CHAPTER 2

PROJECT AREA

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CHAPTER 2 PROJECT AREA

2.1 Climate and Geophysical Environment

The North Mankwe Feasibility Study Area is shown on the Project Location Map. The Area comprises four discrete rural areas lying within Mankwe Magisterial District of North West Province.

Vegetation is predominantly bushveld although a variety of veld types are represented. Average annual rainfall is approximately 420 mm and summer rainfall predominates falling mainly between October and March. Annual average evaporation is around 2,500 mm and is higher in summer than in winter and annual monthly temperatures vary from 12 to 25o C. Prevailing winds are light to moderate in a northeasterly direction, occasionally southeasterly in winter, and typical wind speeds are 2.7 to 3.8 m/s.

The four areas lie within the Crocodile River basin and also drain to the Bierspruit and Brakspruit that are tributaries of the Crocodile River.

The Area does not include any Nature Reserves or National Parks which merit particular consideration from an environmental perspective.

2.2 Present Water Supply Conditions

Within the FS Area the existing sources of water for domestic use comprise groundwater (86%) and water vendor (11%), while untreated surface water is also used in some parts for domestic purposes. Water vendors can be seen where groundwater is inadequate in terms of quality, quantity or both. The source of the water supplied by water vendors is mostly untreated surface water and partly groundwater.

Almost 50% of the existing boreholes for which information regarding depth is available are less than 60 m deep. The depth to groundwater rest level is less than 30 m in 85% of the boreholes for which information is available. As a result these boreholes are quite susceptible to human contamination. Most of the boreholes in use provide a point supply source without reticulation pipes and are equipped with either a diesel engine (52%), a handpump (39%) or with a windmill (9%). Electric motor drives were used in some areas in the past but are now seldom used. More than half of the borehole users (54%), who answered the JICA

quetionnaire survey conducted in March 1997 replied that they experience frequent problems regarding the operation and maintenance of the boreholes. Mechanical breakdown of pumps was cited as the major cause of the problems.

The quality and yield of groundwater is generally unsatisfactory and in many cases inadequate. High concentration of nitrates or fluorides and instances of faecal contamination are common. Accessibility (the probability of a borehole yielding more than 0.1 l/s) is less than 40% while exploitability (the probability of a borehole yielding more than 2 l/s) is as low as 10 to 30%.

The current average monthly water consumption per household is 1,731 litres which, in terms of average per capita water consumption, is 9.1 lcd assuming 6.4 persons per household.

2.3 Socio Economic Conditions

The North Mankwe Area comprises 24 communities and has an estimated 9,436 households or a population of 60,390 based on 6.4 persons per household.

The area is essentially rural in nature but includes several chrome and platinum mines. The development axis from Rustenburg to Thabazimbi runs between the four areas and the Pilannesburg, a centre for tourism, is located to the south.

Although some arable and cattle farming takes place a significant number of the residents commute to urban centres such as Rustenburg or even Johannesburg or else they work in the mines (around 65%), while others rely on pension income (20%) or income remitted from urban areas.

The average monthly income indicated by the JICA survey was R1,216 per household. On average residents are paying water vendors R35.60 per month or if they obtain water from boreholes, they are paying R7.60 per month. The average willingness to pay for the RDP level of service was R8.30 per household per month however for yard connections, the figure per household was R29.60 per month.

Around 94% of the households who answered the JICA questionnaire survey expressed the view that water supply is a higher priority than sanitation. Women and children play a central role in the management (fetching and storing) of household water in 73% of the households that responded.

2.4 Institutional Situation

2.4.1 First and Second Tiers

In terms of the Second Tier, the North Mankwe Area is similar to the Klipvoor Area except that it is closer to the traditional areas of operation of MW. Magalies Water and the Department of Water Affairs and Forestry (DWAF) are the key stakeholders with DWAF operating at both National and Provincial level. The former Rustenburg Region of NWWA has been retained by MW as a separate business unit based in Mogwase.

The origin of Magalies Water was at Vaalkop and the Board now operates a regional water supply scheme from Vaalkop Dam which supplies to Thabazimbi 80 km to the north, to Sun City on the south side of the Pilannesburg and through Saulspoort on the north side of the Pilannesburg to Mabeskraal 65 km in the west and south west to Rustenburg 50 km away. Work is in hand to provide an additional 90 Mld treatment capacity at Vaalkop as part of the Vaalkop South Water Supply Project and to strengthen the supply to communities around the Pilannesburg. This scheme comprises the Western Business Unit of MW. The head office of MW is in Rustenburg.

2.4.2 Third Tier

Mankwe District, within which the four areas lie, falls under the jurisdiction of Rustenburg District Council which is carrying out planning for a total of six Districts and across a variety of sectors (water, sanitation transport, electricity, communications etc.). To facilitate the planning process the overall District Council area has been sub-divided into zones (e.g. five in Mankwe District) and a Zonal Councillor allocated to each zone. A Zonal Engineer (a firm of consulting engineers) has also been appointed to work for the Council to assess and report on the status quo, develop a Business Plan listing priorities established through consultation with the communities, to act as a focus for planning and to facilitate regional planning. This system is in place and operating.

Figure 2-1 shows the locations of the 24 communities included in this feasibility study. They are grouped into four Supply Blocks (Mokgalwaneng, Ramokokstad, Saulspoort and Sefikile). As can be seen in the figure, Mokgalwaneng and Sefikile Supply Blocks fall under Zone 1 of the Rustenburg District Council whilst Saulspoort and Ramokokstad Supply Blocks fall under Zone 2 and Zone 5 respectively.

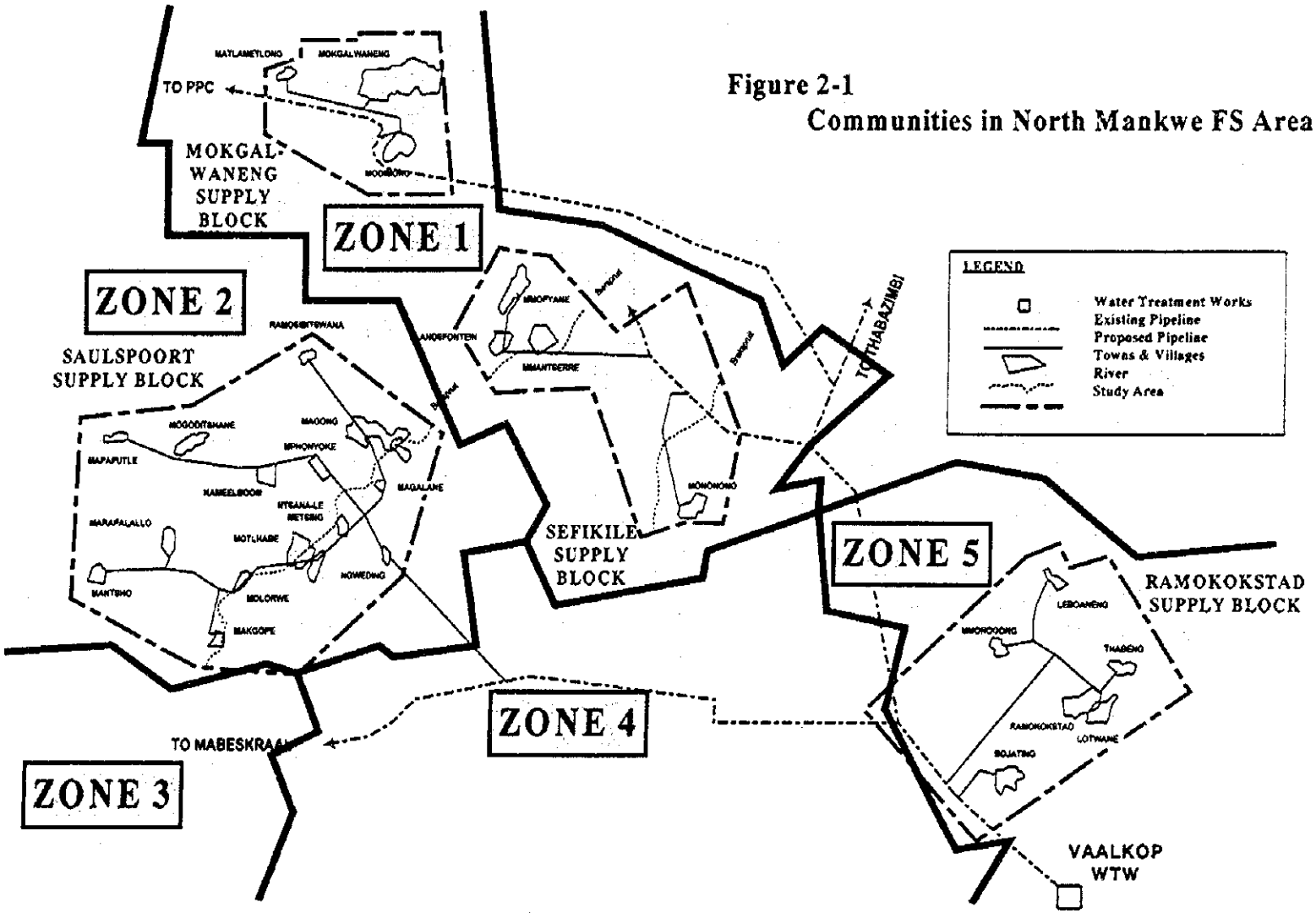

Figure 2-1
Communities in North Mankwe FS Area

CHAPTER 3

WATER DEMAND

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CHAPTER 3 WATER DEMAND

3.1 Population Served

The Study Team conducted a comprehensive study of demographic and socio-economic conditions in the JICA Master Plan Area during 1996. The study envisaged that while movement of the rural population from outside the Master Plan Area to Soshanguve, Wonderboom, Brits, Moretele 1 and Odi 1 will continue, less significant numbers of the rural population living within the Master Plan Area will move out to PWV and other urban areas, and that the overall growth rate of the population in the Area will therefore remain at 2.7 % during the next two decades, slightly higher than the current natural national population growth rate of around 2.3 %.

The Master Plan Study also forecasted that the primary growth will take place in the Pretoria, Ga-Rankuwa, Mabopane and Temba areas in the central region, and that a secondary growth area will be that of Rustenburg in the western region with a growth axis extending up to Monakato - Mogwase - Northam - Thabazimbi.

With regard to the communities in the North Mankwe Area, the Master Plan viewed that there will be no future growth in population, as the natural growth in these communities will be offset by migration of an approximately equal number of people to urban areas.

In February and March 1997, the Study Team conducted extensive surveys of these communities, which included questionnaires regarding the present population and number of households. These surveys were based on interviews with leaders in each community supplemented where necessary by counting the number of houses. Comparison between information obtained from these surveys with the 1/10000 scale ortho-photos of the communities taken in 1989 reinforced the view adopted during the master plan, in that virtually no increase in the number of households in these communities was observed. For this reason, it is also assumed in this Feasibility Study that there will be no growth of population in these communities in the future.

Table 3-1 shows the population and number of households estimated for each of the communities included in the FS Area. In this Feasibility Study it is assumed that the water supply plan proposed will serve all of the population enumerated in the table.

Table 3-1 Population, Level of Service & Water Demand for North Mankwe

North Mankwe		Number of Households	Population	Water Demand (AADD in l/day)*			
				Service Level A	Service Level B		
				100%	90 % Y.C. + 10 % S.P.***		
Settlement	Alternative Name			RDP **	Y.C.	S.P.	Total
1 Matiametiong		80	512	15,360	39,444	1,536	40,980
2 Mokgalwaneng	Mokgalwana	1,050	6,720	201,600	517,709	20,160	537,869
3 Modimong	Disake	260	1,664	49,920	128,195	4,992	133,187
Sub-Total for Mokgalwaneng		***1,390***	***8,896***	***266,880***	***685,348***	***26,688***	***712,036***
4 Mmopyane		700	4,480	134,400	345,139	13,440	358,579
5 Elandsfontein		366	2,342	70,272	180,458	7,027	187,486
6 Mmantserre	Varkensviel/Mahobiestad	400	2,560	76,800	197,222	7,680	204,902
7 Mononono		1,500	9,600	288,000	739,584	28,800	768,384
Sub-Total for Sefikile		***2,966***	***18,982***	***569,472***	***1,462,404***	***56,947***	***1,519,351***
8 Bojating		350	2,240	67,200	172,570	6,720	179,290
9 Ramokokstadt	Ga-Ramokoka/Lotwane/Thabeng	1,269	8,122	243,648	625,688	24,365	650,053
10 Mmorogong		220	1,408	42,240	108,472	4,224	112,696
11 Leboaneng		215	1,376	41,280	106,007	4,128	110,135
Sub-Total for Ramokokstad		***2,054***	***13,146***	***394,368***	***1,012,737***	***39,437***	***1,052,174***
12 Mapaputie	Schoongezincht	216	1,382	41,472	106,500	4,147	110,647
13 Mogoditshane	Vlaksplaats	206	1,318	39,552	101,570	3,955	105,525
14 Marapalallo	Dekameelkuil	150	960	28,800	73,958	2,880	76,838
15 Mantsho	Moskietdogrens	155	992	29,760	76,424	2,976	79,400
16 Makgope	Groenfontein	136	870	26,112	67,056	2,611	69,667
17 Molorwe	Bierkraal	258	1,651	49,536	127,208	4,954	132,162
18 Motlhabe		616	3,942	118,272	303,722	11,827	315,550
19 Ntsanalemetsing	Welgewaagd	142	909	27,264	70,014	2,726	72,740
20 Ngweding		136	870	26,112	67,056	2,611	69,667
21 Magalane		69	442	13,248	34,021	1,325	35,346
22 Magong	Rhenosterkraal/Ngokwane	747	4,781	143,424	368,313	14,342	382,655
23 Kameelboom	Mphonyoke	178	1,139	34,176	87,764	3,418	91,182
24 Ramosibitswana		17	109	3,264	8,382	326	8,708
Sub-Total for Saulspoort		***3,026***	***19,366***	***580,992***	***1,491,987***	***58,099***	***1,550,087***
TOTAL		**9,436**	**60,390**	**1,811,712**	**4,652,476**	**181,171**	**4,833,648**

* : including an allowance of approximately 15% for leakage

** : per capita consumption for RDP level : 30 lcd

**' : Yard Connection, per capita consumption : 85.6 lcd

: Standpipe, per capita consumption : 30.0 lcd

: weighted average per capita consumption: 80.0 lcd

3.2 Level of Service

In the Phase 1 Master Plan Study it was envisaged that the level of service required in these communities would mostly be the RDP minimum so the preliminary water supply infrastructure development plans were prepared for these communities primarily on the basis of the RDP level of service.

However, surveys conducted by the JICA Study Team in February and March 1997 clearly indicated that communities are demanding a water supply through yard connections rather than through standpipes, and that they are willing to pay a higher price for this higher level of service.

Generally, communities express dissatisfaction with the RDP level of service and show a preference for supply through yard connections. In some areas, communities have rejected newly installed RDP water supply schemes and, in some extreme cases, the facilities have been vandalized. Such communities cite the following as the major reasons for their rejection of the RDP standpipe supply.

- A long cartage distance
- A uniform water charge per household being applied irrespective of the actual consumption rate of each household

Experience indicates that community acceptance of the service level is the key to the success of a water supply project, including achieving cost recovery. On the other hand, it is still questionable whether or not communities can actually afford to pay for the level of service they are demanding. A decision regarding the appropriate service level can only be made after the following two parameters have been assessed.

- the level of the water tariff which needs to be levied to recover both capital and operational costs
- the level of affordability

In the provision of water supply, it has been the clear policy of the new South African Government that it will subsidize the full capital cost for providing the RDP level of service (25 lcd and 200 m cartage distance), but that if communities want a higher level of service, they should pay for any additional costs which are necessary to acquire such a service.

Not withstanding this, the following has also been the policy of the Government for the planning and funding of RDP water supply schemes.

- Even for a water supply scheme based on the RDP level of service, certain components of the infrastructure should be constructed with a larger capacity from the outset, as this will facilitate the future upgrading of the service level. The capital cost for providing this extra capacity will also be fully subsidized by the Government.

- Such infrastructure includes raw water conduits, clear water bulk pipelines, clear water distribution mains between service reservoirs and reticulation systems, as well as other infrastructure for which the incremental capital cost of providing a slightly larger capacity is marginal at the time of initial construction but much higher if done at a later stage. Pumping stations, water treatment works, reservoirs and reticulation systems are not included under this policy, as they can readily be constructed on an incremental basis and can be easily upgraded in the future by adding extra units or additional pipes.

- The extra capacity to which this Government policy is applicable is for yard connections with a per-capita consumption rate of approximately 80 lcd on an annual average daily demand (AADD) basis.

Against the background mentioned above, the Study Team developed the following two levels of service for estimating water demands and the subsequent planning of infrastructure.

Service Level A : 100% of households in the community will be supplied through standpipes at the RDP level of service at an average consumption rate of 30 lcd (AADD) including an allowance of approximately 15% for leakage.

Service Level B : 90% of households in the community will be supplied through yard connections (85.6 lcd) and the remaining 10% through standpipes (30 lcd) in accordance with the RDP level of service, giving a weighted average per capita consumption rate of 80 lcd (AADD) including an allowance of approximately 15 % for leakage.

Households that will still be supplied through standpipes for Service Level B are those around the periphery of a community. The extension of the reticulation to such households is not economically viable, as it would result in a significant increase in the reticulation cost.

3.3 Water Demand

The per capita consumption rate of water is an important factor that determines the size of water demand. In general, the rate gradually increases as the standard of living improves. A planning horizon of approximately 10 years or so is therefore usually adopted for a feasibility study to estimate the future water demand based on which the size or capacity of infrastructure is determined.

As mentioned earlier in Section 3.2, the survey conducted by the Study Team in February and March 1997 provided a different perspective to this. The real issue was identified as being not the gradual increase of a per capita consumption rate, but rather the matter of whether water supply should, from the outset, be planned on the basis of RDP standpipes or on the basis of yard connections. The survey indicated that the expectation of communities is already higher than the RDP level of 25 lcd, and that the important question therefore is whether or not communities can actually afford to pay for the level of service they are demanding.

The average water consumption rate of 25 lcd (85% of 30 lcd) assumed for standpipe is not likely to increase in the future, given the labour intensive nature of water cartage. Similarly it is also unlikely that the average per capita consumption rate of 73 lcd (85% of 85.6 lcd) assumed for yard connections will increase significantly within the next decade. In terms of summer peak day demand, these consumption rates are 38 lcd (150% of 25 lcd) and 110 lcd (150% of 73 lcd) respectively assuming a peak day factor of 1.5.

For the reasons mentioned above, no provision has been made for the future increase of these per capita water consumption rates. Instead water demand was estimated for each of the two service levels discussed in Section 3.2 using the assumed population served mentioned in Section 3.1.

Table 3-1 shows the water demand estimated for each of the two service levels. The figures shown in the table were presented both in the Project Execution Group (PEG) Meeting held in Rustenburg on 20 March 1997 and in the Project Steering Committee (PSC) Meeting held in Pretoria on 25 March 1997 and they were accepted by all of the stakeholders for use by the Study Team for the subsequent infrastructure planning and other purposes associated with the Feasibility Study. The same figures were also included in the Interim Report that was issued by the Study Team in July 1997 and accepted by the stakeholders in the joint PSC/PEG meeting held in Pretoria on 29 July 1997.

CHAPTER 4

PROPOSED WATER SUPPLY PLAN AND CONSTRUCTION COST

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CHAPTER 4 PROPOSED WATER SUPPLY PLAN AND CONSTRUCTION COST

4.1 Assumptions for Planning of Infrastructure

Technical assumptions used in this Feasibility Study have been discussed with key stakeholders such as DWAF and Magalies Water. Those assumptions were first prepared during the Phase 1 Study and compiled in the Databook of the Mater Plan Study Final Report which was issued in December 1996; during this Feasibility Study, they have been further reviewed and refined in conjunction with the stakeholders for finalisation. Major technical assumptions used in this Feasibility Study for planning infrastructure are compiled in A.1 of Annex A.

4.2 Proposed Water Supply Plan and Availability of Raw Water

4.2.1 Proposed Water Supply Plan

The water supply plan proposed for this FS Area is shown in Figure 4-1. A summary of the proposed infrastructure and the associated costs are shown in Tables 4-1 and 4-2 for each level of service. The overall bulk supply plan and the supplies to each community are presented schematically in Figures A.2-1 through A.2-5 of Annex A. Tables A.3-1 through A.3-7 of Annex A provide greater detail of the proposed infrastructure and the estimated costs.

Under the proposed water supply plan, all of the communities in the North Mankwe FS Area will be supplied from the Vaalkop WTW. Current planning is already in hand to construct a 90 Mld extension of Vaalkop WTW which will be able to accommodate the Service Level B water demand of 7.25 Mld. The existing 900 mm diameter rising main from the treatment works has spare capacity over a distance of 6 km as far as the Doornhoek offtake but beyond this a new 350 mm is required which would be laid in parallel with the existing mains to La Patrie, the principle regional reservoir for the Vaalkop North system. En route, a new 200 mm pipeline will head in a northeastery direction to a planned central reservoir at Leboaneng, which will serve all of the communities lying within the Ramokokstad Supply Block (except Bojating) by gravity. Fixed planning is in place to supply Bojating from the rising main between Vaalkop and La Patrie. At La Patrie, Magalies Water plan to construct an additional 25 Ml of storage to meet rising demand within the existing supply area: the additional demand required for the FS Area (excluding the Ramakokstad Supply Block which is supplied directly

from Vaalkop WTW) can be met from this expansion.

From La Patrie the existing bulk mains serving Saulspoort and the other communities along the northern side of the Pilannesburg are already over committed. Magalies Water therefore plan to construct a new 350 mm diameter gravity pipeline which will connect the regional reservoir to Mabeskraal following the route of the existing pipelines. This planned pipeline will accommodate the additional demand required for the Saulspoort Supply Block. Near Ga Raphiri a new booster pumping station will be constructed and the 250 mm diameter rising main will head in a northwesterly direction to Ngweding where a regional reservoir will be constructed to serve the FS communities lying within the Saulspoort Supply Block. Downstream of Ngweding, the gravity pipeline bifurcates running to the northeast and southwest following the Bierspruit.

The route to the northeast will supply the communities of Magalane and Magong with a pumped supply to Ramoshibitswana. The pipeline to the southwest again splits with a northwesterly fork supplying Mphonyoke, Kameelboom, Mogoditshane and a pumped supply to Mapaputle. The pipeline, which continues to the southwest, supplies Ntsana-le-metsing and Motlhabe with a pumped supply to Molorwe, Makgope, Marapalallo and Mantsho.

From La Patrie, the remainder of the North Mankwe Area is supplied by utilising spare capacity in the 19.5 km long 700 mm diameter main towards Thabazimbi.

The Sefikile Supply Block will utilize spare capacity in the twin 350 mm diameter pipelines running from the Thabazimbi offtake to the existing Spitskop Regional Reservoir. This reservoir also has adequate capacity to accommodate the additional demand. Downstream of Spitskop RR the existing gravity pipelines to Rustenburg Platinum Mines (RPM) have sufficient spare capacity to meet the additional demand and will be utilised over a distance of 5.4 km. After Spitskop RR a new branch is required to Mononono and in order to supply Mmantsere, Elandsfontein (Mmpoyane South) and Mmpoyane, a booster pumping station would be constructed close to the RPM offtake and a new rising main would be required.

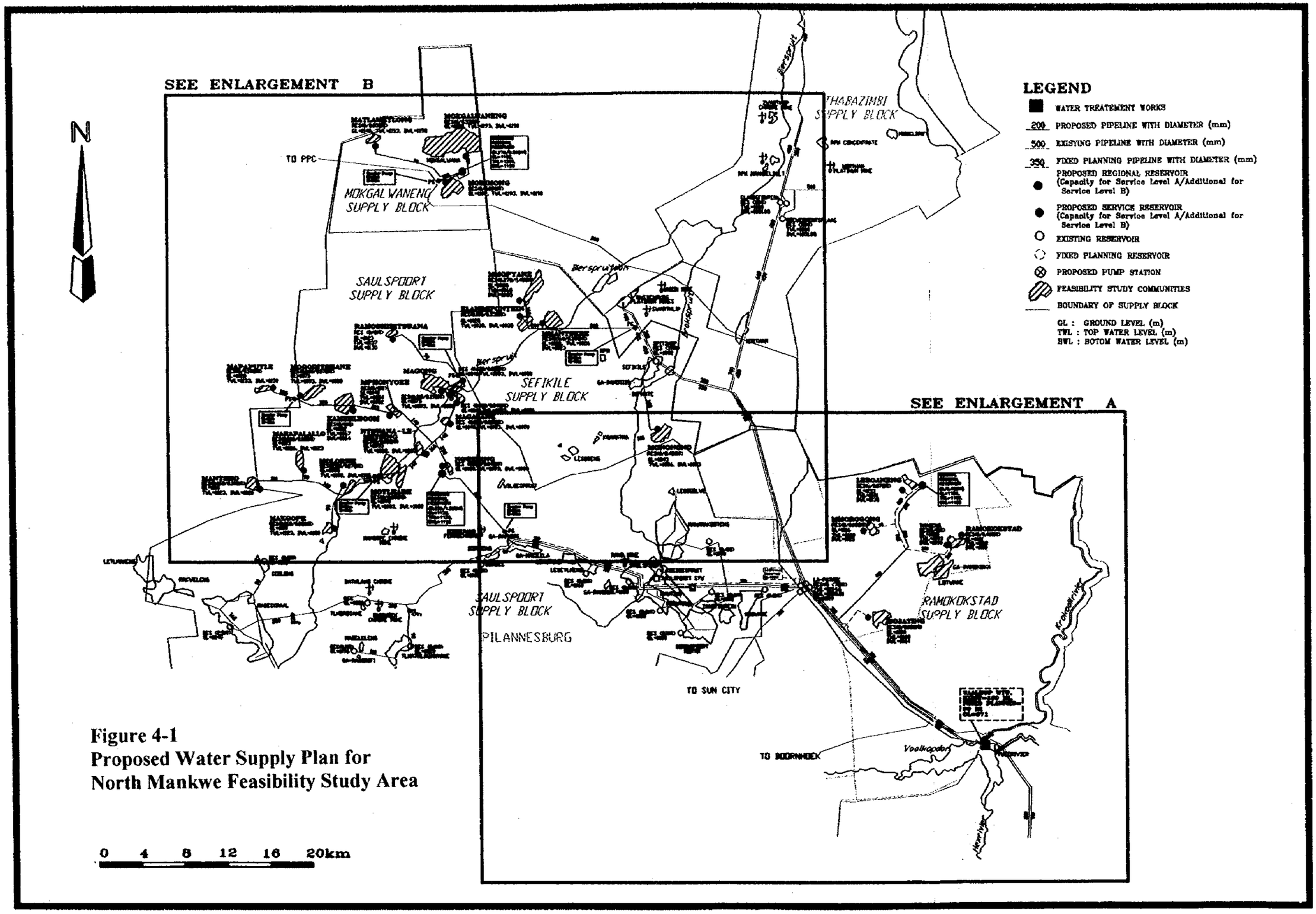

Figure 4-1
Proposed Water Supply Plan for
North Mankwe Feasibility Study Area

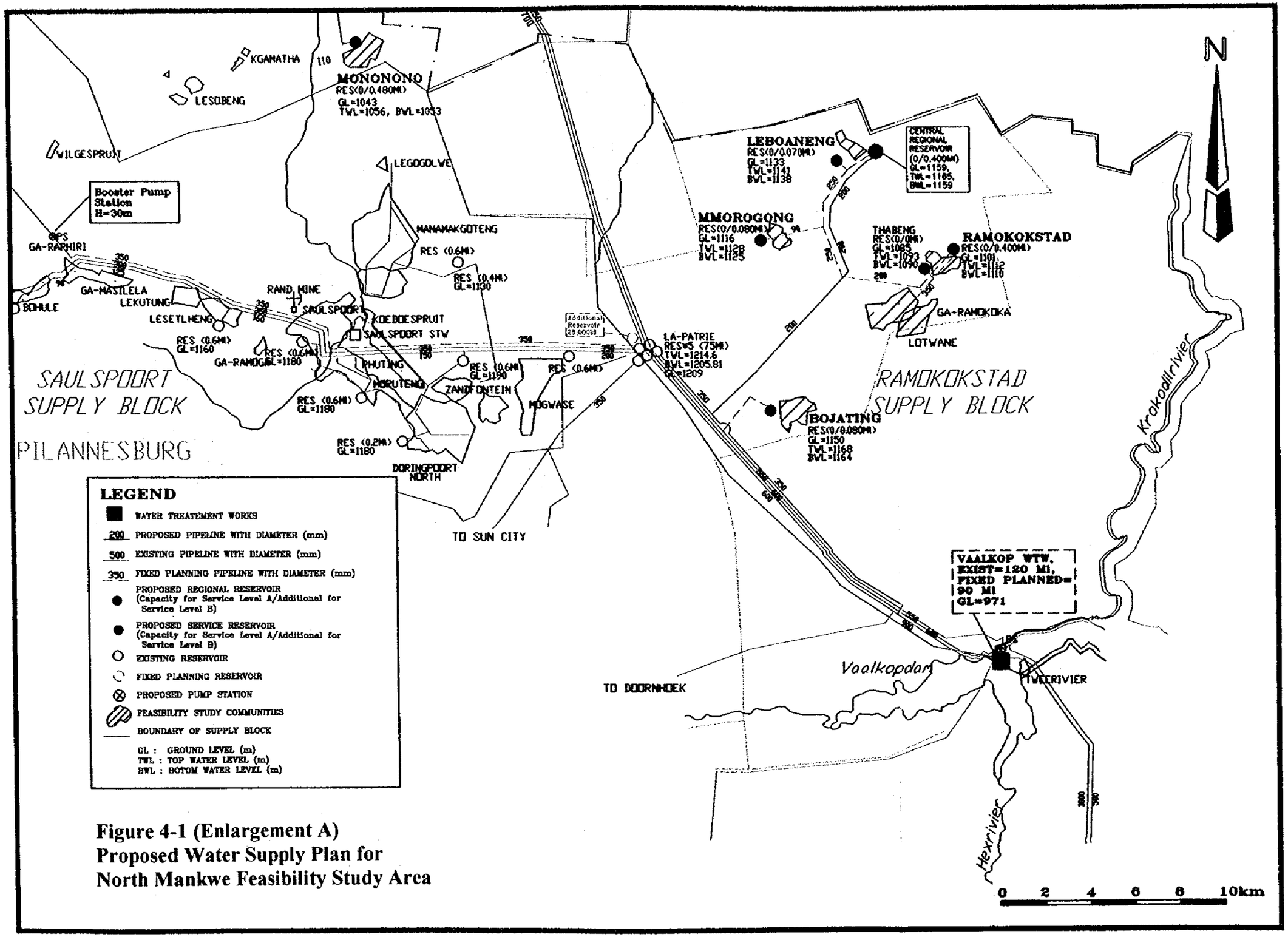

Figure 4-1 (Enlargement A)
Proposed Water Supply Plan for
North Mankwe Feasibility Study Area

Figure 4-1 (Enlargement B)
Proposed Water Supply Plan for North Mankwe Feasibility Study Area

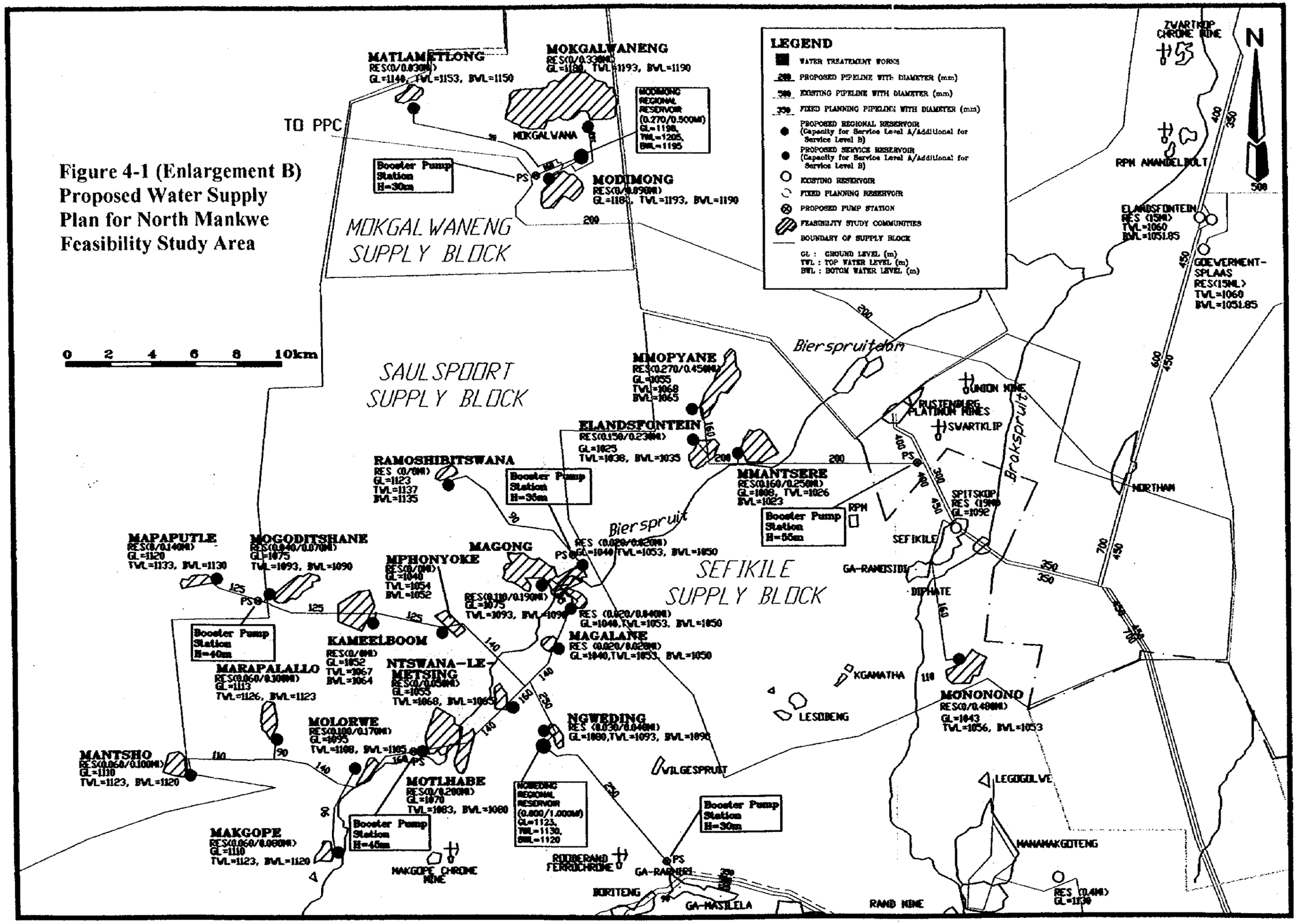

Table 4-1 Summary of Water Supply Plan (Service Level B)

NORTH MANKWE

ITEM			MOKGAL-WANENG	SEFIKILE	RAMOKOK-STAD	SAULS-POORT	TOTAL
POPULATION AND WATER DEMAND							
No. of Communities		nos.	3	4	4	13	24
No. of Households		nos.	1,390	2,966	2,054	3,026	9,436
Population		person	8,896	18,982	13,146	19,366	60,390
Ave. No. of Persons per Household		person	6.4	6.4	6.4	6.4	6.4
Pop. Served by Yard Connection		person	8,006	17,084	11,831	17,429	54,350
Pop. Served by Standpipe		person	890	1,898	1,315	1,937	6,040
Total Water Demand (AADD)		kL/day	712	1,519	1,052	1,550	4,834
Total Water Demand (SPDD)		kL/day	1,068	2,279	1,578	2,325	7,250
OUTLINE OF PROPOSED INFRASTRUCTURE							
BULK SUPPLY INFRASTRUCTURE							
Source of Water			N.A.	N.A.	Vaalkop Dam	N.A.	
Raw Water Supply Pipeline	250 mm	km	N.A.	N.A.	1	N.A.	1.0
Water Treatment Works/Pump Stations		mL/day	N.A.	N.A.	7.25	N.A.	7.3
Regional Reservoirs	0.3 to 1.0 Ml	nos. of tank	2	0	1	2	5
Bulk Supply Pipelines	90 to 350 mm	km	13	26	33	80	151
Pump Stations		nos.	1	1	0	4	6
RETAIL SUPPLY INFRASTRUCTURE							
Service Reservoirs	20 to 480 m3	nos. of tank	3	7	4	23	37
Reticulation Pipelines	63 to 200 mm	km	30	42	17	101	190
Yard connections		nos.	1,251	2,669	1,849	2,721	8,490
Standpipes		nos.	7	28	0	54	89
CAPITAL COST OF PROPOSED INFRASTRUCTURE							
BULK SUPPLY INFRASTRUCTURE							
Intake/Pump Station		x 1,000 R	N.A.	N.A.	280	N.A.	280
Raw Water Pipeline		x 1,000 R	N.A.	N.A.	292	N.A.	292
Water Treatment Works/Pump Stations		x 1,000 R	N.A.	N.A.	4,201	N.A.	4,201
Bulk Supply Pipelines		x 1,000 R	4,141	6,291	11,159	12,300	33,891
Regional Reservoirs		x 1,000 R	550	0	1,364	870	2,784
Pump Stations		x 1,000 R	56	167	0	336	559
Sub-Total		*x 1,000 R*	*4,747*	*6,458*	*17,296*	*13,506*	*42,007*
RETAIL SUPPLY INFRASTRUCTURE							
Service Reservoirs		x 1,000 R	385	1,400	530	2,180	4,495
Reticulation Pipelines		x 1,000 R	2,171	2,967	1,278	6,452	12,867
Yard Connections		x 1,000 R	1,314	2,802	1,941	2,857	8,915
Standpipes		x 1,000 R	11	45	0	86	142
Sub-Total		*x 1,000 R*	*3,880*	*7,214*	*3,749*	*11,575*	*26,419*
Total		**x 1,000 R**	**8,627**	**13,672**	**21,045**	**25,081**	**68,426**

Table 4-2 Summary of Water Supply Plan (Service Level A)

NORTH MANKWE

ITEM			MOKGAL-WANENG	SEFIKILE	RAMOKOK-STAD	SAULS-POORT	TOTAL
POPULATION AND WATER DEMAND							
No. of Communities		nos.	3	4	4	13	24
No. of Households		nos.	1,390	2,966	2,054	3,026	9,436
Population		person	8,896	18,982	13,146	19,366	60,390
Ave. No. of Persons per Household		person	6.4	6.4	6.4	6.4	6.4
Pop. Served by Yard Connection		person	0	0	0	0	0
Pop. Served by Standpipe		person	8,896	18,982	13,146	19,366	60,390
Total Water Demand (AADD)		kl/day	267	569	394	581	1,812
Total Water Demand (SPDD)		kl/day	400	854	592	871	2,718
OUTLINE OF PROPOSED INFRASTRUCTURE							
BULK SUPPLY INFRASTRUCTURE							
Source of Water			N.A.	N.A.	Vaalkop Dam	N.A.	
Raw Water Supply Pipeline	250 mm	km	N.A.	N.A.	1	N.A.	1.0
Water Treatment Works/Pump Stations		mL/day	N.A.	N.A.	2.72	N.A.	2.7
Regional Reservoirs	0.3 to 0.6 ML	nos. of tank	1	0	0	1	2
Bulk Supply Pipelines	90 to 350 mm	km	13	26	33	80	151
Pump Stations		nos.	1	1	0	4	6
RETAIL SUPPLY INFRASTRUCTURE							
Service Reservoirs	20 to 160 m3	nos. of tank	0	3	0	10	13
Reticulation Pipelines	63 to 200 mm	km	17	20	8	39	84
Yard connections		nos.	0	0	0	0	0
Standpipes		nos.	20	36	0	70	126
CAPITAL COST OF PROPOSED INFRASTRUCTURE							
BULK SUPPLY INFRASTRUCTURE							
Intake/Pump Station		x 1,000 R	N.A.	N.A.	151	N.A.	151
Raw Water Pipeline		x 1,000 R	N.A.	N.A.	292	N.A.	292
Water Treatment Works/Pump Stations		x 1,000 R	N.A.	N.A.	1,574	N.A.	1,574
Bulk Supply Pipelines		x 1,000 R	4,141	6,291	11,159	12,300	33,891
Regional Reservoirs		x 1,000 R	230	0	420	350	1,000
Pump Stations		x 1,000 R	37	76	0	189	302
Sub-Total		*x 1,000 R*	*4,408*	*6,367*	*13,596*	*12,839*	*37,210*
RETAIL SUPPLY INFRASTRUCTURE							
Service Reservoirs		x 1,000 R	0	505	0	780	1,285
Reticulation Pipelines		x 1,000 R	1,432	1,677	742	2,896	6,746
Yard Connections		x 1,000 R	0	0	0	0	0
Standpipes		x 1,000 R	32	58	0	112	202
Sub-Total		*x 1,000 R*	*1,464*	*2,239*	*742*	*3,788*	*8,233*
Total		**x 1,000 R**	**5,872**	**8,606**	**14,338**	**16,627**	**45,443**

To serve the Mokgalwaneng Supply Block, a further length of the existing 700 mm diameter Thabazimbi pipeline would be utilised from the Thabazimbi offtake as far as the Northam offtake. At Northam there is an existing 200 mm diameter rising main owned by PPC which supplies their cement factory which is located in Dwaalboom to the west of the communities within the Mokgalwaneng Supply Block. It is proposed that spare capacity in this pipeline be utilised over a distance of 36 km. At the offtake, a booster pumping station would be required which would feed a regional reservoir in Modimong. From the regional reservoir, service reservoirs in the three communities of Mokgalwaneng, Matlametlong and Modimong would be supplied by gravity.

The following briefly describes the methodologies adopted by the Study Team in developing the above water supply plan.

(1) Bulk Infrastructure

As stated previously, the North Mankwe Area differs from the two other FS areas as there is extensive existing water supply infrastructure. This feasibility study has been concerned with extending the existing system into unserved areas rather than providing a completely new system. As a result it will be possible to utilise the existing infrastructure for some components of the water supply scheme. A detailed analysis was conducted to determine whether spare and unallocated capacity exists which could be utilised for the feasibility study. The results of this analysis were discussed with Magalies Water and refined accordingly.

Magalies Water operates a regional water supply scheme from Vaalkop WTW which includes supplies to Thabazimbi 80 km to the north; Rsutenburg Platinum Mine (RPM) in Swartklip 50 km to the northwest; and through Saulspoort on the north side of the Pilannesburg to Mabeskraal 65 km in the west. Pretoria Portland Cement (PPC) in Dwaalboom operates a 200 mm bulk supply line, which is connected to the MW pipeline from Vaalkop to Thabazimbi at Northam.

A detailed analysis by the Study Team, the findings of which were subsequently confirmed by Magalies Water, indicated that some of the infrastructure currently has a spare and unallocated capacity that can be utilised for supplying communities in the FS Area. Such infrastructure includes:

- The 900 mm pipeline between Vaalkop WTW and the Doornhoek offtake
- The 700 mm pipeline between La-Patrie Regional Reservoir and the Thabazimbi offtake
- The 700 mm pipeline between the Thabazimbi offtake and the Northam offtake
- The twin 350 mm pipelines between the Thabazimbi offtake and Spitskop Regional Reservoir
- The 450 (partly 400) mm and 300 mm twin pipelines between Spitskop Regional Reservoir and the RPM offtake at Swartklip
- The 200 mm pipeline between the Northam offtake and PPC in Dwaalboom
- Spitkop Regional Reservoir

In the meantime, Magalies Water informed the Study Team that:

- Planning is now in hand to strengthen the current supply to Vaalkop South, Sun City and the Saulspoort area, as the water demands in these areas are approaching the limit of the existing infrastructure capacity;
- This work includes a 90 Mld extension of the existing Vaalkop WTW which currently has a capacity of 120 Mld, construction of an additional 25 Ml reservoir at La-Patrie which will increase the capacity of the regional reservoir to a total of 100 Ml, and construction of a new 350 mm bulk supply main from La-Patrie to Mabeskraal; and
- This new infrastructure will have sufficient capacity, not only to strengthen the current supply to the areas mentioned above, but also to meet the projected water demand for the FS communities.

Against the background mentioned above, the Study Team developed a bulk water supply plan in which both existing and planned infrastructure that was found to have sufficient spare capacity is utilised. A cost was included for sharing the existing and

planned infrastructure that was calculated on the following basis.

Sharing Cost = A x (B/C)

where,

A: Current Construction Cost

B: Water Demand for FS Communities

C: Capacity of Existing Infrastructure

Where there is no existing or planned infrastructue in place, or there is no spare capacity, new infrastrucutre was planned and costed. Bulk supply pipelines were routed on 1/50,000 scale standard maps and 1/10,000 scale ortho-photos. The routes selected followed existing roadways to minimize both the amount of land acquisition that is necessary and adverse impacts of pipeline construction on the environment. The routes selected were plotted on the 1/10,000 scale ortho-photos and nodes were defined, at offtake points to service reservoirs and at high points along the pipeline routes, and allocated numbers. The distance between adjacent nodes was measured on the ortho-photos and node elevations were recorded.

All of the above information was used as the inputs to a series of hydraulic analyses that were conducted on the basis of Service Level B. The purpose of the analyses was to ensure that the dynamic water pressure will always remain higher than the ground elevation along the proposed bulk supply pipeline routes, and that the summer peak day demand can be met in each community. This exercise determined the size of bulk supply pipelines as well as the head where pumping was found to be necessary.

The water supply plan was first developed on the basis of Service Level B and then re-examined on the basis of the Service Level A. Pumping stations, Vaalkop WTW and reservoirs were planned or sized to meet the RDP level of service and the capital cost required to implement the same bulk water supply scheme but on the basis of the RDP level of service was then calculated. The difference in capital cost between the two different levels of service was then obtained.

(2) Retail Infrastructure

Unlike the other two feasibility study areas, many initiatives promoted by DWAF and MW for providing the RDP level of service (25 lcd within 200 m) are already under

way in this FS Area. Most of these schemes are based on groundwater with standpipe reticulation.

With respect to the implementation of RDP water supply projects, FS communities were classified into the following five categories.

- Type A: communities in which a RDP program has already been implemented
- Type B: communities in which a RDP program is currently being implemented
- Type C: communities for which fixed planning has already been prepared
- Type D: communities for which planning is currently under preparation
- Type E: communities for which no planning has taken place to date

Table 4-3 shows the present status of each community included in this FS Area.

Drawings showing RDP schemes were collected for each community categorised as Type A, B or C according to the above definitions and lengths and diameters of pipelines and the number of standpipes were identified.

As a general principle, it was assumed that all of the infrastructure shown in these drawings, except for the boreholes, will be integrated and will form part of the proposed water supply plan under this Feasibility Study. It is proposed that boreholes should either be held in reserve as a source of potable supply for emergency use or should be used for stock watering and other non-domestic purposes.

Although it is generally assumed that infrastructure shown in these drawings will adequately meet the RDP level of service, each scheme was assessed and, where necessary, additional allowances were included in the cost of the proposed water supply plan (Service Level A). In the case of Service Level B, costs for additional reticulation pipes and yard connections were added to the cost of Service Level A.

In communities classified as Type D or E, most of existing boreholes are being used as point sources of supply without any reticulation. For this reason, a new retail water supply plan comprising a service reservoir and reticulation system was developed for

Table 4-3 Status of FS Communities in North Mankwe (As of Sep. 1997)

ZONE	COMMUNITY	CLASSIFICATION				
		Type A	Type B	Type C	Type D	Type E
1	Modimong	O				
	Mokgalwaneng(Mokgalwana)	O				
	Matlametlong			O		
	Mmanstsere					O
	Elansfontein					O
	Mmopyane					O
	Mononono			O		
2	Ngweding					O
	Ntsana-Le-Metsing			O		
	Mothhabe			O		
	Molorwe					O
	Magope					O
	Marapalallo				O	
	Mantsho					O
	Mogodishane					O
	Mapaputle			O		
	Magalane					O
	Magong (Renosterkraal)				O	
	Ramosibitswana		O (JICA)			
	Kameelboom (Mphonyoke)		O (JICA)			
5	Bojating			O		
	Ramokokstad (Lotwane, Ga-Ramokoka, Thabeng)		O			
	Mmorogong			O		
	Leboaneng			O		

each community. The FS communities were identified on 1/10,000 ortho-photos and a location was selected for a service reservoir on high ground either within or immediately adjacent to each community. Water will be supplied to these service reservoirs through a bulk supply pipeline and they will feed the reticulation system in the community by gravity. The capacity of each service reservoir was determined, taking into account the water demand of the community and whether the reservoir is fed by pumping or by gravity. Given the relatively small capacity required to serve most communities, it is planned that most will be pressed cellular steel elevated tanks.

4.2.2 Availability of Raw Water

The Mankwe Feasibility Study Area lies within the Crocodile River system. The only viable source of surface water for the unserved communities in this FS Area is Vaalkop Dam (capacity 55.3 mcm) at the confluence of the Hex, Elands and Crocodile rivers. Vaalkop is operated as part of a system which also comprises Hartbeesport Dam (furthest upstream, capacity 195.0 mcm) and Roodekoppies Dam (also upstream of Vaalkop, capacity 103.0 mcm). The Crocodile catchment receives large volumes of return flows from Pretoria and northern Johannesburg (around 120 mcm/a in the Upper Crocodile catchment on an annual average basis), the level of which is projected to increase in the future with increasing water consumption and the expansion of mains sewerage systems.

During Phase 1 Master Plan Study, a water balance model was used to assess the availability of water in the Master Plan Study Area to meet the projected demands in 2002 and 2015. The model indicated, and DWAF subsequently confirmed, that sufficient water is available for the Vaalkop - Roodekoppies - Hartbeesport system to meet all of the primary water demands in this region; however in the short to medium term (2002 to 2005), there is a projected shortfall in the amount of water available for irrigation which will prevail until the increase in return flows overtakes the increasing demand.

4.3 Preliminary Designs of Major Infrastructure

Under the recommended scheme for the North Mankwe Area, all communities will be served from a new 90 Mld extension of the existing Vaalkop Water Treatment Works which is supplied with raw water from Vaalkop Dam.

Figure 4-2 shows the layout plan for the 90 Mld extension of the existing Vaalkop WTW that

currently has a capacity of 120 Mld. The extension is fixed planning by Magalies Water and will enable the demand in the Vaalkop South Supply Area and the projected demand in the Sun City and Saulspoort areas, which are already approaching the limit of the existing capacity, to be met in addition to the demand in the Feasibility Study Area. It is anticipated that this 90 Mld extension will ultimately be expanded by a further 30 Mld.

The process units for the extension will be similar to those used for the most recent extension of the works and will comprise flocculation, sedimentation, flotation (to be used intermittently as required), and filtration. Water quality in Vaalkop Dam is generally better than further upstream in the Crocodile River system however Magalies Water use DAF to treat part of the flow during those months when algal blooms could potentially give rise to taste and odour problems.

Preliminary designs of other major infrastructure such as regional reservoir, service reservoirs, pump stations and pipework are shown in Figures A.4-1 through A.4-6 of Annex A. These preliminary designs are only intended to indicate general features of the infrastructure included in the proposed water supply plan. Designs meeting the site-specific requirements will be prepared during the detailed design stage.

4.4 Construction Cost in 1997 Price

Costs for the proposed water supply plan shown in Tables 4-1 and 4-2 are pure construction costs at 1997 prices and they do not include P&G or any contingencies.

For each of the two levels of service, the difference in construction cost is provided in Table 4-4 for each component of the water supply system. As can be seen in the table, the cost difference is not as significant for bulk supply infrastructure as it is for retail supply infrastructure. This is mainly because of the cost of bulk supply pipelines, which usually comprises a major portion of the total bulk infrastructure cost, is same for both levels of service. In summary, the construction costs estimated for each service level are as follows:

Service Level	Construction Cost at 1997 Prices
Alternative-1, Service Level B	R 68,426,000
Alternative-1, Service Level A	R 45,443,000
Difference (Level B - Level A)	R 22,983,000

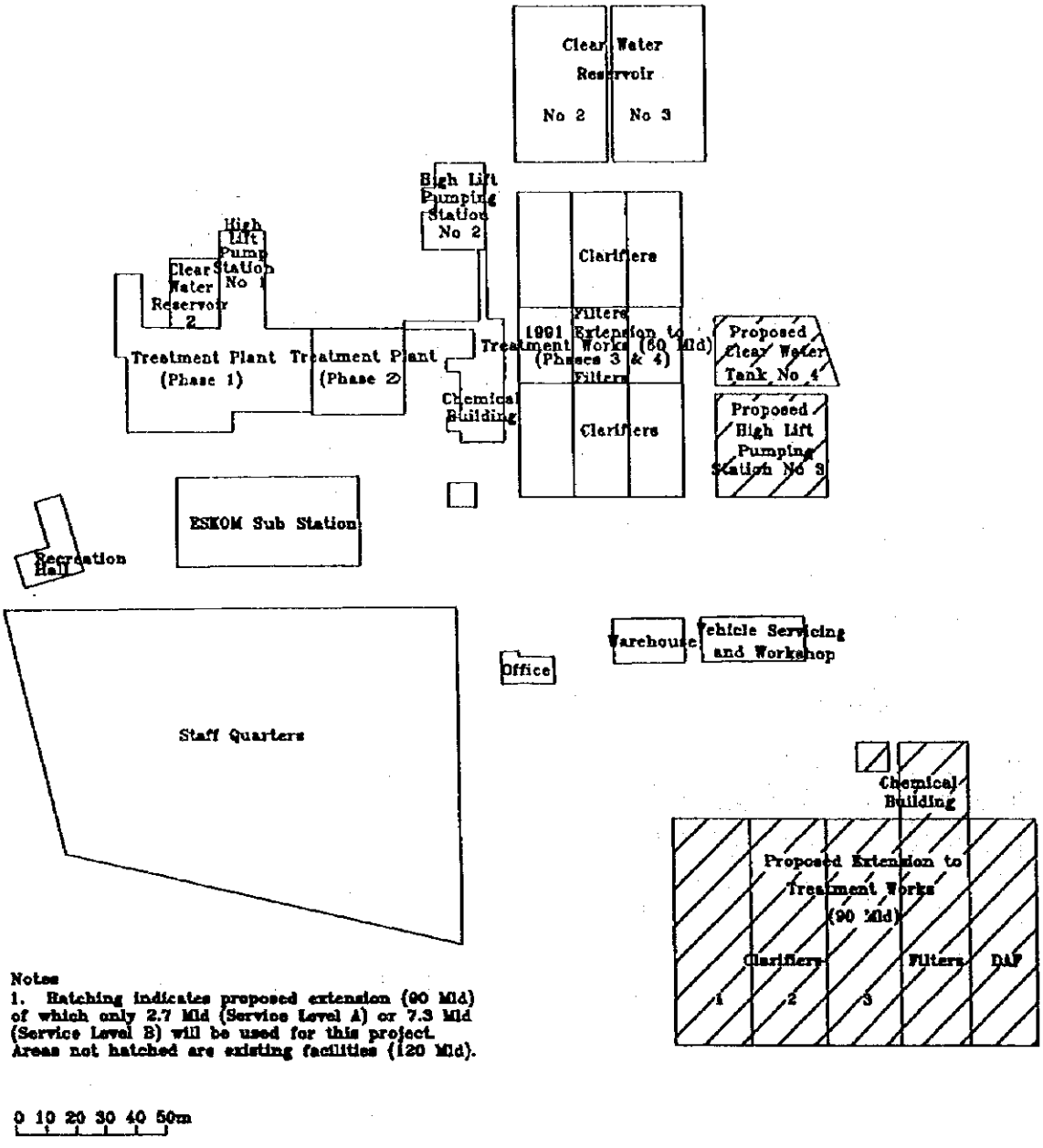

Figure 4-2

Proposed Layout for 90MLD Extension of Vaalkop WTW

Table 4-4 Comparison of Water Supply Plans (Service Level A) and (Service Level B)

NORTH MANKWE

ITEM		MOKGAL-WANENG	SEFIKILE	RAMOKOK-STAD	SAULS-POORT	TOTAL
(Case-B)						
BULK SUPPLY INFRASTRUCTURE						
Intake/Pump Station	x 1,000 R	N.A.	N.A.	280	N.A.	280
Raw Water Pipeline	x 1,000 R	N.A.	N.A.	292	N.A.	292
Water Treatment Works/Pump Stations	x 1,000 R	N.A.	N.A.	4,201	N.A.	4,201
Bulk Supply Pipelines	x 1,000 R	4,141	6,291	11,159	12,300	33,891
Regional Reservoirs	x 1,000 R	550	0	1,364	870	2,784
Pump Stations	x 1,000 R	56	167	0	336	559
Sub-Total	*x 1,000 R*	*4,747*	*6,458*	*17,296*	*13,506*	*42,007*
RETAIL SUPPLY INFRASTRUCTURE						
Service Reservoirs	x 1,000 R	385	1,400	530	2,180	4,495
Reticulation Pipelines	x 1,000 R	2,171	2,967	1,278	6,452	12,867
Yard Connections	x 1,000 R	1,314	2,802	1,941	2,857	8,915
Standpipes	x 1,000 R	11	45	0	86	142
Sub-Total	*x 1,000 R*	*3,880*	*7,214*	*3,749*	*11,575*	*26,419*
Total	**x 1,000 R**	**8,627**	**13,672**	**21,045**	**25,081**	**68,426**
(Case-A)						
BULK SUPPLY INFRASTRUCTURE						
Intake/Pump Station	x 1,000 R	N.A.	N.A.	151	N.A.	151
Raw Water Pipeline	x 1,000 R	N.A.	N.A.	292	N.A.	292
Water Treatment Works/Pump Stations	x 1,000 R	N.A.	N.A.	1,574	N.A.	1,574
Bulk Supply Pipelines	x 1,000 R	4,141	6,291	11,159	12,300	33,891
Regional Reservoirs	x 1,000 R	230	0	420	350	1,000
Pump Stations	x 1,000 R	37	76	0	189	302
Sub-Total	*x 1,000 R*	*4,408*	*6,367*	*13,596*	*12,839*	*37,210*
RETAIL SUPPLY INFRASTRUCTURE		0	0	0	0	0
Service Reservoirs	x 1,000 R	0	505	0	780	1,285
Reticulation Pipelines	x 1,000 R	1,432	1,677	742	2,896	6,746
Yard Connections	x 1,000 R	0	0	0	0	0
Standpipes	x 1,000 R	32	58	0	112	202
Sub-Total	*x 1,000 R*	*1,464*	*2,239*	*742*	*3,788*	*8,233*
Total	**x 1,000 R**	**5,872**	**8,606**	**14,338**	**16,627**	**45,443**
(Casel-B) - (Case-A)						
BULK SUPPLY INFRASTRUCTURE						
Intake/Pump Station	x 1,000 R	N.A.	N.A.	129	N.A.	129
Raw Water Pipeline	x 1,000 R	N.A.	N.A.	0	N.A.	0
Water Treatment Works/Pump Stations	x 1,000 R	N.A.	N.A.	2,627	N.A.	2,627
Bulk Supply Pipelines	x 1,000 R	0	0	0	0	0
Regional Reservoirs	x 1,000 R	320	0	944	520	1,784
Pump Stations	x 1,000 R	19	91	0	147	257
Sub-Total	*x 1,000 R*	*339*	*91*	*3,700*	*667*	*4,797*
RETAIL SUPPLY INFRASTRUCTURE						
Service Reservoirs	x 1,000 R	385	895	530	1,400	3,210
Reticulation Pipelines	x 1,000 R	739	1,290	536	3,556	6,120
Yard Connections	x 1,000 R	1,314	2,802	1,941	2,857	8,915
Standpipes	x 1,000 R	-21	-13	0	-26	-59
Sub-Total	*x 1,000 R*	*2,417*	*4,975*	*3,007*	*7,787*	*18,186*
Total	**x 1,000 R**	**2,755**	**5,066**	**6,707**	**8,455**	**22,983**

As mentioned earlier, these costs are pure construction costs at 1997 prices to which various other costs and fees, such as P&G, an allowance for physical contingencies, inflation, engineering fees, administration costs and VAT must be added to derive the actual project cost.

It should be noted that the construction cost for Service Level B includes the cost of providing yard connections to 90 % of households in all communities, which amounts to approximately R 8.9 million, constituting a significant portion (around 39%) of the difference in cost between the two levels of service.

Considering the relatively small size and capacity of the constituent components of the scheme, and given the manufacturing capability of local industry, it was assumed that all of the materials, equipment and goods required for the construction of the proposed infrastructure, (such as pumps, motors, pipes, fittings, valves, etc.), are manufactured within South Africa.

CHAPTER 5

FINANCIAL APPRAISAL

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CHAPTER 5 FINANCIAL APPRAISAL

5.1 Preliminary Analysis on Case A and Case B

On the basis of the facility planning, the following possible options were analysed and assessed mainly from financial viewpoints:

Case A: Implementation of the level A services (standpipe) only; and

Case B: Implementation of the level B services (yard connections: 90% + standpipe: 10%) only

5.1.1 Premises

(1) Willingness to Pay and Affordability

The socio-economic survey showed that the average monthly income for households in North Mankwe is about R1,216. The average size of the household is approximately 6.4 persons, 65% of monthly income is derived from employment. Consumers in the North Mankwe Area currently spend R35.6 per month on water purchased from vendors or R7.6 per month on borehole water, but water purchased from vendors only represented 11% of total water purchases. Consumer's average Willingness to Pay (WTP) for the RDP level of service was R8.3 per month and R29.6 per month for yard connections as shown in Figure 5-1. The average willingness to pay for yard connections only represents 2.44% of total monthly household income. Current income and affordability levels of beneficiaries in the Project Area will impact on the size of the tariff that can be levied and expected revenues / income.

Generally, respondents seem to state their income smaller, but expenditures bigger. As such, they also have tendency to express lesser amount as WTP, and approximately 3 % of household income is applicable for their affordability to water supply on the basis of World Bank's experience in the planning of this sector.

In addition, the beneficiaries are categorised into three groups in terms of their income with their affordability for water supply as shown below:

Table 5-1 Income Group and Affordability

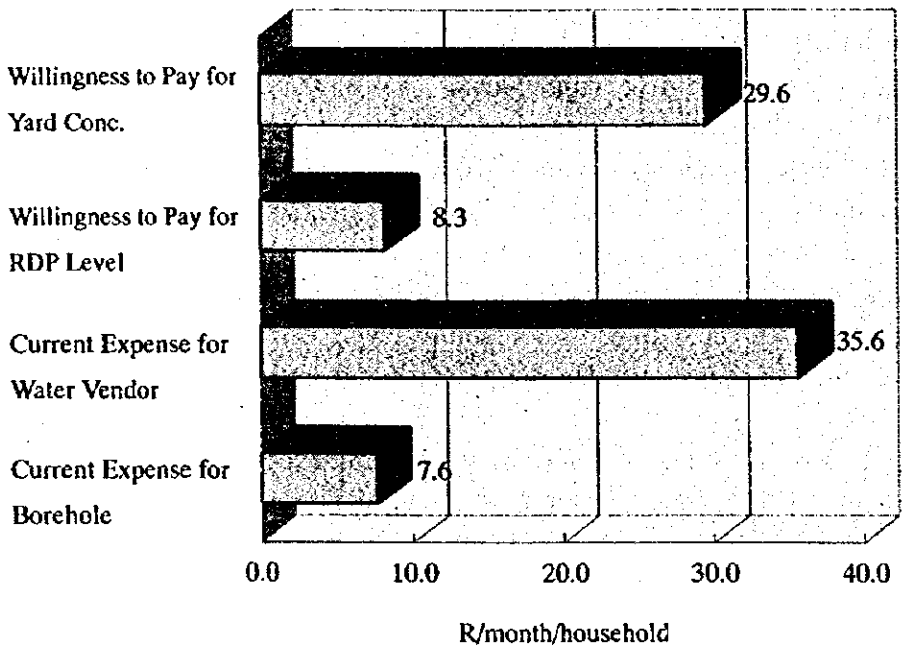
Income Group (%)	Ave. Monthly Income (R)	Affordability (R)
Low : - R499/m (32%)	305	9.15
Middle : R500 - R1999/m (48%)	1,036	31.08
High : R2,000/m - (20%)	3,103	93.09

Figure 5-1 Comparison of Current Expese and Willingness to Pay

North Mnakwe

Current Expense for Borehole	7.6	R/month/household	0.63%
Current Expense for Water Vendor	35.6	R/month/household	2.93%
Willingness to Pay for RDP Level	8.3	R/month/household	0.68%
Willingness to Pay for Yard Conc.	29.6	R/month/household	2.44%
Average Monthly Income	1,216	R/month/household	

Comparison of Current Expense and Willingness to Pay



(2) Implementation Period

In both cases of A and B, overall implementation would requires five (5) years including fund procurement procedures, detailed design and construction supervision as well as institutional development.

5.1.2 Project Cost

(1) Initial Capital Cost

To determine the required initial capital cost, the following cost model has been applied to the bulk and the retail water supply system excluding the specific cost of yard connections.

- Direct Construction Cost (DCC);
- Provisional and General (P&G) Cost: 15% of (1);
- Base Cost: (1) + (2);
- Engineering Fee: 10% of (3);
- Miscellaneous: 2% of (1);
- Institutional Support and Development: 2.5% of (3);
- Sub-total: (3) + (4) + (5) + (6);
- Physical Contingency: 15% of (7);
- Price Contingency: 10% of compound rate for the sum of (7) and (8) at the specified year of disbursement; and
- VAT: 14% of sum of (7), (8) and (9)
- Initial Capital Cost: Sum of (7), (8), (9) and (10)

The cost of the yard connections consists of a direct construction cost, a price contingency and VAT.

Direct construction cost has been estimated on the basis of the proposed water supply system and represents pure construction cost excluding P&G's, any allowance for physical contingencies and the other factors described in (2) to (10) above. More detail concerning the engineering aspects of the assumptions are provided in Chapter 4 of this report.

The estimated initial capital cost for both Case A and Case B is summarised in Table 5-2 and in greater detail in Table C.1-2 in Annex C. In this table, the following definition is applied:

Bulk Supply: Bulk water supply infrastructures covering from raw water intake to bulk supply pipeline until service reservoirs;

Retail Supply: Retail water supply infrastructures covering from service reservoirs to standpipes; and

Yard Connection: Connecting facilities between reticulation pipeline and yard taps.

Table 5-2 Composition of Initial Capital Cost (Unit : R 1,000)

	Case A	Case B	Difference
Bulk Supply			
Base Cost	42,792	48,308	5,516
Engineering etc.	6,093	6,879	786
Contingencies	30,842	34,627	3,785
VAT	11,162	12,574	1,412
Total	**90,888**	**102,388**	**11,499**
Retail Supply (Main)			
Base Cost	9,468	20,130	10,662
Engineering etc.	1,184	2,516	1,332
Contingencies	6,966	14,810	7,844
VAT	2,466	5,244	2,778
Total	**20,084**	**42,700**	**22,616**
Yard Connections			
Direct Construction Cost	-	8,915	8,915
Price Contingency	-	4,161	4,161
VAT	-	1,831	1,831
Total	-	**14,907**	**14,907**
Total Capital Cost	**110,972**	**159,995**	**49,022**

(2) Operation and Maintenance Cost

To operate the water supply system, expenses such as raw water, power for pumping, and chemicals for purification are incurred as well as salaries for staff. The operation and maintenance costs for bulk water supply and the administration cost for retail water supply are estimated separately.

The estimated annual operation and maintenance cost for both Case A and Case B is summarised its Table 5-3 and its greater detail is provided in Table C.1-3 of Annex C.

Table 5-3 Annual Operation and Maintenance Cost (Unit : R1,000)

Case (Annual Demand)	Bulk Water Supply						Retail Water Supply	Total
	Raw water	Electricity	Chemicals	Salaries	Maintenance	Sub-Total	Administration	
	0.24R/kl	0.15R/kl	0.03R/kl	0.17R/kl	0.05R/kl			
Case A (661,271kl)	158.7	118.5	19.8	112.4	33.1	442.5	243.0	685.5
Case B (1,763,388kl)	423.2	315.8	52.9	299.8	88.2	1,179.9	513.0	1,692.9

(a) Operation and Maintenance Cost for Bulk Water Supply

The operating cost for Vaalkop WTW and other bulk water supply infrastructure in the North Mankwe Area are estimated from data for existing Vaalkop WTW schemes.

i) Raw Water Cost: 0.24 R/kl
The applicable raw water cost is 0.24 R/kl which is calculated from the existing Vaalkop WTW raw water cost in 1996.

ii) ESKOM Power: 0.15 R/kl
The cost of energy for all of the pumps and purification plant is assumed to be 0.15 R/kl of purified water produced. Any real price increase is estimated at 3% per annum and is based on data from Eskom.

iii) Chemicals:0.03 R/kl
The cost of chemicals is assumed to be 0.03 R/kl on the basis of the existing Vaalkop WTW data for 1996.

iv) Salaries: 0.17 R/kl
Staff salaries are calculated based on the salary expenses incurred by MW in 1996 and on bulk water production.

v) Maintenance Cost: 0.05 R/kl
Maintenance cost is assumed to be 0.05 R/kl, the average for MW in 1996.

(b) Administration Cost for Retail Water Supply

The administration cost of the Water Services Provider, which will also be the implementation institution for retail water supply, is estimated based on the institutional development plan. The cost is calculated from the organisational structure together with the number of staff for Service Level A (RDP minimum level) and Service Level B (90%Yard Connections and 10% RDP minimum level).

The proposed organisational structure is determined based on the size of the community. For example, a small community is assumed to have a population of 2,100 or 350 Households (approximately 6 persons/household) while a medium size community is assumed to have a population of 4,800 or 800 households. The 24 communities in the North Mankwe Area consist of 6 medium sized communities and 18 small communities.

The costs to a small community for Service Level A and Service Level B are estimated to be R700 per month and R1,150 per month respectively. Whereas the costs of Service Level A and B to a medium sized community are R1,275 and R3,675 per month respectively. The applicable annual retail supply administration costs for Service Level A and Service Level B are R243,000 and R513,000 respectively (See Table C.1-4 through C.1-6 of Annex C).

5.1.3 Calculated Tariff and Implications

(1) General

The financial consideration of the proposed project has two different aspects: the supply side and the demand side approach through which sustainability of the project will be sought.

In considering the financial aspects, the following basic conditions have been applied:

- While the first tier (DWAF) will subsidise the initial capital cost required for the RDP level of service (Case A), it will not extend financial support for a service level higher than the RDP minimum level. This includes grant funding, subsidies, or loan guarantees on behalf of a Services Authority or Services Provider;
- The average affordability of beneficiaries for water supply is around 3% of their household income;
- The real rate of interest in South Africa is around 8% per annum;
- Future perspectives of the inflation rate range from 8% to 10% per annum;
- Full cost recovery (i.e. 100% tariff collection);
- Analysis period is 30 years.

(2) Water Tariff

By applying the basic conditions above, an overall water tariff was determined. Viewed from the standpoint of a Water Services Provider the water tariff should be enough to cover the bulk and retail supply systems.

(a) Case A

i) Bulk Water Tariff

In the cash flow analysis for the bulk water supply system, basic information such as operation, maintenance and administration costs were compared with Magalies Water's current activities, especially relating to Vaalkop WTW. A bulk water tariff of R0.90/kl (at constant 1997 prices) which included replacement cost for components with an economic life less than the analysis period was computed. This tariff was also applied to the tariff calculation of the retail water supply system

ii) Retail Water Tariff

In regard to the third tier, a retail water tariff was also computed as a means to offset the recurrent costs including the bulk water tariff, maintenance and administration costs. This computation resulted in a tariff of R1.49/kl or R7.2/household at constant 1997 prices in 2003 when all beneficiaries will be able to receive the RDP level of service. The same tariff represents about 2.3% and 0.6% of household income of the lower income (R305/month in 1997) and the average income (R1,216/month) groups respectively.

(b) Case B

The water tariff for Case B has been calculated subject to the following additional conditions:

- Long-term loan : real rate of interest 8%, 20 yerars equal repayment
- Yard connection fee is included in the tariff calculation.

i) Bulk Water Tariff

Bulk supply is similar to Case A except that the second tier will acquire loan funding for the initial capital cost for the service level higher than the RDP level. A bulk water tariff of R1.30/kl was calculated for the bulk water supply system.

ii) Retail Water Tariff

The retail water tariff to cover recurrent costs and loan repayment was computed resulting in R3.91/kl. The calculated figure implies monthly expenditure per household for water supply of R51.1 and R18.8 for the average and low-income groups respectively. This is equivalent to 4.2% and 6.2% of the monthly income of each respective group.

Process of caluculation of tariff setting for bouth Case A and Case B is shown in Table C.1-7 of Annex C.

(2) Implications

Project evaluation included the financial viability and sustainability of Case A and Case B. The results of the evaluation are summarised in Table 5-4.

Table 5-4 Implication of Case A and B

		Case A	Case B
Service Level	Standpipes	100%	10%
	Yard Connections	0%	90%
	Consumption (AADD)	25 lcd	68 lcd
1. Community Preference		Very low	Rather High
2. Monthly Tariff	Low Group	R7.2 (25 lcd)	R18.8 (25 lcd)
	Avge. Group	R7.2 (25 lcd)	R51.1 (68 lcd)
3. Affordability	Low Group	R9.15	R9.15
	Avge. Group	R36.48	R36.48
4. Risk of Illegal / Unauthorised connections		Possibly high	Possibly low
5. Fund Mobilisation	2nd Tier	Not necessary	No problem
	3 rd Tier	Not necessary	Possibly no problem
6. Institutional Capacity	2nd Tier	No problem	No problem
	3 rd Tier	Need Reinforcement	Need reinforcement

As can be seen from the table, Case A is affordable to the beneficiaries of the low-income group. However, the community survey conducted by the Study Team showed that the RDP minimum level of service is, generally, not welcomed by the communities and has a higher risk of illegal or unauthorised connections. Non-payment is also a major problem. On the other hand, Case B which provides the higher service level with 90% yard connections is the preferred alternative to most communities but the tariff is higher than the affordability level of beneficiaries. As mentioned earlier, Rustenburg District Council (RDC) is carrying out water

supply planning and positively investing in the provision of infrastructure including water supply, roads and electricity. Thus, RDC seems to have better institutional capacity both in terms of organisational management as well as financial aspects. In this context, a responsible Services Provider (JV of MW and RDC) may not face great difficulty in mobilising the external funding required for the initial capital investment and working capital requirements.

5.2 Staged Development Approach

5.2.1 General

Based on the above evaluation, it would appear that neither simply implementing Case A nor Case B would be the best alternative considering the viability and sustainability of the project. To this end, it is proposed that a staged development approach, "Case C", be introduced that will start the project with Case A in the earlier years and then upgrade the system towards Case B. The proposed option includes a period of five years operation at Service Level A after completion of the infrastructure development in year 2002.

5.2.2 Alternative Plan

To implement the proposed option as Case C, the following two options were further reviewed from financial viewpoints:

Case C-1: A part of the cost required for upgrading service level shall be borne by beneficiaries through prior deposit during the Service Level A period, which must be included in the water tariff of the Level A.

Case C-2: The full cost required for upgrading service level shall be procured through an external loan fund.

5.2.3 Water Tariff and Implications

As similar manner that was applied for financial analysis of Case A and Case B in the earlier part of this chapter, a water tariff is calculated as shown in Table 5-5 and its implications are evaluated in Table 5-6.

Table 5-5 Water Tariff for Case C-1 and C-2

	2002-2007 R/HH	2008-2012 R/Kl	2013-2017 R/Kl	2018-2022 R/Kl	2023-2027 R/Kl
Case C-1	36.20	2.83	2.90	2.97	3.05
Case C-2	7.20	3.86	3.93	4.00	4.08

As mentioned in Table 5-6, it can be said that Case C-1 will be the most realistic option for implementing North Mankwe Water Supply Scheme under the framework of Magalies Water Expansion Project.

Table 5-6 Evaluation on Alternative Plans (Cases C-1 and C-2)

<table>
<tr><th colspan="2" rowspan="2">Particulars</th><th colspan="4">Alternative Plan (Case)</th></tr>
<tr><th colspan="2">C-1</th><th colspan="2">C-2</th></tr>
<tr><td rowspan="4">Water Tariff and Beneficiaries' Share
(While the zero growth for beneficiaries' income is expected, the tariff includes real increase of electricity charge at 3% per annum.)</td><td>1st Stage</td><td colspan="2">Since the tariff includes reserve fund for upgrading service level (a part of retail water supply facility and connection fee), it occupies about 3% of household income of average income group, while it does 11.9% of household income of low income group.</td><td colspan="2">The tariff occupies less than 3% of household income in both average and low income groups.</td></tr>
<tr><td>2nd Stage</td><td colspan="2">Through introduction of quantity base water tariff, it occupies 3.0-3.3% of household income of average income group. On the other hand, it does 4.5-4.8% of that of low income group, respectively.</td><td colspan="2">Similar to Case C-1, the tariff occupies 4.1-4.4% of household income of average group. On the other hand, it does 6.1-6.4% of that of low income group, respectively.</td></tr>
<tr><td rowspan="2">Total Water Charges per Household (2002-2027) (Rand)</td><td>Average Income Group</td><td>Low Income Group</td><td>Average Income Group</td><td>Low Income Group</td></tr>
<tr><td>11,376</td><td>5,556</td><td>12,864</td><td>5,003</td></tr>
<tr><td colspan="2">Contribution to Improvement of Financial Ground of Service Provider</td><td colspan="2">Through the reserve fund accumulated during the 1st Stage, North Mankwe will be able to secure about 13 million Rand as original fund. Due to the original reserve fund, credibility of service providers will be improved for external funding institutions, and it facilitates the service providers to obtain the required loan more easily than Case C-2 in the 2nd Stage.</td><td colspan="2">All the cost to be required for upgrading the service level will be depending on external funding institutions, the proposed service provider, especially District Councils as 3rd Tier will face lack of credibility taking into account the present financial situation.</td></tr>
<tr><td colspan="2">Overall Evaluation</td><td colspan="4">While the tariff in Case C-1 for the 1st Stage exceeds affordability of low income group due to reserve fund as prior investment in the FS area, the tariff for the 2nd Stage occupies household income by 1.1 to 1.2% lower than Case C-2. As for total expenditure for water charge during the calculation period of 25 years, average group of Case C-1 bears lesser burden than Case C-2, low income group of Case C-1 must expend a little bit more water charge by about 500 Rand for 25 years than Case C-2. In this context, the low income group of Case C-1 situates rather severer position than Case C-2, the average group of Case C-1 could enjoy more favourable condition than Case C-2 in terms of their cost sharing for water tariff. In addition, Case C-1 will be able to improve credibility of service providers. Therefore, the Case C-1 is considered the most realistic option when proper measures will be taken for the low income group.</td></tr>
</table>

5.3 Details of Case C-1

5.3.1 Development Concept

The proposed option "Case C-1" aims to ultimately provide the service level B (yard connection) to all beneficiaries of the target communities in the North Mankwe FS area, with lesser cost burden to the beneficiaries and with sound management of the supply system by the service provider. The proposed option shall start to provide the water supply facilities under the service level A, which does not impose any financial burden for the initial capital cost to the beneficiaries. During the course of the service level A, every community has enough time to discuss and to obtain consensus about the possibility to upgrade the water supply system to the service level B. Especially, countermeasures must be fully argued among community members, which should support the low income group.

In order to attain the said target on the sustainable basis, it is prerequisite to reinforce and strengthen the institutional capacity of the 3rd tier including the target communities. In this connection, the proposed staged development approach will facilitate the required institutional development. The way and method of the institutional development of the 3rd tier are detailed in Chapter 6 of this report.

The scenario of the proposed option is shown schematically in Figure 5-2.

5.3.2 Project Cost and Allocation

(1) Initial Cost

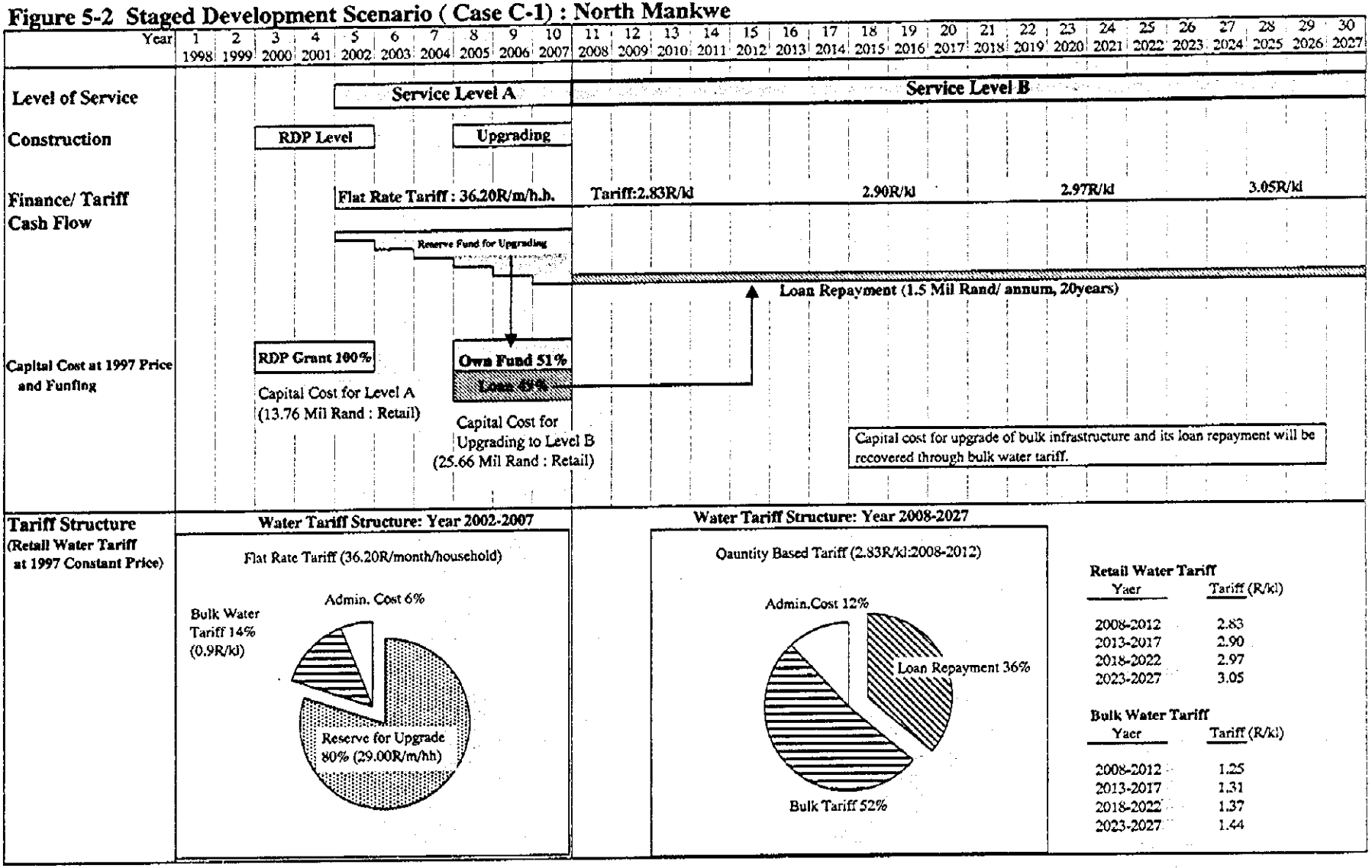
The proposed option requires two sets of initial capital investment, firstly those cost to be invested for providing the infrastructure under the level A services and an institutional development; and secondly those for upgrading the infrastructure from the level A to the level B services and institutional development. Table 5-7 Summarises the initial investment cost, of which detail is given in Table C.1-8 of Annex C.

Table 5-7 Initial Investment Cost (Case C-1) (Unit: R1,000)

	1st Stage (Level A)	2nd Stage (Upgrade)	Total	Executing Body
Bulk Supply	90,888	18,520	109,408	MW
Retail Supply	20,084	36,423	56,507	JV (MW + RDC)
Yard Cnnection		24,008	24,008	- ditto -
Total	110,972	78,951	189,923	
Remarks	1998-2002	2003-2007		

Note: At 1997 prices with price escalation of 10% p.a.

Figure 5-2 Staged Development Scenario (Case C-1) : North Mankwe



The necessary fund for the 1st stage amounting to R111 million must be shouldered by the 1st tier (DWAF Central Office), while those fund for the 2nd stage will be arranged both by the service provider (JV of MW and RDC) and the beneficiaries. A part of the cost required for the 2nd stage should be collected from the beneficiaries as water tariff.

Disbursement schedule of initial cost is shown in Table 5-8 below, and its detail in Table C.1-8 of Annex C.

Table 5-8 Disbursement Schedule of Initial Cost for Case C (Unit:R1,000)

Stage	Stage 1						Stage 2						Total
Year	1	2	3	4	5	Sub-Total	6	7	8	9	10	Sub-Total	
	1998	1999	2000	2001	2002		2003	2004	2005	2006	2007		
Bulk Supply	268	2,284	26,167	42,721	19,447	90,888	56	474	7,162	8,742	2,086	18,520	109,408
Retail Supply	59	392	3,735	11,378	4,520	20,084	108	711	11,131	35,013	13,469	60,431	80,515
Total	**327**	**2,676**	**29,903**	**54,101**	**23,969**	**110,972**	**164**	**1,185**	**18,293**	**43,755**	**15,554**	**78,951**	**189,923**

(2) Operation and Maintenance Cost

In order to maintain the project facilities on sustainable basis, an operation and maintenance cost (O & M cost) including administration cost will be required. The basis for calculating the O & M cost is stated in the earlier part of this Chapter. The proposed project requires the following operation and maintenance cost:

Table 5-9 Annual Operation and Maintenance Cost for Case C (Unit: R1,000)

	Stage 1 (Level A)	Stage 2 (Level B)	Executing Body
Bulk Supply	446	1,230	MW
Retail Supply	243	513	JV (MW + RDC)
Total	689	1,743	
Remarks	2002 – 2007	2008 onward	

All the O & M cost must be reflected in the proposed water tariff.

5.3.3 Water Tariff

(1) General

The North Mankwe FS area is located in economically backward area, and most of all communities have almost none of economic prospect in future, resulted in difficulty to expect

income growth of community people. On the other hand, Rustenburg District Council as the 3rd tier institution for water supply sector has very short history since established in 1994, and its financial ground is still weak, relying on a half of revenue from levies, taxes and grants from the central government.

Under such situation, it is quite difficult for the proposed option Case C-1 to fully satisfy with the requirements from both the supply side and the demand side, in other words, the option faces so-called antinomy. In this context, quite careful analysis on financial aspect of the proposed option has been carried out. However, the result of water tariff calculation is not favourable for the low income group for which careful attention should be paid as mentioned below.

(2) Cash Flow Analysis

By applying the same method and provisions that are used in the preliminary analysis for Case A and Case B in this Chapter 5, cash flow analysis is carried out for both the bulk supply and the retail supply. In this cash flow analysis, firstly the bulk water supply system is analysed for MW as the service provider under the closed system of the proposed option. Then, the retail water supply system is done taking a calculated bulk tariff into consideration. These processes of analysis are shown in Annex C of this report.

(3) Retail Water Tariff

During the 1st stage operation (Level A: 2002 – 2007), a flat rate of water tariff, R36.20 per month per household will be charged, of which 80 %, 14 % and 6 % are allocated to the reserve fund for upgrading, the bulk water tariff and the administration cost, respectively. In other words, R1.50 per month per household is a pure water tariff to be charged to beneficiaries. In year 2007, the accumulated reserve fund will occupy about 51 % of the upgrading cost (R25.7 million), and the rest 49 % or R12.7 million will be secured from the external fund agency.

After upgraded to the level B services, a retail water tariff of R2.83-3.05 per Kl will be chargeable, which includes redemption of a part of the initial capital cost (upgrading cost) and O & M cost.

(4) Issues Relating to Water Tariff Setting

(a) Community level

It is rather difficult to introduce different service levels into a single community from

technical viewpoint, hence the community must obtain consensus of community members on the service level. During the process on the above, community members should discuss on appropriate consideration for the low income group including:

- Possibility of cross-subsidisation within the community
- Positive utilisation of low income group for labour works during construction stage as income increase even temporary basis
- Mobilisation of low income group for O & M works of water supply facilities within the community

(b) Service Provider level

In order to attain full recovery of water tariff, the following items will be examined:

- It is defined that the operation and maintenance of facilities and water charge collection are responsible for the community itself, and incentive and penalty system will be applied on the occasions
- To prepare and distribute easily understandable document on the impact of the reserve fund and to remove uneasiness of beneficiaries through preparation of separate accounting system for the reserve fund for which periodical audit will be applied

(c) Low income group level

In order that the group will be able to participate for the higher service level, the following item must be examined:

- To reduce cost burden of connection cost between the retail supply pipe and yard tap, the low income group shall contribute by offering their efforts for the required labour works

(d) Feedback of experience obtained from Pilot Project

In order to realise the various measures stated above, experiences and best practices obtained during the process and the implementation of the pilot projects, must be reflected including on the following items:

- Approach method and process of establishing Local Project Steering Committees in the three pilot project communities; and
- Method of water tariff computed on the own initiative of the concerned communities (Kameelboom and Segokgo) and the process to obtain consensus of community members on the set tariff.

5.3.4 Funding

(1) General

Table 5-10 shows selected financial data of stakeholders responsible for providing retail water supply to FS areas. These institutions are also responsible for securing funding required to finance the cost of bulk and retail infrastructure for the proposed water supply projects. MW is the designated second tier authority (Water Board) currently responsible for bulk water supply to the North Mankwe FS area while Rustenburg DC has responsibility for retail water supply. MW is statutory not-for-profit organizations (also known in South Africa as Section 21 companies) which can borrow short and long-term funds from the capital market or commercial and investment banks. It receives no central government subsidies or loan guarantees. It also has to follow sound business practices and are subject to certain regulatory, labor law, and accounting standards and practices as commercially-driven enterprises.

As section 21 companies, MW is not allowed to make a profit or declare dividends. Net operating income is appropriated to various funds such as a Capital Redemption Fund used for providing redemption of loans for capital expenditure. Other funds include Betterment/Improvement Funds used to finance future capital expenditure and upgrading and Depreciation and Replacement Funds used to replace existing plant and equipment that has become worn-out or obsolete. The programs and activities of MW are guided through a board of directors who are all appointed for a specific duration by the Minister for Water Affairs & Forestry. The role of the Board is to set broad policy guidelines and procedures on the MW's activities, ensures that policies are being interpreted and implemented correctly and reviews major policy areas in order to keep them current. The Board has responsibility for preparing annual financial statements that fairly represent the financial position and the results of the water utilities.

The directors are also responsible for ensuring that the MW's maintains adequate accounting records and systems of internal control. These are designed to provide reasonable assurance as to the reliability of the annual financial statements and to adequately safeguard the utility's assets and detect irregularities. As a pre-requisite, most borrowers in South Africa require that fund applicants have a solid financial track record and be in good financial standing evidenced by a strong balance sheet.

The RDC covering the FS area has only been in existence since 1994 and is primarily responsible for retail water supply in rural areas where the presence of local government does not exist. Because of their recent development, the RDC does not have a strong movable and immovable asset base and do not meet most of the funding criteria required by lending institutions.

Table 5-10 Financial Status of Stakeholders

(Unit: '000R)

Description	1996 Magalies Water	1996 Rand Water	1996 Eastern DC	Bud. 6/77 Highveld DC	1996 Rustenbrg DC	1996 Brits TLC
Revenues/Income						
Bulk water sales	36,227	948,899	22,300	0	14,246	8,682
Levy income	0		16,000	65,132	36,597	
Central/Provincial Govt. transfers/allocations	0					166
Subsidies & grants	0		10,063		670	
Interest on investments					3939	
Other (sundry income, regional function)	611		2,448	2,790	647	146
Total (budgeted) revenues	**36,838**	**948,899**	**50,811**	**67,922**	**56,099**	**8,994**
Less expenses/budget allocations						
Water purchases	5,002	109,369	20,300	0	14,246	256
Lesotho Highlands Water Project Levy		123,591				
Operating costs	13,262	433,059	4,505	6,677	4,261	8,849
Contributions: provisions and reserves	0				28,264	105
Regional function			14,927	29,270		
Contributions/Allocations to: local bodies, capital outlay			6,607	25,659	1,106	104
Other						
Total expenses	**18,264**	**666,019**	**46,339**	**61,606**	**47,877**	**9,314**
Net operating income/surplus	**18,574**	**282,880**	**4,472**	**6,316**	**8,222**	**-320**
Net margin %	50.42%	29.81%	8.80%	9.30%	14.66%	-3.56%
Less:						
Interest and finance charges	8,339	39,241				
Statutory Transfers		130,088				
Betterment Fund		52,298				
Redemption Fund	0	77,790		25		
Annual Appropriations/Net Surplus	**10,235**	**113,551**	**4,472**	**6,291**	**8,222**	**-320**
Appropriation to Funds						
Betterment Fund		51,985				
Reserve Fund		54,566				
Depreciation & Renewals Fund		7,000				
Current assets (cash, inventory, accounts receivable)	22,560	326,264		22,987	20,632	6,625
Current liabilities (accounts payable)	10,893	230,028		21,238	10,239	6,625
Net current assets (working capital)	**11,667**	**96,236**	**0**	**1,749**	**10,393**	**0**
Fixed assets	194,912	2,301,850		2,735	113	16,765
Investments	69,139	35,560		22,987	24,000	11,027
Other assets	16,162	0			167	
Total	**280,213**	**2,337,410**	**0**	**25,722**	**24,280**	**27,792**
Total assets	**302,773**	**2,663,674**	**0**	**48,709**	**44,912**	**34,417**
Long-term debt (loans, long-term commitments)	184,670	900,205		2,735	113	16,765
Reserves and provisions	44,444			22,094	34,560	9,335
Capital contributions	62,766	73,700		0		
Accumulated Funds	0	1,459,741		2,642		1,692
Total	**291,880**	**2,433,646**	**0**	**27,471**	**34,673**	**27,792**
Total liabilities	**302,773**	**2,663,674**	**0**	**48,709**	**44,912**	**34,417**

Source: RW 1996 Annual Report; MW 1996 Annual Report; Eastern DC, Highveld DC; Rustenberg DC, Brits TLC

Unlike MW, they do not have direct sources of revenue since a substantial percentage of their income is derived from levies (taxes), subsidies and grants. Personnel is typically the largest single item of local government expenditures and the ability of local authorities to recruit, train, and motivate staff is critical to its ability to provide retail water delivery services efficiently.

Under the Green Paper on Local Government published October 1997, local authorities (such as DC's, TRCs, and TLCs) are responsible for delivery of retail water and sewage services to end users/consumers. Loan financing by local authorities for water supply infrastructure has several desirable attributes. Firstly, it depoliticizes the allocation process on the basis of the user's willingness to incur debt. Secondly, lending also forces potential beneficiaries to reveal their degree of commitment to the project. The private market's demonstrated interest in South Africa in lending to local authorities without any implicit or explicit subsidies is extremely limited. Long-term financial commitment of any kind to local authorities is viewed as extremely risky because, as political entities local authorities lack readily marketable collateral and is typically viewed as unattractive to private capital. Local authorities are unable to attract private capital on market terms or obtain the assistance of central government.

(2) Financial Viability and Possible Funding Source

(a) 1st Tier (DWAF)

DWAF is currently implementing water projects under RDP Programmes 1, 2 and 3 of which main features are summarised in table 5-11.

Table 5-11 RDP Budget Allocation

RDP Number	Target Population	Numbers of Projects	Estimated Cost (Millions)	Remarks
1	978,000	12	282	The projects are completed or nearing completion
2	2,765,000	328	629	Projects have been started under this programme
3	2,664,000	345	950	Projects have been started under this programme

From the above table, unit project cost varies from R1.92 million in RDP 3 to R23.5 million in RDP 1. Following to the above, RDP Programme 4 is planned and budgeted amounting to R1.3 billion including R0.3 billion of RDP 2 and 3 cost overruns. Except the cost overrun, the budget allocated new RDP 4 Programmes will be disbursed over 4 years from 1997/98 to 2000/01.

Under the RDP 4, total of R639 million has been allocated for new water projects in which KwaNdebel (Project No. 4101) receives the highest budget for single project, amounting to R28.9 million. In this context, the required capital cost for the Level A services in the North Mankwe FS area, about R111 million is comparatively high, therefore, it is prerequisite for DWAF to secure external loan funding to implement the proposed project in due course.

(b) 2nd Tier (MW)

MW was established September 1983 through a name change of the Vaalkop Water Board, established January 1970. It has a strong balance sheet and a solid financial track record evidenced by a current ratio (CR) of 2.1; return on capital (ROC) of 9.5%; and a current asset base of over R300 million. Its working ratio (i.e. the ratio of operating costs to operating revenues, excluding depreciation and interest payments) is about 0.37. Sound financial management for water and wastewater utilities requires that this ratio be well below 1. Water sales during 1996 amounted to R36.2 million of which direct operating expenses were R18.3 million resulting in a net margin of 50.4%. MW has two funds into which net operating income is appropriated:

- Fund for Reserves and Provisions	R44.4 million
- Capital Contribution	R62.8 million
Total	R107.2 million

Of the R184.7 million in long-term loans, R107.2 million (58%) has been appropriated. The remaining amount is collected through tariffs from industrial consumers and appropriated to the two Funds. As of February 29, 1996 MW had a total outstanding debt of R95.8 million, most of which represents MW stock. Its interest coverage ratio, which reveals the number of times interest is covered by operating income in 1996, is 2.2 indicating that MW is able to meet its interest obligations with room to spare. The strongest asset and reliable consumer base of MW is another demonstration of a financially well positioned utility which meets practically all the necessary funding criteria required by financial institutions.

(c) 3rd Tier (RDC)

Of the three district councils, RDC is financially the most promising evidenced by its current ratio 2.0. Its net margin is 14.6 compared with Highveld and Eastern DCs with net margins of 9.3 and 8.8 respectively. RDC also has a total of R34.6 million in reserves and provisions, most of which is invested. It has virtually no long-term debt. The biggest risk for RDC is the fact that it has almost no collateral in the form of fixed assets and the reliability of its customer base.

Rustenburg DC has budgeted to spend some R15.0 million in fiscal 1997/98 in the 15 zones under its jurisdiction amounting to approximately R800,000 per zone. In addition, R1.0 million has been allocated to each of the four TLCs (Rustenburg, Marikana, Swartruggens and Koster) and each of the four TRCs (Madikwe, Mogwasi, Derby and Montake) bringing total budgeted expenditure to R23.0 million. Although no specifics are available yet on where the funds will be spent, the major sectors in order of priority are community water supply, roads and electricity.

It is proposed that the portion of the tariff over and above the O&M component be transferred to a reserve fund and invested with reasonable and safe return on investment over the five year period for operating at Service Level A. At a flat rate of R36.20/month, 80% (R29.00) of the tariff could be transferred to the reserve fund. The goal is to accumulate 51% of the R25.7 million (at 1997 price) required to upgrade the system from Service Level A to Service Level B. It is anticipated that 51% of the capital cost for upgrading from Level A to B will be available from the reserve fund after five years. It is also hoped that the financial position of the Services Provider would have greatly improved after the five-year period so that loan funding will be possible, when the reserved fund will be kept and accumulated in a certain bank account who will become a possible lending institution to the service provider (JV of MW and RDC).

The possibility of obtaining funding in the form of soft loans or grants is extremely limited due to the current policy of DWAF of not obtaining loans, grants or guaranteeing loans on behalf of local authorities. This limits the funding sources to primarily DBSA, Commercial Banks (including special infrastructure and developments funds), and Merchant Banks (e.g. public finance departments) who would lend at commercial interest rates.