GUIDELINE FOR THE COSTING OF HOUSEHOLD SANITATION PROJECTS

water & forestry

Department:
Water Affairs and Forestry
REPUBLIC OF SOUTH AFRICA

August 2007

FORWARD

The development aims of the South African Government and all role players concerned with the well-being of our country are the provision of minimum living conditions, economic development to eradicate poverty, and the creation of conditions for the maintenance of a healthy lifestyle. The government's ambitious programme to provide adequate water supply and sanitation services to all its citizens by 2010 is one of the flagship programmes that addresses these priority development aims. In particular the provision of sanitation services can be structured in a way that will improve the living conditions of all South Africans, create an environment for lowering health risks, and create sustainable employment opportunities for thousands of people who are currently unemployed. However it must be acknowledged that this is to be done within the framework of a limited budget allocation, and hence must be approached

This sanitation costing guide sets out the average and ceiling costs for the different components of a sanitation system based on both estimated and reported costs for the implementation of household sanitation projects. Municipalities may use these as a guide when estimating the costs and planning the implementation of sanitation services for settlements. The guide covers costing for all types of sanitation technologies, and stipulates ceiling costs that municipalities may claim from MIG for the implementation of the different types of sanitation schemes.

The costs presented in this guide have been formulated after wide consultation with key role players and practitioners in the water services sector. Some municipalities may find that tenders submitted for sanitation projects reflect costs higher than the ceiling costs presented in this document, and will not be able to implement the selected sanitation scheme using MIG funds alone. These municipalities are encouraged to re-visit their planning and consider variations to reduce costs, and/or to supplement the MIG funds with other finding available to them. It has been the experience on many projects that costs within the framework of this guide are achievable.

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1. INTRODUCTION

The budgeting for the provision of basic household sanitation is dependent on a number of factors including the type of sanitation system to be installed and the institutional arrangements for managing the implementation programme. A stipulation of MIG funding is that it be used for the provision of basic services primarily for the poor, which in the case of rural and peri-urban low density residential areas is for dry, on-site sanitation systems, and for urban and other dense settlements may be waterborne sanitation. In all cases where services are provided for poor communities, other types of sanitation systems (including waterborne sanitation) may be implemented with funding from MIG funding, but may need to be co-funded from another source such as a municipality's own finances if this is not considered a basic level of service.

The municipal infrastructure grant programme is aimed at providing all South Africans with at least a basic level of service by the year 2013 through the provision of grant finance aimed at covering the capital cost of basic infrastructure for the poor. The MIG programme is a key part of government's overall drive to alleviate poverty in the country and, therefore, infrastructure is to be provided in such a way that employment is maximised and opportunities are created for enterprises to flourish.

The MIG policy states that "For households using residential services: Only basic infrastructure to poor households (those with household expenditure of below R1 100 per month) may be included. Although it is accepted that in some communities living in individual settlements (or suburbs in urban areas) communally provided services will be used by some who are not poor, demonstrable steps to reduce the extent of subsidy leakage will be required."

It is clear from the current large backlog in the delivery of sustainable sanitation services in South Africa and the government's target of clearing this backlog by 2010, that it is imperative for all local government structures to plan wisely and ensure that the funds allocated to sanitation services are used effectively to achieve the greatest coverage in order to be able to serve the majority of poor within the constraints of budget allocations.

To this end the following budget allocation guidelines have been derived by DWAF, based on previous experience on sanitation projects and an assessment of actual costs in the supply of sanitation systems at different locations in South Africa. The guideline is for all sanitation projects, although the maximum and ceiling costs are specifically for the allocation of MIG funds.

This guideline has been updated taking account of issues raised since the first publishing of the guideline. The use of MIG funds for higher level sanitation systems including waterborne sanitation is now permissible provided the sanitation scheme can be defined as providing a basic sanitation facility that is appropriate for the selected community (see section 3 on definitions).

2. BASIC PRINCIPLES

The principles on which the budget guidelines are based (and which local government authorities should incorporate into their planning) are as follows:

- The quality of the infrastructure must be of an acceptable (good) standard so that the structures will last for at least 20 years. This implies that:
    - the use of corrugated iron (zinc) superstructures is not acceptable,
    - the pits of pit toilets should be at least partially lined, i.e. have at least a constructed collar on which further building (slab, superstructure) will take place.

    - all projects should include a component of quality assurance.
    - only properly trained and accredited builders should be employed on projects.

- The sanitation infrastructure must be socially acceptable and serve the needs of the wards. This implies that:
    - there must be consultation with the communities at the beginning of each project, and their representatives should be included in all decisions regarding the design;
    - there should be a participative assessment of the pre-project situation in each community where the specific needs and environmental concerns are identified as defined in the guidelines for a feasibility report.

- The sanitation infrastructure must be sustainable within the operating parameters of the household and the local municipality. This implies that:
    - the costs to both operate and maintain the system must be affordable to the household and the municipality.
    - O&M budgets in the municipality which are generally derived from tariffs and (in the case of poorer municipalities) from a limited grant from central government (equitable share) must be adequate to meet all the future requirements in terms of O&M.

- The implementation budget allocation should cover the cost of:
    - construction (basic materials, the wages of the builders, labour for digging pits and trenches),
    - social facilitation (including training, health and hygiene education, community liaison, and functioning of the committee),
    - project management, and
    - other expert inputs as required.

- Budget allocations must be in line with the achievement of full sanitation coverage by 2010, with a focus on the infrastructure required for a basic level of service that targets the poor.

- A scale-up of the rate of delivery of sanitation services must not be at the expense of community participation, local employment, and environmental impacts.

- Basic sanitation service provision has the potential to create significant opportunities for employment and other economic spin-offs within local communities. The approach to the provision of the infrastructure should thus be in line with the principles of the Expanded Public Works Programme (EPWP) and municipal LED initiatives.

- Material costs and quality must be compared for both local suppliers and from centralised suppliers. Local supply must not override centrally supplied materials where the cost and/or quality of local supplies are unacceptable.

It is noted that certain municipalities may choose to provide levels of service that are not achievable with the MIG allocations for basic levels of service as set out in this guideline. This may be due to a desire to meet political and community aspirations (e.g. by providing waterborne sanitation to residents where it is not sustainable), to purchase complete pre-manufactured systems rather than construction on-site using local builders and materials, or because of previous bad experience with certain basic sanitation facilities. However cognisance needs to be taken of the impact that any increase in the costs will have on the national and municipal budgets, both in the short term and in terms of the on-going O&M budget requirements.

3. DEFINITIONS

The following definitions are of importance when costing sanitation facilities and services. The definitions of the facility and service are taken from the Strategic Framework for Water Services – 2003, while the definition of indigent is specific for this document.

A basic sanitation facility

A basic sanitation facility is described as "The infrastructure necessary to provide a sanitation facility which is safe, reliable, private, protected from the weather and ventilated, keeps smells to the minimum, is easy to keep clean, minimises the risk of the spread of sanitation-related diseases by facilitating appropriate control of disease carrying flies and pests, and enables safe and appropriate treatment and/or removal of human waste and wastewater in an environmentally sound manner".

A basic sanitation service

A basic sanitation service is "The provision of a basic sanitation facility which is easily accessible to a household, the sustainable operation of the facility including the safe removal of human waste and wastewater from the premises where this is appropriate and necessary, and the communication of good sanitation, hygiene and related practices".

Choice of technology

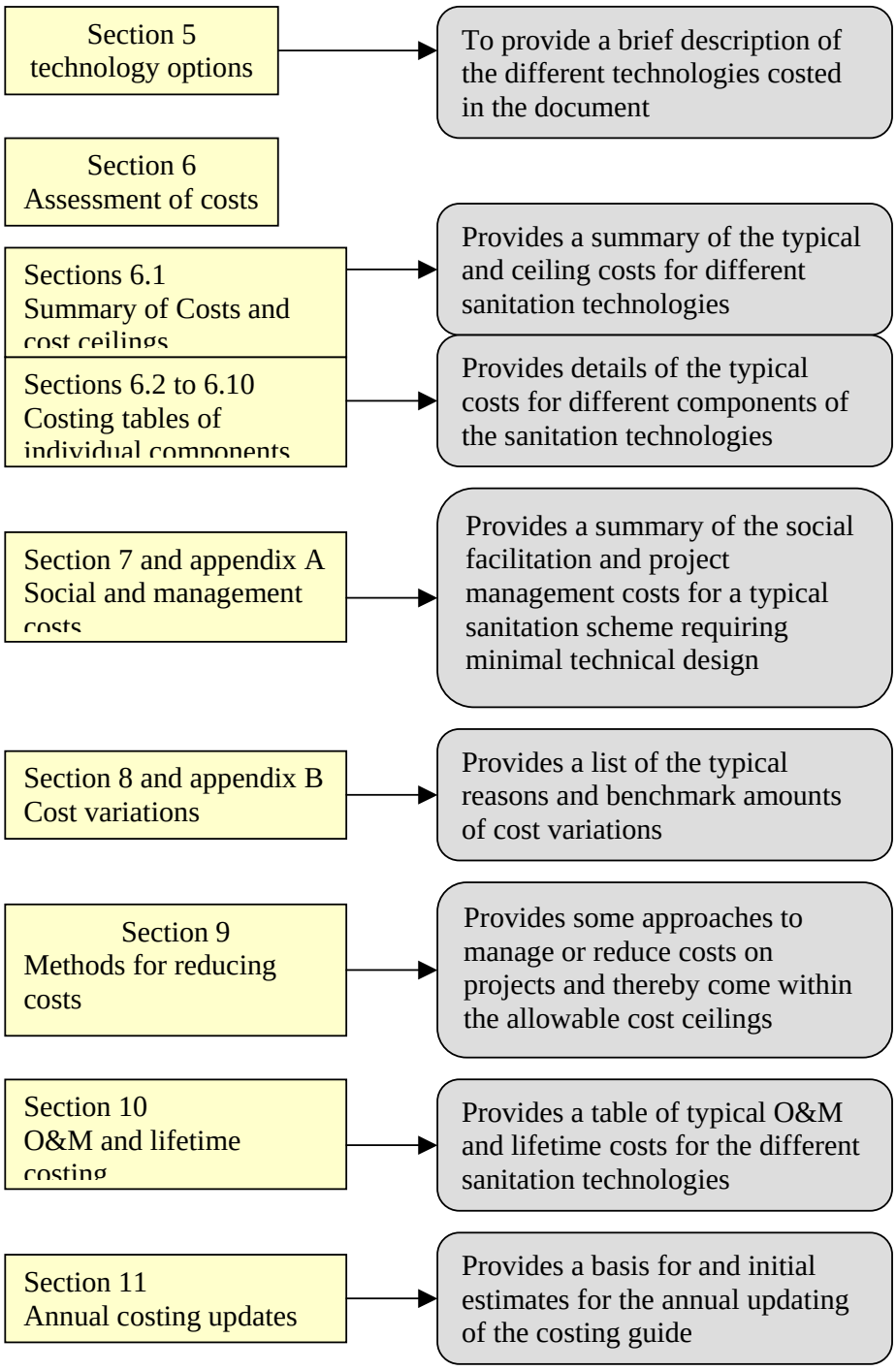
The definition of a basic sanitation service does not define the technology to be used in providing such a service. This decision, made by the water services authority, is the key to the success in providing affordable basic sanitation services in a sustainable manner. The selection of technology is strongly dependent on settlement conditions. These include:

- Urban areas where many businesses are located and where residential densities are high, waterborne sanitation is generally the most appropriate technical solution.
- Rural areas where housing densities are low and few businesses are located, on-site solutions such as VIPs and UDS are appropriate.
- In intermediate areas (peri-urban areas or dense rural settlements) the choice of sanitation technology must be financially viable and sustainable, in most cases this will be on-site sanitation such as VIPs or UDS.

MIG has the mandate to provide a basic sanitation facility to the poor under its capital programme, this including health and hygiene education of the beneficiaries.

4. GUIDE TO THE USE OF THIS DOCUMENT

The users of the document may be guided by the following flow diagram for referencing the sections of this document:



5. TECHNOLOGY OPTIONS

For the purposes of the costing guideline, the following technology groups are considered applicable in the South African situation and are used in the provision of basic sanitation services. The commercial and scientific creativeness of the people of the country will result in the ongoing development of new technologies, and this is to be encouraged. Most, however, will fit within the categories of the technology groups listed below.

The categories of technologies listed here are distinguished by whether the wastes are treated on-site or off-site, the method of treatment of the human wastes, and whether water is used to flush the solids from the pedestal to the treatment facility - i.e. wet or dry sanitation.

	On-site collection or treatment		Off-site treatment	
	Type of system	**Typical examples**	**Type of system**	**Typical examples**
Dry sanitation (no water flush)	Ventilated pit	VIP, Double pit VIP Pungulotho Archloo Commercial VIP toilets	Chemical toilets (temporary use only)	Commercial chemical toilets
	Desiccating	Urine diversion Commercial ecological sanitation toilets		
	Composting	Composting toilet Commercial composting toilets		
	Aquaprivy without flush	Aquaprivy Commercial aquaprivy toilets		
Wet sanitation (water flush)	Aquaprivy with low flush	Commercial aquaprivy toilets	Aquaprivy with digester and small bore sewer	Commercial aquaprivy system with standard small bore sewer to treatment ponds
	Flush toilet with septic tank and soak-away	Flush toilet with plastic or brick/concrete septic tank and soak-away	Flush toilet with septic tank and small bore sewer	Flush toilet with septic tank and standard small bore sewer
	Flush toilet with septic tank and on-site treatment of effluent	Flush toilet with septic tank and reed bed or commercial package treatment system	Flush toilet with shallow sewer system	Flush toilet with shallow sewer system to treatment plant
	Flush toilet with on-site treatment system	Flush toilet with commercial package treatment system	Flush toilet with conventional sewers	Flush toilet with conventional sewers to treatment plant

6. TYPICAL COSTS AND BUDGET CEILINGS FOR BASIC HOUSEHOLD SANITATION PROGRAMMES UNDER MIG

The Minister of Water Affairs and Forestry has specified limits for funding of basic sanitation under MIG including for waterborne sanitation where it is a basic service or part of the bucket eradication programmes. These costs are maximum costs and not average costs, and should only be approved under specially motivated circumstances. Under normal circumstances costs are expected to be 10 to 25% less than the ceiling costs. Municipalities must strive to maintain costs within the "typical maximum cost" envelope. For sanitation projects this is reflected as a unit cost per household.

Previously unit costs were given as a cost for a full sanitation system. This manual provides cost guidelines for the different components of latrines as well as the full system. This simplifies cost comparisons and budgeting, and enables authorities to evaluate cost differences of tenders in terms of individual components of the different sanitation specifications.

6.1 Typical, maximum and ceiling costs

The typical, maximum and ceiling costs for the different types of sanitation systems are as follows, with allowance for additional costs based on motivated circumstances and for annual inflation:

Sanitation Type	Typical Cost s per household						Maximum cost	Ceiling cost
	Super structure	Sub structure	Sewers	Treat-ment facility	Manage-ment and social	Total typical	No additional motivation	Requires motivation
VIP – fixed top structure – single pit	R2,300	R800			R750	R3,850	R4,000	R5,000
VIP – fixed top structure – double pit	R2,300	R1,000			R750	R4,050	R4,200	R5,000
VIP – movable top structure	R2,900	R600			R750	R4,250	R4,500	R5,000
Composting and Desiccating latrines	R2,500	R1,300			R750	R4,550	R5,000	R5,750
Wet on-site digesters (Aquaprivies)	R2,600	R1,050			R750	R4,400	R5,000	R5,750
Flush Latrines with Septic Tanks & Adsorption Trench	R3,000	R2,450			R850	R6,300	R6,800	R7,500
Flush Latrines with Septic Tanks & solids free sewer + Pond Treatment	R3,000	R1,900	R1,650	R1,600	R850	R9,000	R9,500	R12,600
Flush Latrines with Conventional Sewers and Biological Treatment	R3,000	R1,400 (on-site sewer)	R2,600	R3,600	R1,000	R11,600	R12,500	R14,500
Flush Latrines with Shallow Sewers and Biological Treatment	R3,000	R900 (on-site sewer)	R1,800	R3,600	R1,000	R10,300	R11,500	R14,500

Sanitation Type	Typical Cost s per household						Maximum cost	Ceiling cost
	Super structure	Sub structure	Sewers	Treat-ment facility	Manage-ment and social	Total typical	No additional motivation	Requires motivation
Flush Latrines with Waterborne Sewers to conservancy tank and Biological Treatment	R3,000	R900 (on-site sewer)	R1,800	R3,600	R750	R10,050	R10,500	R13,500

Notes:
1. Ceiling costs are the maximum that can be claimed from MIG with appropriate motivation.
2. Maximum costs are costs that can be claimed from MIG without additional motivation
3. Municipalities must strive to remain within the limits of the "typical costs".
4. These costs exclude VAT.
5. Costs for upgrading the water supply for flush latrines is not included in these costs, but must be taken account in planning and for the application for MIG funds.
6. Where tender costs are above the ceiling costs listed above, options for reducing costs must be considered, or additional motivations must be compiled and submitted to DWAF and DPLG, or top-up funding sought from other sources

The above costing is based on the component estimates given in sections 6.2 to 6.11 below. These costs include labour, material, fuel and plant, management fees, training and community liaison, but exclude VAT. Costs have been derived from actual costs reported on sanitation projects in the past, consideration of the bills of quantities, and allowing for escalation.

6.2 On-Site Hard Costs

6.2.1 Latrine Superstructure including pedestal (all sanitation technologies)

All sanitation types require a superstructure for housing the pedestal and providing privacy and protection from the weather.

The following typical costs apply to the different types of superstructure listed, all for a standard size of 0.9m x 1.2m (internal dimensions) as per SANS 10365-1:2004.

Superstructure type	Materials	Construction method	Costs per household		
			Typical	Materials	labour
Brick or block walls, corrug. iron roof	Bricks and cement blocks, mortar, pedestal	Small local builders/ contractors	R2,300	R1,700	R600
Archloo (plastered arch structure on timber and hessian frame), concrete floor slab	Plaster sand, cement, reinforcing frame, built in pedestal	Small local builders/ contractors	R1,800	R1,300	R500
Prefabricated fibre-cement panels, concrete floor slab	Prefabricated panels, pedestal	Factory fabrication of panels, local builders or contractors erect	R2,900	R2,700	R200
Other movable top structures (prefabricated concrete sections or complete structure)	Prefabricated concrete sections or full structure, pedestal	Factory fabrication of sections, specialised builders or contractors erect	R4,000	R3,800	R200

Note 1: materials includes delivery costs
Note 2: for low flush latrines additional costs of R200 for the water tank and R100 for sanitation plumbing may be incurred
Note 3: for full flush latrines addition costs of R500 for the water plumbing and R200 for sanitation plumbing may be incurred
Note 4: for desiccating latrines an additional cost of R200 for the specialised pedestal may be incurred
Note 5: where toilets are installed inside an existing house or structure, typical costs may be reduced by R1,000 to R1,500 or more.
Note 6: Superstructures for people with disabilities are dealt with in sections 8.1 and 8.2
Note 7: The option of local community based contractors manufacturing pre-cast slabs and wall panels has been practiced in some instances, and reduces the cost of prefabrication

6.2.2 Latrine Sub-structure (pit latrines, desiccating latrines, and aquaprivies)

The materials and costs of the sub-structure of on-site sanitation systems where wastes are deposited directly into a treatment chamber, including pit latrines, urine diversion latrines, desiccating latrines, composting latrines and aquaprivies, may be summarised as follows. Note that the assumption is that pits are partially or fully lined (for VIPs the pit lining is not sealed, but remains porous).

Sub-structure type	Materials	Construction method	Pit Configuration	Costs per household		
				Typical	Materials	labour
Pit with brick or block lining	Bricks or cement blocks, mortar	Small local builders/ contractors	Single pit	R 800	R550	R250
			Double pit	R1,000	R650	R350
Pit in firm ground with collar	Bricks or cement blocks, mortar	Small local builders/ contractors	Single pit	R 500	R300	R200
			Double pit	R700	R400	R300
Pit with plastered cylindrical structure with fibre or steel reinforced frame	Plaster sand, cement, reinforcing frame	Small local builders/ contractors	Single pit	R 500	R300	R200
			Double pit	Not applicable		
Pit with prefabricated fibre-cement panels	Prefabricated panels	Factory fabrication of panels, local builders or contractors erect	Single pit	R 750	R600	R150
			Double pit	R 900	R750	R150
Plastic or glass fibre tank (aquaprivies)	Prefabricated tank	Factory fabrication of tank, specialised builders or contractors install	Single pit	R 1,950	R1,800	R150
			Double pit	Not applicable		

Note 1: materials includes delivery costs
Note 2: for composting and desiccating latrines an additional cost of R300 may be incurred for the sub-structure requirements

Note 3: substructures for digesters are sealed with a cement plaster at an average additional cost of R200 (excluding pre-manufactured plastic tanks)
Note 4: Substructures installed in ground with difficult circumstances such as rock or high water table are dealt with in sections 8.1 and 8.2
Note 5: The option of local community based contractors manufacturing pre-cast slabs and wall panels has been practiced in some instances, and reduces the cost of prefabrication

6.2.3 Septic tanks separate from latrine structure (flush latrine with septic tanks)

The materials and costs of the sub-surface collection and treatment structure (septic tank) of sanitation systems where wastes are transported to a sub-surface treatment chamber separate from the toilet with water as carrier, may be summarised as follows:

Sub-surface structure type	Materials	Construction method	Costs per household		
			Typical	Materials	labour
Plastered brick constructed septic tank	Bricks or cement blocks with mortar & plaster, concrete cover, pipes	Small local builders/ contractors	R 1,900	R 900	R1,000
Reinforced concrete septic tank	Concrete, reinforcing steel, pipes	Small local builders/ contractors	R 2,100	R 1,000	R1,100
Plastic or glass fibre septic tank	Prefabricated plastic or glass fibre septic tank, pipes	Factory fabrication of tank, local builders or contractors install	R 2,500	R 2,100	R 400

Note 1: materials includes delivery costs
Note 2: installations in ground with difficult circumstances such as rock or high water table are dealt with in sections 8.1 and 8.2

6.2.4 Soak-away to dispose of septic tank effluent and/or grey water (aquaprivies, flush latrines with septic tanks and soak-away)

The material and costs of the sub-surface soak-away for the disposal of digester or septic tank effluent and/or grey water through soil drainage may be summarised as follows:

Sub-surface drain type	Materials	Construction method	Costs per household		
			Typical	Materials	labour
Double trench filled with rubble or stones, covered with scrap zinc or similar	Rubble or local stones, pipes	Small local builders/ contractors	R 450	R 150	R300
Double trench lined with geo-fabric filled with rubble or stones, covered with scrap zinc or similar	Geo-fabric, rubble or local stones, pipes	Small local builders/ contractors	R 550	R 250	R300

Sub-surface drain type	Materials	Construction method	Costs per household		
			Typical	Materials	labour
Grey water disposal pit	rock-filled pit with plastic or straw covering, pipe	Household or small local contractor	R 100	R 20	R 80

Note 1: materials includes delivery costs

Note 2: drains installed in ground with difficult circumstances such as rock or high water table are dealt with in sections 8.1 and 8.2

6.3 Off-Site Hard Costs

6.3.1 Off-site sanitation – erf connections

The material and costs of the on-site sewers and connections may be summarised as follows:

Sewer system	Materials	Construction method	Costs per household		
			Typical	Materials	Labour
Plastic pipelines with rodding eyes only for small bore sewer connection	63mm PVC or HDPE pipes, PVC rodding eye	Small local contractors + household labour	R 500	R 300	R 200
Plastic pipelines and inspection manhole for shallow sewer	110mm PVC pipes, concrete manhole at household connection	Small local contractors + household labour	R 900	R 500	R 400
Plastic pipelines with rodding eye and inspection manhole for conventional sewer	110mm PVC pipes, PVC rodding eye, concrete manhole at road connection	Small local contractors + household labour	R 1,400	R 800	R 600

Note 1: materials includes delivery costs
Note 2: pipelines installed in ground with difficult circumstances such as rock are dealt with in sections 8.1 and 8.2

6.3.2 Off-site sanitation internal sewer network – liquid effluent transported in solids-free sewer system to treatment plant (or connector sewer)

The material and costs of the internal solids-free sewers where liquid wastes only are transported to an off-site treatment facility (or connector sewer), may be summarised as follows:

Sewer system (small bore sewers)	Materials	Construction method	Costs per household		
			Typical	Materials and/or machinery	Labour
Plastic pipelines with rodding eyes only	63 to 110mm PVC or HDPE pipes, PVC rodding eyes	Main contractor, + small local contractors + community labour	R 900	R 600	R 300
Plastic pipelines with rodding eyes and manholes	63 to 110mm PVC or HDPE pipes, PVC rodding eyes, concrete manholes	Main contractor, + small local contractors + community labour	R 1,100	R 600	R 500

Note 1: materials includes delivery costs
Note 2: pipelines installed in ground with difficult circumstances such as rock or flat terrain are dealt with in sections 8.1 and 8.2
Note 3: where a conservancy tank is installed to collect the effluent, sewer costs are reduced by 50 to 75%.
Note 4: the cost basis is an average plot density of 30 dwellings per hectare, with an average internal sewer length of 12m per household.
Note 5: sewer costs for lower density settlements will increase proportional to the increase in the length of one side of the erf (e.g. at 15 dwellings per hectare the increase would be approximately 67%).

6.3.3 Off-site sanitation internal sewer network – all latrine wastes and grey water transported in sewer system to treatment plant (or connector sewer)

The material and costs of the conventional sewers where all wastes are transported to an off-site treatment facility or connector sewer with water as carrier, may be summarised as follows:

Sewer system	Materials	Construction method	Costs per household		
			Typical	Materials and machinery	Labour
Shallow sewer system connected to bulk sewers	110 to 250mm PVC or other material sewers, manholes	Main contractor + small local contractors + community labour	R 1,800	R1,000	R 800
Conventional sewer system connected to bulk sewers	PVC or other material sewers (min 110mm), manholes	Main contractor + small local contractors + community labour	R 2,600	R1,600	R1,000

Note 1: materials includes delivery costs
Note 2: pipelines installed in ground with difficult circumstances such as rock or flat terrain are dealt with in sections 8.1 and 8.2
Note 3: where a conservancy tank is installed to collect the effluent, sewer costs are reduced by 50 to 75%.
Note 4: the cost basis is an average plot density of 30 dwellings per hectare, with an average internal sewer length of 12m per household.
Note 5: sewer costs for lower density settlements will increase proportional to the increase in the length of one side of the erf (e.g. at 15 dwellings per hectare the increase would be approximately 67%).

6.3.4 Off-site sanitation bulk sewer network – all latrine wastes and grey water transported from internal sewers to treatment plant

The material and costs of the conventional sewers where all wastes are transported to an off-site treatment facility with water as carrier, may be summarised as follows:

Sewer system	Materials	Construction method	Costs per kilometre		
			Typical	Materials and machinery	Labour
Conventional sewer system connecting internal sewers to treatment plant	FC, concrete, PVC or other material sewers (min 160mm), manholes	Main contractor + small local contractors	R 350,000	R 320,000	R 30,000

Note 1: materials includes delivery costs
Note 2: pipelines installed in ground with difficult circumstances such as rock or flat terrain are dealt with in sections 8.1 and 8.2
Note 3: the cost basis is per kilometre, with an average pipe diameter of 250 mm at an average depth of 2.0 m.
Note 4: an average per household cost of R350 may be assumed as an initial "order of magnitude" estimate.
Note 5: Where installation requires crossing of major roads, water courses or other terrain obstructions, costs may be considerably higher.
Note 6: The requirement for pump stations and rising mains may increase costs by an average of R400 and R200 per household respectively.

6.3.5 Off-site sewage treatment works

The material and costs of the treatment works is dependent on a large number of factors requiring a comprehensive feasibility study. However the following estimates may be used to aid an initial cost estimate for sewage treatment works:

STANDARD CAPITAL COST ALGORITHM FOR SEWAGE TREATMENT WORKS

Factor	***Capital cost***
Total construction costs (TCC) Equipment cost (EC) Installation Piping Instrumentation and controls	 Technology-specific cost 25 to 55 per cent of EC 31 to 66 per cent of EC 6 to 30 per cent of EC
Total indirect cost (TIC) Engineering Contingency	 15 per cent of TCC 15 per cent of TCC
Total capital cost	TCC + TIC

The following "order of magnitude" costs have been estimated for different types of sewage treatment plants, based on a medium community size (20,000 people).

Treatment system	**Components**	**Construction method**	**Costs per Mℓ/day**		
			Typical	**Materials & machinery**	**Labour**
Oxidation ponds	Primary and secondary ponds	Main contractor + small local contractors	R 2.0m R1,600/hh	R 1.5m	R 0.5m
Anaerobic pond with maturation ponds	Primary anaerobic pond with secondary maturation ponds	Main contractor + small local contractors	R 2.5m R2,000/hh	R 1.8m	R 0.7m
Activated sludge without biological P removal	Primary settling, Aerated reactor with sludge return from secondary settlers	Main contractor + electrical and mechanical contractors	R 4.5m R3,600/hh		
Activated sludge with biological P removal	Primary settling, Anaerobic and anoxic reactors followed by aerobic reactor and sludge return	Main contractor + electrical and mechanical contractors	R 5.0m R4,000/hh		
Trickling bio-filters	Primary settling, Biofilters with sludge and effluent return	Main contractor + electrical and mechanical contractors	R 4.5m R3,600/hh		
Rotating biological contactors (RBCs)	Primary settling, Biological contactors	Main contractor + electrical and mechanical contractors	R 4.5m R3,600/hh		

Note 1: all plants are assumed to have inlet screens and grit removal

Note 2: activated sludge, bio-filters and RBCs have primary and secondary settling as well as sludge digesters, sludge drying beds and effluent chlorination
Note 3: for plants treating only solids free effluent, savings of R1,000 or more per household may be realised.
Note 4: where existing plants are to be upgraded to accept the additional load, costs per Ml may often be greater than for a new plant by up to 50%.
Note 5: where additional treatment stages are required (e.g. denitrification, filtration, sludge thickening, sludge disposal), concomitant additional costs will be incurred.

6.3.6 Conservancy tank

The material and costs of the conservancy tank may be summarised as follows:

Conservancy tank	Materials	Construction method	Costs		
			Typical	Materials and machinery	Labour
Plastered brick constructed conservancy tank	PVC or other sewers (min 110mm), manholes, concrete, reinforcing steel, biological treatment plant	Main contractor + small local contractors	R 1,300	R800	R 500
Reinforced concrete conservancy tank	PVC or other sewers (min 110mm), manholes, concrete, reinforcing steel, biological treatment plant	Main contractor + small local contractors	R 1,300	R600	R700

Note 1: materials includes delivery costs
Note 2: conservancy tanks installed in ground with difficult circumstances such as rock or high water table are dealt with in sections 8.1 and 8.2

6.4 Summary of Capital Costs – On-site sanitation components

SUPERSTRUCTURE OPTIONS				
	dry sanitation	**low flush**	**full flush**	**disabled toilets**
Typical costs	**R 2,300**	**R 2,600**	**R 3,000**	
Brick or block walls, corrug. iron roof	R 2,300	R 2,600	R 3,000	+ R700
Archloo	R 1,800	R 2,100	R 2,500	not applicable
Prefabricated fibre-cement panels	R 2,900	R 3,200	R 3,600	+ R700
Prefabricated concrete panels or complete structure	R 4,000	R 4,300	R 4,700	+ R700

SUB-STRUCTURE OPTIONS				
	dry sanitation		**low flush**	**difficult ground conditions**
	Single pit	**Double pit**		
Typical costs	**R 800**	**R1,000**	**R 1,200**	
Pit with brick or block lining	R 800	R 1,000	R 1,050	+ R250
Pit with brick or block collar	R 500	R 700		
Pit with plastered cylindrical structure with fibre or steel reinforced frame	R 500	N/A	R 750	+ R250
Pit with prefabricated fibre-cement panels	R 750	R 900	R 1,000	+ R250
Plastic or glass fibre tank	N/A		R 2,000	+ R250

ON-SITE SEPTIC TANK				
	Septic tank	**difficult ground conditions**		
Typical costs	**R 2,100**			
Plastered brick constructed septic tank	R 1,900	+ R250		
Reinforced concrete septic tank	R 2,100	+ R250		
Plastic or fibre glass septic tank	R 2,500	+ R250		

ON-SITE SOAK-AWAY			
	Grey water disposal pit	**Soak-away**	**difficult ground conditions**
Typical costs	**R 100**	**R 550**	
Double trench filled with rubble or stones, covered with scrap zinc or similar		R 450	+ R100
Double trench lined with geo-fabric filled with rubble or stones, covered with scrap zinc or similar		R 550	+ R100
Single pit filled with stones, covered with plastic or straw	R 100		

6.5 Summary of Capital Costs – Off-site sanitation components

ON-SITE ERF CONNECTIONS		
	Erf connection	**difficult ground conditions**
Typical costs	**R 1,400**	
Plastic pipelines with rodding eyes only for small bore sewer connection	R 500	+ R50
Plastic pipelines and inspection manhole for shallow sewer	R 900	+ R50
Plastic pipelines with rodding eye and inspection manhole for conventional sewer	R 1,400	+ R50

INTERNAL SEWERS			
		difficult ground conditions	**Pump station**
Typical costs	**R 2,600**		
Small bore sewer pipelines with rodding eyes only	R 900	+ R100	+ R100
Small bore sewer pipelines with rodding eyes and manholes	R 1,100	+ R100	+ R100
Shallow sewer system connected to bulk sewers	R 1,800	+ R150	+ R350
Conventional sewer system connected to bulk sewers	R 2,600	+ R250	+ R350

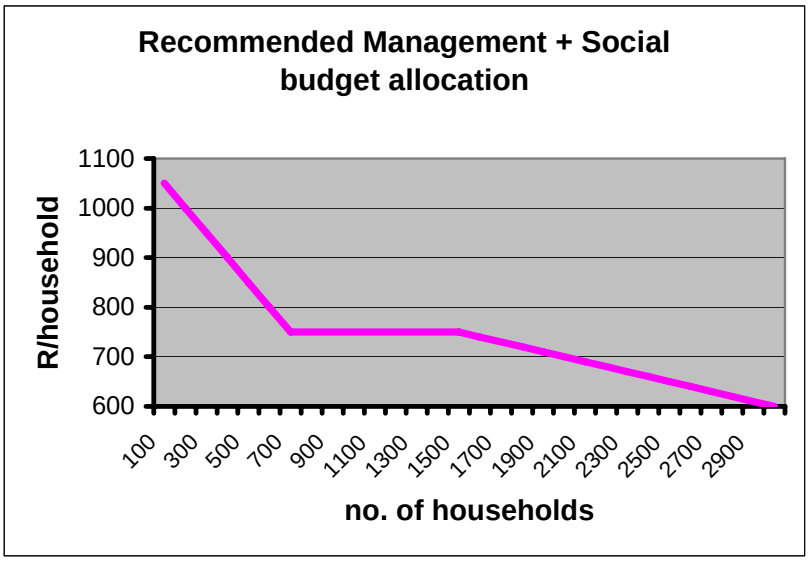
WASTE WATER TREATMENT		
	Treatment plant	**Upgrading surcharge**
Typical costs	**R 3,000**	**+ R 1,500**
Oxidation ponds	R 1,600	+ R 800
Anaerobic pond with oxidation ponds	R 2,000	+ R 1,000
Activated sludge without biological P removal	R 3,600	+ R 1,800
Activated sludge with biological P removal	R 4,000	+ R 2,000
Trickling bio-filters	R 3,600	+ R 1,800
Rotating biological contactors (RBCs)	R 3,600	+ R 1,800

BULK SEWERS (costs per km)			
	Bulk sewers	**difficult ground conditions**	**Pump station + rising main**
Typical costs	**R 350,000**		
Bulk sewers	R 250,000	**+ R 32,000**	+ R400 + R200 / hh

CONSERVANCY TANK		
	Conservancy tank	**difficult ground conditions**
Typical costs	R 1,300	
Plastered brick constructed conservancy tank	R 1,300	+ R100
Reinforced concrete conservancy tank	R 1,300	+ R100

7. SOCIAL FACILITATION AND PROJECT MANAGEMENT

The social and project management allocation for the provision of basic sanitation facilities is fixed at R750 per household, but should be increased proportionately up to R1,050 per household for small communities of less than 700 households. This increase is indicated on the chart below, derived on the basis of an R50/hh increase for each 100 households less than 700. The allocation should also be reduced for wards with a larger number of households than 1,500. A suggested reduction of R10/hh for every 100 households above 1,500 is proposed.



Notes:

a. More complex sanitation technologies will give rise to higher project management costs. The suggested increases are indicated under each technology above.

b. Local conditions must be considered when setting budgets, but for standard conditions social facilitation and project management costs should not be escalated by more than 20% of the recommended rates.

c. Where complex civil engineering works (i.e works requiring significant design and project management such as biological wastewater treatment works, bulk sewers and sewerage pump stations) are required, standard civil engineering procedures, fee structures, and contracting apply as set out by the South African Council of Professional Engineers, where fees are often based on a percentage of capital cost basis (see also appendices B and D).

d. The number of households is for the entire project and not for any specific financial year.

8. TYPICAL CONDITIONS WHERE BUDGET INCREASES FOR CAPITAL EXPENDITURE MAY BE CONSIDERED

8.1 Rural Projects (on-site sanitation schemes)

There are circumstances where budget increases may be warranted that will not prejudice other sanitation projects in the region that are operating within the budget. These are as follows:

a. Projects that experience difficult ground conditions (hard rock, collapsible sands, high water table, …) [the following extract from the DWAF guidelines on "On-site sanitation with difficult technical circumstances" may be used to estimate additional budget needs.]

Table 8.1 Typical Response to Difficult Ground Conditions on on-site sanitation projects

Situation	Option	Typical Response
Weak or collapsible soils	Strengthen pit lining to take full weight of slab and superstructure	Up to R150/latrine may be granted.
	Decrease pit depth but increase width	Up to R200/latrine may be granted.
	Use circular pits with suitable lining to prevent internal collapse	Costs to be covered within existing budget.
	Use ecological sanitation option	Costs to be covered within existing budget for ecological sanitation latrines, or up to R350/latrine may be granted for individual households subject to such soils on VIP projects.
Unpickable ground	Raise the pit partly above ground with the above ground portion fully lined and sealed	Up to R250/latrine may be granted.
	Decrease pit depth but increase width (as double pit if required)	Up to R250/latrine may be granted.
	Use ecological sanitation option	Costs to be covered within existing budget for ecological sanitation latrines, or up to R350/latrine may be granted for individual households subject to such ground on VIP projects.
High Groundwater Table	Install a fine sand filter on the base and sides of the pit, or line with geo-textile	Up to R150/latrine may be granted.
	Raise the pit partly above ground with the above ground portion fully lined and sealed	Up to R250/latrine may be granted.
	Use ecological sanitation option	Costs to be covered within existing budget for ecological sanitation latrines, or up to R350/latrine may be granted for individual households where the high groundwater level is experienced on VIP projects.
Potential pollution of groundwater resources	Move or install water abstraction points sufficiently far from pollution sources	A single grant that covers the cost of moving the borehole may be granted

Situation	Option	Typical Response
	Increase path length to groundwater table by shallower pits, raised pits or partially sealed pits as described in options for high water table above	Costs to be covered within existing budget, or up to R350/latrine may be granted for individual households close to the groundwater abstraction point.
	Use ecological sanitation option	Costs to be covered within existing budget for ecological sanitation latrines, or up to R350/latrine may be granted for individual households close to the groundwater abstraction point on VIP projects.
Potential spread of disease through mosquito vectors	Screen all openings to pit and prevent pooling of waste water with appropriate drains	Up to R200/latrine may be granted.
Potential spread of disease through surface water pooling or contamination	Install household level soak trench or reed bed treatment system	Up to R300/household may be granted.

b. Latrines constructed for persons with physical disabilities. [the following extract from the DWAF guidelines on "Sanitation facilities for people with disabilities" may be used to estimate additional budget needs]

Table 8.2 Typical Response to special facilities for people with disabilities

Additional Requirement	New Toilets	Modification of Existing Toilets	Budget Recommendation
1. Floor space for wheel chairs	Increase size of floor and superstructure by approximately 50%	Breakdown walls and rebuild floor, walls and roof to increase size of floor and superstructure by approximately 50%	New toilets – increase budget by R500 Existing toilets – provide budget of R750
2. Door and entrance features	Additional handle on door	Change to outward opening door + add handles or rope	New toilets – increase budget by R50 Existing toilets – provide budget of R150
3. Pedestal and grab bars	Install grab bars	Install grab bars	New toilets – increase budget by R100 Existing toilets – provide budget of R100
4. Operating devices	Install standard features so as to be accessible	Install standard features so as to be accessible	No additional budget required
5. Urinals (schools)	Install grab bars at one side of urinal	Install grab bars at one side of urinal	New toilets – increase budget by R100 Existing toilets – provide budget of R100

Additional Requirement	New Toilets	Modification of Existing Toilets	Budget Recommendation
6. Toilet structure (for partially sighted users)	Install large screened windows and paint in bright contrasting colours	If required break down part of wall and install large screened windows + paint in bright colours	New toilets – increase budget by R50 Existing toilets – provide budget of up to R350
7. Access path from house	Compact and pave path from house to toilet	Compact and pave path from house to toilet	New toilets – increase budget by R40 per 10m Existing toilets – provide budget of R40 per 10m

c. Where one project covers more than one ward (communities are grouped in order to make up sufficient households). In this case the additional social facilitation and project management costs associated with setting up separate project steering committees, travel between villages, additional storage facilities for materials, etc. should be accounted for within the social and management budgets. Guideline figures are given in appendix A.

d. Where wards are very remote with long distances from main centres and material suppliers. Efforts should be made to localise as many of the activities as possible (local manufacturing of materials, local management, etc), with a budget allowance to accommodate associated additional costs. Guideline figures are given in appendix A.

e. Where no suitably qualified or experienced Implementing Agents (IA's) or Project Agents PA's) exist, it may be necessary to use an experience agent from another region to mentor inexperienced local agents. This may require a budget adjustment. Guideline figures are given in appendix A.

f. Where special measures need to be taken to provide additional security for materials, tools and monthly payment of workers. Guideline figures are given in appendix A.

Note that the maximum variation permissible under MIG is R 1,000 per household

8.2 Projects in Urban and Dense Settlements (incl. off--site sanitation schemes)

There are circumstances where budget increases may be warranted that will not prejudice other sanitation projects in the region that are operating within the budget. These are as follows:

a. Projects that experience difficult ground conditions (hard rock, collapsible sands, high water table, …) [the following extract from the DWAF guidelines on "On-site sanitation with difficult technical circumstances" may be used to estimate additional budget needs.

Table 8.3 Typical Response to Difficult Ground Conditions on off-site sanitation projects

Situation	Option	Typical Response
Weak or collapsible soils	Shoring may be required in deeper pipeline trenches	Up to R150/household may be granted.
Unpickable ground	Mechanical equipment may be required to support the digging of trenches	Up to R250/household may be granted.
Very hilly terrain	Pipelines must lake longer routes to follow contours and/or inverted siphons and pump stations are required	Technical report and design report will give details of requirements. Bulk sewer pipeline costs may increase by up to R20,000 per kilometer
Very flat terrain	Pipelines and manholes need to be deeper in order to get sufficient slope. Pump stations may also be required.	Technical report and design report will give details of requirements. Internal and bulk sewer pipeline costs may increase by up to R1,000/hh for conventional internal sewers and R32,000 per kilometer for bulk sewers
Local material unsuitable for pipe bedding	Import pipe bedding material	Up to R70/household may be granted
High Groundwater Table	Dewatering pumps may be required during trench digging and pipelaying	Up to R30/household may be granted.
High density small plots (where pits cannot be moved or emptied)	Use shallow sewer system within settlement	No additional budget is required.
Potential pollution of groundwater resources	Move manholes to at least 80m from groundwater abstraction points	No additional budget is required.

b. Latrines constructed for persons with physical disabilities. [see item b. in section 7.1 above]

c. Where sewers are to be connected to bulk sewer lines some distance away from the settlement requiring difficult excavations and/or additional pump stations. Technical report and design report will give details of requirements.

d. Where additional manholes are required due to frequent changes in the horizontal alignment of sewers (or other reasons). Technical report and design report will give details of requirements.

e. Where wards are very remote with long distances from main centres and material suppliers. Efforts should be made to localise as many of the activities as possible (local manufacturing of materials, local management, etc), with a budget allowance to accommodate associated additional costs. Guideline figures are given in appendix A.

f. Where no suitably qualified or experienced Implementing Agents (IA's) or Project Agents PA's) exist, it may be necessary to use an experience agent from another region to mentor inexperienced local agents. This may require a budget adjustment. Guideline figures are given in appendix A.

g. Where special measures need to be taken to provide additional security for materials, tools and monthly payment of workers. Guideline figures are given in appendix A.

h. Where there are large differences in the cost basis between provinces (e.g. Northern Cape may experience much higher material and labour costs)

Note that the maximum variation permissible under MIG is R 4,000 per household for waterborne sanitation schemes.

9. STEPS THAT CAN BE TAKEN TO REDUCE COSTS

9.1 Rural projects (on-site sanitation schemes)

Experience has shown that there are a number of ways to reduce costs on a project for basic household sanitation within wards. These include the following:

a. Local manufacture of materials and centralised supply options need to be assessed for both cost effectiveness and quality. Although local supply is desirable, this may not always be feasible or cost effective.

b. Integrating the health and hygiene education programme with the activities of the municipal health services and district health.

c. Appointment of a single project agent that has both technical and social skills rather than two separate agents (NGO's often meet this criteria).

d. Structuring the project to employ more local people, including management tasks like quality assurance, bookkeeping and stores control, with project agents then providing a mentorship role rather than doing the work themselves.

e. Using specialised building teams – i.e. separate teams for pit lining, slab construction and placement, superstructure, and carpentry. With a well-coordinated project this construction approach is highly efficient.

f. Upgrading of existing structures and facilities (where feasible) instead of providing additional new facilities.

g. Group wards/communities that are in close proximity to each other under one project footprint

h. Bulk purchasing of materials for many projects at a time

i. Projects plan to provide services to 100% of the households rather than breaking the project up into phases

9.2 Projects in Urban and Peri-urban Areas (incl. off-site sanitation schemes)

Experience has shown that there are a number of ways to reduce costs on a project for basic household sanitation within wards. These include the following:

a. Adoption of "simplified sewage" design principles within the settlement area (shallow sewers)

b. Local manufacture of materials and centralised supply options need to be assessed for both cost effectiveness and quality. Although local supply is desirable, this may not always be feasible or cost effective.

c. Integrating the health and hygiene education programme with the activities of the municipal health services and district health.

d. Structuring the project to employ more local people, including management tasks like quality assurance, bookkeeping and stores control, with project agents then providing a mentorship role rather than doing the work themselves.

e. Using specialised building teams – i.e. separate teams for pit lining, slab construction and placement, superstructure, carpentry, pipe laying and manholes. With a well-coordinated project this construction approach is highly efficient.

f. Upgrading of existing structures and facilities (where feasible) instead of providing additional new facilities.

10. OPERATION AND MAINTENANCE AND LIFETIME COSTS

The operation and maintenance costs of the different types of latrine are an important consideration when costing sanitation systems. Knowing both the capital and the ongoing O&M costs enables a more realistic economic comparison to be made between sanitation systems. Note that MIG does not fund O&M costs, but these are funded from tariffs, equitable share, and other cross subsidies within municipalities. The tables in this section give the typical capital costs, annual O&M costs, and a net present value for each sanitation system. The net present value is an indication of the sum of the capital cost depreciated over the lifetime of the structure, and the annual equivalent O&M cost.

Sanitation System	Typical Capital Cost	Typical O&M Cost R/annum	Net Present Annual Cost*	Comments
VIP – fixed structure	R3,850	R120	R 512	Assuming pits emptied every 8 years
VIP – fixed top structure – double pit	R 4,050	R 80	R 493	Assuming households empty one pit every 1.5 years
VIP – movable structure	R 4,250	R 80	R 513	Assuming top structure moved every 10 years
Composting and desiccating latrines	R4,550	R 50	R 513	Assuming pits emptied manually every 2 years
Wet on-site digesters (Aquaprivies)	R4,400	R250	R 698	Assuming tanks desludged every 3 years
Flush Latrines with Septic Tanks & Adsorption Trench	R6,300	R250	R 892	Assuming tanks desludged every 3 years
Flush Latrines with Septic Tanks & solids free sewer + Pond Treatment	R9,000	R450	R 1,367	Assuming tanks desludged every 3 years, and simple oxidation pond treatment
Flush Latrines with Waterborne Sewers and Biological Treatment	R11,600	R800	R 1,981	Assuming municipality responsible for all off-site O&M.
Flush Latrines with Shallow Sewers and Biological Treatment	R 10,300	R700	R 1,749	Assuming block households maintain sewer section passing through block
Flush Latrines with Waterborne Sewers to conservancy tank and Biological Treatment	R10,050	R10,400	R 11,424	Assuming conservancy tank emptied weekly.

*Net present annual cost is based on 8% interest over 20 years for on-site sanitation systems, and 8% interest over 30 years for off-site sanitation systems.

Note that O&M costs are what the municipality will have to budget. Households are responsible for maintenance of the on-site component of the facility, but the municipality supports the emptying of pits and desludging of tanks.

11. ANNUAL COSTING UPDATES

The typical and ceiling costs will be updated annually in line with the civil engineering indices as published by STATSSA and projected minimum wage rates. The projected annual increases based on an annual inflation of 8% are as follows:

Sanitation Type	Ceiling cost	Typical cost	Ceiling cost	Typical cost	Ceiling cost	Typical cost
	2007-2008		2008-2009		2009-2010	
VIP – fixed top structure – single pit	R 5,000	R 3,850	R 5,400	R 4,158	R 5,832	R 4,491
VIP – fixed top structure – double pit	R 5,000	R 4,050	R 5,400	R 4,374	R 5,832	R 4,724
VIP – movable top structure	R 5,000	R 4,250	R 5,400	R 4,590	R 5,832	R 4,957
Composting and Desiccating latrines	R 5,750	R 4,550	R 6,210	R 4,914	R 6,707	R 5,307
Wet on-site digesters (Aquaprivies)	R 5,750	R 4,400	R 6,210	R 4,752	R 6,707	R 5,132
Flush Latrines with Septic Tanks & Adsorption Trench	R 7,500	R 6,300	R 8,100	R 6,804	R 8,748	R 7,348
Flush Latrines with Septic Tanks & solids free sewer + Pond Treatment	R 12,600	R 9,000	R 13,608	R 9,720	R 14,697	R 10,498
Flush Latrines with Conventional Sewers and Biological Treatment	R 14,500	R 11,600	R 15,660	R 12,528	R 16,913	R 13,530
Flush Latrines with Shallow Sewers and Biological Treatment	R 14,500	R 10,300	R 15,660	R 11,124	R 16,913	R 12,014
Flush Latrines with Waterborne Sewers to conservancy tank and Biological Treatment	R 13,500	R 10,050	R 14,580	R 10,854	R 15,746	R 11,722

12. CONCLUSIONS

The sanitation component of the MIG programme will result in significant budget allocations in most municipalities over the next four years. It is imperative that costs be contained within limits if this programme is to achieve the targeted 2010 coverage of all households, and ensure that ongoing O&M costs are affordable to households, institutions and municipalities.

This guideline sets out typical, maximum and ceiling costs for budget allocations for basic household sanitation projects. Local authorities are strongly encouraged to work within the maximum amounts.

It should be noted that the Department of Water Affairs and Forestry in collaboration with SALGA and the Department of Provincial and Local Government will undertake an ongoing monitoring and audit process to identify best practices and learn lessons from municipalities implementing successful sanitation projects. These will be documented and disseminated to local authorities with the aim of continuously improving how projects are implemented and the effective use of budgets. Municipalities are thus encouraged to inform the national or provincial offices of these institutions of their successes and/or difficulties. Case studies that are carried out at the local level should also be shared more widely through SALGA, DWAF, WIN and dplg.

APPENDIX A

Management and Social Facilitation Requirements

The budget is comprised of four main components: materials, labour, social facilitation and management. The costing for social facilitation (including training) and management is set out below based on a project of 1,000 households.

A.1 Health and Hygiene Education

Health and hygiene education is budgeted as follows:

H&H Ed Component	Inputs	Costs
PHAST	Facilitators + materials	R 35,000
CHW's and follow-up	CHW's + 6 visits	R 45,000 (1 year)
Special campaigns	WASH + school	R 25,000
Sub-Total		**R 105,000**
VAT		**R 14,700**
TOTAL		**R 120,000**

Note that variations are discussed in appendix B

A.2 Training of Builders and Material Suppliers

Training Component	Inputs	Costs
Builders	Accredited practical training	R 60,000
Material suppliers	Practical + basic entrepreneurial training	R 50,000
Committee	Bookkeeping, admin, etc.	R 15,000
Sub-Total		**R 125,000**
VAT		**R 17,500**
TOTAL		**R142,500**

Note that variations are discussed in appendix B

A.3 Social Facilitation and Mobilisation, and Project Steering Committee

Facilitation Component	Inputs	Costs
Demonstration toilets	3 toilets	R 30,000
Entry & Liaison		R 30,000
PSC establishment		R 15,000
PSC expenses		R 75,000
Sub-Total		**R 150,000**
VAT		**R 21,000**
TOTAL		**R 171,000**

Note that variations are discussed in appendix B

A.4 Expert Inputs

Component	Inputs	Costs
Groundwater Protocol*		R 40,000
Project Planning		R 60,000
Project Management		R 280,000
TOTAL		**R 380,000**

* It is assumed that the Groundwater Protocol study is undertaken for a group of communities within a ward as part of one study, with costs shared between the projects.

Note that variations are discussed in appendix B

Appendix B: Social Facilitation and Management Cost Variations

B.1 Health and Hygiene Education

Small Communities
The cost of R105,000 + VAT is viable for wards of approximately 1,000 households and larger. (This gives a unit cost of between R110 and R120 per household). For small communities, costs may need to be reduced to reduce the unit household cost. The following options to cut the costs may be considered:

i. Exclude any campaigns
ii. Delegating additional tasks to the EHO's
iii. Reduce follow-up to one CHW and visits by consultants
iv. Minimize PHAST programme to cover the essential aspects

Note that where such cost cutting will affect the impact of the health and hygiene education to a level considered ineffective, budget increases may need to be considered.

Remote communities
In more remote areas wards are small and located relatively long distances from main centres. In these situations the travel costs for external consultants may consume a larger portion of the budget than can be afforded. In these wards it may be possible to reduce costs further by not only including EHO's in the H&H programme, but also clinic sisters who will already have a good knowledge of the typical illnesses experienced within the wards. Budget increases may, however, still be required.

B.2 Training of Builders and Material Suppliers

Small Communities
A budget of R125,000 + VAT is proposed for training. As for H&H education, this is viable for wards of approximately 1,000 households and larger. (This gives a unit cost of between R140 and R150 per household). For small communities, it is not recommended that the training programme (which leads to longer term economic development of the community) be cut. However if funds do not permit, the following options may be considered:

i. Provide non-accredited but thorough hands-on training during the construction of demonstration toilets and/or the first month of construction using experienced builders (from neighbouring communities if required).
ii. Provide minimal training of material suppliers – only enhancing the skills of existing enterprises to ensure adequate quality.
iii. Where communities are small and located in remote areas, (often .100 households) and relatively long distances from main centres, it is recommended that joint training be undertaken for a few communities at a more central venue. It will be necessary to budget for the travel and accommodation costs of the trainees, but these should not be excessive.

Note that where such cost cutting will affect the effectiveness of the skills development to a level considered detrimental to the quality of construction, budget increases may need to be considered.

iv. Source additional funds for training and small enterprise development from the municipal LED budget or other sources.

Increased emphasis on Job Creation

Job creation remains a core strategy of government funded infrastructure programmes. In order to maximise job creation on sanitation projects, additional funds may be required for training. Where possible, funding the training should be undertaken jointly by the municipalities LED programme and the sanitation project. Where this cannot be realised, budget increases on the sanitation project may need to be considered.

B.3 Social Facilitation and Mobilisation, and Project Steering Committee

Small communities

The total proposed social facilitation costs are R150,000 + VAT. This is viable for wards of 1,000 households or more. For small communities grouping of projects is again recommended, but costs will not be able to be reduced substantially. Note that where such cost cutting will affect the level of participation such that it becomes ineffective, budget increases may need to be considered.

Note that experience has shown that projects with approximately 2000 households are the most cost effective.

B.4 Design and planning costs for large complex projects

Larger projects that include significant design components (e.g. difficult sewer layouts, pump stations, sewage treatment works) will require appropriate professional design not covered in the recommended management budget. In these cases the planning and design rates as set out by the Engineering Council of South African and their subsidiaries should be used as a guideline for fees (see appendix D).

B.5 Other Aspects

Procurement

The cost of procurement, as well as cost increases in the tenders submitted as compared to the costs of the technical report, may be substantial. Where possible, procurement costs could be funded from the municipality's own funds.

The tender submissions may mean substantial price increases beyond the MIG budget allowances. In these cases the municipality may be able to enter into a negotiation with the preferred bidder to manage costs downwards. DWAF personnel are available to support municipalities in such cases.

APPENDIX C

Bills of Quantities

	VIP Toilet					
Item No	**Description**	**Unit**	**Quantity**	**Rate**	**Amount**	**Comments**
A	**FOUNDATIONS AND PIT**					
	Site clearance:					
1	Clear area of site of all rubbish, debris, vegetation, hedges, shrubs and trees not exceeding 200mm girth, bush, etc including a minimum space around the structre of 3m.	m2	5			Owner's responsibility
	Excavation in soft material exceeding 2m deep and not exceeding 4m deep					
2	Pit	m3	3			
	Extra over trench and hole excavation in soft material for excavation in					
3	Intermediate material	m3	0.5			
4	Hard rock material	m3	0.5			
	Risk of collapse of excavations:					
5	Sides of trench and hole excavations exceeding 1,5m deep	m2	6			
	Keeping excavations free of water:					
6	Keeping excavations free of all water other than subterranean water	Item	1			
	UNREINFORCED CONCRETE CAST AGAINST EXCAVATED SURFACES					
7	Strip footings (20 MPa/19 mm concrete)	m3	1.2			
	VIBRATED REINFORCED CONCRETE					
8	1240 x 400 x 80mm Thick pit cover slab sections with bevelled top edges, reinforced with high tensile steel, two slabs with holes for either the vent pipe or the pedestal, and all external slabs fitted with four 10mm diameter x 650mm girth U-shaped high tensile steel lifting handles, bent to detail and cast in	m3	1.5			
	REINFORCEMENT					
9	High tensile steel Y12	1.2m	20			
	BRICKWORK IN Pit Linings					
10	One brick walls with seepage gaps every 3rd row	m2	14			
	Sub-Total : Carried Forward to Final Summary					
	SUPERSTRUCTURE					

	VIP Toilet					
Item No	**Description**	**Unit**	**Quantity**	**Rate**	**Amount**	**Comments**
	BRICKWORK IN SUPERSTRUCTURE					
	Brickwork of NFP bricks in class II mortar:					
11	One layer of approved 375 micron DPC embossed damp proof course:	m	7			
12	One brick walls	m2	15			
13	100 x 70mm Lintels	m	1.2			
14	150mm Wide brick reinforcement built in horizontally into joints of brickwork	m	30			
15	30 x 1,6mm Roof tie 1,6m long with one end fixed to timber and other end wrapped around two 6mm diameter x 110mm long mild steel reinforcing bars and built into brickwork	No	4			
16	Mortar bed on top of raking gable walls to form close joint with underside of roof sheeting	m2	0.3			
17	15mm Thick high density natural grey fibre cement cills cut to sized including galvanised lugs and fixing to brickwork	m	0.6			
	Sub-Total : Carried Forward to Final Summary					
	ROOF COVERINGS					
	PROFILED IRON SHEETING AND ACCESSORIES					
18	0.5mm galvanised iron currugated sheeting lapped at ends and sides and fixed to timber purlins	m	5			
	Sawn softwood:					
19	38 x 75mm Wall plates	m	2.4			
20	38 x 114mm Longitudinal rafters at a pitch not less than 10 degrees with 500mm overhang on either side	m	6.8			
21	50 x 76mm Purlins	m	4.2			
22	Two coats creosote on sawn roof timbers	m2	3.6			
23	2.5mm Diameter galvanised wire tie 2500mm girth bent double and wrapped around rafter and purlin with ends tied together and spiked to timber	No	5			
24	Galvanised two way hurricane clip	No	4			
25	3" timber nails	kg	0.2			
26	1" tacks (to attach hurricane clips)	kg	0.1			
27	75mm galvanised roof screws with rubber washers	No	32			
	FRAMED DOORS, ETC					
	Red meranti framed braced battened door with plywood veneer covering on both sides, hung to steel frames					
28	44mm x 813 x 2032mm high door	No	1			
29	Approved three lever lockset with striking plate fixed to metal	No	1			
30	Approved internal door latch	No	1			
31	1,2 mm Double rebated frames suitable for 110mm brick walls for door 613 x 2032 high	No	1			
	Sub-Total : Carried Forward to Final Summary					

	VIP Toilet					
Item No	**Description**	**Unit**	**Quantity**	**Rate**	**Amount**	**Comments**
	PLASTERING					
	SCREEDS					
32	3:1 Cement screeds on floor 23mm thick concrete steel trowel floated to a smooth finish	m2	2			
	INTERNAL PLASTER					
33	1:5 Cement plaster on walls	m2	15			
	Sub-Total : Carried Forward to Final Summary					
	SANITARY FITTINGS					
34	Roto moulded HDPE heavy duty pedestal with black safety dropper tube, and fixing in position in hole (hole elsewhere) in concrete slab complete with footpiece, funnel, plug, lifting handle, etc in accordance with SABS standard	No	1			
35	Wash hand basin complete with fittings, and fixing to wall with support wall brackets	No	1			
36	Unplasticised polyvinyl chloride (uPVC) waste and vent piping conforming to SABS 967 with solvent cement jointing 110mm pipe	m	3			
37	110mm Air vent cowl with fly screen	No	1			
	Sub-Total : Carried Forward to Final Summary					
	PAINTWORK					
	One coat primer, one undercoat and two coats acrylic on internal plaster walls	m2	7			
	One coat zink chromate primer and one coat undercoat and finish in two coats alkyd enamel paint on metal frames	m2	2			
	Prime under coat and two coats enamel on doors	m2	3.5			
	Sub-Total : Carried Forward to Final Summary					
	LABOUR COSTS					
1	**FOUNDATIONS and PIT**	day	2			
2	**Strip footings (foundations) and slabs**	day	2			
3	**MASONRY - pit lining**	day	3			
4	**Superstructure - walls**	day	4			
5	**ROOF, DOOR, WINDOW CILL**	day	1			
6	**PLASTERING, PLUMBING AND FINNISHING**	day	2			
	TOTAL OF BUILDING WORK (EXCLUDING VAT)					

APPENDIX D

Engineering Council Civil Engineering rates (2007)

Guideline Scope of Services and Tariff of Fees for Persons Registered in terms of the Engineering Profession Act, (Act No.46 of 2000)

BRIEF SUMMARY

1. GUIDELINE SCOPE OF SERVICES

1.1 Normal Services

1.1.1 *Report stage*

The preparation and submission of a report embodying preliminary proposals or feasibility studies and estimates of cost and time where appropriate for consideration by the client.

1.1.2 *Preliminary Design Stage*

Following the client's instructions to proceed with the development of preliminary proposals or the basic planning of the project.

1.1.3 *Design and Tender Stage*

Following the client's instructions to proceed with the preparation of all documents necessary to enable tenders for the works to be called for or for the works to be otherwise placed by the client.

1.1.4 *Working Drawing Stage*

Following the client's instructions to proceed, the preparation of any further plans, designs and drawings, excluding shop details, which may be necessary for the execution of the works**.**

1.1.5 *Construction Stage*

The overall contract administration and co-ordination, as well as construction monitoring of the execution of the works in accordance with the contract.

1.1.6 *Targeted Procurement*

(i) Should the client during any stage of the project**,** require the consulting engineer to perform work or services pertaining to targeted procurement.

1.2 Additional Services

1.2.1 *Additional Services pertaining to all Stages of the Project*

(1) Enquiries not directly concerned with the works and its subsequent utilisation.
(2) Valuation for purchase, sale or leasing of plant, equipment, material, systems, land or buildings or arranging for such valuation.
(3) Making arrangements for way leaves, servitudes or expropriations.
(4) Negotiating and arranging for the provision or diversion of services not forming part of the works**.**
(5) Additional work in obtaining the formal approval of the appropriate Government Departments or Public Authorities, including the making of such revisions as may be required as a result

of decisions of such Departments or Authorities arising out of changes in policy, undue delay, or other causes beyond the consulting engineer's control.

(6) Surveys, analyses, tests and site or foundation or other investigations, model tests, laboratory tests and analyses carried out on behalf of the client**.**

(7) Setting out or staking out the works and indicating any boundary beacons and other reference marks.

(8) Preparation of drawings for manufacture and installation or detailed checking of such for erection or installation fit.

(9) Detailed inspection, reviewing and checking of designs and drawings not prepared by the consulting engineer and submitted by any contractor or potential contractor as alternative to those embodied in tender or similar documents prepared by the consulting engineer.

(10) Inspection and testing, other than on site, of materials and plant, including inspection and testing during manufacture.

(11) Preparing and setting out particulars and calculations in a form required by any relevant authority.

(12) Abnormal additional services by or costs to the consulting engineer due to the failure of a contractor or others to perform their required duties adequately and timely.

(13) Executing or arranging for the periodic monitoring and adjustment of the works, after final handover and completion of construction and commissioning, in order to optimise or maintain proper functioning of any process or system.

(14) Investigating or reporting on tariffs or charges leviable by or to the client.

(15) Advance ordering or reservation of materials and obtaining licenses and permits.

(16) Preparing detailed operating, operation and maintenance manuals.

(17) Additional services, duties and/or work resulting from project scope changes, alterations and/or instructions by the client**,** or his duly authorized agents, requiring the consulting engineer to advice upon, review, adapt and/or alter his completed designs and/or any other documentation and/or change the scope of his services and/or duties. Such additional services are subject to agreement in writing between the consulting engineer and the client prior to the execution thereof.

(18) Exceptional arrangements, communication, facilitation and agreements with any stakeholders other than the client and contractors appointed for the works on which the consulting engineer provides services.

(19) Any other additional services, of whatever nature, specifically agreed to in writing between the consulting engineer and the client.

1.2.2 *Construction Monitoring*

If the construction monitoring, as set out in clause 1.1.5, is deemed to be insufficient by the consulting engineer**,** the consulting engineer may, with prior written approval having been obtained from the client, appoint or make available additional staff for such construction monitoring as are necessary to undertake additional construction monitoring on site to the extent specifically defined and agreed with the client. The functions in respect of additional construction monitoring are to be limited to detailed inspections and exclude those mentioned under clause 1.1.5.

1.2.3 *Occupational Health and Safety Act, 1993 (Act No.85 of 1993)*

Should the client require the consulting engineer to undertake duties falling under the Occupational Health and Safety Act, 1993 (Act No.85 of 1993) and the Construction Regulations in terms thereof, on behalf of the client, additional services may be required.

1.2.4 *Quality Assurance System*

Where the client requires that a quality management system or quality assurance services, over and above construction monitoring services, be applied to the project, these are in addition to normal services provided by the consulting engineer and to be specifically defined and separately agreed in writing prior to commencement thereof.

1.2.5 *Lead Consulting Engineer*

Should the client require the consulting engineer to assume the leadership of a joint venture, consortium or team of consulting engineers, of the same discipline, prescribed or requested by the client**,** additional services may be required.

1.2.6 *Principal Agent of the Client*

When a consulting engineer is, in addition to his normal functions as consulting engineer, appointed as the principal agent of the client on a project, the consulting engineer will have additional responsibilities and duties.

2. GUIDELINE TARIFF OF FEES

2.2 Fees for Normal Services

2.2.1 Civil and Structural Engineering Services pertaining to Engineering Projects

(1) The basic fee for normal services in the disciplines of civil and structural engineering, pertaining to Engineering Projects, is determined from the table below. The fee is the sum of the primary fee and the secondary fee applicable to the specific cost of the works in respect of which the services were rendered on the project excluding the report stage described in clause 1.1.1 which shall be reimbursed on a time basis.

Cost of the Works		Basis of Fee Calculation		
For projects up to R 366 000		A Lump Sum or on a Time Basis		
Where the cost of the works:		Primary Fee	Secondary fee	
Exceeds	But does not exceed			
R 366,000	R 993,000	R 45,750	12,5% on the balance over	R 366,000
R 993,000	R 4,964,000	R 124,130	10,0% on the balance over	R 993,000
R 4,964,000	R 18,549,000	R 521230	8,0% on the balance over	R 4,964,000
R 18,549,000	R 74,195,000	R 1,608,030	6,0% on the balance over	R 18,549,000
R 74,195,000	R 303,050,000	R 4,946,790	5,5% on the balance over	R 74,195,000
R 303,050,000		R 17,533,810	5,0% on the balance over	R 303,050,000

(2) The following additional fee shall be applicable to the value of the reinforced concrete and structural steel portions of the works, inclusive of the costs of concrete, reinforcing, formwork, structural steel work and any pro-rata preliminary and general amounts.

Cost of the Works		Basis of Fee Calculation		
For projects up to R 366 000		A Lump Sum or on a Time Basis		
Where the cost of the works:		Primary Fee	Secondary fee	
Exceeds	But does not exceed			
R 366,000	R 3,396,000	R 187,300	5,0% on the balance over	R 366,000
R 3,396,000	R 9,4875,000	R 169,800	4,0% on the balance over	R 3,396,000
R 9,875,000	R 33,440,000	R 428,960	2,65% on the balance over	R 9,875,000
R 33,440,000		R 1,053,430	1,65% on the balance over	R 33,440,000

(3) For normal services relating to a description of the works mentioned in the first column of the following table, the proportion of the basic fee relating to the specific item calculated in terms of clause 2.2.1 is multiplied by the category factor mentioned against that description in the second column of the table.

(4) These factors do not apply when fees are a lump sum or on a time basis.

Description of the Works	Factor by which basic fee is multiplied
Water and waste water treatment works	1,25
Services (Excluding roads) for existing informal settlements including roads and to reduced standards or supplies	1,25 to 1,50
Water and sanitation in rural areas	1,35
Alterations to existing works. (Only applicable to the fees on the portion or section of works affected)	1,25
Mass concrete foundations, brickwork and cladding designed and detailed by the consulting engineer (Only applicable to the design portion of the fees on such works)	0,33
Duplication of works (Only applicable to the design portion of the fees on duplicated works)	0,25
Targeted procurement (Additional fee based on the basic fees before the application of any of the other factors)	0, 07

3.2.9 Services provided partially or in Stages

(1) The following table shall be used for proportioning the basic fee for normal services over the various stages of the services:

Stage of Services	Percentage points for each stage
Civil: Engineering Projects: Preliminary design Design and tender Working drawings Construction Completion of all **consulting engineering** services	 30 30 15 20 5

3.3 Fees for Additional Services

(1) For the provision of a construction monitoring service, as contemplated in clause 2.2.2, the consulting engineer is entitled to recover from the client

(a) for monthly monitoring staff costs, the total annual cost of employment of such staff, divided by 12 and multiplied by 2 (actual time, site allowances paid separately)

[redacted]