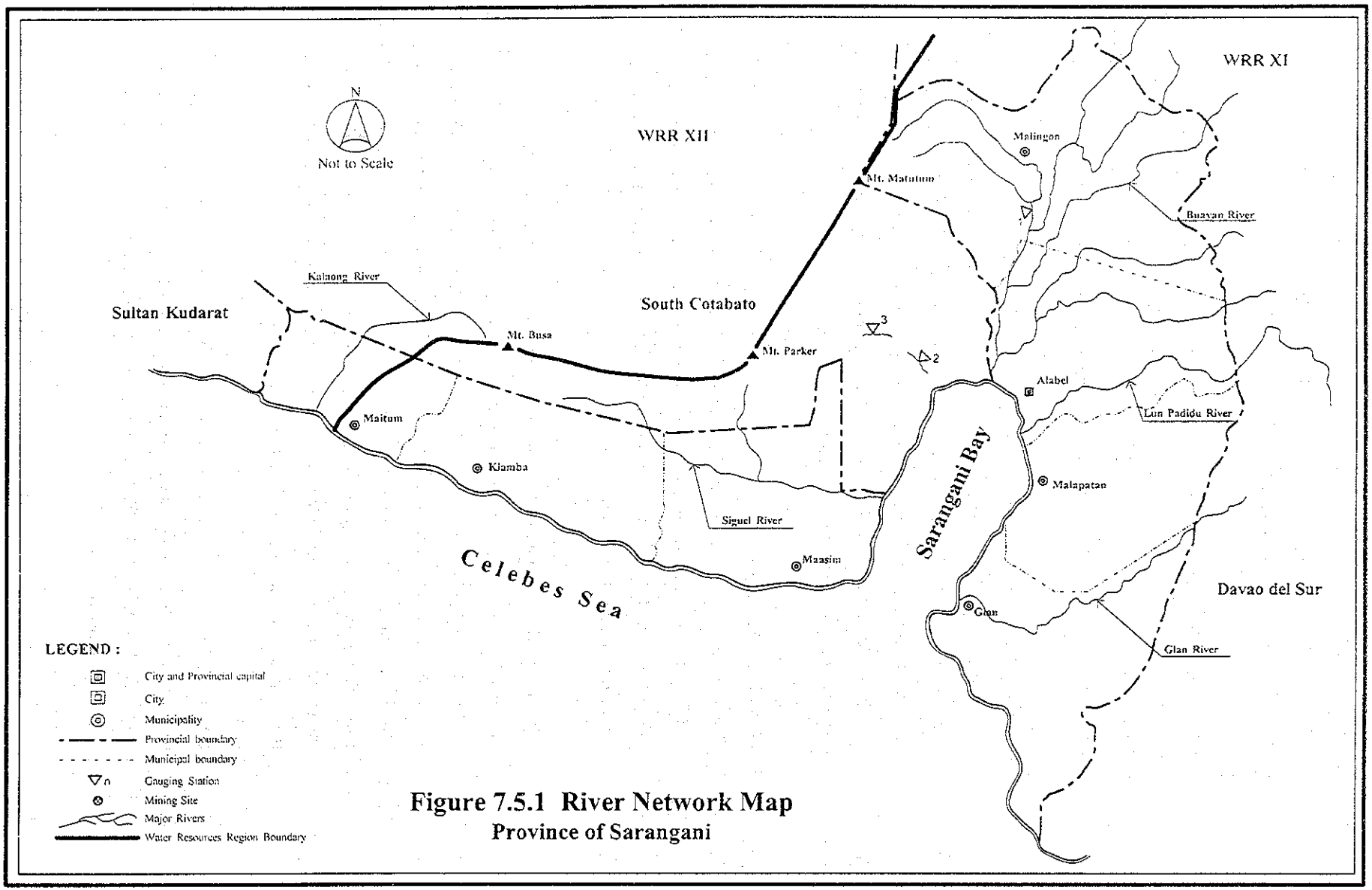


Figure 7.5.1 River Network Map
Province of Sarangani

Table 7.5.1 Gauging Station & River Water Use by Major River Basins

River Basin		Information from Gauging Station						Surface Water Use (Water Rights) in Watershed				
Major River	Systems & Main	Drainage*1	Location	River Flow Rate (Q: cum/sec)				Municipality	Domestic	Industrial	Irrigation	Others*3
		sq.km	No. in Figure 7.5.1	Peak Qp	Max. Qdx	Mini. Qdn	Data Period	in watershed	cum/sec	cum/sec	cum/sec	cum/sec
Glan		Gauging Station is not existed in watershed.						(Davao del Sur)*5	NR*4	NR*4	NR*4	NR*4
								Glan	0.00	0.00	0.12	0.00
Lun Padidu		Gauging Station is not existed in watershed.						(Davao del Sur)*5	NR*4	NR*4	NR*4	NR*4
								Alabel	0.00	0.00	0.57	0.22
Buayan		208.00	(1): downstrea	12.56	10.93	1.41	1957-'70	(Davao del Sur)*5	NR*4	NR*4	NR*4	NR*4
								Malungon	0.00	0.00	3.56	0.00
								Alabel	0.00	0.00	0.35	0.01
Siguel		Gauging Station is not existed in watershed.						(South Cotabato)*5	NR*4	NR*4	NR*4	NR*4
								Kiamba	NR*4	NR*4	NR*4	NR*4
								Maasim	NR*4	NR*4	NR*4	NR*4
Kalaong		Gauging Station is not existed in watershed.						(South Cotabato)*5	NR*4	NR*4	NR*4	NR*4
								Maitum	NR*4	NR*4	NR*4	NR*4

So Philippine Water Resources Summary Data, established January 1980 by NWRC

No Drainage* : Watershed Area at Gauging Station
NA*2 : Recorded River Gauge Hight only
Qp : Peak Discharge of Daily Maximum Discharge
Qdx : Maximum Daily Discharge of Weighted Daily Discharge
Qdn : Minimum Daily Discharge of Weighted Daily Discharge
Others*3 : Including Livestock, Recreation & Fisheries
NR*4 : Surface water utilization was not registered in NWRB Database, as of March 1997.
(Province : Out of Applicable Area

Percent of Time (%) (No. in Figure 7.5.1)	Specific Discharge (cum/sec/100sq.km) Buayan 1	Silway-1 2	Silway-2 3	Allah 4
10%	1.79	2.76	13.02	7.85
20%	1.42	2.35	10.83	6.63
30%	1.33	2.12	8.26	5.82
40%	1.13	1.83	6.65	5.28
50%	1.02	1.67	4.84	4.68
60%	0.98	1.49	4.17	4.19
70%	0.93	1.38	3.23	3.63
80%	0.86	1.30	2.84	3.07
90%	0.74	1.13	2.50	2.51
100%	0.70	0.71	0.02	0.73
Period of Data Used	1957-'70	1950-'70	1956-'70	1951-'70

Source; Philippine Water Resources Summary Data, as of Jan. 1980 by NWRC

Interim Report, Master Plan Study on Water Resources Management, as of Oct. 1997 by NWRB

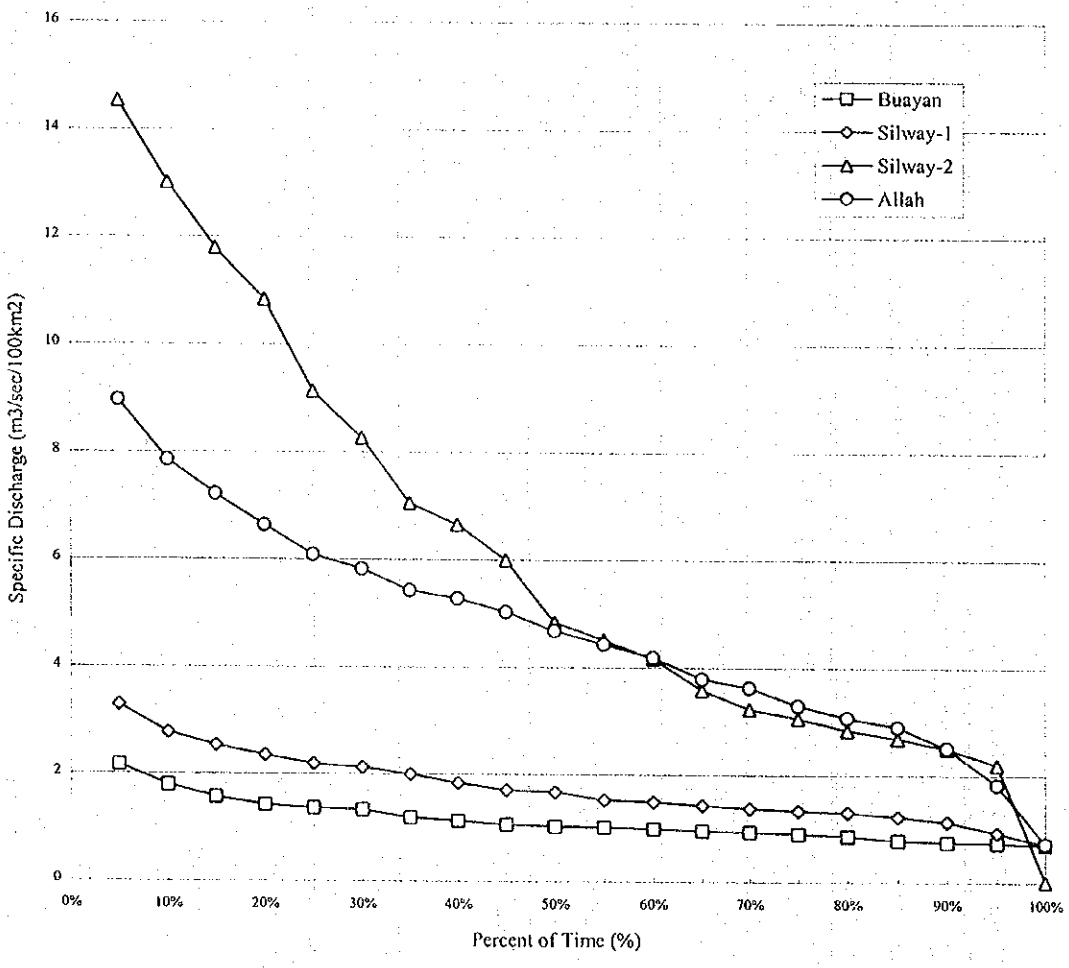


Figure 7.5.2 River Flow Duration Curve

In determining the river maintenance flow, such factors as runoff characteristics, navigation, fishing, picturesque scenery, salt water intrusion, clogging of river mouth, riparian structures, groundwater table, flora and fauna, and river water quality shall be considered to maintain the normal function of the river. In the Philippines, 10% of the dependable flow of the river is at least required as minimum maintenance flow. Therefore, the maintenance flow was calculated as the dependable flow for irrigation, which equals to 80% (5-year return-period) of the whole hydrological period.

Finally, the exploitable potential of surface water in the province was studied in the case of inflow to and outflow from the respective municipalities. The results are summarized in Table 7.5.2.

(3) Surface Water Quality

Within the watersheds of the major rivers in the province, there is no influence of surface water pollution. The palm plantations are widely distributed within the catchment areas in the eastern part of the province. However, some places in the said catchment have no trees for watershed preservation. Presently, the turbidities of the Glan and Lun Padidu rivers are examined at normal levels, but there is a possibility of severe erosion in the future.

The results of water quality analysis are summarized in Table 7.5.1, Data Report. The sampling locations were selected upstream of the respective municipalities. In the said table, Class AA and Class A of the DENR "Water Quality Criteria for Fresh Water" are shown as reference for raw water evaluation. The PNSDW-1994 is also used to evaluate water quality with reference to turbidity and trace elements. The water quality of the selected rivers is classified as class "A", although the parameters tested are limited.

7.6 Future Development Potential of Water Sources

(1) Groundwater

A well inventory covering all the municipalities shows that there are 4,957 existing wells in the province, while 210 wells are recorded in the inventory prepared by PSPT (refer to Table 7.1.1 and 7.3.2, Data Report). Despite the smaller number of wells included in PSPT data, these were used in the analysis, since these provided technical information. Of the total 210 wells, 117 have complete information: depth, static water level and specific capacity. Data are summarized in Table 7.6.1 Existing Well Sources.

Table 7.5.2 Probability of Surface Water

Source Name		Related Data						Probability of Surface Water (10-year returen-period)							
		Location		Watershed Area in		Sp. D (return-period)		Inlet Flow to Municipality				Outlet Flow from Municipality			
Major River Water	System & Main	Municipality & Other Province	River Conn.	Location (1)	Upstream (2)	10-year (3)	5-year (4)	S/Flow (5) (2)x(3)x100	M/Flow (6) (2)x(4)x100x10%	Use (7)	Potential (8) (5)-(6)-(7)	S/Flow (9) (5)-(1)x(3)x100	M/Flow (10) (6)-(1)x(4)x100x10%	Use (11)	Potential (12) (9)-(10)-(11)
		up to down	outlet/inle	sq.km	sq.km	Q	Q	cu.m/sec	cu.m/sec	cu.m/sec	cu.m/sec	cu.m/sec	cu.m/sec	cu.m/sec	cu.m/sec
Glan		Glan		404.61	78.60	0.74	0.86	0.58	0.07	0.00	**0.51**	3.58	0.42	0.12	3.04
Lun Padidu		Alabel		199.99	114.09	0.74	0.86	0.84	0.10	0.00	**0.75**	2.32	0.27	0.79	1.26
Buayan		Malungon		815.93	353.22	0.74	0.86	2.61	0.30	0.00	**2.31**	8.65	1.01	3.56	4.09
		Alabel		264.85	1,169.15	0.74	0.86	8.65	1.01	3.56	**4.09**	10.61	1.23	3.92	5.46
Siguel		Kiamba		75.29	177.08	2.50	2.84	4.43	0.50	0.00	**3.92**	6.31	0.72	0.00	**5.59**
		Maasim		340.48	252.37	2.50	2.84	6.31	0.72	0.00	**5.59**	14.82	1.68	0.00	13.14
Kalaong		Maitum		107.04	148.51	2.51	3.07	3.73	0.46	0.00	**3.27**	6.41	0.78	0.00	**5.63**

Notes; Sp. D (Specific Discharge) was analyzed by montly mean flow records from gauging station.
S/Flow (Stream Flow) was estimated specific diacharge (10-year return-period) multilied by upstream area.
M/Flow (Maintenance Flow) was estimated 10% of river flow in case of 5-year return-period.
Sp.D (10-year or 5-year return-period) without gauging station was adopted by the other analysis result from near gauging station.
Inlet & outlet "Use" (Water Rights) are summed up by NWRB Database, as of March 1997.
Unit Q for Specific Discharge is cu.m/sec/100 sq.km.
S/Flow, M/Flow & Use in final outlet flow of each stream system was added to respective inlet flows' of main system.

Table 7.6.1 Existing Well Sources

Municipality	Type	No.	Depth (m)		SWL (mbgs)		Sp. Cap. (lpsm)	
			Ave.	Range	Ave.	Range	Ave.	Range
Alabel	DW	10	42.3	36.0 - 48.0	9.2	4.0 - 40.0	0.66	0.11 - 0.75
	SW	9	10.0	6.0 - 15.0	7.7	4.0 - 13.0	-	- - -
Glan	DW	23	38.7	36.0 - 42.0	7.1	4.0 - 8.0	-	- - -
	SW	29	8.7	6.0 - 15.0	7.2	4.0 - 12.0	-	- - -
Kiamba	DW	17	46.9	42.0 - 48.0	4.4	4.0 - 6.0	0.12	0.12 - 0.12
	SW	17	13.9	9.0 - 18.0	5.0	4.0 - 6.0	-	- - -
Maasim	DW	11	46.5	42.0 - 48.0	5.2	4.0 - 8.0	-	- - -
	SW	12	18.0	18.0 - 18.0	5.0	4.0 - 6.0	-	- - -
Maitum	DW	13	44.4	24.0 - 54.0	5.4	5.0 - 8.0	-	- - -
	SW	17	18.0	18.0 - 18.0	5.8	5.0 - 8.0	-	- - -
Malapatan	DW	8	42.0	42.0 - 52.0	20.6	8.0 - 38.0	0.09	0.08 - 0.17
	SW	7	10.3	6.0 - 15.0	7.2	4.0 - 13.0	-	- - -
Malungon	DW	19	39.7	36.0 - 42.0	7.4	6.0 - 8.0	0.23	0.23 - 0.23
	SW	18	10.9	9.0 - 12.0	5.5	5.0 - 6.0	-	- - -

Notes; The values of "Ave. depth, SWL and Sp.Cap." by municipality are estimated using the weighted average based on 1995 census population in respective barangays of well locations.
Legend; SWL=static water level, Sp.Cap.=specific capacity, Ave.=average, SW=shallow well and DW=deep well

Considering the well information, the most productive wells are those having depths ranging from 36m to 42m. The good yielding wells have static water levels varying from about 6m to 8mbgs and specific capacity of about 0.75 lpsm.

Based on the hydraulic characteristics and location of wells in Sarangani, aquifers are widely distributed along both sides of the Buayan River flowing in the northern portion of the province from north to south. Shallow well areas are distributed in the southern portion of Kiamba and Maitum. The Pliocene and older rock units are widely distributed in the mountainous areas that are classified as difficult area for groundwater development.

As indicated in Figure 7.3.1 Main Report, the province faces the Sarangani Bay and the Celebes Sea and saline water intrusion is observed in most of the coastal areas. In the eastern part of the province, the groundwater recharge areas are widely covered by limestone hills. Water qualities of both deep wells and springs have high Ca and Mg contents.

As alternative water sources, the untapped springs can be developed for future use. These are the most reliable sources for water supply in the province because groundwater quality has serious problems of saline water intrusion and high Ca and Mg contents. Existing spring sources of 136 are utilized for water supply and they originate from the high mountains of the province. The untapped springs of 45 are proposed as future water sources.

The detailed hydrogeological characteristics of each municipality are summarized in Table 7.6.2, while individual well locations with technical information are shown in Figure 7.6.1 individual Well Location and Specification Map, Data Report.

Additional wells shall be designed employing "gravel packed well" with a filtration thickness at annular space of about 50mm or more depending on the grain sizes of aquifers and pumping capacity. While, natural gravel packed well may be adopted within the areas where well-sorted natural gravel formation is distributed at the expected aquifer. Such areas are usually the upstream areas of alluvial fans or plains in the province. The formations suitable for natural gravel packed method can be observed mostly at shallower depth. The application of such method for Level I well is also justifiable, since inflow velocity of groundwater through the screen is very low because of minimal pumping rate by means of hand-pump operation.

Generally, shallower well has higher possibility to be constructed by the natural gravel packed method than the deeper one in areas formed by recent deposits. This is because the layers at different depths of alluvial plain or fan deposits had been formed by different conditions of transportation and sedimentation between varied grain sizes. Therefore, the availability of the natural packed well development in the province is experimentally assumed considering the limited information such as topography, geology, static water levels, etc., as shown in Table 7.6.3. However, the different proportions of the 2 kinds of deep well structures (gravel packed and natural gravel packed wells) are not estimated by the accurate results based on the hydrogeological study.

Examination on the effective grain sizes and the uniformity coefficient by sieve analysis at the influential aquifers (composed of coarse sand and/or fine gravel) should be conducted during the implementation period. Such analysis and actual well construction results are very helpful in considering the natural gravel packed method for future planning.

Table 7.6.2 Hydrogeological Descriptions by Municipality

Municipality	Ground Information								Well Information						Groundwater Information						
	Topography Area Proportion (%)			Geology Lithofacies (Major Aquifers)	Geology Stratigraphy of Geological Age*				Depth m		SWL mbgs		Sp.Cap. lpsm	L-III	Availability Area Proportion (%)			Potential Comparative		Quality Area Feature	
	Plain-Plateau	Hilly-Piedmont	Mountain		Q	Tertiary Neo.	Tertiary Paleo.	C	mini.	max.	mini.	max.	ave.	well	SW	DW	Diff.	Wells	Springs	Problem	Pollutants
Alabel	10%	79%	11%	recent deposits & limestone	x	x	x		36.0	48.0	4.0	40.0	0.66	3	0%	89%	11%	good	poor	saline & Ca/Mg	
Glan	4%	79%	17%	recent deposits & limestone	x	x	x		36.0	42.0	4.0	8.0	-	5	0%	83%	17%	fair	few	saline & Ca/Mg	
Kiamba	21%	2%	77%	recent deposits	x	x	x	x	42.0	48.0	4.0	6.0	0.12	0	3%	20%	77%	shallow	rich	saline	
Maasim	3%	68%	29%	recent deposits & limestone	x	x	x	x	42.0	48.0	4.0	8.0	-	0	0%	71%	29%	fair	few	saline & Ca/Mg	
Maitum	8%	11%	81%	recent deposits	x	x	x		24.0	54.0	5.0	8.0	-	0	8%	11%	81%	shallow	rich	saline	
Malapatan	2%	65%	33%	recent deposits & limestone	x	x	x	x	42.0	42.0	8.0	38.0	0.09	1	0%	67%	33%	fair	few	saline & Ca/Mg	
Malungon	0%	76%	24%	limestone	x	x	x	x	36.0	42.0	6.0	8.0	0.23	0	0%	76%	24%	fair	poor	Ca/Mg	

Legend; Geological Age, Q=Quaternary, Neo.=Neogene, Paleo.=Paleogene, C=Cretaceous
Well Information, SWL=static water level, Sp.Cap.=specific capacity, L-III=wells operated for L-III service
Groundwater Information, SW=solo shallow well area, DW=deep well area, Diff.=difficult area

Table 7.6.3 Proportion of Gravel Packed and Natural Gravel Packed Wells

Municipality (only potential area)	Proposed Well Depth	Proportion (%) of Level-I Deep Wells	
		Gravel Packed	Natural Gravel Packed
Alabel	40 m	90 %	10 %
Glan	40 m	95 %	5 %
Kiamba	40 m	90 %	10 %
Maasim	80 m	95 %	5 %
Maitum	40 m	85 %	15 %
Malapatan	40 m	95 %	5 %

(2) Spring

Untapped spring source identification data are shown in Table 7.6.4. These data were collected and tabulated by questionnaire sheets-untapped spring information format, Data Report. Data also included the parameters of barangay name, owner, discharge, transmission line length, and elevation difference.

Table 7.6.4 Untapped Spring Source Identification

Location		Identification of Untapped Spring			
Municipality	Barangay	Owner	Discharge (lps)	T.L.L.* (km)	Elevation Difference (m)
Alabel	Alegria	NA	8.0	7.0	60
	Pag-Asa	NA	8.0	5.0	100
	Paraiso	NA	8.0	1.5	150
Glan	Batulaki	NA	1.7	7.0	130
	Burias	NA	1.9	2.0	20
	Datalbukay	NA	0.5	1.5	30
	Laguimit	NA	1.3	1.0	100
	New Aklan	NA	6.0	2.0	150
	Pangyan	NA	1.2	6.0	80
	San Vicente	NA	1.8	1.0	30
	Small Margus	NA	1.5	7.0	50
	Sufatubo	NA	1.5	8.0	50
Kiamba	Lebe	NA	0.5	1.0	2
	Lomuyon	NA	1.5	6.0	40
	Nalus	NA	1.5	4.0	40
	Tamadang	NA	0.8	1.5	5

Table 7.6.4 Untapped Spring Source Identification (contd)

Location		Identification of Untapped Spring			
Municipality	Barangay	Owner	Discharge (lps)	T.L.L.* (km)	Elevation Difference (m)
Maasim	Daliao	NA	1.0	3.7	30
	Kamanga	NA	1.0	5.0	40
	Lumasal	NA	1.0	4.0	40
	Malbang	NA	1.2	4.0	50
	Pananag	NA	1.2	7.0	30
	Seven Hills	NA	0.8	0.8	8
	Tinoto	NA	1.0	6.5	-7
Maitum	Kalaneg	NA	0.8	1.0	15
	Maguling	NA	0.8	3.3	10
	Upo	NA	0.8	0.8	20
	Upo	NA	0.8	1.3	30
	Upo	NA	1.0	1.5	38
	Upo	NA	0.9	1.6	45
	Upo	NA	0.8	1.3	40
	Upo	NA	0.8	1.0	30
	Upo	NA	0.8	0.9	28
	Upo	NA	0.8	0.7	15
	Upo	NA	0.7	0.5	20
	Upo	NA	1.0	1.8	35
	Upo	NA	0.7	1.0	18
	Upo	NA	0.7	1.3	23
Malapatan	Libi	NA	0.8	4.4	50
	Patag	NA	0.9	4.0	50
	Upper Suyan	NA	0.9	2.2	100
Malungon	B'laan	NA	200.0	4.0	120
	Datal Batong	NA	1.0	2.5	150
	Malabod	NA	3.0	1.2	100
	Tamban	NA	1.5	4.0	80
	Upper Lumabat	NA	1.0	2.5	150

Note: T.L.L.; Transmission line length
NA; Data not available

7.7 Water Source Development for Medium-Term Development Plan

7.7.1 Detailed Groundwater Investigation Required

(1) Test Well Investigation on Potable Groundwater Potential in Alluvial Plain

The urbanized areas of Alabel may be covered by Level-III water supply service. Hence, the existing water supply systems should be improved, expanded or combined to meet future demands. Presently, the 1995 census indicated a total population of 12,628 in the Poblacion of Alabel. Most of the water sources in this area are deep wells. Saline water intrusion into the alluvium aquifers is observed along the coastal belt of Alabel.

For the future sustainable groundwater development in terms of quantity and quality, therefore, the study on sustainable yield of potable groundwater shall be conducted. The recommended tasks would involve test wells with pumping tests, the water quality analysis, etc. as specified below.

- Study Site; about 5 km^2 around Poblacion of Alabel
- Review of Electrical Prospecting Survey; Groundwater Investigation, 1982 by NWRC
- Test Well Site; urban area in Alabel
- Test Well; one deep well
- Tentative Well Design; depth of 150m, diameter of 250mm and screen length of 40m
- Pumping Test; Time Draw-down with maximum discharge of 2,500m^3/day and Recovery Test
- Water Quality Examination; to include of Cl
- Results; Potable Groundwater Potential

(2) Pumping Test Investigation on Groundwater Potential in the Limestone Plateaus

The majority of the water source in the limestone plateaus is spring. However, the spring fields are located in the mountainous area where they are generally far from the populated area. Presently, the 1995 census indicated a total population of about 17,315 population at the urban barangays of the western coastal area. In Maasim, deep wells are possible sources for Level III water supply service. Groundwater source imbalance might occur when the water demand of Maasim area is covered by deep well located at the same fields. Therefore, the study on the sustainable yield in the said area shall be conducted. Recommended tasks are the pumping test of existing wells, the water quality

analysis, etc. as specified below.

- Test Wells; several existing wells owned by the Maasim WD
- Pumping Test; Time Draw-down and Recovery Test with maximum discharge of 2,000 m^3/day
- Water Quality Examination; to include of Ca, Mg, Fe, Mn and Cl
- Results; Groundwater Potential

7.7.2 Spacing Allocation for Level II and III Wells

The pumping rates required for Level I facilities are fairly lower compared with that of Level II and III systems. The well interference in Level I facilities need not be studied in terms of spacing of wells and production rate, since most formations in shallow and deep well areas generally have enough groundwater development potential. As Level II and III wells are usually expected to produce higher discharges to meet the water demand, the spacing of wells to avoid well interference has to be considered. Spacing allocation for Level II and III wells was examined considering specific capacity, pumping rate, and assumed drawdown of 1cm at the interference radius for a pumping duration of 16 hours.

(1) Specific Capacity

According to the existing well source information, specific capacity was considered with ranges from 0.5 lpsm to 6.5 lpsm. To simplify the calculation, an average value in each range is adopted in the calculation of interference radius.

(2) Pumping Rate

The pumping rate was estimated by assuming a drawdown of 10m with the average value of specific capacity and pump operation of 16 hours/day. The formula used to determine proper well spacing is the Jacob modified equation. Drawdown at the interference boundary is assumed at 1cm after a pumping duration of 16 hours.

Table 7.7.1 presents the estimated spacing requirements and the number of wells to be constructed within a well field of one km^2. The spacing interval between adjacent wells to avoid well interference is planned to be more than twice the distances of the calculated interference radius.

Table 7.7.1 Spacing Arrangements for Planned Wells

Range of Specific Capacity (lpsm)	Estimated Pumping Rate (m^3/day)	Estimated Interference Radius (m)	Estimated Number of wells/km^2
0.5 - 1.5	500	80	45
1.5 - 3.0	1,000	120	20
3.0 - 4.5	2,000	160	11
4.5 - 6.0	2,500	200	7
> 6.0	>2,500	>200	>7

FUTURE REQUIREMENTS AND DEVELOPMENT PLAN

B

8. FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT

8.2 Targets of Provincial Sector Plan

Table 8.2.1 Estimation of Base Year Service Coverage of Water Supply

Name of Municipality	Area	Population (1997)	Population Served by 1997 Facilities				Population Served by Planned/On-going Projects				Population Served in the Base Year (1997)				Percentage Coverage
			Level III	Level II	Level I	Total	Level III	Level II	Level I	Total	Level III	Level II	Level I	Total	
Alabel (Capital)	Urban	13,341	2,638		8,067	10,705					2,638		8,067	10,705	80
	Rural	35,887	350	840	24,499	25,689					350	840	24,499	25,689	72
	Total	49,228	2,988	840	32,566	36,394					2,988	840	32,566	36,394	74
Glan	Urban	17,851	4,100	108	8,794	13,002					4,100	108	8,794	13,002	73
	Rural	59,093	336	732	34,463	35,531					336	732	34,463	35,531	60
	Total	76,944	4,436	840	43,257	48,533					4,436	840	43,257	48,533	63
Kiamba	Urban	12,098		612	8,341	8,953						612	8,341	8,953	74
	Rural	29,191		3,438	16,510	19,948						3,438	16,510	19,948	68
	Total	41,289		4,050	24,851	28,901						4,050	24,851	28,901	70
Maasim	Urban	8,973	870		5,544	6,414					870		5,544	6,414	71
	Rural	23,656		1,938	14,821	16,759						1,938	14,821	16,759	71
	Total	32,629	870	1,938	20,365	23,173					870	1,938	20,365	23,173	71
Maitum	Urban	10,398			8,857	8,857							8,857	8,857	85
	Rural	25,705		2,640	15,775	18,415						2,640	15,775	18,415	72
	Total	36,103		2,640	24,632	27,272						2,640	24,632	27,272	76
Malapatan	Urban	25,730	1,590	90	17,309	18,989					1,590	90	17,309	18,989	74
	Rural	24,038		1,950	12,764	14,714						1,950	12,764	14,714	61
	Total	49,768	1,590	2,040	30,073	33,703					1,590	2,040	30,073	33,703	68
Malungon	Urban	26,359		390	12,955	13,345						390	12,955	13,345	51
	Rural	73,867		2,142	6,997	9,139						2,142	6,997	9,139	12
	Total	100,226		2,532	19,952	22,484						2,532	19,952	22,484	22
Provincial Total	Urban	114,750	9,198	1,200	69,867	80,265					9,198	1,200	69,867	80,265	70
	Rural	271,437	686	13,680	125,829	140,195					686	13,680	125,829	140,195	52
	Total	386,187	9,884	14,880	195,696	220,460					9,884	14,880	195,696	220,460	57

Table 8.2.2 Population Coverage in Phase I Provided by Served Population in the Base Year (Water Supply)

Name of Municipality	Area	Population Served by 1997 Facilities				1997		2003	
		Level III	Level II	Level I	Total	Total Population	Coverage (%)	Total Population	Coverage (%)
Alabel (Capital)	Urban	2,638		8,067	10,705	13,341	80	15,535	69
	Rural	350	840	24,499	25,689	35,887	72	41,789	61
	Total	2,988	840	32,566	36,394	49,228	74	57,324	63
Glan	Urban	4,100	108	8,794	13,002	17,851	73	20,257	64
	Rural	336	732	34,463	35,531	59,093	60	67,059	53
	Total	4,436	840	43,257	48,533	76,944	63	87,316	56
Kiamba	Urban		612	8,341	8,953	12,098	74	13,592	66
	Rural		3,438	16,510	19,948	29,191	68	32,797	61
	Total		4,050	24,851	28,901	41,289	70	46,389	62
Maasim	Urban	870		5,544	6,414	8,973	71	9,841	65
	Rural		1,938	14,821	16,759	23,656	71	25,943	65
	Total	870	1,938	20,365	23,173	32,629	71	35,784	65
Maitum	Urban			8,857	8,857	10,398	85	11,403	78
	Rural		2,640	15,775	18,415	25,705	72	28,190	65
	Total		2,640	24,632	27,272	36,103	76	39,593	69
Malapatan	Urban	1,590	90	17,309	18,989	25,730	74	28,840	66
	Rural		1,950	12,764	14,714	24,038	61	26,944	55
	Total	1,590	2,040	30,073	33,703	49,768	68	55,784	60
Malungon	Urban		390	12,955	13,345	26,359	51	33,604	40
	Rural		2,142	6,997	9,139	73,867	12	94,167	10
	Total		2,532	19,952	22,484	100,226	22	127,771	18
Provincial Total	Urban	9,198	1,200	69,867	80,265	114,750	70	133,072	60
	Rural	686	13,680	125,829	140,195	271,437	52	316,889	44
	Total	9,884	14,880	195,696	220,460	386,187	57	449,961	49

Table 8.2.3 Number of Households Served by Sanitary Toilets in the Base Year (1997)

Name of Municipality	Area	Population (1997)	Number of Households (1997)	Households Using Sanitary Toilets in 1997				Recipient HHs of Planned/On-going Projects				Households Using Sanitary Toilets in the Base Year (1997)							
												Number				Coverage (%)			
				Flush Toilets	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total
Alabel (Capital)	Urban	13,341	2,647		2,547		2,547						2,547		2,547		96		96
	Rural	35,887	7,309		6,234		6,234						6,234		6,234		85		85
	Total	49,228	9,956		8,781		8,781						8,781		8,781		88		88
Glan	Urban	17,851	3,257	23	1,809		1,832					23	1,809		1,832	1	56		56
	Rural	59,093	11,277	7	3,681		3,688					7	3,681		3,688		33		33
	Total	76,944	14,534	30	5,490		5,520					30	5,490		5,520		38		38
Kiamba	Urban	12,098	2,515	18	1,335		1,353					18	1,335		1,353	1	53		54
	Rural	29,191	5,827	4	3,720		3,724					4	3,720		3,724		64		64
	Total	41,289	8,342	22	5,055		5,077					22	5,055		5,077		61		61
Maasim	Urban	8,973	1,756	10	1,341		1,351					10	1,341		1,351	1	76		77
	Rural	23,656	4,515		1,889	3	1,892						1,889	3	1,892		42		42
	Total	32,629	6,271	10	3,230	3	3,243					10	3,230	3	3,243		52		52
Maitum	Urban	10,398	1,944		1,132		1,132						1,132		1,132		58		58
	Rural	25,705	4,982		2,507	1	2,508						2,507	1	2,508		50		50
	Total	36,103	6,926		3,639	1	3,640						3,639	1	3,640		53		53
Malapatan	Urban	25,730	4,836		2,788		2,788						2,788		2,788		58		58
	Rural	24,038	4,695		1,323	2	1,325						1,323	2	1,325		28		28
	Total	49,768	9,531		4,111	2	4,113						4,111	2	4,113		43		43
Malungon	Urban	26,359	4,890		2,421	8	2,429						2,421	8	2,429		50		50
	Rural	73,867	13,964		3,733	14	3,747						3,733	14	3,747		27		27
	Total	100,226	18,854		6,154	22	6,176						6,154	22	6,176		33		33
Provincial Total	Urban	114,750	21,845	51	13,573	8	13,432					51	13,573	8	13,432		61		61
	Rural	271,437	52,569	11	23,087	20	23,118					11	23,087	20	23,118		44		44
	Total	386,187	74,414	62	36,460	28	36,550					62	36,460	28	36,550		49		49

Table 8.2.4 Number of Public School Student Served by School Toilets in Base Year (1997)

Name of Municipality	1997 Total Number of Public School Student	Standard No. of Student that can be Served by 1997	No. of Student to be Served by Planned / On-going Projects	Standard No. of Students that can be Served by Toilets in Base Year (1997)	Coverage (%)
Alabel (Capital)	10,410	2,920		2,920	28
Glan	16,671	7,040		7,040	42
Kiamba	8,112	6,000		6,000	74
Maasim	7,190	2,040		2,040	28
Maitum	6,007	6,007		6,007	100
Malapatan	9,202	3,320		3,320	36
Malungon	16,914	6,760		6,760	40
Provincial Total	74,506	34,087		34,087	46

Table 8.2.5 Number of Public Utilities with Sanitary Toilets in the Base Year (1997)

Name of Municipality	Type	No. of PU with Toilets in 1997	No. of PU with Sanitary Toilets in 1997	No. of PU with Toilets in Planned/ On-going Project	No. of PU with Sanitary Toilets in Planned/ On-going Projects	No. of PU with Toilets in Base Year 1997	No. of PU with Sanitary Toilets in Base year 1997	Coverage (%)
Alabel (Capital)	Public Market	2	2			2	2	100
	Bus/Jeepney Terminal	1	1			1	1	100
	Parks/Playground	1	1			1	1	100
	Total	4	4			4	4	100
Glan	Public Market	11	11			11	11	100
	Bus/Jeepney Terminal	1	1			1	1	100
	Parks/Playground	2	2			2	2	100
	Total	14	14			14	14	100
Kiamba	Public Market	3	3			3	3	100
	Bus/Jeepney Terminal	3	3			3	3	100
	Parks/Playground							
	Total	6	6			6	6	100
Maasim	Public Market	2	2			2	2	100
	Bus/Jeepney Terminal	1	1			1	1	100
	Parks/Playground	1	1			1	1	100
	Total	4	4			4	4	100
Maitum	Public Market	2	2			2	2	100
	Bus/Jeepney Terminal	1	1			1	1	100
	Parks/Playground							
	Total	3	3			3	3	100
Malapatan	Public Market	1	1			1	1	100
	Bus/Jeepney Terminal	1	1			1	1	100
	Parks/Playground							
	Total	2	2			2	2	100
Malungon	Public Market	15	15			15	15	100
	Bus/Jeepney Terminal							
	Parks/Playground	3	3			3	3	100
	Total	18	18			18	18	100
Provincial Total	Public Market	36	36			36	36	100
	Bus/Jeepney Terminal	8	8			8	8	100
	Parks/Playground	7	7			7	7	100
	Total	51	51			51	51	100

Table 8.2.6 Households Coverage in Phase I Provided by Existing Facilities in the Base Year (Household Toilets)

Name of Municipality	Area	No. of Household Served by Existing Facilities				Coverage in 1997							Coverage in 2003						
							Percentage of Served Households				Served Population			Percentage of Served Households				Served Population	
		Flush	Pour Flush	VIP/Dry	Total	No. of HHs	Flush	Pour Flush	VIP/ Dry	Total	Number	%	No. of HHs	Flush	Pour Flush	VIP/ Dry	Total	Number	%
Alabel (Capital)	Urban		2,547		2,547	2,647		96		96	12,807	96	3,082		83		83	22,212	83
	Rural		6,234		6,234	7,309		85		85	11,340	85	8,511		73		73	35,185	73
	Total		8,781		8,781	9,956		88		88	24,147	88	11,593		76		76	57,397	76
Glan	Urban	23	1,809		1,832	3,257	1	56		56	9,997	56	3,697	1	49		50	15,371	50
	Rural	7	3,681		3,688	11,277		33		33	5,891	33	12,798		29		29	18,847	29
	Total	30	5,490		5,520	14,534		38		38	15,888	38	16,495		33		33	34,218	33
Kiamba	Urban	18	1,335		1,353	2,515	1	53		54	6,533	54	2,826	1	47		48	7,171	48
	Rural	4	3,720		3,724	5,827		64		64	7,743	64	6,546		57		57	20,415	57
	Total	22	5,055		5,077	8,342		61		61	14,276	61	9,372		54		54	27,586	54
Maasim	Urban	10	1,341		1,351	1,756	1	76		77	6,909	77	1,926	1	70		70	7,509	70
	Rural		1,889	3	1,892	4,515		42		42	3,769	42	4,951		38		38	10,053	38
	Total	10	3,230	3	3,243	6,271		52		52	10,678	52	6,877		47		47	17,562	47
Maitum	Urban		1,132		1,132	1,944		58		58	6,031	58	2,131		53		53	6,215	53
	Rural		2,507	1	2,508	4,982		50		50	5,199	50	5,463		46		46	13,218	46
	Total		3,639	1	3,640	6,926		53		53	11,230	53	7,594		48		48	19,433	48
Malapatan	Urban		2,788		2,788	4,836		58		58	14,923	58	5,421		51		51	15,423	51
	Rural		1,323	2	1,325	4,695		28		28	7,204	28	5,263		25		25	7,152	25
	Total		4,111	2	4,113	9,531		43		43	22,127	43	10,684		38		38	22,575	38
Malungon	Urban		2,421	8	2,429	4,890		50		50	13,180	50	6,235		39		39	17,073	39
	Rural		3,733	14	3,747	13,964		27		27	7,117	27	17,801		21		21	24,554	21
	Total		6,154	22	6,176	18,854		33		33	20,297	33	24,036		26		26	41,627	26
Provincial Total	Urban	51	13,373	8	13,432	21,845		61		61	70,380	61	25,318		53		53	90,974	53
	Rural	11	23,087	20	23,118	52,569		44		44	48,263	44	61,333		38		38	129,424	38
	Total	62	36,460	28	36,550	74,414		49		49	118,643	49	86,651		42		42	220,398	42

Table 8.2.7 Public School Students and Public Utilities Coverage in Phase I by Existing Facilities in the Base Year

Name of Municipalities	Public School Toilets					Public Toilets					
		Coverage in 1997		Coverage in 2003		Coverage in 1997			Coverage in 2003		
	Std. No. of Student that can be Served by Base Year	Total No. of Public School Students	%	Total No. of Public School Student	%	No. of PU with Toilets in Base Year	No. of PU with Sanitary Toilets in Base Year	%	No. of PU with Toilets	No. of PU with Sanitary Toilets in Base Year	%
Alabel (Capital)	2,920	10,410	28	13,122	22	4	4	100	8	4	50
Glan	7,040	16,671	42	19,970	35	14	14	100	21	14	67
Kiamba	6,000	8,112	74	9,516	63	6	6	100	14	6	43
Maasim	2,040	7,190	28	8,199	25	4	4	100	9	4	44
Maitum	6,007	6,007	100	7,987	75	3	3	100	8	3	38
Malapatan	3,320	9,202	36	12,571	26	2	2	100	6	2	33
Malungon	6,760	16,914	40	26,590	25	18	18	100	28	18	64
Provincial Total	34,087	74,506	46	97,955	35	51	51	100	94	51	54

8.3 Projection of Frame Values

8.3.1 Review of Past Population Development and Population Projection

Since the NSO has not yet prepared/issued future population of the provinces, the provincial population for the years 1997 (planning base year), 2003 (medium-term target year) and 2010 (long-term target year) were projected. Available information for the study at present is as follows:

- NSO population census results in 1980, 1990 and 1995
- 1995 Census-based National and Regional Population Projection prepared by the NSO
- Provincial Physical Framework Plan/Comprehensive Provincial Land Use Plan (1993-2002)

(1) 1995 Census-Based National and Regional Population Projections: NSO

The NSO conducted the national population projections for the period 1995-2040 and the regional projections for the period 1995-2020. The assumptions take into account future trends in the demographic processes of fertility, mortality and migration required by the cohort-component method for projecting population. The 1995 Population Census was used as the basis for the projection.

In the regional population projection, Regions X and XI, the subject regions for the 2nd batch areas of this study, are classified as medium-sized regions (at least 5 million but less than 10 million by year 2000). The following are the result of projection for the two regions in 2000, 2005 and 2010.

Table 8.3.1 Regional Population Projection

Year		1980	1990	1995	2000	2005	2010
Region X	Population	2,758,985	3,509,753	3,938,252	4,441,739	4,955,545	5,465,272
	Growth	-	2.44 %	2.33 %	2.44 %	2.21 %	1.98 %
Region XI	Population	3,346,803	4,458,829	5,052,730	5,749,821	6,456,464	7,146,889
	Growth	-	2.91 %	2.53 %	2.62 %	2.35 %	2.05 %

(2) Provincial Physical Framework Plan/Comprehensive Provincial Land Use Plan: Sarangani: Planning period 1993-2002

The provincial population for the year 2002 was projected with 1990 as the base year. The provincial growth rate of 2.58 % experienced between 1980 and 1990 was adopted for the projection. Meanwhile, the recorded/ projected growth rates of Region XI are

2.91 % between 1980 and 1990 and 2.58 % between 1990 and 2000 (which is the same growth rate employed for the projection of the provincial population for the year 2002).

The population projection on the provincial total and component municipalities was made with 1990 as base year. The population for the year 2002 was projected using a uniform growth rate between 1990 and 2002 referring to the experience from 1980 to 1990 (census years).

Table 8.3.2 shows the past population developments in census years (1980-1995) and projections for the years 1995 and 2002 with 1990 as base year using the assumed growth rates for the period 1990 to 2002 as established in the Comprehensive Provincial Land Use Plan (hereafter referred to as "Land Use Plan").

Comparing the census and the projected population in 1995, the provincial population based on the census exceeded about 15% of the projected one. Regarding the municipal population in 1995, only the projection for Alabel was lower than the census result, while the census population results of other municipalities were beyond the projected population (between 10% and 30%). Among the municipalities, Maitum, Malapatan and Malungon had remarkable differences of about 30% between census and projected population. In this connection, it is necessary to reflect the 1995 census results in the projection as a base year population.

Table 8.3.2 Census Population and Projected Population

Municipality	Census Population /Growth Rate (%)			Projected Population/Adopted	
	1980	1990	1995	1995	2002
Alabel	25,620	40,730	46,527	50,975	69,751
	-	4.74	2.70	4.59	4.59
Glan	48,882	60,375	73,768	66,626	76,470
	-	2.13	4.09	1.99	1.99
Kiamba	28,467	35,386	39,717	38,992	44,666
	-	2.20	2.34	1.96	1.96
Maasim	22,915	26,725	31,641	28,381	30,863
	-	1.55	3.43	1.21	1.21
Maitum	24,846	25,619	35,009	26,018	26,588
	-	0.31	6.44	0.31	0.31
Malapatan	29,965	36,230	47,911	38,895	42,959
	-	1.92	5.75	1.43	1.43
Malungon	38,677	57,965	92,433	70,557	92,927
	-	4.13	9.78	4.01	4.01
Province	219,372	283,030	367,006	321,474	384,224
	-	2.58	5.33	2.51	2.58

(3) Population Projection of the Province

The following conditions are considered/assumed in the population projection.

Provincial Population

1) The regional population projected by the NSO with the regional average growth rates is referred to, since the Land Use plan employed the regional average growth rate for projection of the provincial population.

In this regard, the growth rate (2.58%) used for the period 1990 to 2002 in the Land Use Plan (the same growth rate used in the projection of the regional population from 1990 to 2000) is applied for the medium-term (1995-2003) projection with 1995 as the base year. For the long-term projection from 2004 to 2010, the growth rate of 2.05% that was adopted for regional population projection between 2005 and 2010 is employed. The projected population for the years 1997, 2003 and 2010 are as follows:

Year	Population	Growth rate
1995	367,006	Census result
1997	386,187	2.58 %
2003	449,961	2.58 %
2010	518,640	2.05 %

2) The range of population ratios of the provincial population to the regional population (from 1980 to 1995 and projected year 2002 in the Land Use Plan) considered the correlation with other component provinces in the region and projected regional population. The following are the population ratios of the province to the region, both in the past and the projected.

Year	1980	1990	1995	2002	2003	2010
Province	219,372	283,030	367,006	384,224	449,961	518,641
Region	3,346,803	4,458,829	5,052,730	6,032,322	6,173,575	7,146,889
P/R (%)	6.55	6.35	7.26	6.37	7.29	7.26

The population ratios of the province from 1980 to 1990 ranged between 6-7%, while the 1995 census results showed a higher figure of 7.26 %. The ratio for the year 2002 as projected in the Land Use Plan (6.37%) was rather conservative with reference to the past experience (1980-1990). This condition may be taken into account for the long-term projection. However, for the medium-term target, 2003, the recent development in 1995 would be signified. In this regard, the projected ratio for the year 2003 (growth rate of 2.58 % is used from base year 1995) is almost the same as that in 1995. The ratio for the year 2010 is within the range of the existing

plan (7.26 %). Therefore, the provincial population by planning target year mentioned above is recommended to be used for the PW4SP.

Municipal population

1) The total population of the province by target year is fixed.

2) The growth rates of the respective municipalities for the years 1997 and 2003 are determined referring to the development experienced between 1990 and 1995. The following rules are established:
   - The growth rates of the municipalities with considerable increase from 1990 to 1995 are modified, in principle, using the figures from 1980 to 1990. This is because the provincial average growth rate adopted for the medium-term target year is the same as that from 1980 to 1990: Glan, Maasim, Malapatan and Malungon.
   - The growth rate of the municipality with a considerable growth from 1990 to 1995, though a minimal growth rate between 1980 and 1990; is assumed to be the same, by itself a municipality with a similar population size and rapid growth experience at present: Maitum.
   - The growth rates of the municipalities with similar growth rates between 1980-1990 and 1990-1995 are assumed to be the same as the one used in the Land Use Plan: Kiamba.
   - The population of Alabel is calculated as the balance between the provincial population and the total population of other municipalities

Table 8.3.3 presents the calculation results under the above conditions/assumptions.

Table 8.3.3 Municipal Population Projection

Municipality	Annual Growth Rate (%)				Population (person)		
	'80-'90	Land Use	'90-'95	Adopted	1995	1997	2003
Alabel	4.74	4.59	2.70	2.86/2.64	46,527	49,231	57,324
Glan	2.13	1.99	4.09	2.13	73,768	76,943	87,316
Kiamba	2.20	1.96	2.34	1.96	39,717	41,289	46,389
Maassim	1.55	1.21	3.43	1.55	31,641	32,629	35,784
Maitum	0.31	0.31	6.44	1.55	35,009	36,102	39,593
Malapatan	1.92	1.43	5.75	1.92	47,911	49,768	55,784
Malungon	4.13	4.01	9.78	4.13	92,433	100,225	127,771
Province	2.58	2.58	5.33	2.58	367,006	386,187	449,961

Note: Population of Alabel is estimated as the balance between the provincial total and the other municipalities' total population. 1995 population is census result.

Regarding the municipal population for the year 2010 in the long-term, it is assumed that the tendency of the population growth of respective municipalities between 1990 and 2002, which is considered in the Land Use Plan, will be realized in line with the land use plan of the province. Thus, the projected growth rates for the year 2002 by municipality in the Land Use Plan are first applied to project the 2010 population from the year 2003. Then, the municipal population estimated initially is adjusted in proportion to the population size of each municipality to the total provincial population, to meet above mentioned provincial population fixed for the year 2010 (518,640 persons). In this adjustment, the growth rate of Maitum (0.31 %) is fixed to avoid a negative growth rate (-0.30 %). Table 8.3.4 shows the study process results and the projected population by municipality for the year 2010 and the adjusted growth rates.

Population by urban and rural area

In the Land Use Plan, urban/rural population by municipality for the year 2002 is projected with 1990 as the base year. The annual growth rate of urban population for the year 2002 by municipality is estimated by PPDO referring to the experience from 1980 to 1990 and the future land use plan. The provincial average growth rate is set at 3.64%. The rural population by municipality is estimated as the balance between the total population and the urban population. The average growth rate of the province is estimated to be double than that of the urban area.

Table 8.3.4 Municipal Population for the year 2010 and Estimated Growth Rates

Municipality	Pop. Projection using G.R in Land Use Plan				2010 Pop.Projection	
	2003 Pop.	Growth Rate (%)	2010 Pop.	Percent	Population	Growth Rate(%)
Alabel	57,324	4.59	78,482	15.68	74,960	3.91
Glan	87,316	1.99	100,230	20.02	95,733	1.32
Kiamba	46,389	1.96	53,140	10.61	50,756	1.29
Maassim	35,784	1.21	38,927	7.78	37181	0.55
Maitum	39,593	0.31	40,460	N.A	40,460	0.31
Malapatan	55,784	1.43	61,613	12.31	58,849	0.77
Malunbon	127,771	4.01	168,251	33.60	160,702	3.33
Province	449,961	2.67	541,103	100.00	518,640	2.05

Note: 2010 Population by municipality is calculated proportionally distributing 478,180 persons to 6 municipalities except for Maitum (the figure before adjustment, 40,460).
N.A: Not Applicable
Growth rate: 2003-2010

Urban and rural population by municipality was studied considering the 1995 census results and the estimated in the Land Use Plan.

1) Past population development

Table 8.3.5 shows the urban and rural population with growth rates in census years (1980-1995) by municipality. With regard to the urban population of the province to

the total population, the provincial average in 1980 and 1990 was 20% and 37%, respectively, while it was significantly reduced to about 30% in 1995. The percentage seems to have been affected by the decrease of urban population in Kiamba, Maasim and Malungon, since there were considerable number of out-migration from 1990 to 1995. Likewise, the provincial average growth rate of 9.09% between 1980 and 1990 was reduced to 0.86% in 1995.

The rural population by municipality had substantially increased with a growth rate of 7.63% from 1990 to 1995 as a provincial average.

Table 8.3.5 Past Population Development by Urban and Rural Area

Unit: Population (person)

	Municipality	1980			1990				1995			
		Total	Urban/ Rural	Share (%)	Total	Urban/ Rural	G.R. (%)	Share (%)	Total	Urban/ Rural	G.R. (%)	Share (%)
Urban Area	Alabel	25,620	8,181	31.9	40,730	11,457	3.43	28.1	46,527	12,628	1.97	27.1
	Glan	48,882	7,215	14.8	60,382	14,696	7.37	24.3	73,768	17,117	3.10	23.2
	Kiamba	28,467	5,432	19.1	35,418	12,481	8.67	35.2	39,717	11,636	-1.39	29.3
	Maasim	22,915	3,529	15.4	26,734	12,464	13.45	46.6	31,641	8,717	-6.90	27.5
	Maitum	24,846	2,461	9.9	25,640	7,900	12.37	30.8	35,009	10,100	5.04	28.8
	Malapatan	29,965	8,240	27.5	36,255	18,483	8.41	51.0	47,911	24,755	6.02	51.7
	Malungon	38,677	8,795	22.7	57,982	27,174	11.94	46.9	92,433	24,277	-2.23	26.3
	Province	219,372	43,853	20.0	283,141	104,65	9.09	37.0	367,006	109,23	0.86	29.8
Rural Area	Alabel	25,620	17,439	68.1	40,730	29,273	5.32	71.9	46,527	33,899	2.98	72.9
	Glan	48,882	41,667	85.2	60,382	45,686	0.93	75.7	73,768	56,651	4.40	76.8
	Kiamba	28,467	23,035	80.9	35,418	22,937	-0.04	64.8	39,717	28,081	4.13	70.7
	Maasim	22,915	19,386	84.6	26,734	14,270	-3.02	53.4	31,641	22,924	9.94	72.5
	Maitum	24,846	22,385	90.1	25,640	17,740	-2.30	69.2	35,009	24,909	7.02	71.2
	Malapatan	29,965	21,725	72.5	36,255	17,772	-1.99	49.0	47,911	23,156	5.44	48.3
	Malungon	38,677	29,882	77.3	57,982	30,808	0.31	53.1	92,433	68,156	17.21	73.7
	Province	219,372	175,519	80.0	283,141	178,48	0.17	63.0	367,006	257,77	7.63	70.2

2) Projection of urban and rural population for the years 1997, 2003 and 2010

The urban population by municipality for the target years was first projected and the rural population was calculated to meet the aforementioned total population by smoothing the urban population.

In the projection of municipal urban population for the short/medium-term and long-term purpose, the following are assumed:

- Short/Medium-term target: 1997 and 2003

  Updated census results in 1995 are applied in terms of the share of urban population to total population by municipality.

- Long-term target: 2010

  The growth rate of the urban population by municipality, which is used for the projection in the year 2002 in the Land Use Plan, is employed with 2003 as the base year. It is anticipated that the share between urban and rural population will be regulated to meet the land use plan in the long-term period.

Under the above assumptions, the provincial average share of the urban population for the year 2010 was arrived at 32.6%, slightly higher than the figure in 1995 (29.8%), but lower than that in 1990 (37%). Table 8.3.6 presents the projected urban and rural population. The growth rates and shares of rural population are calculated using the estimated rural population.

Table 8.3.6 Population Projection by Urban and Rural Area: 1997, 2003 and 2010

	Municipality	1997			2003			2010			
		Total	Urban/ Rural	Share (%)	Total	Urban/ Rural	Share (%)	Total	Urban/ Rural	G.R. (%)	Share (%)
Urban Area	Alabel	49,228	13,341	27.1	57,324	15,535	27.1	74,960	26,762	8.08	35.7
	Glan	76,944	17,851	23.2	87,316	20,257	23.2	95,733	30,742	6.14	32.1
	Kiamba	41,289	12,098	29.3	46,389	13,592	29.3	50,756	14,940	1.36	29.4
	Maasim	32,629	8,973	27.5	35,784	9,841	27.5	37181	10,727	1.24	28.9
	Maitum	36,103	10,398	28.8	39,593	11,403	28.8	40,460	11,726	0.40	29.0
	Malapatan	49,768	25,730	51.7	55,784	28,840	51.7	58,849	30,241	0.68	51.4
	Malungon	100,226	26,359	26.3	127,771	33,604	26.3	160,702	43,776	3.85	27.2
		386,188	114,750	29.7	449,961	133,072	29.6	518,641	168,915	3.47	32.6
Rural Area	Alabel	49,228	35,888	72.9	57,324	41,789	72.9	74,960	48,198	2.06	64.3
	Glan	76,944	59,093	76.8	87,316	67,059	76.8	95,733	64,990	-0.45	67.9
	Kiamba	41,289	29,191	70.7	46,389	32,797	70.7	50,756	35,816	1.27	70.6
	Maasim	32,629	23,656	72.5	35,784	25,943	72.5	37181	26,453	0.28	71.1
	Maitum	36,103	25,705	71.2	39,593	28,190	71.2	40,460	28,734	0.27	71.0
	Malapatan	49,768	24,038	48.3	55,784	26,944	48.3	58,849	28,607	0.86	48.6
	Malungon	100,226	73,866	73.7	127,771	94,167	73.7	160,702	116,926	3.14	72.8
		386,188	271,438	70.3	449,961	316,889	70.4	518,641	349,725	1.42	67.4

Table 8.3.7 Projected Number of Households by Urban and Rural Area by Municipality by Target Year

Name of Municipality	Household Size			Number of Households											
	1995			1995			1997			2003			2010		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Alabel (Capital)	5.04	4.91	4.95	2,501	6,883	9,384	2,647	7,309	9,956	3,082	8,511	11,593	6,691	12,050	18,741
Glan	5.48	5.24	5.30	3,117	10,802	13,919	3,257	11,277	14,534	3,697	12,798	16,495	7,686	16,248	23,934
Kiamba	4.81	5.01	4.95	2,413	5,606	8,019	2,515	5,827	8,342	2,826	6,546	9,372	3,735	8,954	12,689
Maasim	5.11	5.24	5.21	1,703	4,373	6,076	1,756	4,515	6,271	1,926	4,951	6,877	2,682	6,614	9,296
Maitum	5.35	5.16	5.21	1,865	4,826	6,691	1,944	4,982	6,926	2,131	5,463	7,594	2,932	7,184	10,116
Malapatan	5.32	5.12	5.22	4,655	4,522	9,177	4,836	4,695	9,531	5,421	5,263	10,684	7,560	7,152	14,712
Malungon	5.39	5.29	5.32	4,497	12,873	17,370	4,890	13,964	18,854	6,235	17,801	24,036	10,944	29,232	40,176
Provincial Total	5.25	5.16	5.19	20,751	49,885	70,636	21,845	52,569	74,414	25,318	61,333	86,651	42,230	87,434	129,664

8.3.2 School Enrollment Projection

Table 8.3.8 Projected School Enrollment by Municipality by Target Year

Name of Municipality	1997					2003					2010				
	School Age Population	Total Enrollment		Public School Enrollment		School Age Population	Total Enrollment		Public School Enrollment		School Age Population	Total Enrollment		Public Scholl Enrollment	
		Number	Participation Rate	Number	Participation Rate		Number	Participation Rate	Number	Participation Rate		Number	Participation Rate	Number	Participation Rate
Alabel (Capital)	14,086	10,410	74	10,410	74	16,403	13,122	80	13,122	80	21,449	19,304	90	19,304	90
Glan	21,997	17,273	79	16,671	76	24,962	21,218	85	19,970	80	27,368	26,000	95	24,631	90
Kiamba	11,293	9,033	80	8,112	72	12,688	10,785	85	9,516	75	13,882	13,188	95	11,800	85
Maasim	9,345	7,423	79	7,190	77	10,249	8,712	85	8,199	80	10,649	9,584	90	9,052	85
Maitum	9,710	6,392	66	6,007	62	10,649	8,519	80	7,987	75	10,882	9,250	85	8,706	80
Malapatan	14,019	9,202	66	9,202	66	15,714	12,571	80	12,571	80	16,577	14,090	85	14,090	85
Malungon	29,797	18,164	61	16,914	57	37,986	28,490	75	26,590	70	47,776	38,221	80	35,832	75
Provincial Total	110,247	77,897	71	74,506	68	128,651	103,417	80	97,955	76	148,583	129,637	87	123,415	83

8.3.3 Projection of the Number of Public Utilities

Table 8.3.9 Projected Number of Public Utilities by Municipality by Target Year

Name of Municipality	Type	1997	2003		2010	
		No. of Public Utilities	Proposed Construction	Total	Proposed Construction	Total
Alabel (Capital)	Public Market	2	2	4	3	7
	Bus/Jeepney Terminal	1	1	2	2	4
	Parks/Playground	1	1	2	2	4
	Total	4	4	8	7	15
Glan	Public Market	11	5	16	5	21
	Bus/Jeepney Terminal	1	1	2	3	5
	Parks/Playground	2	1	3	2	5
	Total	14	7	21	10	31
Kiamba	Public Market	3	1	4	1	5
	Bus/Jeepney Terminal	3	2	5	2	7
	Parks/Playground		5	5	6	11
	Total	6	8	14	9	23
Maasim	Public Market	2	2	4	3	7
	Bus/Jeepney Terminal	1	1	2	1	3
	Parks/Playground	1	2	3	2	5
	Total	4	5	9	6	15
Maitum	Public Market	2	2	4	2	6
	Bus/Jeepney Terminal	1	1	2	1	3
	Parks/Playground		2	2	2	4
	Total	3	5	8	5	13
Malapatan	Public Market	1	2	3	2	5
	Bus/Jeepney Terminal	1	1	2	2	4
	Parks/Playground		1	1	1	2
	Total	2	4	6	5	11
Malungon	Public Market	15	5	20	5	25
	Bus/Jeepney Terminal		2	2	3	5
	Parks/Playground	3	3	6	3	9
	Total	18	10	28	11	39
Provincial Total	Public Market	36	19	55	21	76
	Bus/Jeepney Terminal	8	9	17	14	31
	Parks/Playground	7	15	22	18	40
	Total	51	43	94	53	147

8.4 Types of Facilities and Implementation Criteria

8.4.1 Water Supply

(1) Urban water supply

Table 8.4.1 shows the existing condition and future requirements of urban water supply in respective municipality.

Alabel

There are 3 Level III systems; one is an LGU operated and the other 2 are by the cooperatives of Santo Niño and San Miguel. These systems serve the Poblacion (20% of urban area). Deep wells are the water sources for these systems. One of the major problems encountered is water supply interruption (2 times) caused by (1) lowering of the water level and (2) power supply cut. Another problem is water quality: high contents of pH (8-8.5), and iron and manganese (200-300 ppm). The potential spring source is Molo spring (600-700m aswl; about 8km from the poblacion). Further study with verification of water rights must be conducted. About 4,000 cu.m will be required in the future.

Glan

There is one WD (population is 4,000, 23% is served by the system). Water source is deep well. F/S for expansion of the system shall be conducted. Saltwater intrusion is currently not a problem, but high iron content is a common one. About 2,000-3,000 cu.m/day is required in the future (about 1,000cu.m/well can be expected).

Kiamba

No Level III systems exist. Meanwhile, there are many Level II systems using spring sources. The water source available is deep well/ spring. Available spring source shall be sought.

Maasim

There is a WD using two spring sources. Ten percent (10%) of the urban population is served by the system. F/S shall be prepared.

Maitum

There is no level III in the urban area. There is a good spring source (10-15 km) in Barangay New La Union. The municipality is currently preparing the F/S (30-40 million pesos) using the spring as the potential source.

Malapatan

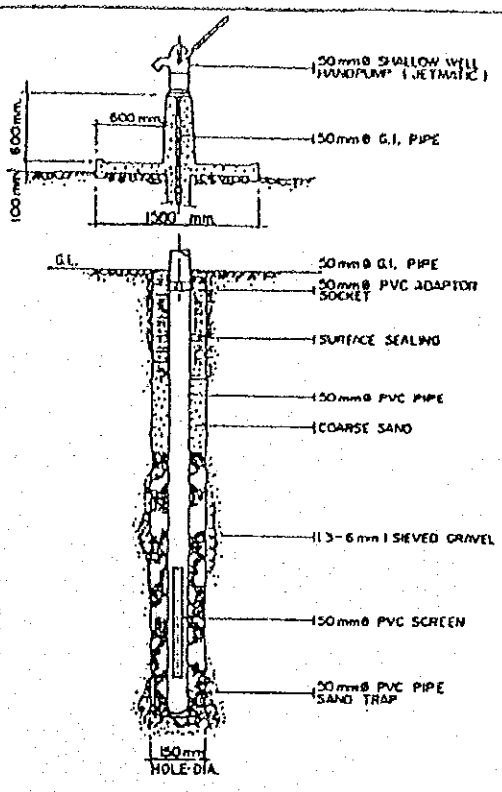
There are two Level III systems operated by the municipality/barangay (900 and 700 persons served by each system). The service coverage is only 6% of the urban population. Water source is deep well. Spring sources (since there are many untapped springs) to be used for Level III systems shall be studied.

Malungon

The municipality is located in a hilly area. No Level III systems exist. Many Level II systems are using spring sources. Ground water level is very low (less than 40m). The spring, Bario Blaan (with a potential discharge rate of 17,000 cu.m/day, 8km from Poblacion) may be used after the required study (water rights, technical requirements. etc.).

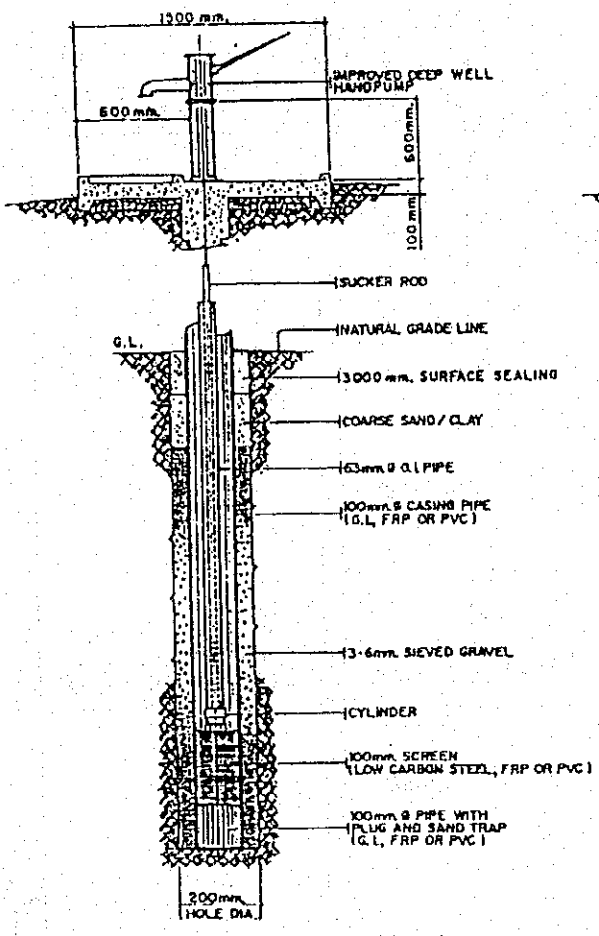
Table 8.4.1 Existing Condition and Future Requirements of Urban Water Supply by Municipality

Name of Municipality	Existing Status (1997)									Phase I (2003)								Phase II (2010)						
	Urban Population (1997)	Pop. Served by Level III and Others						Level III Water Source		Urban Population (2003)	Pop. Served by Level III and Others				Newly developed/ Additional Water source (m3/d)	Total water source required (m3/d)		Urban Population (2010)	Pop. Served by Level-III			Newly developed/ Additional Water source (m3/d)	Total water source required (m3/d)	
		Existing Urban Level-III	Level-III	%	Level-II + Level-I	Served Pop. Total	Total (%)	Type	Production (m3/d)		Additional Pop. Served by L-III	Level-III Total	%	Served Pop. Total	%				Additional Pop. Served(incl. Absorbed L-II,I)	Total	%			
Alabel (Capital)	13,341	2(Mun,Prvt)	2,638	20%	8,083	10,721	80%	DW	596	15,535	2,484	5,122	33%	13,205	85%	400	700	26,762	20,302	25,424	95%	2,700	3,400	
Glan	17,851	1(WD)	4,100	23%	1,431	5,531	31%	DW	3,384	20,257	11,688	15,788	78%	17,219	85%	1,600	2,100	30,742	13,417	29,205	95%	1,800	3,800	
Kiamba	12,098	None			6,637	6,637	55%			13,592	4,917	4,917	36%	11,553	85%	700	700	14,940	9,276	14,193	95%	1,200	1,900	
Maasim	8,973	1(WD)	870	10%	5,387	6,257	70%	SP	158	9,841	2,107	2,977	30%	8,365	85%	300	400	10,727	7,213	10,191	95%	900	1,400	
Maitum	10,398	None			4,392	4,392	42%			11,403	5,301	5,301	46%	9,692	85%	700	700	11,726	5,839	11,140	95%	800	1,500	
Malapatan	25,730	2(Mun,Brgy)	1,590	6%	6,142	7,732	30%	DW		28,840	16,782	18,372	64%	24,514	85%	2,200	2,400	30,241	10,357	28,729	95%	1,400	3,800	
Malungon	26,359	None			3,321	3,321	13%			33,604	25,242	25,242	75%	28,563	85%	3,300	3,300	43,776	16,345	41,587	95%	2,200	5,500	
Provincial Total	114,750		9,198	8%	35,392	44,590	39%			133,072	68,520	77,718	58%	113,111	85%	9,200	10,300	168,915	82,751	160,469	95%	11,000	21,300	

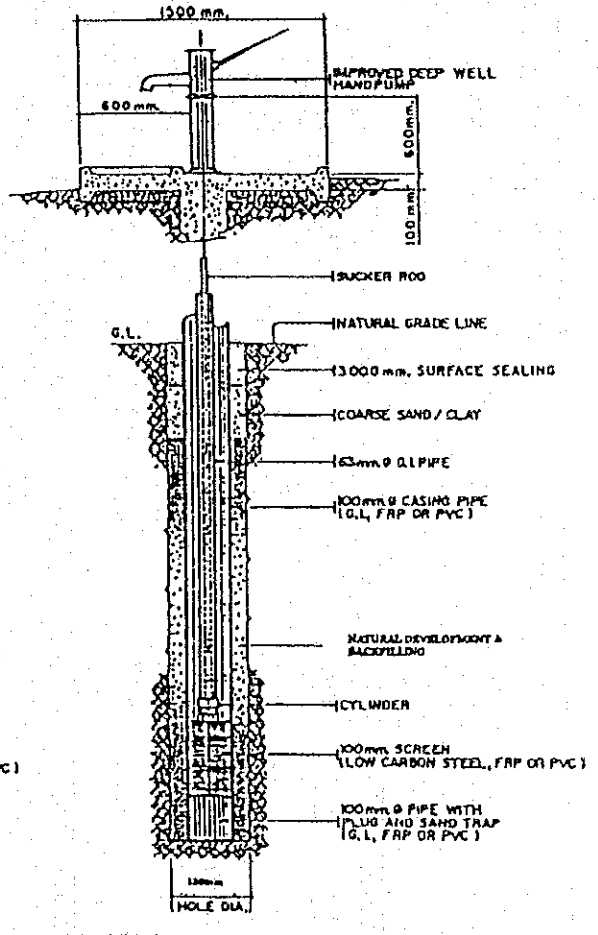


OPEN HOLE DRILLING & GRAVEL PACK METHOD

SHALLOW WELLS



OPEN HOLE DRILLING & GRAVEL PACK METHOD



OPEN HOLE DRILLIG & NATURAL GRAVEL PACK METHOD

DEEP WELLS

FIGURE 8.4.1

TYPICAL STRUCTURE OF LEVEL I WELL FACILITY

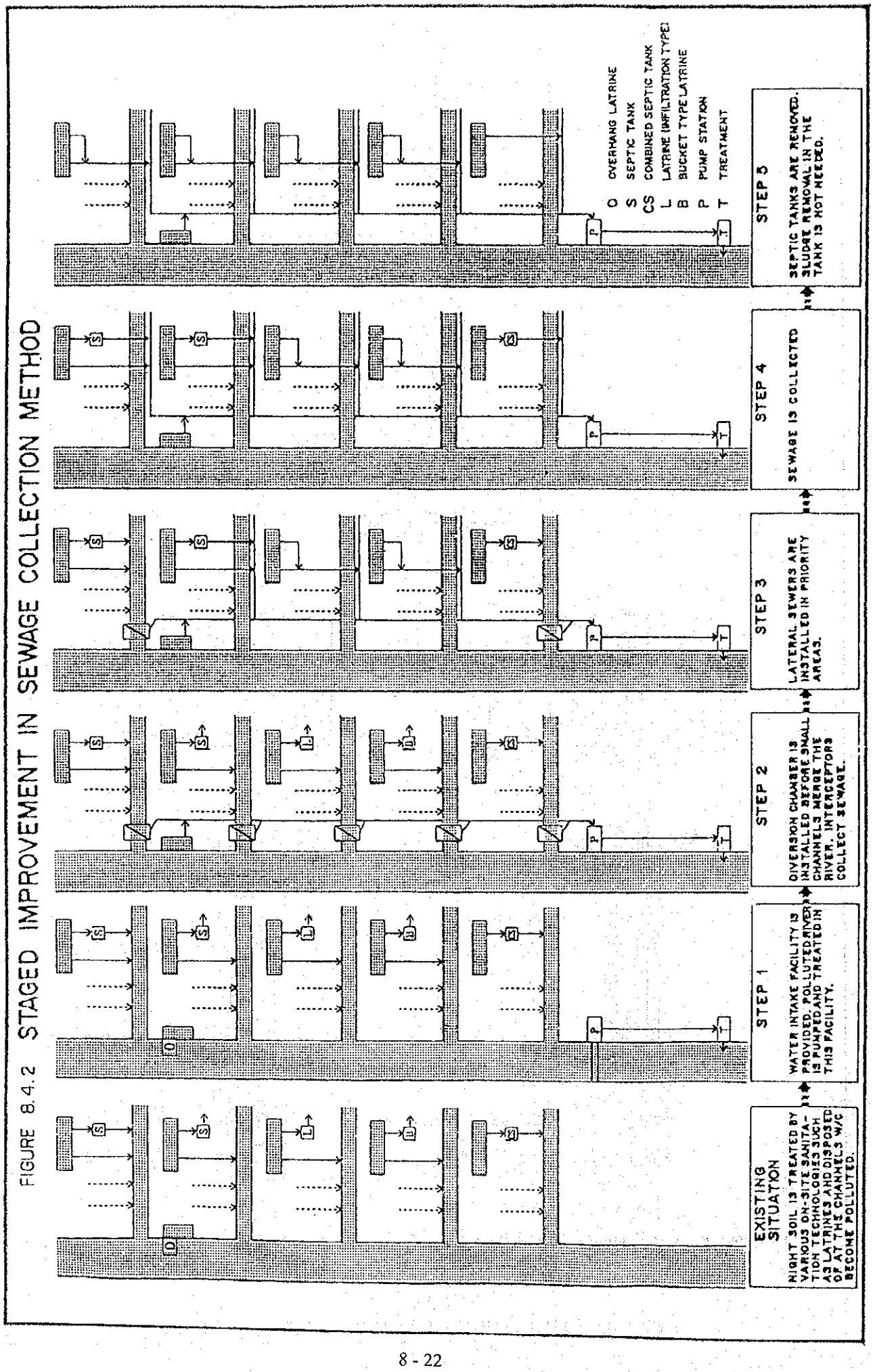


FIGURE 8.4.2 STAGED IMPROVEMENT IN SEWAGE COLLECTION METHOD
EXISTING SITUATION
RIGHT SOIL IS TREATED BY VARIOUS ON-SITE SANITATION TECHNOLOGIES SUCH AS LATRINES AND DISPOSED OF AT THE CHANNELS W/C BECOME POLLUTED.
STEP 1
WATER INTAKE FACILITY IS PROVIDED. POLLUTED RIVER IS PUMPED AND TREATED IN THIS FACILITY.
STEP 2
DIVERSION CHAMBER IS INSTALLED BEFORE SMALL CHANNELS MERGE THE RIVER. INTERCEPTORS COLLECT SEWAGE.
STEP 3
LATERAL SEWERS ARE INSTALLED IN PRIORITY AREAS.
STEP 4
SEWAGE IS COLLECTED
STEP 5
SEPTIC TANKS ARE REMOVED. SLUDGE REMOVAL IN THE TANK IS NOT NEEDED.
O OVERHANG LATRINE
S SEPTIC TANK
CS COMBINED SEPTIC TANK
L LATRINE (INFILTRATION TYPE)
B BUCKET TYPE LATRINE
P PUMP STATION
T TREATMENT

8.5 Service Coverage by Target Year

8.5.1 Water Supply

(1) Population to be served by Level II system in Phase I

Forty-five (45) untapped spring sources were confirmed to be suitable for Level II systems in rural water supply during the PW4SP preparation as shown in Table 8.5.1. The conditions and assumptions applied for this estimation are as follows:

Source capacity:

The average source capacity of untapped spring was assumed to meet the needs of 100 households based on the review of existing Level II systems with spring sources.

Number of systems:

Forty-five (45) untapped springs were considered to serve 45 Level II systems in 31 rural barangays of 7 municipalities.

Table 8.5.1 Population to be Served by Level II System in Phase I

Name of Municipality	Number of Untapped Spring	Number of Barangay to be Served	Number of Household to be Served	Population to be Served
Alabel (Capital)	3			
Glan	9	9	900	4,716
Kiamba	4			
Maasim	7			
Maitum	14			
Malapatan	3	3	300	1,536
Malungon	5	5	500	2,645
Provincial Total	45	17	1,700	8,897

(2) Population to be served by target year

Phase I

For urban area, the additional service coverage was estimated to be served by Level III service. For rural area, the population to be served by Level II systems with untapped springs was first calculated and the rest of the additional service coverage was estimated to be served by Level I facilities.

Phase II

For urban area, the population served by Level I and II facilities in base year was considered to be absorbed by Level III service aside from the additional service coverage to be estimated by the sector target. For rural area, all existing facilities in Phase I were assumed to be utilized throughout the future.

The population to be served by target year is exhibited in Table 8.5.2 and Table 8.5.3.

Table 8.5.2 Population to be Served in Phase I (Water Supply)

Name of Municipality	Area	Population Served in the Base Year				Phase I Coverage (2003)								
							Service Coverage				Additional Population to be Served			
		Level III	Level II	Level I	Total	Total Population	Level III	Level II	Level I	Total	Level III	Level II	Level I	Total
Alabel (Capital)	Urban	2,638		8,067	10,705	15,535	3,118		8,067	11,185	480			480
	Rural	350	840	24,499	25,689	41,789	350	840	24,499	25,689				
	Total	2,988	840	32,566	36,394	57,324	3,468	840	32,566	36,874	480			480
Glan	Urban	4,100	108	8,794	13,002	20,257	5,683	108	8,794	14,585	1,583			1,583
	Rural	336	732	34,463	35,531	67,059	336	5,448	31,098	36,882		4,716		4,716
	Total	4,436	840	43,257	48,533	87,316	6,019	5,556	39,892	51,467	1,583	4,716		6,299
Kiamba	Urban		612	8,341	8,953	13,592	833	612	8,341	9,786	833			833
	Rural		3,438	16,510	19,948	32,797		3,438	16,510	19,948				
	Total		4,050	24,851	28,901	46,389	833	4,050	24,851	29,734	833			833
Maasim	Urban	870		5,544	6,414	9,841	1,542		5,544	7,086	672			672
	Rural		1,938	14,821	16,759	25,943		1,938	14,821	16,759				
	Total	870	1,938	20,365	23,173	35,784	1,542	1,938	20,365	23,845	672			672
Maitum	Urban			8,857	8,857	11,403			8,857	8,857				
	Rural		2,640	15,775	18,415	28,190		2,640	15,775	18,415				
	Total		2,640	24,632	27,272	39,593		2,640	24,632	27,272				
Malapatan	Urban	1,590	90	17,309	18,989	28,840	3,366	90	17,309	20,765	1,776			1,776
	Rural		1,950	12,764	14,714	26,944		3,486	11,333	14,819		1,536		1,536
	Total	1,590	2,040	30,073	33,703	55,784	3,366	3,576	28,642	35,584	1,776	1,536		3,312
Malungon	Urban		390	12,955	13,345	33,604	10,850	390	12,955	24,195	10,850			10,850
	Rural		2,142	6,997	9,139	94,167		4,787	47,005	51,792		2,645	40,008	42,653
	Total		2,532	19,952	22,484	127,771	10,850	5,177	59,960	75,987	10,850	2,645	40,008	53,503
Provincial Total	Urban	9,198	1,200	69,867	80,265	133,072	25,392	1,200	69,867	96,459	16,194			16,194
	Rural	686	13,680	125,829	140,195	316,889	686	22,577	161,041	184,304		8,897	40,008	48,905
	Total	9,884	14,880	195,696	220,460	449,961	26,078	23,777	230,908	280,763	16,194	8,897	40,008	65,099

Table 8.5.3 Population to be Served in Phase II (Water Supply)

Name of Municipality	Area	Population Served in 2003				Phase II Coverage (2010)							
						Total Population	Service Coverage				Additional Population to be Served			
		Level III	Level II	Level I	Total		Level III	Level II	Level I	Total	Level III	Level II	Level I	Total
Alabel (Capital)	Urban	3,118		8,067	11,185	26,762	25,424			25,424	22,306			22,306
	Rural	350	840	24,499	25,689	48,198	350	840	43,634	44,824			19,135	19,135
	Total	3,468	840	32,566	36,874	74,960	25,774	840	43,634	70,248	22,306		19,135	41,441
Glan	Urban	5,683	108	8,794	14,585	30,742	29,205			29,205	23,522			23,522
	Rural	336	5,448	31,098	36,882	64,991	336	5,448	54,658	60,442			23,560	23,560
	Total	6,019	5,556	39,892	51,467	95,733	29,541	5,448	54,658	89,647	23,522		23,560	47,082
Kiamba	Urban	833	612	8,341	9,786	14,940	14,193			14,193	13,360			13,360
	Rural		3,438	16,510	19,948	35,816		3,438	29,871	33,309			13,361	13,361
	Total	833	4,050	24,851	29,734	50,756	14,193	3,438	29,871	47,502	13,360		13,361	26,721
Maasim	Urban	1,542		5,544	7,086	10,727	10,191			10,191	8,649			8,649
	Rural		1,938	14,821	16,759	26,454		1,938	22,664	24,602			7,843	7,843
	Total	1,542	1,938	20,365	23,845	37,181	10,191	1,938	22,664	34,793	8,649		7,843	16,492
Maitum	Urban			8,857	8,857	11,726	11,140			11,140	11,140			11,140
	Rural		2,640	15,775	18,415	28,734		2,640	24,083	26,723			8,308	8,308
	Total		2,640	24,632	27,272	40,460	11,140	2,640	24,083	37,863	11,140		8,308	19,448
Malapatan	Urban	3,366	90	17,309	20,765	30,241	28,729			28,729	25,363			25,363
	Rural		3,486	11,333	14,819	28,608		3,486	23,119	26,605			11,786	11,786
	Total	3,366	3,576	28,642	35,584	58,849	28,729	3,486	23,119	55,334	25,363		11,786	37,149
Malungon	Urban	10,850	390	12,955	24,195	43,776	41,587			41,587	30,737			30,737
	Rural		4,787	47,005	51,792	116,926		4,787	103,954	108,741			56,949	56,949
	Total	10,850	5,177	59,960	75,987	160,702	41,587	4,787	103,954	150,328	30,737		56,949	87,686
Provincial Total	Urban	25,392	1,200	69,867	96,459	168,914	160,469			160,469	135,077			135,077
	Rural	686	22,577	161,041	184,304	349,727	686	22,577	301,983	325,246			140,942	140,942
	Total	26,078	23,777	230,908	280,763	518,641	161,155	22,577	301,983	485,715	135,077		140,942	276,019

Table 8.5.4 Additional Number of Households to be Served in Phase 1 (Household Toilets)

Name of Municipality	Area	No. of Household Served in the Based Year				Phase I Coverage (2003)							
						Total No. of HHs	Household Coverage				Additional No. of HHs to be Served			
		Flush	Pour Flush	VIP/Dry	Total		Flush	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total
Alabel (Capital)	Urban		2,547		2,547	3,082		2,292	255	2,547			255	255
	Rural		6,234		6,234	8,511		4,987	1,247	6,234			1,247	1,247
	Total		8,781		6,234	11,593		7,279	1,502	8,781			1,502	1,502
Glan	Urban	23	1,809		1,832	3,697	592	2,070	296	2,958	569	261	296	1,126
	Rural	7	3,681		3,688	12,798	7	6,136	1,536	7,679		2,455	1,536	3,991
	Total	30	5,490		3,688	16,495	599	8,206	1,832	10,637	569	2,716	1,832	5,117
Kiamba	Urban	18	1,335		1,353	2,826	452	1,583	226	2,261	434	248	226	908
	Rural	4	3,720		3,724	6,546	4	3,138	786	3,928			786	786
	Total	22	5,055		3,724	9,372	456	4,721	1,012	6,189	434	248	1,012	1,694
Maasim	Urban	10	1,341		1,351	1,926	308	1,079	154	1,541	298		154	452
	Rural		1,889	3	1,892	4,951		2,377	594	2,971		488	591	1,079
	Total	10	3,230	3	1,892	6,877	308	3,456	748	4,512	298	488	745	1,531
Maitum	Urban		1,132		1,132	2,131		1,534	171	1,705		402	171	573
	Rural		2,507	1	2,508	5,463		2,622	656	3,278		115	655	770
	Total		3,639	1	2,508	7,594		4,156	827	4,983		517	826	1,343
Malapatan	Urban		2,788		2,788	5,421	867	3,036	434	4,337	867	248	434	1,549
	Rural		1,323	2	1,325	5,263		2,526	632	3,158		1,203	630	1,833
	Total		4,111	2	1,325	10,684	867	5,562	1,066	7,495	867	1,451	1,064	3,382
Malungon	Urban		2,421	8	2,429	6,235	998	3,491	499	4,988	998	1,070	491	2,559
	Rural		3,733	14	3,747	17,801		8,545	2,136	10,681		4,812	2,122	6,934
	Total		6,154	22	3,747	24,036	998	12,036	2,635	15,669	998	5,882	2,613	9,493
Provincial Total	Urban	51	13,373	8	13,432	25,318	3,217	15,085	2,035	20,337	3,166	2,229	2,027	7,422
	Rural	11	23,087	20	23,118	61,333	11	30,331	7,587	37,929		9,073	7,567	16,640
	Total	62	36,460	28	36,550	86,651	3,228	45,416	9,622	58,266	3,166	11,302	9,594	24,062

Table 8.5.5 Additional Number of Households to be Served in Phase II (Household Toilets)

Name of Municipality	Area	No. households Served in 2003				Phase II Coverage (2010)							
						Total No. of HHs	Household Coverage				Additional No. of HHs to be Served			
		Flush	Pour Flush	VIP/Dry	Total		Flush	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total
Alabel (Capital)	Urban		2,292	255	2,547	6,691	3,112	2,856	255	6,223	3,112	564		3,676
	Rural		4,987	1,247	6,234	12,050	350	8,043	1,247	9,640	350	3,056		3,406
	Total		7,279	1,502	8,781	18,741	3,462	10,899	1,502	15,863	3,462	3,620		7,082
Glan	Urban	592	2,070	296	2,958	7,686	3,574	3,278	296	7,148	2,982	1,208		4,190
	Rural	7	6,136	1,536	7,679	16,248	336	11,126	1,536	12,998	329	4,990		5,319
	Total	599	8,206	1,832	10,637	23,934	3,910	14,404	1,832	20,146	3,311	6,198		9,509
Kiamba	Urban	452	1,583	226	2,261	3,735	1,737	1,511	226	3,474	1,285			1,285
	Rural	4	3,138	786	3,928	8,954	4	6,373	786	7,163		3,235		3,235
	Total	456	4,721	1,012	6,189	12,689	1,741	7,884	1,012	10,637	1,285	3,235		4,520
Maasim	Urban	308	1,079	154	1,541	2,682	1,247	1,093	154	2,494	939	14		953
	Rural		2,377	594	2,971	6,614		4,697	594	5,291		2,320		2,320
	Total	308	3,456	748	4,512	9,296	1,247	5,790	748	7,785	939	2,334		3,273
Maitum	Urban		1,534	171	1,705	2,932	1,364	1,192	171	2,727	1,364			1,364
	Rural		2,622	656	3,278	7,184		5,091	656	5,747		2,469		2,469
	Total		4,156	827	4,983	10,116	1,364	6,283	827	8,474	1,364	2,469		3,833
Malapatan	Urban	867	3,036	434	4,337	7,560	3,516	3,081	434	7,031	2,649	45		2,694
	Rural		2,526	632	3,158	7,152		5,090	632	5,722		2,564		2,564
	Total	867	5,562	1,066	7,495	14,712	3,516	8,171	1,066	12,753	2,649	2,609		5,258
Malungon	Urban	998	3,491	499	4,988	10,944	5,089	4,590	499	10,178	4,091	1,099		5,190
	Rural		8,545	2,136	10,681	29,232		21,250	2,136	23,386		12,705		12,705
	Total	998	12,036	2,635	15,669	40,176	5,089	25,840	2,635	33,564	4,091	13,804		17,895
Provincial Total	Urban	3,217	15,085	2,035	20,337	42,230	19,639	17,601	2,035	39,275	16,422	2,930		19,352
	Rural	11	30,331	7,587	37,929	87,434	690	61,670	7,587	69,947	679	31,339		32,018
	Total	3,228	45,416	9,622	58,266	129,664	20,329	79,271	9,622	109,222	17,101	34,269		51,370

Table 8.5.6 Additional Number of Public School Students to be Served in Phases I and II (School Toilets)

Name of Municipality	Std. No. of Public School Student that can be Served in the Base Year (1997)	Projected No. of Public School Student in 2003	Phase I Coverage (2003)		Projected Number of Pulic School Students in 2010	Phase II Coverage (2010)	
			Public School Students Coverage	Additional No. of Public School Student to be Served		Public School Students Coverage	Additional No. of Public School Students to be Served
Alabel (Capital)	2,920	13,122	7,873	4,953	19,304	17,374	9,501
Glan	7,040	19,970	11,982	4,942	24,631	22,168	10,186
Kiamba	6,000	9,516	5,710		11,800	10,620	4,910
Maasim	2,040	8,199	4,919	2,879	9,052	8,147	3,228
Maitum	6,007	7,987	4,792		8,706	7,835	3,043
Malapatan	3,320	12,571	7,543	4,223	14,090	12,681	5,138
Malungon	6,760	26,590	15,954	9,194	35,832	32,249	16,295
Provincial Total	34,087	97,955	58,773	26,191	123,415	111,074	52,301

Table 8.5.7 Additional Number of Public Utilities with Sanitary Toilets in Phase I and II

Name of Municipality	Type	Coverage in Base Year (1997)		Phase I Coverage (2003)			Phase I Coverage (2010)		
		No. of PU with Toilets Facilities	No. of PU with Sanitary Toilets	No. of PU with Toilets Facilities	Add'l. No. of Public Utilities with Sanitary Toilets	No. of PU with Sanitary Toilets	No. of PU with Toilets Facilities	Add'l. No. of Public Utilities with Sanitary Toilets	No. of PU with Sanitary Toilets
Alabel (Capital)	Public Market	2	2	4	2	4	7	3	7
	Bus/Jeepney Terminal	1	1	2	1	2	4	2	4
	Parks/Playground	1	1	2	1	2	4	2	4
	Total	4	4	8	4	8	15	7	15
Glan	Public Market	11	11	16	5	16	21	5	21
	Bus/Jeepney Terminal	1	1	2	1	2	5	3	5
	Parks/Playground	2	2	3	1	3	5	2	5
	Total	14	14	21	7	21	31	10	31
Kiamba	Public Market	3	3	4	1	4	5	1	5
	Bus/Jeepney Terminal	3	3	5	2	5	7	2	7
	Parks/Playground			5	5	5	11	6	11
	Total	6	6	14	8	14	23	9	23
Maasim	Public Market	2	2	4	2	4	7	3	7
	Bus/Jeepney Terminal	1	1	2	1	2	3	1	3
	Parks/Playground	1	1	3	2	3	5	2	5
	Total	4	4	9	5	9	15	6	15
Maitum	Public Market	2	2	4	2	4	6	2	6
	Bus/Jeepney Terminal	1	1	2	1	2	3	1	3
	Parks/Playground			2	2	2	4	2	4
	Total	3	3	8	5	8	13	5	13
Malapatan	Public Market	1	1	3	2	3	5	2	5
	Bus/Jeepney Terminal	1	1	2	1	2	4	2	4
	Parks/Playground			1	1	1	2	1	2
	Total	2	2	6	4	6	11	5	11
Malungon	Public Market	15	15	20	5	20	25	5	25
	Bus/Jeepney Terminal			2	2	2	5	3	5
	Parks/Playground	3	3	6	3	6	9	3	9
	Total	18	18	28	10	28	39	11	39
Provincial Total	Public Market	36	36	55	19	55	76	21	76
	Bus/Jeepney Terminal	8	8	17	9	17	31	14	31
	Parks/Playground	7	7	22	15	22	40	18	40
	Total	51	51	94	43	94	147	53	147