Chapter 6

PAST FINANCIAL PERFORMANCE IN WATER SUPPLY AND SANITATION

6. PAST FINANCIAL PERFOMANCE IN WATER SUPPLY AND SANITATION

6.1 General

Based on the Local Government Code of 1991 and NEDA Board Resolution No. 4 (1994), the locally funded programs and projects for the water supply and sanitation sector have been devolved from the central government agencies to the LGUs since 1992. However, the central government still retains its role of providing support to LGUs in the form of technical, institution-building and limited financial assistance.

The financial arrangements conducted, since the sector's devolution to the LGUs, by the province with a special attention to the subject sector are reviewed and discussed in this chapter. The past experience is the basis to seek for appropriate financial arrangements for the medium term development. The essential study components are: (1) LGUs' past financial performance; (2) past public investment and present plans; (3) LGUs' present financing sources and management participation in the sector, (4) Existing practices by the LGUs on cost recovery and (5) affordability by users.

6.2 LGU's Past Financial Performance

The provincial government's past financial performance during the period from 1994 to 1998 was investigated. Actual financial data were obtained for the years 1994 to 1997, while the financial figures in 1998 are only budgetary estimates. Likewise, the municipalities' past financial performance in the same period (1994 to 1998) is included in the Supporting Report.

6.2.1 Sources and Uses of Funds

(1) Sources of Funds in the Province

The sources of income of the LGU are Internal Revenue Allotments (IRA), local tax revenues, and non-tax revenues such as grants, aids and subsidies, as shown below. At the present time, IRA is a major financial source of the LGUs.

(a) IRA -- the amount allotted by the National Government to different provinces, municipalities and barangays. A standard formula is used, which consider parameters such as population, land area, number of barangays, cost of devolved national functions, and other factors.

(b) Tax Revenues – mainly consist of real property tax and miscellaneous taxes, accounting for 5.6% of the total income of the province.

(c) Grants, Aids and Subsidies -- assisted by JICA, UNDP, UNICEF, etc. and the NDCC (Calamity Fund from the Central Government during floods or when ever the province is declared as calamity area)

(d) Income from economic enterprises of the province and rental income derived from the lease of the equipment procured by the province

Based on the Local Government Code of 1991, 40% of the national internal revenue taxes of the 3rd fiscal year preceding the current year (from 1994 onwards) is allocated to the LGUs nationwide, specifically to the administrative units of (1) province (23%); (2) city (23%); (3) municipality (34%), and barangay (20%). Further, respective IRAs in different administrative levels are allotted to all administrative units concerned.

Table 6.2.1 presents the income and expenditures of Agusan del Sur during the period of 1994-1998. Local tax revenues, which were 5.6 % of the total income of the province, consist of real property tax, business taxes and licenses, and miscellaneous taxes. IRA's share to total income in annual average was about 90.0 % during the period of 1995 to 1997, which indicates that the province has been dependent on the IRA with its low tax and non-tax revenue collections.

Another source of income of the province is that from the operation of its economic enterprises. By law, the profits from economic enterprises are put in the general fund. In 1997, these economic enterprises were subsidized by the province. The existing economic enterprises of the Agusan del Sur include:

Provincial Reproduction Center -- business center (dissolved in 1998)
Equipment Rental Operations -- Motor Pool
Pagkain ng Bayan – Agriculture
Provincial Training Center
Patin-ay Waterworks
Provincial Agricultural Demonstration
DXDA -- Radio Station

Table 6.2.Income and Expenditures between 1994 and 1998

PROVINCE	1994	1995	1996	1997	1998
RECEIPTS:					
Local Revenues 1/	18,955,387.30	22,256,488.65	4,588,482.95	15,443,110.66	23,031,000.00
IRA	169,656,401.00	186,003,853.25	201,838,363.26	248,369,512.65	282,456,999.00
Other Income	10,190,578.83	11,957,801.69	17,535,666.79	12,530,246.82	10,037,200.00
Total Revenues	198,802,367.13	220,218,143.59	223,962,513.00	276,342,870.13	285,703,821.00
EXPENDITURES:					
Current Operating Expenditures	110,417,894.40	129,847,993.90	138,887,396.80	283,039,829.43	85,222,118.18
Personal Services (P.S.)	75,951,219.12	9,646,732.98	111,706,304.29	150,231,403.26	68,114,753.30
Maint. & Other Oper. Exp. (MOOE)	34,466,675.31	33,409,260.96	27,181,092.56	132,808,426.17	17,107,364.88
NET OPERATING INCOME	88,384,472.73	90,370,149.69	85,075,116.20	(6,696,959.30)	200,481,702.82
Less: Capital Outlays 2/	48,474,610.41	103,444,925.18	92,265,217.82	12,377,418.29	109,687,174.35
Non-Office	36,511,934.70	45,715,172.46	17,767,373.11	-	33,958,618.68
5% Budgetary	625,978.10	-	-	-	-
Sub-total Other Expenditures	85,612,523.21	149,160,097.50	110,032,590.90	12,377,418.29	143,645,792.90
Add: Capital Revenue	-	-	-	-	12,500,000.00
Grants	2,173,416.00	-	-	-	4,200,000.00
Borrowings	22,107,000.00	52,893,000.00	25,212,048.58	-	5,000,000.00
Net Income	27,052,365.40	(4,896,948.10)	254,573.88	(19,074,417.70)	44,856,403.00

1/ includes Tax Revenues (Real Property Taxes, Business Taxes and Licenses, National Wealth Share, Miscellaneous Taxes, etc.). National Wealth in 1990s.

2/ include Amortization Payments. Source: Provincial Treasurer's Office

In addition, there is rental income derived from the lease of the equipment that was procured by the province through a loan from the LBP. The equipment is leased to organizations outside the Provincial Government. This arrangement is made based on the 1987 Constitution and the 1991 Local Government Code, which granted the Provincial Government to have its initiative to create new revenue sources. The Sangguniang Panlalawigan (SP) has issued Ordinance No. 6, series of 1990, which prescribes the hauling rates for the lease of the heavy equipment owned by the Provincial Government.

(2) Uses of Funds in the Province

Actual expenditures of the provincial government during the period of 1994 to 1997 show that personnel expenses were major parts with an average of 42% to total revenue. Maintenance and operating expenses of the province was 21%. In addition, the province had a capital outlay with an average share of 24.8% to the total revenue. The funds for the water supply sector were part of the capital outlays of the province.

In 1997, the province had a net loss from its operations of about ₱ 19.1 million. However, the province has projected net operating income of ₱44.86 million in 1998 from operating

revenues of ₱285.76 million, after deducting the projected expenses and capital outlay amounting to ₱85.2 million and ₱109.7 million, respectively.

6.2.2 Availability of Funds

As previously noted, the IRA comprises about 90% of the total income of the province, which is tapped to finance most of its expenditures including capital outlays and even non-office expenses (incidental). According to the Provincial Treasurer's Office, the amount of IRA that will be received by the province is known in advance before the end of the preceding year. Thus, for budgeting purposes, the province just uses the actual amount of IRA it received in the preceding year as its estimate of IRA for the budget year. In the case where the IRA received is higher than that of the preceding year, the province prepares a supplemental budget.

Table 6.2.2 presents the historical IRA of the provincial government and its municipalities between 1994 and budget year 1998. As shown, the IRA of the province was 1.4% of the provincial IRA nationwide in the period of 1994-1997 and budget year 1998. While, the total amount of IRA allotted to all its municipalities in the years 1994-1997 was 1.4% in annual average, but in 1998, this share decreased to only 1.2% to the municipal IRA nationwide which is ₱28.24 billion. The IRA percentage of each municipality to total municipal IRA nationwide is presented in Table 6.2.2, Supporting Report.

Based on the past financial performance of the province, IRA has been a major source of funds. At first, 20% Development Fund (DF) and 5% Calamity Fund are deducted from the total amount of provincial IRA. Then, the remaining portion of the IRA is combined with other income sources. Contractual and statutory items, which is covered by R.A. 324 (b) are first deducted from the pooled income (75% IRA + all other income) before other appropriations are made.

According to the income statement of the province, available funds of the province are mainly spent to cover personnel salaries, benefits, the MOOE and capital expenditures. The provincial government's combined income from IRA and its tax, and non-tax revenues are just sufficient for its operating, capital and non-office expenses. Thus, there is little surplus income that can be tapped for additional capital expenditures.

Table 6.2.2 Past Internal Revenue Allotment to the Province

		1994	1995	1996	1997	1998
National	I. National Total of IRA	46,753,000,000.00	55,202,000,000.00	58,022,990,000.00	71,049,000,000.00	80,990,763,000.00
	(a) IRA to all Provinces	11,498,991,198.00	12,696,644,000.00	13,755,011,803.00	17,813,000,000.00	20,054,018,925.00
	(b) IRA to all Municipalities	16,325,288,074.00	18,768,952,000.00	19,607,715,553.00	24,849,000,000.00	28,245,815,434.00
Province	II. IRA to Agusan del Sur	33,931,280.20	37,200,766.40	40,367,672.60	49,673,902.53	564,491,399.80
	(1) Total: (2) + (3)	408,878,021.00	449,294,857.37	487,951,446.00	597,022,943.65	628,449,321.00
	(2) Provincial Government	169,656,401.00	186,003,832.00	201,838,363.00	248,369,512.65	282,456,999.00
	Percentage against (a)	1.48%	1.46%	1.47%	1.39%	1.41%
	(3) Municipalities	239,221,800.00	263,291,025.37	286,113,083.00	348,653,431.00	345,992,322.00
	Percentage against (b)	1.47%	1.40%	1.46%	1.40%	1.22%
	III. Total Income of the Provincial Government	198,802,367.13	220,218,143.59	223,962,513.00	276,342,870.13	328,025,199.00
	Percentage of IRA	85%	84%	90%	90%	86%
	IV. Total Income of Municipalities	310,870,204.14	261,115,322.38	306,415,845.59	394,099,759.68	481,328,151.74
	Percentage of IRA	77%	100%	93.40%	88.50%	71.88%
Municipality	V. IRA to Municipalities**					
	TOTAL	**239,221,800.00**	**263,291,025.37**	**286,113,083.00**	**348,653,431.00**	**345,992,322.00**
	Bayugan	21,554,626.00	25,541,933.00	27,573,214.00	35,449,284.00	36,842,855.00
	Bunawan	15,994,088.00	17,277,623.00	18,608,751.00	19,588,853.00	20,597,235.00
	Esperanza	23,891,468.00	26,144,439.36	27,800,364.00	34,940,700.00	27,301,987.00
	La Paz	18,704,390.00	20,344,877.79	23,405,837.00	29,943,777.00	32,003,360.00
	Loreto	29,263,324.00	31,671,875.00	33,605,037.00	34,754,813.00	37,284,693.00
	Prosperidad	19,545,918.00	20,966,298.00	23,178,262.00	30,307,354.00	24,862,640.00
	Rosario	11,873,293.00	13,096,629.47	14,253,020.00	17,626,505.00	18,574,735.00
	San Francisco	16,534,480.00	18,285,692.00	19,660,601.00	25,236,409.00	24,788,395.00
	San Luis	16,885,901.00	18,373,165.18	19,585,131.00	24,500,506.00	22,927,013.00
	Sibagat	14,158,692.00	6,808,488.46	16,589,126.00	21,475,887.00	22,591,320.00
	Sta. Josefa	6,158,920.00	15,701,473.00	10,783,299.00	15,404,349.00	16,154,893.00
	Talacogon	11,028,352.00	12,238,294.00	11,864,666.00	15,750,651.00	16,386,118.00
	Trento	15,485,101.00	17,010,755.12	18,199,047.00	23,798,482.00	24,908,339.00
	Veruela	18,143,247.00	19,829,481.99	21,006,728.00	19,875,861.00	20,768,739.00
	TOTAL	**239,221,800.00**	**263,291,025.37**	**286,113,083.00**	**348,653,431.00**	**345,992,322.00**

Sources: (1) Department of Budget and Management, (2) Bureau of Local Government Finance (DOF) and (3) Provincial Annual Report.

Notes: In the computation of (IV), number of municipalities covered by year: 1995 - 9 Municipalities; 1996 - 12 Municipalities; 1997 - 13 Municipalities & 1998 - 13 Municipalities

* IRA to Barangays is not included.

** Figures in bracket are shares (%) in a total of all municipalities in the province.

For capital expenditures of the province, 20% Development Fund (DF) of the IRA are appropriated. The percentage allotted as the DF is the minimum requirement that should be arranged for capital projects as stated in the memorandum circulars of the DILG. Table 6.2.3 shows past performance in use of the DF.

Table 6.2.3 Available Funds for Capital Expenditures (20% DF), 1994-1998

Unit: Pesos

Year	IRA of the Province (a)	20% Dev't. Fund (b)	Actual/projected Capital Expenditures (c)	Surplus/(Shortfall) of 20% DF
1994	169,656,401.00	33,931,280.20	48,474,610.41	(14,543,330.21)
1995	186,003,832.00	37,200,766.40	103,444,925.18	(66,244,158.70)
1996	201,838,363.00	40,367,672.60	92,265,217.18	(51,897,544.58)
1997	248,369,512.65	49,673,902.53	12,277,418.29	37,396,484.24
1998	282,456,999.00	56,491,399.80	109,687,174.35	(53,195,774.50)

Note: Data Source: Table 6.2.2; Capital expenditures in 1998 are projected figure.

Referring to the amount of actual capital expenditures of the province from 1994 to 1996, the allotted DF was not sufficient and provided only about 50% of the total capital. While, in 1997 the DF was more than sufficient, since the capital expenditures were relatively smaller (24.7% of the DF). In 1998, the DF may not be adequate to cover the capital expenditures of the province, since the projected figure is only 51.5% of the amount of capital outlays.

In order to finance its capital investment program, the funds were sourced from grants and borrowings as summarized in Table 6.2.4.

Table 6.2.4 Other Sources of Funds for Capital Expenditures and 20% DF, 1994-1998

Unit: Pesos

Year	Actual Capital Expenditures (a)	Grants (b)	Borrowings (c)	20% DF (Computed) (d)	Sub-Total Financial Sources (e)	Surplus/ Shortfall (f)
1994	48,474,610.41	2,173,416.00	22,107,000.00	33,931,280.20	58,211,696.40	9,737,085.99
1995	103,444,925.18	-	52,893,000.00	37,200,766.40	90,093,766.40	(13,351,158.70)
1996	92,265,217.18	-	25,212,048.57	40,367,672.60	65,579,721.17	(26,685,496.01)
1997	12,277,418.29	-	-	49,673,902.53	49,673,902.53	37,396,484.24
1998	109,687,174.35	4,200,000.00	5,000,000.00	56,491,399.80	65,691,399.60	(43,995,774.70)

The total financial resources of the province, which include grants and borrowings, were not sufficient to finance its capital expenditures during the years 1995 and 1996. In 1997, how-

ever, it has excess funds of ₱37.396 million as a result of much lower capital expenditures during the year. But, a shortfall of ₱43.99 million is projected for the year 1998 as a result of much higher projected capital outlays. Further clarification on the supplemental fund and/or the accuracy of data is necessary with reference to a huge shortfall in its capital outlays during 1995-1996 and 1998.

6.2.3 Financial Indicators

In order to determine the debt servicing capability of the province, the formula used by the Bureau of Local Government Finance (BLGF) under the Department of Finance was employed. It takes into account the regular income of the LGUs referring to revenues (real property and business taxes) and receipts from economic enterprises and fees and charges that are collected regularly. Receipts from borrowings, grants, inter-fund transfers are not considered as regular income.

Following is the formula adopted by BLGF in computing the debt servicing capacity, where the average annual growth rate to be used should not exceed 15%, according to the MDF Policy Governing Board Resolution 4-95.

DSC = [{RINC 1 (1+AGR) + RINC 1} + IRA 2]x 20% - AMORT

Where:

DSC = debt servicing capacity of the LGU

RINC = regular income

AGR = average growth rate

IRA = internal revenue allotment

20% = debt servicing ceiling percentage imposed by the Local Government Code of 1991 under Section 324 (b).

AMORT = amortization of the LGU's outstanding loan

1 =current year

2 =preceding year

Based on the above formula, the amount of the debt servicing capacity of the provincial government was computed to be ₱53.5 million for the year 1998. This figure reflects the maximum loan amount that the provincial government can borrow from the MDF. It is noted that MDF is a potential funding source for the province in the implementation of water supply sector plan. The regular income as projected by the province for 1998 is ₱23.03 million and IRA is ₱282.45 million, while the loan amortization payment is ₱7.6 million.

6.3 Past Public Investment and Present Plans

6.3.1 Past and Current Annual Investment Plans

The past and recent development of the water supply and sanitation sector in the province was mainly undertaken by the line agencies such as DPWH, LWUA, DILG and DOH as well as the provincial government. The sector investments by these agencies between 1995 and 1998 are shown in Table 6.3.1. For Level III water supply, an aggregated amount of ₱114.35 million was spent during the said period, 82.3% of which was contributed by the provincial government. The investments provided for Levels I and II water supply were much smaller with the amount of ₱18.3 million and ₱16.1 million, respectively.

Table 6.3.1 Previous Sector Investment to the Province by Concerned Agencies

Unit: '000 Pesos

Funding Category		1995-1998			
Agency	Funds	Level I	Level II	Level III	Sanitation
DILG		2,283.00			
DPWH	Foreign Fund 1)	N.A.	2,800.00	2,200.00	
	Local Fund 2)	550.00	10,730.00		
LWUA				18,000.00	
DOH					
PROVINCE	Provincial Government	15,494.00	2,600.00	94,150.00*	60.00
	Municipal Government				
MUNICIPALITY					
TOTAL		18,327.00	16,130.00	114,350.00	60.00

Note: N.A: no information available

* Amount includes the investments of the three water districts operating in the province and Level III invested by the municipal LGU

(1) Budgetary Allocation to the Sector

The Budget Office of the province consolidates the budget proposal submitted by all offices of the Provincial Government. While, the DBM issues a Local Budget Memorandum every October of the preceding budget year to guide the provinces in their budget preparation. The sector obtains allotment from the 20% DF allocation by the Provincial Development Council (PDC).

Once, the budgetary arrangement is completed, the local chief executive (Governor) endorses it to the SP for approval and appropriation. The SP usually approves the budget, ideally before January of the budget year. In case the budget is not approved, the province operates on a re-enacted budget, which is based on the last year's budget, until the budget for the current year is approved.

(2) Capital Expenditures in the Sector

The projects programmed for implementation in the province by sector, by funding source, and by implementing agency are consolidated and presented by the PPDO in the Provincial Annual Investment Plan (AIP). The AIP is based on the planned investment of the province, as well as on the submission to the PPDO from the municipalities on their planned investments for the coming year. The AIPs of Agusan del Sur for the Sector from 1995 to 1998 are summarized in Tables 6.3.2 and 6.3.3.

Table 6.3.2 summarizes annual sector investments by service level and activities, while Table 6.3.3 shows annual activities in the water supply sector; the corresponding funding source and the amount of investment from 1995 to 1998.

Table 6.3.2 Annual Investment Plan (P'000)

Item	1995	1996	1997	1998	Total
Level I	5,076	2,212	2,283	[illegible]	33,171
Foreign Assisted	5,076	2,212	2,283	[illegible]	29,531
National	-	-	-	[illegible]	930
Local	-	-	-	[illegible]	2,710
Level 2/3	8,000	19,400	12,500	[illegible]	107,800
Foreign Assisted	-	-	-	[illegible]	4,700
National	8,000	-	-	[illegible]	8,300
Local	-	19,400	12,500	[illegible]	44,800
Loan - DBP/LBP	-	-	-	[illegible]	50,000
Expansion	-	-	-	[illegible]	1,500
Repair/Maintenance	10,000	-	8,580	[illegible]	20,080
LGU Counterpart to FAPs	-	2,500	1,000	-	3,500
Special Water Supply Projects (Gov't. Centers, Hosp.)-Local	-	2,600	-	[illegible]	11,884
Health Centers	-	350	-	-	350
Water Quality	-	-	-	[illegible]	60
Total-Water Supply	23,076	26,712	24,363	[illegible]	177,935
Total-Sanitation (Health)		350	-	[illegible]	410
Grand Total	23,076	27,062	24,363	[illegible]	178,345

Note: Estimated from Table 6.1

Level I had the lowest fund allocation (construction of DW, SW, reservoir, etc.), particularly in 1996 with the amount of ₱2.21 million. In 1998, a total amount of ₱67.9 million has been invested mainly through a loan from DBP/LBP (₱50 million) for the construction of Levels II and III water supply facilities. The remaining cost required was shared by LGU counterpart fund with ₱12.9 million and foreign fund, ₱4.7 million.

Water supply and sanitation sector obtained ₱178.345 million as a cumulative investment amount from 1995 to 1998, of which only ₱410,000 were allotted to the sanitation sector

Table 6.3.3 Annual Activities in the Water Supply Sector

Item	1995			1996			1997			1998		
	IA	Fund Source	Amount (P '000)	IA	Fund Source	Amount (P '000)	IA	Fund Source	Amount (P '000)	IA	Fund Source	Amount (P '000)
Construction (DW, SW, Spring Box, Reservoir, Tank)			1,804			2,212			2,283.00			20,960
Various Foreign Assisted		FA	1,804	DPWH	NG/FA	2,212	LGU	FA/DILG	2,283.00	LGU/NG/BWSA	ADB	18,260
National										LGU/NG/BWSA	NG	40
Various Local Funding											20%DF/SP-PDF/NG	
										LGU	Prov./Mun.	2,660
Construction of Rain Collectors/Water Tanks		FA/NG	2,952							LGU	NG/Prov.	390
Develop Spring Sources			320			-			-			2,250
Various Foreign Assisted		FA	320							LGU/NG/BWSA	ADB	1,700
National										LGU	NG	500
Various Local Funding										LGU	20% PDF	50
Spring Development with L2			-			-			-			4,950
Various Foreign Assisted										LGU/NG	ADB	2,500
National										LGU	NG	300
National/Local Funding										LGU	NG/LGU	150
Various Local Funding										LGU	CDF/PDF	1,500
Various Local Funding										LGU/DPWH	CDF	500
Spring Development with L3										LGU	NG/MDF97	5,000
Spring Development with pipes, water tank										LGU	20% DF	250
Construction Levels 2/3			8,000			19,400			10,000.00			56,200
Various Foreign Assisted										LGU/NG/BWSA	ADB	2,200
National		LWUA/NG	8,000									
Various Local Funding				PEO		19,400	MEO/LGU	LGU	10,000.00	LGU/NG/BWSA	Prov.	4,000
Loan										LGU	DBP/LBP/LGU	50,000
Maintains/Rehab/Improve L1/L2/L3 & SD		LWUA/NG	10,000				LGU	LGU/CDF	8,580.00	LGU	NG/Prov./Mun.	1,500
Expansion L2/L3										LGU/BWSA	no data/Prov./Mun.	1,500
Completion of L3 On-going							MEO/LGU	LGU	2,500.00			
Construction/Rehab Level 2 & Gov't. Center's Works				LGU	20% DF/NW	2,600						
Counterpart to WATSAN FAPs				LGU	20% DF/NW	2,500	LGU	20%DF/NW	1,000.00			
Construction of Health Center/Stations-Barangay				PEO		350						
Water Disinfection/Chlorination of Water Sources-14 Mun.										PHO	LGU	60
Construction of Water Reservoir-Bunawan Dist. Hosp.											LGU	150
Water Supply for Provincial Resettlement Project Site											LGU/NG/20%PDF	9,134

Source: Agusan del Sur Annual Investment Programs, 1995 to 1998

(refer to Table 6.3.1). The above amounts were funded from various sources: local funds (provincial and municipal government) and foreign funds.

Even the experience of previous large investments, the provincial government has very limited funding source (amount of capital expenditures is from the 20% DF). Furthermore, as discussed in the following section, the water supply and sanitation sector was given low priority in the allocation of the 20% DF.

6.3.2 Past and Current Breakdown of 20% Development Fund

The allocation of the 20% DF is guided by DILG Memorandum Circular No.95-215 as amended by Memorandum Circular No. 96-263 issuing 'the Policies and Guidelines on the Utilization of the DF and other related matters'. Based on these guidelines, the LGUs appropriate the DF for human and ecological security concerns.

The allocation results of the 20% DF of the provincial government is presented in Table 6.3.4. It is noted that the infrastructure sector obtained 60% of the 20% DF in 1998 (i.e. ₱33.85 million out of ₱56.49 million). Water supply and sanitation sector's share was very minimal with 2.0% to 5% of the DF.

Table 6.3.4 Allocation of the 20% Development Fund, 1994-1998

Unit: Pesos

Year	20% DF	Social Development	Economic Development	Infrastructure	Water Supply/ Sanitation	Others
1994	33,931,280.20	1,100,000.00	1,094,738.00	5,792,000.00	1,000,000.00	24,944,542.20
1995	37,200,766.40	650,000.00	-	90,000.00	1,320,000.00	35,140,766.40
1996	40,367,672.60	2,650,000.00	450,000.00	21,700,000.00	2,000,000.00	13,567,672.60
1997	49,673,902.53	3,200,000.00	2,400,000.00	18,874,097.00	1,000,000.00	24,191,806.00
1998	56,491,399.80	5,700,00.00	2,520,000.00	33,850,000.00	1,800,000.00	12,621,399.30

Note: 1/ Above figures were actually disbursed as planned, sanitation's share is only ₱300,000 in 1998.

6.3.3 Existing Plans of the LGUs for the Sector

The Provincial Government has been undertaking various programs for the water supply and sanitation sector. However, there are no specific projects to be implemented at present. The following are the items to be budgetary arranged.

(1) Training/Logistic Support

Last year, the SP created the WATSAN Center through an ordinance. Thus, a separate plantilla was required for the personnel of WATSAN Center. However, due to the delayed timing of its creation, this plantilla was not appropriated in the budget. For the time being, personnel from other offices have been detailed to the WATSAN Center to undertake the required functions.

The budgetary requirements for the personnel and activities of the WATSAN Center shall be integrated with the regular budget of the PPDO, but will be subject to the limitations prescribed by the DBM.

(2) O&M Assistance

The AIP of the province during the years 1995-1998 included the repair and maintenance items for water supply facilities. In 1996, however, no such items were included. In order to make the water supply facilities efficient, repair and maintenance budget for water supply facilities shall be considered.

6.4 LGUs' Present Financing Sources and Management Participation in the Sector

6.4.1 Cost Sharing Arrangements / Counterpart Funding

The implementation of water supply projects was previously undertaken by DPWH (construction through OECF up to 1995) and DILG (BWP-institutional building, UNDP-WATSAN, and CIDA-capability building). The DPWH, through its DEOs, still receive requests for assistance from barangay people. This is due to lack of awareness on the part of people regarding the new institutional arrangement and proved the DEOs' technical ability. The requests, however, are granted on a case-to-case basis, usually if the manpower and budget are available.

The new cost-sharing scheme was authorized in 1998 in accordance with the policy of national government grants. It is stated that "this scheme shall be applied to all new ODA-assisted projects that are currently being packaged in support of LGUs".

Programs of central government agencies that involve devolved functions, particularly those that have social and/or environmental objectives are implemented through a cost-sharing ar-

rangement between the central government agency and LGUs. For any central government grants that are provided for the development of Level I water supply systems and sanitation facilities to the limited municipalities, the LGUs and beneficiaries concerned shall share the capital cost required. No subsidies from the central government will be provided for the construction of Level II and III water supply systems.

The province has graduated from being part of the SRA. It was upgraded to first class province this year. The province has only one 5th municipality, the Municipality of Sta. Josefa and no 6th class municipality. As such, the planning parameters in LGU's cost sharing for most of the municipalities should comply with self-supporting principle for the sector projects.

6.4.2 ODA Assisted Projects and Grant Aid

In the recently completed UNDP-WATSAN Project, which involved some physical development, cost sharing was made among the concerned parties. The BWSA, the Barangay Government and the DSWD contributed in kind, while the other participants provided funds. The provincial Government provided the largest counterpart with its contribution of 41% of project cost. The UNDP provided 24% of the project cost, while the DPWH provided 18% and the Municipal Government, 11% of the project cost.

For its forthcoming foreign-assisted projects in the sector, the Province has earmarked from its 20% DF of 1998, the amount of ₱1.0 Million as counterpart fund to the ADB-RW3SP and PW4SP. The earmarked amount is programmed to provide the materials and labor for the project.

(1) Arrangement Through Conduits

1) Municipal Development Fund (MDF)

The MDF is a revolving fund created under Presidential Decree No. 1914 to provide LGUs access to foreign loans, assistance or grants. Operations of the MDF, as well as the evaluation and control of local government transactions of the fund, are guided by the financial policies defined in the Joint Circular No. 6-87 of the DOF, COA and DBM. The policies include, among others, the following:

- On-lending terms for local governments or government corporations to be in accordance with the terms and conditions of the international agreements with foreign financial institutions;
- Loan repayments to conform with the terms and conditions of the corresponding Loan and Project Agreements;
- Annual debt service liabilities to all creditors to be at least 120 per cent of total net annual revenues from all sources after operating costs, unless otherwise provided in a mutual agreement among all parties concerned;
- Repayment to MDF to take precedence over all subsequent borrowings incurred;
- Payment of additional interest, charges and fees on amounts to be relent to local governments may be required by the Secretary of Finance in consultation or agreement with foreign lending institutions and LGUs/Project Cities to cover foreign exchange risks, commitment charges and front-end fees applied on foreign borrowings by lending institutions; and
- Internal revenue/specific tax allotments to be withheld by the DOF in case of default or arrearages for more than three (3) months.

The Policy on accessing loans through the MDF is currently under review by the central government to make the terms and conditions more concessional towards the LGUs.

2) Governmental Financing Institutions (GFI)

In the past, the LGUs could not access financing institutions for direct assistance. But with the devolution of the sector to the LGUs, the LGUs could now access direct financing from banks and other financing institutions.

Among the GFIs through which LGUs can access ODA loans are the Land Bank of the Philippines (LBP) and the Development Bank of the Philippines (DBP). For the LGU to enter into a loan, the respective legislative council (PA for the Province, Sangguniang Panlunsod; SP for the City and Sangguniang Bayan; SB for the Municipality) will authorize the Chief Executive Officer (Governor or Mayor, as the case may be). The collateral that the LGU may use in order to avail of loans from the bank could be any of the followings: deposit hold out, public land and assignment of IRA.

The province has experienced accessing external funds through loans from aforementioned government banks. The most recent loan of the Province was for heavy equipment from LBP.

In a deposit hold out loan, loanable amount is based on the amount in the time deposit account of the LGU in the bank. The LGU is allowed a maximum loanable amount of up to 90 per cent of the total amount of its time deposit account in the bank. One of the terms for this kind of loan includes deduction of amount due from the LGU's IRA deposited in that bank.

Other collaterals accepted by the bank are: public land and assignment of IRA. The condition imposed by the bank on the loan is the signing of a MOA with the provincial government, which guarantees that the loan will be honored even if the administration that incurred the loan is no longer the incumbent. Interest rate is not fixed and fluctuates depending on the current interest rates prevailing during repayment. Penalty charges are imposed, whenever the IRA of the province is delayed.

There exist several banks in Agusan del Sur, both government and private commercial banks. The largest banks include DBP, PNB, LBP and Metrobank. Other banks are Rural Bank of Talacogon (now called People's Bank of Caraga), First Consolidated Bank and Rural Bank of Montevista, etc.

3) Loan Lending Agencies

Other external assistance to the Sector in the province comes from foreign assisted projects. With the devolution of the sector to the LGUs, the participation of the LGUs has been important. Before the devolution of the sector, the province was a beneficiary of UNICEF and JICA health services projects through the DOH. After the devolution, the province became the direct recipient of foreign grants. The most recent experience of the province in foreign grants was the UNDP-WATSAN project.

6.4.3 LGU-Financed and Managed Waterworks/Water District.

(1) Past Financial Performance of WDs and RWSAs/BWSAs

Three (3) WDs and eleven (11) municipal waterworks are currently managed in the province. Table 6.4.1 and Table 6.4.2 show financial indicators and loan status of WDs

in 1998, respectively. Based on the reported average monthly income and expenditures, it is noted that water revenues are not enough to manage their monthly expenditures.

Table 6.4.1 Financial Indicators of Provincial/Municipal Waterworks

Waterworks	Description						
	No. of Metered Connections	No. of Flat Rate Connections	Average Monthly Rate	Average Consumption per HH	Average Expenditures Costs	Average Revenue	Collections
	Nos.	Nos.	Pesos/cu.m.	cu.m./mo.	Pesos/mo.	Pesos/mo.	Percent (%)
Bunawan WD	250	-	8.12	16.50	N.A	N.A	N.A
Prosperidad WD	729	8	8.60	5.78	110,325.50	110,325.50	75%
San Francisco WD	1,999	-	N.A	N.A	1,604,795.34	1,604,795.34	
Sta. Fe BWSA	70	-	5.00	23.00	8,050.00	8,050.00	100%
Esperanza W.S.	100	-	N.A	N.A	N.A	N.A	N.A
Calaitan W.S.	-	36	N.A	N.A	N.A	N.A	N.A
Rosario W.S	549	27	3.00	8.26	38,995.00	38,995.00	80%
Mahayahay W.S	163	-	12,880.75	26.33	N.A	N.A	-
San Pedro W.S.	-	237	₱15.00 flat rate	-	-	-	-
Karaos W.S.	-	235	₱10.00 flat rate	-	-	-	-
Patin-ay W.S.	152	52	8.00	47.50	17,600.00	17,600.00	60%
Bayugan II BMSWSO	228	-	3.00	12.69	N.A	N.A	-
San Juan	-	35	N.A	N.A	N.A	N.A	
San Jose	-	61	3.50	N.A	1,104.16	940.00	30%

Source: Provincial Manning Development Office, Barangay Survey Questionnaire

Table 6.4.2 Loan Status of Provincial/Municipal Waterworks (as of June 1998)

Waterworks	Description			
	Total Loan Availed	Remaining Payment Period	Average Monthly Amortization	Current Arrears
	1,000 Pesos	Months	Pesos	1,000 Pesos
SAN FRANCISCO WD	428.91	7	6,054.00	24.12
PROSPERIDAD WD	491.56	75	5,282.00	293.76
BUNAWAN WD	N.A	N.A	N.A	N.A

6.5 Existing Practices by the LGU on Cost Recovery

6.5.1 Capital Cost

In the previous arrangements, the capital cost for Level I systems was free to the community, while operation and maintenance was the responsibility of the association. As for Level II systems, the capital cost is shouldered by the RWSA through the loan or grants. Water

charges collected by each association cover cost of operation and maintenance, and loan amortization. According to the Loan Department of LWUA, the new loan disbursement to RWSAs has been stopped for the last couple of years.

For Level III systems, WDs or RWSAs bear the entire capital cost financed by LWUA through loans with concessional terms of 8.5%-12.5% interest rate and repayment period extending up to thirty (30) years. Less capable WDs are granted soft loans that are interest free during the first five (5) years' operation. In the occasion of the first assistance by the LWUA, the loan for the full investment required could be provided for the WDs. For the expansion/rehabilitation works of the WDs, 90% of required investment may be granted by a loan and remaining 10% shall be arranged by the equity of WDs. The cost of amortizing the loan and operation and maintenance of the system is recovered through monthly water bills. In case of LGU's operating Level III systems, the capital cost is managed by the LGU using the part of the DF and other financial sources (borrowings and grants/aid).

Regarding sanitation sector, construction of the superstructure and the depository of household toilet is through self-help.

6.5.2 Operation and Maintenance Cost

The operation and maintenance cost for Level I and II water supply systems is envisioned to be the responsibility of the users. As such the users shall form an organization (or association) to handle the collection of water charges.

When the DPWH had been undertaking the construction of Level I water supply facilities, the DPWH through DEOs assisted to form many BWSAs. However, most of these BWSAs are no longer functioning, which resulted to non-collection of water. As a consequence, the users had to go to the LGUs (usually barangay or municipal) to address the problem. In some cases, the users also requested the DEOs for assistance.

Although the DPWH has no budget for operation and maintenance, it extends assistance in the form of materials (such as gaskets or joint pipes) from their supplies, if these items are available. Because of this situation, the emphasis was placed on the need of monthly contributions from the users for the O&M. While, some of the active BWSAs for Level I water supply collect monthly fees ranging from ₱5.00 to ₱15.00 per household.

Cost recovery for Level III systems, particularly for those covered by Water Districts is managed through different systems. The households covered by the Water District can be disconnected in case no payment by the users. In case of the San Francisco Water District (SFWD), delinquent residential customers are given one-month allowance to settle their unpaid water charges before they are cut off from the system.

The SFWD is charging a minimum fee (10 cu.m.) of ₱47.00. The water rate structure is based on LWUA's guidelines for water rate setting. Water rate is socialized, based on operating expenses and capital expenditures required by the WD, and it should not exceed 5% of the low-income group's household income. Water rate is kept minimal since the WD should be service-oriented and not profit-oriented. Although the SFWD reported that it receives complaints on the water rates, its collection efficiency is as high as 93%. The SFWD has not incurred losses as of now having paid to LWUA its loan amortization on time. In addition, the SFWD was able to contribute, from its operational income, to the logistic support for the watershed management of the area.

In case of LGU's operating Level III systems, O&M cost is also collected as the water charge, although the LGU may extend a support to a certain extent of requirements in the initial stage of operation.

6.6 Affordability of Users

This sub-section presents the affordability of users by sector service level. However, base information for the analysis is limited to that gathered from field survey at selected barangays and from the water districts in the province.

6.6.1 Capital Cost Contribution

Referring to survey results for Level I and II water supply conducted in this study (refer to Chapter 4), 126 respondents out of 146 respondents (86%) showed the willingness to participate in the water supply projects in the future. Of these respondents (105 of 126 respondents), 83% indicated their willingness to contribute free labor during construction. About 80% of the said corespondents (101 out of 126 respondents) are willing to be involved in facility site selection. There is no information on the amount to be contributed for the construction of the facilities.

On the other hand, construction cost of private toilet seems to be expensive as compared with the family income. The estimated cost of flush type toilet facility is around 5-6 times higher than the median monthly family income in the province and thus, may require subsidy from LGU.

6.6.2 Operation and Maintenance Cost

In the aforementioned survey for Level I and II water supply, 28 respondents replied on the payment for O&M of facilities. Twelve persons (12) paid ₱10-20 and 6 persons paid more than ₱50, while the rest failed to pay.

The highest amount paid is ₱50 that is 1.3% of the median family income, although survey sample size is limited. Thus, it may be assumed that the users can well afford to pay the amounts being currently charged by the BWSA. In the said survey, 76.7% of respondents are willing to participate in O&M of the water supply facilities in the future. They also indicated that the water fees being collected are not enough to operate and maintain the facilities.

In the same survey results, a total of 41.1% out of the 146 respondents answered that they were willing to pay ₱2.00-20.00 per month, while 30.85%, ₱21.00-30.00.

For the water districts or Level III waterworks, O&M expenses are mainly covered by the user fees which are charged on a per cum. basis by user category. The system was established by LWUA to compel water districts to be self-sufficient, financially viable and be able to re-pay any loans obtained to improve water supply services.

Table 6.6.1 presents the affordability by service level. At present the current water bills in the province seem to be within an affordable range based on experience, although the actual income vary from municipality to municipality and barangay to barangay (urban barangay population have higher income than those in rural barangays because of more varied economic activities).

Table 6.6.1 Affordability in Water and Sanitation Services

Income/ Level of Service	Amount (Pesos)	% to Monthly Income	Affordable Range (%) 5/
Median of Monthly Income 1/	₱ 3,855.00	100	-
Average Level III: Monthly Water Bill 2/	100.00 -- 130.00	2.6 -3.4	5.0 or less
Average Level II: Monthly Water Bill 3/	55 – 60.00	1.4 – 1.6%	2.0-3.0
Mo. Level I Expenditures	10.00 – 20.00	0.3-0.5	1.0-less
Private Toilet Construction Cost – Flush Type Toilet 4/	21,300.00	5.53	-

Notes:

1/ 1994 Family Income and Expenditures Survey, NSO

2/ Data from PSPT. It is assumed that 21 cum. is consumed per family.

3/ Common figures in the province.

4/ Current prices estimated in this study.

5/ Based on the experiences mainly from LWUA, DPWH and DILG.

Chapter 7

WATER SOURCE DEVELOPMENT

7. WATER SOURCE DEVELOPMENT

7.1 General

The study on water source development covers the entire province to come up with water source potential exploitable for mainly domestic water supply. An emphasis is placed on the groundwater availability due to its prevalent use and comparatively conservative development through the future in the jurisdiction of the provincial government. It is also advantageous to utilize groundwater for domestic water supply because of better quality and economical use. Nevertheless, surface water potential of major rivers was studied in terms of quantity (return period flow rate) and quality to provide information for LGU's future use, if necessary.

A "groundwater Availability Map" was prepared, which identifies the areas with available potable water sources. The study has two major components: (1) interpretation of existing geological and groundwater conditions and (2) preparation of Groundwater Availability Map to show groundwater potential areas under three kinds of categorized areas. Furthermore, standard well specifications by municipality were also established to reflect in the medium-term sector development plan. A groundwater quality map was also prepared to supplement the information on the groundwater development for drinking purpose.

The major data used in the study were obtained from concerned agencies (NAMRIA, BMGS, NWRB, LWUA, DPWH and PPDO) and supplemented by the information gathered through questionnaires from relevant local offices in the field (including spring inventories with verifications). The field information directly collected by the Study Team was also effectively used to increase the accuracy of the Map. Among the information, the Geologic Map published by BMGS, the Water Resource Investigation Report and the Well Inventory Database of NWRB are essential for the analysis of geological characteristics, projection of high yielding area and possible area with salt water intrusion, and classification of groundwater potential areas, respectively.

The Groundwater Availability Map may be used for provincial level master plan and feasibility study at present. However, the recommendations on the required investigations were presented for the specific areas with scope of survey, as a reference for LGUs, to conduct them prior to D/D and construction work. Aside from the requirements, updating the map is a requisite to gain more information on prevailing groundwater conditions using the questionnaires prepared for the study. An annual review and updating of the database will enable the LGUs to implement water source development on a project site basis.

The overview on current groundwater use with the conditions is summarized in Table 7.1.1 (Well data collected from each municipality are presented in Table 7.1.1, Water Source Information, Data Report). There are 1,271 shallow wells, 323 deep wells and 266 developed springs in the province (functional sources). Majorities of the wells are shallow wells. About 60% of these water sources are public facilities. Of the total existing wells, 73% remains functional at present. In addition to the above sources, 65 untapped springs are accounted.

Table 7.1.1 Existing Groundwater Sources in the Province

Category and Classification	Shallow Well	Deep Well	Spring	Total
1.Water source being availed				
a. Public sources	590	281	266	1,137
b. Privately owned sources	681	42	0	723
c. Number of water sources	1,271	323	266	1,860
d. Profile of different sources	68%	17%	14%	100%
2.Water sources with problems and non-functional wells				
a. Water quality problems*	240	0	0	240
b. Non-functional	379	207		586
3.Spring source information				
a. Undeveloped			1 (P)	1 (P)
b. Untapped			65	65

Note. 1: Number of water sources being availed at present including those with water quality problems.

2: Number of existing water sources with problems: being used, but with water quality problem/abandoned wells.

3: Number of springs availed, but not adequately protected; and those as candidate sources to be developed.

*: Assumed number of sources (unsafe category) based on the study on existing water supply facilities in Chapter 4. (P): Public spring source.

7.2 Geology

The rock units in the province are classified into three (3) main groups based on the ages of the rock formation. These are, from the oldest to youngest, the Miocene and Older rocks, the Pliocene to Pleistocene Rocks and the Recent Deposits. The grouping of the rocks is related to their potential as groundwater sources. The younger rocks are considered the most impor-

tant to groundwater because of their porosity and permeability relative to the older rocks. The distribution of these rock groups is shown in Figure 7.2.1, Geological Map of the Province and their geological features are described below.

(1) Miocene and Older rocks

The oldest rocks are metamorphic rocks and sediments of Cretaceous age and are distributed in a limited area on the southwest side of the province. Other old rocks are composed of volcanoes of Oligocene-Miocene age and well-compacted sediments of Oligocene-Miocene age. These rocks are distributed on the southwest, the northeast and southeast sides of the province and form mountainous areas with the elevations ranging from 200 m to 1,400 m. The formations are generally distributed from southeast to northwest and the structural lines of their syncline and anticline are also running in the same direction.

These old rocks are well compacted and their groundwater development potential is considered difficult. A small possibility of exploiting groundwater may be in the fissure and fracture zones of the faults.

(2) Pliocene to Pleistocene formations

These formations are distributed with a fairly wide width in the central part of the province, extending from southeast to northwest. The formation is parallel and adjacently distributed to the alluvial formation, which has been formed by the Agusan River. The formation consists of conglomerate, sandstone, shale, thin limestone beds and is under an unconsolidated condition. The area forms low hills with the elevations ranging from 60 m to 100 m. The area's groundwater development potential is not so high due to the geological characteristics but groundwater development may be possible via deep wells.

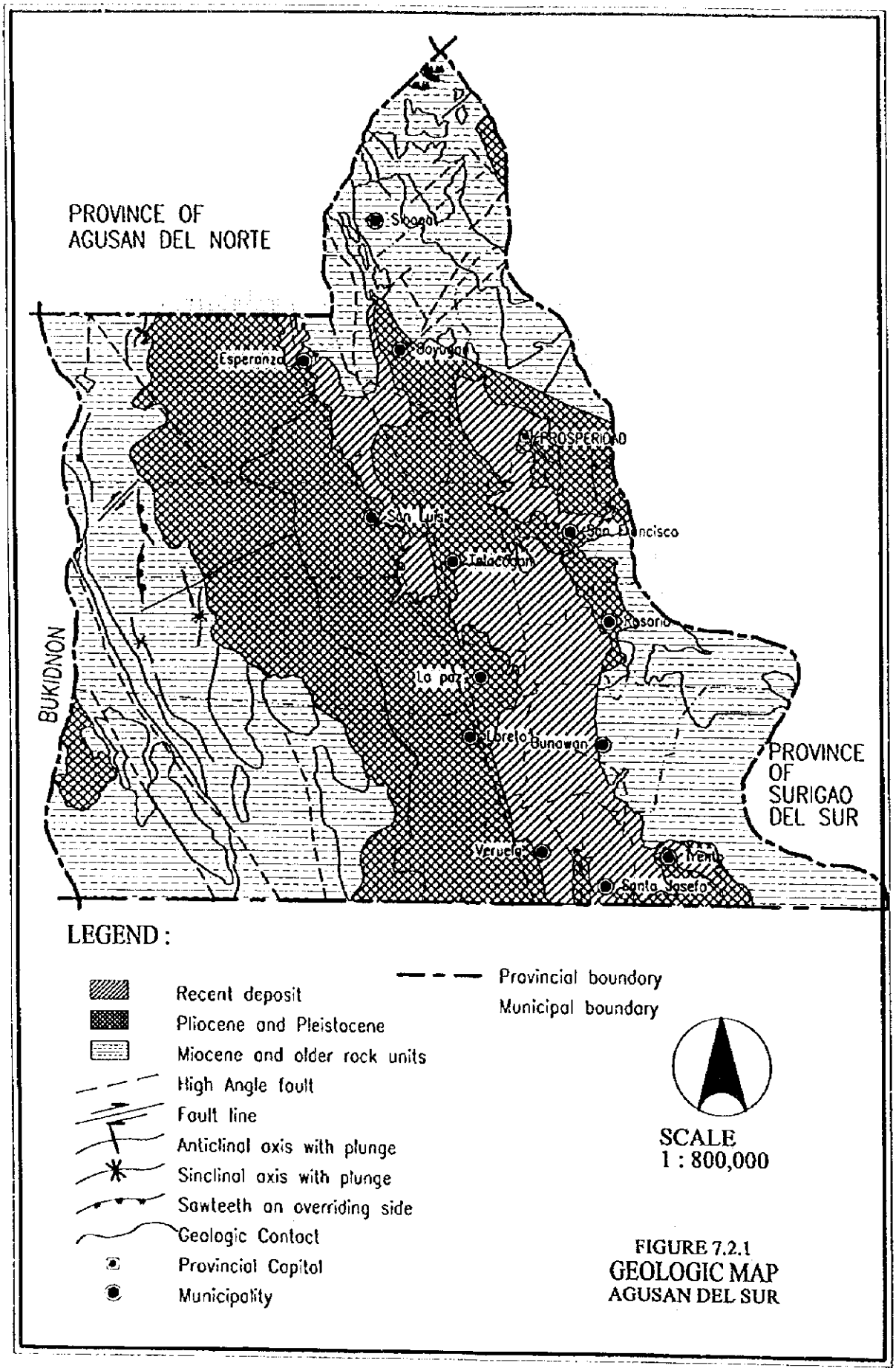

FIGURE 7.2.1
GEOLOGIC MAP
AGUSAN DEL SUR

DISK NAME : AGUSAN DEL SUR(DISK1)
FILENAME : AGUSAN-DELSUR(GEOLOGIC)

(3) Recent Deposits

The Agusan River and its tributaries have formed the recent deposits (alluvium). The deposits are widely distributed in the southern part of the province. These deposits consist mainly of clay, silt and sand deposits, which are in unconsolidated condition. The deposits have high groundwater development potential in the places where the layers are fairy thick.

7.3 Groundwater Sources

7.3.1 Classification of Groundwater Availability

For planning purpose, the provincial area is divided into the following sub-areas in terms of groundwater availability.

(1) Shallow well area

These are areas having water bearing rock formations extending not more than 20 m in depth from the ground surface. Shallow well areas are usually located in alluvial and coastal plains, where recent unconsolidated materials overlie impervious rocks at shallow depth. The extent of completely shallow well area is limited, because most of the recent formations are thick or deposited on the Late Pliocene to Pleistocene rocks that usually have multiple aquifers located at greater depths.

(2) Deep well area

In deep well areas, the aquifers are located more than 20 m from the ground level. These areas could be found in portions underlain by the Pliocene to Pleistocene and Recent formations. Most of these areas have more than one aquifer occurring at various depths. Areas where shallow and deep wells could be developed are categorized as deep well areas.

(3) Difficult area

These are areas not suitable for well. The areas under this category largely consist of rock formations older than Miocene in age. The groundwater availability in the aforesaid rocks is very low and usually released in the opened rock fractures. Springs are the common sources of water supply in these areas.

In addition to the above classification, potential areas to have high yielding deep aquifers are also presented based on NWRB's geo-resistivity survey.

7.3.2 Groundwater Availability in the Province

The Groundwater Availability Map is presented in Figure 7.3.1. The major databases used in the preparation of the map were obtained from BMGS and NWRB. The methodology and study procedures with respective outputs are discussed in 7.3, Supporting Report.

Technical information on the wells by municipality is also shown in the same report. The groundwater development potential areas in the province through the future are summarized below.

(1) Shallow well area

The province has no shallow well area. The development of shallow wells is, however, possible in the Deep Well Area" (recent alluvium and beach deposits), where shallow aquifers usually occur. The shallow wells in the province are driven to an average depth of 15m (7.62 m to 19.81 m). These wells have average static water level of 3.56 mbgl (0.61 m to 12.20 m) and average specific capacity of 0.55 l/sec/m of drawdown (0.10 to 1.45 l/sec/m).

(2) Deep well Area

The deep well area covers approximately 50% of the province, widely distributed on the western and eastern sides of both banks of the Agusan River that flows through the province. The deep well area is composed of alluvial plain and low hills of sediments of Pliocene to Pleistocene age. The alluvial plain is composed of recent deposits of clay, silt, sand, and gravel, which form a groundwater storage basin for some aquifers. While, the sedimentary formations of Pliocene to Pleistocene age consist of conglomerates, sandstone, limestone, and shale.

Considering the geological formations, the alluvial plain is categorized as a high potential area for deep well development, while the sediments of Pliocene to Pleistocene age are classified as a low-yielding area for deep well development. In alluvial plain, the average depth of the existing deep wells is 15.4 mbgl with average water level of 3.5 mbgl, and the average specific capacity is 1.9 cu. m/hr/m.

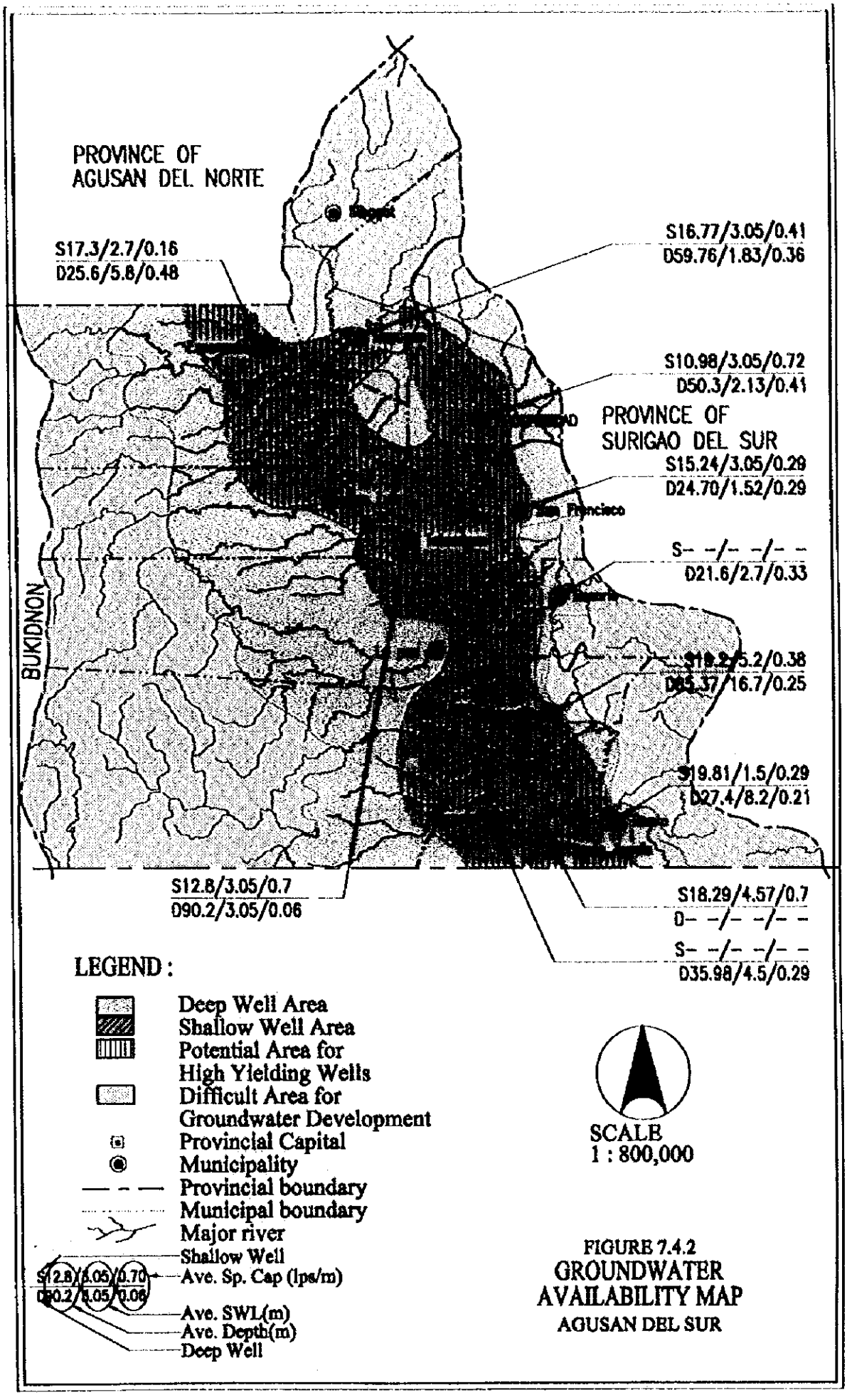

FIGURE 7.4.2
GROUNDWATER
AVAILABILITY MAP
AGUSAN DEL SUR

DISK NAME : AGUSAN DEL SUR(DISK2)
FILENAME : AGUSAN-DELSUR(PGAM)

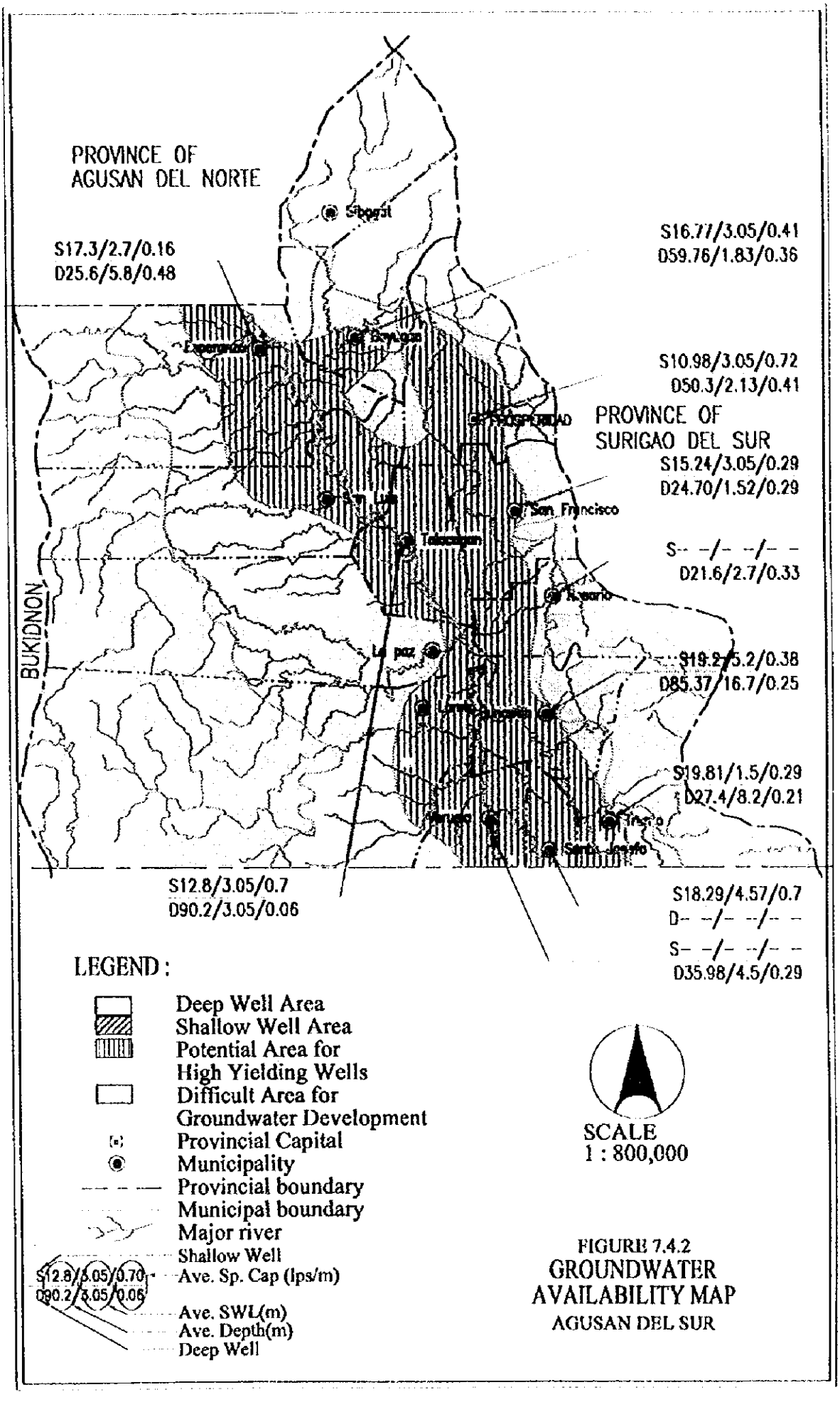

FIGURE 7.4.2
GROUNDWATER
AVAILABILITY MAP
AGUSAN DEL SUR

DISK NAME : AGUSAN DEL SUR(DISK2)
FILENAME : AGUSAN-DELSUR(PGAM)

In the sediment area of Pliocene to Pleistocene age, the average depth of the existing deep wells is 36.8 mbgl with an average water level of 4.1 mbgl, and a specific capacity of 1.2 cu. m/hr/m.

(3) Difficult area

About 50% of the provincial area are classified as a difficult area to exploit groundwater. The topography in such areas is mountainous on the western, northern, and eastern sides of the province.

The geology is made up of 1) metamorphic rocks of Cretaceous to Paleocene age, 2) well-compacted sediments of Oligocene to Miocene age including sandstone, siltstone and conglomerate, 3) volcanic and igneous rocks of Oligocene to Miocene age. These rocks and formations are in dense, massive and consolidated conditions and have impervious characteristics. The groundwater occurs only in fissures or fault fracture zones.

7.3.3 Groundwater Quality

There are water quality problems in both shallow and deep wells in most areas of the province. Water has high iron content and often contains methane gas, and in some places, evens salt. A water resources investigation for the province conducted by NWRB and general information from DPWH-DEO and PPDO revealed the problem areas, as shown in the Groundwater Quality Map in Figure 7.3.2. The following are summary of the findings.

(1) High iron content area

Among the water quality problems of the province, high iron content is most serious one with a high percentage of affected existing wells (about 80% of shallow and deep wells). The problems are extended to most of the areas in many municipalities including Prosperidad, San Francisco, Rosario, Bunawan, Trento, Esperanza, San Luis, Talacogon, La Paz, Loreto, and Sta. Josefa Municipalities area, and a partial area of Bayugan Municipality. To remove the iron in the water, DPWH-DEO installed iron removal facilities at some sites as pilot test plants, some of which are being used at present.

(2) Salty water

The province has no salt-water intrusion because it has no coastal plain. However,

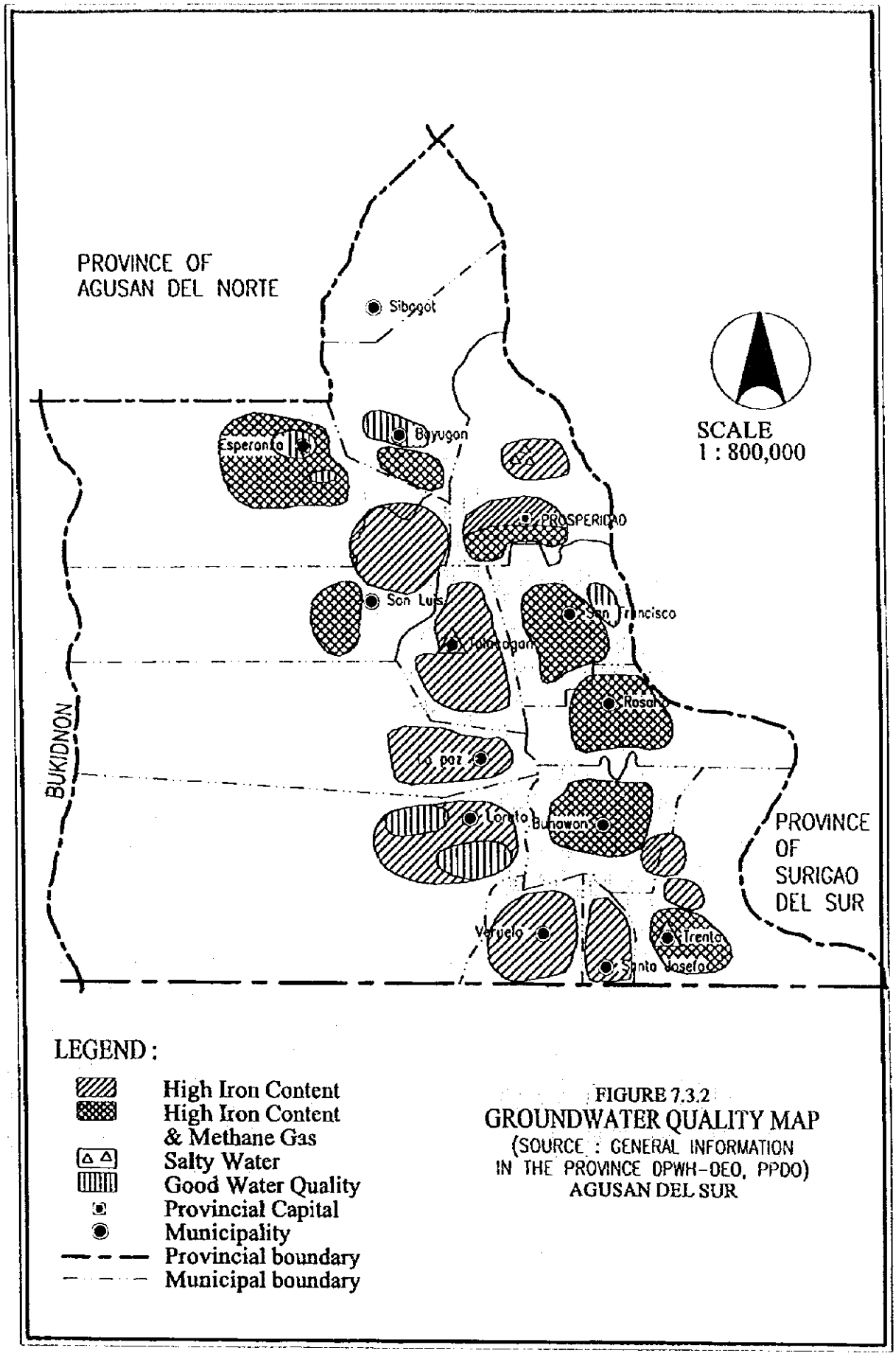

FIGURE 7.3.2
GROUNDWATER QUALITY MAP
(SOURCE : GENERAL INFORMATION
IN THE PROVINCE DPWH-DEO, PPDO)
AGUSAN DEL SUR

DISK NAME : AGUSAN DEL SUR(DISK1)
FILENAME : AGUSAN-DELSUR(WQPA)

shallow and/or deep wells have salty groundwater affected by geological formations. The problem is found in Bgy. Bahbah in Prosperidad Municipality, the poblacion of Trento Municipality, and in Talacogon Municipality. The spring water source located in Talacogon is also saline.

(3) Methane Gas

Groundwater with high iron content generally entails high levels of methane gas. Such conditions both in shallow and deep wells are prevalent in the municipalities of Prosperidad, San Francisco, Bunawan, La Paz, Vernuela, and Sta. Josefa, and found partially in Esperanza Municipalities. While, water with iron and methane gas is present only at shallow aquifer in Rosario Municipality. In addition, a part of Bayugan Municipality experiences methane gas.

7.4 Spring Sources

Spring is a natural outlet of groundwater at the ground surface. It occurs when water table intersects the ground surface, usually along the contacts of pervious and impervious rock formation and through rock features. Because of the intense fracturing, particularly older formation, and the presence of large solution openings in limestone, secondary permeability is induced to the rocks that favors spring development.

For the study, springs are categorized into developed, undeveloped and untapped springs. A developed spring is utilized and must have sanitary protection, otherwise it is classified as undeveloped spring, which is considered as unsafe water source. An untapped spring, as the name implies, is unutilized and flowing in its natural state.

Based on the inventory of water sources prepared through the study, the province has 266 developed springs currently serving the province, which issue from high mountain areas in northern and eastern parts, and from low hilly areas in central part. Of these springs, 238 have discharges of less than 2.8 l/sec, while 28 yield with 2.8 l/sec or more. A total of 65 undeveloped springs are reported in the municipalities of Sibagat, Bayugan, Prosperidad, San Francisco, Talacogon, Rosario, Trento, Esperanza, San Luis, and Veruela. Most of these springs are not dried up during a draught year with yields varying from 0.03 to 31.6 l/sec. The technical information of springs in each municipality is presented in Table 7.4.1 Existing Spring Sources, Supporting Report.

7.5 Surface Water Sources

The major surface water sources in the province are only the Agusan River and its tributaries. There are eleven stream gauging stations in the province.

Surface water use in the province totaled 16.90 cu.m/sec according to the NWRB's water rights registration database, as of March 1997. Of this usage, 99.8% of the water rights were registered for irrigation. Other surface water rights were for domestic and industrial by water supply system and a private company. For domestic water supply, the San Francisco WD had registered 2,800 cu.m/day water from the Binus-Agan and Lapag creek (sub tributaries of the Simurao-Gibang stream system) in the years 1993 and 1994, but this surface water is not utilized yet.

Data on river flow, maintenance flow and water use of the major rivers and stream systems, based on available runoff records from the gauging stations are given in Table 7.5.2, Supporting Report. The inflow to and the outflow from the respective municipalities are estimated as the exploitable potential of the major rivers in the province.

Water quality analyses were conducted through this study. The results of water quality analysis at selected streams meet the Class AA limitation of "DENR Fresh Water Quality Criteria" within the tested parameters. Only the Wawa stream was observed to have high Fe and Mn contents. It is noted that gold mining operations are located in the Gibong stream watershed at municipality of Rosario. These operations have caused contamination of the surface water by heavy metals such as mercury solution.

7.6 Future Development Potential of Water Sources

(1) Groundwater

Based on the study of existing water sources, groundwater is considered as a safe and more economical source for future water supply requirements of the province.

Shallow wells are the possible source for Level I service. Considering the existing wells in the province, the potential aquifers for shallow wells occur between 5 to 20 mbgl. One disadvantage of shallow wells is the lowering of water level during dry season that reduces the discharge of the wells. Another disadvantage is the usual high susceptibility of shallow aquifers to direct infiltration of surface pollutants.

In general, deep wells have better water quality and invariable yields when developed with appropriate technology. This depends that the wells tap to comparatively deeper aquifer. It reduces the hazards of groundwater pollution. In addition, lowering of groundwater level does not affect the discharge, since usual confinement of deep aquifer rises water level above the aquifers. In Recent deposits and Pliocene to Pleistocene sediments, good aquifers apparently occur from 20 to 115 mbgl.

Additional wells can still be developed to meet the future water supply demand of the province. For future planning purpose, the Groundwater Availability Map includes basic information for municipal groundwater development with the following data: well depth, static water level, and specific capacity, and aquifer formation as shown in Table 7.6.2, Supporting Report. The groundwater development potential in the province is shown in Table 7.6.1.

(2) Spring

A total of 65 untapped spring sources for future development are listed in Table 7.6.3 Untapped Spring Source Identification, Supporting Report. The list includes detailed data on barangay name, owner, discharge rate in dry season, transmission line length and elevation difference between spring source and served area.

Such springs are mainly located in the mountainous municipalities of Sibagat, Bayugan and Esperanza. Other municipalities have a few untapped springs. Discharge rates of the springs are generally small ranging from 3.6 l/sec to 0.4 l/sec except for those in Rosario, and Prosperidad municipalities. The spring development potential in the province is shown in Table 7.6.2.

(3) Surface Water

The potential surface water volume exploitable from major rivers for the use of domestic water supply was estimated by municipality. It was arranged in this calculation to ensure maintenance flow of the rivers under the draught flow in the 10-year return period in consideration of the present water rights.

Table 7.6.1 Groundwater Development Potential in the Province

Area	Groundwater Development Potential	Water Quality	Area Feature
1.Sibagat Area	Difficult area for groundwater development. Main water sources are springs.	Potable	Mountainous area and covered by metamorphosed older rocks and well compacted sedimentary rocks.
2. Bayugan Area	Groundwater development is possible in southern lowland areas of Bayugan covered by alluvial and the sediments of Pliocene to Pleistocene. Deep well conditions: well depth 14 to 19 m and 21 to 60 m; water table 1 to 5 m; Specific capacity 0.21 to 1.0 l/s/m.	High iron content and methane gas: 80% of existing shallow and deep wells	Northern area: mountainous area. Southern area: alluvial low land formed by the Agusan River.
3. East. Area	Difficult area for groundwater development. Main water sources are springs.	Potable	Mountainous area (200 m to 800 m in Elev.)
4. Central Low Land Area	Alluvial plain is good for groundwater development via shallow and deep wells. Deep well conditions: well depth 7 to 20 m and 20 to 127 m; water table 0.4 to 13 m; Specific capacity-0.06 to 1.5 l/s/m.	High iron content: 80% of total shallow and deep wells in most areas such as Prosperidad, San Francisco, Rosario, Bunawan, Trento, Esperanza, San Luis, Talacogon,La Paz, Loreto, and Sta Josefa. Salty water: shallow and/or deep wells in the poblacion of Trento, Talacogon. Methane gas: shallow and deep wells in Prosperidad, San Francisco, Bunawan, a part of Esperanza, Talacogon, La Paz, Vemuela, and Sta Josefa. Iron and methane gas is presented only in shallow groundwater in Rosario.	Alluvial plain widely distributed extending from north - north-west to south-south-east. The Agusan River and its tributaries formed the plain.
5. Western Area	Difficult area for groundwater development		Mountainous area (600 m to 1,400 m in Elev.)

Table 7.6.2 Spring Development Potential in the Province

Area	Spring Water Development Potential	Water Quality	Aerial Feature
1. Sibagat Area	Existing spring sources: 47 developed and 24 untapped. Discharge of untapped springs: 0.11 to 0.5 l/sec.	Potable	Most areas mountainous. Almost no low land.
2. Bayugan Area	Existing spring sources of 46 developed and 9 untapped springs. Discharge of untapped springs: 0.25 to 1.0 l/sec.	Potable	Northern and eastern parts are steep mountains areas.
3. Eastern Mountainous Area	Existing spring sources: 75 developed and 8 untapped. Discharge of untapped springs: 0.2 to 30.6 l/sec.	Potable	Slight high mountain area on the eastern side of the province. The mountains on the east side of the national highway running from south to north has elevations of 200 m to 600 m and is strongly dissected.
4. Central Low Land Area	Low hills are formed by sediments of Pliocene and Pleistocene age. Many springs issue from the low hills. Existing spring sources: 108 developed and 24 untapped. Discharge of untapped springs: 0.03 to 10.0 l/sec.	Potable	Low hills with elevations of about 60m to 100 m in the alluvial plain.
5. Western Mountainous Area	Mountain areas have numerous springs. However, the distance from water sources to barangays is very far. Spring water cannot be used for water supply.	Potable	Mountains located on the west side have width of about 30 km and extend from north to south. Elevation range from 1,400 m to 600 m. Mountain slope is very steep.

The calculation results are shown in Table 7.5.2, Supporting Report. In particular, municipalities situated in the Agusan River basin are privileged to use larger amount of river water.

7.7 Water Source Development for Medium-Term Development Plan

For preparation of the medium-term development plan in terms of water source development, standard specifications of wells by municipality were prepared. The parameters such as well depth, static water level and specific capacity are shown in Table 7.7.1, which were established using well information from NWRB and the province (detailed data base is included in Table 7.1.1, Data Report) and hydrogeological assessment presented in Table 7.6.2, Supporting Report.

Shallow wells are currently used in some municipalities. The municipal areas are categorized into deep well and shallow well areas considering the practices. The proportion (%) of shallow and deep wells are determined with reference to groundwater development potential in the Groundwater Availability Map. Furthermore, the well locations are assumed in terms of rural and urban areas by municipality referring to the classification of rural and urban barangays.

For the municipalities without any well data, the well parameters are appropriated using those in adjoining towns, provided they have similar hydrogeologic features.

For the furtherance in collecting accurate information to design the concrete specifications of the planned wells, the following recommendations are made. Prior to the detailed design or pre-construction stages, additional detailed groundwater investigations entailing electric resistivity survey and the construction of test wells shall be conducted. The municipalities that fall on this group are San Francisco, Rosario, and San Luis. While, only electric resistivity survey may be carried out in the areas of Loreto and La Paz, because of no appropriate access roads for mobilization of well drilling equipment. Table 7.7.2 summarizes the requirements.

The groundwater development for water supply in urban areas (Level II and III systems) will require the construction of deep wells with larger casing diameters of 6" or more, which expect larger production rates. In these cases, short spacing intervals between the adjacent wells often cause the well interference due to the large lowering of pumping water level when the adjacent wells simultaneously pump up during long period. This results in the intermittent pump operation with excess electric consumption. Thus, appropriate spacing interval and

Table 7.7.1 Standard Specification of Wells by Municipality

Municipality		Type	Proportion (%)	Standard Specification			Remarks
				Depth Range (m)	SWL (m)	Specific Capacity (l/sec/m)	
Bayugan	Rural	SW	0	15<D<20	3	0.5	
		DW	50	25<D<60	3	0.5	
	Urban	SW	0	15<D<20	3	1.0	
		DW	100	25<D<60	3	1.0	
Bunawan	Rural	SW	0	15<D<20	4	0.5	
		DW	60	25<D<90	10	0.5	
	Urban	SW	0	15<D<20	4	0.5	
		DW	80	25<D<90	10	0.5	
Esperanza	Rural	SW	0	10<D<20	4	0.5	
		DW	50	25<D<85	4	0.5	
	Urban	SW	0	10<D<20	4	1.0	
		DW	100	25<D<85	4	1.0	
Properidad	Rural	SW	0	10<D<15	3	0.5	
		DW	80	25<D<130	4	0.5	
	Urban	SW	0	10<D<15	3	1.0	
		DW	100	25<D<130	4	1.0	
Rosario	Rural	SW	0	-	-	-	
		DW	30	20<D<25	3	-	
	Urban	SW	0	-	-	-	
		DW	100	20<D<25	3	-	
San Franscisco	Rural	SW	0	15<D<20	3	0.5	
		DW	85	25<D<35	2	0.5	
	Urban	SW	0	15<D<20	3	0.5	
		DW	100	25<D<35	2	0.5	
Sta. Josefa	Rural	SW	0	15<D<20	6	0.5	
		DW	90				
	Urban	SW	0	15<D<20	6	0.5	
		DW	100				
Talacogon	Rural	SW	0	10<D<15	3	0.5	
		DW	85	45<D<95	4	0.5	
	Urban	SW	0	10<D<15	3	0.5	
		DW	100	45<D<95	4	0.5	
Trento	Rural	SW	0	15<D<20	2	0.5	
		DW	30	25<D<30	10	0.5	
	Urban	SW	0	15<D<20	2	1.0	
		DW	100	25<D<30	10	1.0	
Veruela	Rural	SW					
		DW	90	20<D<40	5	0.5	
	Urban	SW					
		DW	100	20<D<40	5	1.0	
	Rural	SW					
		DW					
	Urban	SW					
		DW					
	Rural	SW					
		DW					
	Urban	SW					
		DW					

number of wells to be constructed per sq. Km were estimated as shown in Table 7.7.1 Spacing Arrangements for Planned Wells, Supporting Report.

Spring sources, proposed by barangay level, for future developments are shown in Table 7.6.3, Supporting Report. They shall also be investigated to confirm the development possibility in the following items: (1) locations and type of spring sources. (2) Fluctuation of discharge rates through the year, (3) distance from spring sources and proposed served areas and (4) elevation differences between the two points.

Table 7.7.2 Additional Detailed Groundwater Investigation

Municipality	Survey Area	Survey Activities and Specification	
		Electric Resistivity Survey	Test Well Construction
San Francisco & Rosario	Urban area	Measuring line: 4./each municipality Measuring interval: 200 m Length of a measuring line: 1 km Prospecting depth: 100 m.	Number of test well: one/each Municipality Casing diameter: 200 mm Well depth: 100 m. Including pumping test, electric logging, and water quality analysis.
San Luis	Urban area	Measuring line: 4. Measuring interval: 200 m Length of a measuring line: 1 km Prospecting depth: 150 m.	Number of test well: one Casing diameter: 200 mm Well depth: 100 m. Including pumping test, electric logging, and water quality analysis.
La Paz & Loreto	Urban area	Measuring line: 4/each municipality Measuring interval: 200 m Length of a measuring line: 1 km Prospecting depth: 150 m.	N.A.

Note: N.A Not Applicable

Table 7.5.1 Surface Water Quality

Surface Water Information				Parameter												PNSDW-1994-			SW Pollutant in upstream
Major Surface Water	Stream & Main System	Sampling Location	Sampling Date (m/d/y)	Color TCU	pH -	D.Oxy. mg/l	BOD mg/l	SS mg/l	TDS mg/l	MBAS mg/l	O/G mg/l	N mg/l	P mg/l	Coli. MPN/100ml	Cl mg/l	Cu mg/l	Tur. NTU	Fe mg/l	Mn mg/l	
DENR Water Quality Criteria for Fresh Water			Class AA	15	6.5-8.5	70	1	25	500	nil	nil	1	nil	50	250	1	5>	1>	0.5>	
			Class A	50	6.5-8.5	70	5	50	1,000	0.2	1	10	0.1	1,000	250	1				
Agusan	Panusgan	Bunawan				-	-	-	-	-	-	-	-		-	-				
	Haoan-Umayan	Santa Josefa				-	-	-	-	-	-	-	-		-	-				
		Verucla				-	-	-	-	-	-	-	-		-	-				
		Loreto (Umayan)				-	-	-	-	-	-	-	-		-	-				
	Simurao-Gibong	Prosperidad				-	-	-	-	-	-	-	-		-	-				
		San Francisco				-	-	-	-	-	-	-	-		-	-				
		Rosario	16-May-98	-	7.1	-	-	-	-	-	-	-	-	-	-	-	32.5	0.4	0.2	Mining
	Adgaoan-Kawayan	Loreto				-	-	-	-	-	-	-	-		-	-				
		La Paz (Kawayan)				-	-	-	-	-	-	-	-		-	-				
		La Paz (Adgaoan)				-	-	-	-	-	-	-	-		-	-				
	Kasilayan	La Paz				-	-	-	-	-	-	-	-		-	-				
		San Luis	30-Apr-98	10	8.5	-	-	-	-	-	-	-	-	-	-	-	3.3	0.2	0.5	
		Talacogon				-	-	-	-	-	-	-	-		-	-				
	Maasim	La Paz				-	-	-	-	-	-	-	-		-	-				
		San Luis	30-Apr-98	1	8.5	-	-	-	-	-	-	-	-	-	-	-	2.2	0.2	0.5	
	Libang	San Luis				-	-	-	-	-	-	-	-		-	-				
		Esperanza				-	-	-	-	-	-	-	-		-	-				
	Busirao	Esperanza				-	-	-	-	-	-	-	-		-	-				
	Wawa-Andanan	Sibagat				-	-	-	-	-	-	-	-		-	-				
		Buyagan				-	-	-	-	-	-	-	-		-	-				
		Esperanza	20-May-98	-	7.2	-	-	-	-	-	-	-	-	-	-	-	12.8	198.0	89.0	
	Agusan Main	Trento				-	-	-	-	-	-	-	-		-	-				
		Santa Josefa				-	-	-	-	-	-	-	-		-	-				
		Bunawan				-	-	-	-	-	-	-	-		-	-				
		Loreto				-	-	-	-	-	-	-	-		-	-				
		La Paz				-	-	-	-	-	-	-	-		-	-				
		Talacogon				-	-	-	-	-	-	-	-		-	-				
		San Luis				-	-	-	-	-	-	-	-		-	-				
		Esperanza				-	-	-	-	-	-	-	-		-	-				

Source; Water quality results were collected from respective Water Districts or analyzed by PSPT on site in the field survey using procured instruments.

Notes; Sampling point is located at upstream boundary of each river in respective municipalities.
If several streams are present in an area, the stream nearest from populated area shall be selected.
If these is no upstream, sampling point shall be selected near populated area.

Remarks; Class AA - Public Water Supply Class-I.
Intended for waters having watersheds which are uninhabited and otherwise protected and which require only approved disinfection in order to meet the PNSDW.
Class A - Public Water Supply Class-II.
Sources of water supply that will require complete treatment (coagulation, sedimentation, filtration & disinfection) in order to meet the PNSDW.

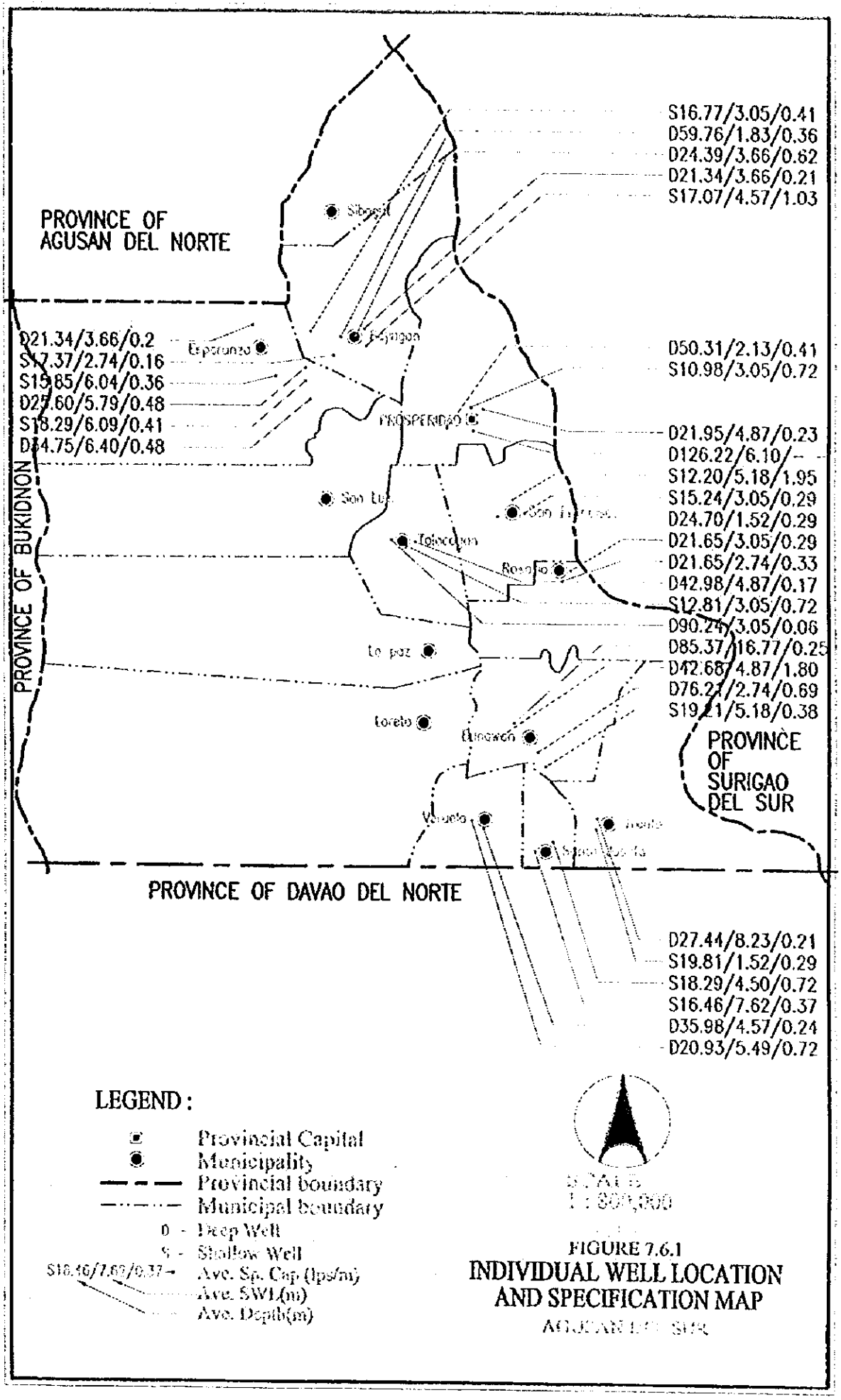

FIGURE 7.6.1
INDIVIDUAL WELL LOCATION AND SPECIFICATION MAP

DISK NAME : AGUSAN-DELSUR(DISK2)
FILENAME : AGUSAN-DELSUR(WELSW)

Chapter 8

FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT

8. FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT

8.1 General

Phased investments for provincial sector development are planned in almost the same manner as adopted in the 1998 Philippine National Development Plan (PNDP) and the National Sector Master Plan (NSMP), Medium-Term Investment covering the years 1999 to 2003 and Long-Term Development covering the period 2004 to 2010.

Targets of provincial service coverage for the two phases are established as percentages of beneficiaries or utilities to be served by sub-sector. Service coverage in the base year (1997) and national sector targets indicated in the National Sector Master Plan (NSMP) and the updated Medium-Term Philippine Development Plan, 1996 - 1998 (MTPDP) are the bases of the study. Sector targets which are not prescribed in the national plan; school and public toilets as well as sewerage are assumed based on the current conditions. In addition, preliminary discussions on solid waste management are included as a vital component of sanitation sector.

Projection of frame values by municipality is undertaken for respective sub-sectors; future population by urban and rural area, the number of student enrollment to public schools and the number of public utilities. Reference base figures for the study of framework are the 1995 Census of Population and Housing, the statistical data of the province and the information from relevant agencies. Provincial population by target year and the base year (1997) is estimated by adopting the projection method being used by NSO. While, the population distribution to urban and rural areas prepared by NSO in 1995 is modified to meet actual conditions in the classification of the areas.

Types of required facilities and their implementation criteria according to service level standards are referred to the NSMP and the NEDA Board Resolution No. 12 (s. 1995). Some planning conditions and assumptions not prescribed in the national plan are conferred to the relevant standards of sector agencies and provincial government. For sewerage requirements, the deficit in sanitation must first be addressed. Partial upgrading of on-site disposal to a sewerage system (off-site disposal) is envisaged in the final target year.

In estimating future requirements by municipality, additional population (or number of students/public utilities) to be served by sub-sector is first calculated as a shortfall at target years

in comparison between each target and its base year service coverage. In this regard, planned/on-going projects to be completed by respective base years are considered as part of existing services for each target year. Required number of facilities by sector component is then estimated corresponding to the said additional population (or number of students/public utilities) to be served. Rehabilitation work for Level I facilities limited to new deep wells to be constructed under PW4SP is taken into account. Generally, rehabilitation of deep wells and shallow wells constructed by means of conventional method is difficult.

Logistic support is considered as a minimum requirement of LGUs for community development and training, and other relevant activities along with the implementation of PW4SP. The types and number of well drilling/rehabilitation equipment and supporting vehicle for Level I facilities are also suggested as reference information. Also, minimum requirements for setting up a provincial laboratory to support drinking water quality surveillance and monitoring are described. This will include building, instrument/equipment and reagent/chemical requirements. The 1993 Philippine National Standards for Drinking Water (PNSDW) requires that initial examinations of water from newly constructed sources should first be undertaken before operation for public use and henceforth periodic examinations of these water supply sources/facilities.

Project priority for medium-term development is discussed entailing general criteria to identify specific projects. However, at the provincial level master plan, it is suggested that municipal priority ranking be used for allocation of provincial fund.

8.2 Targets of Provincial Sector Plan

Provincial sector targets for the years 2003 and 2010 are determined as the provincial average of the desirable minimum level for each sub-sector. Table 8.2.1 summarizes the target percentages to be served by sub-sector. Details by sub-sector are discussed in this sub-section.

(1) Water supply

The base year (1997) service coverage was calculated as a total of 1997 figures and expected by planned/on-going projects scheduled to be completed by 1998. Table 8.2.2 shows service coverage for the planning purpose (details are referred to Supporting Report).

Table 8.2.1 Provincial Sector Targets

Sub-sectors	Existing Service Coverage	Phase I (1999-2003)		Phase II (2004-2010)	
Water Supply	Population Coverage (%)	Population Coverage (%)	Additional Population to be Served	Population Coverage (%)	Additional Population to be Served
Urban Water Supply	67	80	55,900	95	177,058
Rural Water Supply	47	60	127,491	93	266,444
Sanitation	Household Coverage (%)	Household Coverage (%)	Additional Households to be Served	Household Coverage (%)	Additional Households to be Served
Household Toilet					
Urban Household Toilet	73	80	10,536	93	29,957
Flush	21	30	4,992	50	21,400
Pour Flush	79	60	2,334	50	8,557
VIP	0	10	3,210	0	0
Rural Household Toilet	64	75	27,169	85	59,761
Flush	0	10	2,703	20	4,060
Pour Flush	100	60	4,648	80	55,701
VIP	0	30	19,818	0	0
School Toilet	Public School Student Coverage (%)	Public School Student Coverage (%)	Additional Public School Students to be Served	Public School Student Coverage (%)	Additional Public School Students to be Served
	30	60	87,000	90	85,050
Public Toilet	Public Utilities Coverage (%)	Public Utilities Coverage (%)	Additional Public Utilities with Sanitary Toilets	Public Utilities Coverage (%)	Additional Public Utilities with Sanitary Toilets
	100	100	29	100	10
Sewerage	Urban Population Coverage (%)	Not Applicable		Urban Population Coverage (%)	Urban Population to be Served
	0			50	121,760
Solid Waste	Urban Household Coverage (%)	Urban Household Coverage (%)	Additional Urban Households to be Served	Not Applicable	
	40	60	11,969		

Table 8.2.2 Estimation of Base Year Service Coverage of Water Supply

Name of Municipality	Area	Population (1997)	Population Served by 1997 Facilities				
			Level III	Level II	Level I	Total	Percentage Coverage
Bayugan	Urban	39,451			32,815	32,815	83
	Rural	57,080	340	6,290	26,968	33,598	59
	Total	96,531	340	6,290	59,783	66,413	69
Bunawan	Urban	10,706	1,296	3,103	2,990	7,389	69
	Rural	15,557		3,962	4,911	8,873	57
	Total	26,263	1,296	7,065	7,901	16,262	62
Esperanza	Urban	4,193	660		1,701	2,361	56
	Rural	40,342	420	2,390	15,988	18,798	47
	Total	44,535	1,080	2,390	17,689	21,159	48
La Paz	Urban	7,456			2,810	2,810	38
	Rural	18,046			2,171	2,171	12
	Total	25,502			4,981	4,981	20
Loreto	Urban	5,046		340	2,621	2,961	59
	Rural	20,123		1,801	7,335	9,136	45
	Total	25,169		2,141	9,956	12,097	48
Prosperidad (Capital)	Urban	21,840	3,276			3,276	15
	Rural	44,361	2,088	3,282	26,913	32,283	73
	Total	66,201	5,364	3,282	26,913	35,559	54
Rosario	Urban	3,031	3,029			3,029	100
	Rural	25,080	5,605	4,501	1,171	11,277	45
	Total	28,111	8,634	4,501	1,171	14,306	51
San Francisco	Urban	25,519	10,791	1,296	12,156	24,243	95
	Rural	28,665	3,480	2,249	10,530	16,259	57
	Total	54,184	14,271	3,545	22,686	40,502	75
San Luis	Urban	5,038			3,103	3,103	62
	Rural	18,257		1,321	7,071	8,392	46
	Total	23,295		1,321	10,174	11,495	49
Santa Josefa	Urban	4,261	888		1,861	2,749	65
	Rural	20,506			3,615	3,615	18
	Total	24,767	888		5,476	6,364	26
Sibagat	Urban	7,884	623		3,762	4,385	56
	Rural	22,000	290	9,294	5,686	15,270	69
	Total	29,884	913	9,294	9,448	19,655	66
Talacogon	Urban	17,903		5,978	10,493	16,471	92
	Rural	12,123		218	2,603	2,821	23
	Total	30,026		6,196	13,096	19,292	64
Trento	Urban	16,725		423	10,322	10,745	64
	Rural	22,778	500		8,936	9,436	41
	Total	39,503	500	423	19,258	20,181	51
Veruela	Urban	6,267		1,251		1,251	20
	Rural	34,802		4,041	1,761	5,802	17
	Total	41,069		5,292	1,761	7,053	17
Provincial Total	Urban	175,320	20,563	12,391	84,634	117,588	67
	Rural	379,720	12,723	39,349	125,659	177,731	47
	Total	555,040	33,286	51,740	210,293	295,319	53

The base year service coverage in urban area (67%) is almost the same with the updated MTPDP sector target (68.8%) for the year 1998, while rural area (47%) is far behind the sector target of 79%. As identified in Chapter 4, the lower service coverage in rural area is caused by the presence of a large number of unsafe sources/facilities or no provision of water supply facilities.

For Phase I development, targets of service coverage for water supply by urban and rural area are established in consideration of about 10% increase from the base year. 80% and 60% is adopted for urban and rural area, respectively. Phase II targets are planned to increase urban and rural water supply coverage to 95% and 93%, respectively, as envisaged in the NSMP.

(2) Sanitation

1) Household toilets

As with water supply, the base year service coverage is calculated as shown in Table 8.2.3 reflecting any planned or on-going projects scheduled to be completed by 1998 (details are referred to Supporting Report).

The province has base year service coverage of 67%, which is a little above the current national average coverage of 60%. Urban area registers a level of 73% that is well above the national average coverage. Rural area however, has only 64% owing to the presence of numerous unsanitary facilities. By type of sanitary toilet facility, the existing percentage composition to total households is as follows:

Type	Urban (%)	Rural (%)
Flush	21	0
Pour-flush	79	100
VIP latrine	0	0

To attain sufficiency and equitable access to basic services, provincial target of Phase I for urban household toilets is planned at 80%, while, for rural household toilets, 75% is projected. This is almost equal to the existing urban service coverage of 73% that is pursued to lessen the gap of the coverage between the urban and rural areas and to achieve a balanced distribution of this basic facility as embodied in the PNDP. For Phase II, 93% as set by the NSMP is adopted for urban household toilets, while, 85% is arranged for rural household toilets.

Table 8.2.3 Base Year Service Coverage of Household Toilets

Name of Municipality	Area	1997		Households and Population Using Sanitary Toilets								
				Number of Households				Population	Service Coverage (%)			
		Population	HHs	Flush	Pour Flush	VIP/ Dry	Total		Flush	Pour Flush	VIP/ Dry	Total
Bayugan	Urban	39,451	7,388	875	5,360		6,235	33,139	12	73		84
	Rural	57,080	10,570		6,867		6,867	37,102		65		65
	Total	96,531	17,958	875	12,227		13,102	70,241	5	68		73
Bunawan	Urban	10,706	2,120	150	869		1,019	5,139	7	41		48
	Rural	15,557	2,986		3,041		3,041	15,869		102		102
	Total	26,263	5,106	150	3,910		4,060	21,008	3	77		80
Esperanza	Urban	4,193	747	17	456		473	2,642	2	61		63
	Rural	40,342	7,230		4,159		4,159	23,399		58		58
	Total	44,535	7,977	17	4,615		4,632	26,041		58		58
La Paz	Urban	7,456	1,126	187	487		674	4,474	17	43		60
	Rural	18,046	3,074		1,435		1,435	8,482		47		47
	Total	25,502	4,200	187	1,922		2,109	12,956	4	46		50
Loreto	Urban	5,046	888	15	574		589	3,331	2	65		66
	Rural	20,123	3,645		2,893		2,893	15,898		79		79
	Total	25,169	4,533	15	3,467		3,482	19,229		76		77
Prosperidad (Capital)	Urban	21,840	4,160	702	2,620		3,322	17,472	17	63		80
	Rural	44,361	8,276		5,006		5,006	26,617		60		60
	Total	66,201	12,436	702	7,626		8,328	44,089	6	61		67
Rosario	Urban	3,031	605	16	488		504	2,516	3	81		83
	Rural	25,080	4,577		4,037		4,037	22,071		88		88
	Total	28,111	5,182	16	4,525		4,541	24,587		87		88
San Francisco	Urban	25,519	4,824	1,708	2,046		3,754	19,905	35	42		78
	Rural	28,665	5,450		2,706		2,706	14,333		50		50
	Total	54,184	10,274	1,708	4,752		6,460	34,238	17	46		63
San Luis	Urban	5,038	867	150	325		475	2,771	17	37		55
	Rural	18,257	3,375		1,375		1,375	7,486		41		41
	Total	23,295	4,242	150	1,700		1,850	10,257	4	40		44
Santa Josefa	Urban	4,261	789	35	491		526	2,855	4	62		67
	Rural	20,506	3,898		1,838		1,838	9,638		47		47
	Total	24,767	4,687	35	2,329		2,364	12,493	1	50		50
Sibagat	Urban	7,884	1,439	230	820		1,050	5,756	16	57		73
	Rural	22,000	4,022		2,925		2,925	16,060		73		73
	Total	29,884	5,461	230	3,745		3,975	21,816	4	69		73
Talacogon	Urban	17,903	3,279	590	1,490		2,080	11,279	18	45		63
	Rural	12,123	2,161		1,687		1,687	9,456		78		78
	Total	30,026	5,440	590	3,177		3,767	20,735	11	58		69
Trento	Urban	16,725	3,150	234	2,311		2,545	13,548	7	73		81
	Rural	22,778	4,493		3,328		3,328	16,856		74		74
	Total	39,503	7,643	234	5,639		5,873	30,404	3	74		77
Veruela	Urban	6,267	1,127	46	570		616	3,447	4	51		55
	Rural	34,802	6,362		3,301		3,301	18,098		52		52
	Total	41,069	7,489	46	3,871		3,917	21,545	1	52		52
Provincial Total	Urban	175,320	32,509	4,955	18,907		23,862	128,274	15	58		73
	Rural	379,720	70,119		44,598		44,598	241,365		64		64
	Total	555,040	102,628	4,955	63,505		68,460	369,639	5	62		67

The existing composition of the 3 facility types serves as an indicator in the distribution for Phase I, while for Phase II, VIP and sanitary pit privy/latrine (dry-type) is phased-out.

2) School toilets

The base year service coverage of public school students is shown in Table 8.2.4 counting expected coverage of any planned or on-going projects scheduled to be completed by 1998 (details are referred to Supporting Report).

Table 8.2.4 Base Year Service Coverage of Public School Toilets and Public Toilets

Name of Municipality	Public School Toilets			Public Toilets		
	Total Number of Public School Students (1997)	Std. No. of Public School Students that can be Served by Sanitary Toilets in Base Year (1997)	Service Coverage (%)	Number of Public Utilities with Toilets in 1997	Number of Public Utility with Sanitary Toilets in Base Year (1997)	Service Coverage (%)
Bayugan	33,259	14,080	42	2	2	100
Bunawan	9,582	3,440	36	2	2	100
Esperanza	16,857	5,560	33	2	2	100
La Paz	6,274	2,240	36	2	2	100
Loreto	11,483	3,440	30	2	2	100
Prosperidad	24,762	5,280	21	2	2	100
Rosario	9,769	3,520	36	5	5	100
San Francisco	21,361	2,360	11	3	3	100
San Luis	7,570	1,760	23	2	2	100
Santa Josefa	8,504	2,320	27	2	2	100
Sibagat	11,659	2,240	19	1	1	100
Talacogon	11,444	3,600	31	2	2	100
Trento	15,140	8,240	54	3	3	100
Veruela	10,811	1,920	18	2	2	100
Provincial Total	198,475	60,000	30	32	32	100

Base year service coverage is 30% applying the standard number of public school students to be served by one (1) unit of toilet facility. The low level is due to a large number of unsanitary or absence of facilities.

In the absence of national targets for school toilets, the existing level of service coverage is the base in setting up the targets. It is expected that all new construction of school-buildings will entail sanitary toilets enabling the coverage to increase on a high level. For Phase I and II, 60% and 90% are set, respectively.

3) Public toilets

The base year service coverage considering expected additional coverage by 1998 is shown in Table 8.2.4 (details are referred to Supporting Report).

All existing public utilities are served with at least one sanitary toilet giving a 100% coverage. This can be attributed by the fact that all public utilities (mostly public markets) are provided with sanitary toilet facilities.

Without national targets as of now, the indicator in setting up provincial targets would be the existing level of coverage. Accordingly, 100% coverage for both Phase I and Phase II are assumed.

(3) Sewerage

Given the non-existence of sewerage systems in any municipality at the present time, this plan does not consider the service during Phase I. For Phase II, a target of 50% coverage was applied to urban population of municipalities with more than 10,000 urban population provided by Level III water supply systems.

(4) Solid waste

The municipal level data in 1997 on the number of households served by the municipal refuse collection revealed that the current practice is concentrated to urban areas. The base year service coverage for urban area by municipality is reflected in Table 8.2.5.

Table 8.2.5 Base Year Service Coverage of Municipal Solid Waste System in 1997

Name of Municipality	Total No. of Households	No. of Urban Households	No. of Households Served	Coverage of Households (%)	Coverage of Urban Households (%)
Bayugan	17,958	7,388	748	4	10
Bunawan	5,106	2,120	1,643	32	78
Esperanza	7,977	747			
La Paz	4,200	1,126			
Loreto	4,533	888	848	19	95
Prosperidad	12,436	4,160	2,037	16	49
Rosario	5,182	605			
San Francisco	10,274	4,824	3,639	35	75
San Luis	4,242	867			
Santa Josefa	4,687	789	675	14	86
Sibagat	5,461	1,439	748	14	52
Talacogon	5,440	3,279			
Trento	7,643	3,150	2,672	35	85
Veruela	7,489	1,127			
Provincial Total	102,628	32,509	13,010	13	40

About 13% of the total households in the province relied on municipal refuse collection using trucks or a 40% urban household coverage. These municipalities have a total of 10 units of collection truck.

No national targets have yet been set. However, considering the present level of coverage, a 60% urban household coverage is applied for the medium-term period (1999-2003).

8.3 Projection of Frame Values

8.3.1 Population Projection

Future population for all municipalities by urban and rural area was projected for the target years of 2003 and 2010 together with the present population in 1997 as a planning base year.

Regional population projection is published by the NSO, however, projection at provincial and municipal levels was not yet available during the time of study. The future population of the province as well as the municipalities was therefore projected in the ensuing manner (details are included in the Supporting Report) using the following reference information/data:

- Population census data of 1980, 1990 and 1995 on different administrative levels,
- National and Regional population projection by the NSO based on 1995 census results,
- "Ratio method" generally used by the NSO for population projection (details are shown in 8.3.1, Supporting Report),
- Revised classification of urban and rural barangays by the PPDO comparing with NSO statistical information, and
- The 1995 Philippine Yearbook.

The past population development at different administrative levels was first reviewed to come up with the demographic characteristics of the region and province. Then, through review of NSO regional population projection and the 1995 Philippine Yearbook, the behavior of population development through the future was analyzed. Referring to these demographic studies, population projection of the region by target year was confirmed to be reasonable.

Population projection of the province was carried out applying the "ratio method". Projected figures were studied by means of declining annual growth rates employing a simple compounded formula $(1+r)^n$. Present population of the province in 1997 was also estimated in the same manner. Likewise, municipal population was projected. Major study procedures and their results are presented below:

(1) Review of past population development in the province and population distribution in 1995 to urban and rural areas.

The past population development during census periods from 1980 to 1990 and from 1990 to 1995 revealed that:

- The province recorded an average annual growth rates of 4.73% (1980-1990) and 4.11% (1990-1995), which were almost double the regional rates of 2.44% and 2.33%, respectively.
- Percentage of provincial population to the regional population increased from 9.6% in 1980 to 13.1% in 1995 caused by the higher growth rates than those of the region.

The classification of urban and rural areas compiled in 1995 population census was reviewed and updated by the PPDO. As a result of some revisions in the barangay classification, the population by municipality was adjusted as shown in Table 8.3.2, Section 8.3.1, Supporting Report.

(2) Manner of population projection

The regional population projected by the NSO based on 1995 census results was employed. However, a review of the population has to be made in the near future upon endorsement of the Regional Development Plan (1998-2008) for the Caraga Region that is currently under preparation. The following are the projection procedures.

1) Adoption of regional population projected by the NSO for the years 1995 to 2020

Annual growth rates of regional population projected by NSO were analyzed using simplified formula. The conservative growth rates were calculated reflecting demographic characteristics of moderate decline of fertility and mortality rates described in the 1995 Philippine Yearbook.

2) Application of ratio method for population projection of the province and municipalities

Adopted formula is: $$R(k) = R(0)\prod_{1}^{k} (1 + r - kr / 50)$$

where: R(k) = ratio in "k"th year from 1995 of the population to that of the region or of the population of the municipality to that of the province

R(0) = ratio in 1995 of the population of the province to that of the region or of the population of the municipality to that of the province

r = initial rate of change of the ratio

k = "k"th year from 1995

The initial rate of change is derived based on the levels and trends of the ratio observed in the 1970, 1980, 1990 and 1995 censuses.

3) Categorization of the province and municipalities to set initial rate (r)

Four standard types are prepared based on the trends of the rate (r) as observed in the censuses of 1970, 1980, 1990 and 1995. Initial rate to be used for each type of province or municipality is determined using a set criteria (refer to Section 8.3.1, Supporting Report).

The province was classified as Type I and an initial rate of change (r) was estimated at 0.0154.

(3) Present provincial population (1995) including its municipalities (further broken down to urban and rural areas) was estimated applying the initial rates of change as mentioned above, assuming that the behaviors of past population development prevailed up to the present.

(4) Household size in 1997 was also assumed to be the same as that in 1995.

Population by target year and the year 1997 is presented in Table 8.3.1 covering all municipalities broken down to urban and rural areas. The number of households by target year was also studied and included in Table 8.3.5, Supporting Report.

Table 8.3.1 Future Population by Urban and Rural Area by Municipality

Name of Municipality	1997			2003			2010		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Bayugan	39,451	57,080	96,531	48,136	69,647	117,783	58,370	84,455	142,825
Bunawan	10,706	15,557	26,263	12,875	18,710	31,585	15,390	22,363	37,753
Esperanza	4,193	40,342	44,535	4,919	47,330	52,249	5,736	55,195	60,931
La Paz	7,456	18,046	25,502	9,915	24,001	33,916	13,102	31,715	44,817
Loreto	5,046	20,123	25,169	5,772	23,020	28,792	6,565	26,179	32,744
Prosperidad	21,840	44,361	66,201	26,550	53,928	80,478	32,076	65,154	97,230
Rosario	3,031	25,080	28,111	3,466	28,675	32,141	3,940	32,591	36,531
San Francisco	25,519	28,665	54,184	30,590	34,362	64,952	36,445	40,938	77,383
San Luis	5,038	18,257	23,295	6,000	21,744	27,744	7,102	25,740	32,842
Santa Josefa	4,261	20,506	24,767	6,590	31,708	38,298	10,124	48,715	58,839
Sibagat	7,884	22,000	29,884	9,320	26,006	35,326	10,950	30,555	41,505
Talacogon	17,903	12,123	30,026	22,904	15,510	38,414	29,116	19,716	48,832
Trento	16,725	22,778	39,503	20,231	27,554	47,785	24,322	33,126	57,448
Veruela	6,267	34,802	41,069	9,271	51,479	60,750	13,624	75,654	89,278
Provincial Total	175,320	379,720	555,040	216,539	473,674	690,213	266,862	592,096	858,958

8.3.2 School Enrollment Projection

From the 1995 total population of the province, the number of children who would be enrolling in elementary and high school levels for all municipalities is derived.

School age population is extrapolated from the NSO age group classification of 5-9, 10-14 and 15-19 years old bracket by municipality. The age group for the elementary level is from 6 to 13 years, while that for the high school level is from 14 to 17 years. The percentages of school age population for the target years are based on the existing composition or structure of the 1995 population.

From the school age population, the number of children who would attend either private or public school, by target year is computed using the projected participation rate. The participation rate by target year varies depending on the socio-economic condition of the province. Generally, an improved economy will result to a higher participation rate. For the province, an descrease in the participation rate in both private and public schools is foreseen by year 2010.

The number of public school students by target year is then derived from the projected number of children who will attend school. A participation rate for public school enrollment is established based on the existing participation rate of public school students to the total school age population. Based on DECS projection, a decrease of 6% from the 1997 rate is foreseen in 2003 and another decrease of 12% from the 2003 rate in 2010 (details are referred to Table 8.3.6, Supporting Report). It should be noted that the participation rate in 1997 was over 100%, an indication that a number of school enrollees are over-aged.

Table 8.3.2 shows the projected number of public school students by municipality, by target year. About 245,000 and 258,000 public school students are estimated to enroll for years 2003 and 2010, respectively.

8.3.3 Projection of the Number of Public Utilities

The number of public utilities (limited to public markets and bus/jeepney terminals) by target year is projected in urban areas for all municipalities. The provincial physical framework plan and the provincial comprehensive development plan serve as references in the projection. Bus or jeepney terminals are considered in major transport routes of the province.

Table 8.3.2 Projected Public School Enrollment and Number of Public Utilities by Municipality

Name of Municipality	Number of Public School Student			Number of Public Utilities		
	1997	2003	2010	1997	2003	2010
Bayugan	33,259	40,674	41,768	2	4	4
Bunawan	9,582	11,518	11,849	2	2	2
Esperanza	16,857	19,806	19,770	2	3	3
La Paz	6,274	8,291	8,505	2	3	3
Loreto	11,483	13,104	13,155	2	4	4
Prosperidad	24,762	30,135	31,335	2	4	7
Rosario	9,769	11,158	10,791	5	7	7
San Francisco	21,361	25,535	26,533	3	6	7
San Luis	7,570	8,974	8,887	2	3	4
Santa Josefa	8,504	13,139	17,228	2	2	2
Sibagat	11,659	13,825	14,103	1	2	2
Talacogon	11,444	14,573	15,174	2	10	13
Trento	15,140	18,301	19,103	3	6	8
Veruela	10,811	15,967	19,630	2	5	5
Provincial Total	198,475	245,000	257,831	32	61	71

A total of 29 public markets, bus/jeepney terminals and parks/playgrounds are planned for construction by year 2003 and another 10 by the year 2010. Refer to Table 8.3.2 for the number of public utilities by municipality by target year (details are referred to Supporting Report).

8.3.4 Planning Area and its Projected Population for Sewerage

Urban areas with more than 10,000 population provided by Level III water supply systems in 2010 serve as the planning area. Population in the area is considered as the potential population to be served.

Ten (10) municipalities with a total urban population of about 244,000 are considered (refer to Table 8.5.5).

8.3.5 Number of Households to be Served by Municipal Solid Waste Collection System

The number of urban households in 2003 is the potential households for the planning (refer to Table 8.3.5, Supporting Report).

8.4 Types of Facilities and Implementation Criteria

In principle, types of facilities and their implementation criteria as prescribed in the NSMP and the NEDA Board Resolution No. 12 (s. 1995) are adopted to this PW4SP.

8.4.1 Water Supply

The following are major conditions and assumptions applied to urban and rural water supply, which are intended as a guide for the implementation of sector projects.

(1) Urban water supply

Prevailing situation of urban water supply in each municipality was first reviewed mainly focusing on existing water sources and magnitude of service coverage. Planned/on-going projects for concerned municipalities were also studied and reflected on PW4SP planning, with due attention to merging of municipalities into an integrated water supply system. Potential water source for future development was then evaluated based on the study results in Chapter 7, taking into account the possibility to utilize untapped spring sources. Recommendations arising from these studies were also incorporated for furtherance of water supply development.

Aforementioned studies were carried out by the following sequence:

- Review of existing water supply systems and water sources;
- Review of planned/on-going projects;
- Establishment of planning conditions covering service level, utilization of existing facilities, water sources, and number of systems; and
- Recommendations for furtherance of water supply development.

1) Review of existing water supply systems and water sources

Majority of the existing Level III and II systems in urban areas is utilizing spring sources. The municipalities of Bunawan, Prosperidad and San Francisco are served by WD with spring and deep well sources, while the municipalities of Esperanza, Rosario and Sibagat are served by Level III systems being operated by either the municipality or the local community.

Currently, 7 out of the total 14 municipalities, namely: Bayugan, La Paz, Loreto, San Luis, Talacogon, Trento and Venuela have no Level III system in their urban area and are presently served by Level II system and/or Level I facilities.

Population served by Level III systems range from about 600 persons in Sibagat to 10,800 persons in San Francisco. The average size of served population is about 3,700 persons.

Preference is made to utilize spring sources owing to less O&M activities and cost compared to deep well with electric motor pump.

2) Review of planned/on-going projects

At present, there is no particular planned/on-going project for municipalities in the province.

3) Establishment of planning conditions

a. Service level

It shall be noted that a national policy for urban water supply is a Level III system, in general, as the most suitable measure. Therefore, for the investment needs of the sector development, it is assumed in this PW4SP that underserved or unserved urban population at present and in the future will be provided with individual house connections. However, it does not intend to exclude from being implemented Level I and II facilities in urban area as individual cases in the future

b. Utilization of existing facilities

The existing Level I and II facilities are considered to be utilized during the Phase I period. However, the population served by these facilities is assumed to be absorbed by Level III service in Phase II.

c. Water sources

Possibility/availability to utilize surface water and groundwater (spring and deep well) is evaluated as potential water sources for water supply development.

From the viewpoints of cost effectiveness and easy O&M of water supply system, utilization of spring sources is given due priority in the course of urban water supply planning. Application of deep wells for water source is regarded as the second priority in principle. Surface water is, on the other hand, not adopted at this moment, because of large capital investment requirements and complexity of surface water treatment.

Water source development study revealed that most of the municipalities in the planning area have high potential for spring development. Among various untapped spring sources identified during the course of PW4SP preparation, three (3) untapped sources, located in the municipalities of Esperanza, Rosario and Veruela, were considered to have favorable conditions for use in Level III service (details are referred to in Supporting Report).

Table 8.4.1 presents a summary of potential water source together with water supply conditions of the existing systems. The magnitude of water supply coverage varies from about 600 persons to 11,000 persons by municipality.

Table 8.4.1 Potential Water Source for Urban Water Supply

Name of Municipality	Served Population in Base Year			Existing Source in Municipality		Potential Water Source		Remarks
	Level III	Others	Total	Spring	Deep Well	Spring	Deep Well	
Buyugan	0	32,815	32,815	O		O	O	
Bunawan	1,296	6,093	7,389	O		O	O	Existing WD
Esperanza	660	1,701	2,361		O	O	O	Existing Level III
La Paz	0	2,810	2,810	O	O	O	O	
Loreto	0	2,961	2,961	O		O	O	
Prosperidad (Capital)	8,793	0	8,793	O		O	O	Existing WD
Rosario	3,029	0	3,029	O		×	O	Existing Level III
San Francisco	10,791	13,452	24,243	O		O	O	Existing WD
San Luis	0	3,103	3,103	O		O	O	
Santa Josefa	888	1,861	2,749		O	O	O	Existing Level III
Sibagat	623	3,762	4,385	O		O	×	Existing Level III
Talacogon	0	16,471	16,471	O		O	O	
Trento	0	10,745	10,745	O	O	O	O	
Veruela	0	1,251	1,251	O		O	O	

Note: O - Available; x – Not available.

The municipality of Sibagat does not have a preferable deep well development potential because to its locality in mountainous area, while the rest of the municipalities have high potential for spring and deep well sources.

With regard to deep well development, the groundwater productivity was assumed based on the study results of water sources in Chapter 7 and presented in Table 8.4.2.

Table 8.4.2 Groundwater Productivity

Name of Municipality	Specific Capacity (liter/sec/m)	Well Depth (meter)	Groundwater Productivity per Deep Well (m^3/16 Hr)
Bayugan	0.59	40	340
Bunawan	0.61	80	351
Esperanza	0.45	80	259
La Paz	0.23	80	132
Loreto	0.23	80	132
Prosperidad (Capital)	0.55	120	317
Rosario	0.31	40	179
San Francisco	0.64	40	369
San Luis	0.23	80	132
Santa Josefa	0.54	40	311
Sibagat	Not Applicable (Difficult Area for Deep Well)		
Talacogon	0.23	80	132
Trento	0.26	40	150
Veruela	0.5	40	288

d. Number of systems

In principle, one (1) Level III system is considered for urban area of every municipality. In the municipalities with an existing Level III system/s, the expansion of the system was first considered. In case of no existence of Level III system/s, a new system was recommended. Existing plan/s on the development of Level III/WD are also taken into account to determine respective systems of the municipalities.

Possibility and necessity to merge service area of some neighboring municipalities to an urban water supply system were also studied from the view points of:

- water source constraints, and
- economical development/scale merit of water supply system by cost reduction of water source development and other common facilities as well as O&M cost/minimized number of technical staff.

Municipalities taken up in this PW4SP are scattered throughout the province and therefore have less possibility of merging with neighboring municipalities in urban water supply.

In addition to the above, any rural barangay/s being served by an existing urban Level III system are considered to continue throughout the future.

e. Rehabilitation

Rehabilitation of existing and future facilities is assumed to be undertaken by the operating bodies.

4) Recommendations for future water supply development

The province has high potential for spring development and various untapped spring sources favorable for urban water supply were identified during the course of PW4SP preparation. However, further survey to evaluate appropriate development of spring sources is prerequisite in the course of feasibility study and detailed design. Among others, confirmation of possible/dependable yield throughout the year, elevation and distance from the potential service area as well as topographic conditions to allow gravity flow of supply is indispensable.

(2) Rural water supply

1) Service level

Level I systems (deep and shallow wells) are generally planned for rural areas where houses are scattered. In the PW4SP, public investment for Level I facilities covers 80% of the total number of required facilities, considering the existing share of population served between public (78%) and private facilities (22%).

Level II systems are considered where houses are clustered and suitable untapped spring is available.

Service level standards are set forth as 15 households per source for Level I and 5 households per communal faucet for Level II, as defined in the national plan.

Application of Level III systems in rural areas may be considered in a case to case basis during actual implementation.

2) Utilization of existing facilities

The existing facilities/systems in all service levels are considered to be utilized throughout the future.

3) Water source

For Level I facilities, deep well construction is given priority wherever applicable considering safety against possible contamination and stable water supply. Standard specifications of shallow and deep wells are summarized in Table 8.4.3 based on the water source evaluation results presented in Chapter 7. Conventional construction method (driven well) may be employed under favorable substrata or hydrogeological

conditions. The standard structure of wells in application of "open-hole drilling and gravel pack" is presented in Figure 8.4.1, Supporting Report.

Spring development is also included in Level I planning adopting its share of 20%. This takes into account the existing percentage of developed springs (21%) among public Level I facilities as safe water sources.

Table 8.4.3 Standard Specifications of Level I Wells

Specification	Shallow Well	Deep Well
Construction Method	Open-hole drilling and gravel pack	
Casing Diameter	50mm	100mm
Borehole Diameter	150mm	200mm
Ranges of Well Depth	Standard Depth	
0 - 20m	20m	Not Applicable
21 - 50m	Not Applicable	40m
51 - 100m	Not Applicable	80m
101 - 150m	Not Applicable	120m

Profile between gravel packed well and natural gravel packed well for Level I water supply:

The open-hole drilling method is employed for the well construction to ensure yielding ground water from adequate aquifer in provision of proper screen location and specifications. The conventional "cased-hole driven well" shall be used only in cases where well specifications are established in the specified area with sufficient information on the hydrogeological condition including existence of natural gravel at the expected aquifer.

It is important to study on the potential area to adopt natural gravel method, which can perform the same level of function as gravel-packed wells. Such areas are usually limited to the upper stream of larger rivers in alluvial fans and alluvial plains. The arial proportion between those in application of gravel-packed and natural gravel pack wells will be worked out referring to the condition of the province.

Modification needs of riser pipe diameter according to the water level of deep wells:

The standard specification of deep well hand pump is set with a diameter of 2-1/2 inch in the plan. However, water level of the deep wells may range between 20 m and around 40 m, depending on the aquifer conditions.

Although, Maruei type deep well pump with a cylinder, currently used in the Philippines, has operation experience up to 40 m in pumping water level, the diameter of riser pipe shall be adjusted between 1" to 2-1/2" to mitigate required power at the pump handle (calculating required power under the specific pumping water level).

For Level II systems, only untapped springs suitable for water supply purpose are considered. Identified untapped springs are presented in Table 7.4.1, Supporting Report.

4) Number of systems/facilities

The number of Level I wells and spring development is estimated based on the service level standard; while the number of Level II systems coincides with the number of untapped springs.

5) Rehabilitation

Rehabilitation of existing Level I wells is not considered, since most of the existing wells constructed by driving method is not suitable for rehabilitation to recover their functions. However, minor repair work for handpump and concrete apron is a requisite.

8.4.2 Sanitation

The conditions and assumptions are established for the different sanitation components to serve as guides in the implementation of projects.

(1) Household toilets

Three types of sanitary toilet facilities for individual houses are considered for Phase I; flush, pour-flush and VIP/sanitary pit privy (dry-type). While for Phase II, flush and pour-flush are planned considering the improvement of living standard.

The type of toilet facilities is dependent on the existing or planned service level of water supply in the community. In urban and rural areas with Level I or II water supply facilities, only pour-flush and/or VIP are considered, while in urban areas with Level III water supply systems, flush type toilets requiring a piped water connection are included. Isolated rural areas where there is dearth of water supply, sanitary pit privy (dry type) is considered.

(2) School toilets

Standard service level currently used by DECS (40 students per unit facility) is employed for both phases.

The standard toilet facility (1 building) with 5 units of toilet bowl to serve for 200 students is adopted for the planning purpose, which is modified from FW4SP design to provide a shallow well as a water source.

(3) Public toilets

As a minimum requirement, at least 1 sanitary toilet facility is assumed to be provided for respective utilities: public market and bus/jeepney terminal.

The standard FW4SP design with 6-units of toilet bowl for the market is adopted. In this design, it is assumed that water supply will be tapped from the existing system, hence an elevated water tank is provided.

8.4.3 Urban Sewerage

The commencement of staged implementation of the sewerage program is planned in Phase II for the limited urban area (50% of urban population served by Level III system for the municipalities with urban population of more than 10,000). It is practical to start the program fully using the existing facilities to allow for lower initial investment cost than starting at once a conventional sewerage system (refer to Figure 8.4.2 Staged Improvement in Sewage Collection Method, Supporting Report).

Low cost off-site technologies such as small bore sewer for collection of effluent from septic tank are to be adopted. Improvement of sewage collection method may be gradually achieved from combined sewer to separate sewerage system.

Sewage treatment facilities may range from community scale septic tank or imhoff tank to aerated lagoon systems and to a more advanced treatment process such as oxidation ditch. For this PW4SP, aerated lagoons are assumed as a representative treatment facility for planning purpose. Daily average wastewater quantity is assumed to be 100 liters per capita per day.

8.4.4 Solid Waste

In terms of facility requirements, this PW4SP only studied the number of refuse collection trucks required for the year 2003. A rated capacity of 5 cu.m truck/vehicle is considered for calculation of required units of truck. Disposal of solid waste shall be studied in detail through investigations, F/S and D/D. Unit solid waste generation for urban area is assumed to be 0.418 kg. per capita per day.

8.5 Service Coverage by Target Year

8.5.1 Water Supply

The service coverage in terms of population to be served by target year was estimated by urban and rural area by municipality. The service coverage in rural area was further subdivided by service level (Level I & Level II) to finally come up with physical requirements.

Base figures applied to estimate the future service coverage and the additional population to be served are:

- provincial sector targets,
- population projection by target year, and
- base year service coverage (served population) by existing facilities.

Future requirements in terms of additional population to be served were then estimated by urban (Level III) and rural (Level I & II) area by municipality as a shortfall to meet the population to be served in each target year. The population served in base year is adopted as the population served in target year, when the former population exceeds the population to be served in the target year/s. Manner of calculation is specifically presented by phase.

(1) Phase I requirements

Additional service coverage was estimated as a shortfall of the population to be served in Phase I comparing with the population served in base year. In this connection, existing facilities both in urban and rural areas are assumed to be utilized during the Phase I period.

The utilization of untapped springs for Level II systems was given priority during Phase I period for rural water supply. At the time of this plan preparation, 65 untapped springs in 10 municipalities were identified.

(2) Phase II requirements

Additional service coverage was estimated as a shortfall of the population to be served in Phase II comparing with the population served in Phase I. In this regard, existing facilities in rural area were assumed to be utilized through the two Phases, while urban population served by Level I and II facilities in base year was assumed to be absorbed by Level III service during Phase II period.

Table 8.5.1 presents the service coverage by target year and by level of service as well as the additional population to be served (details are referred to Supporting Report).

Through Phase I development, approximately 183,400 persons in the province will be served by additional water supply services, of which 55,900 persons or 30% of the total will be urban population and 127,500 persons or 70% will be rural population.

For Phase II period, a total of 443,500 persons, of which 177,100 persons or 40% in urban area and 266,400 persons or 60% in rural area, will be further benefited by water supply services. This additional service coverage in urban area includes the upgrade of service level for 97,000 persons served by Level I and II facilities in 1997.

8.5.2 Sanitation

(1) Household toilets

The service coverage (number of households to be served) by different types of sanitary facility is estimated by urban and rural area by municipality for the years 2003 and 2010.

The future service coverage and additional households to be served are estimated to meet the provincial targets using the number of household served in the base year and the number of households in target years.

Additional number of households to be served by different type of facility by urban and rural area by municipality is the shortfall of the number of households to be served in target years comparing with either that in base year or in Phase I (details are referred to Supporting Report). However, when the number of households to be served in target year/s is less than or equal to that in base year, no additional number of households to be served is counted.

Table 8.5.1 Population to be Served by Target Year (Water Supply)

Name of Municipality	Area	Phase I Coverage (2003)									Phase II Coverage (2010)								
		Total Population	Service Coverage				Additional Population to be Served				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	Level III	Level II	Level I	Total
Bayugan	Urban	48,136	5,694		32,815	38,509	5,694			5,694	58,370	55,452			55,452	49,758			49,758
	Rural	69,647	340	6,290	35,158	41,788		1,685	6,505	8,190	84,455	340	6,290	71,913	78,543			36,755	36,755
	Total	117,783	6,034	6,290	67,973	80,297	5,694	1,685	6,505	13,884	142,825	55,792	6,290	71,913	133,995	49,758		36,755	86,513
Bunawan	Urban	12,875	4,207	3,103	2,990	10,300	2,911			2,911	15,390	14,621			14,621	10,414			10,414
	Rural	18,710		3,962	7,264	11,226			2,353	2,353	22,363		3,962	16,836	20,798			9,572	9,572
	Total	31,585	4,207	7,065	10,254	21,526	2,911		2,353	5,264	37,753	14,621	3,962	16,836	35,419	10,414		9,572	19,986
Esperanza	Urban	4,919	2,234		1,701	3,935	1,574			1,574	5,736	5,449			5,449	3,215			3,215
	Rural	47,330	420	2,390	25,588	28,398		6,653	2,947	9,600	55,195	420	2,390	48,521	51,331			22,933	22,933
	Total	52,249	2,654	2,390	27,289	32,333	1,574	6,653	2,947	11,174	60,931	5,869	2,390	48,521	56,780	3,215		22,933	26,148
La Paz	Urban	9,915	5,122		2,810	7,932	5,122			5,122	13,102	12,447			12,447	7,325			7,325
	Rural	24,001			14,401	14,401			12,230	12,230	31,715			29,495	29,495			15,094	15,094
	Total	33,916	5,122		17,211	22,333	5,122		12,230	17,352	44,817	12,447		29,495	41,942	7,325		15,094	22,419
Loreto	Urban	5,772	1,657	340	2,621	4,618	1,657			1,657	6,565	6,237			6,237	4,580			4,580
	Rural	23,020		1,801	12,011	13,812			4,676	4,676	26,179		1,801	22,545	24,346			10,534	10,534
	Total	28,792	1,657	2,141	14,632	18,430	1,657		4,676	6,333	32,744	6,237	1,801	22,545	30,583	4,580		10,534	15,114
Prosperidad (Capital)	Urban	26,550	21,240			21,240	17,964			17,964	32,076	30,472			30,472	9,232			9,232
	Rural	53,928	2,088	3,282	26,987	32,357		296		296	65,154	2,088	3,282	55,223	60,593			28,236	28,236
	Total	80,478	23,328	3,282	26,987	53,597	17,964	296		18,260	97,230	32,560	3,282	55,223	91,065	9,232		28,236	37,468
Rosario	Urban	3,466	3,029			3,029					3,940	3,743			3,743	714			714
	Rural	28,675	5,605	4,501	7,099	17,205		22,752		22,752	32,591	5,605	4,501	20,204	30,310			13,105	13,105
	Total	32,141	8,634	4,501	7,099	20,234		22,752		22,752	36,531	9,348	4,501	20,204	34,053	714		13,105	13,819
San Francisco	Urban	30,590	11,020	1,296	12,156	24,472	229			229	36,445	34,623			34,623	23,603			23,603
	Rural	34,362	3,480	2,249	14,888	20,617		2,319	2,039	4,358	40,938	3,480	2,249	32,343	38,072			17,455	17,455
	Total	64,952	14,500	3,545	27,044	45,089	229	2,319	2,039	4,587	77,383	38,103	2,249	32,343	72,695	23,603		17,455	41,058
San Luis	Urban	6,000	1,697		3,103	4,800	1,697			1,697	7,102	6,747			6,747	5,050			5,050
	Rural	21,744		1,321	11,725	13,046		1,613	3,041	4,654	25,740		1,321	22,617	23,938			10,892	10,892
	Total	27,744	1,697	1,321	14,828	17,846	1,697	1,613	3,041	6,351	32,842	6,747	1,321	22,617	30,685	5,050		10,892	15,942
Santa Josefa	Urban	6,590	3,411		1,861	5,272	2,523			2,523	10,124	9,618			9,618	6,207			6,207
	Rural	31,708			19,025	19,025			15,410	15,410	48,715			45,305	45,305			26,280	26,280
	Total	38,298	3,411		20,886	24,297	2,523		15,410	17,933	58,839	9,618		45,305	54,923	6,207		26,280	32,487
Sibagat	Urban	9,320	3,694		3,762	7,456	3,071			3,071	10,950	10,403			10,403	6,709			6,709
	Rural	26,006	290	9,294	6,020	15,604		4,306		4,306	30,555	290	9,294	18,832	28,416			12,812	12,812
	Total	35,326	3,984	9,294	9,782	23,060	3,071	4,306		7,377	41,505	10,693	9,294	18,832	38,819	6,709		12,812	19,521
Talacogon	Urban	22,904	1,852	5,978	10,493	18,323	1,852			1,852	29,116	27,660			27,660	25,808			25,808
	Rural	15,510		218	9,088	9,306		778	5,707	6,485	19,716		218	18,118	18,336			9,030	9,030
	Total	38,414	1,852	6,196	19,581	27,629	1,852	778	5,707	8,327	48,832	27,660	218	18,118	45,996	25,808		9,030	34,838
Trento	Urban	20,231	5,440	423	10,322	16,185	5,440			5,440	24,322	23,106			23,106	17,666			17,666
	Rural	27,554	500		16,032	16,532		447	6,649	7,096	33,126	500		30,307	30,807			14,275	14,275
	Total	47,785	5,940	423	26,354	32,717	5,440	447	6,649	12,536	57,448	23,606		30,307	53,913	17,666		14,275	31,941
Veruela	Urban	9,271	6,166	1,251		7,417	6,166			6,166	13,624	12,943			12,943	6,777			6,777
	Rural	51,479		4,041	26,846	30,887		19,030	6,055	25,085	75,654		4,041	66,317	70,358			39,471	39,471
	Total	60,750	6,166	5,292	26,846	38,304	6,166	19,030	6,055	31,251	89,278	12,943	4,041	66,317	83,301	6,777		39,471	46,248
Provincial Total	Urban	216,539	76,463	12,391	84,634	173,488	55,900			55,900	266,862	253,521			253,521	177,058			177,058
	Rural	473,674	12,723	39,349	232,132	284,204		59,879	67,612	127,491	592,096	12,723	39,349	498,576	550,648			266,444	266,444
	Total	690,213	89,186	51,740	316,766	457,692	55,900	59,879	67,612	183,391	858,958	266,244	39,349	498,576	804,169	177,058		266,444	443,502

In the determination of the number of households to be served by flush type toilet, when the number of households to be served in the target year is higher than in base year, the target coverage is applied with conditions. When the target coverage is higher than Level III water supply coverage, the latter coverage is adopted, while in the other case, the target coverage is applied. In cases where the target coverage is less than that in base year, the base year coverage is adopted.

For Phase I, any type of existing sanitary facilities both in urban and rural areas is to be utilized during Phase I period. For Phase II, water-sealed toilet facilities in Phase I both in urban and rural areas are to be utilized.

The projected number of served households at the end of the Phase I period is 98,200. Additional households to be served totaled to 37,700, of which 28% is urban households and 72% is rural households. While at the end of Phase II period, the number of served households are 187,900 with an additional households to be served at 89,700. Table 8.5.2 provides the number of households to be served by target year for urban and rural areas by municipality.

(2) School toilets

The service coverage or the number of public school students to be served is estimated by municipality for the years 2003and 2010.

The future service coverage and additional number of students to be served are estimated using the number of students served in the base year, the number of students in target years and the provincial sector targets.

Additional number of students to be served by municipality is the shortfall of the number of students to be served in targets comparing with either that in base year or in Phase I (details are referred to Supporting Report). However, when the number of students to be served in target/s is less than or equal to the base year, no additional number of households to be served is considered.

The existing facilities are to be utilized during Phase I period, while the facilities in Phase I are to be utilized during Phase II period.

Table 8.5.2 Additional Number of Households to be Served by Target Year (Household Toilets)

Name of Municipality	Area	Phase I Coverage (2003)									Phase II Coverage (2010)								
		Total Households	No. of Served Households				Add'l. No. of Households to be Served				Total Households	No. of Served Households				Add'l. No. of Households to be Served			
			Flush	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total		Flush	Pour Flush	VIP/Dry	Total	Flush	Pour Flush	VIP/Dry	Total
Bayugan	Urban	9,014	2,163	4,327	721	7,211	1,288		721	2,009	14,593	6,786	6,064	721	13,571	4,623	1,737		6,360
	Rural	12,898	340	6,432	2,902	9,674	340		2,902	3,242	21,114	340	14,705	2,902	17,947		8,273		8,273
	Total	21,912	2,503	10,759	3,623	16,885	1,628		3,623	5,251	35,707	7,126	20,769	3,623	31,518	4,623	10,010		14,633
Bunawan	Urban	2,550	612	1,224	204	2,040	462	355	204	1,021	3,848	1,790	1,585	204	3,579	1,178	361		1,539
	Rural	3,591		2,129	912	3,041			912	912	5,591		3,840	912	4,752		1,711		1,711
	Total	6,141	612	3,353	1,116	5,081	462	355	1,116	1,933	9,439	1,790	5,425	1,116	8,331	1,178	2,072		3,250
Esperanza	Urban	877	211	421	70	702	194		70	264	1,434	667	597	70	1,334	456	176		632
	Rural	8,482	420	4,033	1,909	6,362	420		1,909	2,329	13,799	420	9,400	1,909	11,729		5,367		5,367
	Total	9,359	631	4,454	1,979	7,064	614		1,979	2,593	15,233	1,087	9,997	1,979	13,063	456	5,543		5,999
La Paz	Urban	1,498	359	719	120	1,198	172	232	120	524	3,276	1,524	1,403	120	3,047	1,165	684		1,849
	Rural	4,089		2,147	920	3,067		712	920	1,632	7,929		5,820	920	6,740		3,673		3,673
	Total	5,587	359	2,866	1,040	4,265	172	944	1,040	2,156	11,205	1,524	7,223	1,040	9,787	1,165	4,357		5,522
Loreto	Urban	1,016	244	488	81	813	229		81	310	1,641	763	682	81	1,526	519	194		713
	Rural	4,170		2,190	938	3,128			938	938	6,545		4,625	938	5,563		2,435		2,435
	Total	5,186	244	2,678	1,019	3,941	229		1,019	1,248	8,186	763	5,307	1,019	7,089	519	2,629		3,148
Prosperidad (Capital)	Urban	5,057	1,214	2,427	405	4,046	512		405	917	8,019	3,729	3,324	405	7,458	2,515	897		3,412
	Rural	10,061	755	4,527	2,264	7,546	755		2,264	3,019	16,289	2,088	9,494	2,264	13,846	1,333	4,967		6,300
	Total	15,118	1,969	6,954	2,669	11,592	1,267		2,669	3,936	24,308	5,817	12,818	2,669	21,304	3,848	5,864		9,712
Rosario	Urban	692	166	333	55	554	150		55	205	985	458	403	55	916	292	70		362
	Rural	5,233		2,826	1,211	4,037			1,211	1,211	8,148	1,385	4,330	1,211	6,926	1,385	1,504		2,889
	Total	5,925	166	3,159	1,266	4,591	150		1,266	1,416	9,133	1,843	4,733	1,266	7,842	1,677	1,574		3,251
San Francisco	Urban	5,783	1,388	2,775	463	4,626		729	463	1,192	9,111	4,237	3,773	463	8,473	2,849	998		3,847
	Rural	6,533	490	2,940	1,470	4,900	490	234	1,470	2,194	10,235	1,740	5,490	1,470	8,700	1,250	2,550		3,800
	Total	12,316	1,878	5,715	1,933	9,526	490	963	1,933	3,386	19,346	5,977	9,263	1,933	17,173	4,099	3,548		7,647
San Luis	Urban	1,033	248	495	83	826	98	170	83	351	1,776	826	743	83	1,652	578	248		826
	Rural	4,019		2,110	904	3,014		735	904	1,639	6,435		4,566	904	5,470		2,456		2,456
	Total	5,052	248	2,605	987	3,840	98	905	987	1,990	8,211	826	5,309	987	7,122	578	2,704		3,282
Santa Josefa	Urban	1,220	293	585	98	976	258	94	98	450	2,531	1,177	1,079	98	2,354	884	494		1,378
	Rural	6,028		3,165	1,356	4,521		1,327	1,356	2,683	12,179		8,996	1,356	10,352		5,831		5,831
	Total	7,248	293	3,750	1,454	5,497	258	1,421	1,454	3,133	14,710	1,177	10,075	1,454	12,706	884	6,325		7,209
Sibagat	Urban	1,701	408	817	136	1,361	178		136	314	2,738	1,273	1,137	136	2,546	865	320		1,185
	Rural	4,754	290	2,206	1,070	3,566	290		1,070	1,360	7,639	290	5,133	1,070	6,493		2,927		2,927
	Total	6,455	698	3,023	1,206	4,927	468		1,206	1,674	10,377	1,563	6,270	1,206	9,039	865	3,247		4,112
Talacogon	Urban	4,795	1,007	2,013	336	3,356	417	523	336	1,276	7,279	3,385	3,048	336	6,769	2,378	1,035		3,413
	Rural	2,765		1,452	622	2,074			622	622	4,929		3,568	622	4,190		2,116		2,116
	Total	6,960	1,007	3,465	958	5,430	417	523	958	1,898	12,208	3,385	6,616	958	10,959	2,378	3,151		5,529
Trento	Urban	3,810	914	1,829	305	3,048	680		305	985	6,081	2,828	2,522	305	5,655	1,914	693		2,607
	Rural	5,435	408	2,445	1,223	4,076	408		1,223	1,631	8,282	500	5,317	1,223	7,040	92	2,872		2,964
	Total	9,245	1,322	4,274	1,528	7,124	1,088		1,528	2,616	14,363	3,328	7,839	1,528	12,695	2,006	3,565		5,571
Veruela	Urban	1,667	400	801	133	1,334	354	231	133	718	3,406	1,584	1,451	133	3,168	1,184	650		1,834
	Rural	9,411		4,941	2,117	7,058		1,640	2,117	3,757	18,914		13,960	2,117	16,077		9,019		9,019
	Total	11,078	400	5,742	2,250	8,392	354	1,871	2,250	4,475	22,320	1,584	15,411	2,250	19,245	1,184	9,669		10,853
Provincial Total	Urban	40,113	9,627	19,254	3,210	32,091	4,992	2,334	3,210	10,536	66,718	31,027	27,811	3,210	62,048	21,400	8,557		29,957
	Rural	87,469	2,703	43,543	19,818	66,064	2,703	4,648	19,818	27,169	148,028	6,763	99,244	19,818	125,825	4,060	55,701		59,761
	Total	127,582	12,330	62,797	23,028	98,155	7,695	6,982	23,028	37,705	214,746	37,790	127,055	23,028	187,873	25,460	64,258		89,718

The projected number of served students at the end of Phase I period is 147,000. The additional students to be served are 87,000. While at the end of Phase II period, the projected number of served students are 232,000 with an additional students to be served at 85,000. Table 8.5.3 summarizes the number of public school students to be served by target year.

Table 8.5.3 Additional Number of Public School Students to be Served by Target Year (School Toilets)

Name of Municipality	Phase I Coverage (2003)			Phase II Coverage (2010)		
	Total No. of Public School Students	Std. No. of Public School Students to be Served	Add'l. No. of Public School Students to be Served	Total No. of Public School Students	Std. No. of Public School Students to be Served	Add'l. No. of Public School Student to be Served
Bayugan	40,674	24,404	10,324	41,768	37,591	13,187
Bunawan	11,518	6,911	3,471	11,849	10,664	3,753
Esperanza	19,806	11,884	6,324	19,770	17,793	5,909
La Paz	8,291	4,975	2,735	8,505	7,655	2,680
Loreto	13,104	7,862	4,422	13,155	11,840	3,978
Prosperidad)	30,135	18,081	12,801	31,335	28,202	10,121
Rosario	11,158	6,695	3,175	10,791	9,712	3,017
San Francisco	25,535	15,321	12,961	26,533	23,880	8,559
San Luis	8,974	5,384	3,624	8,887	7,998	2,614
Santa Josefa	13,139	7,883	5,563	17,228	15,505	7,622
Sibagat	13,825	8,295	6,055	14,103	12,693	4,398
Talacogon	14,573	8,744	5,144	15,174	13,657	4,913
Trento	18,301	10,981	2,741	19,103	17,193	6,212
Veruela	15,967	9,580	7,660	19,630	17,667	8,087
Provincial Total	245,000	147,000	87,000	257,831	232,050	85,050

(3) Public toilets

The service coverage of public utilities with sanitary toilet facility by municipality is estimated for the years 2003 and 2010.

The future service coverage and additional coverage are estimated using the existing number of public utilities with sanitary toilets in the base year, the number of public utilities in target years, and provincial sector targets.

The additional number of public utilities with sanitary toilets needed by municipality is the shortfall of the number of public utilities in target year comparing with either the existing coverage or Phase I coverage (details are referred to Supporting Report).

The existing sanitary facilities are to be utilized during Phase I period. The facilities in Phase I are to be utilized during Phase II period.

The number of served public utilities at the end of Phase I period is 61. The additional public utilities to be served are 29. While at the end of Phase II period, the number of served public utilities are 71 with an additional public utilities to be served at 10. Table 8.5.4 summarizes the additional number of public utilities to be served by municipality by target year.

8.5.3 Urban Sewerage

The service coverage in 2010 (Phase II) is estimated for the municipalities with population of more than 10,000 in urban area provided by Level III water supply. It is assumed that half of the population in the area/s is to be served by the sewerage systems. Table 8.5.5 shows the population to be served in Phase II.

8.5.4 Solid Waste

Future requirements in the sub-sector are studied giving priority to urban area for the Phase I. Staged improvement for the rural area shall be studied in the future.

Service coverage in Phase I was assumed at 60% with reference to the present service coverage of 40% in urban area.. Additional service coverage in Phase I is calculated as a shortfall of target coverage in Phase I comparing with current service coverage. Table 8.5.6 presents additional service coverage for Phase I in the urban area.

8.6 Facilities, Equipment and Rehabilitation to Meet the Target Services

8.6.1 Water Supply

(1) Required facilities

Water supply facilities required by service level were estimated by urban and rural area by municipality based on the additional service coverage by target year and summarized in Table 8.6.1 (details are referred to Supporting Report).

Urban water supply:

Physical requirements of Level III systems were estimated as the number of required house connections. Mode of project indicates whether future urban water supply will be implemented as expansion of existing system or construction of a new system. The number of water sources was also estimated based on the water source evaluation results in Chapter 7.

Table 8.5.4 Additional Number of Public Utilities with Sanitary Toilets by Target Year

Name of Municipality	Type	Phase I Coverage (2003)		Phase II Coverage (2010)	
		Add'l. No. of Public Utility with Sanitary Toilets	No. of Public Utility with Sanitary Toilets	Add'l. No. of Public Utility with Sanitary Toilets	No. of Public Utilities with Sanitary Toilets
Bayugan	Public Market		1		1
	Bus/Jeepney Terminal		1		1
	Parks/Playground	2	2		2
	Total	2	4		4
Bunawan	Public Market		1		1
	Bus/Jeepney Terminal		1		1
	Parks/Playground				
	Total		2		2
Esperanza	Public Market		1		1
	Bus/Jeepney Terminal	1	2		2
	Parks/Playground				
	Total	1	3		3
La Paz	Public Market		1		1
	Bus/Jeepney Terminal	1	2		2
	Parks/Playground				
	Total	1	3		3
Loreto	Public Market		1		1
	Bus/Jeepney Terminal	1	2		2
	Parks/Playground	1	1		1
	Total	2	4		4
Prosperidad (Capital)	Public Market	1	2	1	3
	Bus/Jeepney Terminal	1	2		2
	Parks/Playground			2	2
	Total	2	4	3	7
Rosario	Public Market		3		3
	Bus/Jeepney Terminal	1	2		2
	Parks/Playground	1	2		2
	Total	2	7		7
San Francisco	Public Market	2	3		3
	Bus/Jeepney Terminal		2		2
	Parks/Playground	1	1	1	2
	Total	3	6	1	7
San Luis	Public Market	1	2		2
	Bus/Jeepney Terminal		1	1	2
	Parks/Playground				
	Total	1	3	1	4
Santa Josefa	Public Market		1		1
	Bus/Jeepney Terminal		1		1
	Parks/Playground				
	Total		2		2
Sibagat	Public Market		1		1
	Bus/Jeepney Terminal				
	Parks/Playground	1	1		1
	Total	1	2		2
Talacogon	Public Market	3	4	1	5
	Bus/Jeepney Terminal	1	2	1	3
	Parks/Playground	4	4	1	5
	Total	8	10	3	13
Trento	Public Market	2	3	1	4
	Bus/Jeepney Terminal		1	1	2
	Parks/Playground	1	2		2
	Total	3	6	2	8
Veruela	Public Market	1	2		2
	Bus/Jeepney Terminal	1	2		2
	Parks/Playground	1	1		1
	Total	3	5		5
Provincial Total	Public Market	10	26	3	29
	Bus/Jeepney Terminal	7	21	3	24
	Parks/Playground	12	14	4	18
	Total	29	61	10	71

Table 8.5.5 Population to be Served by Urban Sewerage in Phase II

Name of Municipality	Urban Population in 2010	Level III Water Supply Coverage	Population to be Served
Bayugan	58,370	55,452	29,185
Bunawan	15,390	14,621	7,695
La Paz	13,102	12,447	6,551
Prosperidad (Capital)	32,076	30,472	16,038
San Francisco	36,445	34,623	18,223
Santa Josefa	10,124	9,618	5,062
Sibagat	10,950	10,403	5,475
Talacogon	29,116	27,660	14,558
Trento	24,322	23,106	12,161
Veruela	13,624	12,943	6,812
Provincial Total	266,862	253,521	121,760

Table 8.5.6 Add'l. No. of Urban HHs to be Served by Municipal Solid Waste System in Phase I

Name of Municipality	No. of Urban House-holds Served in the Base Year	Phase I Coverage (2003)		
		No. of Urban Households	Urban Households Coverage	Add'l. No. of Urban Households to be Served
Bayugan	748	9,014	5,409	4,661
Bunawan	1,643	2,550	1,643	
Esperanza		877	527	527
La Paz		1,498	899	899
Loreto	848	1,016	848	
Prosperidad (Capital)	2,037	5,057	3,035	998
Rosario		692	416	416
San Francisco	3,639	5,783	3,639	
San Luis		1,033	620	620
Santa Josefa	675	1,220	732	57
Sibagat	748	1,701	1,021	273
Talacogon		4,195	2,517	2,517
Trento	2,672	3,810	2,672	
Veruela		1,667	1,001	1,001
Provincial Total	13,010	40,113	24,979	11,969

Table 8.6.1 Water Supply Facilities Required by Target Year

Name of Municipality	Phase I (2003) Requirements											Phase I (2010) Requirements							
	Urban Water Supply (Level III)			Rural Water Supply								Urban WS (Level III)		Rural Water Supply					
				Level II		Level I								Level I					
	Mode of Project	No. of Add'l. Deep Wells	No. of HHs Connection	No. of System	No. of Communal Faucets	Number of Deep Wells				No. of Shallow Wells	Total No. of Wells	No. of Add'l. Deep Wells	No. of HHs Connection	Number of Deep Wells				No. of Shallow Wells	Total No. of Wells
						40 m	80 m	120 m	Sub-total					40 m	80 m	120 m	Sub-total		
Bayugan	Expansion	1	1,066	9	63	40			40	40	80	7	12,440	307			307	306	613
Bunawan	Expansion	1	576				18		18	12	30	2	2,604		96		96	64	160
Esperanza	Expansion	1	281	12	239		18		18	17	35	1	804		192		192	191	383
La Paz	New	1	774				119		119	20	139	1	1,831		215		215	37	252
Loreto	New	1	292				48		48	8	56	1	1,145		150		150	26	176
Prosperidad	Expansion	3	3,422	1	11							2	2,308			377	377	94	471
Rosario	N/A			1	830							1	179	66			66	153	219
San Francisco	Expansion	1	43	2	88	23			23	3	26	4	5,901	248			248	43	291
San Luis	New	1	292	8	60		32		32	5	37	1	1,263		155		155	27	182
Santa Josefa	Expansion	1	467			176			176	19	195	1	1,552	395			395	43	438
Sibagat	Expansion	1	560	24	158							1	1,677					214	214
Talacogon	New	1	339	3	28		58		58	10	68	4	6,452		129		129	22	151
Trento	Expansion	1	1,024	2	18	27			27	60	87	3	4,417	72			72	166	238
Veruela	New	1	1,109	3	696	67			67	7	74	1	1,694	593			593	65	658
Provincial Total	Exp.- 8 / New- 5	15	10,245	65	2,191	333	293		626	201	827	30	44,267	1,681	937	377	2,995	1,451	4,446

Rural water supply:

Physical requirements of Level II systems were estimated as the number of systems and number of communal faucets, while that of Level I facilities were first estimated as the number of wells with classification of deep and shallow wells. Deep wells were further subdivided in terms of three different standard depths based on the water source evaluation results.

Furthermore, as for Level I facilities, in this PW4SP, 80% of the total required facilities will be implemented by public (LGUs) and 20% of these public Level I facilities will be allocated to spring development.

(2) Rehabilitation

Rehabilitation requirements were estimated as 10% of the total number of deep wells to be constructed under PW4SP. Rehabilitation work will be mainly redevelopment of wells by means of air surging, while minor repair of concrete apron and handpump will be undertaken by respective beneficiary organizations.

(3) Equipment

Logistic support:

For rural water supply development, 1 unit each or set of the following equipment was considered necessary for the provincial government to conduct various activities of PW4SP implementation;

Transportation- service vehicle

Office equipment- computer with printer, typewriter, mimeo machine, scanning machine and copier

Field equipment- sound system, tape recorder and tools for maintenance

For urban water supply, no hardware was considered.

Well drilling and rehabilitation equipment:

As a reference information, necessary types and number of well drilling and rehabilitation equipment were studied considering the existing equipment of sector agencies in the province.

During Phase I, a total of 507 Level I deep wells shall be newly constructed by public (LGUs) and 10% of these deep wells shall be rehabilitated annually. Although there are

huge requirements, only 1 unit of spindle type drilling rig is available at DPWH-DEO in the province and 1 unit of truck-mounted percussion rig at DPWH-regional office. Air compressor equipment for well rehabilitation is not available either at provincial government or sector agencies.

Therefore, a total of 10 sets of drilling rigs (medium size percussion type) together with 2 sets of well rehabilitation equipment, 2 units of support vehicle for well rehabilitation and 10 units of service truck for deep well construction shall be mobilized/procured either by the private sector or LGUs (details are referred to Supporting Report).

Selection of well drilling machine

An appropriate type of well drilling machine with its specifications shall be selected after comprehensive study on the technical requirements, local capability in O&M of the machine and cost effectiveness.

From the technical viewpoint, geological conditions in the province allow for the use of either rotary or percussion type drilling machine (no rock drilling is expected). While, in view of economical and O&M experience on the machine in the local area, a percussion type is recommendable. Although, the rotary type machine is quite effective to reduce construction period under soft soil condition, special training on mud-circulation, handling manner, etc. are required together with additional equipment and materials as compared with percussion type. The drilling speed of the percussion type is rather slow, but has advantages in drilling boulder and cobble formations.

One unit of truck mounted percussion drilling machine was considered to be procured in the long-term development period.

(4) Laboratory

Required New Building:

To ensure potability of drinking water supplies, a new laboratory facility in Loreto to cover the remote southern towns of Veruela, Santa Josefa, La Paz and also Loreto will be provided because of the difficulty of transporting the water samples to Prosperidad. Water samples have to be examined on time to avoid unpredictable changes of the quality due to long storage. The new building will have a floor area of 57m^2 to house an examining laboratory, an office space, a storage room and a toilet. Water and power supplies will be provided.

Instrument/Equipment and Other Laboratory Accessory:

Two (2) sets of instrument/equipment will be necessary to undertake regular water quality monitoring and surveillance activities. The distribution would be: 1 set for the upgrading of the existing provincial laboratory, and the other set, to the new laboratory. The new laboratory will also be provided with laboratory accessories such as sink, working table, etc. The following are the requirements:

Item	Unit	Upgrading of Existing Laboratory	New Laboratory
1. Instrument/Equipment			
Turbidity meter	set	1	1
Color meter	set	1	1
pH/Residual chlorine checker	set	1	1
Incubator	set	x	1
Refrigerator	set	1	1
Sterilizer	set	x	1
Portable water quality testing kit	set	1	1
Electric stove	set	1	1
Range hood	set	1	1
2. Glassware/Chemical	set	1	1
3. Accessory			
Sink	set	x	1
Working table	set	x	1
Shelf	set	x	1
Office desk	set	x	1
Chair	set	x	1

8.6.2 Sanitation

This sub-section refers to physical requirements by target year covering household, school and public toilet facilities. Table 8.6.2 presents the required sanitation facilities by target year. Rehabilitation for the sanitation facilities is considered as part of recurrent cost.

(1) Household toilets

Future requirements in the number of household toilets by different type for urban and rural areas were estimated based on the additional households to be served by type of facility both for urban and rural areas by target year (details are referred to Supporting Report).

Table 8.6.2 Sanitation Facilities Required by Target Year

Name of Municipality	Phase I (2003) Requirements													Phase II (2010) Requirements												
	Urban Sanitation								Rural Sanitation					Urban Sanitation								Rural Sanitation				
	No. of Households				No. of Public Sch. Toilets	No. of Public Toilets			No. of Households				No. of Public Sch. Toilets	No. of Households				No. of Public Sch. Toilets	No. of Public Toilets			No. of Households				No. of Public Sch. Toilets
	Flush	Pour Flush	VIP/ Dry	Total		Public Market	Bus/ Jeepney Terminal	Parks/ Playground	Flush	Pour Flush	VIP/ Dry	Total		Flush	Pour Flush	VIP/ Dry	Total		Public Market	Bus/ Jeepney Terminal	Parks/ Playground	Flush	Pour Flush	VIP/ Dry	Total	
Bayugan	1,288		721	2,009	40			2	340		2,902	3,242	58	4,623	1,737		6,360	61					8,273		8,273	89
Bunawan	462	355	204	1,021	11						808	808	17	1,178	361		1,539	17					2,059		2,059	26
Esperanza	194		70	264	4		1		420		1,909	2,329	44	456	176		632	7					5,367		5,367	64
La Paz	172	232	120	524	6		1			712	920	1,632	14	1,165	684		1,849	9					3,673		3,673	22
Loreto	229		81	310	6		1	1			938	938	25	519	194		713	9					2,435		2,435	38
Prosperidad (Capital)	512		405	917	24	1	1		755		2,264	3,019	48	2,515	897		3,412	37	1		2	1,333	4,967		6,300	76
Rosario	150		55	205	3		1	1			1,211	1,211	24	292	70		362	4				1,385	1,504		2,889	35
San Francisco		729	463	1,192	29	2		1	490	234	1,470	2,194	32	2,849	998		3,847	45			1	1,250	2,550		3,800	51
San Luis	98	170	83	351	5	1				735	904	1,639	17	575	248		826	7		1			2,456		2,456	25
Santa Josefa	258	94	98	450	5					1,327	1,356	2,683	27	884	494		1,378	11					5,831		5,831	51
Sibagat	178		136	314	9			1	290		1,070	1,360	24	865	320		1,185	13					2,927		2,927	38
Talacogon	417	523	336	1,276	21	3	1	4			622	622	14	2,378	1,035		3,413	33	1	1	1		2,116		2,116	22
Trento	680		305	985	19	2		1	408		1,223	1,631	25	1,914	693		2,607	29	1	1		92	2,872		2,964	40
Veruela	354	231	133	718	6	1	1	1		1,640	2,117	3,757	32	1,184	650		1,834	11					9,019		9,019	60
Provincial Total	4,992	2,334	3,210	10,536	188	10	7	12	2,703	4,648	19,714	27,065	401	21,400	8,557		29,957	293	3	3	4	4,060	56,049		60,109	637

(2) School toilets

The future requirements in the number of toilet facilities were estimated based on the standard number of students to be served by a 5-unit standard facility and the additional students to be served by target year (details are referred to Supporting Report).

Total required facilities were further broken down into urban and rural areas by applying the percentage share of urban and rural population.

(3) Public toilets

Future requirements in the number of toilet facilities were estimated based on the additional number of toilets for public markets and bus/jeepney terminals located in urban areas (details are referred to Supporting Report).

8.6.3 Urban Sewerage and Solid Waste

Physical requirements for the sewerage facilities are not discussed in this sub-section. Further study shall be conducted in the future.

As reference information, the number of refuse collection trucks is estimated for the urban area in Phase I. Ten (10) additional units of truck are required to meet assumed service coverage as reflected in Table 8.6.3.

Table 8.6.3 Number of Refuse Collection Trucks Required in Phase I

Name of Municipality	Additional Urban Households to be Served	Estimated Daily Amount of Refuse to be Generated, (Kg)	Number of Collection Truck Required
Bayugan	4,661	1,949	1
Bunawan			
Esperanza	527	221	1
La Paz	899	376	1
Loreto			
Prosperidad (Capital)	998	418	1
Rosario	416	174	1
San Francisco			
San Luis	620	260	1
Santa Josefa	57	24	1
Sibagat	273	115	1
Talacogon	2,517	1,053	1
Trento			
Veruela	1,001	419	1
Provincial Total	11,969	5,009	10

8.7 Identification of Priority Projects for Medium-Term Development Plan

In general, the present service coverage by municipality with reference to the target coverage indicates the direction of development effort for implementing PW4SP with municipal priorities.

Specific projects shall be selected subject to detailed studies and will not be discussed in the provincial master plan. In addition, pertinent information to identify priority projects is not available both at provincial and municipal level during this PW4SP preparation, except some future expansion work for WDs.

The general criteria for identifying priority projects as guide for implementing the PW4SP are summarized below.

The first level of priority should be given to projects with positive feasibility studies and identified funding. Next level of priority should be given to projects with positive feasibility studies, although no funding source has been identified. The third level should be for which feasibility study has been conducted. Within each level, if funds were insufficient, a ranking could be carried out applying some factors, such as willingness to pay, water-related diseases status and per capita cost. Under the above-mentioned conditions, the implementors should prepare a list of projects.

Due attention shall be paid on the importance of integrated development of relevant sub-sectors to maximize the effects and benefits through simultaneous implementation of water supply and sanitation projects. On a municipal level priority, synthetic evaluation of sector components for concerned municipalities (which is studied in the financial arrangements, Chapter 11) may be used for implementation arrangements.